Environmental Assessment

SH 146
(Red Bluff to FM 518)
Harris and Galveston Counties, Texas

CSJs: 0389-05-088, 0389-05-116 & 0389-06-095

Prepared by:
U.S. Department of Transportation
Federal Highway Administration

and

Texas Department of Transportation

Houston District

April 2013

Table of Contents

ACRONYMS, ABBREVIATIONS, AND TERMS ..... **IV**

INTRODUCTION **1**

CHAPTER 1. PROJECT NEED AND PURPOSE **1**

Need for and Purpose of the Proposed Project 1
Planning Process 6
Congestion Management System 9

CHAPTER 2. DESCRIPTION OF THE ALTERNATIVES **10**

No Build Alternative 10
Build Alternative 11

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES **14**

Land Use 14
Soils and Farmlands 16
Relocations and Right-of-Way Acquisition 17
Community Cohesion 23
Travel Patterns 25
Public Facilities and Services 26
Safety 27
Population Trends 28
Environmental Justice 29
Limited English Proficiency 40
Business and Employment 44
Air Quality 47
Traffic Noise 53
Hazardous Materials 59
Water Quality 63
Groundwater 65
Floodplains 66
Coastal Management Program 67
Waters of the U.S. including Wetlands 68
Vegetation 71
Wildlife 75
Threatened and Endangered Species 77
Essential Fish Habitat 81
Cultural Resources 81
Parkland and Section 4(f) / 6(f) Properties 84
Visual Resources 84
Construction Impacts 85

CHAPTER 4. INDIRECT IMPACTS **86**

CHAPTER 5. CUMULATIVE IMPACTS **103**

CHAPTER 6. REFERENCES **120**

List of Tables

Table 1: Population Trends 2
Table 2: Range of Current and Predicted Traffic Volumes 3
Table 3: Vehicle Fleet Mix for Peak Hour 3
Table 4: Traffic Characteristics and Service Levels 4
Table 5: Build Alternative Cost Estimates 7
Table 6: Soils Identified within the Study Area 16
Table 7: Potential Partially Impacted Properties (No Relocations) 18
Table 8: Potential Relocations and Displacements 19
Table 9: Area of Displaced Housing 21
Table 10: MLS Housing Availability by Key Map 22
Table 11: Office/Retail and Industrial Space Availability by Key Map 22
Table 12: Public Facilities and Services 26
Table 13: Population Trends 29
Table 14: Minority Populations 32
Table 15: Median Household Incomes and Poverty Status 37
Table 16: Occupation and Class of Worker 44
Table 17: Economic Characteristics 46
Table 18: Congestion Management Strategies 48
Table 19: Projected National MSAT Emission Trends 2010 – 2050 for Vehicles Operating on Roadways Using EPA's MOVES2010b Model 50
Table 20: Common Sound/Noise Levels 54
Table 21: FHWA Noise Abatement Criteria 55
Table 22: Traffic Noise Levels (dBA Leq) 56
Table 23: Design Year Predicted Leq Contour 59
Table 24: Regulatory Databases and Search Distances 60
Table 25: Regulatory Database Sites 61
Table 26: Petroleum Pipelines within the Study Area 62
Table 27: 100-Year Floodplains 66
Table 28: CNRA Locations 67
Table 29: Comparisons of Texas CMP Policies for Transportation Projects 67
Table 30: Waters of the U.S. within the Study Area 69
Table 31: Potential Effects to Jurisdictional Waters of the U.S., including Wetlands 69
Table 32: Comparison of Natural Vegetation Types Affected 74
Table 33: Potential Effects to Listed Species Potentially Occurring within the Study Area 78
Table 34: Seven Step Approach to Estimate Indirect Impacts 87
Table 35: Communities within the Area of Influence 88
Table 36: Year 2005 – 2035 Demographic Data 90
Table 37: AOI Communities Year 2000 – 2030 Demographic Data 90
Table 38: Impact-Causing Activities 94
Table 39: Summary of Estimated Indirect Impacts to Vegetation and Wildlife Habitat 97
Table 40: Future Land Use Capacity within the AOI 99
Table 41: Guidelines for Identifying and Assessing Cumulative Impacts 104
Table 42: Resources and Indicators for the Cumulative Impacts Analysis 105
Table 43: List of Actions by Federal, State, and Local Agencies/Other Interests 110
Table 44: Summary of Existing Resource Conditions and Potential Impacts 112

List of Figures

Figure 1: Levels of Service for Freeways 4
Figure 2: Proportion of population by age group who speak only English..... 41
Figure 3: Households by predominant language spoken in the household 42
Figure 4: Number of non-English speaking households that are linguistically isolated, categorized by primary household language 43
Figure 5: National MSAT Emission Trends 1999-2050 for Vehicles Operating on Roadways Using EPA's MOVES2010B Model 49

Exhibits

Exhibit 1. Project Location Map
Exhibit 2. FEMA Floodplain and USGS Topographic Map
Exhibit 3. Proposed Typical Sections and Line Diagram
Exhibit 4: Proposed Project and Environmental Constraints
Exhibit 5: Potential Relocation Properties
Exhibit 6a. Census 2010 Minority Population Density Map
Exhibit 6b. Census 2010 Median Household Income Map
Exhibit 7. Mobile Source Air Toxics (MSAT) Sensitive Receptors
Exhibit 8. Potential Archeological Liability Maps
Exhibit 9a: Key Map - 580
Exhibit 9b: Key Map - 620
Exhibit 9c: Key Map - 619
Exhibit 9d: Key Map - 660
Exhibit 10: Area of Influence
Exhibit 11: Resource Study Area for Biological and Water Resources
Exhibit 12: Resource Study Area for Land Use
Exhibit 13: Resource Study Area for Air Quality

Appendices

Appendix A. Representative Photographs of the Study Area
Appendix B. SH 146 Corridor Major Investment Study, Executive Summary
Appendix C. Applicable Laws and Regulations
Appendix D. Congestion Mitigation Analysis
Appendix E. Resource Agency and Local Official Coordination
Appendix F. Supplemental Data
Table 1: Threatened and Endangered Species of Potential Occurrence in Harris County
Table 2: Threatened and Endangered Species of Potential Occurrence in Galveston County
Essential Fish Habitat and Relative Abundance of Managed Species within the Study Area

ACRONYMS, ABBREVIATIONS, AND TERMS

ACHP: Advisory Council on Historic Preservation
ADT: Average Daily Traffic
Alternatives: General term that refers to a possible approach to meeting a project's stated need and purpose. Typically refers to the No-Build Alternative or the Build Alternative.
AIAN: American Indian and Alaska Native
AOI: area of influence
APE: area of potential effects
ASTM: American Society for Testing and Materials
BFE: Base Flood Elevation
BG: Block Group
BMPs: Best Management Practices
Building Attenuation: The reduction in the energy of a sound field resulting from its passage through a building's structural elements
CAA: Clean Air Act of 1970
Cars: Four wheeled vehicles, 0 to 5,000 lbs
CEQ: Council on Environmental Quality
CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System
CFR: Code of Federal Regulations
CMA: Congestion Mitigation Analysis
CMAQ: Congestion Mitigation and Air Quality
CMP: Congestion Management Program
CMS: Congestion Management System
CMSA: Consolidated Metropolitan Statistical Area
CNRA: Coastal Natural Resource Area
CO: Carbon Monoxide
COR: Corrective Action Report
CR: County Road
CSJ: Control, Section, Job
CT: Census Tract
CWA: Clean Water Act of 1977
dBA: "A" Weighted Sound Level. A method of representing the human ear's interpretations of the loudness of an equal sound level throughout the audible frequency range.
Decibel (dB): a unit of measure of sound pressure to describe the loudness of sound.
DHHS: Department of Health and Human Services
EA: Environmental Assessment
Effects: Exact same meaning as *Impacts* and *Consequences*
EFH: Essential Fish Habitat
EIS: Environmental Impact Statement
ENV: TxDOT Environmental Affairs Division
EPA: U.S. Environmental Protection Agency
ERNS: Emergency Response Notification System
ESA: Endangered Species Act of 1973
Existing Noise: noise that is characteristic of an area before the proposed construction
FEMA: Federal Emergency Management Agency
FHWA: Federal Highway Administration
FINDS: Facility Index
FIRM: Flood Insurance Rate Map
FM: Farm-to-Market Road
FMC: Fishery Management Council
FMP: Fishery Management Plan
FONSI: Finding of No Significant Impact
FPPA: Farmland Protection Policy Act
FTA: Federal Transit Administration
FWCA: Fish and Wildlife Coordination Act
FY: Fiscal Year
GBEP: Global Bioenergy Partnership
GEN: Generator
GLO: General Land Office
GMFMC: Gulf of Mexico Fishery Management Council
HAR: Houston Association of Realtors
HCFCD: Harris County Flood Control District
H-GAC: Houston-Galveston Area Council
H-GCSD: Harris-Galveston Coastal Subsidence District
HOV: High Occupancy Vehicle
HCTRA: Harris County Toll Road Authority
Heavy trucks: vehicles with three or more axles and more than six wheels
Hertz (hz): frequency in cycles per second
HOV: High Occupancy Vehicle Lane
Human Environment: See CEQ Regulations 1508.14. The term *human environment* includes and requires the appropriate consideration of the potential effects on the physical, biological (natural), economic, and social environmental factors in TxDOT analysis and documents. As used in the FHWA Environmental Policy Statement, *human environment* included the natural environment, the built environment, the cultural and social fabric or our country and our neighborhoods, and the quality of life of the people who live there.
IH: Interstate Highway
ILF: in-lieu fee
Insertion Loss: is the difference between the sound level at a receptor before and after a proposed barrier is "inserted" between the sound energy source and the receiver
IRIS: Integrated Risk Information System
ISD: Independent School District
ITS: Intelligent Transportation Systems
L10 Noise Level: that level of noise where A-weighted sound pressure level in decibels is exceeded 10 percent of the time
lbs: pounds

