PEARLAND TRAFFIC MANAGEMENT PLAN

TECHNICAL MEMORANDUM # 3: ASSESSMENT OF TRANSPORTATION SYSTEM

PREPARED FOR:

CITY OF PEARLAND
PEARLAND
TEXAS
EST. 1894

PREPARED BY:

CDM Smith®

JULY 2015

FINAL REPORT

PEARLAND TRAFFIC MANAGEMENT PLAN

TECHNICAL MEMORANDUM NO. 3:

ASSESSMENT OF TRANSPORTATION SYSTEM

Issued as a Final Report for City of Pearland review on July 15, 2015.

Submitted to:

City of Pearland

Submitted by:

CDM Smith

Firm Registration # F-3043

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1. INTRODUCTION

The purpose of the *Traffic Management Plan* is to evaluate mobility needs for the City of Pearland and develop recommendations to enhance traffic flow and improve safety at critical signalized intersections and along major roadways within the City. The plan consists of the following three tasks:

1. **Signal Timing** - This task included development and implementation of optimized traffic signal timing plans to provide maximum progression for traffic flow along the thoroughfares with heavy traffic volumes and several signalized intersections.

2. **Local Travel Demand Model** – This task involved development of a refined travel demand model for the City of Pearland based on the Houston-Galveston Area Council (H-GAC) Regional Travel Demand Model. This refined model was developed to evaluate Capital Improvement Plan (CIP) improvements and other transportation needs for the City of Pearland.

3. **Assessment of Transportation System** – The purpose of this task is to assess the City's transportation system, evaluate the current Thoroughfare Plan, conduct safety analysis, identifying constrained corridors, and prioritize proposed roadway and intersection improvements in short-term, medium-term, and long-term horizons.

Technical Memoranda 1 and 2 for the first two tasks were submitted on February/2011 and April/2013, respectively. The purpose of this technical memorandum is to document traffic evaluation, findings, and recommendations performed as part of Task 3: Assessment of Transportation System. The *Traffic Management Plan* is prepared by CDM Smith for the City of Pearland as part of the Pearland Traffic Engineering Consulting Services contract.

1.1 Background

According to the U.S Census Bureau, the City of Pearland's population has increased from 37,640 people in 2000 to 91,252 people in 2010. Pearland is the fastest growing city in Brazoria County with an annual growth rate of 9.3 percent compared to 2.6 percent for the county and approximately two percent for the state of Texas. The City estimates the 2014 population to be 106,500 which translates to approximately four percent annual growth rate when compared to 2010's population.

The City offers a unique location to its residents and businesses within the Houston metropolitan area with access to Downtown Houston, the Texas Medical Center, and other major employment and activity centers including convenient access to Hobby Airport. According to H-GAC's regional growth forecasts, the population in the Pearland area is expected to double to around 200,000 by 2035. It is critical to have an efficient transportation system to sustain the mobility needs of the growing population and foster economic growth in the region.

1.2 Study Area

The study area encompasses the boundary formed by the City limits and the extraterritorial jurisdiction of the City of Pearland, as shown in **Figure 1.** Pearland's regional roadway network consists of freeway, tollway, arterial, collector, and local roadways providing mobility and access at the regional and local levels. The Texas Department of Transportation (TxDOT) maintains the state's roadway system, which mainly provides regional mobility. Cities and counties collectively maintain the rest of the road network, which provides access to the state system and also serves travel needs within the region and between and within local communities. Major highways traversing the study area are SH 288, Main Street/SH 35, Broadway Street/FM 518, Cullen Parkway/FM 865, McHard Road/FM 2234 and Manvel Road/FM 1128.

Pearland is known as primarily a bedroom community, with many travel destinations located in and around Houston. The resultant travel patterns focus on north-south movement along major roadways such as SH 288. Secondary east-west movements to access SH 288 impose high traffic demands on arterials such as Broadway Street.

1.3 Study Purpose

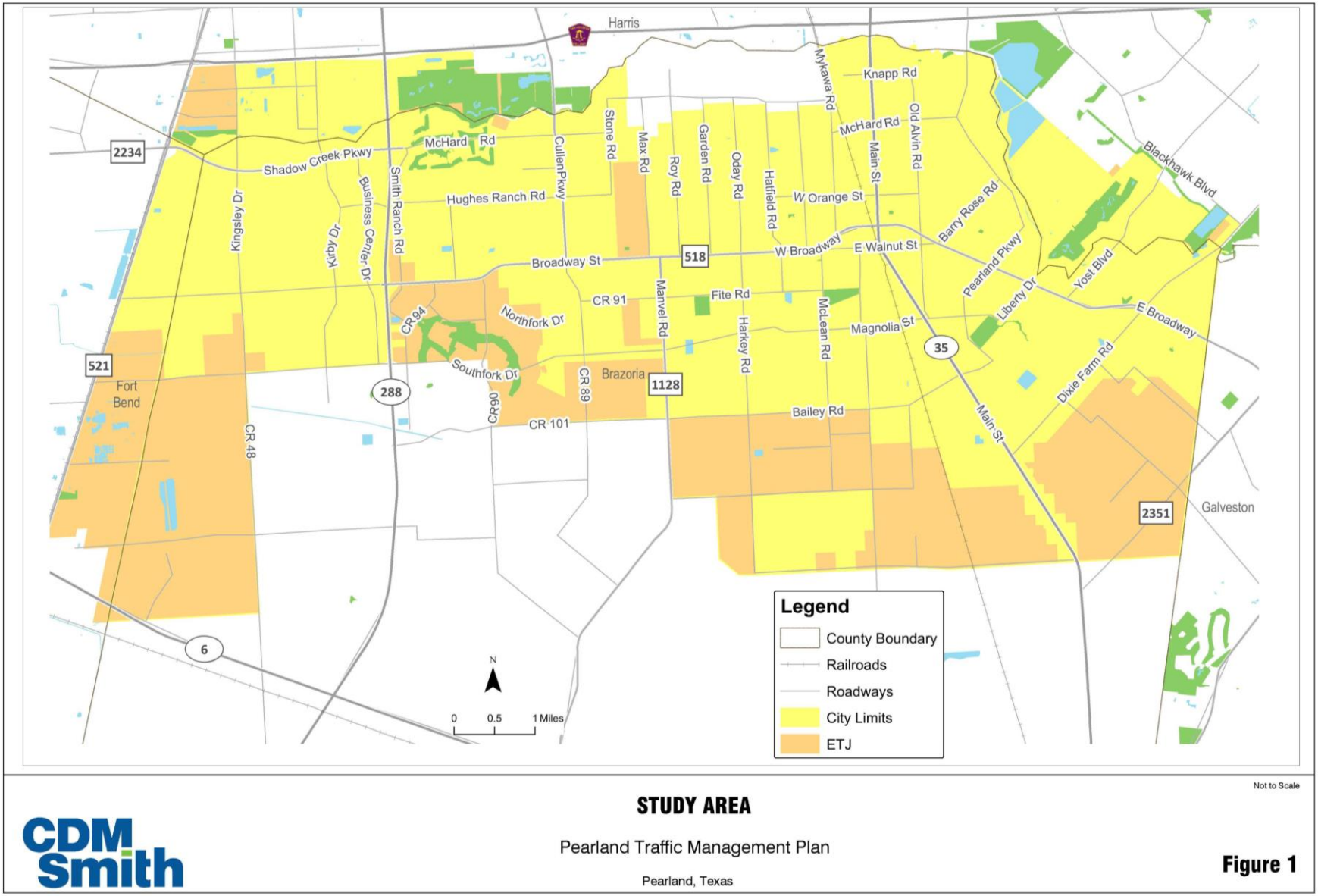
This study focuses on identifying capacity constrained corridors and signalized intersections with operational deficiencies in coordination with the City. It includes performing traffic analysis for existing and future conditions using the Pearland travel demand model and an operational model using *Synchro* to determine future mobility needs ranging from intersection improvements such as right-turn lanes and left-turn lanes, to more significant capacity improvements along major thoroughfares in the Pearland area. The proposed improvements have been developed and prioritized as short-term, medium-term, and long-term time frames based on mobility and safety needs.

1.4 Study Methodology

The methodology employed in conducting this study is outlined as follows:

- Conducted a field reconnaissance of the roadways and intersections in the study area.
- Collected TxDOT annual average daily traffic (AADT) counts (including urban saturation counts).
- Obtained recent Traffic Impact Assessment (TIA) reports from the City of Pearland to collect morning and evening peak period turning movement counts at study intersections.
- Supplemental peak period turning movement counts were collected from the field in December 2013, where count data was not available.
- Modeled existing roadway and traffic conditions using *Synchro*, version 8.0 which is a traffic operations software.

Figure 1: Study Area



Not to Scale

STUDY AREA

Pearland Traffic Management Plan

Pearland, Texas

Figure 1

- Analyzed traffic operations during morning and evening peak hours of a typical weekday. Existing and future traffic analyses were conducted using capacity methodology outlined in the Highway Capacity Manual (2010).
- Collected 2010-2012 crash data from TxDOT's Crash Record Information System (CRIS).
- Conducted crash analysis on selected corridors and intersections.
- Forecasted future traffic growth based on the Pearland Travel Demand Model.
- Conducted existing and future capacity analyses for selected roadway corridors using the Pearland model.
- Developed and evaluated roadway and intersection improvements to mitigate congestion.
- Estimated preliminary cost of improvements at the planning level.
- Developed evaluation matrix to prioritize improvements.

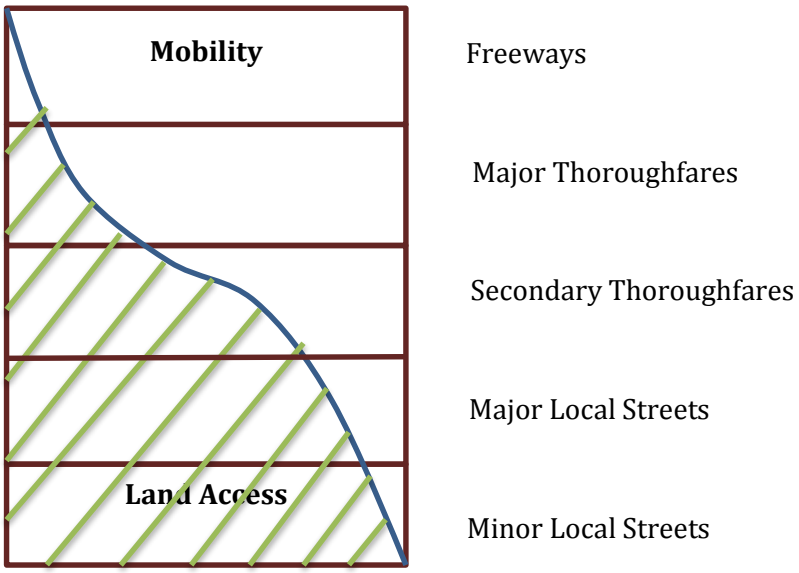
2. ROADWAY SYSTEM

The existing roadway system provides residents of the City of Pearland with the ability to travel for work, shopping, and other important activities. The efficiency with which these trips can be made determines the effectiveness of the roadway system.

2.1 Thoroughfare Plan

The City of Pearland has a regularly updated Thoroughfare Plan that defines the functional classification of the roadways. Functional class defines the characteristics as well as the purpose and the relationship with other roadways in a region. It is somewhat a subjective measure, and may change over time as traffic patterns change with residential and commercial developments. Generally, roadways of higher functional class are designed to accentuate mobility over accessibility, while lower-class roadways focus on providing accessibility and may have more driveways to the abutting land. This relationship is illustrated in **Figure 2**.

Figure 2: Mobility-Access Relationship



The City of Pearland current Thoroughfare Plan was last updated and adopted by City Council in February 2014 and is illustrated in **Figure 3**. Line styles are applied to roads on the Thoroughfare Plan map to identify the status of roads and projects and to define each road by its functional class. Existing roadways that already have sufficient width as well as segments of roadways that need to be extended or widened are shown and categorized in the five functional classes:

- **Freeways** are shown in black and are part of the state system. They serve high-volume, high-speed regional traffic with full access control. Freeways in the Pearland region are SH 288 and the Harris County Toll Road Authority's (HCTRA) Sam Houston Tollway.

- **Major Thoroughfares**, shown in blue, have a minimum 120' right-of-way. They primarily function to provide regional mobility, but also have a smaller element of providing access. This functional class typically serves 10,000 to 30,000 vehicles per day. Major thoroughfares in Pearland include roads such as Broadway Street/FM 518, Main Street/SH 35, Bailey Avenue, Dixie Farm Road, Almeda Road/FM 521, and the Pearland Parkway.

- **Secondary Thoroughfares,** shown in green, have a minimum 100' right-of-way. This functional class typically serves 5,000 to 15,000 vehicles per day. Examples of secondary thoroughfares in Pearland include Kirby Drive, South Fork Road, Magnolia Street, Harkey Road, and Veterans Road.

- **Major Collector Streets,** shown in red, have a minimum 80' right-of-way. This functional class typically serves 1,500 to 10,000 vehicles per day. Collector streets provide a larger degree of access to homes and to destinations other than thoroughfares. Stone Road, Walnut Street, Fite Road, and a portion of Orange Street are examples of major collectors.

- **Minor Collector Streets,** shown in purple, have a minimum 60' right-of-way. This functional class typically serves less than 2,000 vehicles per day. Minor collector streets in Pearland include North Fork Drive, Clear Lake Loop, and a portion of Orange Street.

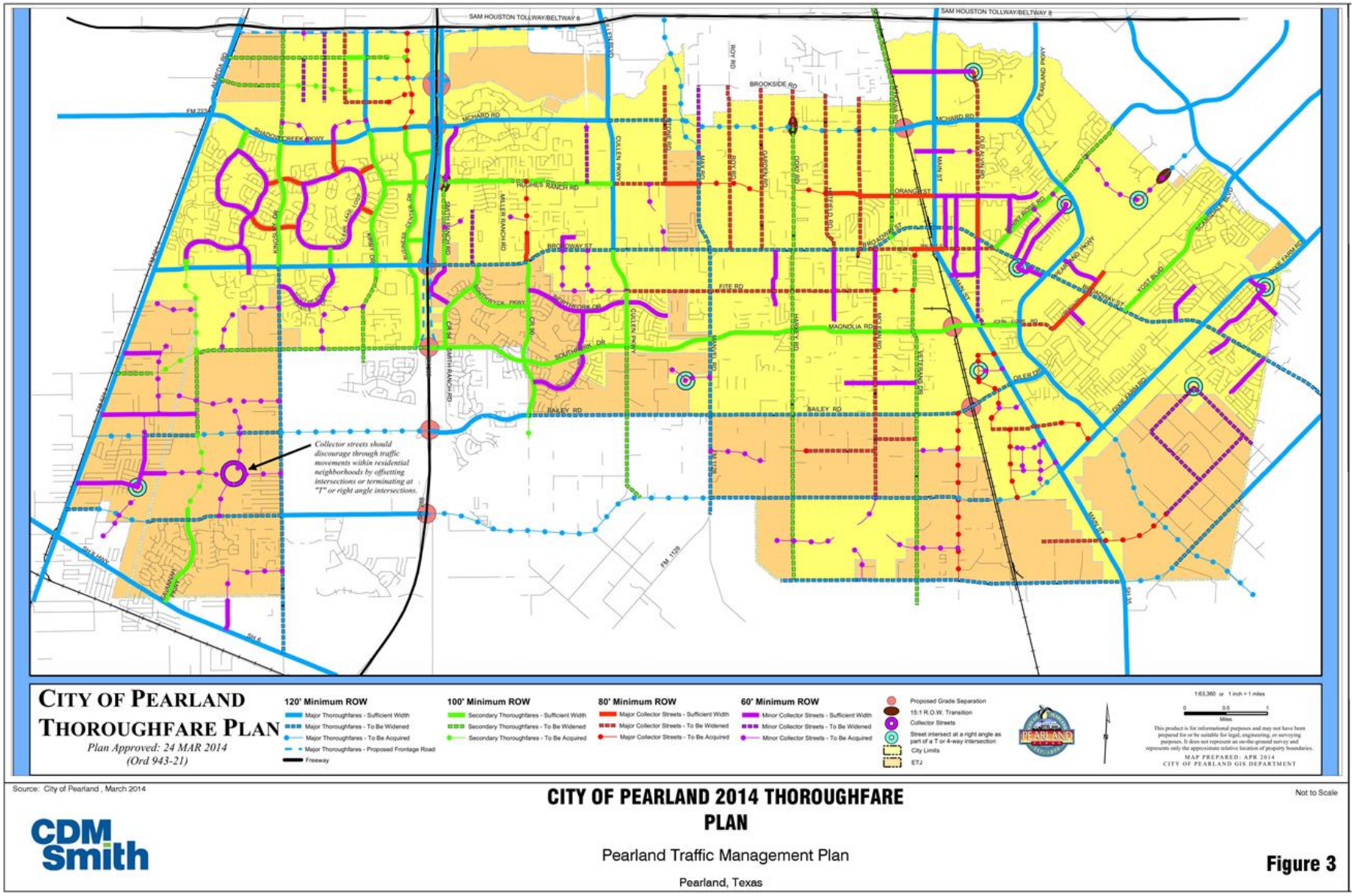
2.2 Roadways

The City of Pearland has a roadway system that provides access locally and regionally. The characteristics and functions of these important roadways are presented in this section. The roadways which are categorized as major thoroughfares in the 2014 Thoroughfare Plan are considered regional roadways while the secondary thoroughfares are considered local roadways.

2.2.1 Regional Roadways

While most trips within the City of Pearland involve local roads, the close proximity of the Houston metropolitan area provides residents access through its several state and county thoroughfares. Many Pearland residents are employed in Houston and other cities within the region, and as such contribute to trips made during weekdays on these regional corridors. Regional roadways which provide access to nearby cities are the Sam Houston Tollway/Beltway 8, SH 288, SH 6, SH 35, FM 521, FM 518, FM 865, FM 2234, FM 1128, FM 2351, and Dixie Farm Road.

Figure 3: City of Pearland 2014 Thoroughfare Plan



Source: City of Pearland , March 2014

CDM Smith

CITY OF PEARLAND 2014 THOROUGHFARE PLAN

Pearland Traffic Management Plan

Pearland, Texas

Not to Scale

Figure 3

Sam Houston Tollway

Sam Houston Tollway, along with Beltway 8, is an 88-mile roadway which encompasses the City of Houston. The tolled freeway portion of this facility, which is operated and maintained by the Harris County Toll Road Authority (HCTRA), is referred to as the Sam Houston Tollway while the adjacent frontage roads along the controlled access sections are referred to as Beltway 8. Within the study area, this facility is tolled and traverses in an east-west direction running from FM 521/Almeda Road to I-45. The facility was recently expanded from two lanes to four lanes in each direction between US 59 and SH 288, and has two lanes in each direction between SH 288 and just west of I-45. There are two-lane one-way frontage roads on either side of the tollway. The posted speed limit is 65 mph.

SH 288

It is a 60-mile north-south highway between I-45 in Downtown Houston and extends south to Freeport, where it terminates at FM 1495. SH 288 is the predominant roadway serving the majority of travel needs within the study area. It also provides connectivity to other regional routes including Sam Houston Tollway, I-610, and US 59 as well as providing access to major employment centers such as Texas Medical Center, Midtown, and Downtown Houston. Within the study area, SH 288 serves as a freeway between Beltway 8 and SH 6 with three lanes in each direction. South of SH 6 it becomes a limited access highway with two lanes in each direction. It is also referred to as the Nolan Ryan Expressway from the Harris-Brazoria county line to Freeport. The posted speed limit is 60 mph.

There are plans to construct toll lanes along the SH 288 corridor to help alleviate congestion; TxDOT, HCTRA, BCTRA, and METRO all show the SH 288 managed lanes project in their future project plans. The project will have several phases. The ultimate build-out of the project is for four toll lanes to CR 58 within the existing median of SH 288 with direct connectors at Beltway 8 and also direct access to the Texas Medical Center from the managed lanes. The project is currently envisioned to open around 2018.

SH 6

This facility is a major regional thoroughfare in the study area. It traverses in southeast direction along the south side of the City of Pearland connecting to the Cities of Manvel and Alvin and eventually to I-45 north of Galveston. To the west, it provides connectivity to the Cities of Sugar Land and Missouri City in Fort Bend County. Within the study area, SH 6 is a six-lane highway with a center turn lane and has a posted speed limit of 55 mph.

Main St/SH 35

It is a major north-south highway in the study area connecting the City of Pearland to the City of Houston region in the north and the City of Alvin to the south. It is referred to as Main Street within the City of Pearland. It is the City's principal north-south thoroughfare and the center of its industrial and commercial activity. This highway was the main connection from the City of Pearland to the City of Houston prior to the construction of SH 288. It also provides direct access to Hobby Airport for residents. Within the study area, the segment between Beltway 8 and Broadway Street

was recently widened from four lanes to six lanes; the rest of the facility is a four-lane divided roadway with a posted speed limit of 45 mph.

FM 521

This Farm-to-Market roadway is approximately 95-miles which starts near US 90A in Downtown Houston and continues south and southwest through Harris, Brazoria, and Matagorda counties. In the study area, FM 521 serves as a major north-south arterial skirting the western city limits of the City of Pearland and provides connectivity to regional thoroughfares including Sam Houston Tollway and I-610, and provides access to destinations such as the Texas Medical Center. It also serves as an alternate route to SH 288 that parallels this roadway to the east. To the south, FM 521 provides connectivity to Business SH 288 to the north of the City of Angleton. Within the study area, the number of lanes range from two to four with a posted speed limit of 45 mph.

Broadway Street/FM 518

FM 518 is a 26-mile Farm-to-Market roadway that traverses the Greater Houston area, primarily running from FM 521 in Pearland to SH 146 in Kemah in Galveston County. This roadway has a length of approximately 9.7 miles within the study area. It is the City of Pearland's only continuous east-west thoroughfare which connects to SH 288, SH 35, and I-45 and is the center of the City's retail and commercial activity. This roadway is referred to as Broadway Street within the City of Pearland. Within the study area, FM 518 is a four-lane divided facility with a posted speed limit of 45 mph.

Cullen Parkway/FM 865

This Farm-to-Market roadway is about ten miles in length and travels south from US 90A in the City of Houston to the City of Pearland where it terminates at Broadway Street. It runs parallel to SH 288 and serves as a possible alternate route. Within the study area, this roadway is known as Cullen Parkway. It is a four-lane divided roadway with a posted speed limit of 45 mph.

McHard Road/FM 2234

Farm-to-Market Road 2234 provides connections between the City of Pearland and Missouri City in Fort Bend County. In the study area, it is an east-west arterial between FM 521 and Pearland Parkway. It also known as Shadowcreek Parkway or McHard Road between FM 521 and Stone Road and between Mykawa Road and Pearland Parkway, respectively. Within the study area, it is a four-lane roadway except the section from FM 865 to Stone Road (two lanes), and has a posted speed limit ranging from 30 mph to 50 mph.

Manvel Road/FM 1128

FM 1128, also known as Manvel Road or Max Road, parallels Cullen Parkway and also provides a north-south connection. It is currently not connected to Beltway 8 but a future extension is planned. Within the study area from Broadway Street to SH 6, it is a two-lane undivided facility with a posted speed limit of 50 mph.

FM 2351
FM 2351 crosses the southeast edge of the City of Pearland. It provides a connection between SH 35 and I-45. The segment between Main Street and Broadway Street within the study area is a two-lane undivided roadway with a posted speed limit of 45 mph.

Dixie Farm Road
This eight-mile east-west divided roadway primarily provides a connection from Main Street to I-45. It has two lanes in each direction and a posted speed limit of 45 mph.

Bailey Road/CR 101
This county roadway provides an east-west connection from SH 288 to Main Street. It connects to Pearland Parkway after it traverses Main Street eastward and connects to Oiler Drive. It is a two- to four-lane roadway with a posted speed limit ranging from 30 mph to 35 mph.

Pearland Parkway
This roadway connects several east-west arterials such as Broadway Street and McHard Road to Beltway 8. It currently terminates at Oiler Drive at the southern terminus but it is planned to extend to Dixie Farm Road and continue further south. It is a four-lane divided roadway with a posted speed limit of 45 mph.

2.2.2 Local Roadways

The following is a brief description of the local roadways within the City of Pearland.

Magnolia Road/CR 59
CR 59 is an east-west corridor which generally parallels Bailey Road and connects FM 521 to Pearland Parkway. West of SH 288, it is a two-lane roadway with a posted speed limit of 45 mph; east of SH 288, it is a four-lane roadway with a posted speed limit ranging from 30 mph to 40 mph.

Cullen Parkway/CR 89
This county road, which is also referred to as Cullen Parkway, runs south of Broadway Street traversing CR 91, Magnolia Road, Bailey Road and terminates at Manvel Road. Within the study area, the number of lanes ranges from two to four lanes, and the posted speed limit is 35 mph.

Kingsley Drive/CR 48
CR 48 is a north-south corridor which extends from Beltway 8 to SH 6 within the study area. It serves as an alternative route to FM 521 and SH 288. It is primarily a two-lane roadway, with the exception of the segment from McHard Road to Broadway Street, which has four lanes. This facility has a posted speed limit of 30 mph.

Kirby Drive
Kirby Drive runs parallel to CR 48 and begins at Beltway 8 and ends slightly south of Magnolia Road. It is a four-lane roadway from Beltway 8 to Broadway Street and becomes a two-lane roadway south of Broadway Street. It has a posted speed limit of 30 mph.

Mykawa Road

It is a north-south corridor that runs parallel to the Santa Fe Railroad. It starts from just north of I-610 in Houston and terminates at Broadway Street in Pearland. Within the study area, it is a two-lane undivided roadway with a posted speed limit of 40 mph.

Veterans Drive/Pearland Sites Road/CR 143

CR 143 is a north-south roadway which starts from West Walnut Street and terminates at SH 6. Within the study area, it is a two-lane roadway with a posted speed limit of 40 mph.

Yost Boulevard/Scarsdale Boulevard

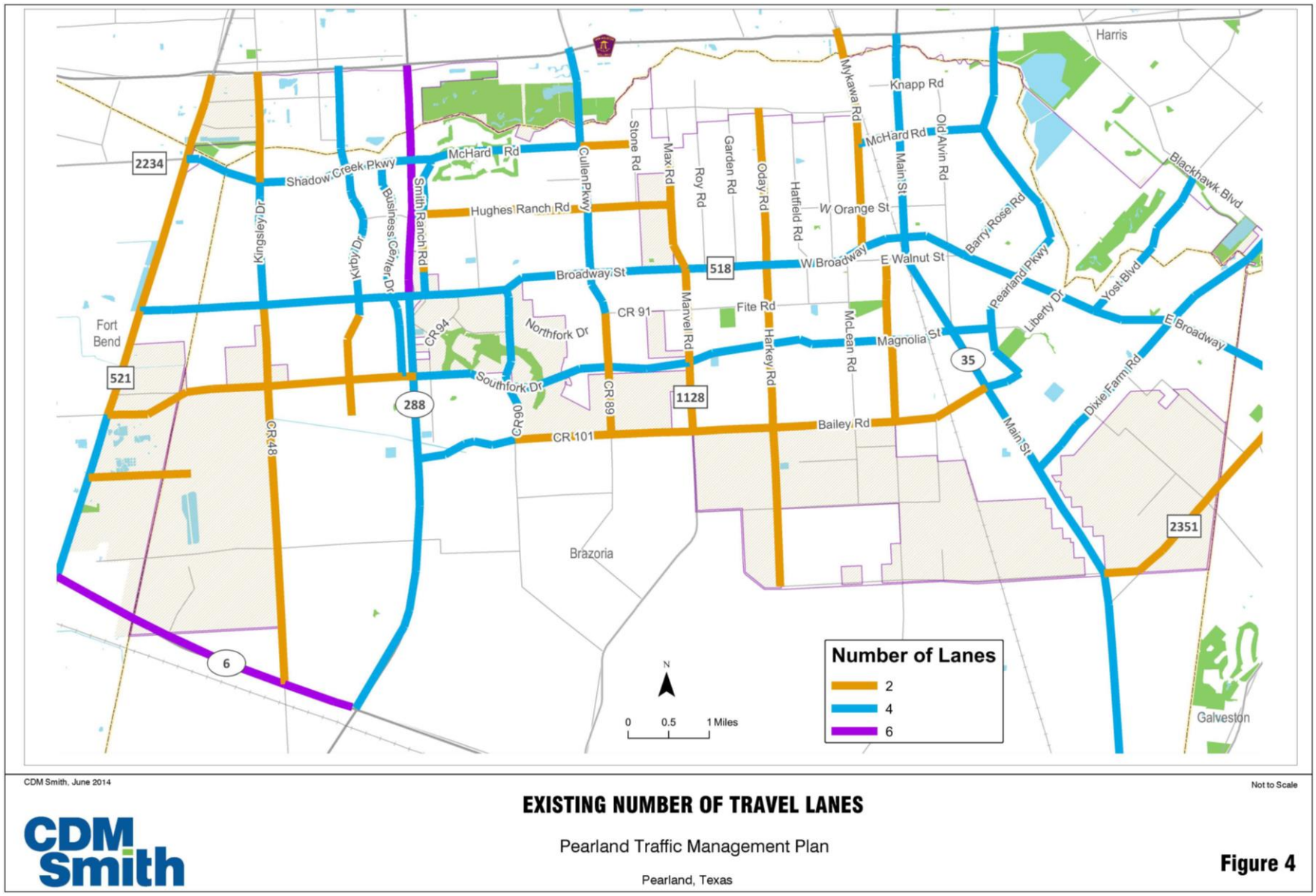
This four-mile roadway connects Broadway Street to Blackhawk Boulevard and then continues to I-45. It has four lanes with a raised median and a posted speed limit of 30 mph.

