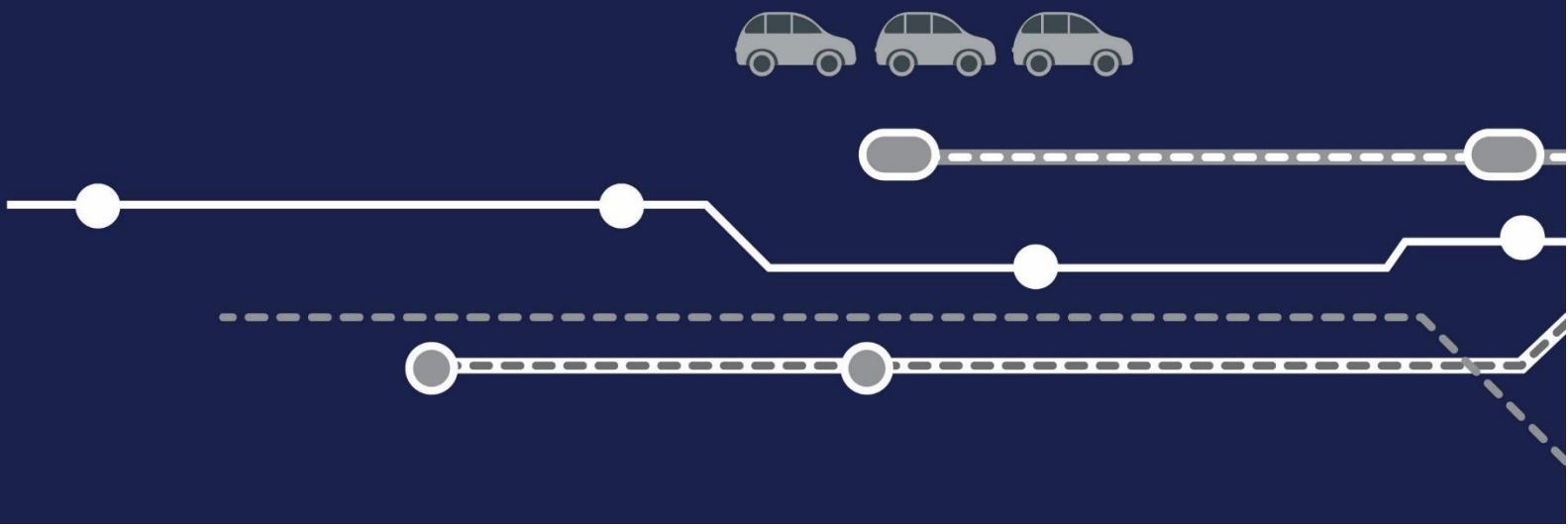
League City
TEXAS

LEAGUE CITY 2018
MASTER MOBILITY PLAN UPDATE

Executive Summary



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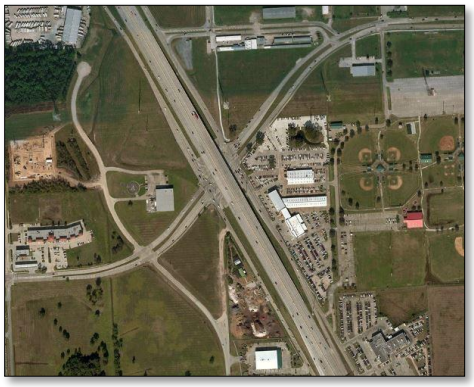
Purpose of the Plan



The purpose of the League City Master Mobility Plan Update is to retrofit the 2011 Master Mobility Plan with up-to-date travel demand model analyses and improve long-term transportation connectivity and access and create a more efficient framework for economic development. The Master Mobility Plan Document includes transportation policy, goals and objectives, and implementation strategies to guide the growth and development of the thoroughfare network. The Mobility Plan Map is the long-term illustration of the thoroughfare network with identified general alignments and rights-of-way for future preservation.

The League City Master Mobility Plan update was coordinated with other adopted city planning documents, as well as those from adjacent Cities and regional agencies. The plan identifies current deficiencies in the existing network and provides a guide for the development of a comprehensive citywide thoroughfare system. Because the Master Mobility Plan guides the preservation of rights-of-way needed for the development of long-range improvements, it has far-reaching implications on the growth and development of both developed and undeveloped areas.

As one of the most visible and permanent public investments for the city, it is critically important for the plan to align roadway and right-of-way needs for facility implementation and to maximize the potential for economic development. This long-term plan will be a catalyst for private development in the city and inform decisions on transportation infrastructure needs, maintenance, and facility placement. As development occurs, it becomes increasingly difficult to make changes to the thoroughfare network without significant cost and disruption.

By identifying and preserving rights-of-way along existing corridors and connecting planned developments, stakeholders can maximize the economic return on transportation investments. The plan considers current conditions, stakeholder input, City goals and objectives, H-GAC's Metropolitan Transportation Plan, and other input from TxDOT and regional and local agency documents.

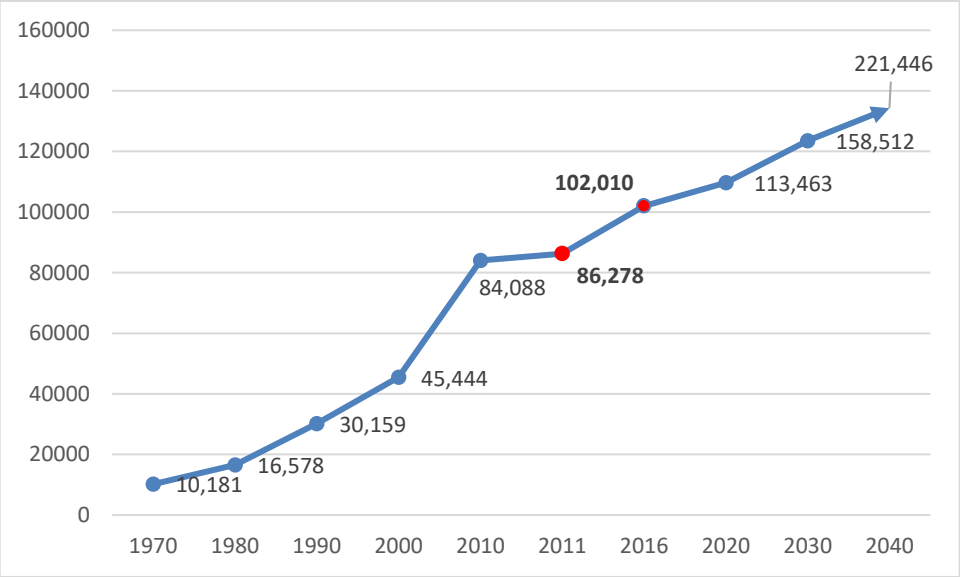
City Profile

League City is located in the southeast sector of the Houston-Woodlands-Sugarland metropolitan area. The city's population has dramatically increased in the past 30 years, growing from 30,000 in 1990 to over 100,000 in 2016; it is projected to more than double to over 220,000 residents by 2040.

Demographics

Figure 1 illustrates population growth from 2000 to 2040. Since adoption on the 2011 Master Mobility Plan, forecasted population has increased 18 percent. More importantly, since 2010 the city's population has increased nearly twice as fast as the county and the region as a whole.

Figure 1. League City Population Projection



Source: 2010 Census and FNI Calculations

Table 1. League City and the Region Population Growth Comparison

Location	2000 Census	2006 Estimate	2010 Census	2016 Estimate	2010-2016 Growth
League City	47,406	64,097	83,471	102,010	22%
Galveston County	250,155	278,865	291,309	322,054	11%
Harris County	3,400,577	3,855,800	4,092,459	4,555,625	11%
Houston MSA	4,669,545	5,434,389	5,891,999	6,647,828	12%

Source: US Census, American Community Survey, PCensus, CDS Community Development Strategies

Plan Input

Town Hall Meeting

A town hall meeting to glean input on the initial draft of the Master Mobility Plan was held on January 11, 2018. Residents provided feedback on the plan recommendations including the draft mobility plan map, roadway alignments, functional classifications, and associated right-of way designations throughout the city. Approximately 50 persons attended and heard an overview presentation followed by break-out sessions to receive public comment.

Key feedback/ concerns included:

- Landing Extension
- Palomino Bridge/ Roadway Improvements
- Main Street Congestion
- Southwest League City Network Additions

League City Staff Input

League City staff provided input and feedback throughout the planning process, providing guidance on network and demographic amendments, transportation issues and needs, and proposed development plans throughout the city. Staff Input meetings were held with League City staff between November 2016 and April 2017 and included guidance on inputs to the travel demand model, new and amended roadway alignments, and planned developments within the city. In addition to the meetings, various conference calls were had throughout the planning process to ensure plan recommendations were in alignment with League City's long-term vision.

League City Transportation and Infrastructure Committee

A meeting was also held with the League City Transportation and Infrastructure Committee to gather input on the plan approach, preliminary recommendations, initial travel demand model results, and overall transportation system connectivity.

Key feedback/ concerns included:

- Main Street Congestion
- Base 2015 and 2040 Projected Volumes and Level-of-Service
- Critical Intersections

Chapter 2: Goals and Objectives

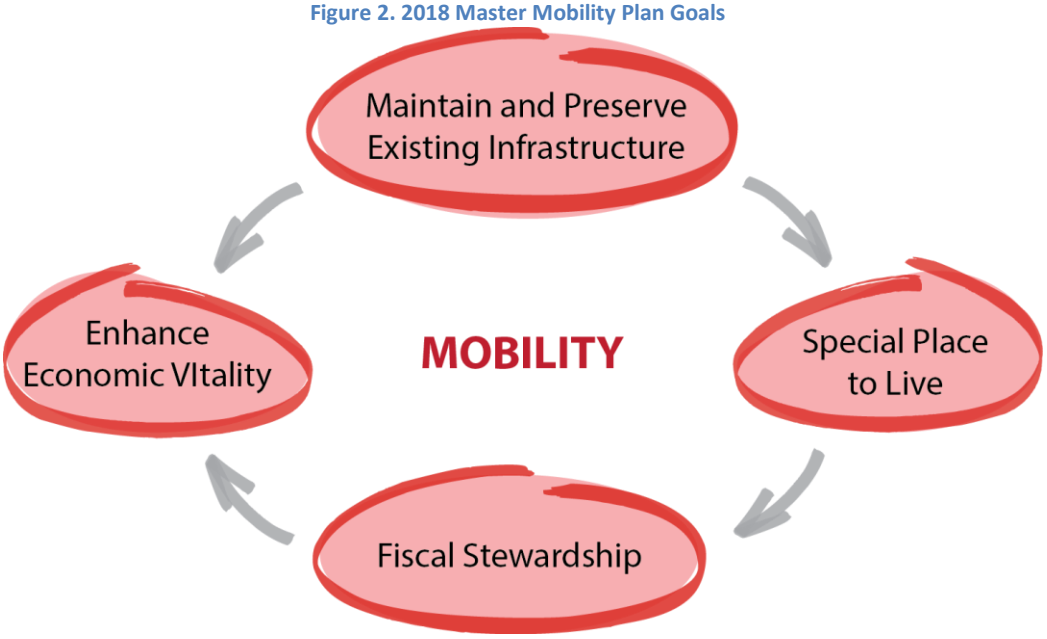
Objectives

- **S**pecific
- **M**easurable
- **A**chievable
- **R**elevant
- **T**ime Oriented

The Goals and Objectives section of a Mobility Plan reflects the ideology and aspirations that a city desires of its transportation system. Goals are philosophical in nature and serve as a vision of what transportation should be in the future. The objectives discussed in this section are action oriented and are intended to create the framework for specific strategies to achieve the stated goals. Objectives should be: **S**pecific, **M**easurable, **A**chievable, **R**elevant, and **T**imely.