LEP: Limited English Proficiency
Leq Noise Level: that level of constant noise which contains the same amount of acoustic energy as time varying noise levels (e.g. traffic noise) during a given time interval
Level of Service "C": with respect to vehicle movements, represents stable flow; however, most of the drivers are restricted in their freedom to select their own speed, change lanes or pass. This combination of speed and volume usually creates the worst noise condition
LOM: Level of Mobility
LOS: Level of Service
LUST: Leaking Underground Storage Task
MBTA: Migratory Bird Treaty Act
Medium Trucks: vehicles with two axles and six wheels
MHT: mean high tide
MIS: Major Investment Study
MOA: Memorandum of Agreement
MOU: Memorandum of Understanding
mph: miles per hour
MPO: Metropolitan Planning Organization
MSATs: Mobile Source Air Toxics
MSFCMA: Magnuson-Stevens Fishery Conservation and Management Act
MS4: Municipal Separate Storm Sewer System
MSL: mean sea level
MTP: Metropolitan Transportation Plan
NAAQS: National Ambient Air Quality Standards
NAC: Noise Abatement Criteria
NATA: National Air Toxics Assessment
NCHRP: National Cooperative Highway Research Program
NDD: Natural Diversity Database
NEPA: National Environmental Policy Act
NFIP: National Flood Insurance Program
NFRAP: No Further Remedial Action Planned
NHPA: National Historic Preservation Act
NHPI: Native Hawaiian and Other Pacific Islander
NLEV: national low emission vehicle
NMFS: National Marine Fisheries Service
NMHC: non-methane hydrocarbon
NOAA: National Oceanic and Atmospheric Administration
NOI: Notice of Intent
Noise Abatement Criteria (NAC): noise levels established by FHWA in 23 CFR 772 for various activities and land uses as the upper limit of acceptable noise levels
Noise Contours: areas along a roadway within which noise levels will exceed a specified noise level. (Not to be interpreted as any single line.)
Noise Sensitive Areas or Locations: general areas of land or specific locations having activities affected by excessive noise levels
NOx: Nitrogen Oxide compounds
NPDES: National Pollutant Discharge Elimination System
NPL: National Priorities List
NRCS: Natural Resources Conservation Service
NRHP: National Register of Historic Places
NWI: National Wetland Inventory (maps)
NWP: Nationwide Permit
PCN: Preconstruction Notification
Peak Hourly Volume: the highest hourly volume of vehicles with its associated speed on a roadway. This relationship is generally used as the noisiest traffic condition as long as the levels-of-service are not worse than LOS C or D
Project: The whole of an action that has a potential for resulting in a physical change in the environment, directly or ultimately, and that is any of the following:
(1) An activity directly undertaken by any public agency, including but not limited to public works construction and related activities, clearing or grading of land, improvements to existing public structures, enactment and amendment of zoning ordinances, and the adoption and amendment of local General Plans or elements thereof pursuant to Government Code Sections 65100-65700.
(2) An activity undertaken by a person, which is supported in whole or in part through public agency contracts, grants, subsidies, loans, or other forms of assistance from one or more public agencies.
(3) An activity involving the issuance to a person of a lease, permit, license, certificate, or other entitlement for use by one or more public agencies.
OHWM: ordinary high water mark
OSHM: Official State Historical Markers
PA: Programmatic Agreement
PCBs: Polychlorinated biphenyls
PS&E: Plans, Specifications and Estimates (Division of TxDOT)
psi: pounds per square inch
RCRA: Resource Conservation and Recovery Act
Receiver: a location at which noise levels are predicted and analyzed.
REG: Regulatory Underground Storage Tanks/ Aboveground Storage Tanks
RFG: reformulated gasoline
RHA: Rivers and Harbors Act of 1899
ROW: Right-of-Way
RRC: Railroad Commission
RSA: Resource Study Area
RTHL: Recorded Texas Historical Landmarks
RTP: Regional Transportation Plan

SAFETEA-LU: Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SAL: State Archeological Landmarks
SARA: Superfund Amendments and Reauthorization Act of 1986
SH: State Highway
SHPO: State Historic Preservation Officer
SIP: State Implementation Plan
SOV: Single Occupancy Vehicle
SWL: Solid Waste Facilities/Landfill Sites
SW3P: Storm Water Pollution Prevention Plan
TAC: Texas Administrative Code
TAQA: Traffic Air Quality Analysis
TCEQ: Texas Commission of Environmental Quality
TCIT: Texas City International Terminal
TCM: Transportation Control Measures
TDM: Travel Demand Management
THC: Texas Historical Commission
TIP: Transportation Improvement Plan
TMA: Transportation Management Area
TNM: Traffic Noise Model (software)
TNRCC: Texas Natural Resource Conservation Commission
TPDES: Texas Pollutant Discharge Elimination System
TPP: Transportation Planning and Programming Division (of TxDOT)
TPWD: Texas Parks and Wildlife Department
TRB: Transportation Research Board
TRIS: Toxic Release Inventory System
TSD: Treatment, Storage and Disposal
TSM: Transportation Systems Management
TSS: Total Suspended Solids
TU: Transportation Undertakings
TWDB: Texas Water Development Board
TxDOT: Texas Department of Transportation
Undeveloped Land: those tracts of land or portions thereof that contain no improvements or activities devoted to frequent human use or habitation
URARPAA : Uniform Relocation Assistance and Real Property Acquisition Act
US: United States
USACE: U.S. Army Corps of Engineers
USCG: U.S. Coast Guard
USDA: U.S. Department of Agriculture
USDOT: U.S. Department of Transportation
USFWS: U. S. Fish and Wildlife Service
USGS: U. S. Geological Survey
UST: Underground Storage Tank
VCP: Voluntary Cleanup Program
VMT: Vehicles Miles Traveled
VOCs: Volatile Organic Compounds
VPD: Vehicles Per Day

INTRODUCTION

This Environmental Assessment (EA) presents the potential environmental effects of a project proposed by the Texas Department of Transportation (TxDOT) – Houston District and the Federal Highway Administration (FHWA) to improve 4.0 miles of State Highway (SH) 146 in Harris and Galveston Counties. This EA presents the need for and purpose of the proposed project, a description of the proposed project, and an interdisciplinary evaluation of the potential effects to the human and natural environment for those issues of concern.

TxDOT proposes to widen SH 146 from Red Bluff in Harris County to Farm-to-Market (FM) 518 in Galveston County, which includes the current project. This proposed project is part of the larger SH 146 widening and restructuring project.

The proposed project consists of widening and restructuring the existing four-lane divided facility to a six- to 12-lane freeway with grade separations at major intersections, access roads in selected locations, and express lanes over Clear Creek. A more detailed description of the proposed project is provided in Chapter 2: Description of the Alternatives. The project corridor passes through the cities of Seabrook and Kemah. A map depicting the project location is shown in **Exhibit 1**. The project is located on the USGS 7.5 Minute Quadrangle Maps of League City, Texas, as shown in **Exhibit 2**. Representative photographs are provided in **Appendix A**.

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality (CEQ) Regulations (40 CFR §1502.13), FHWA Technical Advisory T6640.8A, and the TxDOT Environmental Manual. The public has been and will continue to be afforded the opportunity to comment on this project.

CHAPTER 1. PROJECT NEED AND PURPOSE

Need for and Purpose of the Proposed Project

Need for the Project

The need for the proposed project is demonstrated by the following conditions:

- Demand exceeds or approaches capacity during both a.m. and p.m. daily commute periods.
- Hurricane and emergency evacuation options are a documented concern.
- Congestion due to competing uses (i.e. local traffic use and through traffic use).
- Roadway design deficiencies.
- Congestion at intersections with access to the major employment generators, including Kemah/Seabrook entertainment center, NASA corridor communities, and nearby port facilities.

Currently, SH 146 is a multi-lane, paved highway that consists of four 11- to 12-foot main lanes (two in each direction) and lacks sidewalks. The existing right-of-way (ROW) along the project corridor ranges from 100 to 440 feet at stream crossings or in areas that include intersections. Intersections are all

at-grade, including Red Bluff, Repsdorph Road, NASA Road 1, FM 2094, and FM 518. An existing bridge is located at the Clear Creek Channel.

Due to the facility's limited capacity, residents (generally located south of the study area) responding to warnings of approaching hurricanes has experienced significant delays using the SH 146 Corridor as a main evacuation route. The shipping industry has made substantial investments to existing and new container port facilities for the Bayport Ship Channel Container/Cruise Terminal near La Porte (located north of the study area) and Shoal Point Terminal in Texas City (located south of the study area).

Tourism and recreational activities are highly visible in the cities of Seabrook and Kemah with the recent commercial development and sailboat/yacht facilities associated with Clear Lake and Galveston Bay. Furthermore, residential development has been keeping pace with the increased employment in the study area and along the east/west roadways connecting to SH 146 and the Galveston Bay communities, such as Shoreacres and Bacliff. With the high growth in both population and employment that the city of Houston and surrounding areas are experiencing, travel demand along the SH 146 Corridor is exceeding its capacity causing severe congestion and bottlenecks along the proposed project (including intersections at Red Bluff, NASA Road 1, FM 2094, and FM 518) during peak hour time periods. Information regarding congestion along the project corridor includes the following:

- *Growth Trends*: Examining the projected growth (population, employment, trips) within the project vicinity shows that the greatest growth is expected within the city of Kemah at the Harris and Galveston County Line. Over a 10-year period from 1990 to 2000, the population within Kemah has increased more than 100 percent (see **Table 1**). According to the *SH 146 Corridor Major Investment Study (MIS)*, this growth suggests that communities north of the study area (such as La Porte) are reaching build-out, and the next ring of sub-urbanization is rapidly occurring within the project vicinity (TxDOT 2003). This new ring of growth affects travel patterns within the study area and further contributes to the increasing congestion levels observed on SH 146.

Table 1: Population Trends

Geographic Area	Population						
	1980 Census	1990 Census	2000 Census	2010 Census	2020 Projection	2030 Projection	2040 Projection
Kemah	N/A	1,094	2,330	1,773	3,550	3,885	4,021
Seabrook	4,670	6,685	9,443	11,952	14,377	16,771	19,141
Harris County	2,409,547	2,818,199	3,400,578	4,092,459	4,629,335	5,180,439	5,731,543
Galveston County	195,738	217,399	250,158	291,309	284,731	294,218	298,057

Geographic Area	Percent Change					
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030	2030-2040
Kemah	N/A	113.0	-23.9	100.2	9.4	3.5
Seabrook	43.1	41.3	26.6	20.3	16.7	14.1
Harris County	17.0	20.7	20.4	13.1	11.9	10.6
Galveston County	11.1	15.1	16.5	-2.3	3.3	1.3

Source: U.S. Census Bureau, Census 2000 (1980, 1990 and 2000 data), Census 2010 data, and Texas Water Development Board 2011 Projections (2020, 2030, 2040 data).

- *Traffic Projections*: Relatively high population and employment levels for a primarily suburban corridor are reflected by the estimated trip characteristics observed within the project vicinity. In the project vicinity, the annual average daily traffic (ADT) on SH 146 is estimated to increase from approximately 40,900 vehicles per day (vpd) in 2005 to approximately 63,700 vpd in 2035, which represents a 56 percent increase. **Table 2** presents the current and predicted range of traffic volumes for the peak hour and ADT.