Figure 4 shows the existing number of travel lanes for major corridors in the study area.

2.3 Study Corridors and Intersections

The focus of this study is to assess the city's transportation system by evaluating constrained corridors and critical intersections, with an ultimate goal of prioritizing identified roadway and intersection improvements. **Figure 5** illustrates the major roadways and critical intersections that were selected for this study in coordination with the City and based on projected roadway congestion using the Pearland model.

Figure 4: Existing Number of Travel Lanes



CDM Smith, June 2014

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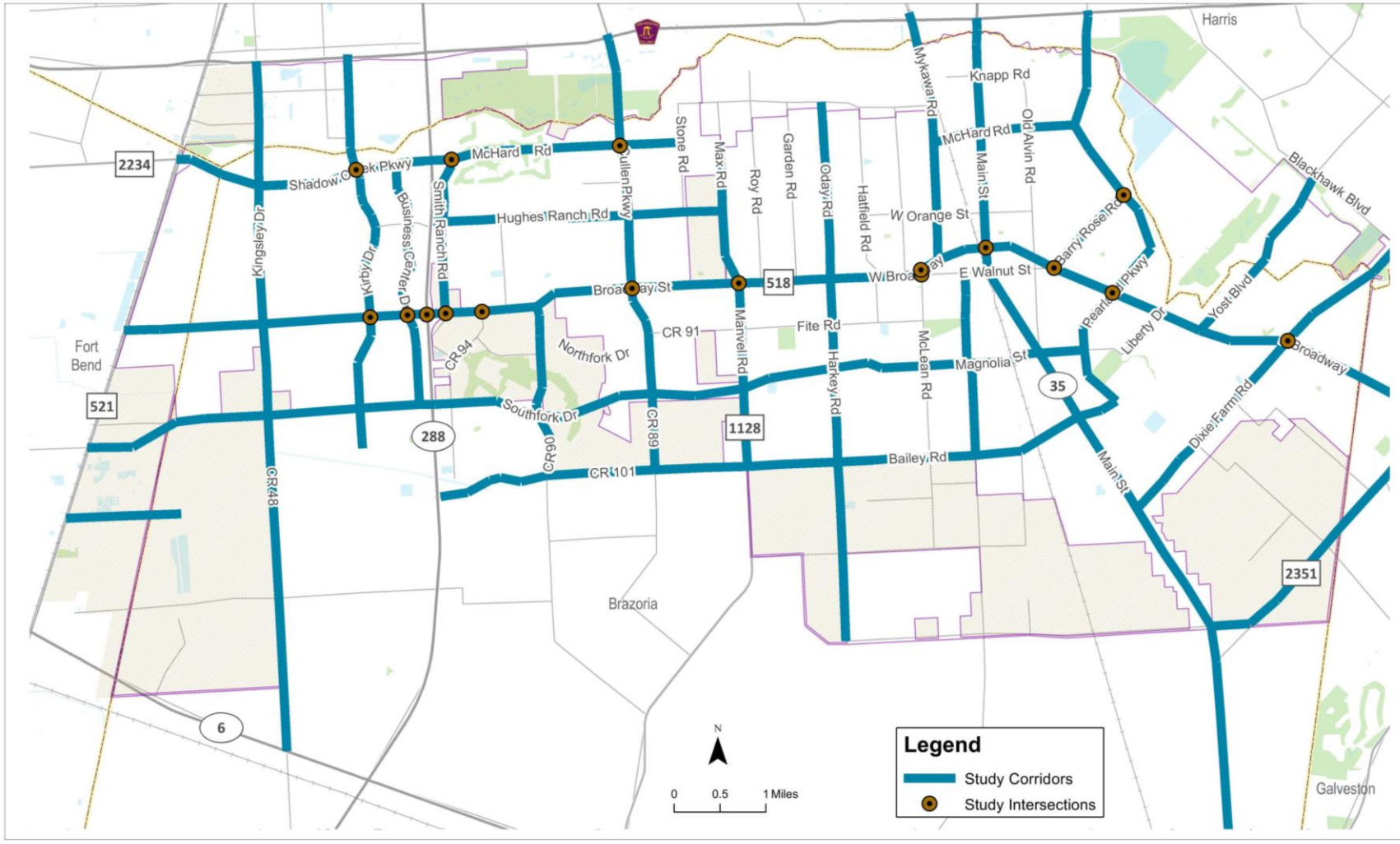
EXISTING NUMBER OF TRAVEL LANES

Pearland Traffic Management Plan

Pearland, Texas

Figure 4

Figure 5: Study Corridors and Intersections



CDM Smith, June 2014

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STUDY CORRIDORS AND INTERSECTIONS

Pearland Traffic Management Plan

Pearland, Texas

Figure 5

3. EXISTING TRAFFIC CONDITIONS

The existing traffic conditions for both study corridors and study intersections are presented in this section.

3.1 Existing Roadway Analysis

The following discuss daily traffic volumes and level-of-service for the study area roadways.

3.1.1 Daily Traffic Volumes

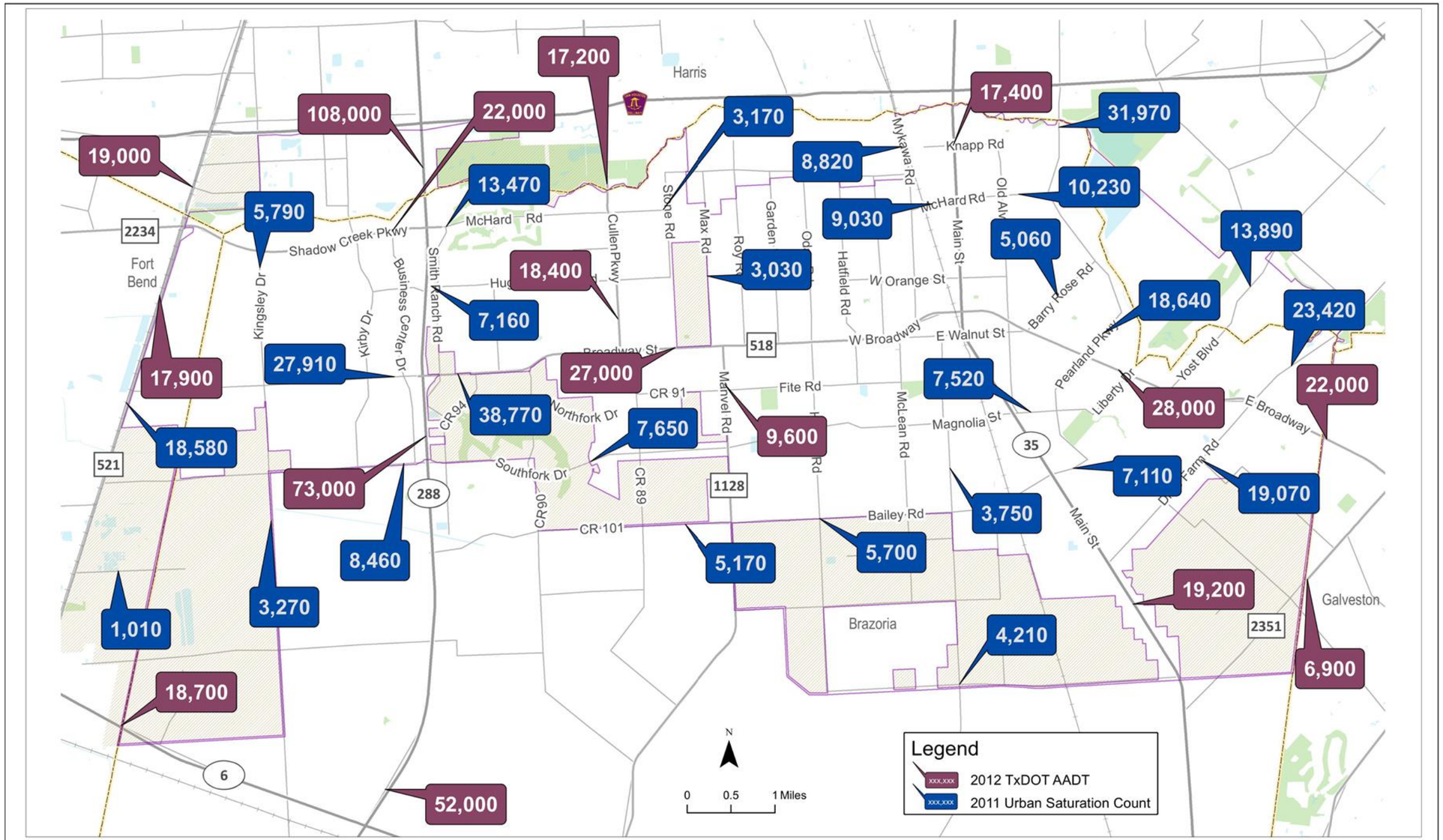
Annual average daily traffic (AADT) counts were obtained from TxDOT. AADT represents 24-hour counts with truck and seasonal factors applied. Each roadway segment has one to several counting points, and an average volume of the segment is used. Since TxDOT AADT count program does not include counts on all roadways in the study area, TxDOT's Urban Saturation Counts were utilized to supplement the existing daily traffic volumes used in this study. Saturation counts are made available to the public every five years and represent the maximum number of counts collected for an urban area. The counts are 24-hour weekday (Monday through Thursday) and are not adjusted for truck or seasonal variations. Existing traffic counts are illustrated in **Figure 6**. As shown in the figure, the segment between SH 288 and Cullen Parkway on FM 518 carries the highest amount of daily traffic [38,770 vehicles per day (vpd)] followed by the segment between Sam Houston Tollway and McHard Road on Pearland Parkway which carries an average daily traffic of 31,970 vpd.

3.1.2 Level-of-Service

Level-of-service (LOS) measures the quality of traffic flow. It is a qualitative measure ranging from A to F, which characterizes both operational conditions within a traffic stream and highway users' perception. Transportation planners derive LOS for a roadway by examining its traffic volume and the operating capacity (the number of vehicles per hour the roadway can accommodate without creating congestion). **Figure 7** gives an illustration of the LOS classification.

Volume-to-capacity ratio (V/C) is the measure of total volume of vehicles passing a section on a roadway in an hour relative to the maximum volume the roadway section was designed for. The V/C ratio for roadways in the study area are obtained from the Pearland model and computed based on output volumes, number of lanes, speed, and roadway functional class. The LOS standards for roadways are based on Highway Capacity Manual (2010) and the maximum V/C ratio threshold for a two-lane and multi-lane roadway is presented in **Table 1**. The existing LOS for roadways in the study area is illustrated in **Figure 8**. *Note: Roadways including SH 288, BW 8, FM 521 and SH 6 were not selected as part of the study corridors and therefore the LOS analysis was not conducted for these roadways*.

Figure 6: Existing Traffic Counts



Source: 2012 TxDOT AADT and 2011 TxDOT Urban Saturation Counts

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EXISTING DAILY TRAFFIC COUNTS

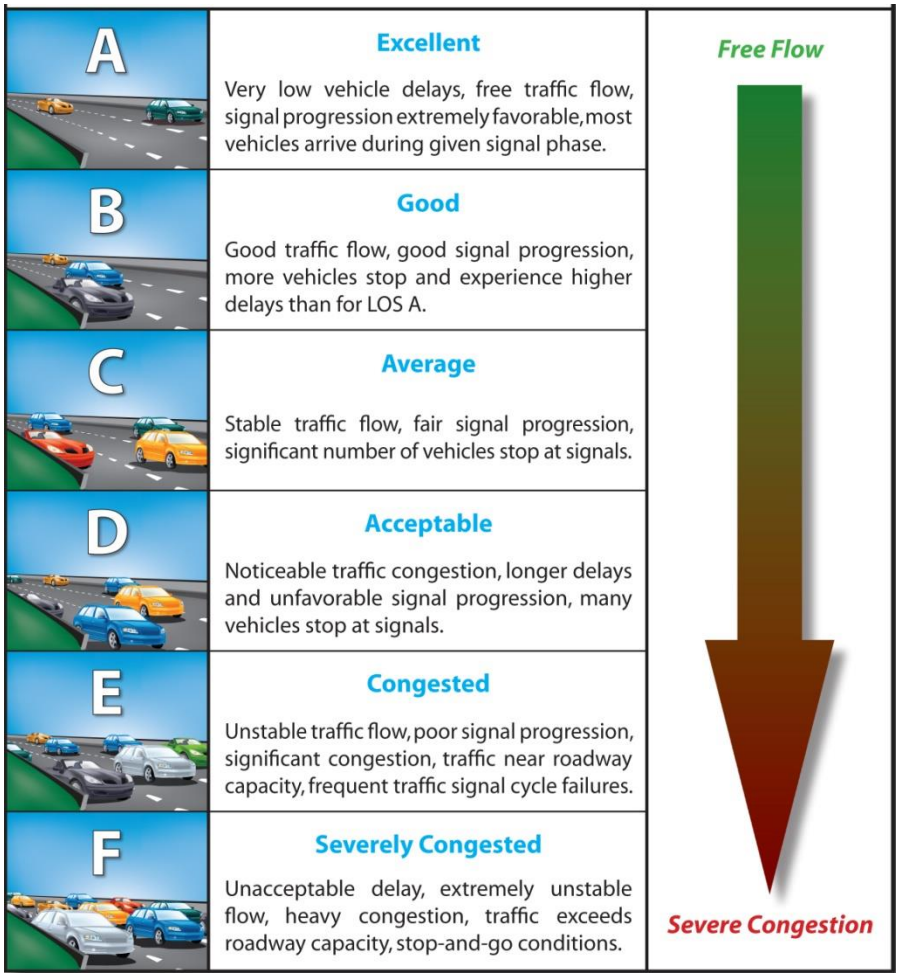
Pearland Traffic Management Plan

Pearland, Texas

Figure 6

kayak

Figure 7: Level-of-Service Definition



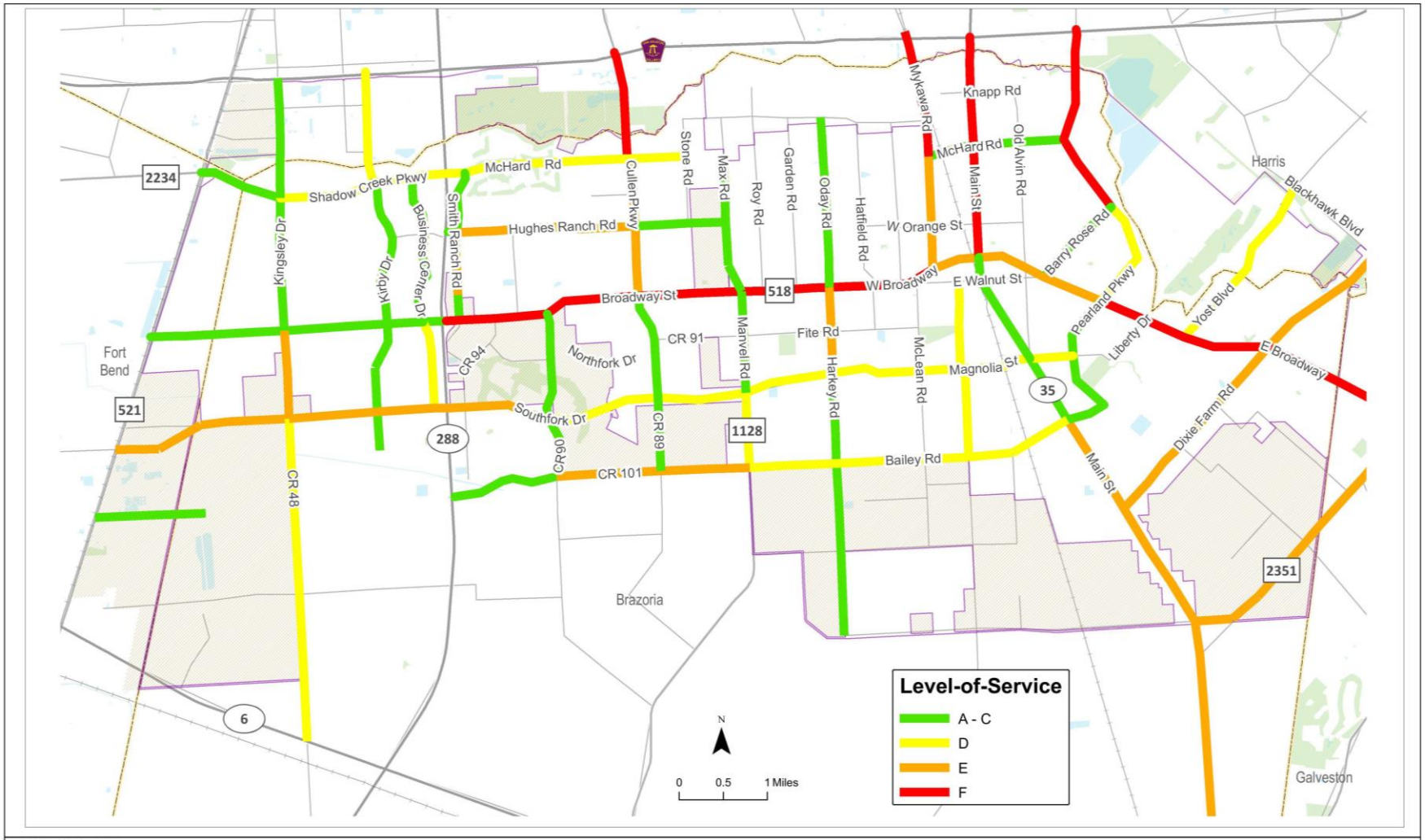
Source: CDM Smith

Table 1: Level-of-Service Criteria for Roadways

Level-of-Service	Maximum Volume-to-Capacity Ratio	
	Two-Lane Roadways	Multi-Lane Roadways
A	0.10	0.35
B	0.25	0.50
C	0.40	0.65
D	0.60	0.80
E	1.00	1.00
F	> 1.00	> 1.00

Source: Highway Capacity Manual, Transportation Research Board, 2010

Figure 8: Existing Peak Period Roadway Level-of-Service



CDM Smith, June 2014

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EXISTING ROADWAY LEVEL-OF-SERVICE

Pearland Traffic Management Plan

Pearland, Texas

Figure 8

3.2 Existing Intersection Analysis

This section provides information on traffic counts and traffic operations analysis conducted for study intersections.

3.2.1 Turning Movement Volumes

The following two sources were used to obtain existing turning movement counts for the study intersections:

1. Traffic counts collected by CDM Smith in December 2013.
2. Traffic counts collected from most recent Traffic Impact Analysis (TIA) studies.

3.2.2 Level-of-Service

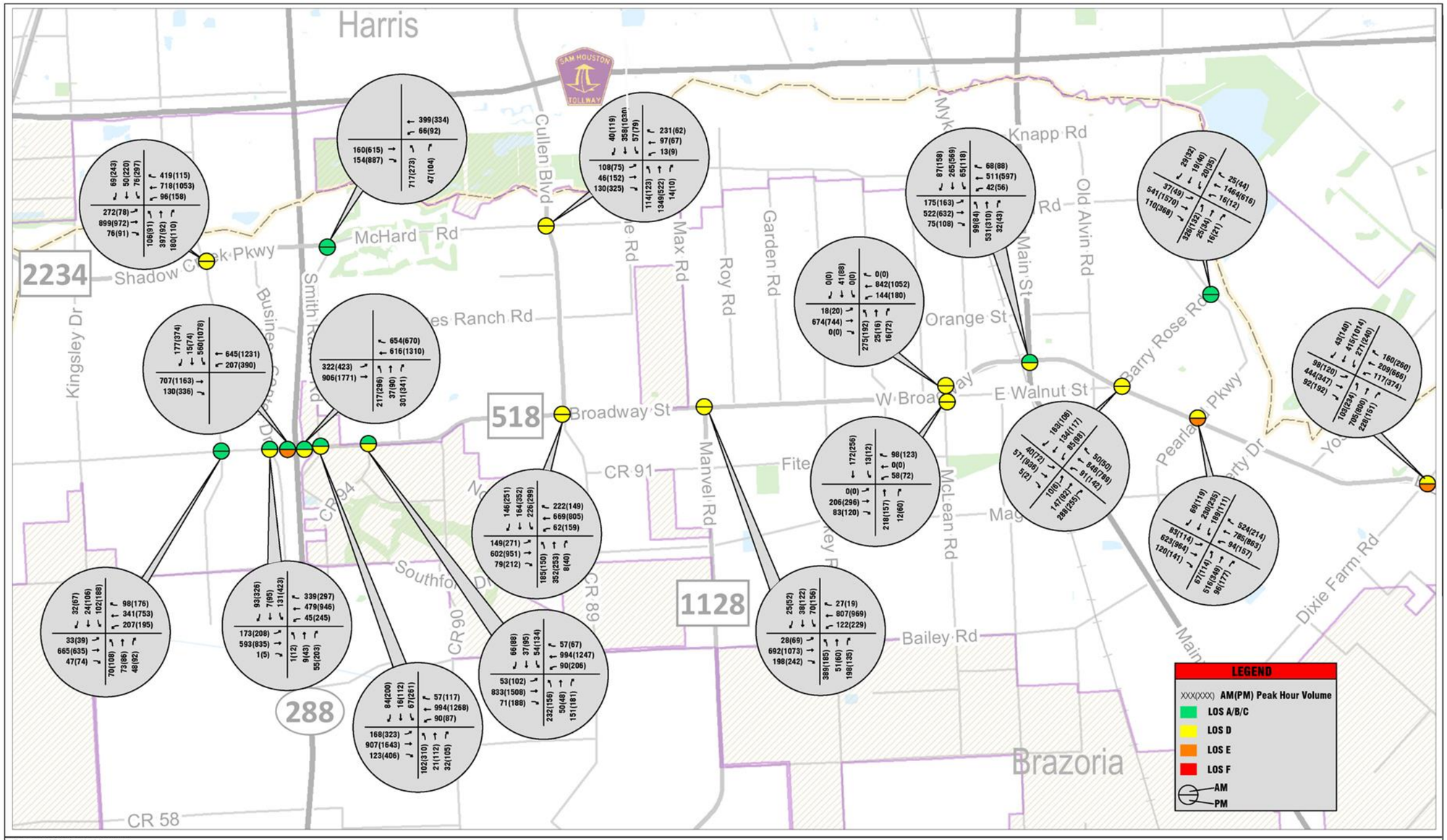
Capacity analyses were conducted for study area intersections to evaluate existing traffic operating conditions. The Highway Capacity Manual (2010) defines capacity at an intersection as the maximum hourly rate at which vehicles can reasonably be expected to pass through the intersection under prevailing traffic roadway and signalization conditions. The primary Measures of Effectiveness (MOEs) used in evaluating the traffic impacts were peak hour intersection control delay (measured in units of seconds per vehicle) and level-of-service (LOS).

Control delay is defined as that component of total delay caused by decelerating and accelerating at a traffic signal or stop sign. LOS is a qualitative measure of operating conditions at an intersection based on control delay. LOS is given a letter designation from A to F, where LOS A represents free-flow conditions and LOS F represents heavy congestion. The relationship between the various LOS classifications and control delay is summarized in **Table 2.**

Analysis of existing conditions was conducted using *Synchro* software. *Synchro* is macroscopic simulation tool developed by Trafficware® for capacity analysis for intersections that are either isolated or part of a network, and includes evaluation of delay and queues. *Synchro* also has the capability of optimizing traffic signals, thereby allowing the development of traffic signal timing to accommodate roadway and intersection reconfigurations evaluated as part of this study.

Figure 9 shows the existing turning movement counts and LOS at the study intersections during morning and evening peak hours.

Figure 9: Existing Turning Movement Volumes at Study Intersections



Source: CDM Smith, May 2014

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EXISTING YEAR 2013
TURNING MOVEMENT VOLUMES AND LEVEL OF SERVICE

Pearland Traffic Management Plan

Pearland, Texas

Figure 9

Table 2: Level-of-Service Criteria for Signalized Intersections

Level-of-Service	Average Control Delay (seconds/vehicle)	Typical Traffic Condition
A	⩽ 10.0	**Very Low Delays**: Progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all.
B	> 10.0 and ⩽ 20.0	**Minimal Delays**: Generally good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of average delay. Drivers begin to feel restricted.
C	> 20.0 and ⩽ 35.0	**Acceptable Delays**: Fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear, though many still pass through the intersection without stopping. Most drivers feel somewhat restricted.
D	> 35.0 and ⩽ 55.0	**Tolerable Delays**: The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable. Queues may develop but dissipate rapidly, without excessive delays.
E	> 55.0 and ⩽ 80.0	**Significant Delays**: Considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences. Vehicles may wait through several signal cycles and long queues of vehicles form upstream.
F	> 80.0	**Excessive Delays**: Considered to be unacceptable to most drivers. Often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. Poor progression and long cycle lengths may also be major contributing causes to such delay levels. Queues may block upstream intersections.

Source: Highway Capacity Manual, Transportation Research Board, 2010

Using the traffic analysis methodology previously discussed, existing traffic operating conditions were evaluated for the study intersections. A summary of the morning and evening peak hour LOS and intersection delay is provided in **Table 3**.

Table 3: Existing (2013) Intersection Level-of-Service

Intersection	Morning Peak Hour		Evening Peak Hour	
	Delay (s/veh)	LOS	Delay (s/veh)	LOS
McHard Road at Kirby Drive	41.2	D	45.4	D
McHard Road at County Place Parkway	19.0	B	16.5	B
McHard Road at Cullen Parkway	48.0	D	39.9	D
Broadway Street at Kirby Drive	17.3	B	21.8	C
Broadway Street at Business Center Drive	18.9	B	40.3	D
Broadway Street at SH 288 SBFR[1]	31.0	C	**78.9**	**E**
Broadway Street at SH 288 NBFR[1]	23.3	C	40.4	D
Broadway Street at Smith Ranch Road	25.5	C	43.4	D
Broadway Street at CR 94	26.3	C	40.5	D
Broadway Street at Cullen Parkway	35.4	D	41.4	D
Broadway Street at Manvel Road	37.7	D	49.9	D
Broadway Street at McLean Road[1]	36.0	D	35.4	D
McLean Road at W. Walnut Street[1]	45.4	D	42.6	D
Broadway Street at Main Street	34.9	C	36.9	D
Broadway Street at Barry Rose Road	40.8	D	37.6	D
Broadway Street at Pearland Parkway	38.9	D	**77.1**	**E**
Broadway Street at Dixie Farm Road	39.9	D	**66.9**	**E**
Pearland Parkway at Barry Rose Road	22.7	C	21.1	C

Source: CDM Smith, using Synchro, Version 8

[1]HCM (2010) does not analyze clustered intersections; HCM 2000 was employed

Analysis of the existing conditions indicates that the study area intersections operate at LOS D or better during the peak hours, with the exception of Broadway Street/FM 518 at: SH 288 SB Frontage Road, Pearland Parkway, and Dixie Farm Road which operates at LOS E during evening peal hour.