The goals and objectives for the League City Master Mobility Plan Update were adopted from the guiding principles developed for the 2011 plan, and refined and redeveloped under the umbrella of the following categories: Mobility, Preservation and Maintenance of Existing Infrastructure, Enhance Economic Vitality, Fiscal Stewardship, and Special Place to Live. The 2011 guiding prnciples, listed below, reflect the city's longterm mobility vision.

Figure 2. 2018 Master Mobility Plan Goals



2011 League City Master Mobility Plan Guiding Principles

- Effieciently and safely move people and goods
- Connects destinations
- Offers travel options
- Respects and enhances context and character
- Adds to community marketability

Key Issues and Existing Conditions

Mobility and Connectivity Issues

Mobility is one of the most important goals of a transportation plan. The ability of commuters to safely and efficiently travel between destinations is not only a transportation issue, but a quality of life issue as well. Important transportation measures, such as vehicle miles traveled (VMT) or hours of congestions delay, not only indicate congestion levels, but how much time it takes commuters to get to work or family activities. The following section summarizes mobility and congestion issues within League City.

Safety Issues

High Collision Areas

The number of annual traffic collisions is important because it provides a real-life illustration of the impacts of operational and congestion issues in a city. The location, timing, and conditions of the collisions are also pivotal when assessing critical locations. **Figure 3** illustrates growth in the annual number of traffic collisions between 2012 and 2017. There was a total of 9,401 collisions in League City during this time; 25 resulted in fatalities. Annually, the number of traffic collision in League City was relatively consistent between 2012 and 2014, averaging about 1,300 collisions per year. Since then, the annual number of collisions has increased to over 2,000. Some of the causes reported by on-scene police officers include failure to control speed, failure to yield on a left turn or intersection, and following too closely.

Figure 3. League City 2012-2016 Traffic Collisions

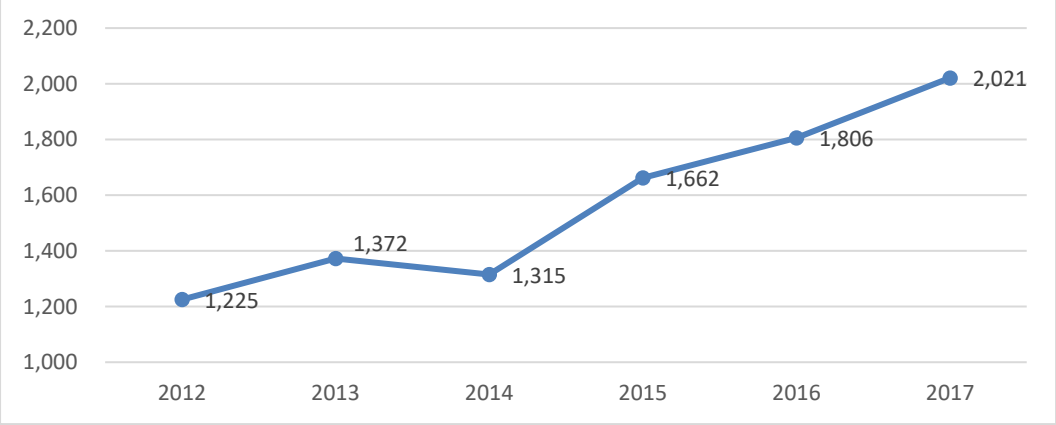


Table 2 highlights League City Corridors with the highest number of traffic collisions between 2012 and 2017. The table also summarizes the corridors' crash rate by vehicle miles traveled. This may help identify potentially dangerous roadway conditions that have not manifested themselves due to low

traffic volumes. Between 2012 and 2017, the highest number of collisions in League City occurred along the IH 45, Main Street (FM 518), and FM 646 corridors.

Table 2. League City High Collision Corridors

Streets	2012	2013	2014	2015	2016	2017	Total	Rate Per 100 M VMT
Main (FM 518)	235	276	255	319	352	337	1,774	6.81
FM 646	148	172	201	181	216	227	1,145	15.75
IH 45 (Gulf Freeway)	242	295	283	420	424	593	2,257	16.71
League City Parkway (SH 96)	119	151	123	161	168	226	948	4.22
Marina Bay (FM 2094)	91	88	73	72	82	64	470	24.22
SH 3	53	46	60	98	90	100	447	12.68
Egret Bay (FM 270)	49	41	54	74	80	79	377	14.90
Total (all collisions)	1,225	1,372	1,315	1,662	1,806	2021	9,401	0.24

Existing Roadway Functional Classification

The functional classification of streets is used to identify the hierarchy, function, and dimensions of a roadway. Streets and highways are grouped into classes based on facility characteristics, such as geometric design, speed, and traffic capacity. Functional class can be updated over time if surrounding land uses change significantly.

Typical functional classifications include: freeway/ highways, principal arterials, minor arterials, and collectors. Local or residential roads are not typically included in thoroughfare plans. League City's existing functional classifications include: major arterials, minor arterials, minor collectors, and residential streets.

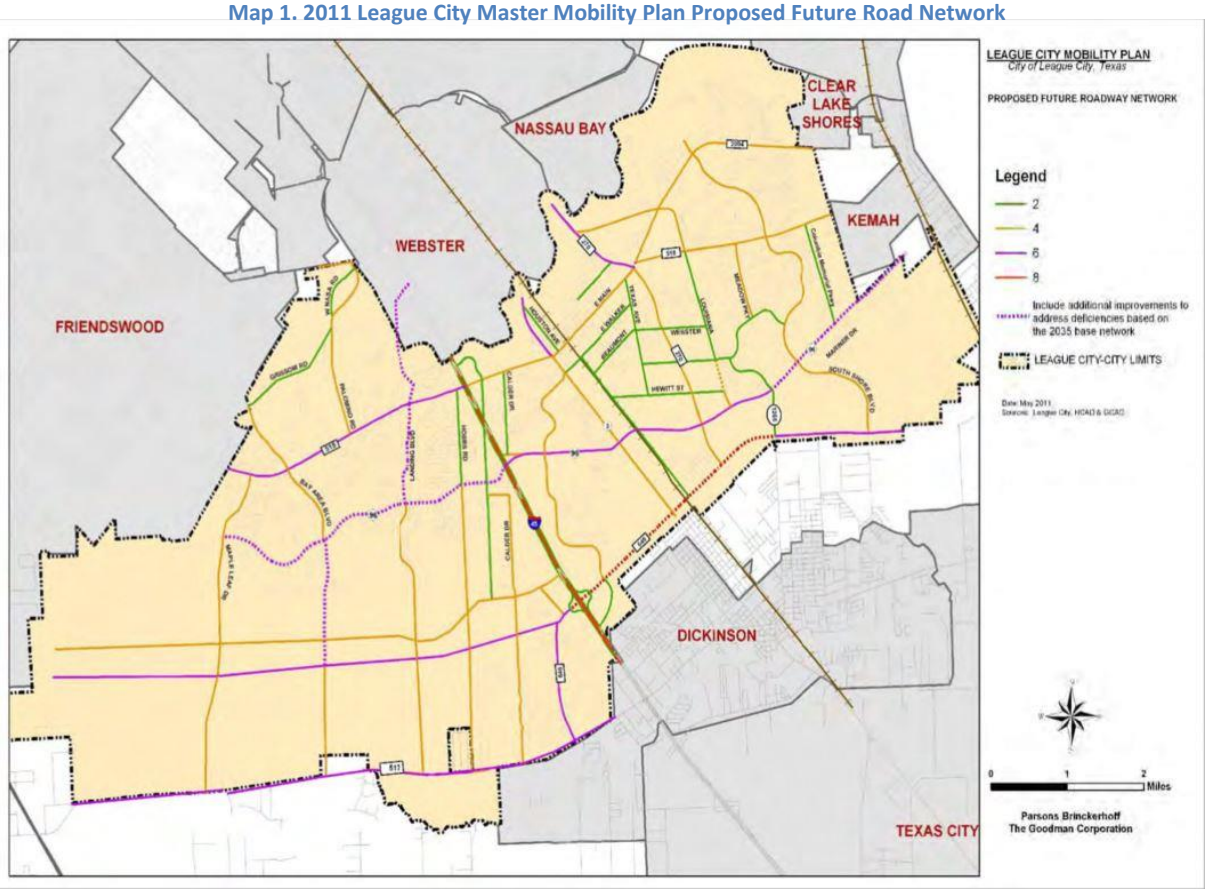
A facility will move up in hierarchy as the surrounding area becomes denser and additional vehicles are attracted to the area. Typically, the higher the roadway's classification, the lower the access to adjacent land uses. Freeways, for instance, typically provide no direct access to land uses, but allow continuous connectivity between regional destinations.

The following functional classification descriptions were taken from the League City Traffic and Transportation Standards and Guidelines. The City's 2011 Master Mobility Plan Thoroughfare Map is depicted in **Map 1.** It displays the existing functional classification of League City roadways classified as collectors or higher.

Table 3. Existing League City Functional Classification

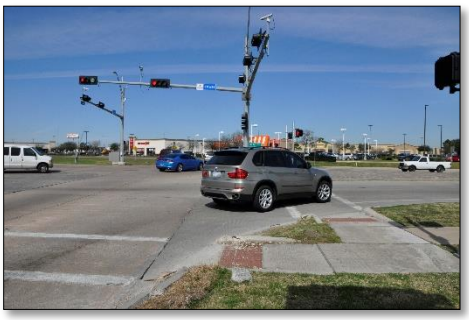
Functional Classification	Minimum Right-of-Way *	Lanes
Major Arterial	120	2 to 6
Minor Arterial	100	2 to 4
Divided Collector	90	2 to 4
Collector	80	2 to 4
Residential Street	60	2

Map 1. 2011 League City Master Mobility Plan Proposed Future Road Network



Existing Transportation Framework

League City's existing transportation network is relatively multi-modal in nature. It includes automobile, non-motorized, and transit options, and is only a few miles from Hobby Airport. Below is a summary of League City's existing transportation network. A more detailed analysis is available in **Chapter 5** of the Master Mobility Plan Update document.



Existing Operational Conditions

Understanding current traffic volumes on a road network is an important step in determining if facilities are functioning at capacity under current conditions. The Annual Average Daily Traffic (AADT) provides information on traffic history. AADT is the total volume of vehicle traffic divided by 365 days.