Table 2: Range of Current and Predicted Traffic Volumes

Description	Number of Vehicles			
	Current Year (2005)		Design Year (2035)	
	Low (1)	High (2)	Low (3)	High (2)
ADT	30,700	40,900	53,900	63,700
Peak Hour (4)	3,350	4,460	5,880	6,940

Source: TxDOT 2007, Gunda 2005.
Note: (1) Red Bluff to Repsdorph Road, (2) NASA Road 1 to FM 2094, (3) Repsdorph to NASA Road 1, (4) K factor = 10.9%

During the peak hour in 2005, the approximate mix of vehicles on the highway (4,460 vehicles) consisted of automobiles (56 percent), medium trucks (27 percent), and heavy trucks (15 percent). By 2035, automobiles would represent 53 percent of the traffic. However, peak hour truck traffic in the project vicinity is expected to increase to 1,388 vehicles (from 669 heavy trucks in 2005), which represents a five percent increase in heavy trucks. This increase is expected due to the proposed express lanes that would carry the through movement of additional trucks traveling north from the Shoal Point Container Terminal or the numerous chemical/industrial facilities located in Texas City. Peak hour traffic for medium trucks is also expected to increase by 2035 (from 1,204 to 1,874 medium trucks) but would continue to represent 27 percent of the traffic. **Table 3** presents vehicle fleet mix for peak hour traffic.

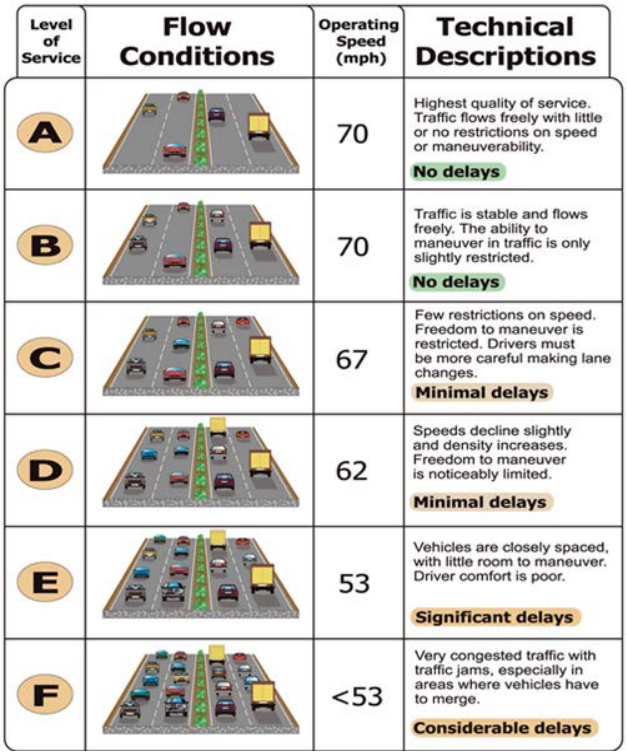
Table 3: Vehicle Fleet Mix for Peak Hour

Vehicle Type	Current Year (2005)	Design Year (2035)
Automobiles	56%	53%
Medium Trucks	27%	27%
Heavy Trucks	15%	20%

Source: TxDOT 2007, Gunda 2005.

Level of Service (LOS) calculations were used to assess roadway operating conditions. LOS is a qualitative measure of the operating conditions of a traffic stream on a transportation facility (Transportation Research Board {TRB} 2000). There are six LOSs (LOS A-F) defined for each type of facility. LOS A represents the free-flow or best operating conditions with no congestion, and LOS F denotes the forced-flow or worst operating conditions with heavy congestion. LOS D is considered an acceptable LOS, especially for urban areas such as the city of Houston. **Figure 1** illustrates the different LOSs.

Figure 1: Levels of Service for Freeways



Source: California Department of Transportation 2003.

The review of current traffic counts and the traffic model forecasts prepared by TxDOT indicate that traffic congestion is occurring or is projected to occur along the project corridor. The SH 146 route is currently operating at capacity during the peak hours of travel while traffic growth continues to add to congestion in hours outside the a.m. and p.m. peak hours. As shown in **Table 4**, the determination of existing and projected traffic volumes levels indicate that widening SH 146 from Red Bluff to FM 518 would result in substantially improved travel speeds and LOS for the design year 2035.

Table 4: Traffic Characteristics and Service Levels

Segment (Intersection)	Service Level (2000)		Projected Service Level (2035)	
	AM	PM	AM	PM
SH 146/Red Bluff Characteristics				
Red Bluff to Repsdorph Road	D	F	B	B
SH 146/ Repsdorph Road Characteristics				
Repsdorph Road to NASA Road 1	B	D	C	C
SH 146/ NASA Road 1Characteristics				
NASA Road 1 to FM 2094	B	E	B	C
SH 146/FM 2094 Characteristics				
FM 2094 to FM 518	B	B	B	A

Source: TxDOT 2007.

Truck Percentages: It is anticipated that future truck traffic would be significantly impacted by the development of container terminals along Galveston Bay (Gunda 2005). With the Houston Port Authority's plan to expand the Bayport Ship Channel Container/Cruise Terminal near La Porte as well as the Shoal Point Container Terminal in Texas City, it is estimated that 85 percent of the truck traffic from the two terminals would utilize the SH 146 Corridor to the north of their proposed locations. Therefore, it is anticipated that truck volumes from the Bayport Terminal, which generally use SH 146 from Red Bluff to north of the study area (near Fairmont Parkway), added to trucks from the Shoal Point Terminal, which generally use SH 146 from south of the study area (near FM 519) to Fairmont Parkway, would increase truck percentages along SH 146 from FM 519 to Fairmont Parkway.

- *Travel Patterns*: Travel patterns within the study area reinforce the need to plan for improved roadway facilities. According to the *SH 146 Corridor MIS*, weekday trips remaining within the SH 146 Corridor represented approximately 65 percent of the total trips generated by the corridor in 2000 (TxDOT 2003). Only 35 percent of the total daily trips either left the corridor or entered the corridor from outside the study area. However, this does not hold true for weekends and holidays when tourist attractions bring in a larger percentage of trips from outside the project vicinity. These travel patterns are expected to be maintained, suggesting that the regional travel facilities, such as SH 146, would continue to be used for shorter intra-corridor type trips as well as regional ones.

  In the proposed section of SH 146 from Red Bluff to FM 518, seasonal recreational, holiday and special event directional demand exceeds capacity on a regular basis. This excess demand typically occurs during the weekends and is in addition to an underlying bi-directional travel commute demand between the cities of Texas City, Dickinson, Kemah, Seabrook, La Porte, and other small communities. According to Houston-Galveston Area Council's (H-GAC) Regional Transportation Plan (2025 RTP), the section between Repsdorph Road and FM 518 registers severe levels of mobility during morning and afternoon commutes; representing a 104.3 percent increase in daily vehicle miles traveled (VMT) between 2000 and 2025 (H-GAC 2005).

- *Hurricane Evacuation*: Existing north-south roadways serving the study area consist exclusively of SH 146. Evacuation from Galveston Island and the lower mainland is a concern during pre-storm conditions and emergency evacuations. Due to low elevation levels, emergency conditions are enhanced in the study area due to flooding and congestion during weather of approaching storms. This is most noticeable at peak traffic conditions such as recreational and special event parking, intersection congestion, and when incidents obstruct the Kemah Bridge. Other roadways such as SH 3 and IH 45 provide limited relief to this primary route, which is designated as a hurricane evacuation route for the surrounding communities.

Purpose of the Proposed Project

The purpose of the proposed project is to improve mobility and safety, reduce traffic congestion, improve hurricane evacuation, create a facility consistent with thoroughfare and transit plans, and provide travel options while minimizing adverse environmental effects. Therefore, the TxDOT-Houston District and the FHWA propose to widen SH 146 from Red Bluff in Harris County to FM 518 in Galveston County, a distance of approximately 4.0 miles. The proposed expansion would consist of a six- to 12-lane divided freeway (three to six lanes in each direction) with grade separations at major intersections (including Red

Bluff, Repsdorph Road, and NASA Road 1), access roads in selected locations, and express lanes (two lanes in each direction) over Clear Creek. Additionally, a sidewalk would be proposed along the entire length of the east side of the project. The original design included a proposed Bike Path for bicycle and pedestrian travel on the railroad/utility ROW paralleling the west side of the proposed project on SH 146. During the Public Hearing held on January 26, 2012, the City of Seabrook requested to have the shared us path removed from the SH 146 proposed roadway ROW within the City of Seabrook. The City of Seabrook thereafter agreed to design and build a shared use path along the Centerpoint Energy high-line corridor that bisects the City of Seabrook north to south, and parallel to the SH 146 alignment. The shared use path within the City of Seabrook will be funded by the City of Seabrook (City of Seabrook letters dated September 18, 2012 and April 5, 2013). A detailed description of the proposed project is included in **Chapter 2** Description of the Alternatives. This project was developed based on an analysis of the existing traffic conditions, forecasts of future travel demand, projected population growth in the area, and input from the public and federal, state, and local agencies.

Planning Process

Project Background

The *SH 146 Corridor MIS*, completed in July 2003, analyzed the potential improvements to the SH 146 Corridor from Fairmont Parkway in Harris County to IH 45 in Galveston County. The corridor was divided into four segments: Segment 1 (IH 45 to FM 517), Segment 2 (FM 517 to FM 518), Segment 3 (FM 518 to Red Bluff), and Segment 4 (Red Bluff to Fairmont Parkway). The corridor's third segment, part of which is the focus of this EA, extends from Red Bluff to FM 518. A map depicting the project location is shown in **Exhibit 1**.

The MIS team included TxDOT, their contractor team, and several regional agencies. The MIS defined the transportation infrastructure investment to be made over a twenty-year planning period (through year 2022). The goal of the MIS was to identify corridor transportation needs and determine improvements that best address those needs. The MIS steering committee evaluated several alternatives and selected a Recommended Preferred Alternative (TxDOT 2003), which was carried forward for implementation. The MIS Executive Summary is included in **Appendix B**.

Project Funding

The RTP Update was adopted by the Transportation Policy Council on October 29, 2010. The U.S. Department of Transportation (USDOT, which includes FHWA/Federal Transit Administration {FTA}) found the 2013-2016 TIP to conform to the State Implementation Plan (SIP) on November 1, 2012. The widening of SH 146 from Red Bluff to FM 518 (CSJs: 0389-05-088, 0389-05-116, and 0389-06-095) is listed in the 2035 RTP Update, Appendix E pages 36 and 85.