4. CRASH ANALYSIS

To better understand the safety issues in the study area, crash data from TxDOT's Crash Records Information System (CRIS) were obtained and analyzed. Crash data were collected for years 2010 through 2012 for the Pearland area. High crash locations, crash rates, and types of injuries and fatalities were evaluated for the study area.

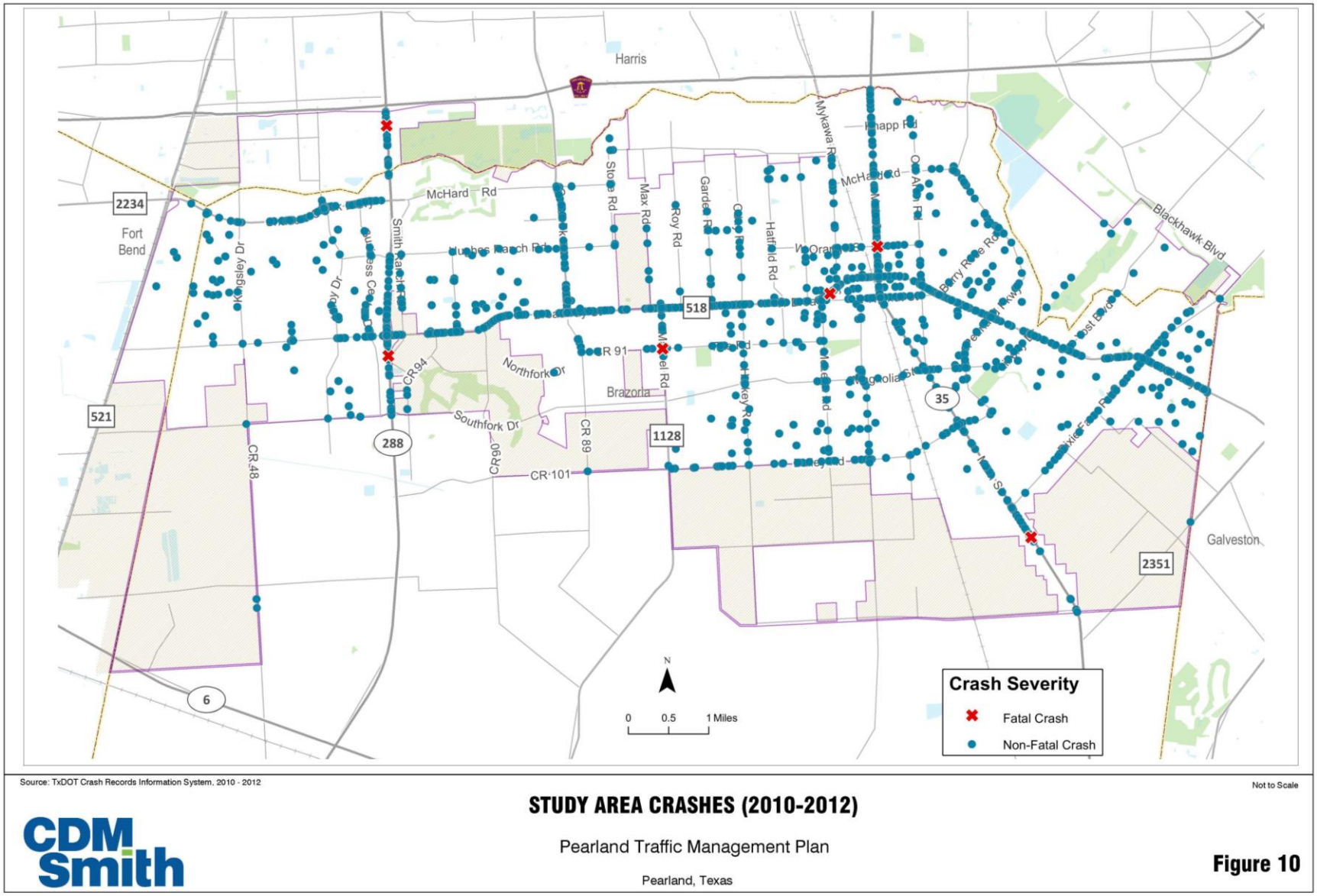
4.1 Number of Crashes

There were a total of 3,409 crashes recorded within the City of Pearland during the three-year period from 2010 to 2012. Out of which, 2,970 (87 percent) occurred along the corridors selected for this study and 1,534 (45 percent) occurred at the study intersections. Of all the crashes along the study corridors, approximately 40 percent occurred on Broadway Street while approximately 14 percent were on Main Street. Approximately 26 percent of the total number of crashes within the City limits resulted in some type of injury and six crashes resulted in fatalities. Also, 14 crashes involved pedestrians while 11 crashes involved bicyclists. The location of crash incidents and fatalities in the study area is illustrated in **Figure 10**.

4.2 Crash Hot Spots

Using the crash data points obtained from 2010 to 2012, GIS approach based on Kernel Density Estimation (KDE) was performed to obtain crash concentration maps to identify crash hot spots. **Figure 11** shows the density of crashes in the Pearland area using this methodology. Locations with darker red spots have a higher concentration of crashes than locations with blue spots. As seen, the majority of crash hot spots are located at the intersections of major thoroughfares. To better understand the safety issues, a detailed crash analysis was conducted at the study roadways and intersections to develop safety rankings which are discussed next. The safety rank was utilized as one of the criteria to prioritize the proposed improvements in this study.

Figure 10: Study Area Crashes (2010-2012)



Source: TxDOT Crash Records Information System, 2010 - 2012

Not to Scale

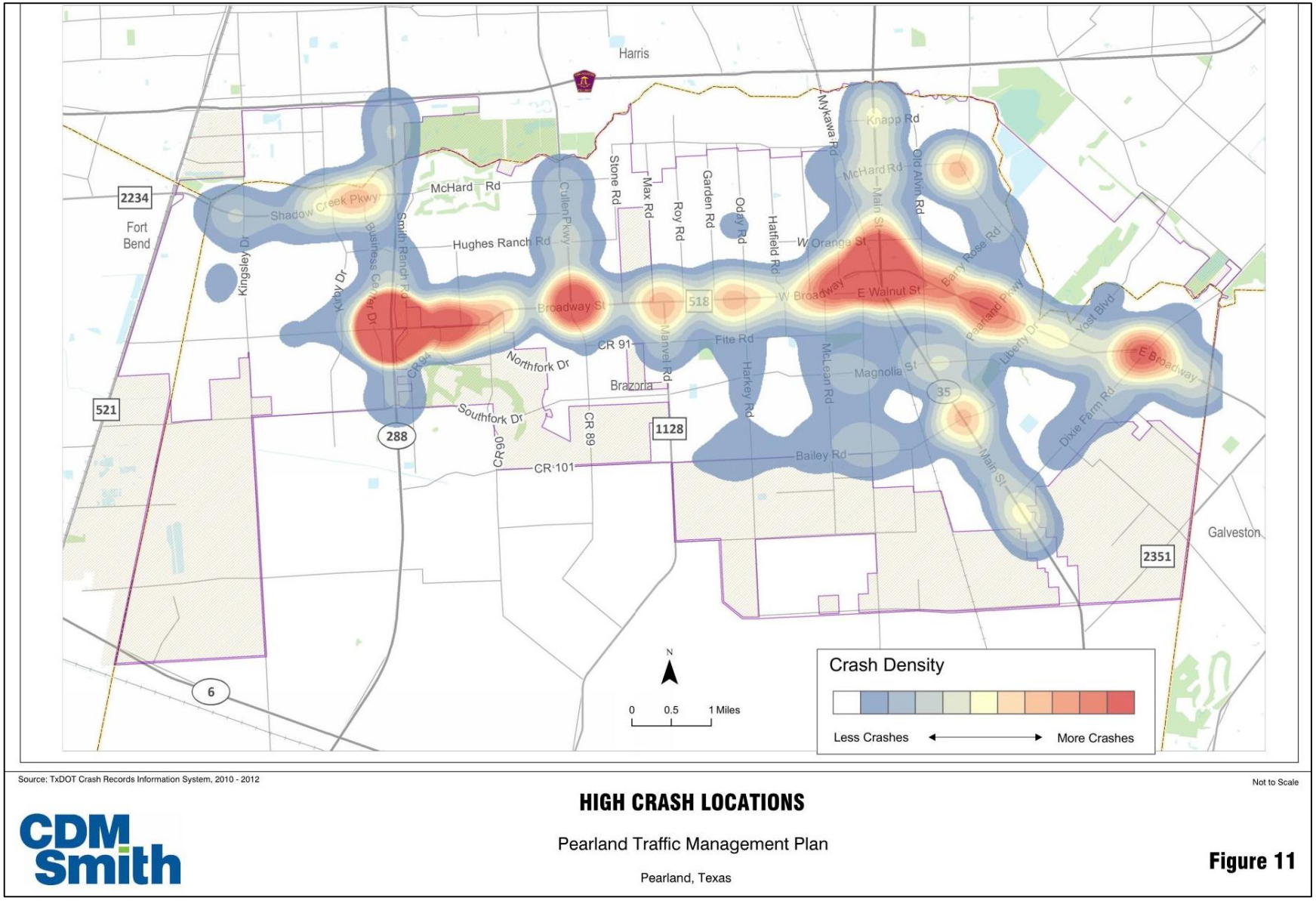
STUDY AREA CRASHES (2010-2012)

Pearland Traffic Management Plan

Pearland, Texas

Figure 10

Figure 11: High Crash Locations



Source: TxDOT Crash Records Information System, 2010 - 2012

Not to Scale

HIGH CRASH LOCATIONS

Pearland Traffic Management Plan

Pearland, Texas

Figure 11

4.3 Study Roadway Crashes

Crashes occurring on study roadways were analyzed to identify roadways with safety issues and to develop a ranking for the roadways to aid in prioritizing roadways improvements. To understand the economic burden of these traffic crashes, **Table 4** provides a breakdown of crashes by severity and associated average cost.

Table 4: Roadway Crashes by Severity and Cost

Severity	Number of Crashes	Number of Persons	Average Cost (2012 Dollars)	Total Cost of Crashes (2010-2012)
Fatality	6	7	$4,538,000	$31,766,000
Incapacitating Injury	68	81	$230,000	$18,630,000
Non-Incapacitating Injury	280	379	$58,700	$22,247,300
Possible Injury	402	621	$28,000	$17,388,000
Property Damage Only	2,214	7,751	$2,500	$5,535,000
Total	**2,970**	**8,839**	**$4,857,200**	**$95,566,300**

Source: TxDOT Crash Records Information System and National Safety Council
Property Damage Only = Non-Injury and Unknown

The number of crashes is summarized based on severity and since the number of persons involved in a crash might differ from the number crashes, a separate column for the number of persons involved in each particular type of crash severity is also summarized. A total number of 8,839 persons were involved in all crashes on the study roadways for the three-year period, with seven fatalities and 1,081 sustaining various types of injuries. The National Safety Council (NSC) develops estimates of average costs of fatal and non-fatal injuries to depict their impact on the nation's economy. The cost represents a measure of the dollars spent and income not received due to accidents, injuries, and fatalities. These costs are comprehensive and include the value of a person's natural desire to live longer or to protect the quality of one's life. As shown in Table 4, the total cost of crashes on all study roadways amounts to about $96 million.

Safety ranking was developed for the study corridors based on total number of crashes, the number of incapacitating injuries and fatalities per 100 crashes, and crash rate. These three criteria were utilized since the number of crashes along a given segment of roadway is not in and of itself indicative of a crash problem. The crash rate is the number of crashes per 100 million vehicle-miles traveled.

Table 5 through **Table 7** show rankings of top 20 study roadway segments by total crashes, incapacities injuries and fatalities per 100 crashes, and crash rate.

Table 5: Roadway Segments Ranked by Total Crashes

Rank	Roadway	From	To	Total Crashes
1	SH 288	FM 518	CR 101	317
2	Broadway St/FM 518	SH 288	FM 865	306
3	Broadway St/FM 518	SH 35	Pearland Pkwy	220
4	Broadway St/FM 518	FM 1128	Mykawa Rd	164
5	Main St/SH 35	CR 101	SH 6	147
6	Main St/SH 35	FM 2234	FM 518	144
7	Broadway St/FM 518	Mykawa Rd	SH 35	134
8	Broadway St/FM 518	Pearland Pkwy	Dixie Farm Rd	134
9	Broadway St/FM 518	FM 865	FM 1128	115
10	McHard Rd/FM 2234	Kingsley Dr	SH 288	98
11	Dixie Farm Rd	SH 35	FM 518	93
12	Bailey Rd/CR 101	FM 1128	SH 35	76
13	Broadway St/FM 518	Dixie Farm Rd	FM 2351	71
14	Cullen Pkwy/FM 865	FM 2234	FM 518	71
15	Main St/SH 35	Beltway 8	FM 2234	70
16	SH 288	FM 2234	FM 518	64
17	Business Center Drive	McHard Rd	FM 518	61
18	Broadway St/FM 518	FM 521	SH 288	60
19	McHard Rd/FM 2234	SH 35	Pearland Pkwy	55
20	Main St/SH 35	FM 518	CR 101	52

Table 6: Roadway Segments Ranked by Injuries and Fatalities per 100 Crashes

Rank	Roadway	From	To	Fatalities + Injuries/100 Crashes
1	McHard Rd/FM 2234	FM 865	Stone Rd	20.00
2	Mykawa Rd	Beltway 8	FM 2234	20.00
3	Max Rd	FM 518	McHard Rd	14.29
4	Harkey Rd	FM 518	CR 59	14.29
5	Magnolia Rd/CR 59	FM 1128	SH 35	6.98
6	Kingsley Dr/CR 48	FM 2234	FM 518	6.67
7	Cullen Pkwy/FM 865	Beltway 8	FM 2234	5.88
8	McHard Rd/FM 2234	FM 521	Kingsley Dr	5.88
9	Main St/SH 35	Beltway 8	FM 2234	5.71
10	Broadway St/FM 518	Dixie Farm Rd	FM 2351	5.63
11	Bailey Rd/CR 101	FM 1128	SH 35	5.26
12	Main St/SH 35	FM 2234	FM 518	4.86
13	Veterans Dr	CR 59	CR 101	4.76
14	SH 288	Beltway 8	FM 2234	4.55
15	Broadway St/FM 518	FM 1128	Mykawa Rd	4.27
16	Pearland Pkwy	FM 518	Oiler Dr	4.17
17	Manvel Rd/FM 1128	FM 518	CR 59	4.17
18	McHard Rd/FM 2234	SH 35	Pearland Pkwy	3.64
19	Main St/SH 35	CR 101	SH 6	3.40
20	Dixie Farm Rd	SH 35	FM 518	3.23

Table 7: Top 20 Roadway Segments Ranked by Crash Rate

Rank	Roadway	From	To	Crash Rate (Crashes per 100 MVMT)
1	Broadway St/FM 518	Mykawa Rd	SH 35	1,574.96
2	Broadway St/FM 518	SH 35	Pearland Pkwy	1,122.42
3	Hughes Ranch Rd/CR 403	FM 865	Stone Rd	1,113.71
4	Main St/SH 35	FM 2234	FM 518	776.62
5	Veterans Dr	CR 59	CR 101	744.78
6	Oiler Dr	SH 35	Pearland Pkwy	719.86
7	McHard Rd/FM 2234	SH 35	Pearland Pkwy	711.58
8	Veterans Dr	W Walnut St	CR 59	674.98
9	Oday Rd	Brookside Rd	FM 518	637.78
10	Broadway St/FM 518	FM 865	FM 1128	496.56
11	Bailey Rd/CR 101	FM 1128	SH 35	490.33
12	Broadway St/FM 518	SH 288	FM 865	482.67
13	Main St/SH 35	Beltway 8	FM 2234	444.43
14	Harkey Rd	CR 59	CR 101	440.39
15	Mykawa Rd	FM 2234	FM 518	404.48
16	Broadway St/FM 518	FM 1128	Mykawa Rd	373.96
17	Cullen Pkwy/FM 865	FM 2234	FM 518	336.68
18	Magnolia Rd/CR 59	SH 35	Pearland Pkwy	334.58
19	Broadway St/FM 518	Pearland Pkwy	Dixie Farm Rd	322.94
20	McHard Rd/FM 2234	FM 865	Stone Rd	322.49

As seen from these tables, each criterion yields a different rank for a roadway segment. For example, SH 288 between FM 518 and CR 101 had the highest number of crashes (317) but did not appear in the other two tables. This is indicative of the fact that, crash numbers alone are not conclusive in knowing the true state of safety issues prevalent on a roadway. The segments between FM 865 and Stone Road on McHard Road and on Mykawa Road between Beltway 8 and FM 2234, are the highest ranked based on fatalities and injuries per 100 crashes. Injuries here refer to incapacitating injuries. The segments on Broadway Street between Mykawa Road and Pearland Parkway have the highest crash rates.

4.4 Intersection-Related Crashes

As discussed earlier, high concentration of crashes were usually identified at major intersections. Since this study involves evaluating mobility and safety issues at critical intersections and developing improvements, a detailed analysis of crashes occurring at the study intersections was performed. **Table 8** provides a summary of these crashes by severity and associated average and total cost.

Table 8: Intersection Crashes by Severity and Cost

Severity	Number of Crashes	Number of Persons Involved	Average Cost (2012 Dollars)	Total Cost of Crashes (2010-2012)
Fatality	2	2	$4,538,000	$9,076,000
Incapacitating Injury	22	25	$230,000	$5,750,000
Non-Incapacitating Injury	113	156	$58,700	$9,157,200
Possible Injury	194	281	$28,000	$7,868,000
Property Damage Only	1,203	4,236	$2,500	$3,007,500
Total	**1,534**	**4,700**	**$4,857,200**	**$34,858,700**

Source: TxDOT Crash Records Information System and National Safety Council
Property Damage Only = Non-Injury and Unknown

The total cost of 1,534 crashes at the study intersections, involving two fatalities and 462 person injuries, stands at nearly $35 million.

Similar to the roadway crash analysis, study intersections were also analyzed and ranked based on total number of crashes, the number of incapacitating injuries and fatalities per 100 crashes, number of crashes per 1,000 Average Daily Traffic (ADT). Ranking results are provided in **Table 9** through **Table 11**.

Table 9: Study Intersections Ranked by Total Crashes

Rank	Intersection	Unknown	Incapacitating Injury	Non-Incapacitating Injury	Possible Injury	Fatality	Not Injured	Total Crashes
1	Broadway Street at SH 288 SBFR	0	1	7	12	0	130	150
2	Broadway Street at SH 288 NBFR	0	1	8	11	0	130	150
3	Broadway Street at Main Street	0	1	5	18	0	74	98
4	Broadway Street at Cullen Parkway	0	0	9	7	0	68	84
5	Broadway Street at CR 94	1	0	9	8	0	61	79
6	Broadway Street at Pearland Parkway	0	0	4	11	0	55	70
7	Broadway Street at Dixie Farm Road	1	1	4	10	0	45	61
8	Broadway Street at Business Center Drive	0	1	2	6	0	33	42
9	McHard Road at Kirby Drive	0	0	5	5	0	30	40
10	Broadway Street at Manvel Road	0	0	1	3	0	36	40
11	Broadway Street at Barry Rose Road	0	0	3	3	0	24	30
12	Broadway Street at McLean Road	0	0	2	3	0	18	23
13	McHard Road at Cullen Parkway	0	1	0	1	0	17	19
14	Pearland Parkway at Barry Rose Road	0	0	2	4	0	9	15
15	McLean Road at W Walnut Street	0	0	1	0	0	11	12
16	Broadway Street at Smith Ranch Road	0	0	0	0	0	10	10
17	Broadway Street at Kirby Drive	0	0	0	0	0	8	8
18	McHard Road at County Place Parkway	0	0	0	0	0	0	0

Table 10: Study Intersections Ranked by Injury and Fatalities per 100 Crashes

Rank	Intersection	Unknown	Incapacitating Injury	Non-Incapacitating Injury	Possible Injury	Fatality	Not Injured	Total Crashes	Fatalities + Injuries/ 100 Crashes
1	McHard Road at Cullen Parkway	0	1	0	1	0	17	19	5.26
2	Broadway Street at Business Center Drive	0	1	2	6	0	33	42	2.38
3	Broadway Street at Dixie Farm Road	1	1	4	10	0	45	61	1.64
4	Broadway Street at Main Street	0	1	5	18	0	74	98	1.02
5	Broadway Street at SH 288 SBFR	0	1	7	12	0	130	150	0.67
6	Broadway Street at SH 288 NBFR	0	1	8	11	0	130	150	0.67
7	Broadway Street at Cullen Parkway	0	0	9	7	0	68	84	0.00
8	Broadway Street at CR 94	1	0	9	8	0	61	79	0.00
9	Broadway Street at Pearland Parkway	0	0	4	11	0	55	70	0.00
10	McHard Road at Kirby Drive	0	0	5	5	0	30	40	0.00
11	Broadway Street at Manvel Road	0	0	1	3	0	36	40	0.00
12	Broadway Street at Barry Rose Road	0	0	3	3	0	24	30	0.00
13	Broadway Street at McLean Road	0	0	2	3	0	18	23	0.00
14	Pearland Parkway at Barry Rose Road	0	0	2	4	0	9	15	0.00
15	McLean Road at W Walnut Street	0	0	1	0	0	11	12	0.00
16	Broadway Street at Smith Ranch Road	0	0	0	0	0	10	10	0.00
17	Broadway Street at Kirby Drive	0	0	0	0	0	8	8	0.00
18	McHard Road at County Place Parkway	0	0	0	0	0	0	0	0.00

Table 11: Study Intersections Ranked by Crashes per 1,000 ADT

Rank	Intersection	Unknown	Incapacitating Injury	Non-Incapacitating Injury	Possible Injury	Fatality	Not Injured	Average Daily Traffic (ADT)	Total Crashes	Crashes per 1,000 ADT
1	Broadway Street at SH 288 SBFR	0	1	7	12	0	130	35,400	150	4.24
2	Broadway Street at SH 288 NBFR	0	1	8	11	0	130	39,700	150	3.78
3	Broadway Street at Main Street	0	1	5	18	0	74	27,000	98	3.63
4	Broadway Street at Cullen Parkway	0	0	9	7	0	68	33,800	84	2.49
5	Broadway Street at CR 94	1	0	9	8	0	61	33,500	79	2.36
6	Broadway Street at Pearland Parkway	0	0	4	11	0	55	34,400	70	2.03
7	Broadway Street at Dixie Farm Road	1	1	4	10	0	45	36,000	61	1.69
8	Broadway Street at Business Center Drive	0	1	2	6	0	33	27,600	42	1.52
9	Broadway Street at Manvel Road	0	0	1	3	0	36	29,800	40	1.34
10	McLean Road at W Walnut Street	0	0	1	0	0	11	9,800	12	1.22
11	Broadway Street at Barry Rose Road	0	0	3	3	0	24	25,300	30	1.19
12	McHard Road at Kirby Drive	0	0	5	5	0	30	34,400	40	1.16
13	Broadway Street at McLean Road	0	0	2	3	0	18	22,000	23	1.05
14	McHard Road at Cullen Parkway	0	1	0	1	0	17	25,700	19	0.74
15	Pearland Parkway at Barry Rose Road	0	0	2	4	0	9	28,000	15	0.54
16	Broadway Street at Kirby Drive	0	0	0	0	0	8	20,000	8	0.40
17	Broadway Street at Smith Ranch Road	0	0	0	0	0	10	42,700	10	0.23
18	McHard Road at County Place Parkway	0	0	0	0	0	0	19,300	0	0.00

The intersection at the Broadway Street and SH 288 interchange had the highest number of crashes (300) for the three-year analysis period, accounting for around 30 percent of the total number of crashes at all study intersections. The second highest number of crashes occurred at the FM 518 and SH 35 intersection with 98 crashes. There were no crashes found at the intersection of McHard Road and Country Place Parkway. Intersections that did not have any incapacitating injuries or fatalities were not ranked under the fatalities and injuries per 100 crashes criteria. The intersection at McHard Road and Cullen Parkway recorded one incapacitating injury out of just 19 crashes and therefore ranked highest in Table 10. As shown in Table 11, intersections are ranked based on crashes weighted against total daily traffic volumes entering the intersection. The intersections at the FM 518 and SH 288 interchange and FM 518 and SH 35 were again ranked the highest.

5. PLANNED TRANSPORTATON IMPROVEMENTS

This section describes the planned and financially committed transportation improvements in the Pearland area.

5.1 H-GAC Regional Transportation Plan

The Regional Transportation Plan (RTP) is the long-range transportation plan that identifies the projects related to various aspects of transportation that are projected to be needed in the region for the next 20 years and beyond. The future projects are categorized into three types according to the projected time of implementation:

- Transportation Improvement Program (TIP): 2013-2016
- Short-Term: 2017-2025
- Long-Term: 2026-2035

Table 12 shows list of projects in the H-GAC's 2035 RTP Update within the Pearland area, and **Figure 12** illustrates the locations of these projects. These planned transportation projects are capacity enhancement projects including roadway widening or extensions. TIP projects include roadway widenings of Bailey Road, Mykawa Road, Max Road, CR 48 and CR 59, and roadway extensions of Fite Road, McHard Road, and Pearland Parkway. SH 288 also has several projects in the TIP period, including the construction of four toll lanes from I-610 to Brazoria County line and the construction of four toll lanes with grade separations from Harris County Line to CR 58.

Planned projects within the short-term horizon include widening of Hughes Ranch Road, CR 48, Cullen Parkway, Max Road, Veterans Drive, Oday Road, Palmetto Road/CR 49, FM 2351, and CR 58. Also included in the short-term projects are construction of new roadways including extending Hughes Ranch Road from Max Road to Garden Road, Pearland Parkway between Dixie Farm Road and FM 2351, and Orange West Street between Oday Road and Hatfield Street. Long-term projects include roadway widening of Hastings Cannon Road, CR 894, and Harkey Road. Other projects include construction of new roads such as extending Mykawa Road from FM 518 to Walnut Street West. SH 288 also has several projects in the long-term, including widening, extension, and the construction of four direct connectors at the Beltway 8 interchange.