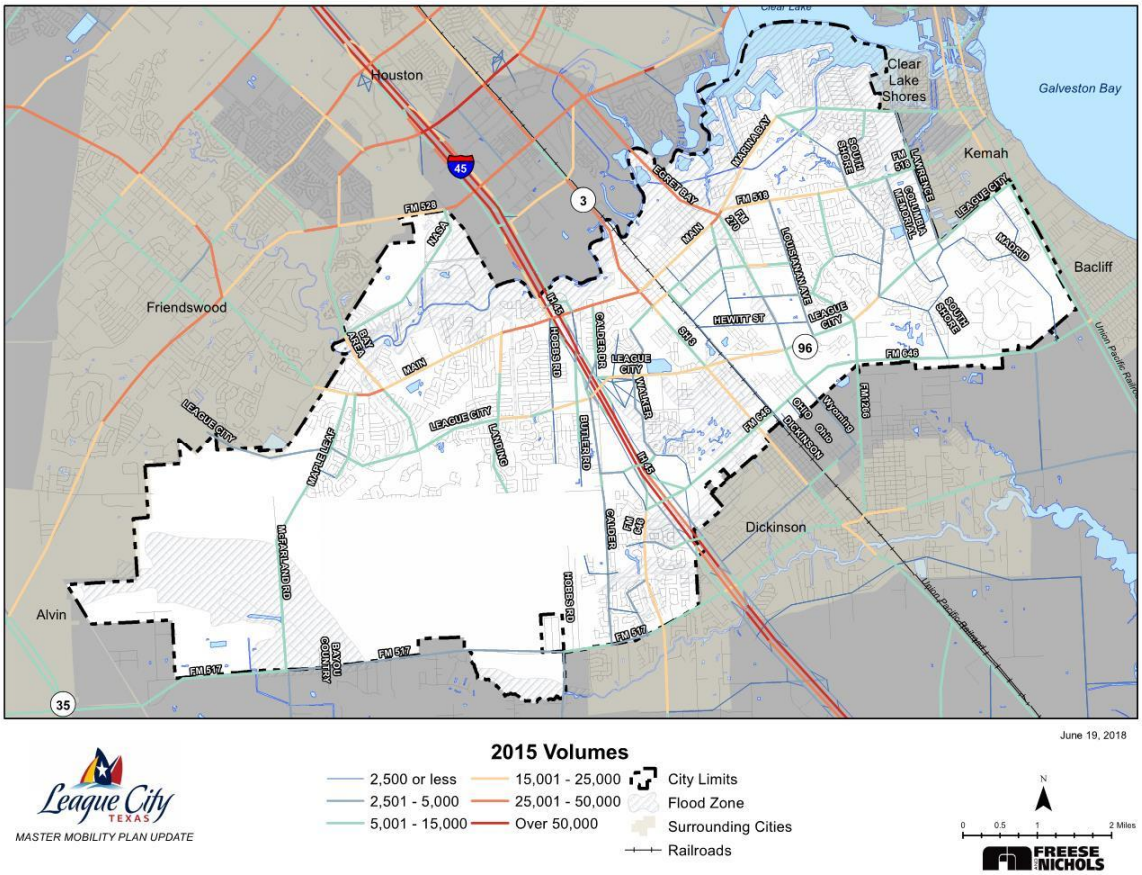
2015 Traffic Volumes

Traffic volumes within the city currently range from as few as 100 vehicles per day to nearly 85,000. The lowest volumes are along Cross Colony drive at just over 100 vehicles per day, and the highest are on IH 45 at nearly 85,000. These are, however outliers, and most facilities, such as Main Street (FM 518) or League City Parkway, carry between 5,000 and 45,000 vehicles per day. Outside of IH 45, the highest volumes are found on FM518. Interestingly, the lowest volume facilities, depicted in blue on **Map 2**, are primarily concentrated in the eastern sector of city – south of downtown.

Table 4. League City 2015 Traffic Volumes

Road	Limits	2015 Daily Volumes	AM Peak	PM Peak
IH 45 NB	Wesley Rd to North City Limits	84,491	19,225	19,370
IH 45 SB	Wesley Rd to North City Limits	69,309	8,842	22,299
FM 518 (Main Street)	FM 2094 to Egret Bay	42,170	8,274	12,118
FM 518 (Main Street)	IH 45 to Williamsport	36,304	7,140	10,250
Egret Bay	7th St to North City limits	33,341	5,561	10,287
FM 518 (Main Street)	Wesley Rd to Calder	33,337	6,929	8,100
Galveston Rd	FM 518 to Walker St	32,329	5,214	8,612
FM 518 (Main Street)	Bay Area Blvd to Country LN	32,164	6,605	9,542
FM 518 (Main Street)	Calder to SH 3	30,831	6,524	7,614
SH 96	Walker St to SH 3	22,944	5,179	6,953
Dickinson	FM 646 to Hewitt St	1,115	281	330

Map 2. 2015 League City Traffic Volumes



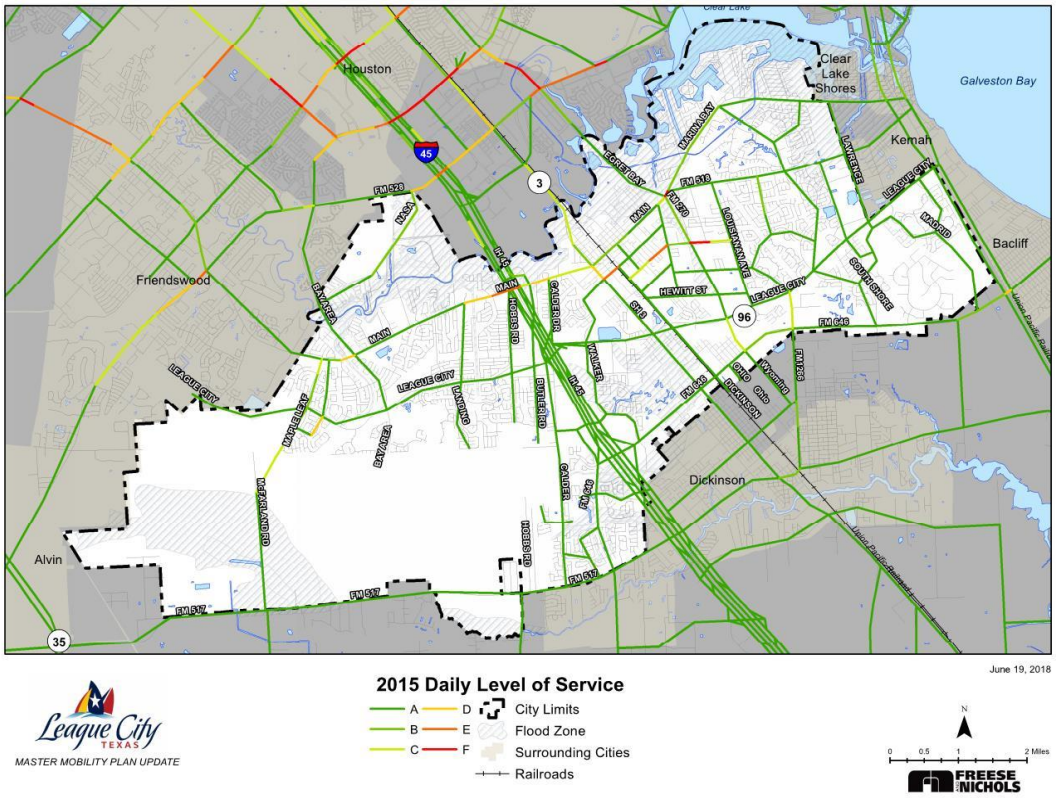
2015 Level-of-Service

The Houston-Galveston Area Council (H-GAC) model is designed to assess level-of-service (LOS) at the regional level using a roadways volume to capacity ratio. Its ability to assess localized traffic inhibitors, however, is limited. The volume to capacity ratio gages roadway congestion based on the ratio of designed roadway capacity and traffic volumes. This is an issue on roadways such as Main Street, which exhibits higher levels of congestion than indicated in the model LOS output. To compensate for this, an additional Synchro analysis was conducted on the corridor to determine roadway LOS. The travel demand model was used to illustrate the high-level operation and performance of the network.

Map 3 illustrates 2015 League City LOS. League City's thoroughfare network performs adequately on daily a basis during peak hour operations. There are few highly congested areas, but commuters can easily traverse the city without too much congestion delay. Major roadways, such as SH 96 and Bay Area

Boulevard, operate at LOS A. Other roadways, such as FM 518 (Main Street) operate at LOS D or E – but spike to LOS F at intersections.

Map 3. League City 2015 Daily Level-of-Service



Intersection Operational Conditions

A number of intersections were identified as congested by League City staff and other stakeholders. These intersections are not only characterized by a high number of traffic incidents, but geometric issues, high speeds, congestion, and/or poor maintenance as well. The following intersections were analyzed in the Master Mobility Plan.

This analysis was completed to determine current conditions for the following intersections:

1. IH 45 and FM 518
2. FM 518, Marina Bay, and Egret Bay (Five Points)
3. FM 518 and Landing Boulevard
4. League City Parkway and Brittany Lakes
5. League City Parkway and Finnegan Lane
6. FM 518 and Bay Area Boulevard
7. Bay Area and League City Parkway

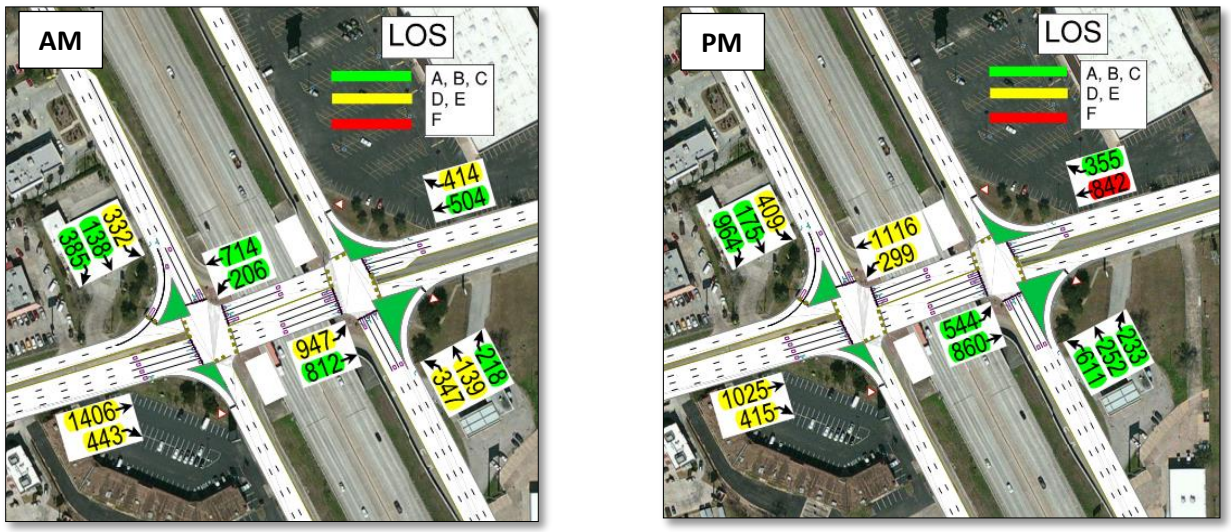
The executive summary summarizes the analysis of the intersection of IH 45 and Main Street. The complete intersection analysis is available in **Chapter 4** of the Master Mobility Plan document.