Funding for the project would be through federal (80 percent) and state/local (20 percent) sources. Additionally, the Port of Houston Authority has funded its respective costs for the proposed grade separation at Red Bluff through Congressional SAFETEA-LU funding sources. Estimated costs for construction of the Build Alternative are shown in **Table 5**. These costs would likely be revised following completion of the final project design. Construction of this project may be phased dependent on funding.

Table 5: Build Alternative Cost Estimates

	SH 146 Widening Improvements		SH 146 Widening, Grade Separations at Major Intersections, and Two 2-Lane Frontage Roads	Total [1]
CSJ	**0389-05-116**	**0389-06-095**	**0389-05-088**	
Build Alternative	$186,624,509	$226,200,432	$98,077,222	$510,902,163

Source: H-GAC - 2035 RTP Update, 2012.
Note: [1] Dollars spent on ROW acquisition are not included.

Tolling

The proposed project is not being considered for tolling.

Public Involvement

In July 2003, TxDOT completed the *SH 146 Corridor MIS* to develop and evaluate transportation alternatives for the SH 146 Corridor. The MIS Public Involvement Program was initiated to gather community input and forward recommendations throughout the planning process. Several public meetings were also held to gather input from the public as well as agencies, businesses, and public representatives. Regular meetings of a municipal advisory committee and several presentations to community groups were also conducted to gather input. Four series of public meetings were held during the MIS process from August 2000 to April 2003.

MIS Planning Phase

- The first series of public meetings were held August 22 and 23, 2000. These meetings offered the public an opportunity to provide input about transportation problems and needs along the SH 146 Corridor.
- The second series of public meetings were held November 28 and 29, 2000. These meetings gave the public an opportunity to comment on seven alternatives developed from technical analysis and earlier public comments.
- The third series of public meetings were held February 19 and 20, 2002. The public commented on the recommended alternative proposed by TxDOT.
- A final public meeting for the MIS was held April 16, 2003. Decision-makers finalized the plans for the SH 146 Corridor from public input.

NEPA Planning Phase

Public involvement continued through the NEPA process. This effort was initiated with public meetings held on December 14, 2004 in La Porte and December 15, 2004 in Texas City. A second public meeting was held on March 19, 2007 in Seabrook.

- At the early stages of the NEPA process, public meetings were held December 14 and 15, 2004 to present the proposed improvements to SH 146 from Fairmont Parkway in Harris County to SH 3 in Galveston County; these meetings were held in La Porte and Texas City, respectively. The meetings gave the public an opportunity to comment on viable alternatives, which emerged from the MIS. Many of the comments received at this series of meetings included maintaining access to

businesses on SH 146, safety of the at-grade railroad crossing at Choate Road west of SH 146, roadway flooding, pipeline relocations, time and cost of construction, and the Port of Houston's ongoing expansion and associated truck and rail traffic. Public input was used to help select the preferred alternative.

- An additional public meeting was held March 19, 2007 to present the recommended preferred alternative to SH 146 from Red Bluff to FM 518, as discussed in this EA. A summary of this public meeting and comments received during the public comment period are on file and available for review at TxDOT.

Related Studies and Relevant Documents

- *SH 146 Corridor MIS*: TxDOT completed the MIS in July 2003, which analyzed the potential improvements to SH 146 from Fairmont Parkway in Harris County to SH 3 in Galveston County. The MIS evaluated transportation options and provided an opportunity for TxDOT and participating agencies to assess the most cost-efficient solutions for addressing long-term needs.
- *SH 146 (Red Bluff Road to Dickinson Bayou)*: TxDOT prepared a Final Environmental Impact Statement (EIS) in 1973 for relocating SH 146 one mile west of its existing location for 10.8 miles of roadway within Harris and Galveston Counties, Texas.
- *Bayport Toll Road Alternative Corridor Assessment*: The Harris County Toll Road Authority (HCTRA) completed this study in February 2003. The study analyzed two alternative toll road alignments (along Fairmont Parkway and Red Bluff) intended to serve the Bayport Corridor adjacent to SH 146. The purpose of this study was to develop preliminary estimates of traffic and revenue and determine the most feasible alternative.
- *SH 146 at the Kemah Bridge over Clear Creek* (CSJ: 0389-06-086). A U.S. Coast Guard (USCG) bridge permit was issued for a new pier protection system for an auxiliary channel at Clear Lake (Permit 158-79-8).
- *City of Seabrook Wetland Conservation Plan*. This conservation plan was developed to assist Seabrook with becoming a model for wetlands preservation and ecotourism in the Galveston Bay area. The primary goal was to develop a plan for the conservation and enhancement of wetlands within the community.
- *San Jacinto Rail Limited Final Environmental Impact Statement* (STB Docket No. 34079). This study was completed for approximately 12.8 miles of new rail line in Harris County to serve petrochemical industries in the Houston-area Bayport Industrial District (Bayport Loop). Proposed construction would be completed by San Jacinto Rail Limited and operation by The Burlington Northern and Santa Fe Railway.

Applicable Regulatory Requirements and Required Coordination

Executive orders and regulations that influence the design, operational, and environmental decisions concerning the proposed project are discussed throughout this EA. A detailed description of these applicable regulatory requirements is included in **Appendix C**.

Congestion Management System

H-GAC's current CMP evolved from the H-GAC Congestion Management System (CMS) Plan originating in the mid-1990s. The H-GAC CMS Plan was adopted in 1997, and revised in 1998 and 2005. The CMP was adopted by H-GAC on January 25, 2013 and incorporated into the 2035 RTP and 2013-2016 TIP.

The CMS requires the performance of a Congestion Mitigation Analysis (CMA), which was formerly known as Single Occupancy Vehicle (SOV) Analysis, on substantial added capacity roadway projects. It is the state policy of the CMS to apply cost-effective Transportation System Management (TSM) and Travel Demand Management (TDM) measures as the first component of all congestion reduction strategies. Added capacity roadway projects, such as those being considered for the SH 146 Corridor, are justified only if cost-effective demand and system management strategies fail to reduce vehicular congestion to acceptable (or tolerable) levels.

A CMA report for the 24-mile section of SH 146 from Fairmont Parkway in Harris County and SH 3 in Galveston County (CSJs; 0389-05-087, 0389-05-088, 0389-06-088, and 0389-07-029), which includes the current project, was prepared in conjunction with the *SH 146 Corridor MIS* dated July 2003 (**Appendix D**). By year 2010, congestion along SH 146 between Fairmont Parkway and SH 3 will have deteriorated enough to justify added capacity. The implementation of Transportation Control Measures (TCM), such as Intelligent Transportation Systems (ITS) and freeway high occupancy vehicle (HOV) lanes within the study area, would not have sufficient impact to negate the added capacity justification. According to the CMA, mobility within the project limits would improve because of implementation of these TCM projects; however, the area's congestion is projected to deteriorate from Tolerable to Serious by 2010 and Serve by 2025. Therefore, the widening of SH 146 between Fairmont Parkway and SH 3 is justifiable even after the implementation of TCM projects. Added capacity roadway projects, such as the project which is the focus of this EA, are justified only if cost-effective TCM strategies fail to reduce the forecast vehicular congestion to acceptable (or tolerable) levels. The result of this analysis also suggests that the implementation of TCMs on the SH 146 Corridor have a degree of impact on the congestion mitigation; therefore, they are considered "significant," and they include an ITS throughout the corridor.

The CMS Plan stipulates that implementing agencies must demonstrate their commitment to the construction of any TCMs identified as having significant impact to the traffic flow on a candidate roadway project. The H-GAC requires a Letter of Commitment, which shall include a firm assurance that the implementing agencies will execute these TCM projects along with or incremental to the added capacity project.

Furthermore, the final rule for Statewide and Metropolitan Planning regulations was issued in the Federal Register (Volume 72, Number 30) on February 14, 2007. This final rule "revises the regulations governing the development of metropolitan transportation plans and programs for urbanized areas, State transportation plans and programs, and the regulations for Congestion Management Systems" to be consistent with current statutory requirements (USDOT 2007). The revised Statewide and Metropolitan Planning regulations now reflect requirements for a Congestion Management Process (CMP) rather than a CMS. The CMP refers to several methods of roadway management including ITS, TSM, and TDM. These programs seek to improve traffic flow and safety through better operation and management of transportation facilities while also providing low cost solutions that can be constructed in less time and

provide air quality benefits to the region. The CMP incorporates all commitments within the 2035 RTP Update and the 2013-2016 TIP, which were approved January 25, 2013.

CHAPTER 2. DESCRIPTION OF THE ALTERNATIVES

TxDOT considered several conceptual alternatives using a systematic, interdisciplinary approach. This approach focused on input from the public as well as resource agencies during the MIS phase and the NEPA planning phase of the proposed project. The reasonable alternatives that were considered included those that satisfied the need for and purpose of the proposed project while minimizing potential effects to the environment. These alternatives were further evaluated based on determining an alignment that used the existing roadway as a portion of any future facility to maximize the existing resources and minimize adverse environmental effects, construction costs, utility adjustments, community disruptions, and ROW acquisitions. The range of alternatives considered by TxDOT is documented in the MIS. The alternatives considered in this document are presented below.

No Build Alternative

The No Build Alternative would leave the existing facility as is; it would remain as an urban facility. Normal routine maintenance would continue and all other pending, previously authorized actions would proceed as long as they do not require additional travel lanes. Typical maintenance activities under this alternative would include inspections of the roadway and bridges, minor rehabilitations, pavement edge repair, seal coats and overlays, and other activities such as striping, signing, and patchwork.

Although the No Build Alternative does not meet the purpose and need for the project, it is retained as a basis for comparison with the Build Alternative carried forward for detailed study as required by CEQ regulations (40 CFR §1502.14(d)).

<u>Existing Facility</u>

Currently SH 146 has many different cross sections, but typically it is a multi-lane, paved highway with a center turn lane or grassy median. Intersections along the project corridor are all at-grade (including Red Bluff, Repsdorph Road, NASA Road 1, FM 2094, and FM 518). An existing bridge is located at the Clear Creek Channel. The multiple roadway cross sections throughout the project limits are described as follows:

- From the beginning of the project limits at Red Bluff, SH 146 proceeds south for approximately 0.4 mile where the existing facility consists of four 12-foot main lanes (two in each direction) with 8-foot outside shoulders. This portion of SH 146 does not include inside shoulders or a center median. The existing ROW varies from 120 to 440 feet wide.
- From 0.4 mile south of Red Bluff to Repsdorph Road, SH 146 consists of four 11-foot mainlanes (two in each direction) with 3-foot outside shoulders and a 15-foot center turn lane. The existing ROW for this portion is approximately 120 feet wide.
- SH 146 proceeds south for approximately 1.0 mile to NASA Road 1 where the existing facility consists of four 11-foot mainlanes (two in each direction) with 3-foot outside shoulders and a 14-foot center turn lane. The existing ROW varies from 100 to 120 feet wide.