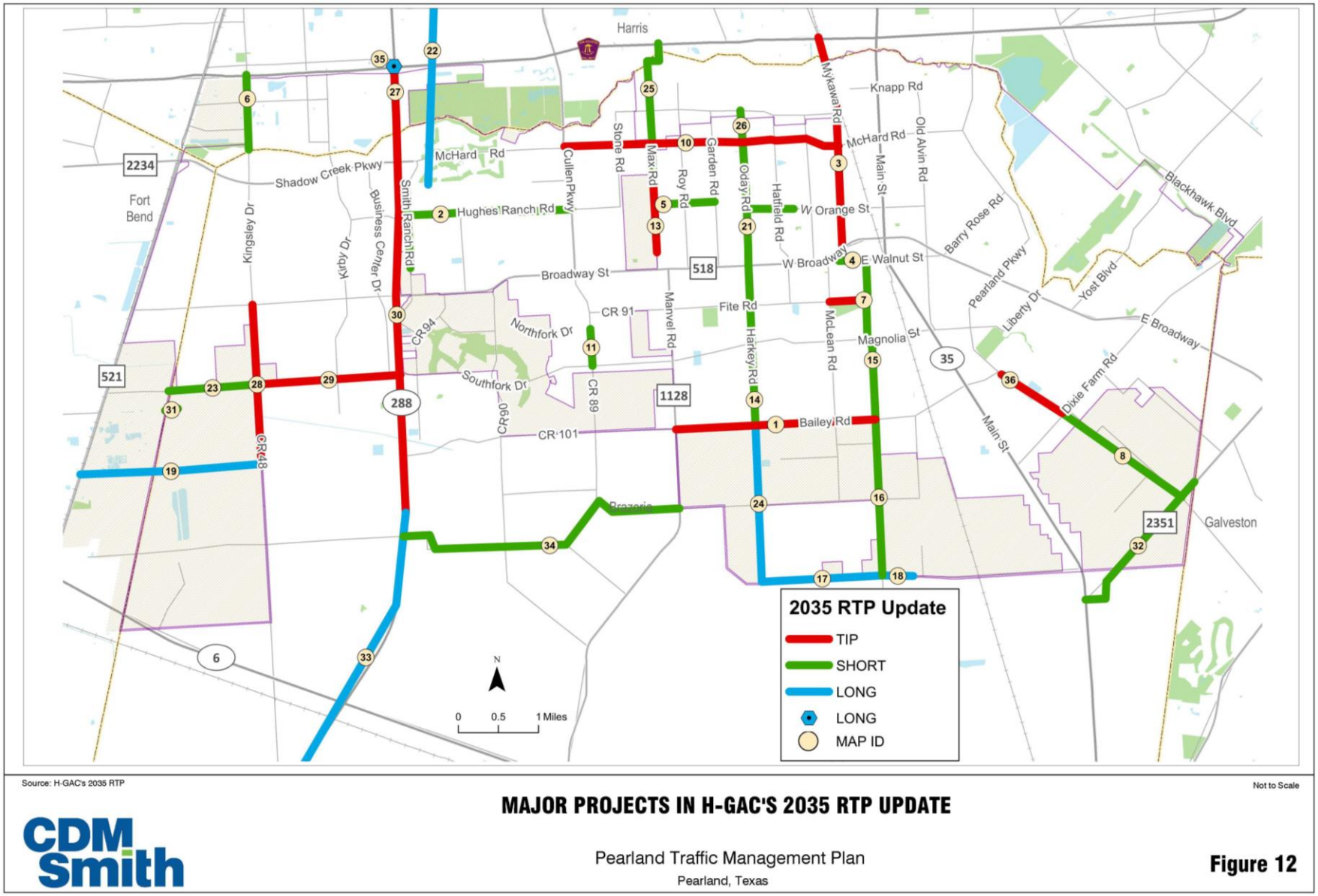
Table 12: Major Projects in H-GAC's 2035 RTP Update

Map ID	Project ID	Roadway	From	To	Project Description	Total Cost ($Million)	Date	Status
1	668	Bailey Rd	FM 1128	Veterans Dr	Widen from 2 to 4 lanes divided with raised median	33.8	5/1/2015	TIP
2	671	Hughes Ranch Rd	Smith Ranch Rd	Cullen Blvd	Widen 2 lanes to 4 lanes, add median and shoulders, and sidewalks	22.3	8/1/2017	Short
3	7602	Mykawa Rd	BW 8	FM 518	Widen 2 lanes to 4 lanes with raised median (S of McHard) & flush median (N of McHard)	20.7	7/1/2016	TIP
4	7624	Mykawa Rd	FM 518	Walnut St W	Construct new 4 lane divided to connect Mykawa to Veterans	6.7	1/1/2021	Short
5	7625	Hughes Ranch Rd	Max Rd	Garden Rd	Construct 4 lane roadway	12.8	1/1/2018	Short
6	7626	CR 48	BW 8	Clear Creek	Widen 2 lane to 4 lane divided	9.9	1/1/2018	Short
7	7628	Fite Rd	McLean Rd	Veterans Dr	Construct 4 lane undivided roadway	5.3	8/1/2014	TIP
8	7630	Pearland Pkwy	Dixie Farm Rd	FM 2351	Construct 4 lane divided on new location	19.5	1/1/2018	Short
9	7631	Orange W St	Oday Rd	Hatfield St	Construct 4 lane undivided	5.6	1/1/2018	Short
10	7874	McHard Rd	Cullen Blvd	Mykawa Rd	Construct 4 lane divided on new location	45.9	2/1/2016	TIP
11	11633	Cullen Parkway	Southfork Dr	Bailey Rd	Widen from 2 to 4 lanes divided curb and gutter	9.5	1/1/2018	Short
12	11635	Max Rd	McHard Rd	Hughes Ranch Rd	Widen from 2 to 4 lanes divided curb and gutter	8.9	1/1/2018	Short
13	11636	Max Rd	Hughes Ranch Rd	FM 518	Widen from 2 to 4 lanes divided curb and gutter	7.9	12/1/2014	TIP
14	11639	Harkey Rd	Broadway	Bailey	Widen from 2 to 4 lanes divided curb and gutter	22.3	1/1/2021	Short
15	11640	Veterans Dr	Walnut W	Bailey Rd	Widen from 2 to 4 lanes divided curb and gutter	24.5	1/1/2018	Short
16	11641	Veterans Dr	Bailey Rd	Hastings Cannon Rd	Widen from 2 to 4 lanes divided curb and gutter	45.7	1/1/2020	Short
17	11642	Hastings Cannon Rd	Harkey Blvd	Veterans Rd	Widen from 2 to 4 lanes divided curb and gutter	4.1	1/1/2032	Long
18	11643	Hastings Cannon Rd	Veterans Rd	SH 35	Widen from 2 to 4 lanes divided curb and gutter	38.8	1/1/2033	Long
19	11653	CR 894	Fort Bend C/L	CR 48	Widen from 2 to 4 lane divided curb and gutter	37.6	1/1/2031	Long
20	11654	Smith Ranch Rd	Hughes Ranch Rd	N of Broadway (FM 518)	Widen from 2 to 4 lane divided curb and gutter	5.3	5/1/2017	TIP*
21	11655	Oday Rd	McHard Rd	Broadway	Widen from 2 to 4 lane divided curb and gutter	20.7	1/1/2018	Short
22	11764	SH 288 Rapid Transit Line	Almeda Line GRT (RR ROW)	Intermodal Terminal	SH 288- Almeda line guided rapid transit	250	9/1/2033	Long

Map ID	Project ID	Roadway	From	To	Project Description	Total Cost ($Million)	Date	Status
23	12759	CR 59	Fort Bend C/L	CR 48	Widen from 2 to 4 lanes divided curb and gutter in sections	12.6	1/1/2023	Short
24	13564	Harkey Rd	Bailey Rd	Hastings Cannon Rd	Widen from 2 to 4 lane divided curb and gutter	26.1	1/1/2025	Long
25	13565	Max Rd	BW 8	McHard Rd	Widen from 2 to 4 lane divided curb and gutter	13.9	1/1/2018	Short
26	13566	Oday Rd	Brookside Rd	McHard Rd (future alignment)	Widen from 2 to 4 lane divided curb and gutter	1	1/1/2018	Short
27	13856	SH 288	IH 610	Brazoria C/L	Construct 4 toll lanes	192	8/1/2014	TIP
28	13583	CR 48	FM 518	CR 894	Widen from 2 to 4 lane divided rural section with 10 ft outside shoulders	15	6/1/2014	TIP
29	12760	CR 59	CR 48	Business Centre Dr	Widen from 2 to 4 lanes w/ bridge	20.3	1/1/2015	TIP
30	13765	SH 288	Harris C/L	CR 58	Construct 4 toll lanes with grade separations	196.4	1/1/2014	TIP
31	11644	Palmetto Rd/CR 49	FM 521	Fort Bend C/L	Widen to 4 lane divided	1.9	1/1/2020	Short
32	669	FM 2351	SH 35	Galveston C/L	Reconstruct and widen to a 4 lane divided rural section	3.3	9/1/2019	Short
33	13767	SH 288	CR 58	SH 99	Construct 4 toll lanes with grade separations	261	8/1/2032	Long
34	12402	CR 58	SH 288	FM 1128	Widen to 4 lanes	34.8	1/1/2020	Short
35	14255	SH 288 at BW 8	-	-	Construct 4 DCS at BW 8 interchange	130	4/1/2032	Long
36	7622	Pearland Pkwy	Oiler Dr	Dixie Farm Rd	Construct new 4-lane divided roadway with raised medians	6	8/1/2013	LET/TIP

Source: Houston-Galveston Area Council (H-GAC) 2035 Regional Transportation Plan (RTP) Update
**Project status updated based on input from City of Pearland*

Figure 12: Major Projects in H-GAC's 2035 RTP Update



Source: H-GAC's 2035 RTP

Not to Scale

MAJOR PROJECTS IN H-GAC'S 2035 RTP UPDATE

CDM Smith

Pearland Traffic Management Plan
Pearland, Texas

Figure 12

5.2 Pearland Capital Improvement Program

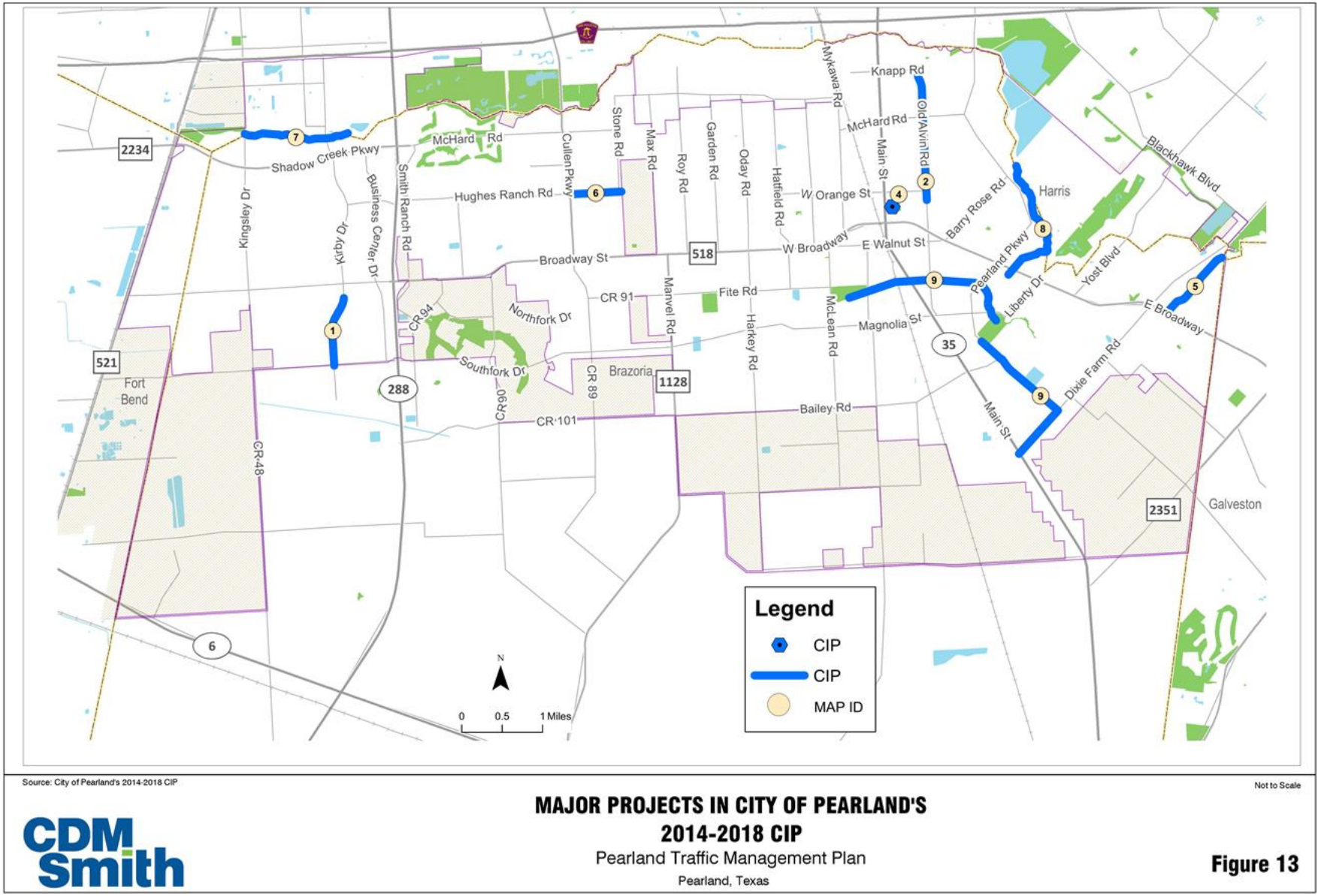
In addition to the regional transportation projects in the 2035 RTP Update, there are local planned projects in the City of Pearland's 2014–2018 Capital Improvement Program (CIP). The CIP covers a five-year planning period and is updated every year. A capital improvement program is a major, non-routine expenditure for new construction and improvements to the city's drainage, parks, facilities, streets, and water/wastewater. The program focuses on the community and city's goals and needs, allowing projects to be prioritized based on needs. **Table 13** presents the additional transportation-related projects in the CIP and these projects are illustrated in

Figure 13. Roadway projects include the widening of Kirby Drive from Pearland Town Center to CR 59, Old Alvin Road from Plum Street to McHard Road, Hughes Ranch Road between Cullen Blvd. and Stone Road.

Table 13: Major Projects in City of Pearland's 2014-2018 CIP

Map ID	Project ID	Type	Roadway	From	To	Project Description	Total Cost ($Million)	Date
1	TR1404	Roadway	Kirby Dr	Pearland Town Center Entrance	CR 59 (Southfork Dr)	Widen from 2 to 4 lanes concrete curb with sidewalks	$2,257,545	2014-2015
2	T20002	Roadway	Old Alvin Rd	Plum St	McHard Rd	Widen from 2 to 4 lanes undivided curb and gutter roadway	$7,888,189	2015-2017
3	TR1502	Roadway	Old Alvin Rd	McHard Rd	Knapp Rd	Rehabilitate and widen Old Alvin Road from McHard to Knapp Road. Install sidewalks, drainage, and turn lanes.	$1,633,750	2015-2016
4	TR0803	Roadway	Old Town Area Sidewalks			Enclose ditches and install sidewalks in the Old Town area between Houston St. and Grand Ave., from FM 518 to Orange St. N. Houston and E. Orange will be completed in 2015	$1,000,000	2015-2017
5	TR1601	Roadway	Longwood Street	FM 518	Myrtlewood Dr	Various roadway reconstructions, including adding 4' sidewalk on both sides of road. Also complete similar work on Paul Drive from Longwood to city limits and McDonald Drive from Dixie Farm Road to Longwood.	$7,008,948	2016-2017
6	TR1701	Roadway	Hughes Ranch Road	Cullen Blvd	Stone Rd	Expansion, including 4-lanes undivided concrete curb and gutter, sidewalks, and drainage	$3,481,500	2017-2018
7	PK1401	Bike/Ped	Shadow Creek Ranch Trail	Shadow Creek Park	E of Kirby Dr	Extension of a 10-foot hike and bike trail from the future Shadow Creek Park site along Clear Creek to the existing trail 1,300 feet east of Kirby Drive.	$1,935,458	2014-2016
8	PK1402	Bike/Ped	Green Tee Terrace Trail	Pearland Library/City Hall	Barry Rose Rd	Extension of a 10-foot hike and bike trail from the Pearland Library/City Hall to Barry Rose Road along the Clear Creek Corridor.	$4,173,936	2014-2016
9	P20006/P5007	Bike/Ped	Trail Connectivity	Centennial Park	FM 518	Implement phases of the Hike and Bike Master Plan. Scheduled in 2013, Phase II will connect Centennial Park, along Mary's Creek, Magnolia, and John Lizer to Independence Park. Phase III is scheduled in 2017 and will connect Independence Park to FM 518 via Pearland Parkway and Dixie Farm Road.	$2,206,973	2017

Figure 13: Major Projects in City of Pearland's 2014-2018 CIP



Source: City of Pearland's 2014-2018 CIP

Not to Scale

MAJOR PROJECTS IN CITY OF PEARLAND'S 2014-2018 CIP

Pearland Traffic Management Plan

Pearland, Texas

CDM Smith

Figure 13

6. FUTURE TRAFFIC CONDITIONS

This chapter discusses the future traffic conditions for study roadways and intersections including growth rates, future traffic volumes, and level-of-service.

6.1 Pearland Travel Demand Model

The Pearland Travel Demand Model was previously developed as part of the *Traffic Management Plan*, under Task 2, to evaluate transportation mobility needs for Pearland. It involved developing a refined travel demand model for Pearland using the *Cube Voyager* software and was based on the Houston-Galveston Area Council (H-GAC) Regional Travel Demand Model. The model included disaggregating traffic analysis zones, updating socioeconomic data, and refining the street network within the City limits and extraterritorial jurisdiction (ETJ) boundaries. The Pearland model was validated for base year 2010, and included interim year 2019 and future year 2035 scenarios.

As part of this study (Task 3), the Pearland model was updated to 2012 base year. It incorporated roadway improvements that were constructed between 2010 and 2012 (most importantly the extension of Magnolia Street from CR 89 to Harkey Road) and updated socioeconomic variables using 2012 US Census data estimates.

The Pearland model was primarily utilized to predict changes in travel patterns and transportation demands based on future transportation improvements, land use developments, and demographic forecasts.

6.2 Future Roadway Analysis

To evaluate future deficiencies and identify potential transportation improvements, roadway analysis was performed for short-range and long-range using 2019 and 2035 Pearland travel demand models. All planned and committed transportation projects in the H-GAC region were included in the 2019 and 2035 models to evaluate improvements for the Pearland area. Growth factors derived from the model are discussed next that provided information on changes in travel patterns and demand on these study roadways.

6.2.1 Roadway Growth Factors

Year 2019 and 2035 model volumes from the Pearland model were utilized in developing the traffic growth rates. Growth factors were calculated for each study roadway segment first and then computed to a weighted average for each roadway. For the medium-term scenario, growth factors for year 2025 were developed by interpolating model volumes between 2019 and 2035. A summary of growth factors is presented in **Table 14**.

Hughes Ranch Road/CR 403 shows significant growth in the short-term with a growth factor of around 11. This is mainly resulting from changes in travel patterns due to the future SH 288 Managed Lanes and the access from CR 403. Conversely, Cullen Parkway shows nearly 20 percent decrease in traffic with the new SH 288 Managed Lanes. McHard Road also shows a very high growth in 2019 and which is mainly due to the extension of this roadway from Cullen Parkway to

Mykawa Road. In the long-term (2035), Max Road shows the highest growth, with an average growth factor of over 13. This can be attributed to extension of Max Road to Beltway 8 providing north-south connectivity in the Pearland area and also due to its widening from McHard Road to Broadway Street. Cullen Parkway continues to show low growth in the long-term with the Max Road connection to Beltway 8. Most roadways show increased demand by 2035 with growth factors ranging from 1.3 to 6.5 due to increased land use activities, and growth in population and employment in the area.

Table 14: Roadway Growth Factors

Functional Class	Roadway	Growth Factors		
		2012-2019	2012-2025	2012-2035
Major Thoroughfare	Main St/SH 35	1.14	1.28	1.51
	Broadway St/FM 518	1.02	1.14	1.32
	Pearland Pkwy	1.26	1.44	1.75
	Oiler Dr	1.69	2.60	4.12
	Cullen Pkwy/FM 865	0.79	0.89	1.05
	Cullen Pkwy/CR 89	1.16	1.92	3.19
	McHard Rd/FM 2234	2.29	2.44	2.69
	Dixie Farm Rd	1.10	1.29	1.62
	Manvel Rd/FM 1128	0.51	0.96	1.70
	Max Rd	2.92	6.85	13.41
	FM 2351	1.08	1.59	2.43
	CR 48	1.85	2.37	3.24
	Bailey Rd/CR 101	1.10	1.60	2.44
	Kingsley Dr	1.82	2.37	3.30
Secondary Thoroughfare	Kirby Dr	2.51	3.98	6.44
	Business Center Drive	1.01	1.53	2.40
	Smith Ranch Rd/CR 94	1.69	1.89	2.23
	Hughes Ranch Rd/CR 403	11.02	11.53	12.38
	CR 90	1.14	1.56	2.26
	Mykawa Rd	1.42	1.63	1.98
	Veterans Dr	1.22	1.79	2.74
	Pearland Sites Rd	1.08	1.72	2.78
	Barry Rose Rd	2.06	2.27	2.62
	Yost Blvd	0.59	0.69	0.87
	Magnolia Rd/CR 59	1.49	1.60	1.80
	Oday Rd	4.58	5.31	6.52
	Harkey Rd	1.99	3.58	6.21

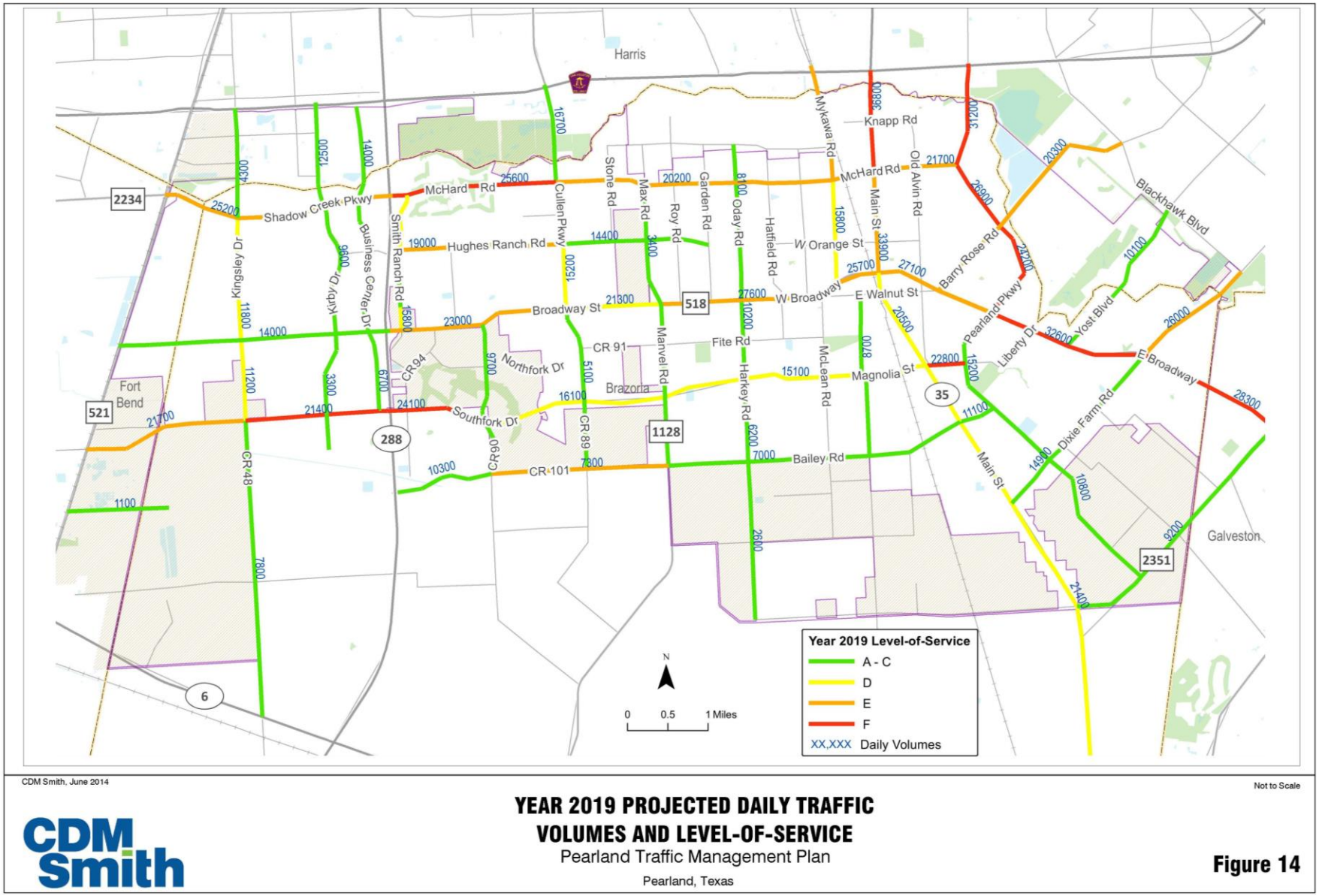
6.2.2 Year 2019 Traffic Conditions (Short-Term)

The Pearland model was utilized to evaluate the projected traffic volumes in 2019 and associated roadway LOS, and the results are presented in **Figure 14**. As shown in the figure, the segments that operate at unacceptable LOS F are McHard Road from SH 288 to Cullen Parkway, CR 59 from CR 48 to CR 90 and from SH 35 to Pearland Parkway, Main Street from Beltway 8 to McHard Road, Pearland Parkway from Beltway 8 to Broadway Street, and Broadway Street from Pearland Parkway to FM 2351.

Thoroughfares reaching roadway capacity by 2019 include the following that are projected to operate at LOS E: McHard Road from FM 521 to SH 288 and from Cullen Parkway to Pearland Parkway, most segments of Broadway Street between SH 288 and Pearland Parkway, CR 59 from FM 521 to CR 48, Bailey Road from CR 90 to Manvel Road, Main Street from McHard Road to Broadway Street, Barry Rose Road from Broadway Street to Pearland Parkway, Hughes Road from Pearland Parkway to Blackhawk Boulevard, and Dixie Farm Road from Broadway Street to Blackhawk Boulevard.

Roadway segments with highest volumes are Main Street and Pearland Parkway near Beltway 8 and Broadway Street near Main Street. These volumes range from around 31,200 to 36,800 vehicles per day (vpd).

Figure 14: Year 2019 Roadway Volumes and Peak Period Level-of-Service



CDM Smith, June 2014

Not to Scale

YEAR 2019 PROJECTED DAILY TRAFFIC VOLUMES AND LEVEL-OF-SERVICE

Pearland Traffic Management Plan

Pearland, Texas

Figure 14

6.2.3 Year 2025 Traffic Conditions (Medium-Term)

Year 2025 traffic volumes were interpolated using Pearland model outputs from 2019 and 2035, and the resulting LOS was computed and presented in **Figure 15**. Compared to 2019, traffic conditions continue to disintegrate by 2025 with the increased demand for travel on these roadways. The additional segments that exceed roadway capacity and operate at LOS F include McHard Road from FM 521 to SH 288, Broadway Street from Manvel Road to Mykawa Road and from Main Street to Pearland Parkway, CR 59 from FM 521 to CR 48, and Dixie Farm Road from Broadway Street to Blackhawk Boulevard.