IH 45 and FM 518

The intersection of the IH 45 frontage road and FM 518 currently accommodates about 4,300 vehicles per day during the AM peak hour and performs adequately at LOS C. AM peak hour traffic is primarily generated west of the intersection, heading north on IH 45 or east on FM 518 at LOS C. There is capacity for additional traffic.

PM peak hour conditions are worse, accommodating about 5,300 vehicles at LOS D. The westbound segment of FM 518 is most negatively affected. As development increases, PM peak hour congestion may become a serious issue. A summary intersection performance is detailed below in **Table 5**. A full analysis is available in the **Appendices** of the Master Mobility Plan Document.

Figure 4. IH 45 and FM 518: AM LOS and Volume; PM LOS and Volume



IH 45 Widening

It is important to note that construction is currently underway to expand the IH 45 corridor from the Harris County line to the area about 2,000 feet north of League City Parkway. The project will expand IH 45 from six to 10 lanes and widen the intersection to include six through lanes, dual left-turn lanes, and dual right-turn lanes on Main Street. The IH 45 frontage road will also be widened from two to three lanes in each direction, and include dual left-turn lanes, dual right-turn lanes, and a Texas U-turn. This should relieve some of the projected congestion at the intersection. The project is estimated to be completed in 2020.

Table 5. AM IH 45 and FM 518 Intersection Evaluation

AM FM 518 and IH 45 - Synchro Optimized Cycle Length								
Intersection	**SBFR**				**NBFR**			
Cycle length	60				60			
Approach	EB	WB	SB	**Overall**	EB	WB	NB	**Overall**
Delay	61.2	17.4	14.1	**38**	42.2	32.9	15.5	**33.4**
LOS	E	B	B	**D**	D	C	B	**C**
AM FM 518 and IH 45 - Alternative Cycle Length								
Intersection	**SBFR**				**NBFR**			
Cycle length	90				90			
Approach	EB	WB	SB	**Overall**	EB	WB	NB	**Overall**
Delay	45.1	13.1	23.9	**31.4**	37	31.5	30.2	**33.9**
LOS	D	B	C	**C**	D	C	C	**C**
PM FM 518 and IH 45 - Synchro Optimized Cycle Length								
Intersection	**SBFR**				**NBFR**			
Cycle length	65				65			
Approach	EB	WB	SB	**Overall**	EB	WB	NB	**Overall**
Delay	48.7	61.6	31.7	**46.7**	21.6	62.9	20.2	**34.5**
LOS	D	E	C	**D**	C	E	C	**C**
PM FM 518 and IH 45 - Alternative Cycle Length								
Intersection	**SBFR**				**NBFR**			
Cycle length	135				135			
Approach	EB	WB	SB	**Overall**	EB	WB	NB	**Overall**
Delay	65.9	55.5	41.9	**53.8**	11	83.3	47.6	**45.5**
LOS	EB	E	D	**D**	B	F	D	**D**

Travel Forecast Modeling

H-GAC utilizes the Cube Voyager Model for travel forecast modeling in the region. Because it is regional in nature, the model is not specifically calibrated to assess small area networks or specific corridors. To provide more detailed analysis of the city's network, SYNCHRO and SimTraffic were utilized.

The network assessment included analyses of the 2015 base network, 2025 10-year scenario, and the 2040 long-term assessment. Travel demand model runs were only conducted on the 2015 base network and the 2040 long-range network. The following section summarizes the operational performances of the base 2015 and 2040 long-range networks.

2015 Network Additions

Because H-GAC's network is regionally calibrated, a number of existing network facilities were added to the 2015 base network to better illustrate current network conditions within league city. An abbreviated summary of key 2015 network additions is available in **Table 6.** A full summary of network additions is available in the **Appendices** of the Master Mobility Plan document.

Table 6. 2015 H-GAC Network Additions

Roadway	Limits	Lanes	Volumes
Walker Street	League City Parkway to South of FM 646	4D	4,586
League City Parkway Extension	Extend from Maple Leaf Dr to the east city limits	4D	3,576
Big League Dreams Parkway	From Calder Rd to IH45 Frontage Rd	3D (Center Turn Lane)	5,894
Landing Boulevard	League City Parkway to Sandvalley Way	2U	11,645
Dickinson Avenue	Deats Rd to Hewitt St	2U	584

2025 Network Additions

Although the 2025 network was not tested in the travel demand model, several mid-term alignments were recommended for the network. These alignments are pertinent to implementation of the long-range network additions. Roadways extended in the model are not based on city limits, but the overall regional network.

Table 7. 2025 H-GAC Network Additions

Roadway	Limits	Lanes
Bay Area Boulevard	Magnolia Greens Ln to FM 517	4D
Hobbs Road Extension	Ervin Ave to FM 517	4D
Landing Boulevard Extension	Sandvalley Way to FM 517	4D
League City Parkway Extension	Maple Leaf Dr to FM 528	4D
Madrid Lane Extension	Existing alignment to FM 646	2U
Walker Street Extension (Southern Segment)	South of FM 646 to IH 45 Frontage Rd	3D
Walker Street Extension (Eastern Segment)	Texas Ave to FM 270	2U
Ervin Avenue	Calder Rd to Landing Blvd (Extension)	4D
New Street B	Landing Blvd Extension to Hobbs Rd Extension	4D
Palomino Lane Extension	Palomino Ln to Grissom Rd	2U
Beamer Road Extension	Grissom Rd to North City Limits	2U

2040 Network Additions

League City's 2040 network includes a number of long-term network additions to improve overall connectivity within the city of League City. The recommended improvements should be implemented as development unfolds rather than on a specific planning horizon.

Table 8. 2040 Network Additions

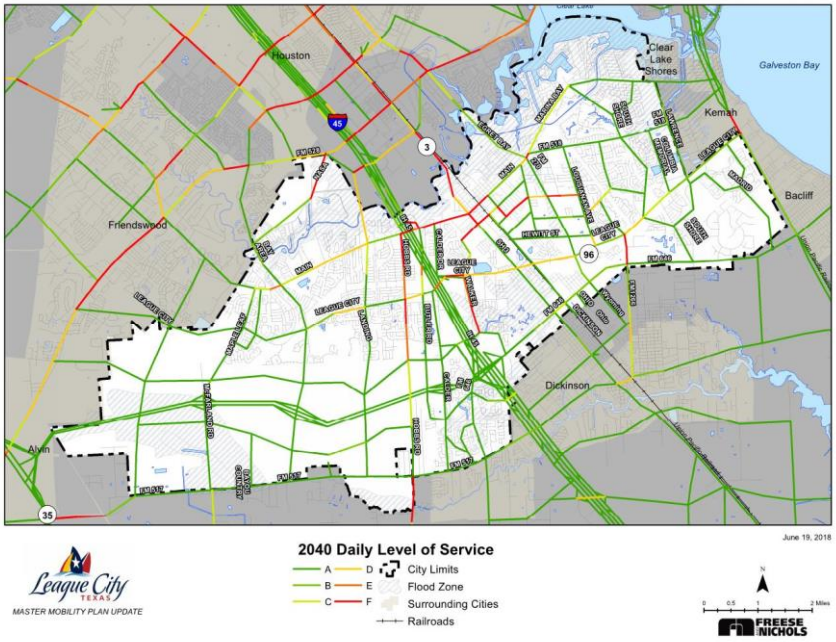
Roadway	Limits	Lanes	Volumes
Butler Road (Extension)	Ervine Ave to Cross Colony	2U	1,200
Ervin Avenue (Extension)	Landing Blvd (Extension) to FM 528	4D	13,650
New Street B (Extension)	Landing Blvd (Extension) New Street C	4D	25,000
New Street C	FM 518 to FM 517	4D	14,300
New Street D*	Hobbs Extension to New Street E	4D	
New Street E	Ervine Ave to FM 517	4D	11,152
New Street F*	Ervine Ave to FM 517	4D	
New Street G*	Ervine Ave to FM 517	2U	
New Street H*	New Street D to FM 517	2U	
SH99 (Grand Parkway)	FM 646 to League City Limits	4D	26,000

*Not included in the travel demand model. Volumes not available.

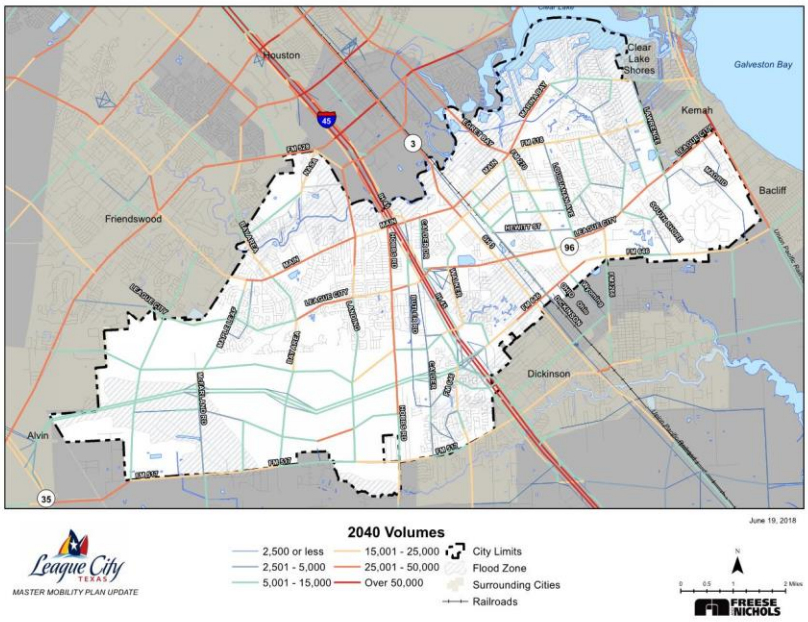
2040 Volumes and Level-of-Service

2040 volumes and LOS are depicted below in **Map 4** and **Map 5.** Overall, the 2040 network operates at an adequate LOS, with commuters able to easily travel to destinations within the city with little congestion. There are, however a few segments, detailed below in **Table 9** and **Table** 10 that warrant further examination as development unfolds within the city.

Map 4. League City 2040 High Level Level-of-Service



Map 5. League City 2040 Traffic Volumes



Similar to existing travel flows, traffic volume increases follow the existing pattern of travel flow – focused volume to and from I-45. Travel flows east of IH 45 are projected to increase about 54 percent; flows west of IH 45 are projected to increase as much as 87 percent. Given the different levels of development in the city, the model results for eastern and western segments of the city were examined separately.