- From NASA Road 1, SH 146 continues south for 0.6 mile. This portion of SH 146 consists of four 11-foot mainlanes (two in each direction) with a 14-foot center turn lane and curb and gutter. The existing ROW varies from 150 to 200 feet wide.
- Continuing south for approximately 0.75 mile, SH 146 turns into the Kemah Bridge, where the existing facility consists of four 12-foot mainlanes (two in each direction) with 9-foot outside shoulders and an 8-foot center turn lane with no barriers. The existing ROW varies from 200 to 265 feet wide.
- South of the Kemah Bridge to FM 518, SH 146 consists of four 12-foot mainlanes (two in each direction) with an intermittent third lane for turning, a 14-foot center turn lane, and curb and gutter. The existing ROW varies from 110 to 135 feet wide.

Build Alternative

The Build Alternative would consist of widening and restructuring the existing facility to a six- to 12-lane freeway with grade separations at major intersections, access roads in selected locations, express lanes over Clear Creek, and a sidewalk on the east side of the proposed project. Original design included a proposed Bike Path for bicycle and some pedestrian travel on the railroad/utility ROW paralleling the west side of the proposed project on SH 146. Based on public comment received during the Public Hearing held on January 26, 2012 and coordination with public officials, the City of Seabrook requested to have the shared use path removed from the roadway project for the portion within the City of Seabrook, with the agreement that the City would find an alternative location for the path. The City of Seabrook has decided to locate the shared use path along the Centerpoint Energy high-line corridor that bisects the City of Seabrook north to south, and parallel to the SH 146 alignment. (**Appendix E**, letters dated September 18, 2012 and April 5, 2013). The logical termini for this project extend from Red Bluff to FM 518. The study limits extend from approximately 1,893 feet south of Red Bluff to FM 518. The limits near Red Bluff represents a transition where the proposed project would tie into a separate project, a proposed six-lane divided facility with access roads extending to the north along SH 146 from Fairmont Parkway (CSJ: 0389-05-087).

Overall, the alignment of the proposed project would be widened to the east and west of the existing facility to a total of 12-lanes and thus, would include eight main lanes (four in each direction) with two auxiliary/access lanes (one in each direction) that permit entrance and exit to the facility between Red Bluff and Repsdorph Road, and an eight-lane divided freeway (four in each direction) with two two-lane access roads in each direction from Repsdorph Road to NASA Road 1. Construction of the project from NASA Road 1 to FM 518 would include a six-lane arterial facility (three in each direction) with a four lane-elevated express facility (two in each direction) on the west side of and adjacent to the arterial lanes.

This alternative would also include a sidewalk paralleling SH 146 to the east. The sidewalk on the east side of the project would be proposed as a continuous sidewalk along the entire length of the project terminating on both ends of the Kemah Bridge. Crosswalks would be located at NASA Road 1 and Marina Bay Drive. Signage would be placed at the south end of the continuous sidewalk at NASA Road 1 and at the north end of the continuous sidewalk at Marina Bay Drive instructing pedestrians to cross SH 146 at the designated crosswalks and use the sidewalk (see Typical Section E-E). Example language used for signage states, “Sidewalk Ends, Use Crosswalk at Marina Bay Drive.” New grade-separated

intersections would be proposed at Red Bluff, Repsdorph Road, and NASA Road 1. All proposed major intersections would have a minimum 20-foot separation distance between the u-turn and cross street where pedestrians and bicyclists can safely cross and seek refuge, if needed, during heavy traffic times. The proposed project improvements under this alternative would extend from Red Bluff in Harris County to FM 518 to Galveston County. The total distance of the Build Alternative is approximately 4.0 miles.

The following bullets describe the multiple roadway alignments proposed throughout the project limits. Proposed typical sections and a line diagram of the Build Alternative are shown in **Exhibit 3.**

- The existing at-grade crossing of SH 146 at Red Bluff would be converted to a grade-separated facility. This overpass would consist of elevating the SH 146 main lanes over the cross street, which would remain at-grade. The on- and off-ramps would also be constructed at-grade. No additional ROW would be acquired along the west or east sides of SH 146 as part of the proposed grade separation.
- From south of the grade separation at Red Bluff to 976 feet north of a new grade separation at Repsdorph Road, a distance of approximately 1,689 feet, SH 146 would include eight 12-foot main lanes (four in each direction), with two 12-foot auxiliary/access lanes (one in each direction) that permit entrance and exit to the facility. The proposed facility would also consist of 4-foot outside shoulders and 10-foot inside shoulders with a 2-foot center barrier. Approximately 73 feet of additional ROW would be acquired along the west side of SH 146 to accommodate the proposed improvements. The proposed at-grade typical section for this portion of SH 146 is presented in **Exhibit 3 (Section A-A)**.
- The existing at-grade crossing of SH 146 at Repsdorph Road would be converted to a grade-separated facility in the same manner as Red Bluff. The SH 146 main lanes would be elevated over Repsdorph Road and would consist of eight 12-foot main lanes (four in each direction), 12-foot outside shoulders with a 1.21 foot outside barrier, and 10-foot inside shoulders with a 2-foot center barrier. A 6-foot median would separate the northbound main lanes from two 12-foot access lanes with 2-foot outside shoulders. An approximate 9-foot median would separate the southbound main lanes from two 12-foot access lanes and a 12-foot right-turn lane with 2-foot outside shoulders. The access road and cross street would remain at-grade. To accommodate these improvements, approximately 70 to 80 feet of additional ROW would be acquired along the west and east sides of SH 146. The proposed grade-separated typical section for this intersection is presented in **Exhibit 3 (Section B-B)**.
- From approximately 716 feet south of the new grade separation at Repsdorph Road to approximately 1,461 feet north of NASA Road 1, the proposed facility would consist of eight 12-foot main lanes (four in each direction) with two two-lane access roads in each direction. The main lane facility would include 12-foot outside shoulders with a 1.21 foot outside barrier and 10-foot inside shoulders with a 2-foot center barrier. A 6-foot median would separate the northbound main lanes from two 12-foot access lanes with 2-foot outside shoulders. An approximate 9-foot median would separate the southbound main lanes from two 12-foot access lanes with 2-foot outside shoulders. Approximately 60 to 80 feet of additional ROW would be acquired along the

west and east sides of SH 146 to accommodate the proposed improvements. The proposed at-grade typical section for this portion of SH 146 is presented in **Exhibit 3 (Section C-C)**.

- From approximately 1,461 feet north of NASA Road 1, the SH 146 main lanes would transition into express lanes as the proposed facility proceeds south towards the Kemah Bridge. The alignment of SH 146 (approximately 1,461 feet north and 483 feet south of the SH 146/NASA Road 1 interchange) would consist of four 12-foot express lanes (two in each direction), 10-foot outside shoulders with a 1.21 foot outside barrier, and 4-foot inside shoulders with a 2-foot center barrier. The express lanes would pass between the northbound and southbound access roads. A six- to 20-foot median would separate the express lanes from the southbound and northbound access roads, respectively. The southbound access road would consist of three 12-foot travel lanes with a 12-foot center left-turn lane and a 12-foot right-turn lane. The northbound access road would consist of three 12-foot travel lanes. The access roads and cross street would remain at-grade. In order to construct the express lanes in this area, up to 116 feet of additional ROW would be acquired along the west side of SH 146 and approximately 35 feet of additional ROW would be acquired along the east side of SH 146. The proposed section for this portion of SH 146 is presented in **Exhibit 3 (Section D-D)**.
- Over Clear Creek, the Kemah Bridge would consist of six 12-foot main lanes (three in each direction), 10-foot outside shoulders with a 1.42 foot outside barrier, and 10-foot inside shoulders with a 2-foot center barrier. The proposed express lanes would be constructed as a new structure paralleling the Kemah Bridge main lanes to the west and would consist of four 12-foot lanes (two in each direction), 10-foot outside shoulders with a 1.21 foot outside barrier, and 4-foot inside shoulders with a 2-foot center barrier. The proposed typical section depicting this portion of the project is shown **Exhibit 3 (Section E-E)**.
- South of the Kemah Bridge, the SH 146 main lanes would descend and consist of six 12-foot main lanes (three in each direction) at-grade with a southbound 12-foot right-turn lane, a 16-foot grassy median, and 2-foot outside shoulders. The proposed express lanes would consist of four 12-foot lanes (two in each direction), 10-foot outside shoulders with a 1.21 foot outside barrier, and 4-foot inside shoulders with a 2-foot center barrier. The express lanes would slowly descend south of the Kemah Bridge to just south of FM 518 where the SH 146 main lanes and express lanes would merge. The proposed typical section for this portion of SH 146 is presented in **Exhibit 3 (Section F-F)**.
- South of FM 2094, the proposed northbound and southbound SH 146 access roads would transition toward the SH 146 main lanes, which would consist of six 12-foot main lanes (three in each direction), with a 16-foot grassy median and 2-foot outside shoulders. The proposed express lanes would consist of four 12-foot lanes (two in each direction), 10-foot outside shoulders with a 1.21 foot outside barrier, and 4-foot inside shoulders with a 2-foot center barrier. The proposed typical section depicting this portion of the project is shown **Exhibit 3 (Section G-G)**.
- South of FM 518 the project would consist of four 12-foot main lanes (two in each direction) separated by the proposed express lanes. The proposed express lanes would consist of four 12-foot lanes (two in each direction), 10-foot outside shoulders with a 1.21 foot outside barrier, and 4-foot

inside shoulders with a 2-foot center barrier. The proposed northbound and southbound SH 146 express lanes would descend and transition into the proposed northbound and south bound SH 146 mainlanes. The proposed typical section depicting this portion of the project is shown **Exhibit 3 (Section H-H).**

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Land Use

Existing Environment

The proposed project is located within the communities of Seabrook and Kemah, as well as unincorporated areas of Harris and Galveston Counties. Within these communities, land use along SH 146 is primarily developed land (93 percent). Land use within the proposed ROW consists primarily of railroad (56 percent), commercial (16 percent), and residential (1 percent) uses (see **Exhibit 4**).