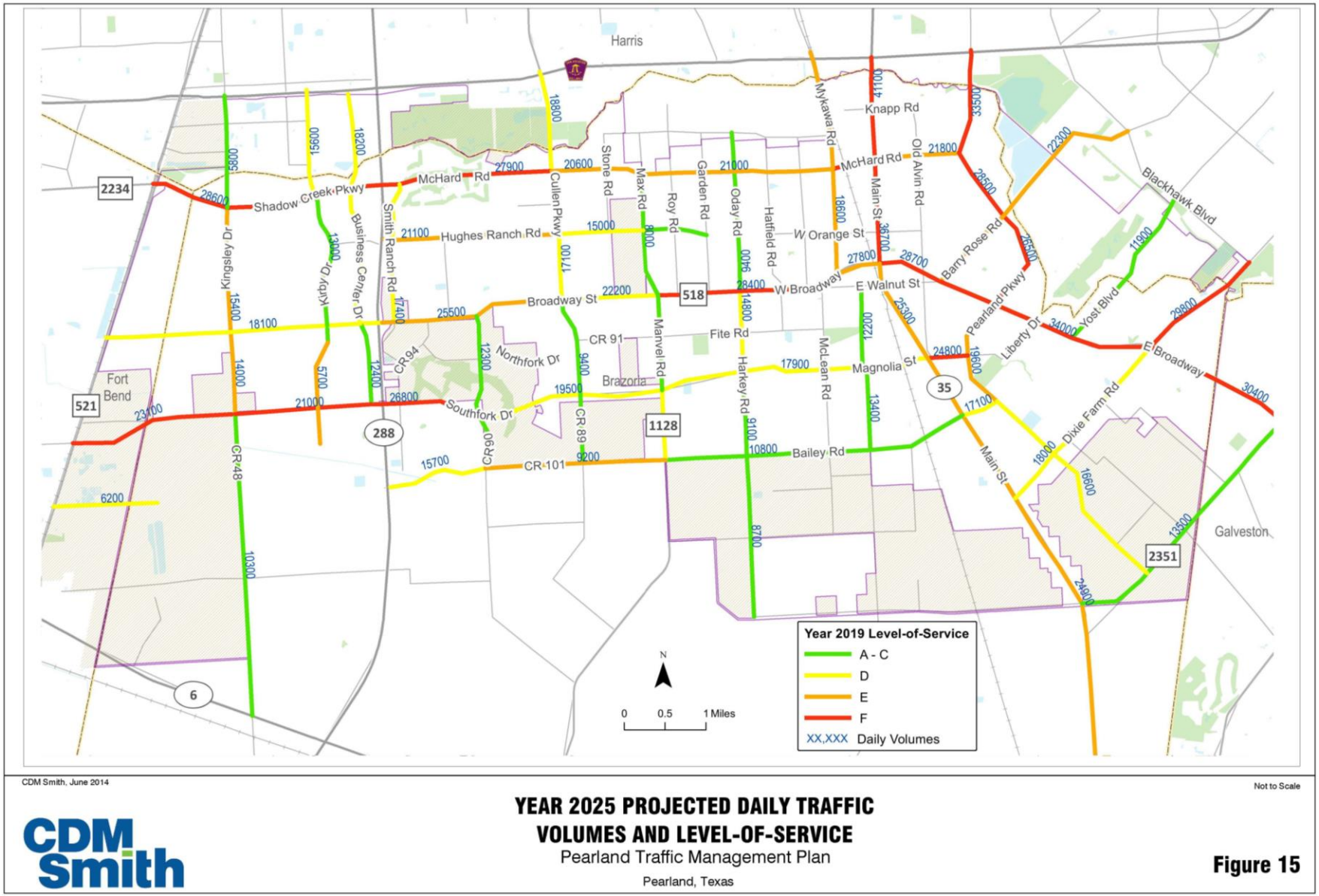
Similar to 2019, roadways experiencing highest traffic volumes are Main Street near Beltway 8, Broadway Street near and east of the intersection at Main Street, and Pearland Parkway near Beltway 8. Projected daily traffic volumes range from 33,500 to 41,100 vpd.

6.2.4 Year 2035 Traffic Conditions (Long-Term)

Pearland model was utilized to evaluate the projected traffic volumes in 2035 and associated roadway LOS. The model results are presented in **Figure 16**. As seen, majority of the roadways are projected to operate at unacceptable LOS E or F based on the available planned roadway capacity in 2035. A condition worth noting is that all the segments on Main Street and most segments on Broadway Street and Magnolia Road would operate over capacity at LOS F in 2035. Projected traffic volumes in 2035 are expected to increase over 30,000 vpd on along Main Street, Broadway Street east of Mykawa Road, and Pearland Parkway north of Broadway Street. For the purposes of this study, roadways operating over capacity at LOS F were considered as capacity constrained corridors and would require capacity improvements.

The City has responded to this challenge by implementing a Thoroughfare Plan with projects that enhance the capacity of existing roads, involve new roads, or focus on intersection improvements, which was discussed earlier in this report. One approach to mitigate mobility impacts due to increased travel demand is to expand roadway capacities, as Pearland continues to do through its Thoroughfare Plan and Capital Improvements Program.

Figure 15: Year 2025 Roadway Volumes and Peak Period Level-of-Service



CDM Smith, June 2014

Not to Scale

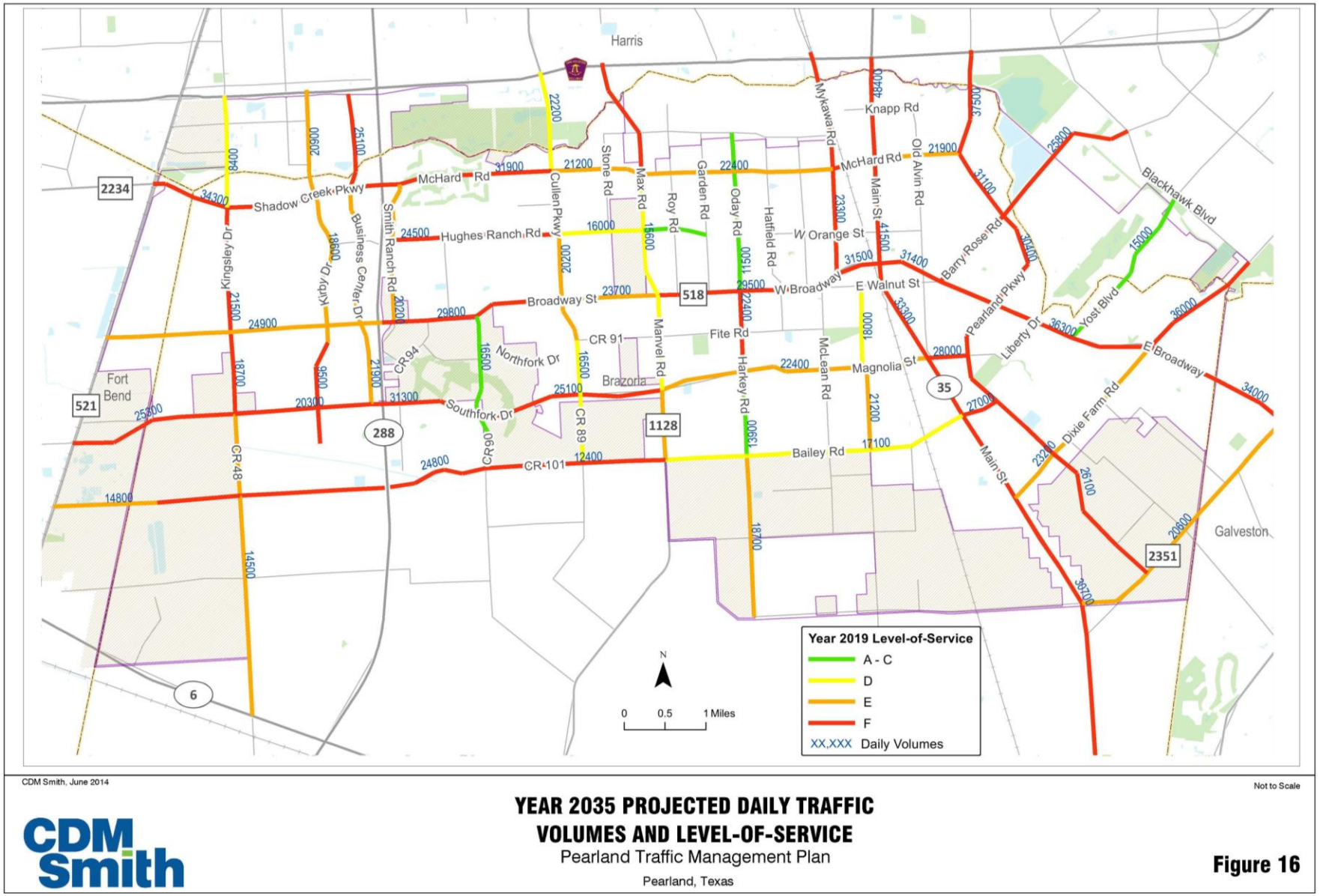
YEAR 2025 PROJECTED DAILY TRAFFIC VOLUMES AND LEVEL-OF-SERVICE

Pearland Traffic Management Plan

Pearland, Texas

Figure 15

Figure 16: Year 2035 Roadway Volumes and Peak Period Level-of-Service



CDM Smith, June 2014

Not to Scale

YEAR 2035 PROJECTED DAILY TRAFFIC VOLUMES AND LEVEL-OF-SERVICE

Pearland Traffic Management Plan

Pearland, Texas

Figure 16

6.3 Future Intersection Analysis

As indicated earlier in Chapter 3, *Synchro* was utilized to identify operational deficiencies for study intersections. Future intersection analysis was performed to evaluate short-term (2019), medium-term (2025) and long-term (2035) improvement needs based on the projected traffic volumes.

6.3.1 Intersection Growth Factors

Future growth factors for study intersections were obtained using 2019 and 2035 projected traffic volumes from the Pearland model. Growth factors for 2025 were developed by interpolating 2019 and 2035 model outputs. Growth factors were developed for each approach at the intersections, reviewed to ensure reasonableness, and adjusted to make sure the rates are consistent with the local growth trends. Individual approach growth factors were utilized to develop future turning movement traffic volumes; however, for the purposes of presenting this information, directional growth factors were averaged at the intersection level and presented in **Table 15**.

Table 15: Intersection Growth Factors

Intersection	Growth Factors		
	2012-2019	2012-2025	2012-2035
McHard Road at Kirby Drive	1.15	1.32	1.61
McHard Road at County Place Parkway	1.42	1.52	1.70
McHard Road at Cullen Parkway	1.62	1.70	1.83
Broadway Street at Kirby Drive	1.61	1.85	2.24
Broadway Street at Business Center Drive	1.22	1.48	1.90
Broadway Street at SH 288 SBFR	1.02	1.11	1.25
Broadway Street at SH 288 NBFR	1.02	1.11	1.25
Broadway Street at Smith Ranch Road	1.76	1.78	1.81
Broadway Street at CR 94	1.02	1.06	1.13
Broadway Street at Cullen Parkway	1.02	1.10	1.24
Broadway Street at Manvel Road	1.17	1.30	1.51
Broadway Street at McLean Road	1.02	1.09	1.21
McLean Road at W. Walnut Street	1.02	1.09	1.21
Broadway Street at Main Street	1.21	1.33	1.53
Broadway Street at Barry Rose Road	1.38	1.37	1.35
Broadway Street at Pearland Parkway	1.25	1.37	1.56
Broadway Street at Dixie Farm Road	1.10	1.22	1.43
Pearland Parkway/Barry Rose Road	2.49	2.74	3.17

Pearland Parkway at Barry Rose Road intersection shows the highest growth for all years with growth factor as high as 3.17 in 2035. A number of intersections along Broadway Street show low growth in 2019.

6.3.2 Year 2019 Traffic Analysis (Short-Term)

Analysis of 2019 traffic conditions was conducted using *Synchro* to evaluate operational deficiencies in the short-term. The LOS and associated delay during morning and evening peak hours at the study intersections are presented in **Table 16**.

Traffic analysis was performed by applying growth factors to the existing turning movement counts and updating intersection geometry to include any committed planned improvements. Signal timings were optimized and LOS was obtained based on the HCM 2010 methodology in *Synchro*. Where HCM 2010 methodology was not applicable, HCM 2000 methodology was employed. The 2019 projected turning movement volumes during the morning and evening peak hours are shown in **Figure 17**.

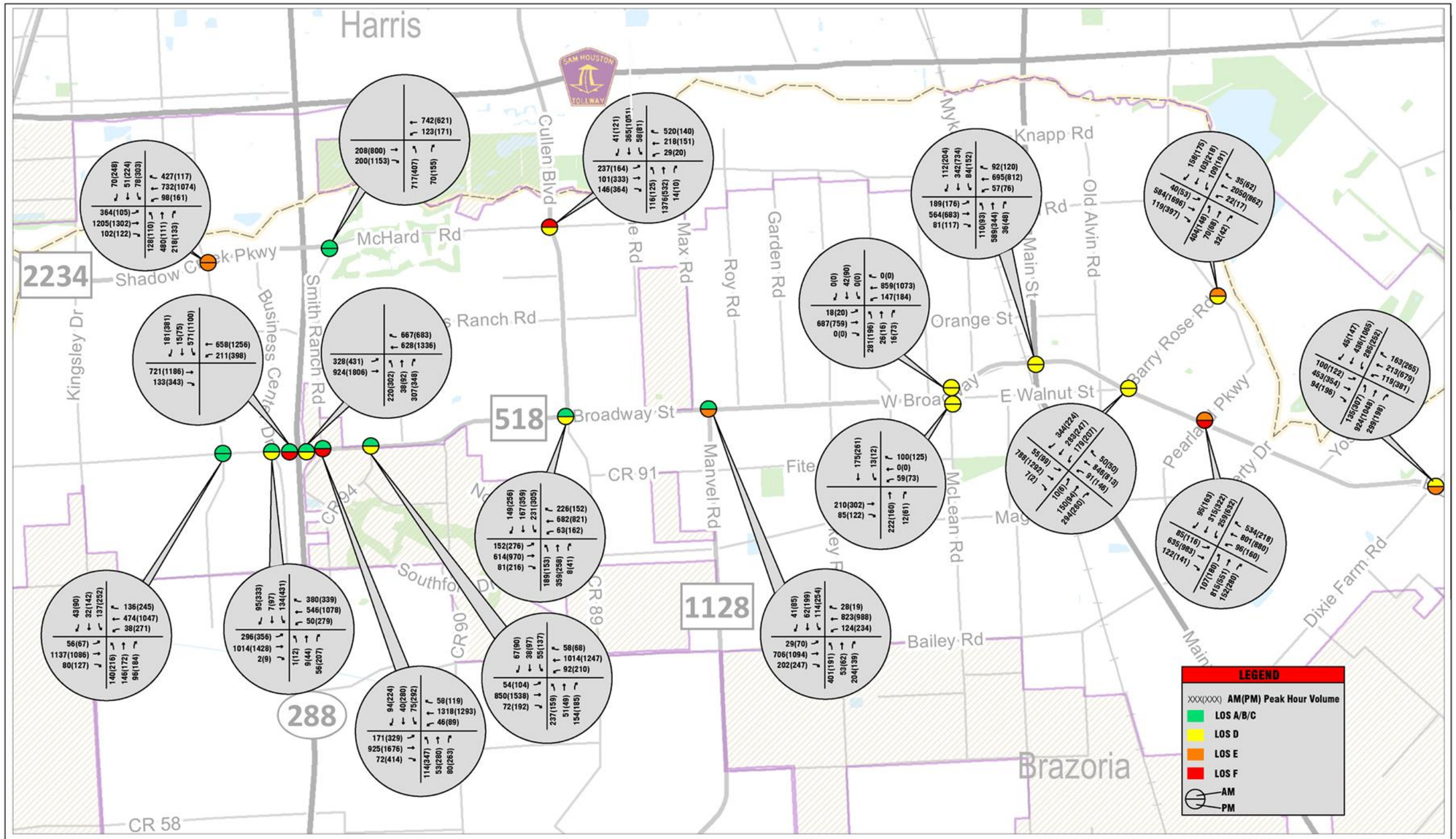
Table 16: Year 2019 Peak Hour Intersection LOS

#	Intersection	AM Peak		PM Peak	
		Delay (s)	LOS	Delay (s)	LOS
1	McHard Road at Kirby Drive	**59.0**	**E**	**56.7**	**E**
2	McHard Road at County Place Parkway	27.2	C	33.2	C
3	McHard Road at Cullen Parkway	**111.4**	**F**	44.6	D
4	Broadway Street at Kirby Drive	21.8	C	29.9	C
5	Broadway Street at Business Center Drive	24.4	C	53.4	D
6	Broadway Street at SH 288 SBFR[1]	34.3	C	**81.5**	**F**
7	Broadway Street at SH 288 NBFR[1]	19.1	B	43.7	D
8	Broadway Street at Smith Ranch Road	23.8	C	**106.7**	**F**
9	Broadway Street at CR 94	23.4	C	49.7	D
10	Broadway Street at Cullen Parkway	34.5	C	41.7	D
11	Broadway Street at Manvel Road	33.1	C	**60.5**	**E**
12	Broadway Street at McLean Road[1]	38.2	D	45.2	D
13	McLean Road at W. Walnut Street[1]	38.6	D	37.2	D
14	Broadway Street at Main Street	38.7	D	45.4	D
15	Broadway Street at Barry Rose Road	45.2	D	54	D
16	Broadway Street at Pearland Parkway	**59.7**	**E**	**140.8**	**F**
17	Broadway Street at Dixie Farm Road	44.6	D	**79.7**	**E**
18	Pearland Parkway at Barry Rose Road	**68.1**	**E**	35.5	D

Source: CDM Smith, using Synchro, Version 8
[1]HCM (2010) does not analyze clustered intersections; HCM 2000 was employed

LOS C or better is generally considered to be acceptable, while LOS D is tolerable. LOS E or F is considered intolerable and unacceptable. For the purposes of this study, an LOS E or F would require an improvement made to the intersection.

Figure 17: Year 2019 Intersection Volumes and Level-of-Service



Source: CDM Smith, May 2014

Not to Scale

YEAR 2019
INTERSECTION VOLUMES AND LEVEL OF SERVICE

Pearland Traffic Management Plan

Pearland, Texas

Figure 17

Traffic signal timings were optimized and as such, any improvements required to be made by tweaking timings have already been made. Based on the acceptable LOS criteria described above, the following intersections are projected to operate at unacceptable levels:

- McHard Road at Kirby Drive (AM and PM)
- McHard Road at Cullen Parkway (AM)
- Broadway Street at SH 288 SBFR (PM)
- Broadway Street at Smith Ranch Road (PM)
- Broadway Street at Manvel Road (PM)
- Broadway Street at Pearland Parkway (AM and PM)
- Broadway Street at Dixie Farm Road (PM)
- Pearland Parkway at Barry Rose Road (AM)

6.3.3 Year 2025 Traffic Analysis (Medium-Term)

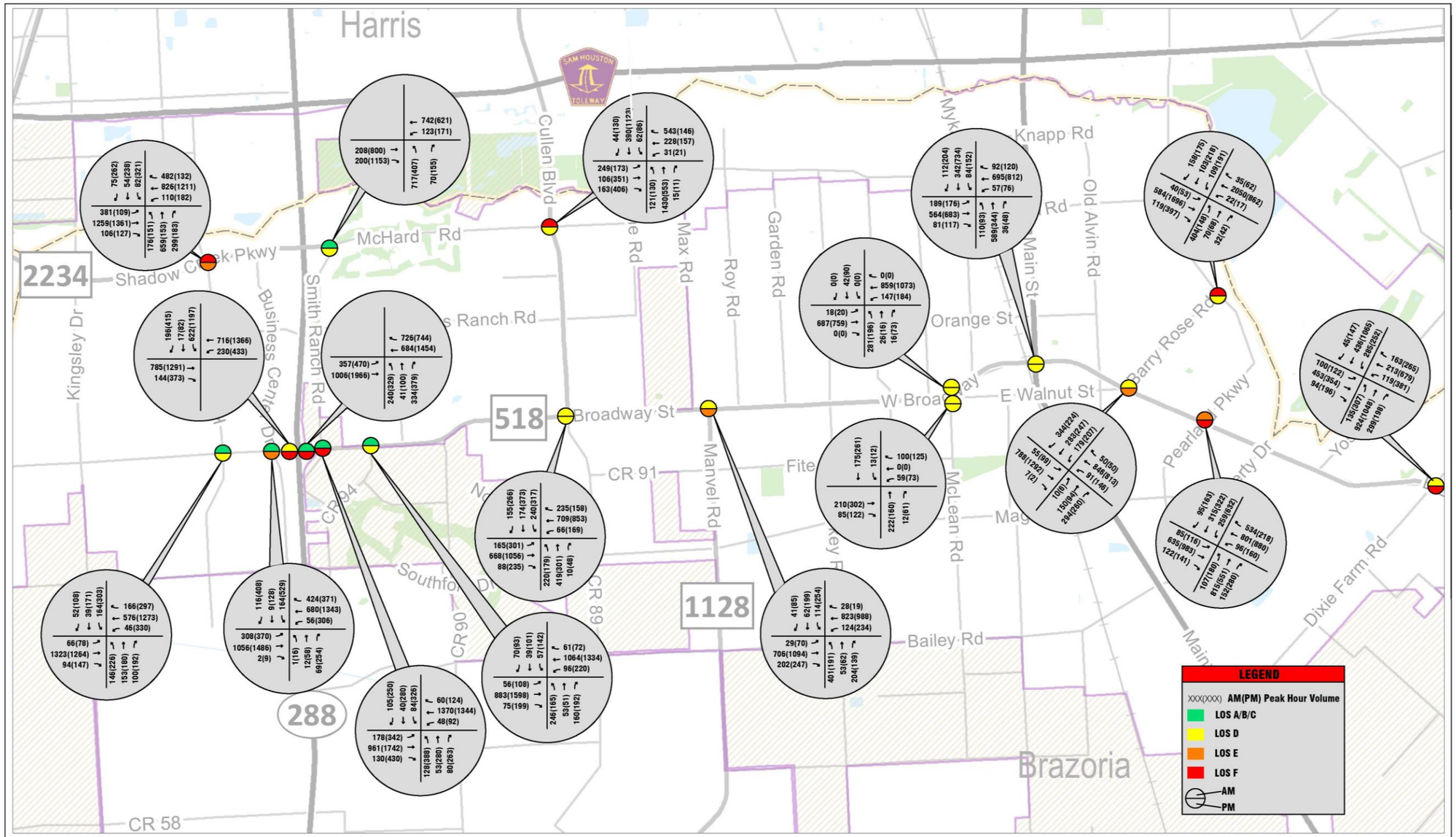
Analysis of 2025 traffic conditions was conducted using *Synchro* to evaluate operational deficiencies in the medium term. The LOS and associated delay during morning and evening peak hours at the study intersections are presented in **Table 17**.

Traffic analysis was performed by applying growth factors to the existing turning movement counts and updating intersection geometry to include any planned improvements already committed by 2025. Signal timings were optimized and LOS obtained based on the HCM 2010 methodology in *Synchro*. Where HCM 2010 methodology was not applicable, HCM 2000 methodology was employed. The 2025 projected turning movement volumes during the morning and evening peak hours are shown in **Figure 18**.

Traffic signal timings were optimized and as such, any improvements required to be made by tweaking timings have already been made. Based on the acceptable LOS criteria described earlier, the following intersections are projected to operate at unacceptable levels:

- McHard Road at Kirby Drive (AM and PM)
- McHard Road at Cullen Parkway (AM)
- Broadway Street at Business Center Drive (PM)
- Broadway Street at SH 288 SBFR (PM)
- Broadway Street at SH 288 NBFR (PM)
- Broadway Street at Smith Ranch Road (PM)
- Broadway Street at Manvel Road (PM)
- Broadway Street at Barry Rose Road (PM)
- Broadway Street at Pearland Parkway (AM and PM)
- Broadway Street at Dixie Farm Road (PM)
- Pearland Parkway at Barry Rose Road (AM)

Figure 18: Year 2025 Intersection Volumes and Level-of-Service



Source: CDM Smith, May 2014

Not to Scale

YEAR 2025
INTERSECTION VOLUMES AND LEVEL-OF-SERVICE
Pearland Traffic Management Plan
Pearland, Texas

Figure 18

Table 17: Year 2025 Peak Hour Intersection LOS

#	Study Intersection	AM Peak		PM Peak	
		Delay (s)	LOS	Delay (s)	LOS
1	McHard Road at Kirby Drive	**87.2**	**F**	**67.6**	**E**
2	McHard Road at County Place Parkway	29.2	C	37.9	D
3	McHard Road at Cullen Parkway	**121.6**	**F**	53.6	D
4	Broadway Street at Kirby Drive	23.8	C	46.1	D
5	Broadway Street at Business Center Drive	31	C	**74.4**	**E**
6	Broadway Street at SH 288 SBFR[1]	46.4	D	**111.5**	**F**
7	Broadway Street at SH 288 NBFR[1]	22.8	C	**171.2**	**F**
8	Broadway Street at Smith Ranch Road	23.5	C	**112.3**	**F**
9	Broadway Street at CR 94	24	C	54.1	D
10	Broadway Street at Cullen Parkway	35.8	D	46.5	D
11	Broadway Street at Manvel Road	37.3	D	**72.5**	**E**
12	Broadway Street at McLean Road[1]	38.7	D	37.3	D
13	McLean Road at W. Walnut Street[1]	45.5	D	37	D
14	Broadway Street at Main Street	42.1	D	51.7	D
15	Broadway Street at Barry Rose Road	52.2	D	**62.5**	**E**
16	Broadway Street at Pearland Parkway	**66**	**E**	**170.8**	**F**
17	Broadway Street at Dixie Farm Road	54.6	D	**105.7**	**F**
18	Pearland Parkway at Barry Rose Road	**101.1**	**F**	37.0	D

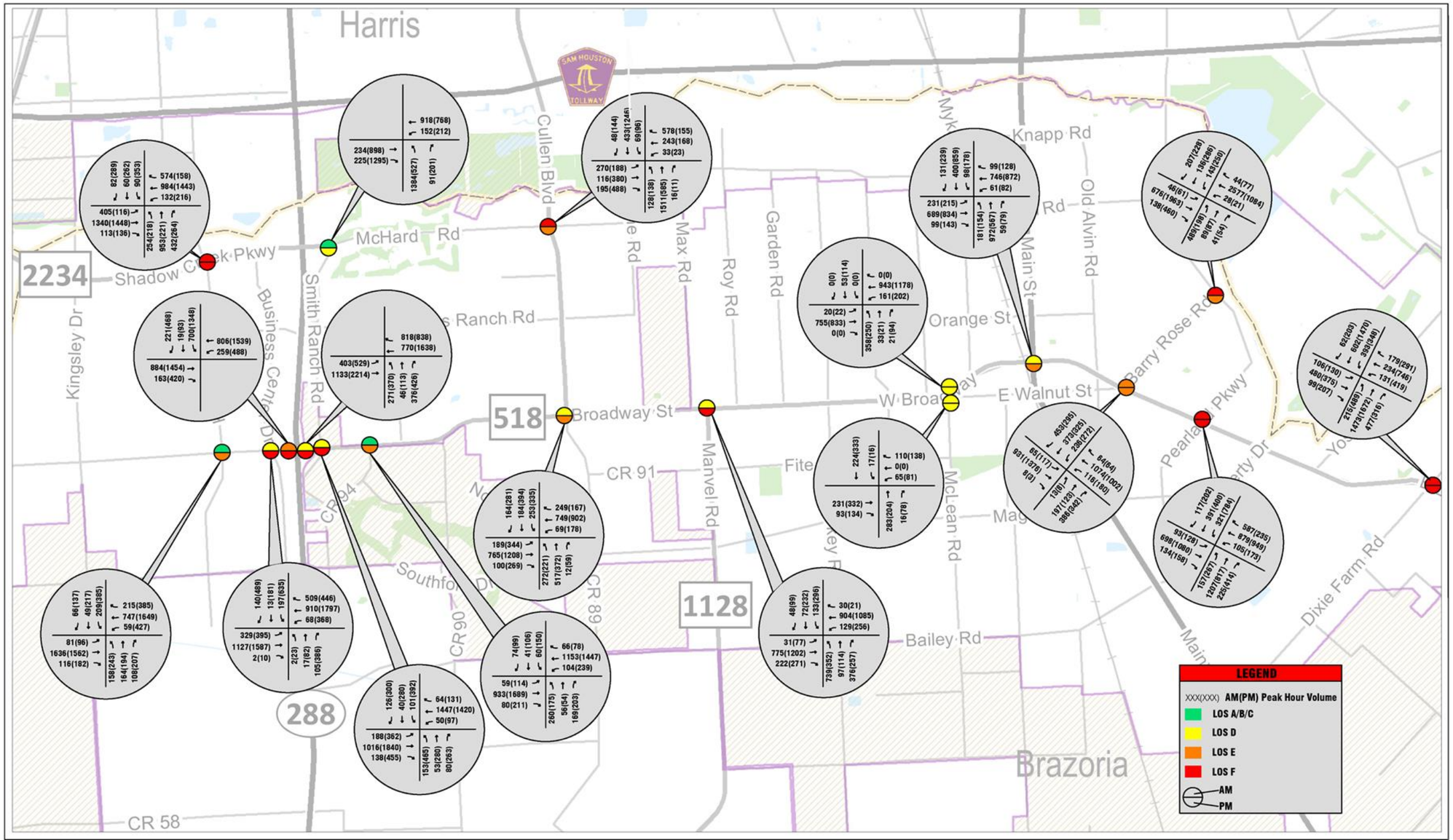
Source: CDM Smith, using Synchro, Version 8
[1]HCM (2010) does not analyze clustered intersections; HCM 2000 was employed

6.3.4 Year 2035 Traffic Analysis (Long-Term)

Analysis of 2035 traffic conditions was conducted using *Synchro* to evaluate operational deficiencies in the long-term. The LOS and associated delay during morning and evening peak hours at the study intersections is presented in **Table 18**.