The eastern segment of the city is largely developed with much of the 2040 network already in place. Four lane arterials, such as League City Parkway and Marina Bay, can maintain flows at level-of-service D or better. Other segments, such as Egret Bay Blvd north of FM 518, SH 3 North of Main, and FM 518 between SH 3 and I-45, indicate a demand for more than four lanes. These segments, described below in **Table 9**, will require six lanes or more to maintain a level-of-service D or better.

Table 9. Eastern League City Critical Corridors

Road	Segment	Lanes	2015 Volume	2015 LOS	2040 Volume	2040 LOS
Egret Bay	North of FM518	6	31,472	E	37,709	F
SH-3	North of FM 518	4	24,419	F	31,488	F
FM518 (Main Street)	IH45 to SH 3	4	36,697	F	48,132	F
League City Parkway	IH45 to Walker	4	23,554	F	42,477	F

Roadways west of I-45 are anticipated to develop steadily as the network and development unfold. The 87 percent increase in traffic flow is due to the sparse existing road network and high number of large undeveloped parcels.
Table 10 details volumes and level-of-service for roadways located in the western sector of the city. Model results indicate demand for most arterial roadways are within acceptable daily levels of service (D or better). There are, however a few segments projected to operate at a poor LOS.

The segments of FM 518 between Newport Boulevard and the IH 45 frontage road is projected to carry as many as 65,000 vehicles per day in 2040 at level-of-service F. Other high congestion areas include, but are not limited to, FM 518, from Landing to Magnolia Estates, League City Parkway from Landing Boulevard to Creeksage, and Landing Boulevard, from FM 518 to Fredericksburg Drive. With the exception of Landing Boulevard, LOS would be improved to E with two additional lanes.

Table 10. Western Sector Roadway Volumes and Level-of-Service

Road	Segment	Lanes	2015 Volume	2015 LOS	2040 Volume	2040 LOS
FM518 (Main Street)	Newport Blvd to Hobbs Rd	4	36,303	F	65,721	F
FM518 (Main Street)	Landing to Magnolia Estates	4	18,651	E	30,658	F
Landing Boulevard	FM 518 to Fredericksburg Dr	4	17,335	E	28,344	F
FM518 (Main Street)	Ellis Rd to Bay Area Blvd	4	21,008	E	27,971	F
Bay Area Boulevard	FM 518 to NASA Blvd	4	21,112	E	21,826	E
Bay Area Boulevard	FM 518 to League City Pkwy	4	7,889	AB	12,002	C
League City Parkway	IH 45 Frontage Rd to Butler Rd	4	16,573	D	22,384	E
League City Parkway	Landing to Creeksage Ln	4	28,457	F	32,063	F
Bay Area Boulevard (Extended)	League City Pkwy to New Street A (2040)	4	N/A	N/A	17,977	D
Bay Area Boulevard (Extended)	New Street A to SH 99 (2040)	4	N/A	N/A	12,006	C
Ervin Avenue	IH 45 Frontage to Brookport Dr	4	N/A	N/A	23,912	F
Ervin Avenue	Hobbs Rd to Landing Blvd	4	N/A	N/A	16,943	C
Ervin Avenue	Bay Area Blvd to Maple Leaf Dr (Extended)	4	N/A	N/A	11,342	AB
New Street B	Hobbs Rd to Landing Blvd	4	N/A	N/A	13,683	C
New Street B	Landing Blvd to New Street F	4	N/A	N/A	25,457	E
New Street B	Bay Area Blvd to New Street E	4	N/A	N/A	10,055	AB
SH99 (Grand Parkway)	IH 45 to Calder Rd	4	N/A	N/A	26,009	AB
SH99 (Grand Parkway)	Butler Rd to New Street F	4	N/A	N/A	23,297	AB
SH99 (Grand Parkway)	Bay Area Blvd to Maple Leaf Dr (Extended)	4	N/A	N/A	18,356	AB
Maple Leaf Drive	New Street A to SH99 (2040)	4	N/A	N/A	17,365	D
Hobbs Road (4 Lanes in 2040)	FM 518 to League City Pkwy	2	671	AB	34,697	F
Hobbs Road (4 Lanes in 2040)	League City Pkwy to Sedona Dr	2	551	AB	44,741	F
Hobbs Road (4 Lanes in 2040)	New Street A to SH 99	4	N/A	N/A	26,716	F

Thoroughfare Plan Recommendations

The following plan recommendations were vetted through League City Staff and residents at the January 11, 2018 Town Hall Meeting. Recommended roadway alignments and intersection improvements were tested in the regional travel demand model and/ or SYNCHRO to determine their impact on the overall thoroughfare network.

Recommended Functional Classification

To provide flexibility in the thoroughfare network, recommended functional classifications were developed with variable rights-of-way and lane configurations. This is a change from the previous mobility plan, which recommended specific right-of-way designations for each functional classification.

Thoroughfare Design Standards

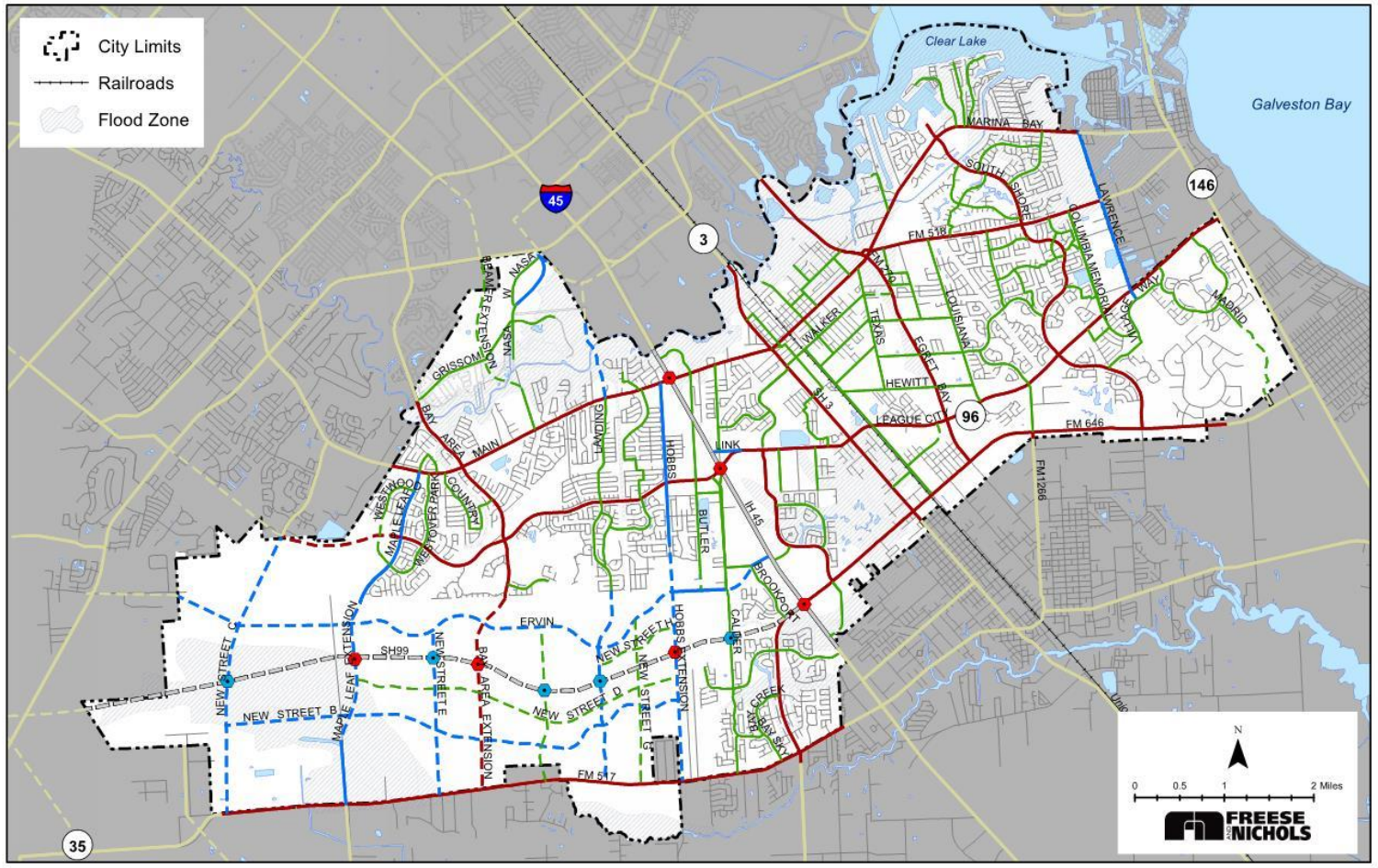
Functional classification not only dictates the function and relationship between roadways in a transportation network but provides minimum design standards as well. The following section outlines the targeted details of each functional classification developed for the League City Master Mobility Plan. **Table 11** summarizes the specifications of each functional classification. The League City recommended Thoroughfare network is illustrated in **Map 6**.

Table 11. League City Recommended Thoroughfare Standards

Functional Classification	Area Type	Lanes*	General Spacing (Miles)	ROW	Pavement Width (feet)	Design Speed (mph)	Median
Freeway/ Highway		4 to 8		400' - 500'			Yes
Major Arterial	Urban	2D	1	100' - 120'	2 @ 13	40-50	Yes
	Urban	4D	1	100' - 120’	2 @ 25	40-50	Yes
	Urban	6D	1	100 - 120’	2 @37	40-50	Yes
Minor Arterial	Urban	2-4D	½	80'-100'	2 @ 25	40-50	Yes
	Urban	4D	½	100’	2 @25	40-50	Yes
Collector	Urban	2-4D	¼	90'	2 @ 25	35	Yes
	Urban	2U	¼	80'	42	35	No
	Rural*	2-4D	¼	100’	2 @ 25	35	Yes
	Rural*	2U	¼	90	42	35	No
Residential	Urban	2	¼	60	28	25	No
	Rural	2	¼	70	28	25	No

* Rural open ditch sections require 10 additional feet of ROW

Map 6. 2018 League City Recommended Thoroughfare Map



Draft Thoroughfare Map

October 3, 2018

League City TEXAS
MASTER MOBILITY PLAN UPDATE

- Interchange
- Grade Separation
- Freeway
- Proposed Freeway
- Major Arterial (100'-120' ROW, 2 to 6 lanes)
- Proposed Major Arterial
- Minor Arterial (80'-100' ROW, 2 to 4 lanes)
- Proposed Minor Arterial
- Collector (80' ROW, 2 to 4 lanes)
- Proposed Collector
- Outside City Limits (existing)
- Outside City Limits (proposed)

Alignments for proposed roadways are only conceptual and serve to identify right-of-way for preservation. Specfic alignments will be designed as development unfolds within the city.

Recommended Roadway Cross-Sections

The following cross-sections were developed to illustrate the roadways design standards recommended for the League City Master Mobility Plan. Recommendations include urban sections with curb a gutter, sidewalks, and where applicable, parkways, on-street parking, and/or bike lanes. Additional cross-sections are available in **Chapter 6** and the **Appendices**.