Commercial land use is scattered along the project corridor and is especially prevalent near the SH 146 intersections with Repsdorph Road, NASA Road 1, FM 2094, and FM 518. These commercial uses include restaurants, banks, small retail centers, auto repair stores, and fueling stations. Residential land uses, including single-family subdivisions and multi-family housing units, are primarily found behind commercial properties or undeveloped tracts of land. Residential developments near the project corridor include Lake Pointe Forest, Lake Cove Estates, Harbor Cove Estates, and Harbor Homes.

Existing transportation patterns in the study area include SH 146, Red Bluff, Repsdorph Road, NASA Road 1, FM 2094, and FM 518. Several intersecting local streets also occur throughout the study area. The Southern Pacific Railroad is located west of the project corridor and parallels SH 146.

Land Use Planning

Land use plans for the cities of Seabrook and Kemah, along with transportation infrastructure/expansion plans, were reviewed to determine land use effects resulting from the proposed project.

Seabrook Comprehensive Master Plan ~ 2025: The city of Seabrook guides future growth and development based on their 1998 Comprehensive Master Plan as well as previous planning efforts dating back to 1968. This plan discusses goals and objectives as a way for the city to “enhance the quality of life in a safe environment employing Seabrook’s unique waterfront resources” (Seabrook 2004). The goals and objectives for the city focus on the following:

- Maintain and expand land allocated for single-family owner occupied homes in order to provide a range of income and age groups;
- Encourage growth of employment though use of areas presently zoned for commerce and industry as a way to balance residential, employment, and recreational activities;
- Enhance special characteristics of the city such as conserving Seabrook’s shoreline, encouraging maritime activities, linking existing and future parks with schools, and creating a pedestrian, bike and hike network; and

- Improve and maintain regional and local transportation systems allowing for efficient movement of traffic serving the city and adjacent uses.

The resulting land use map establishes several land use categories including three residential categories as well as mixed-use, commercial, and light industry categories. With respect to the SH 146 Corridor, land is zoned as 'Commercial' along the east side of SH 146 from the northern city limits to Delabrook Court and 'Mixed-Use' from Delabrook Court to the southern city limits. Also, land along the west side of SH 146 is zoned as a mix of 'Commercial', 'Single-Family Housing', 'Medium Density Single-Family Housing', and 'Mixed-Use'. These designations and accompanying zoning are largely consistent with existing land use patterns in the study area.

Kemah Comprehensive Plan ~ 2015: Kemah is characterized as a "tourist attraction as well as a bedroom community for workers" who live and work in Kemah and commute to nearby cities such as Clear Lake and Houston (Kemah 1997). Kemah's development is centered on commercial aspects through leisure activities including boating and fishing. The city is experiencing slow but steady growth. To make Kemah a desirable place to live and work, goals have been established through the city's comprehensive plan:

- Adopt and implement the central business district and thoroughfare elements;
- Adopt and implement the water, wastewater, drainage, and street elements;
- Promote an aesthetically pleasing, durable, and safe living environment for present and future residents; and
- Consider zoning as initial stepping stone for future land use planning.

With high growth communities such as League City and Clear Lake located to the west of Kemah, the city is anticipating significant development of vacant and unused agricultural land. The city's land use plan and associated maps indicate a considerable increase in commercial and residential land. With respect to the SH 146 Corridor, land is planned for commercial uses along the east side SH 146 from the Clear Creek Channel to FM 2094 and along the east and west sides of SH 146 south of FM 518. In addition, public land use is planned for the west side of SH 146 north of FM 2094. An increase in residential and public land use is also indicated adjacent to or behind the commercial properties.

Transportation Planning

The H-GAC is the Metropolitan Planning Organization (MPO) for transportation planning in the eight-county Houston-Galveston area, which includes Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties. H-GAC's Transportation Policy Council approves the RTP and TIP. The RTP is a mechanism to help local and state governments and transportation agencies identify transportation investments that will improve mobility, increase safety, and complement community development plans. The 2035 RTP identifies priority transportation investments for ports, airports, roadways, and transit systems (H-GAC 2007).

Environmental Consequences

The No Build Alternative does not require new ROW; therefore, no direct effects to land use would occur. However, growth and development would likely continue as population increases.

The Build Alternative would impact approximately 7.23 acres of commercial land use, 0.36 acre of industrial land use, 0.03 acre of municipal land use, 0.5 acre of land belonging to places of worship, 0.56 acre of residential land use, 25.41 acres of railroad land use, 3.21 acres of utilities land use, 3.26 acres of unclassified land use, 0.01 acres of vacant land, 2.53 acres of water, and 1.90 acres of adjacent transportation uses. A total of 45 acres of land use and adjacent transportation uses would be converted to roadway ROW by the proposed project.

Soils and Farmlands

Existing Environment

Three soil associations underlie the study area (U.S. Department of Agriculture {USDA} 1976 and 1988). In Harris County, the *Midland-Beaumont* type is poorly drained, nearly level, loamy and clayey soils that have very slow permeability. This soil type is used for cultivated crops and native or improved pasture. The *Aldine-Ozan* type is somewhat poorly to poorly drained, nearly level, loamy soils that have slow to very slow permeability. This soil type is used mostly for timber production, woodland grazing, and improved pasture. In Galveston County, the *Bernard-Verland* type is somewhat poorly drained, nearly level, loamy and clayey soils that have very slow permeability. This soil type is used mainly as cropland and pastureland. Additionally, in some areas each of these soil types are covered by urban development. As shown in **Table 6**, seven soil types in Harris County and three soil types in Galveston County were mapped by the Natural Resources Conservation Service (NRCS) as occurring within the study area.

Table 6: Soils Identified within the Study Area

Soils	Prime Farmland Soils	Hydric Soils
Harris County		
Aldine-Urban land complex	No	No
Aris fine sandy loam	Yes, if drained	Yes
Edna fine sandy loam	No	Yes
Harris clay	No	Yes
Ijam soils	No	Yes
Midland silty clay loam	Yes, if drained	Yes
Midland-Urban land complex	No	No
Galveston County		
Kemah silt loam, 0 to 1 percent slopes	No	Yes
Verland silty clay loam	No	Yes
Veston loam, slightly saline-strongly saline complex	No	Yes

Source: USDA 1976 and 1988.

Farmland Protection Policy Act

Undeveloped land comprises approximately 7 percent of the land use within the study area. The Farmland Protection Policy Act (FPPA) requires that federal agencies identify and take into account the adverse effects of their programs on the preservation of farmlands; consider alternative actions, as appropriate, that could lessen adverse effects; and ensure that the project is compatible with state and local programs

and policies to protect farmlands (7 CFR Part 658). Coordination with the NRCS was conducted to meet these requirements.

Environmental Consequences

The No Build Alternative would have no effect on prime farmland, hydric, or statewide important soils.

As indicated in **Table 6**, the Build Alternative is underlain by 11 different soil mapping units, three of which are considered to be prime farmland soils by the NRCS (USDA 1976 and 1988). Out of 45 acres of additional ROW to be acquired for the proposed project, none (zero acres) of the proposed new ROW occurs over prime farmland soils. The additional ROW has been scored using Form CPA-106. Based on a final assessment and calculation of Part VI of the form, the project received a score less than 160; therefore, no further consideration with the NRCS is required. A copy of the form is included in **Appendix E**.

Relocations and Right-of-Way Acquisition

Existing Environment

The existing ROW width along SH 146 varies from 100 to 440 feet. Currently, land use along the project corridor is a mixture of residential, commercial, and municipal properties, with large tracts of undeveloped land near the northern portion of the study area. The numerous commercial buildings located along the existing ROW have a variety of functions and uses. Single-family subdivisions and multi-family housing units are primarily found behind commercial properties or undeveloped tracts of land. Several utilities, including water, telephone, electrical and gas lines, are present.

History of the Project's ROW

Log records from the TxDOT-Houston District SH 146 construction projects show that most of the existing ROW along the proposed project was acquired prior to 1970. The original roadway was purchased from Galveston County in 1929 and Harris County in 1935; ROW varied mainly from 100 to 120 feet.

After the original roadway was purchased, all ROW acquisitions within the project limits were purchased directly by TxDOT. ROW maps of the proposed project limits provide a record of these ROW acquisitions. In 1964, prior to the 1970 Uniform Relocation Act, 11 parcels, consisting of 0.895 acre, were acquired in the city of Seabrook along the Harris County portion of SH 146. In 1982, an additional seven parcels, consisting of 2.204 acres, were acquired in the city of Seabrook. Also in 1982, 10 parcels, consisting of 1.472 acres, were acquired in the city of Kemah along the Galveston County portion of SH 146. In 1985, ROW purchases in the city of Kemah included 11 parcels, consisting of 2.86 acres. One additional parcel (0.216 acre) in the city of Kemah was purchased 1987.

Environmental Consequences

If the No Build Alternative were implemented, no relocations would occur and no additional ROW would be acquired.

The Build Alternative would require approximately 45 acres of additional ROW. Under the Build Alternative, approximately 57 businesses, two single-family residences, one multi-family housing unit, two churches, and a municipal facility would be affected from the proposed widening of SH 146. Some of these effects include changes in access, loss of frontage or parking (for partial acquisition properties see **Table 7**) while other effects include business displacements (for total acquisition properties see **Table 8**).

Partial Acquisition

Table 7 lists the properties that would be partially acquired if the proposed improvements were implemented. These properties are generally located adjacent to SH 146 between Repsdorph Road and NASA Road 1. Partial acquisition implies that, because widening of the existing alignment would occur in this area, the project would result in changes to access and loss of frontage or parking to a structure's property or complex but would not be considered substantial and would not result in the relocation of the business or structures' inhabitants.

Table 7: Potential Partially Impacted Properties (No Relocations)

Facility	Type	Estimated Effect	Area of Impact
Bay Area Body Shop	Automotive Service/Repair	4,878 square feet	Frontage/Parking
Coastal Storage	Services	8,973 square feet	Frontage/Parking (includes one building displacement)
Residential Property – 2818 Bayport Boulevard	Residence	8,668 square feet	Frontage
Bay Area Storage	Services	7,579 square feet	Access/Frontage/Parking
Batavia Services	Services	8,319 square feet	Frontage
Miramar Court	Apartments, Condos, and Townhomes	5,532 square feet	Frontage
First Baptist Church of Seabrook	Church	15,768 square feet	Frontage/Parking
Seabrook United Methodist Church	Church	6,098 square feet	Frontage
Kemah Boardwalk Human Resources	Municipal Facility	2,221 square feet	Frontage
Kemah Food Mart	Services	1,742 square feet	Access/Frontage
Parking Lot	Services	11,020 square feet	Frontage/Parking
Vacant Land	Vacant Land	5,837 square feet	Frontage
Bay Area Houston Convention & Visitors Center	Services	348 square feet	Frontage
Total	**86,983 square feet / 2.11 acres**		

With the widening of SH 146, a few businesses adjacent to the proposed project would experience changes in access. As a result of the widening, access controls would be put in place, restricting points of ingress and egress. For the majority of the buildings, if ROW is taken, then the points of ingress and

egress would be shortened. However, for those facilities that currently have unrestricted access or oversized access, defined points of access would be designed and provided.