Traffic analysis was performed by applying growth factors to the existing turning movement counts and updating intersection geometry to include any planned improvements already committed by 2035. Signal timings were optimized and LOS obtained based on the HCM 2010 methodology in *Synchro*. Where HCM 2010 methodology was not applicable, HCM 2000 methodology was employed. The 2035 projected turning movement volumes during the morning and evening peak hours are shown in **Figure 19**.

Figure 19: Year 2035 Intersection Volumes and Level-of-Service



Source: CDM Smith, May 2014

Not to Scale

YEAR 2035
INTERSECTION VOLUMES AND LEVEL-OF-SERVICE

Pearland Traffic Management Plan

Pearland, Texas

Figure 19

Table 18: Year 2035 Peak Hour Intersection LOS

#	Study Intersection	AM Peak		PM Peak	
		Delay (s)	LOS	Delay (s)	LOS
1	McHard Road at Kirby Drive	**155.7**	**F**	**105.9**	**F**
2	McHard Road at County Place Parkway	32.3	C	51.0	D
3	McHard Road at Cullen Parkway	**138.4**	**F**	**72.6**	**E**
4	Broadway Street at Kirby Drive	29.9	C	**61.8**	**E**
5	Broadway Street at Business Center Drive	37.3	D	**131.9**	**F**
6	Broadway Street at SH 288 SBFR[1]	**68.9**	**E**	**152.4**	**F**
7	Broadway Street at SH 288 NBFR[1]	46.7	D	**141.5**	**F**
8	Broadway Street at Smith Ranch Road	25.8	D	**133.3**	**F**
9	Broadway Street at CR 94	25.5	C	**60.7**	**E**
10	Broadway Street at Cullen Parkway	39.7	D	**56**	**E**
11	Broadway Street at Manvel Road	48.6	D	**96.6**	**F**
12	Broadway Street at McLean Road[1]	45.2	D	48.8	D
13	McLean Road at W. Walnut Street[1]	43.1	D	42.2	D
14	Broadway Street at Main Street	49.1	D	**62.0**	**E**
15	Broadway Street at Barry Rose Road	**69.3**	**E**	**57.5**	**E**
16	Broadway Street at Pearland Parkway	**118.8**	**F**	**228.2**	**F**
17	Broadway Street at Dixie Farm Road	**86.7**	**F**	**180.4**	**F**
18	Pearland Parkway at Barry Rose Road	**157.8**	**F**	**58.8**	**E**

Source: CDM Smith, using Synchro, Version 8
[1]HCM (2010) does not analyze clustered intersections; HCM 2000 was employed

Based on the acceptable LOS criteria described earlier, only the following intersections are projected to operate at acceptable levels:

- McHard Road at County Place Parkway
- Broadway Street at McLean Road
- McLean Road at W. Walnut Street

7. PROPOSED TRANSPORTATION IMPROVEMENTS

This chapter summarizes proposed improvements as short, medium, and long-term solutions to meet the mobility needs of the study intersections and roadways corridors. This chapter also provides prioritization of improvements based on mobility and safety, and documents the estimated preliminary cost of improvements and generalized benefit-cost ratios of the proposed improvements. The recommendations in this study are primarily based on traffic and mobility considerations and do not include engineering, utility, and right-of-way constraints.

7.1 Roadway Improvements

The need for capacity improvements was evaluated for short-term (2014-2019), medium-term (2020-2025) and long-term (2026-2035) based on deficiencies identified using the projected travel demand from the Pearland model.

The existing plus committed (E+C) transportation network was utilized as the basis to evaluate capacity needs using the 2019 and 2035 projected travel demand from the model. The E+C conditions include the existing transportation network plus all committed transportation improvements. The 2025 traffic conditions were evaluated by interpolating model volumes between 2019 and 2035.

7.1.1 Short-Term Improvements (2014 - 2019)

Roadway segments projected to operate at or over roadway capacity (LOS F or V/C ≥ 1) in 2019 were identified and additional capacity needs were evaluated to meet the projected travel demand. **Table 19** summarizes the traffic operating conditions with number of travel lanes, associated V/C ratio, and LOS under E+C and proposed conditions.

Table 19: Short-Term Capacity Constrained Corridors

Roadway	From	To	Year 2019 Existing plus Committed			Year 2019 with Proposed Improvements		
			Lanes	V/C	LOS	Lanes	V/C	LOS
Broadway St/FM 518	Pearland Pkwy	Dixie Farm Rd	4	1.17	F	6	0.78	D
	Dixie Farm Rd	FM 2351	4	1.05	F	6	0.70	D
CR 59	FM 521	CR 48	2	1.27	F	4	0.64	C
Magnolia Rd/Southfork Dr/CR 59	SH 288	CR 90	4	1.05	F	6	0.70	D
McHard Rd/FM 2234	SH 288	FM 865	4	1.09	F	6	0.73	D
Pearland Pkwy	Beltway 8	FM 2234	4	1.11	F	6	0.74	D
	FM 2234	Barry Rose Rd	4	1.15	F	6	0.77	D
	Barry Rose Rd	FM 518	4	1.05	F	6	0.70	D

In the short term, capacity improvements for approximately 29 miles of roadway are identified. They include portions of Broadway Street, Magnolia Road, Main Street, McHard Drive, and Pearland Parkway.

7.1.2 Medium-Term Improvements (2020 - 2025)

Roadway segments projected to operate at or over roadway capacity (LOS F or V/C ≥ 1) in 2025 were identified and additional capacity needs were evaluated to meet the projected travel demand. **Table 19** summarizes the traffic operating conditions with number of travel lanes, associated V/C ratio, and LOS under E+C and proposed conditions.

Table 20: Medium-Term Capacity Constrained Corridors

Roadway	From	To	Year 2025 Existing plus Committed			Year 2025 with Proposed Improvements		
			Lanes	V/C	LOS	Lanes	V/C	LOS
Broadway St/FM 518	FM 1128	Mykawa Rd	4	1.02	F	6	0.68	D
	SH 35	Pearland Pkwy	4	1.05	F	6	0.70	D
	Pearland Pkwy	Dixie Farm Rd	4	1.25	F	6	0.84	E
	Dixie Farm Rd	FM 2351	4	1.09	F	6	0.73	D
Dixie Farm Rd	FM 518	Blackhawk Blvd	4	1.06	F	6	0.70	D
Magnolia Rd/Southfork Dr/CR 59	CR 48	SH 288	4	1.06	F	6	0.71	D
	SH 288	CR 90	4	1.14	F	6	0.76	D
Main St/SH 35	Beltway 8	FM 2234	6	1.13	F	8	0.85	E
	FM 2234	FM 518	6	1.04	F	8	0.78	D
McHard Rd/FM 2234	FM 521	Kingsley Dr	4	1.04	F	6	0.70	D
	Kingsley Dr	SH 288	4	1.04	F	6	0.69	D
	SH 288	FM 865	4	1.20	F	6	0.80	D
	Mykawa Rd	SH 35	4	1.01	F	6	0.67	D
Pearland Pkwy	Beltway 8	FM 2234	4	1.27	F	6	0.85	E
	FM 2234	Barry Rose Rd	4	1.27	F	6	0.85	E
	Barry Rose Rd	FM 518	4	1.17	F	6	0.78	D

In the medium term, capacity improvements for approximately 53 miles of roadway are identified. They include portions of Broadway Street, Dixie Farm Road, Magnolia Road, Main Street, McHard Road, and Pearland Parkway.

7.1.3 Long-Term Improvements (2026 - 2035)

Roadway segments projected to operate at or over roadway capacity (LOS F or V/C ≥ 1) in 2035 were identified and additional capacity needs were evaluated to meet the projected travel demand. **Table 19** summarizes the traffic operating conditions with number of travel lanes, associated V/C ratio, and LOS under E+C and proposed conditions.

Table 21: Long-Term Capacity Constrained Corridors

Roadway	From	To	Year 2035 Existing plus Committed			Year 2035 with Proposed Improvements		
			Lanes	V/C	LOS	Lanes	V/C	LOS
Bailey Rd/CR 101	CR 90	FM 1128	2	1.12	F	4	0.56	C
Barry Rose Rd	FM 518	Pearland Pkwy	4	1.03	F	6	0.69	D
Broadway St/FM 518	SH 288	FM 865	4	1.1	F	6	0.73	D
	FM 1128	Mykawa Rd	4	1.07	F	6	0.71	D
	Mykawa Rd	SH 35	4	1.12	F	6	0.75	D
	SH 35	Pearland Pkwy	4	1.14	F	6	0.76	D
	Pearland Pkwy	Dixie Farm Rd	4	1.34	F	6	0.89	E
	Dixie Farm Rd	FM 2351	4	1.23	F	6	0.82	E
Business Center Dr	Beltway 8	McHard Rd	4	1.04	F	6	0.69	D
Dixie Farm Rd	FM 518	Blackhawk Blvd	4	1.28	F	6	0.85	E
Harkey Rd	FM 518	CR 59	4	1.07	F	6	0.71	D
Hughes Ranch Rd/CR 403	SH 288	CR 94	4	1.04	F	6	0.69	D
	CR 94	FM 865	4	1.09	F	6	0.73	D
Hughes Rd	Pearland Pkwy	Blackhawk Blvd	4	1.08	F	6	0.72	D
Kingsley Dr/CR 48	FM 2234	FM 518	4	1.29	F	6	0.86	E
	FM 518	CR 59	4	1.13	F	6	0.75	D
Kirby Dr	FM 518	CR 59	2	1.08	F	4	0.54	C
Magnolia Rd/Southfork Dr/CR 59	FM 521	CR 48	4	1.13	F	6	0.75	D
	CR 48	SH 288	4	1.2	F	6	0.8	D
	SH 288	CR 90	4	1.33	F	6	0.89	D
	CR 90	FM 1128	4	1.03	F	6	0.69	D
	SH 35	Pearland Pkwy	4	1.34	F	6	0.89	E
Main St/SH 35	Beltway 8	FM 2234	6	1.34	F	8	1.01	F
	FM 2234	FM 518	6	1.16	F	8	0.87	E
	FM 518	CR 101	4	1.31	F	6	0.87	E
	CR 101	SH 6	4	1.1	F	6	0.73	D
Manvel Rd/FM 1128	CR 59	CR 101	2	1	E	4	0.5	B
Max Rd	McHard Rd	Beltway 8	4	1.03	F	6	0.69	D
McHard Rd/FM 2234	FM 521	Kingsley Dr	4	1.25	F	6	0.83	E
	Kingsley Dr	SH 288	4	1.19	F	6	0.79	D
	SH 288	FM 865	4	1.36	F	6	0.91	E
	Mykawa Rd	SH 35	4	1.18	F	6	0.79	D
Mykawa Rd	Beltway 8	FM 2234	4	1.1	F	6	0.73	D
	FM 2234	FM 518	4	1.03	F	6	0.69	D
Oiler Dr	SH 35	Pearland Pkwy	4	1.09	F	6	0.73	D
Pearland Pkwy	Beltway 8	FM 2234	4	1.42	F	6	0.95	E
	FM 2234	Barry Rose Rd	4	1.39	F	6	0.93	E
	Barry Rose Rd	FM 518	4	1.34	F	6	0.89	E
	FM 518	Oiler Dr	4	1.13	F	6	0.75	D
	Oiler Dr	FM 2351	4	1.07	F	6	0.71	D

In the long term, capacity improvements for approximately 126 miles of roadway are identified. They include portions of Bailey Road, Barry Rose Road, Broadway Street, Business Center Drive, Dixie Farm Road, Harkey Road, Hughes Ranch Road, Kingsley Drive, Kirby Drive, Magnolia Road, Main Street, Manvel Road, Max Road, McHard Drive, Mykawa Road, Oiler Drive, and Pearland Parkway.

7.1.4 Prioritization of Roadway Improvements

The proposed roadway improvements discussed in the short, medium, and long-term horizons were prioritized to help the City identify high priority projects to meet the mobility and safety needs. The mobility criterion is based on traffic congestion and uses V/C ratios. The safety criterion is based on crash analysis, as discussed in Chapter 4, and uses three safety measures to evaluate an overall safety rank. It includes: 1) Total number of crashes, 2) Injuries + Fatalities per 100 crashes, and 3) Crash rates. For the ranking of improvements, both mobility and safety criteria are given equal weights to determine an overall rank or priority for the proposed improvements.

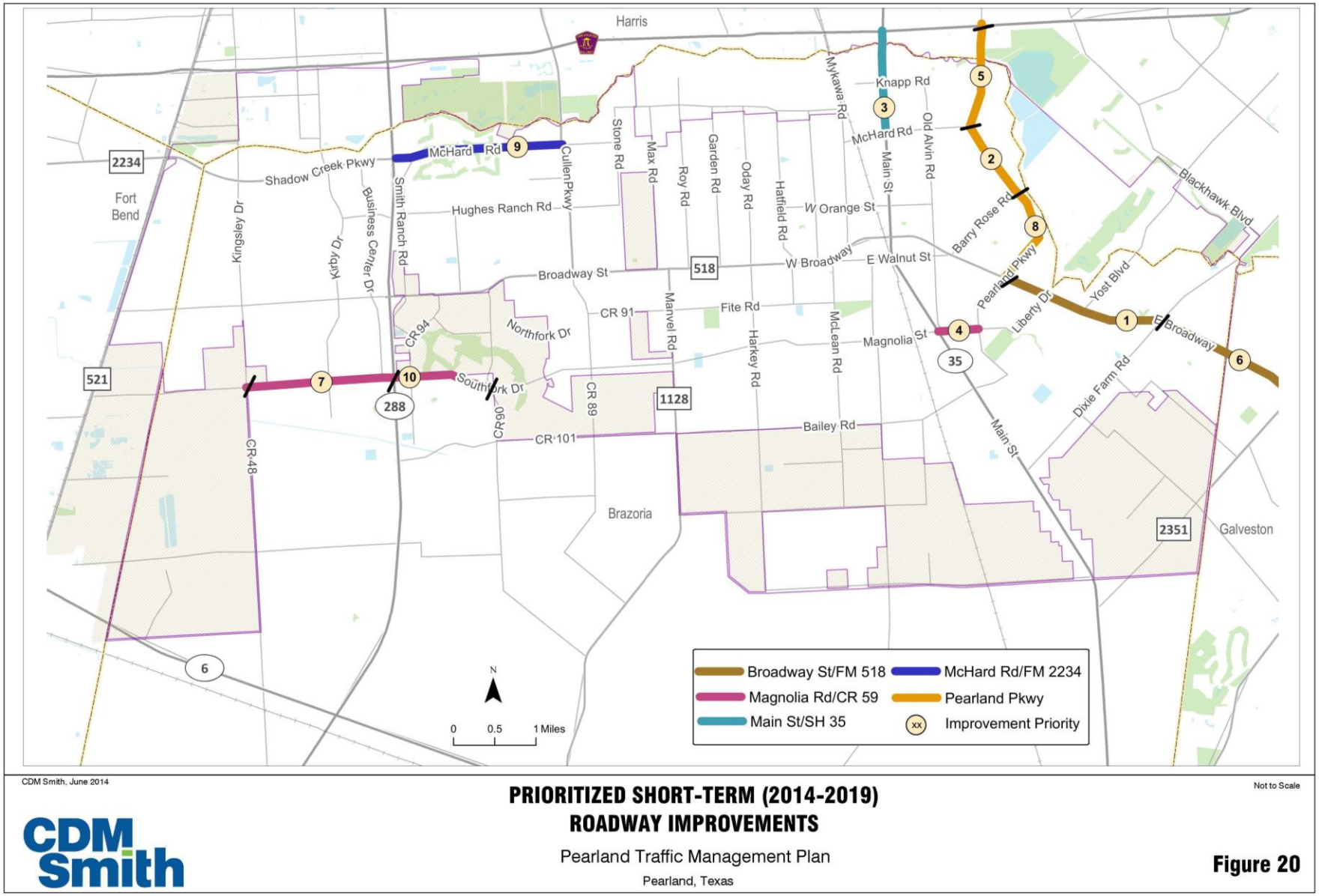
Short-term roadway improvements showing project priority with assigned mobility and safety ranks are summarized in **Table 22** and illustrated in **Figure 20**. In the short-term, Broadway Street between Pearland Parkway and Dixie Farm Road is the first on the priority list while Southfork Drive between SH 288 and CR 90 is the last.

Table 22: Prioritized Short-Term Roadway Improvements

PRIORITY	Rank		Roadway	From	To	Improvement
	Mobility	Safety				
1	2	1	Broadway St/FM 518	Pearland Pkwy	Dixie Farm Rd	Widen from 4 to 6 lanes
2	3	3	Pearland Pkwy	FM 2234	Barry Rose Rd	Widen from 4 to 6 lanes
3	1	5	Southfork Dr/CR 59	FM 521	CR 48	Widen from 2 to 4 lanes
4	6	2	Broadway St/FM 518	Dixie Farm Rd	FM 2351	Widen from 4 to 6 lanes
5	4	6	Pearland Pkwy	Beltway 8	FM 2234	Widen from 4 to 6 lanes
6	7	4	Pearland Pkwy	Barry Rose Rd	FM 518	Widen from 4 to 6 lanes
7	5	7	McHard Rd/FM 2234	SH 288	FM 865	Widen from 4 to 6 lanes
8	8	8	Southfork Rd/CR 59	SH 288	CR 90	Widen from 4 to 6 lanes

Improvements do not include planned projects identified in H-GAC's RTP or City of Pearland CIP

Figure 20: Prioritized Short-Term Roadway Improvements



CDM Smith, June 2014

Not to Scale

PRIORITIZED SHORT-TERM (2014-2019) ROADWAY IMPROVEMENTS

Pearland Traffic Management Plan

Pearland, Texas

Figure 20

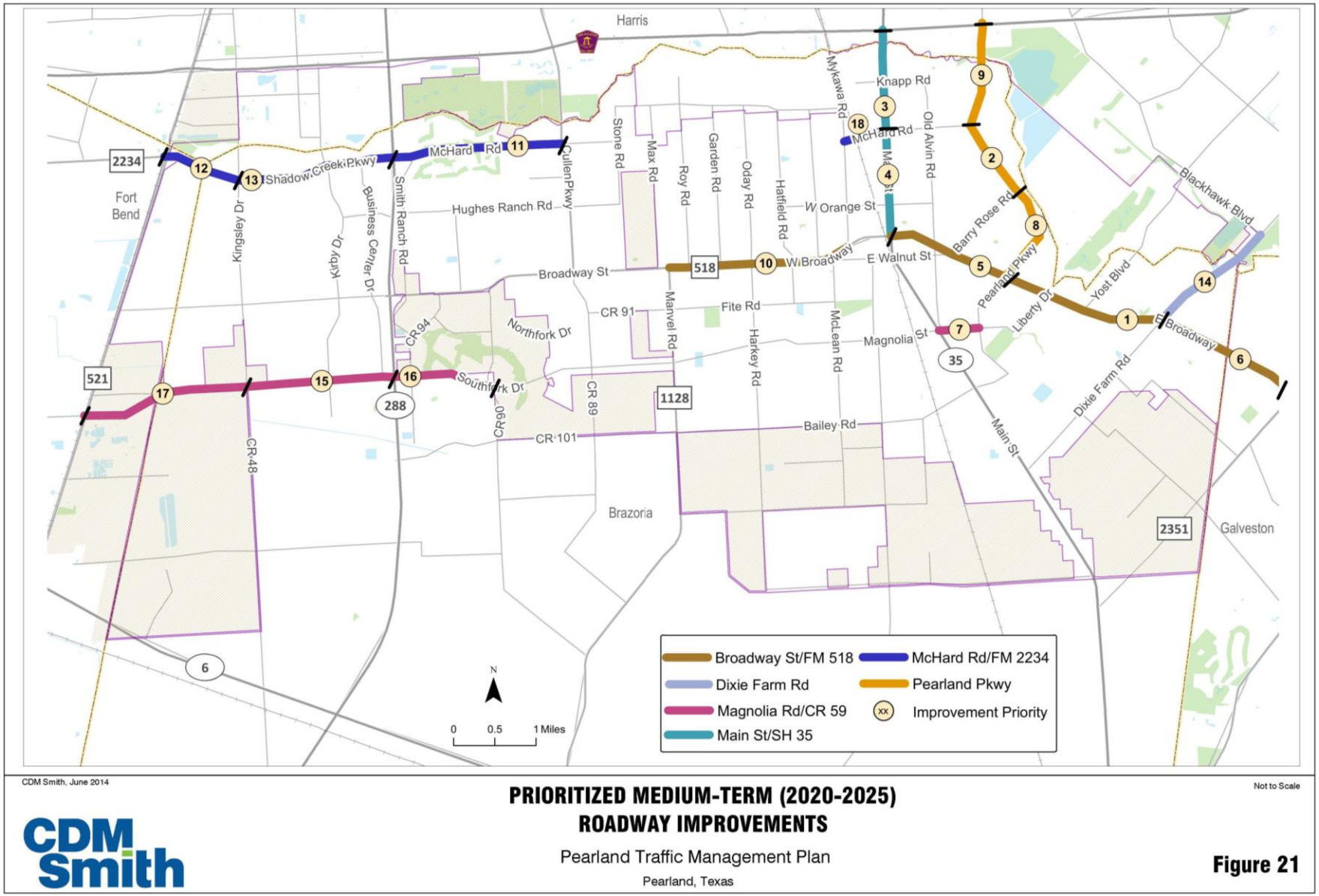
Medium-term roadway improvements showing project priority with assigned mobility and safety ranks are summarized in **Table 23** and illustrated in **Figure 21**. Similar to short-term, Broadway Street between Pearland Parkway and Dixie Farm Road continues to rank first in the medium-term list. Other roadway segments that top the list include Pearland Parkway from FM 2234 to Barry Rose Road, Main Street from Beltway 8 to FM 2234, and Broadway Street from Main Street to Pearland Parkway.

Table 23: Prioritized Medium-Term Roadway Improvements

PRIORITY	Rank		Roadway	From	To	Improvement
	Mobility	Safety				
1	3	6	Broadway St/FM 518	Pearland Pkwy	Dixie Farm Rd	Widen from 4 to 6 lanes
2	1	9	Pearland Pkwy	FM 2234	Barry Rose Rd	Widen from 4 to 6 lanes
3	7	4	Main St/SH 35	Beltway 8	FM 2234	Widen from 6 to 8 lanes
4	12	1	Main St/SH 35	FM 2234	FM 518	Widen from 6 to 8 lanes
5	11	3	Broadway St/FM 518	SH 35	Pearland Pkwy	Widen from 4 to 6 lanes
6	9	5	Broadway St/FM 518	Dixie Farm Rd	FM 2351	Widen from 4 to 6 lanes
7	5	10	Pearland Pkwy	Barry Rose Rd	FM 518	Widen from 4 to 6 lanes
8	2	13	Pearland Pkwy	Beltway 8	FM 2234	Widen from 4 to 6 lanes
9	15	2	Broadway St/FM 518	FM 1128	Mykawa Rd	Widen from 4 to 6 lanes
10	4	14	McHard Rd/FM 2234	SH 288	FM 865	Widen from 4 to 6 lanes
11	14	7	McHard Rd/FM 2234	FM 521	Kingsley Dr	Widen from 4 to 6 lanes
12	13	8	McHard Rd/FM 2234	Kingsley Dr	SH 288	Widen from 4 to 6 lanes
13	10	11	Dixie Farm Rd	FM 518	Blackhawk Blvd	Widen from 4 to 6 lanes
14	8	12	Southfork Dr/CR 59	CR 48	SH 288	Widen from 4 to 6 lanes
15	6	15	Southfork Dr/CR 59	SH 288	CR 90	Widen from 4 to 6 lanes
16	16	16	McHard Rd/FM 2234	Mykawa Rd	SH 35	Widen from 4 to 6 lanes

Improvements do not include planned projects identified in H-GAC's RTP or City of Pearland CIP

Figure 21: Prioritized Medium-Term Roadway Improvements



CDM Smith, June 2014

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PRIORITIZED MEDIUM-TERM (2020-2025) ROADWAY IMPROVEMENTS

Pearland Traffic Management Plan

Pearland, Texas

Figure 21

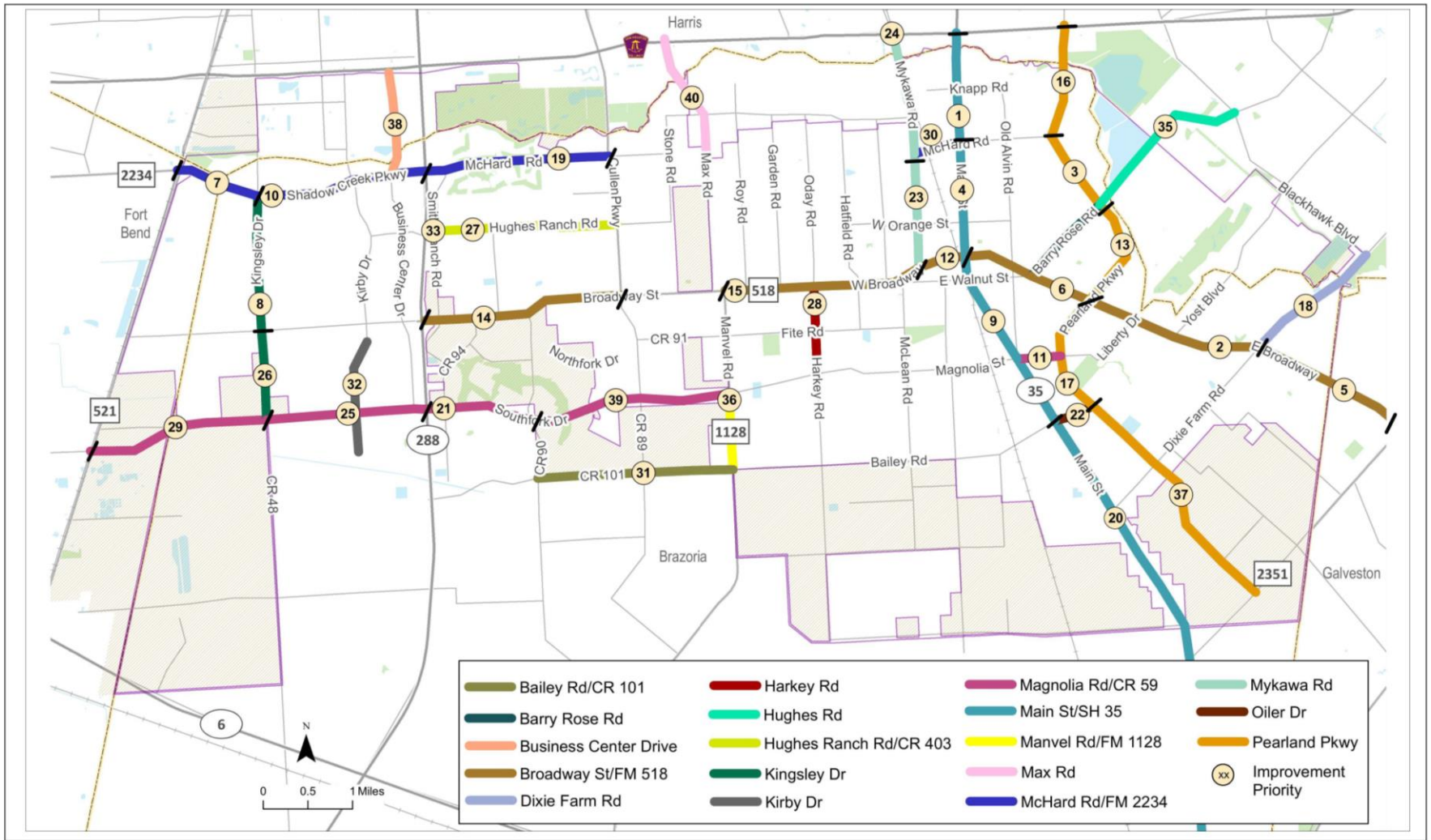
Long-term roadway improvements showing project priority with assigned mobility and safety ranks are summarized in **Table 24** and illustrated in **Figure 22**. Main Street between Beltway 8 and FM 2234 has the highest priority in the list of long-term improvements. The other roadway segments in the top five include Broadway Street from Pearland Parkway to Dixie Farm Road, Pearland Parkway from FM 2234 to Barry Rose Road, Main Street from FM 2234 to Broadway Street, and Broadway Street from Dixie Farm Road to FM 2351.