Freeways/ Highways

Freeways and highways are designed for long distance travel with a high level of mobility and very limited land access. League City freeways/ highways include IH 45 and the proposed Grand Parkway (SH 99), which is a proposed as a tolled facility. Lane numbers vary from four (4) to six (8) lanes and right-of-way is 300 feet or greater.

Major Arterials

Major arterials are Ideal for long distance trips and handling large volumes of traffic at a high level of mobility. Examples of major arterials include League City Parkway and Main Street. **Figure 5** and **Figure 6** illustrate the recommended cross-section for major arterial facilities Major arterials should include two (2) to six (6) 12-foot lanes within 100 to 120 feet of right-of-way. Major arterial intersections should be two or three lanes wider than the typical section to accommodate turning vehicles.

Figure 5. Major Arterial - 6 Lane, 120' ROW, 12 - Foot Lanes

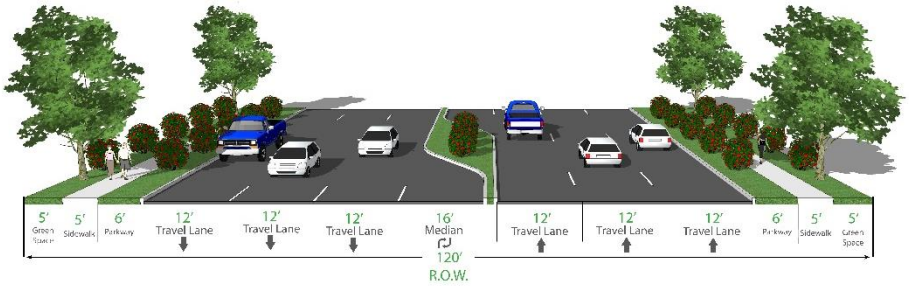
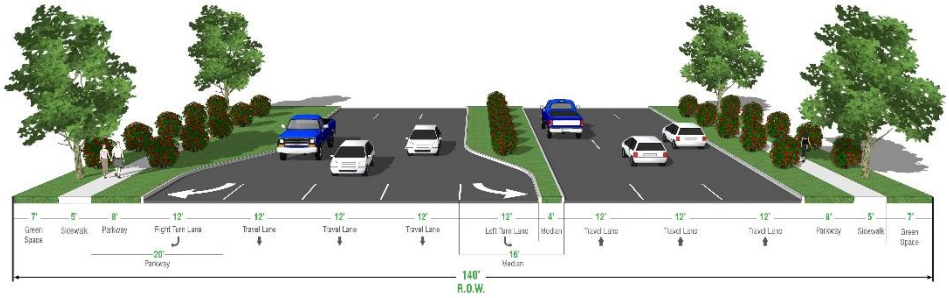


Figure 6. Major Arterial - 6 Lane, 140' ROW, 12 - Foot Lanes



Minor Arterial

Minor arterials accommodate moderate traffic volumes at relatively low speeds and provide a link between major arterials and collectors. Examples of minor arterials include Hobbs Road and Louisiana Avenue. **Figure 7** and **Figure 8** illustrate the recommended cross-section for minor arterials. Minor arterials are recommended to include two (2) to four (4) 12-foot lanes within 80 to 100 feet of right-of-way.

Figure 7. Minor Arterial - 4 Lane, 100' ROW, 12-Foot Lanes

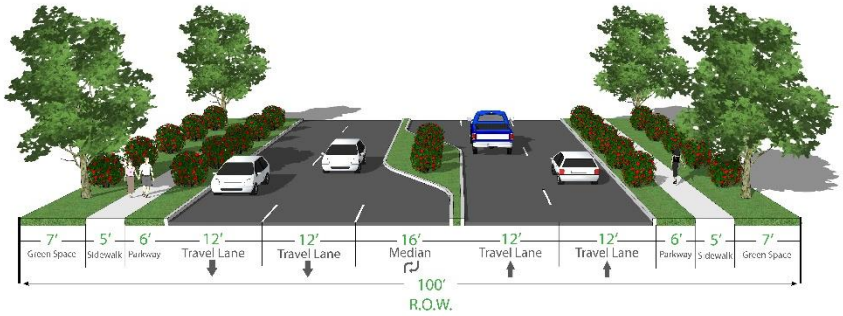
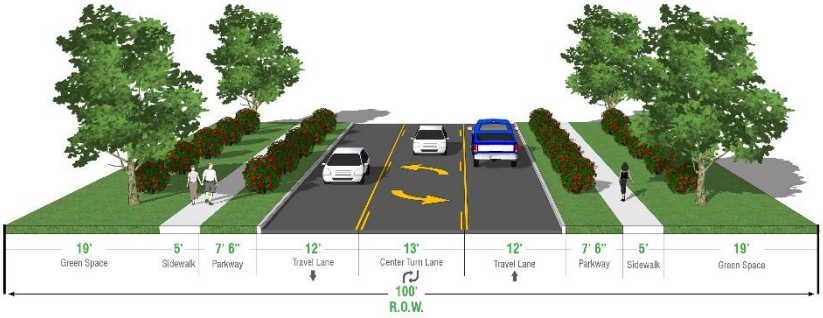


Figure 8. Minor Arterial - 3 Lanes, 100' ROW, 12-Foot Lanes



Collector

Collector facilities are designed for short trips at low speeds with a high level of access, and primarily connect commuters to higher functional class facilities. Examples of collectors include the northern segment of Landing Boulevard and Texas Avenue. Urban collectors are recommended to include two (2) to four (4) 12-foot lanes within 80 to 90 feet of right-of-way. Rural collectors include an additional 10 feet of ROW. **Figure 9** and **Figure 10** illustrate the recommended cross-section for a two-lane divided collector facility.

Figure 9. Collector - 3 Lanes, 80' ROW, 12- Foot Lanes

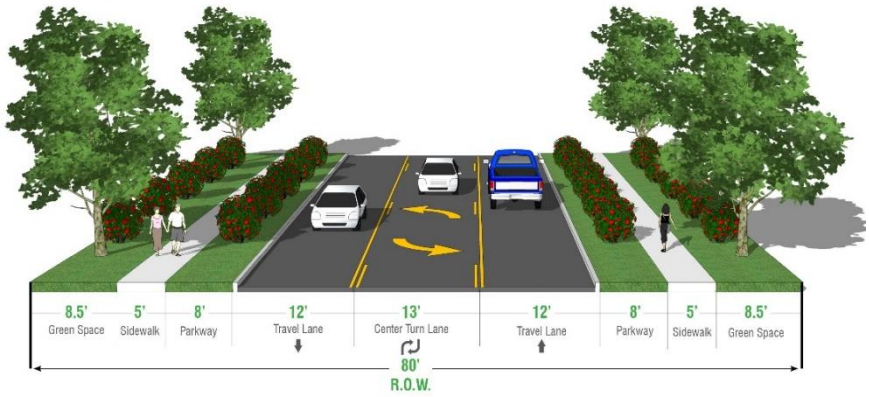
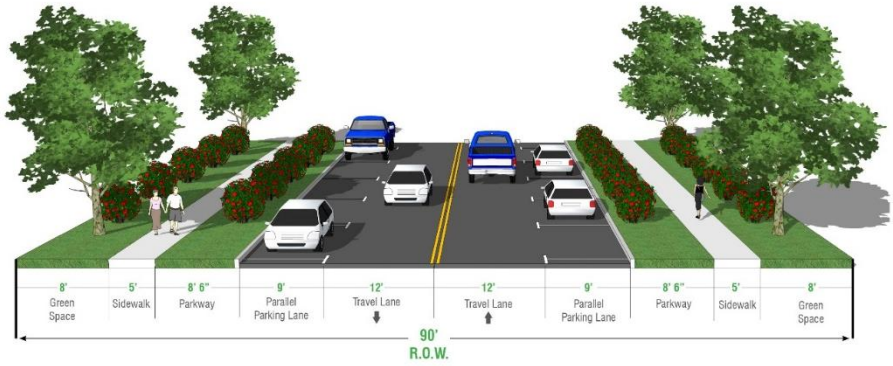


Figure 10. Collector - 2 Lanes, 90' ROW, 12-Foot Lanes, On-Street Parking



Recommended Network Amendments

The following recommendations were developed to improve connectivity and reduce congestion in League City's thoroughfare network. New alignments, lane additions, intersection improvements were incorporated into the network to improve its overall operational efficiency.

New Network Alignments

Table 12 details the functional classification and number of lanes for new alignments recommended for the thoroughfare network. Most of the recommended alignments are located in the southwest sector of the city to help accommodate planned growth and development.

Table 12. Recommended New Roadway Alignments

NAME	Functional Class	Recommended Lanes
Bay Area Boulevard Extension	Major Arterial	4
Beamer Road Extension	Collector	2
Butler Road Extension	Collector	2
Hobbs Road Extension	Minor Arterial	4
Landing Boulevard Extension	Minor Arterial	6
League City Parkway	Major Arterial	6
Madrid Lane Extension	Collector	2
Maple Leaf Drive Extension	Collector	4
Mulberry Street	Collector	2
Ervin Avenue	Major Arterial	4
New Street B	Minor Arterial	4
New Street C	Major Arterial	4
New Street D	Collector	4
New Street E	Minor Arterial	4
New Street F	Collector	4
New Street G	Collector	4
New Street H	Collector	4
New Street I	Collector	4
SH99 (Grand Parkway)	Freeway/ Toll Road	4
Tuscan Lakes Boulevard	Collector	2
Walker Street Northern Extension	Collector	3
Walker Street Southern Extension	Collector	3

Recommended Intersection Improvements

One of the key components of a thoroughfare network is the ability of intersections to efficiently process traffic. Operational conditions typically diminish when insufficient turn-lane capacity is available to absorb turn movements from the traffic stream. Many of League City's congested intersections can be improved by increasing capacity. The following sections provides general recommendations for League City intersections. An additional 22-feet should be provided at key major and minor arterial intersections to ensure the ability to provide channelized turn movements, such as a second left-turn or right-turn lane.

Other intersections, such as FM 518 and IH 45 may require additional improvements. Table 13 summarizes mitigation strategies that may be implemented at critical intersections to improve congestion.