Access points including the location of left-turn lanes, the number of left-turn lanes, access for side streets and businesses, as well as residential driveways along SH 146would be determined by TxDOT. In general, TxDOT follows the "Texas Department of Transportation Access Management Manual." While this manual is designed primarily for new construction, it provides guidelines for the access control standards. Access to any residences or use of any business and community facility would be maintained at all times during and after project construction.

Total Acquisition

A list of businesses and residences that would be displaced from the proposed widening of SH 146 is provided in **Table 8**. These 52 businesses (including, at least, 53 commercial buildings) and one residence are generally located adjacent to SH 146 from Repsdorph Road to NASA Road 1 (**Exhibit 5**). Of the 52 businesses, approximately 23 businesses lease property from the Southern Pacific Railroad for the use of their establishment and are located along the west side of SH 146. Additionally, the Build Alternative would not require the relocation of schools, hospitals, cemeteries, churches, libraries, or fire/police stations.

Potential displacements (including lease properties) were counted based on whether a structure (i.e. residence, business, public facility) was within the proposed additional ROW, if the amount of a residential parcel to be acquired was substantial, or if the majority of parking from a business would be displaced. Sheds and outbuildings were not counted. If a business had more than one building displaced, then the business was counted as one displacement.

Table 8: Potential Relocations and Displacements

Property Number	Facility	Type	Leased Property (1)	Property Number	Facility	Type	Leased Property (1)
1	Waffle House	Restaurant	No	27	Taylor Boats	Services	Yes
2	Coastal Storage	Services	No	28	Sno Cone Express	Services	Yes
A	3014 Bayport Boulevard	Residence	No	29	Wells Fargo	Bank	No
3	Galveston Bay Marine Center	Services	No	30	Dent Repair	Automotive Service/Repair	Yes
4	Percoco Sails	Services	No	31	Wild West BBQ	Restaurant	Yes
5	MIB Pest Terminators	Services	Yes	32	Benjamin's Auto Repair	Automotive Service/Repair	Yes
6	CVS	Pharmacy	No	33	Custom Upholstery	Services	Yes
7	Auto Zone	Automotive Service/Repair	No	34	Seabrook Lawnmower	Retail	Yes
8	Volvo Rents	Rental Services	No	35	Ryan's Express Cleaners/ Mattress Outlet/ Angel Cuts/ Donald's Donuts	Services	No

Table 8, Cont.: Potential Relocations and Displacements

Property Number	Facility	Type	Leased Property (1)	Property Number	Facility	Type	Leased Property (1)
9	Valero "Angels"	Automotive Service/Repair	No	36	All American Automotive Repair	Automotive Service/Repair	Yes
10	Sonic	Restaurant	No	37	Whataburger	Restaurant	No
11	Hill's Discount Liquor	Liquor Store	No	38	Marburger's Sporting Goods	Retail	No
12	Seabrook Flower	Services	No	39	Lenire Yacht Restoration	Services	Yes
13	Popeye's Chicken & Biscuits	Restaurant	No	40	Steve's Super Shine	Automotive Service/Repair	Yes
14	Kwik Kar Oil & Lube	Automotive Service/Repair	No	41	Boats Etc.	Services	Yes
15	Laredo's Mexican Restaurant	Restaurant	Yes	42	Mario's Flying Pizza	Restaurant	No
16	McDonalds	Restaurant	No	43	Citgo Quick Mart	Service Station	No
17	Twice Ice	Service	Yes	44	100% Hand Car Washing	Services	Yes
18	KFC-Taco Bell	Restaurant	No	45	Valentine Law Office	Professional Services	No
19	Blockbuster	Retail	No	46	Pelican Point Plaza	Retail	No
20	Psychic	Services	Yes	47	Millers Machine and Welding	Services	Yes
21	We Buy New Surplus	Retail	Yes	48	Tookie's Hamburger and Grill	Restaurant	No
22	Scuba Dive	Retail	Yes	49	Gas Depot	Services	Yes
23	Neptune Subs	Restaurant	Yes	50	Kaferhaus	Automotive Service/Repair	Yes
24	Walgreens	Pharmacy	No	51	Outriggers Seafood Grill & Oyster Bar	Restaurant	No
25	Enterprise Rent-A-Car	Rental Service	Yes	52	Shrimp Boat Dock	Services	No
26	Bay Texaco Food Mart	Service Station	No				
Total Displacements			**53**				

Note: Leased Property (1) column indicates businesses that are currently leasing property from Southern Pacific Railroad.

Existing Housing

There are approximately 9,060 housing units within the 12 Census Block Group area. The average age of a house within this area is 32 years. Nearly 95 percent of the housing units were built before 2000; therefore, the 2000 U.S. Census was used for analysis of existing homes in the area.

As indicated in **Table 8**, the construction of the proposed project would result in the relocation/displacement of the main property structure on two residential parcels. The residence is located within Census Tract 3416, Block Group 2 where the average age of a house is 23 years. Residential units within this area are exclusively single-family consisting mostly of three bedroom homes (44 percent average) followed by homes with more than four bedrooms (42 percent average) (U.S. Census 2000). An average of 14 percent of the homes has up to two bedrooms (U.S. Census 2000). **Table 9** shows housing characteristics for the area where the displaced residence is located. Furthermore, Census Tract 3416, Block Group 2 is located within Key Map page 620, which was used to assess the price range of homes within the study area. A search of the Multiple List Service (MLS) at www.har.com (April 2009) was conducted, which indicated that current home prices within the area for a three bedroom home range from $49,900 to $990,000. Current prices for homes with more than four bedrooms range from $44,000 to $2,990,000.

Table 9: Area of Displaced Housing

Home Characteristics	Geographic Area	
	3416:2 (1)	**12 Block Group Total (2)**
No. of Households	907	9,060
0-2 Bedrooms	126 (14%)	3,012 (33%)
3 Bedrooms	402 (44%)	2,695 (30%)
4 or more Bedrooms	379 (42%)	3,353 (37%)
Age of Housing (Average)	23 yrs.	32 yrs.
Home Price	**Key Map Page**	
	620 (3)	
0-2 Bedrooms	$89,900 to $325,000	
3 Bedrooms	$49,900 to $990,000	
4 or more Bedrooms	$44,000 to $2,990,000	

Source: U.S. Census Bureau, Census 2000: Summary Tape File 3. HAR, MLS Listings as of April 2009.
Note: (1) Geographic Area represents the Census Tract (four digit number) and the Block Group (one digit number) within the Census Tract where the relocation/displacement of the main property structure would occur.
(2) The entire 12 Block Group Area is located in Key Map Page 620.
(3) The Key Map Page indicates the area where the relocation/displacement of the main property structure would occur.

Availability of Comparable Properties

The data shown in **Table 10** indicates that an adequate quantity of replacement housing is available within the study area for the displaced residence. To assess availability of replacement properties within the study area, a search of the Multiple List Service (MLS) at www.har.com (April 2009) was conducted. Available residential properties were searched by the Key Map page that the project is located directly adjacent to (580, 619, and 660) or within the same Key Map page (620) where the displacement would occur (**Exhibits 9a, 9b, 9c,** and **9d**).

Table 10: MLS Housing Availability by Key Map

Price Range	Key Map Page				Total
	580	619	620*	660	
$10,000 - $50,000	6	0	4	2	**12**
$50,000 - $100,000	21	2	8	8	**39**
$100,000 - $150,000	18	2	11	22	**53**
$150,000 - $200,000	9	19	27	11	**66**
$200,000 - $250,000	3	31	24	17	**75**
$250,000 - $300,000	2	26	20	7	**55**
$300,000 - $10,000,000	8	77	60	37	**182**
Total	**67**	**157**	**154**	**104**	**482**

Source: HAR, MLS Listings as of April 2009.
Note: All housing units listed includes at least two bedrooms and one full bathroom. Available single-family residential homes were searched by the Key Map page directly adjacent to or within the same Key Map page where the displacements would occur.
* All displacements would occur in Key Map 620.

The data shown in **Table 11** indicates available commercial (office/retail) and industrial properties for sale or lease as of April 2009. The properties were searched by the Key Map page that the project is located directly adjacent to or within the same Key Map page where the displaced businesses would occur (**Exhibits 9a, 9b, 9c,** and **9d**).

Table 11: Office/Retail and Industrial Space Availability by Key Map

Properties	Key Map Page				Total
	580	619	620*	660	
Office/Retail for Lease	0	9	15	4	28
Office/Retail for Sale	0	3	2	1	6
Industrial for Lease	3	0	0	3	6
Industrial for Sale	7	14	8	15	44
Undeveloped land for Lease	0	1	0	0	1
Undeveloped land for Sale	5	9	5	14	33
Total	8	60	77	37	182

Source: HAR, Commercial Gateway – listings as of April 2009.
Note: Available Office/Retail space and Industrial space was searched by the Key Map page directly adjacent to or within the Key Map page where the displacements would occur.
* The business displacement would occur in Key Map 620.

As of April 2009, the HAR Commercial Gateway website lists the following numbers of commercial properties for sale or for lease within the four Key Map locations: six office/retail properties for sale, 28 office/retail properties for lease, 44 industrial properties for sale, and six industrial properties for lease. Some of these properties contain one or more buildings or units (HAR 2009). These properties range in price from $500,000 to $6.9 million or up to $21 per square foot for leased properties. An additional 34 parcels consist of undeveloped land that has been zoned or designated for office/retail or industrial uses, which range in price from $292,500 to $239 million (HAR 2009). It should be noted that these are only

the properties listed by the HAR online and it is likely that there are additional office/retail and industrial properties available for sale or for lease.

The businesses to be displaced have needs associated with property size, building size, zoning requirements, access, and parking. Furthermore, 23 of the 52 businesses that would be displaced from the proposed project lease property from the Southern Pacific Railroad; however, additional office/retail properties are for lease within the surrounding area (see **Table 11**). With the exception of leased properties, the following factors would be considered for the remaining 29 acquisitions when determining the availability of properties or sites to meet the needs of the property to be displaced:

- Highway Access
- Visibility
- Type of business
- Dependence on drive-by customers
- Dependence on walk-by customers
- Has neighborhood trade area
- Has sub-regional trade area
- Has metropolitan-wide trade area

None of the businesses throughout the study area exhibit any unique needs which would preclude them from relocating in the Seabrook-Kemah area. Should the businesses being displaced choose to relocate in and around the area, it is anticipated the available properties would be capable of meeting the needs of these businesses.