Table 24: Prioritized Long-Term Roadway Improvements

PRIORITY	Rank		Roadway	From	To	Improvement
	Mobility	Safety				
1	4	3	Main St/SH 35	Beltway 8	FM 2234	Widen from 6 to 8 lanes
2	5	8	Broadway St/FM 518	Pearland Pkwy	Dixie Farm Rd	Widen from 4 to 6 lanes
3	2	14	Pearland Pkwy	FM 2234	Barry Rose Rd	Widen from 4 to 6 lanes
4	17	1	Main St/SH 35	FM 2234	FM 518	Widen from 6 to 8 lanes
5	13	7	Broadway St/FM 518	Dixie Farm Rd	FM 2351	Widen from 4 to 6 lanes
6	18	4	Broadway St/FM 518	SH 35	Pearland Pkwy	Widen from 4 to 6 lanes
7	12	10	McHard Rd/FM 2234	FM 521	Kingsley Dr	Widen from 4 to 6 lanes
8	10	12	Kingsley Dr/CR 48	FM 2234	FM 518	Widen from 4 to 6 lanes
9	9	15	Main St/SH 35	FM 518	CR 101	Widen from 4 to 6 lanes
10	15	11	McHard Rd/FM 2234	Kingsley Dr	SH 288	Widen from 4 to 6 lanes
11	6	20	Magnolia Rd/CR 59	SH 35	Pearland Pkwy	Widen from 4 to 6 lanes
12	22	5	Broadway St/FM 518	Mykawa Rd	SH 35	Widen from 4 to 6 lanes
13	7	22	Pearland Pkwy	Barry Rose Rd	FM 518	Widen from 4 to 6 lanes
14	24	6	Broadway St/FM 518	SH 288	FM 865	Widen from 4 to 6 lanes
15	31	2	Broadway St/FM 518	FM 1128	Mykawa Rd	Widen from 4 to 6 lanes
16	1	32	Pearland Pkwy	Beltway 8	FM 2234	Widen from 4 to 6 lanes
17	19	17	Pearland Pkwy	FM 518	Oiler Dr	Widen from 4 to 6 lanes
18	11	25	Dixie Farm Rd	FM 518	Blackhawk Blvd	Widen from 4 to 6 lanes
19	3	33	McHard Rd/FM 2234	SH 288	FM 865	Widen from 4 to 6 lanes
20	25	13	Main St/SH 35	CR 101	SH 6	Widen from 4 to 6 lanes
21	8	34	Southfork Dr/CR 59	SH 288	CR 90	Widen from 4 to 6 lanes
22	27	16	Oiler Dr	SH 35	Pearland Pkwy	Widen from 4 to 6 lanes
23	36	9	Mykawa Rd	FM 2234	FM 518	Widen from 4 to 6 lanes
24	26	19	Mykawa Rd	Beltway 8	FM 2234	Widen from 4 to 6 lanes
25	14	31	Southfork Dr/CR 59	CR 48	SH 288	Widen from 4 to 6 lanes
26	20	26	Kingsley Dr/CR 48	FM 518	CR 59	Widen from 4 to 6 lanes
27	28	21	Hughes Ranch Rd/CR 403	CR 94	FM 865	Widen from 4 to 6 lanes
28	32	18	Harkey Rd	FM 518	CR 59	Widen from 4 to 6 lanes
29	21	30	Southfork Dr/CR 59	FM 521	CR 48	Widen from 4 to 6 lanes
30	16	35	McHard Rd/FM 2234	Mykawa Rd	SH 35	Widen from 4 to 6 lanes
31	23	29	Bailey Rd/CR 101	CR 90	FM 1128	Widen from 4 to 6 lanes
32	29	28	Kirby Dr	FM 518	CR 59	Widen from 4 to 6 lanes
33	34	24	Hughes Ranch Rd/CR 403	SH 288	CR 94	Widen from 4 to 6 lanes
34	37	23	Barry Rose Rd	FM 518	Pearland Pkwy	Widen from 4 to 6 lanes
35	30	36	Hughes Rd	Pearland Pkwy	Blackhawk Blvd	Widen from 4 to 6 lanes
36	40	27	Manvel Rd/FM 1128	CR 59	CR 101	Widen from 4 to 6 lanes
37	33	37	Pearland Pkwy	Oiler Dr	FM 2351	Widen from 4 to 6 lanes
38	35	38	Business Center Drive	Beltway 8	McHard Rd	Widen from 4 to 6 lanes
39	38	39	Magnolia Rd/CR 59	CR 90	FM 1128	Widen from 4 to 6 lanes
40	39	40	Max Rd	McHard Rd	Beltway 8	Widen from 4 to 6 lanes

Improvements do not include planned projects identified in H-GAC's RTP or City of Pearland CIP

Figure 22: Prioritized Long-Term Roadway Improvements



7.2 Intersection Improvements

The intersection improvements were evaluated for short-term (2014-2019), medium-term (2020-2025) and long-term (2026-2035) to meet desirable traffic operations with the projected travel demand. The improvements were evaluated based on traffic operations analysis in *Synchro* using growth factors derived from the Pearland Travel Demand Model.

Since intersection improvements tend to be low-cost improvements and are implementable within a short time frame, improvements proposed in short-term are assumed to have been implemented and considered part of the existing plus committed (E+C) conditions in the subsequent term. For example, adding a separate right-turn lane in 2019 will be considered part of the 2025 E+C scenario before evaluating additional improvements based on the 2025 demand.

Signal timings were optimized prior to evaluating intersection improvements. Traffic signal timing improvements need to be implemented before mitigating congestion with capacity enhancements. As discussed with the City, intersections were evaluated to only include reasonable turn lane improvements such as adding left-turn lanes, right-turn lanes, and changing lane sharing configurations to improve traffic flow. No additional through lanes are proposed at the intersections. Also, raised medians will be considered at intersections to improve safety.

7.2.1 Short-Term Intersection Improvements (2014 - 2019)

Short-term improvements were identified based on analysis of 2019 E+C traffic conditions, as discussed in Chapter 6. Intersections operating at unacceptable LOS E or worse were identified and evaluated for additional capacity for critical turning movements to minimize overall intersection delay and achieve LOS D or better. **Table 25** summarizes the 2019 traffic operations with LOS and delay during morning and evening peak hour with the proposed improvements.

Table 25: Proposed Short-Term Intersection Improvements

Intersection	Improvement	2019 with Improvements			
		AM Peak		PM Peak	
		Delay (s)	LOS	Delay (s)	LOS
McHard Road at Kirby Drive	SB - Dual left-turn lanes	54.0	D	46.9	D
McHard Road at Cullen Parkway	EB - Dual left-turn lanes; WB - Exclusive right-turn lane	48.9	D	44.9	D
Broadway Street at SH 288 SBFR[1]	EB - 4 thru lanes; WB - Triple thru lanes and dual left-turn lanes; SB - Triple left-turn lanes, one thru and one shared right-turn lane	23.7	C	27.1	C
Broadway Street at SH 288 NBFR[1]	WB - 4 thru lanes; EB - Triple thru lanes and dual left-turn lanes; NB - One thru lane, one exclusive left-turn lane and one shared left-turn lane	17.6	B	21.4	C
Broadway Street at Smith Ranch Road	EB - Dual left-turn lanes, three thru lanes and exclusive right-turn lane; SB - Dual left-turn lanes	20.6	C	53.1	D

Broadway Street at Manvel Road	NB/SB - Dual left-turn lanes	32.6	C	47.9	D
Broadway Street at Pearland Parkway	NB/SB - Exclusive right-turn lane; two thru lanes and dual left-turn lanes	37.7	D	54.7	D
Broadway Street at Dixie Farm Road	NB/SB/WB - Dual left-turn lanes	35.7	D	48.9	D
Pearland Parkway at Barry Rose Road	EB/WB - Dual left-turn lanes (Barry Rose); NB - Dedicated right-turn lane (Pearland Pkwy)	**66.9**	**E**	36	D

Source: CDM Smith, using Synchro, Version 8
[1]HCM (2010) does not analyze clustered intersections; HCM 2000 was employed

All study intersections are projected to operate at acceptable LOS D or better with the proposed improvements, with the exception of Pearland Parkway and Barry Rose intersection operating at LOS E during the morning peak hour.

7.2.2 Medium-Term Intersection Improvements (2020 - 2025)

Medium-term improvements were identified based on analysis of 2025 E+C traffic conditions, as discussed in Chapter 6. Intersections operating at unacceptable LOS E or worse were identified and evaluated for additional capacity for critical turning movements to minimize overall intersection delay and achieve LOS D or better. **Table 26** summarizes the 2025 traffic operations with LOS and delay during morning and evening peak hour with the proposed improvements.

Table 26: Proposed Medium-Term Intersection Improvements

Intersection	Improvement	Results after Mitigation			
		AM Peak		PM Peak	
		Delay (s)	LOS	Delay (s)	LOS
McHard Road at Kirby Drive	EB/WB - Dual left-turn lanes; NB - Exclusive right-turn lane	45.5	D	49.3	D
Broadway Street at Business Center Drive	SB - Dual left-turn lanes	30.8	C	53.5	D
Broadway Street at Smith Ranch Road	NB - Exclusive right-turn lane	22.3	C	43.9	D
Broadway Street at Barry Rose Road	SB - Dual left-turn lanes	51.7	D	**56.9**	**E**
Broadway Street at Pearland Parkway	EB/WB - Dual left-turn lanes	43.7	D	**57.2**	**E**
Broadway Street at Dixie Farm Road	EB - Dual left-turn lanes	38.1	D	54.7	D

Source: CDM Smith, using *Synchro*, Version 8

With proposed improvements, most intersections would operate at acceptable LOS D or betterBarry Rose Road which would operate at LOS E during the evening peak hour.

7.2.3 Long-Term Intersection Improvements (2026 - 2035)

Long-term improvements were identified based on analysis of 2035 E+C traffic conditions, as discussed in Chapter 6. Intersections operating at unacceptable LOS E or worse were identified and evaluated for additional capacity for critical turning movements to minimize overall intersection

delay and achieve LOS D or better. **Table 27** summarizes the 2035 traffic operations with LOS and delay during morning and evening peak hour with the proposed improvements.

With proposed improvements, most intersections would operate at acceptable LOS D or better with the exception of McHard Road at Kirby Drive, McHard Road at Cullen Parkway, and Broadway Street at Barry Rose Road which would operate at LOS E during the morning peak hour.

Table 27: Proposed Long-Term Intersection Improvements

Intersection	Improvement	Results after Mitigation			
		AM Peak		PM Peak	
		Delay (s)	LOS	Delay (s)	LOS
McHard Road at Kirby Drive	NB - Dual left-turn lanes	**72.2**	**E**	53.9	D
McHard Road at Cullen Parkway	EB/NB/SB - Exclusive right-turn lane	**61**	**E**	37.5	D
Broadway Street at Business Center Drive	EB - Dual left-turn lanes; SB - Exclusive right-turn lane; NB - Shared thru lane and right-turn lane	29.1	D	50.5	D
Broadway Street at Manvel Road	EB/WB - Exclusive right-turn lanes	44.3	D	51.8	D
Broadway Street at Main Street	EB - Dual left-turn lanes	43.8	D	53.6	D
Broadway Street at Barry Rose Road	NB - Dual right-turn lanes	**62.8**	**E**	49.9	D
Broadway Street at Kirby Drive	SB - Dual left-turn lanes	27.8	C	47.5	D
Broadway Street at Cullen Parkway	EB - Dual left-turn lanes	38.1	D	51.5	D
Broadway Street at CR 94	WB - Dual left-turn lanes	26.9	C	52.1	D

Source: CDM Smith, using Synchro, Version 8

7.2.4 Prioritization of Intersection Improvements

Similar to the roadway improvements, proposed intersection improvements identified in the short-, medium, and long-term horizons were prioritized to help the City categorize the improvements from high to low priority based on mobility and safety criteria. To evaluate mobility ranking, intersection delay obtained from *Synchro* analysis was utilized. The safety criterion is based on crash analysis, as discussed in Chapter 4, and uses three safety measures to evaluate an overall safety rank. It includes: 1) total number of crashes, 2) injuries + fatalities per 100 crashes, and 3) crashes per 1,000 ADT. For the study purpose, both mobility and safety criteria are given equal weights to determine an overall rank or priority for the proposed improvements.

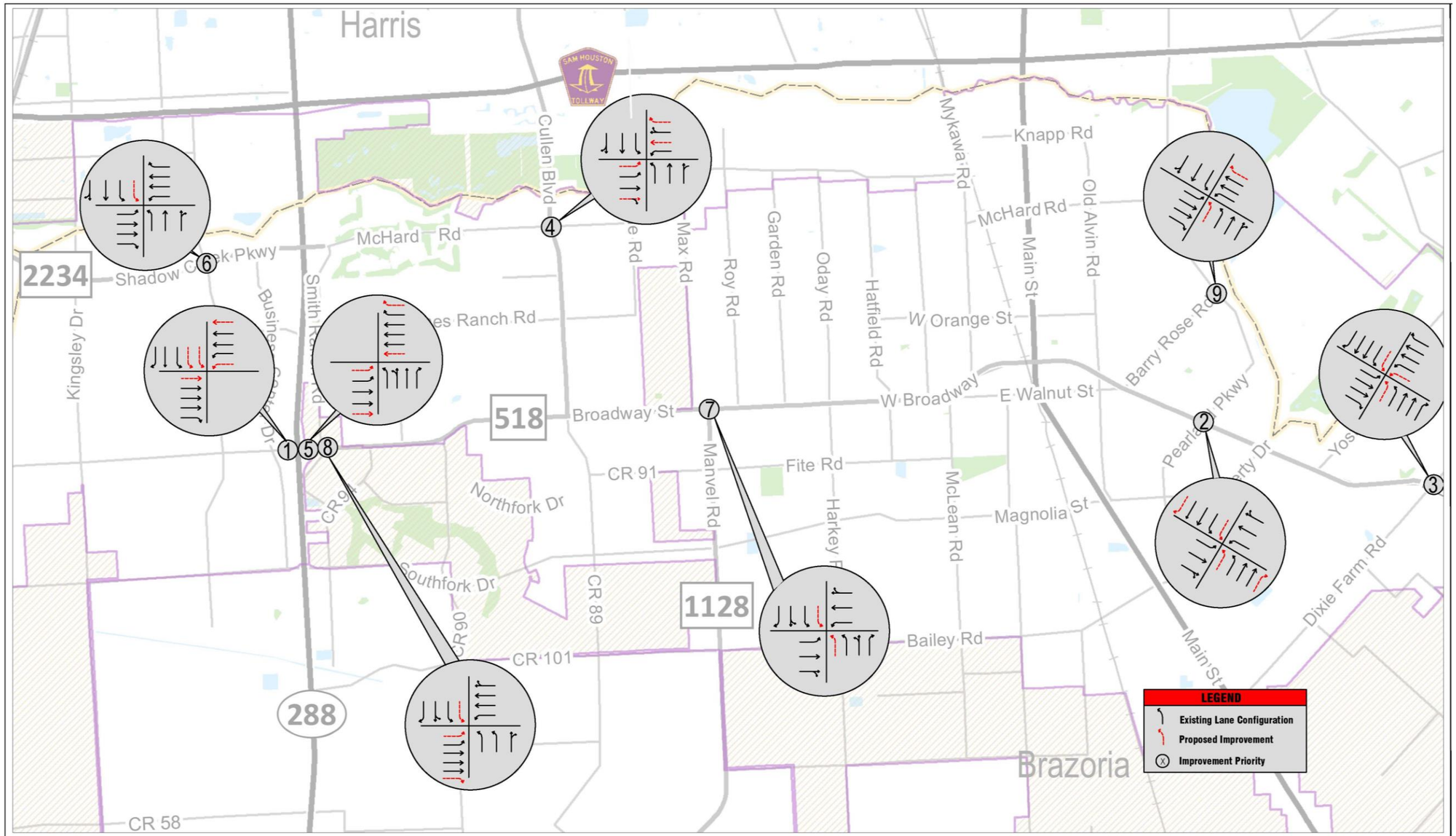
Short-term intersection improvements with overall project priority with assigned mobility and safety rank are summarized in **Table 28** and illustrated in **Figure 23.**

In the short term, the intersection at Broadway Street and SH 288 SBFR has the highest priority followed by the intersection at Broadway Street and Pearland Parkway. The intersection at Pearland Parkway and Barry Rose Road has the least priority.

Table 28: Prioritized Short-Term Intersection Improvements

PRIORITY	Rank		Intersection	Short-Term Improvements
	Mobility	Safety		
1	3	1	Broadway Street at SH 288 SBFR	EB - 4 thru lanes; WB - Triple thru lanes and dual left-turn lanes; SB - Triple left-turn lanes, one thru and one shared right-turn lane
2	1	4	Broadway Street at Pearland Parkway	NB/SB - Exclusive right-turn lane; two thru lanes and dual left-turn lanes
3	4	3	Broadway Street at Dixie Farm Road	NB/SB/WB - Dual left-turn lanes
4	2	5	McHard Road at Cullen Parkway	EB - Dual left-turn lanes; WB - Exclusive right-turn lane
5	9	2	Broadway Street at SH 288 NBFR	WB - 4 thru lanes; EB - Triple thru lanes and dual left-turn lanes; NB - One thru lane, one exclusive left-turn lane and one shared left-turn lane
6	6	7	McHard Road at Kirby Drive	SB - Dual left-turn lanes
7	8	6	Broadway Street at Manvel Road	NB/SB - Dual left-turn lanes
8	5	9	Broadway Street at Smith Ranch Road	EB - Dual left-turn lanes, three thru lanes and exclusive right-turn lane; SB - Dual left-turn lanes
9	7	8	Pearland Parkway at Barry Rose Road	EB/WB - Dual left-turn lanes (Barry Rose); NB - Dedicated right-turn lane (Pearland Pkwy)

Figure 23: Prioritized Short-Term Intersection Improvements



Source: CDM Smith, May 2014

Not to Scale

PRIORITIZED SHORT-TERM (2014-2019) INTERSECTION IMPROVEMENTS

Pearland Traffic Management Plan

Pearland, Texas

Figure 23

Medium-term intersection improvements with overall project priority with assigned mobility and safety ranks are summarized in **Table 29** and illustrated in **Figure 24**. In the medium term, the intersection at Broadway Street and Pearland Parkway has the first priority with highest ranking in both mobility and safety criteria, followed by the intersection at Broadway Street and Dixie Farm Road. The intersection at Broadway Street and Smith Ranch Road has the least priority.

Table 29: Prioritized Medium-Term Intersection Improvements

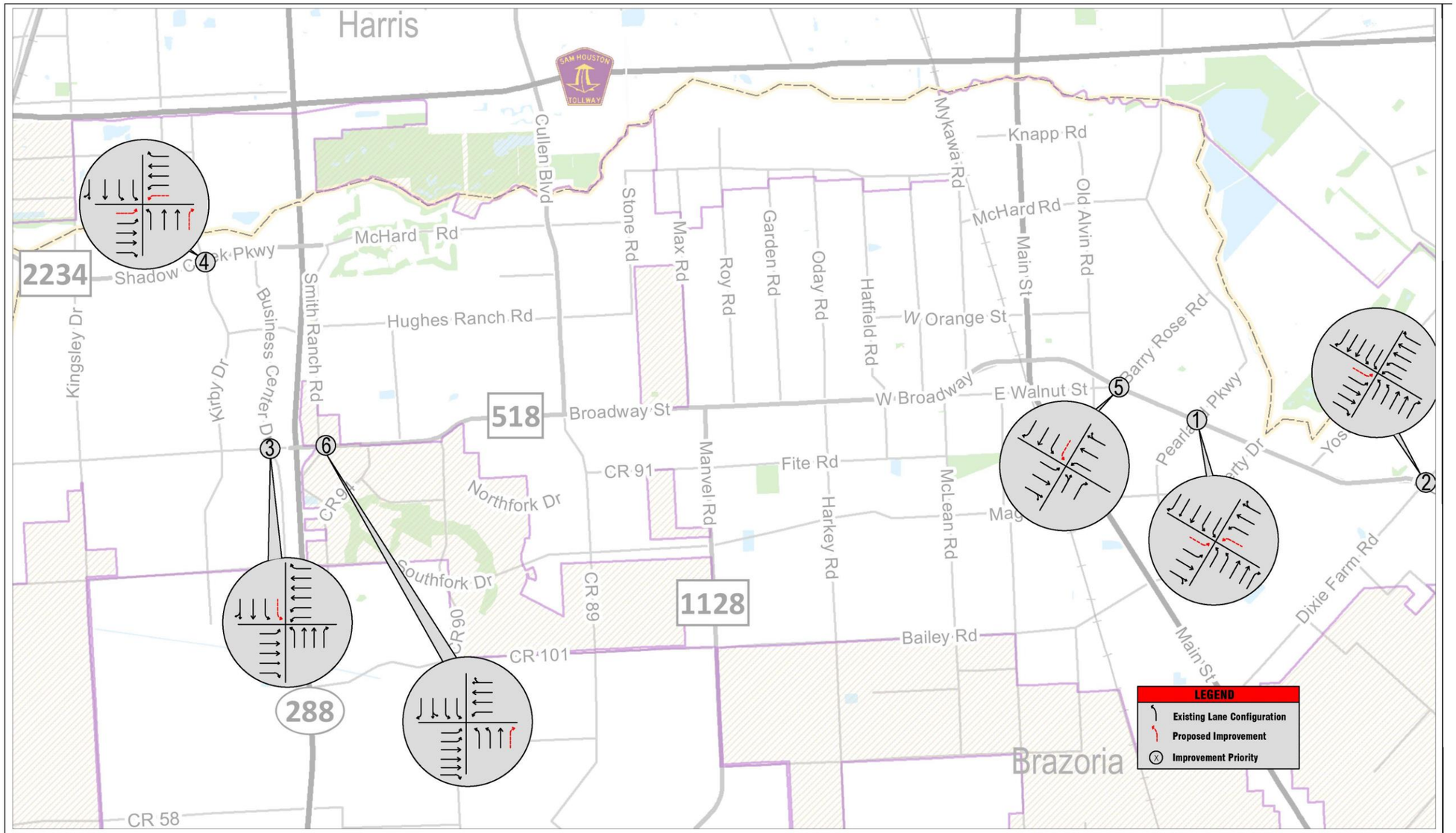
PRIORITY	Rank		Intersection	Short Term Improvements
	Mobility	Safety		
1	1	1	Broadway Street at Pearland Parkway	EB/WB - Dual left-turn lanes
2	2	2	Broadway Street at Dixie Farm Road	EB - Dual left-turn lanes
3	5	3	Broadway Street at Business Center Drive	SB - Dual left-turn lanes
4	3	5	McHard Road at Kirby Drive	EB/WB - Dual left-turn lanes; NB - Exclusive right-turn lane
5	6	4	Broadway Street at Barry Rose Road	SB - Dual left-turn lanes
6	4	6	Broadway Street at Smith Ranch Road	NB - Exclusive right-turn lane

Long-term intersection improvements with overall project priority with assigned mobility and safety ranks are summarized in **Table 30** and illustrated in **Figure 25**. In the long term, the intersection at Broadway Street and Main Street has the highest priority followed by the intersection at Broadway Street and Business Center Drive. The intersection at Broadway Street and Kirby Drive has the lowest priority.