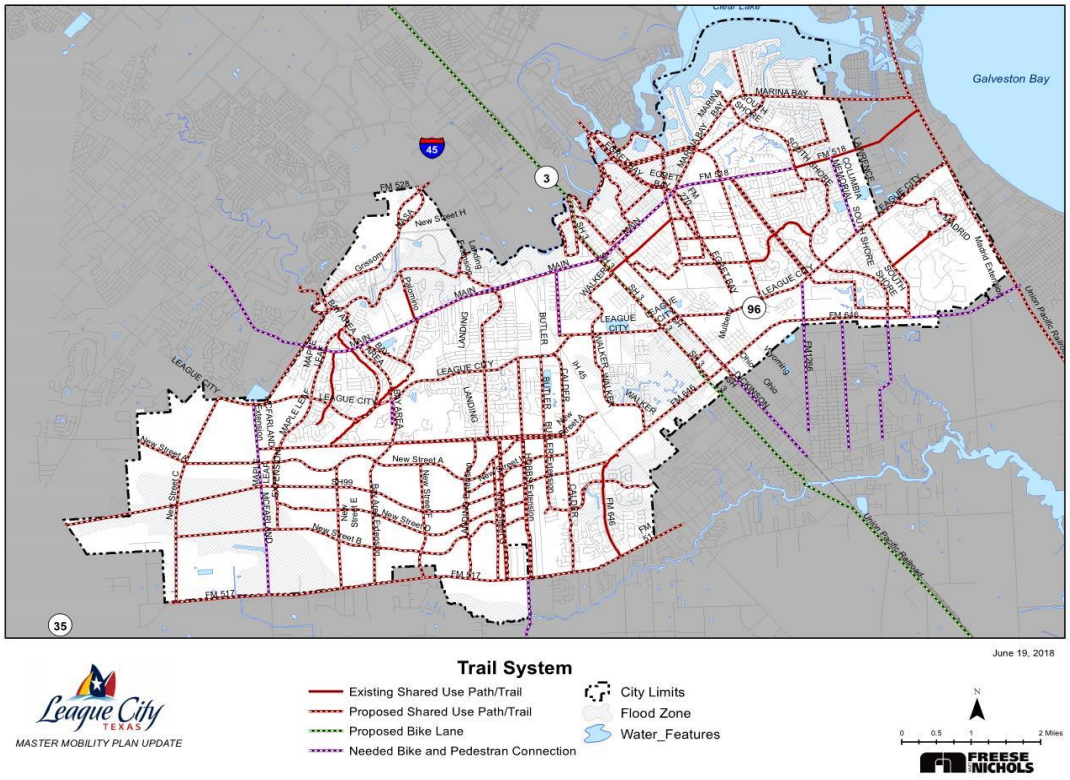
Table 13. Critical Intersection Mitigation Strategies

Intersection	Potential Mitigation
FM 518 and IH 45	• Improved signal timing • Dual left and right-turn lanes at all approaches • Develop alternate routes
FM 518 and FM 270; FM 518 and FM 2094	• Widen Main St to 6 through lanes
FM 646 and IH 45	• Widen FM 646 to 6 through lanes
FM 518 and Landing Boulevard	• Right turn bays on FM 518 (100' recommended)
League City Parkway at Brittany Lakes Drive / Finnegan Lane	• Signalization • Left turn bays on League City Pkwy (100' recommended) • Trim brush at corners to improves sight-distance
FM 518 and Bay Area Boulevard	• Widen FM 518 to 6 lanes; • Dual left turn lanes from SB Bay Area Blvd (100' recommended)
League City Parkway and Bay Area Boulevard	• Signalization

Non-Motorized Recommendations

The following Non-motorized recommendations are based on the alignments developed in 2017 Trails Master Plan and enhanced to fit the 2018 recommended thoroughfare network. **Map 7** illustrates planned and existing bike pedestrian trails and/or routes by trail type. The majority of the planned trails are either on-street facilities or shared use pathways.

Map 7. Trail System Adaption to Recommended Thoroughfare Network



Cross-Sections with Non-Motorized Elements

The following cross-sections were developed to illustrate how the non-motorized network can be integrated into the thoroughfare system.

Figure 11. Four Lane Minor Arterial with Shared-Use Pathway

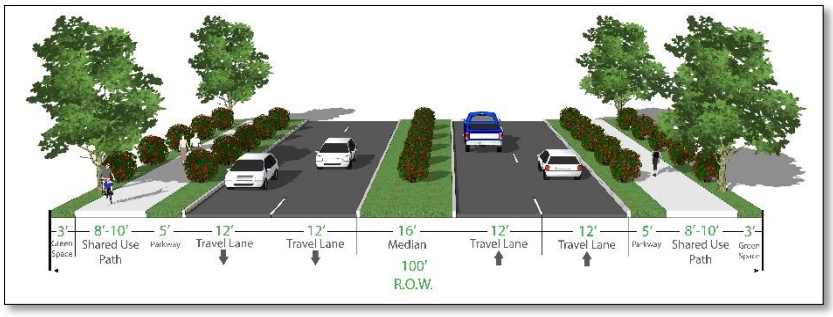


Figure 12. Six Lane Major Arterial with Shared-Use Pathway

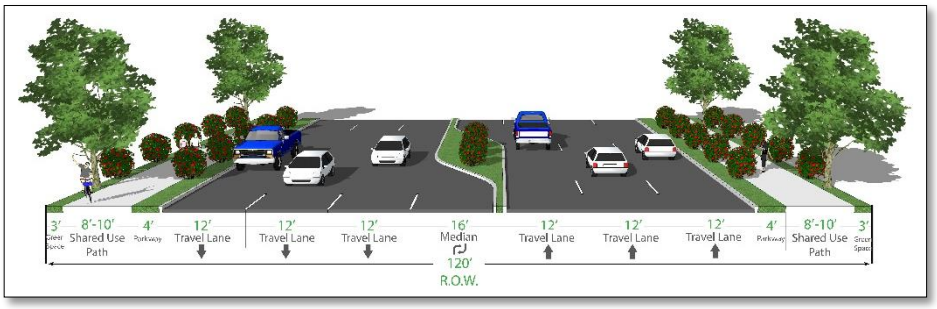
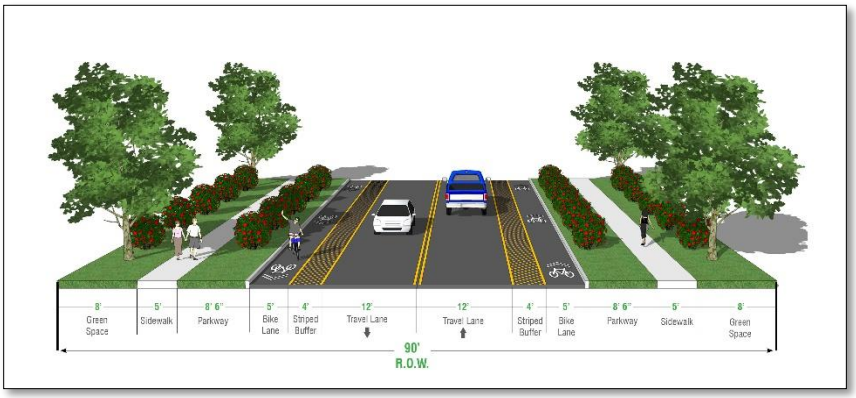


Figure 13. Two Lane Collector with Buffered Bike Lane



Transit Recommendations

The following transit recommendations were developed to supplement enhancements to roadway network. Additional transit recommendations were based on recommendations developed from the 2011 League City Master Mobility Plan. Potential transit corridors are illustrated in **Map 8**.

Identify Potential Transit Corridors and Station Locations for a Transit Feasibility and Demand Analysis

The 2011 Master Mobility Plan indicated that League City may be a viable option for a station location along the Galveston, Houston, and Henderson (GH&H) freight line, which runs parallel to SH 3 between Galveston, League City and Houston. The corridor was identified in the H-GAC 2008 Regional Commuter Rail Study as only one of the top five commuter rail corridors in the region. Among the top five corridors, the GH&H corridor had the highest forecasted ridership. With IH 45 being a key regional corridor, it should be leveraged for express bus service to Houston and Galveston. Such service would not only provide an important regional connection but help relieve congestion around future developments along the corridor as well. A study should be conducted to identify the most feasible and effective commuter rail and express bus station locations and corridors within the city.

General Fixed Route Service Criteria

League City does not currently have the land use and population density to support a standalone fixed route transit service. This is evidenced by the failure of previous fixed route services, such as BayTran. This may, however, change in the future as the western sector of the city is built out and corridors within the city become more congested. If a fixed route service is developed within the city, the following criteria need to be taken into consideration when developing routes.

- The four-step travel model should be considered when developing transit routes: trip generation, trip distribution, modal split, and trip assignment. Transit considerations include; travel time, frequency of trips, and reasons why commuters may be more likely to ride the bus, (trip generation), their origin and destination (trip distribution), if other modes of transportation are available, and the likelihood commuters will travel via bus to destinations (modal split), and optimal routing between compatible destinations (trip assignment). Using the four-step modeling process, as part of route planning, will help transit planners determine optimal routes and service schedules.

- Identify potential transit corridors based on existing and planned transit compatible land uses such as retail, educational, service, and mixed-use, that may be denser in nature, and may attract a variety of different users. The City's future land use map identified several pockets of development in the western sector of the city and along the IH-45 corridor that may be conducive to fixed route service. At a minimum, residential density should be at least five to 10 dwelling units per acre; employment should be about two to five employees per acre.

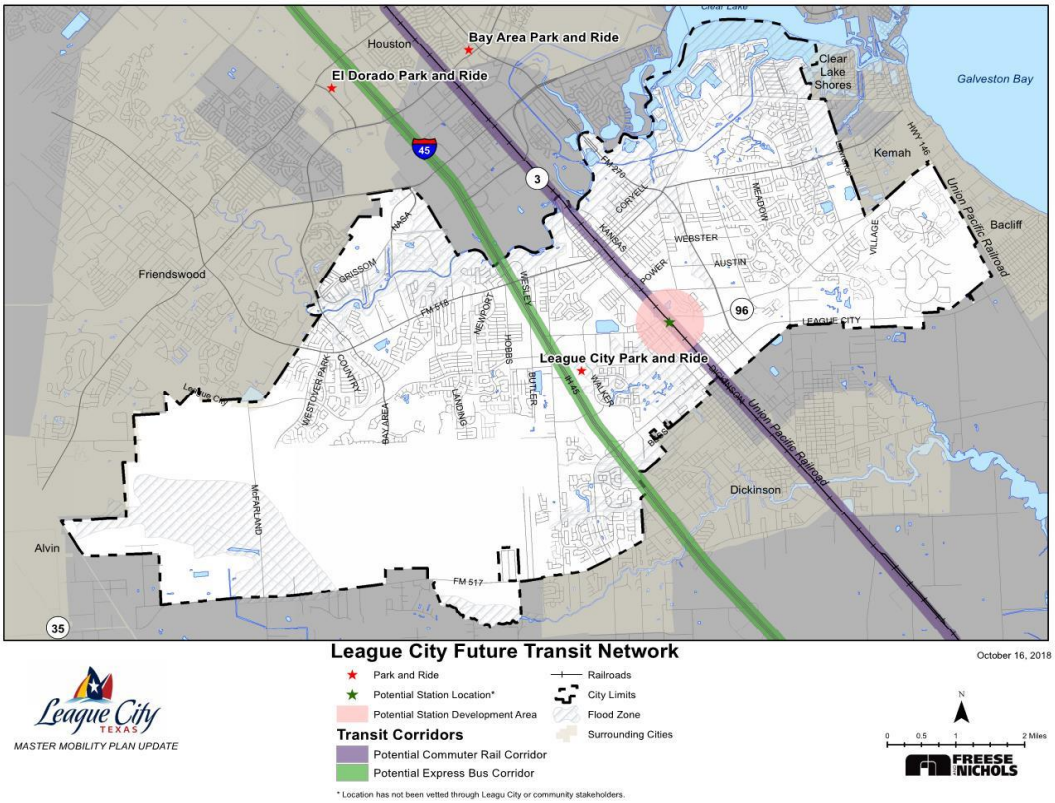
- The transit system should have enough busses to ensure adequate headways within the service area throughout the day. Headways should be shorter during a.m. and p.m. peak periods to accommodate higher transit demand. The optimal headway for bus service is 15 – 20 minutes,

but this period may be extended during off-peak hours to 30-minutes. According to the Transit Capacity and Quality of Service Manual (TCQSM), transit service becomes unattractive to choice riders after 30-minutes, and all riders after an hour. The bus schedule should be posted at all stops to inform commuters of anticipated wait times. If operating and maintaining fixed route service within desired headways becomes too costly, the city may consider reducing the service area and operating times.

- Fixed routes should be visible and easily accessible for pedestrians and automobiles. Ideal fixed route corridors may include landscaping, street trees, pedestrian scale lighting, benches, and other pedestrian amenities to create a more pedestrian friendly environmental. Sheltered bus stops are beneficial along routes with longer headways and fewer street trees for shade. Mid-block crossings, pedestrian signals, and illuminated signage may also be appropriate for bus stops not located at intersections.

- Prior to implementation of fixed route service, a transit feasibility analysis should be conducted to determine both the demand and feasibility of fixed route service. If fixed route service is not feasible, a flex route program may suffice until density and demand warrant fixed route service. Flex route service is a combination of fixed route service and demand response service and may be implemented in two ways: point deviation and route deviation. With point deviation, service is available at specific points within the city at specified times, but not on a fixed route. Route deviation service operates along a fixed route, but vehicles may deviate from the route to pick-up or drop-off passengers upon request. Flex service is cheaper than fixed route service and requires fewer vehicles.

Map 8. League City Potential Transit Corridors



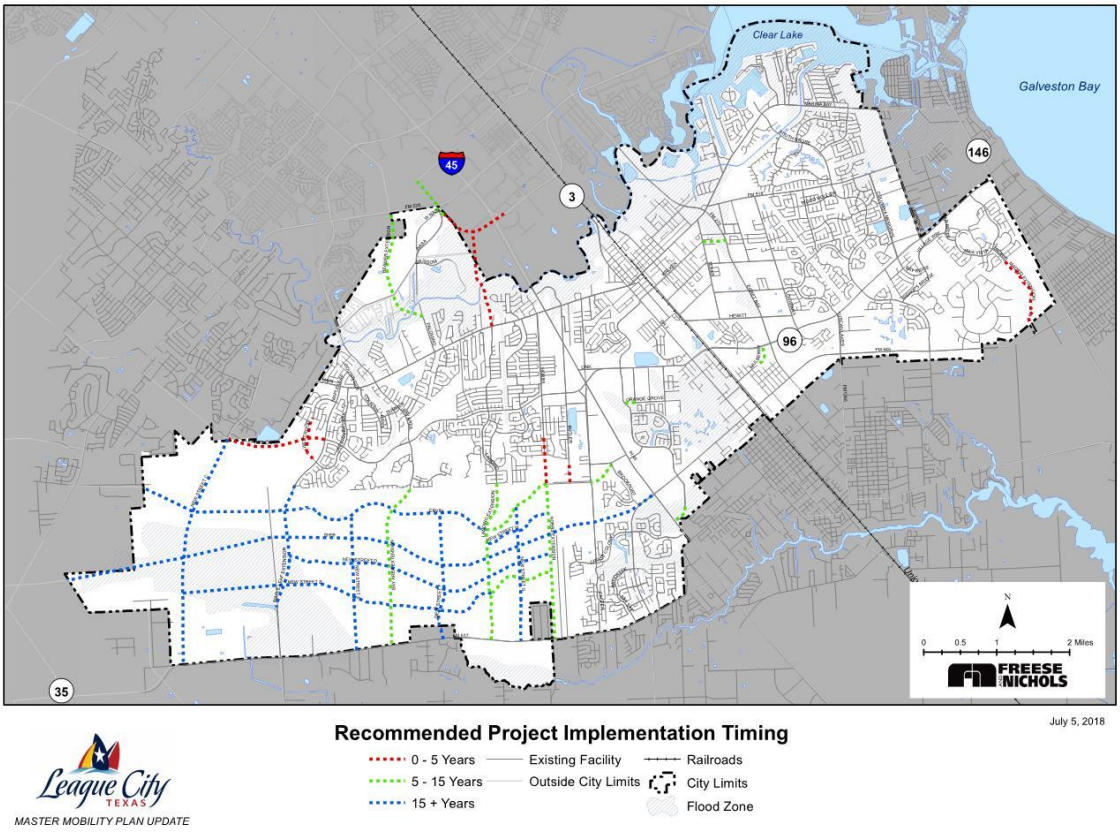
Thoroughfare Plan Implementation

Projects recommended for implementation in the League City Master Mobility Plan will be prioritized based on available funding, potential to leverage additional transportation improvements, and economic benefit. Projects selected for implementation range from new road construction and realignments to rehabilitation and intersection improvements. In addition to the prioritization of recommended projects, a number of funding sources were identified and categorized based on the types of transportation projects eligible for the funds.

Plan Implementation

Timing for recommended projects is based on available or identified funding for recommended projects, overall network impact, and/or the ability of the project to facilitate additional transportation improvements. Short-range projects include projects recommended for the one (1) to five (5) year term, medium-term projects are recommended for the five (5) to 15-year term, and long-term projects are envisioned for the 15-plus year horizon. Implementation timing is illustrated in **Map 9.**

Map 9. Recommended Project Implementation Timing



Alignments for proposed roadways are only conceptual and serve to identify right-of-way for preservation. Specfic alignments will be designed as development unfolds within the city.

Short-term Project Implementation (0 – 5 Years)

Table 14. Recommended Short-Term Project Implementation

Project	Limits	Functional Class	Priority
League City Parkway Extension	Maple Leaf Dr to Western City Limits	Major Arterial	0 - 5 years
Madrid Lane Extension	Existing alignment to FM 646	Collector	0 - 5 years
Right Turn-bays on FM 518	FM 518 and Landing Blvd Intersection	Major Arterial	0 - 5 years
Traffic Signal	League City Pkwy and Bay Area Blvd	Major Arterial	0 - 5 Years
Traffic Signal	League City Pkwy and Brittany Lakes Dr Intersection	Major Arterial	0 - 5 Years
Traffic Signal	Landing Blvd and League City Pkwy Intersection	Major Arterial	0 - 5 Years
Ervin Avenue	Calder Rd to Hobbs Rd Extension	Major Arterial	0 - 5 Years
Landing Boulevard Extension	Sandvalley Way to FM517	Minor Arterial	0 - 5 Years
Turn Bays at SB SH 3 and FM 518 Intersection	SH 3 and FM 518 Intersection	Major Arterial	0 - 5 Years
Walker Street Extension (Northern Segment)	Texas Ave to FM 270	Collector	0 - 5 Years

Many of the short-term projects, such as the League City Parkway Extension, are currently being designed or under construction. Other roadways, such as the Madrid Extension are dependent upon development in the area.

Medium-term Project Implementation (5 – 15 Years)

Table 15. Recommended Medium-term Project Implementation

Project	Limits	Functional Class	Priority
Walker Street Extension (Southern Segment)	South of FM 646 to IH 45 Frontage Rd	Major Arterial	5 - 15 Years
Ervin Avenue (Extension)	From Hobbs Rd to Landing Blvd (Extension)	Minor Arterial	5 - 15 Years
New Street B	From Landing Blvd Extension to Hobbs Rd Extension	Minor Arterial	5 - 15 Years
Hobbs Road (Extension)	Ervin Ave to FM 517	Minor Arterial	5 - 15 Years
Palomino Bridge	Clear Creek	Collector	5 - 15 Years
Widen FM 518 to Six Lanes	IH45 Frontage Rd to SH 3	Major Arterial	5 - 15 Years
Right-turn bays at League City Parkway	League City Pkwy and Brittany Lakes Dr Intersection	Major Arterial	5 - 15 Years
Palomino Lane Extension	Clear Creek to Grissom Rd	Collector	5 – 15 Years
Beamer Road Extension	Grissom Rd to North City Limits	Collector	5 – 15 Years

Long-term Project Implementation (15 + Years)

Table 16. Recommended Long-term Project Implementation

Project	Limits	Functional Class	Time Frame
Ervin Avenue (Extension)	Landing Blvd to Western City Limits	Minor Arterial	15 + Years
Ervin Avenue Widening to Four Lanes	Brookport Dr to Western City Limits	Minor Arterial	15 + Years
New Street B (Extension)	Landing Blvd (Extension) to New Street C	Minor Arterial	15 + Years
New Street C	FM 518 to FM 517	Major Arterial	15 + Years
New Street D	Hobbs Rd Extension to New Street E	Collector	15 + Years
New Street E	Ervin Ave to FM 517	Minor Arterial	15 + Years
New Street F	Ervin Ave to FM 517	Collector	15 + Years
New Street G	Ervin Ave to FM 517	Collector	15 + Years
New Street H	New Street D to FM 517	Collector	15 + Years
Grand Parkway	FM 646 to Western League City Limits	Freeway/ Toll Road	15 + Years
Walker Street Extension (Northern Segment)	Texas Ave to FM 270	Collector	15 + Years

Funding Strategies

Implementation Matrix

The funding and implementation matrix was developed to identify potential funding sources for Plan recommendations. **Table 17** summarizes funding sources that may be used for transportation improvements in League City. The Master Mobility Plan document details funding options for the following transportation improvement categories:

- Roadway Construction
- Roadway Rehabilitation
- Intersection Improvements
- Miscellaneous

Table 17. Summary of Potential Funding Sources

Summary of Potential Funding Sources		
Recommendation	**Problem Addressed**	**Potential Funding Source(s)**
Street Construction/ Roadway Realignment	Improved Access Capacity Improvement Congestion Relief Economic Development	Category 12: Strategic Priority Funds Category 4E: Rural Mobility/Rehabilitation Category 11: Texas Mobility Fund Category 8B: Texas FM Road Expansion Proposition 7 Funds Roadway Impact Fees
Right-of-Way Acquisition	ROW for future Road Expansion	Category 2 Category 4E: Rural Mobility/Rehabilitation Proposition 7 Funds
Traffic Signalization	Congestion Relief Safety	CMAQ Category 10A: Traffic Control Devices category 10B: Rehab of Traffic Management Systems Category 11
Intersection Geometry Improvements	Safety Congestion Relief Capacity Improvement Accommodates Wider Vehicles	CMAQ Category 4E Category 11
Bridge Construction/ Reconstruction	Safety Capacity Improvement Accommodate Wider Vehicles	Category 6A: On System Bridge Program Funds Category 6B: Off System Bridge Program Funds Category 11 Roadway Impact Fees
Pedestrian Amenities/ Landscaping	Traffic Calming Safety Economic Development Beautification	CMAQ STEP Funds Green Ribbon Funds Category 11