Table 30: Prioritized Long-Term Intersection Improvements

PRIORITY	Rank		Intersection	Short Term Improvements
	Mobility	Safety		
1	5	1	Broadway Street at Main Street	EB - Dual left-turn lanes
2	3	3	Broadway Street at Business Center Drive	EB - Dual left-turn lanes; SB - Exclusive right-turn lane; NB - Shared thru lane and right-turn lane
3	2	5	McHard Road at Cullen Parkway	EB/NB/SB - Exclusive right-turn lane
4	1	7	McHard Road at Kirby Drive	NB - Dual left-turn lanes
5	8	2	Broadway Street at Cullen Parkway	EB - Dual left-turn lanes
6	4	6	Broadway Street at Manvel Road	EB/WB - Exclusive right-turn lanes
7	9	4	Broadway Street at CR 94	WB - Dual left-turn lanes
8	6	8	Broadway Street at Barry Rose Road	NB - Dual right-turn lanes
9	7	9	Broadway Street at Kirby Drive	SB - Dual left-turn lanes

Figure 24: Prioritized Medium-Term Intersection Improvements



Source: CDM Smith, May 2014

Not to Scale

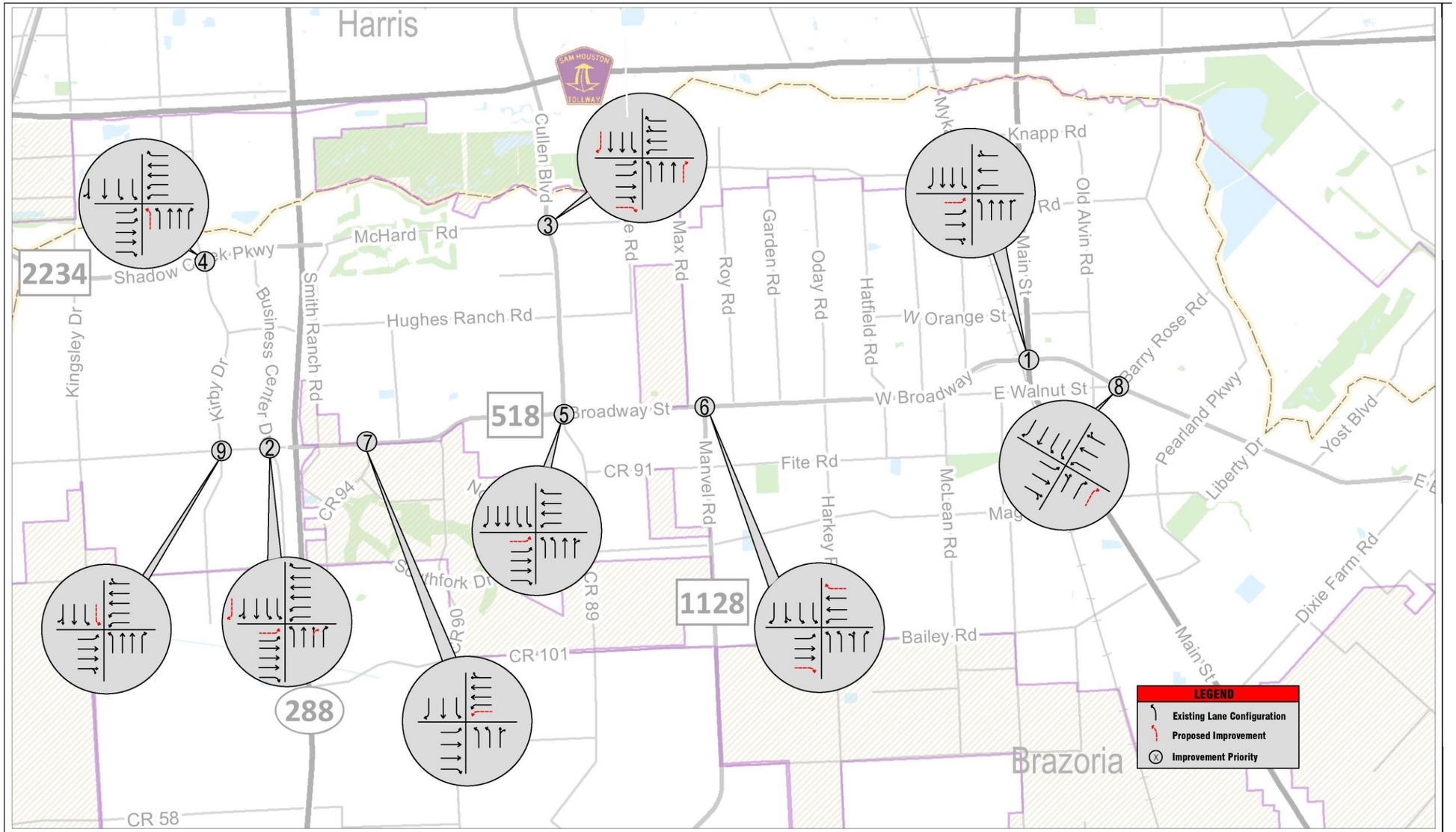
PRIORITIZED MEDIUM-TERM (2020-2025)
INTERSECTION IMPROVEMENTS

Pearland Traffic Management Plan

Pearland, Texas

Figure 24

Figure 25: Prioritized Long-Term Intersection Improvements



Source: CDM Smith, May 2014

Not to Scale

PRIORITIZED LONG-TERM (2026-2035) INTERSECTION IMPROVEMENTS

Pearland Traffic Management Plan

Pearland, Texas

Figure 25

8. BENEFIT-COST ANALYSIS

The following section discusses the benefit-cost analysis (BCA) conducted to see how the various improvements perform when the monetized delay reduction benefits are compared with the estimated cost of construction. The purpose of calculating a generalized benefit-cost ratio is to assist the City in evaluating and comparing the various proposed roadway and intersection improvements. The methodology adopted by H-GAC to evaluate the feasibility of their Transportation Improvement Program (TIP) was utilized to perform the benefit-cost analysis.

8.1 Roadway Improvements

The following sections discuss the benefit-cost analysis for the proposed roadway improvements in the short and medium terms.

8.1.1 Cost

The cost for implementing the improvements was based on reference to TxDOT Houston District's cost estimates in developing planning-level cost estimates of proposed capacity improvements. The cost includes moderate utility and drainage improvement costs but does not include any right-of-way acquisition cost. The study assumed roadway construction per lane-mile cost of $1 million and it is based on 2015 dollars.

8.1.2 Benefit

The benefit for implementing the improvements was based on the travel time savings which typically generate the greatest amount of benefit. Travel time is expressed as vehicle-hours traveled (VHT) and was derived from the Pearland Travel Demand Model, comparing VHT of the No-Build (existing conditions) and Build (with proposed improvements) scenarios, and the travel time values were applied to travel time savings to derive the monetary travel time saving benefit. The benefit was evaluated over a 20-year period. The annual growth rate was calculated comparing the 2019 and 2035 projected traffic volumes from the Pearland model and applied to derive the annual VHT savings for various years within the analysis period.

Two other sources were used to determine the travel time value: (1) the H-GAC Regional Travel Demand Model was utilized to sort out the percentages of person trips by purpose; (2) the TIGER BCA Resource Guide was used as a reference to determine the travel time cost for each person trip type, and the percentages of person trips from the H-GAC model were used as weights to derive the weighted average of the travel time cost. The BCA has three percent and seven percent real discount rates; seven percent was applied to be conservative to convert benefit occurring in the future into 2015 dollars.

8.1.3 BCA Results - Short-Term Roadway Improvements

The estimated planning-level construction cost and associated B/C ratios of the proposed short-term roadway improvements are summarized in **Table 31**. The improvement of Broadway St from Pearland Parkway to Dixie Farm Road not only has the highest rank in prioritization but also has the highest B/C ratio (7.6). Two improvements on Southfork Drive have the second and third

highest B/C ratios among all the improvements. All these projects except Pearland Parkway from Barry Rose Road to FM 518 have a B/C ratio higher than 1.

Table 31: Prioritized Short-Term Roadway Improvements with B/C Ratio

Rank	Roadway	From	To	Improvement	Cost	B/C Ratio
1	Broadway St/ FM 518	Pearland Pkwy	Dixie Farm Rd	Widen from 4 to 6 lanes	$3,837,400	7.6
2	Pearland Pkwy	FM 2234	Barry Rose Rd	Widen from 4 to 6 lanes	$2,161,000	1.6
3	Southfork Dr/ CR 59	FM 521	CR 48	Widen from 2 to 4 lanes	$4,061,600	6.7
4	Broadway St/ FM 518	Dixie Farm Rd	FM 2351	Widen from 4 to 6 lanes	$3,691,800	5.4
5	Pearland Pkwy	Beltway 8	FM 2234	Widen from 4 to 6 lanes	$2,576,400	5.0
6	Pearland Pkwy	Barry Rose Rd	FM 518	Widen from 4 to 6 lanes	$2,477,000	1.0
7	McHard Rd/ FM 2234	SH 288	FM 865	Widen from 4 to 6 lanes	$4,124,200	5.6
8	Southfork Dr/ CR 59	SH 288	CR 90	Widen from 4 to 6 lanes	$2,489,400	6.3

8.1.4 BCA Results - Medium-Term Roadway Improvements

The cost and B/C ratios of the proposed medium-term roadway improvements, sorted by the prioritization rank, are summarized in **Table 32**. The B/C ratio of highest-in-rank improvement in prioritization is on Main St from Beltway 8 to FM 2234 (3.6). Two other projects have higher B/C ratios than 3.6, which are Dixie Farm Road from FM 518 to Blackhawk Boulevard (4.1) and McHard Road from FM 521 to Kingsley Drive (3.9). All these projects except Southfork Drive from CR 48 to SH 288 have a B/C ratio higher than 1.

Table 32: Prioritized Medium-Term Roadway Improvements with B/C Ratio

Rank	Roadway	From	To	Improvement	Cost	B/C Ratio
1	Main St/SH 35	Beltway 8	FM 2234	Widen from 6 to 8 lanes	$2,485,300	3.6
2	Main St/SH 35	FM 2234	FM 518	Widen from 6 to 8 lanes	$2,535,000	1.7
3	Broadway St/FM 518	SH 35	Pearland Pkwy	Widen from 4 to 6 lanes	$3,277,400	2.1
4	Broadway St/FM 518	FM 1128	Mykawa Rd	Widen from 4 to 6 lanes	$4,537,000	1.6
5	McHard Rd/FM 2234	FM 521	Kingsley Dr	Widen from 4 to 6 lanes	$1,986,200	3.9
6	McHard Rd/FM 2234	Kingsley Dr	SH 288	Widen from 4 to 6 lanes	$3,977,600	1.8

Rank	Roadway	From	To	Improvement	Cost	B/C Ratio
7	Dixie Farm Rd	FM 518	Blackhawk Blvd	Widen from 4 to 6 lanes	$3,239,400	4.1
8	Southfork Dr/ CR 59	CR 48	SH 288	Widen from 4 to 6 lanes	$4,676,800	0.9
9	McHard Rd/FM 2234	Mykawa Rd	SH 35	Widen from 4 to 6 lanes	$1,034,000	1.6

8.2 Intersection Improvements

The following sections discuss the benefit-cost analysis for the intersection improvements proposed in the short and medium terms.

8.2.1 Cost

The cost for implementing the improvements was based on reference to TxDOT Houston District's cost estimates in developing planning cost estimates of recommended improvements. The cost is based on 2015 dollars. The assumed construction cost is $40,000 for 200' turn lane storage, $100,000 for one-approach signal modifications, $150,000 for two-approach signal modifications, and $300,000 for more-than-two-approach signal modifications.

8.2.2 Benefit

The benefit for implementing the improvements was based on the travel time savings. The travel time savings for intersections were derived from the *Synchro* models, comparing VHT of the No-Build and Build scenarios. The travel time savings for intersections were calculated based on reduction in delay after the improvements were implemented in the model. For intersection improvements, the benefits are typically derived over a shorter span compared to the roadway improvements. For the study purpose, the benefits were evaluated over a five-year period. The annual growth rate was calculated comparing the 2019 and 2035 projected traffic volumes and applied to derive the annual VHT savings for various years within the analysis period.

8.2.3 BCA Results - Short-Term Intersection Improvements

The cost and B/C ratios of the proposed short-term intersection improvements, sorted by the prioritization rank, are summarized in **Table 33**. The intersection improvement with the highest B/C ratio is Broadway Street at Pearland Parkway (135), which is also highest in rank in prioritization. It is followed by McHard Road at Cullen Parkway (97). Broadway Street at Smith Ranch Road has the third highest B/C ratio (76) among these improvements. All the improvements except Pearland Parkway at Barry Rose Road have a B/C ratio higher than 1.

Table 33: Prioritized Short-Term Intersection Improvements with B/C ratio

Rank	Intersection	Improvement	Cost	B/C Ratio
1	Broadway Street at Pearland Parkway	NB/SB - Exclusive right-turn lane; two thru lanes and dual left-turn lanes	$360,000	135
2	Broadway Street at Dixie Farm Road	NB/SB/WB - Dual left-turn lanes	$420,000	42
3	McHard Road at Cullen Parkway	EB - Dual left-turn lanes; WB - Exclusive right-turn lane	$230,000	97
4	McHard Road at Kirby Drive	SB - Dual left-turn lanes	$140,000	45
5	Broadway Street at Manvel Road	NB/SB - Dual left-turn lanes	$280,000	16
6	Broadway Street at Smith Ranch Road	EB - Dual left-turn lanes, three thru lanes and exclusive right-turn lane; SB - Dual left-turn lanes	$320,000	76
7	Pearland Parkway at Barry Rose Road	EB/WB - Dual left-turn lanes (Barry Rose); NB - Dedicated right-turn lane (Pearland Pkwy)	$320,000	0.9

8.2.4 BCA Results - Medium-Term Intersection Improvements

The cost and B/C ratios of the proposed medium-term intersection improvements, sorted by the prioritization rank, are summarized in **Table 34**. Broadway Street at Pearland Parkway has the highest B/C ratio (103), followed by Broadway Street at Smith Ranch Road (94). Broadway Street at Dixie Farm Road has the third highest B/C ratio (88) among these improvements. All the improvements have a B/C ratio higher than 1.

Table 34: Prioritized Medium-Term Intersection Improvements with B/C ratio

Rank	Intersection	Improvement	Cost	B/C Ratio
1	Broadway Street at Pearland Parkway	EB/WB - Dual left-turn lanes	$230,000	103
2	Broadway Street at Dixie Farm Road	EB - Dual left-turn lanes	$140,000	88
3	Broadway Street at Business Center Drive	SB - Dual left-turn lanes	$140,000	23
4	McHard Road at Kirby Drive	EB/WB - Dual left-turn lanes; NB - Exclusive right-turn lane	$321,000	34
5	Broadway Street at Barry Rose Road	SB - Dual left-turn lanes	$140,000	6.0
6	Broadway Street at Smith Ranch Road	NB - Exclusive right-turn lane	$140,000	94

9. SUMMARY

The purpose of the *Traffic Management Plan* is to evaluate mobility needs for the City of Pearland and develop recommendations to enhance traffic flow and improve safety at critical signalized intersections and major roadways within the City. Roadway and intersection traffic operations in the future terms were evaluated and improvements are proposed as short, medium, and long-term solutions to meet the mobility needs of the study intersections and roadways corridors.

9.1 Overall Roadway Improvements

Table 35 and **Figure 26** show the proposed improvements as short, medium and long-term solutions to meet the mobility needs of the roadways corridors. Roadway segments projected to operate at or over roadway capacity (LOS F or V/C ≥ 1) in 2019, 2025, and 2035 were identified and additional capacity needs were evaluated to meet the projected travel demand.

Table 35: Overall Roadway Improvements by Time Period

Roadway	Status	From	To	Improvement
Bailey Rd/CR 101	LONG	CR 90	FM 1128	Widen from 4 to 6 lanes
Barry Rose Rd	LONG	FM 518	Pearland Pkwy	Widen from 4 to 6 lanes
Broadway St/FM 518	SHORT	Dixie Farm Rd	FM 2351	Widen from 4 to 6 lanes
Broadway St/FM 518	LONG	FM 1128	Mykawa Rd	Widen from 4 to 6 lanes
Broadway St/FM 518	LONG	Mykawa Rd	SH 35	Widen from 4 to 6 lanes
Broadway St/FM 518	SHORT	Pearland Pkwy	Dixie Farm Rd	Widen from 4 to 6 lanes
Broadway St/FM 518	LONG	SH 288	FM 865	Widen from 4 to 6 lanes
Broadway St/FM 518	MEDIUM	SH 35	Pearland Pkwy	Widen from 4 to 6 lanes
Business Center Drive	LONG	Beltway 8	McHard Rd	Widen from 4 to 6 lanes
Dixie Farm Rd	MEDIUM	FM 518	Blackhawk Blvd	Widen from 4 to 6 lanes
Harkey Rd	LONG	FM 518	CR 59	Widen from 4 to 6 lanes
Hughes Ranch Rd/CR 403	LONG	CR 94	FM 865	Widen from 4 to 6 lanes
Hughes Ranch Rd/CR 403	LONG	SH 288	CR 94	Widen from 4 to 6 lanes
Hughes Rd	LONG	Pearland Pkwy	Blackhawk Blvd	Widen from 4 to 6 lanes
Kingsley Dr/CR 48	LONG	FM 2234	FM 518	Widen from 4 to 6 lanes
Kingsley Dr/CR 48	LONG	FM 518	CR 59	Widen from 4 to 6 lanes
Kirby Dr	LONG	FM 518	CR 59	Widen from 4 to 6 lanes
Magnolia Rd/CR 59	LONG	CR 90	FM 1128	Widen from 4 to 6 lanes
Magnolia Rd/CR 59	LONG	SH 35	Pearland Pkwy	Widen from 4 to 6 lanes
Main St/SH 35	MEDIUM	Beltway 8	FM 2234	Widen from 6 to 8 lanes

Roadway	Status	From	To	Improvement
Main St/SH 35	LONG	CR 101	SH 6	Widen from 4 to 6 lanes
Main St/SH 35	MEDIUM	FM 2234	FM 518	Widen from 6 to 8 lanes
Main St/SH 35	LONG	FM 518	CR 101	Widen from 4 to 6 lanes
Manvel Rd/FM 1128	LONG	CR 59	CR 101	Widen from 4 to 6 lanes
Max Rd	LONG	McHard Rd	Beltway 8	Widen from 4 to 6 lanes
McHard Rd/FM 2234	MEDIUM	FM 521	Kingsley Dr	Widen from 4 to 6 lanes
McHard Rd/FM 2234	MEDIUM	Kingsley Dr	SH 288	Widen from 4 to 6 lanes
McHard Rd/FM 2234	MEDIUM	Mykawa Rd	SH 35	Widen from 4 to 6 lanes
McHard Rd/FM 2234	SHORT	SH 288	FM 865	Widen from 4 to 6 lanes
Mykawa Rd	LONG	Beltway 8	FM 2234	Widen from 4 to 6 lanes
Mykawa Rd	LONG	FM 2234	FM 518	Widen from 4 to 6 lanes
Oiler Dr	LONG	SH 35	Pearland Pkwy	Widen from 4 to 6 lanes
Pearland Pkwy	SHORT	Barry Rose Rd	FM 518	Widen from 4 to 6 lanes
Pearland Pkwy	SHORT	Beltway 8	FM 2234	Widen from 4 to 6 lanes
Pearland Pkwy	SHORT	FM 2234	Barry Rose Rd	Widen from 4 to 6 lanes
Pearland Pkwy	LONG	FM 518	Oiler Dr	Widen from 4 to 6 lanes
Pearland Pkwy	LONG	Oiler Dr	FM 2351	Widen from 4 to 6 lanes
Southfork Dr/CR 59	MEDIUM	CR 48	SH 288	Widen from 4 to 6 lanes
Southfork Dr/CR 59	SHORT	FM 521	CR 48	Widen from 4 to 6 lanes
Southfork Dr/CR 59	SHORT	SH 288	CR 90	Widen from 4 to 6 lanes

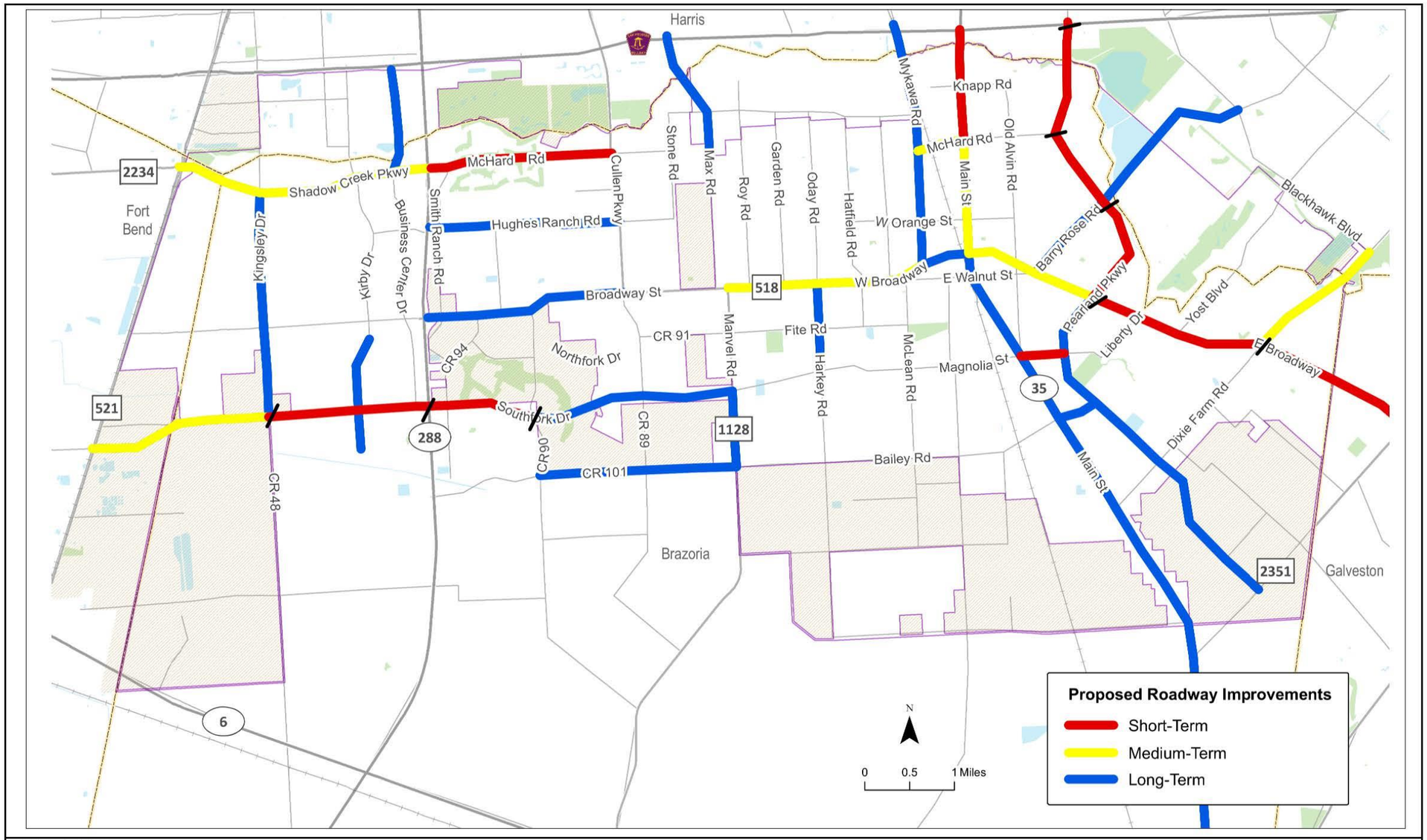
9.2 Overall Intersection Improvements

Table 36 and **Figure 27** show the proposed improvements as short, medium and long-term solutions to meet desirable traffic operations with the projected travel demand and the short-term prioritization. The improvements were evaluated based on traffic operations analysis in *Synchro* using growth factors derived from the Pearland Travel Demand Model. Intersections projected to operate at unacceptable LOS E or F were identified and evaluated for additional capacity for critical turning movements to minimize overall intersection delay and achieve LOS D or better.

Table 36: Overall Intersection Improvements by Time Period

Intersection	Short Term	Medium Term	Long Term
McHard Road at Kirby Drive	SB - Dual left-turn lanes	EB/WB - Dual left-turn lanes; NB - Exclusive right-turn lane	NB - Dual left-turn lanes
McHard Road at Cullen Parkway	EB - Dual left-turn lanes; WB - Exclusive right-turn lane	-	EB/NB/SB - Exclusive right-turn lane
Broadway Street at SH 288 SBFR[1]	EB - 4 thru lanes; WB - Triple thru lanes and dual left-turn lanes; SB - Triple left-turn lanes, one thru and one shared right-turn lane	-	-
Broadway Street at SH 288 NBFR[1]	WB - 4 thru lanes; EB - Triple thru lanes and dual left-turn lanes; NB - One thru lane, one exclusive left-turn lane and one shared left-turn lane	-	-
Broadway Street at Smith Ranch Road	EB - Dual left-turn lanes, three thru lanes and exclusive right-turn lane; SB - Dual left-turn lanes	NB - Exclusive right-turn lane	-
Broadway Street at Manvel Road	NB/SB - Dual left-turn lanes	-	EB/WB - Exclusive right-turn lanes
Broadway Street at Pearland Parkway	NB/SB - Exclusive right-turn lane; two thru lanes and dual left-turn lanes	EB/WB - Dual left-turn lanes	-
Broadway Street at Dixie Farm Road	NB/SB/WB - Dual left-turn lanes	EB - Dual left-turn lanes	-
Pearland Parkway at Barry Rose Road	EB/WB - Dual left-turn lanes (Barry Rose); NB - Dedicated right-turn lane (Pearland Pkwy)	-	-
Broadway Street at Business Center Drive	-	SB - Dual left-turn lanes	EB - Dual left-turn lanes; SB - Exclusive right-turn lane; NB - Shared thru lane and right-turn lane
Broadway Street at Main Street	-	-	EB - Dual left-turn lanes
Broadway Street at Barry Rose Road	-	SB - Dual left-turn lanes	NB - Dual right-turn lanes
Broadway Street at Kirby Drive	-	-	SB - Dual left-turn lanes
Broadway Street at Cullen Parkway	-	-	EB - Dual left-turn lanes
Broadway Street at CR 94	-	-	WB - Dual left-turn lanes

Figure 26: Overall Roadway Improvements by Time Period



CDM Smith, April 2015

Not to Scale

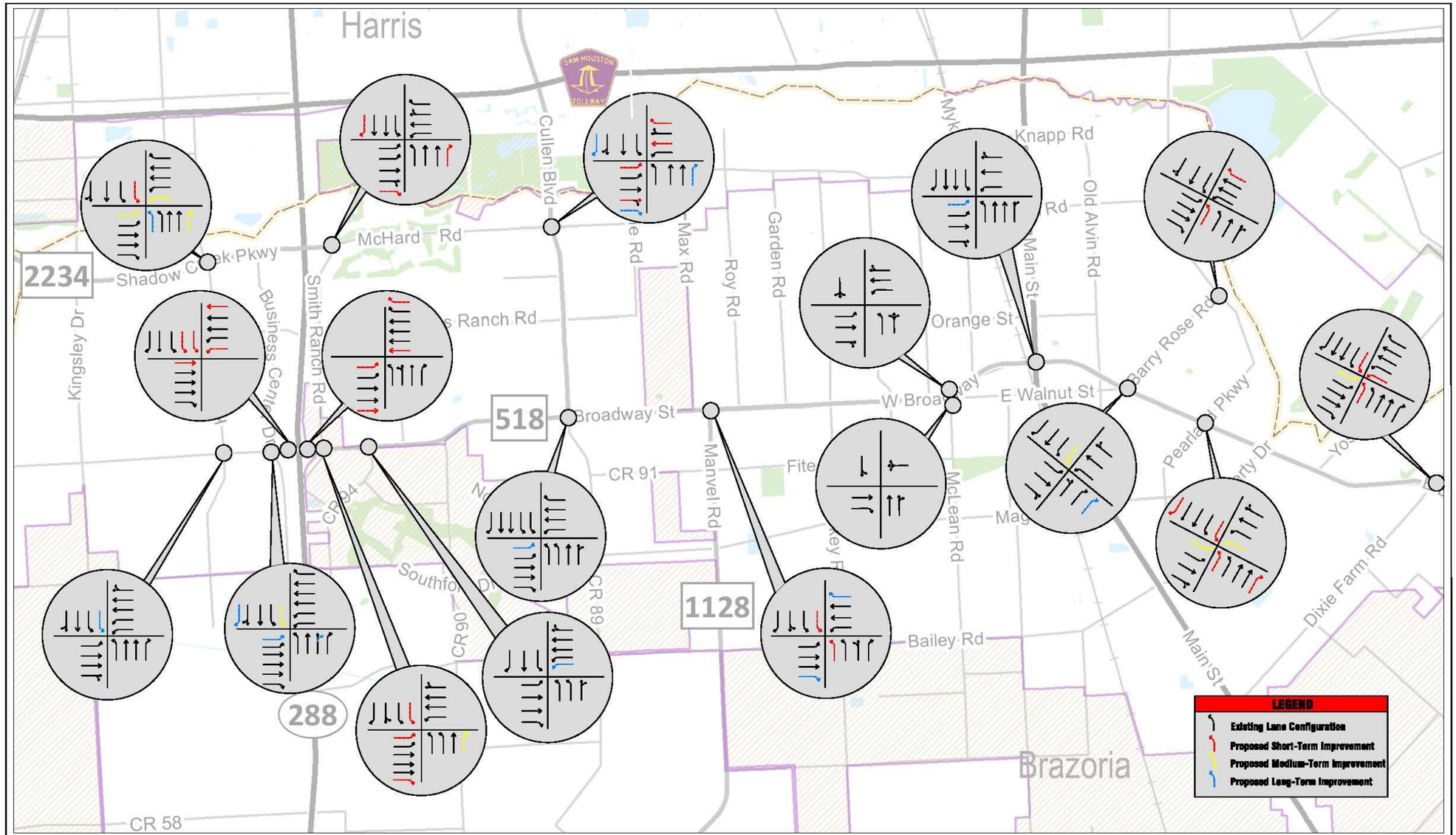
OVERALL ROADWAY IMPROVEMENTS BY TIME PERIOD

Pearland Traffic Management Plan

Pearland, Texas

Figure 26

Figure 27: Overall Intersection Improvements by Time Period



Source: CDM Smith, April 2015

Not to Scale

OVERALL INTERSECTION IMPROVEMENTS BY TIME PERIOD

Pearland Traffic Management Plan
Pearland, Texas

Figure 27

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