The adjustment or relocation of several utilities (including water lines, telephone cables, electrical lines, and other subterranean and aerial utilities) may be necessary and would be handled so that no substantial interruptions in service would occur. The appropriate utility company would provide adjustments or relocations.

Compliance with Uniform Relocation Assistance and Real Property Acquisition Act Policies of 1970 and Other Applicable Standards

The Uniform Relocation Assistance and Real Property Acquisition Act (URARPAA) requires that comparable, decent, safe, and sanitary replacement housing within a person's financial means be made available to all affected residents. The State's Relocation Assistance Program would be available to all individuals, families, businesses, farmers, ranchers, and nonprofit organizations displaced as a result of the proposed project. Acquisitions of businesses and residential relocations would be conducted in accordance with the URARPAA, as amended in 1987. Relocation assistance would be made available to all businesses and residences without discrimination, consistent with the requirements of the Civil Rights Act of 1964 and the Housing and Urban Development Amendment of 1974.

Community Cohesion

Existing Environment

Cohesion is defined by the FHWA as "those behavior or perceptual relationships that are shared among residents of a community that cause the community to be identifiable as a discrete, distinctive geographic entity." Kemah and Seabrook are individual communities with distinctive geographic entities. The communities contain several sub-areas or neighborhood districts, which have unique characteristics within a larger community. A number of individual homesteads and four residential subdivisions (Lake

Pointe Forest, Lake Cove Estates, Harbor Cove Estates, and Harbor Homes) are located within proximity to the proposed project (**Exhibit 4**). As such, a cohesive community enables residents to have a sense of belonging to their neighborhood or community, and/or a strong relationship between people with their neighborhood or with people from different backgrounds in the workplace and in schools.

Environmental Consequences

The No Build Alternative would not affect the existing structure of the local communities; however, negative effects to the communities may occur with increased use of the roadway. Effects would include increased traffic volumes, increased congestion, and deterioration of mobility. As a result, future effects to the structure of the local communities may occur from the No Build Alternative.

As defined in the FHWA Technical Advisory T 6640.8A, changes in community cohesion because of highway construction and improvements may be beneficial or adverse. Changes in community cohesion induced by a roadway may include splitting neighborhoods, isolating a minority group or a portion of a neighborhood, generating new development, changing property values, terminating residential roads, and separating residents from community facilities. At a broader level there are inter-community linkages (transportation links) that affect the individual communities to be considered.

During construction of the proposed facility, short-term impacts would occur due to the movement of workers and materials through the area. Construction noise and dust as well as temporary disruption of traffic on local roads may also temporarily affect residents and businesses in the vicinity of the project. Construction activities may be allowed at night to minimize the effects of daytime traffic on existing facilities. Coordination between TxDOT and landowners regarding construction scheduling and access to the construction site and ROW would help to minimize such temporary disruptions.

As previously mentioned, there are a number of individual homesteads and four residential subdivisions within close proximity to the proposed project (**Exhibit 4**). As indicated in the *Relocations and Right-of-Way* section of this document, the Build Alternative would acquire ROW from and displace one single-family residence. This residence is located within a commercial area; however, community cohesion should not be affected based on a single residence.

Potential effects to these residential areas include noise, visual effects, and a change in access across the property. Potential temporary effects to these areas are those created by highway construction, including dust, noise, and traffic from trucks and heavy equipment. Additionally, with construction of the proposed project, improved local and regional access could lead to both an increase in commercial activities and population. The proposed project would increase accessibility for commercial and industrial traffic, and offer the ability for faster response times from emergency vehicles due to the proximity of hospitals and fires stations.

Additionally, public facilities were identified along the project corridor. Several resources including parks, city halls, schools, and churches are located within the project vicinity; however, few would be affected by the proposed project. The Build Alternative would acquire ROW from three of the 37 public facilities located within close proximity to the proposed project, which includes Seabrook United Methodist Church, First Baptist Church of Seabrook, and Kemah Boardwalk Human Resources (see **Table 7**).

Overall, the proposed project is not anticipated to have an adverse effect on community cohesion. Community cohesion would likely remain intact since SH 146 is an existing facility that serves as a boundary between neighborhoods and communities. A few residences and public facilities would be affected by the proposed project due to changes to access and loss of frontage or parking to a structure's property or complex. However, there are no distinct neighborhoods, ethnic groups, or other specific groups directly adjacent to the proposed project. As a result, the Build Alternative is not expected to affect, separate, or isolate any distinct neighborhoods, ethnic groups, or other specific groups.

Travel Patterns

Existing Environment

SH 146 serves both local and through traffic. Local traffic includes residents, business employees and patrons, and students on school busses. Through traffic includes commuters, freight associated with the Port of Houston and Port of Texas City, and tourists to the Gulf Coast. SH 146 is one of the main flood and hurricane evacuation routes for southern Harris County and eastern Galveston County.

According to 2000 Census, approximately 91 percent of all workers within the 12 census tracts that represent the study area used a car, truck, or van to travel to work. Dependent upon their travel route, it is likely that many of these commuters use SH 146. Only three percent of workers walked, bicycled, or used public transportation to commute to work.

During the *SH 146 Corridor MIS* public involvement process, access to bicycle and pedestrian facilities was found to be an important element of any design. As depicted in **Exhibit 4**, the Build Alternative includes improvements for these non-motorized modes of transportation/travel. These facilities would complement the roadway improvements by providing an alternative to motorized roadway travel.

Environmental Consequences

The No Build Alternative would not alter existing travel patterns or accessibility in the study area; however, linkages between the communities could be affected due to projected increases in traffic and population over time.

The Build Alternative would offer opportunities to not only link with existing roadway improvements but also provide joint development opportunities with public agencies and private development, resulting in changes to the existing transportation patterns in the area. Such changes include the following:

- *Transportation Links to other Transportation Improvements*: Within the surrounding area, there are several roadway improvement projects occurring, planned, or proposed. The Build Alternative would directly link with additional capacity improvements planned on SH 146 as well as several Smart Street Improvements (see the *Cumulative Impacts* section of this document for additional roadway improvement projects in the project vicinity). These improvements would either benefit from a new interchange with the proposed project or be located within proximity to the proposed project.

  With the completion of SH 146 from Red Bluff to FM 518, it would be a six- to 12-lane facility through Harris and Galveston Counties, which would tie into a planned six-lane facility to the north (from Fairmont Parkway to Red Bluff in Harris County) and to the south (from FM 518 to SH 3 in

Galveston County). SH 146 would then be a continuous interstate-quality facility from La Porte to Texas City.

- *Transportation Links to regional shopping, recreation, and employment areas*: The Build Alternative would improve access and provide improved travel times to and from regional shopping districts, recreational facilities and employment centers, including the Kemah Boardwalk, the numerous marina's and shipyards located along the SH 146 Corridor, and Galveston Island. Additionally, the Build Alternative would improve access to the Shoal Point Container Terminal in Texas City as well as the Bayport Ship Channel Container/Cruise Terminal near La Porte.
- *Bicycle and Pedestrian Patterns*: The Build Alternative would provide a bicycle and pedestrian trail along the railroad/utility ROW paralleling SH 146, along the entire west side of the proposed facility. This bicycle and pedestrian facility would link with the additional roadway improvement projects occurring, planned, or proposed along SH 146, which would provide connectivity for a trails system developed by local municipal agencies. TxDOT will continue to coordinate with the City of Seabrook to determine if a shared use path or another on-road facility provides the greatest benefit for bicyclists and pedestrians.

Public Facilities and Services

Existing Environment

Public facilities within the study area mainly serve residents throughout the communities of Seabrook and Kemah. Various religious, educational, and recreational facilities are located nearby. These facilities are listed in **Table 12.**

Table 12: Public Facilities and Services

Type	Name	
Schools	Clear Creek Independent School District (ISD): James F. Bay Elementary School Ed White Memorial Youth Center LaVace Stewart Elementary School Bay Area Charter Elementary School Seabrook Intermediate School Southshore Church: Southshore Christian Academy	
Churches	Seabrook United Methodist Church First Baptist Church of Seabrook Covenant Word Church New Life Praise Center	
Parks/Recreational Areas	Cameron Festival Park / Seabrook Fairgrounds Seabrook Sports Complex Miramar Park Rex L Meador Park Seabrook Meyer Road Park Hester Parks McHale Park Kemah Park	Clear Lake, Clear Lake Boat Ramp Clear Creek, Clear Creek Boat Ramp Blue Dolphin Yachting Center Lakewood Yacht Club Seabrook Shipyard Kemah Boardwalk Portofino Harbour Marina Houston Yachts, Inc. Marina Bay Harbor Yacht Club

Table 12, Cont.: Public Facilities and Services

Type	Name
Community Centers	Seabrook Visitor Center Kemah Visitor Center Jimmy Walker's Community Center (Kemah)
City Hall/Post Offices	Seabrook City Hall / Police Department Seabrook Post Office Kemah City Hall / Police Department Kemah Post Office
Fire Departments	Seabrook, El Lago, and Kemah

Environmental Consequences

The No Build Alternative would not affect any public facility or service.

Access to or use of any public facility and service would be maintained at all times during project construction. After the completion of the proposed project, it is anticipated that the project corridor would become less congested and more convenient for local traffic; thus, enhancing access to the various facilities and services throughout Seabrook and Kemah as well as Harris and Galveston Counties. In addition, emergency and law enforcement services would have a more efficient facility to use in the performance of their duties, as travel time through these communities would be decreased.

Safety

Existing Environment

According to the H-GAC, 387 crashes (three being fatal) were reported along SH 146, which in its entirety extends 40 miles from US 90 in Liberty County to I-45 in Galveston County (H-GAC 2005). High crash and/or severity rates along SH 146 indicate roadway and operational deficiencies contributing to unsafe conditions. The highest accident rates were identified outside of the study area. Anticipated increases in traffic volumes (**Table 2**) demonstrate the need for improvements.

The *SH 146 Corridor MIS* identified other safety issues along the project corridor, which includes the following:

- Lack of hurricane and other evacuation options from the lower mainland areas along Galveston Bay, which are needed due to threatening high tides of an approaching storm or associated heavy rains.
- Flooding conditions due to ground level subsidence/lowered elevations reducing the ability to provide for evacuation.
- Increased congestion resulting from underlying bi-directional travel commute demand between Texas City, Dickinson, Kemah, Seabrook, and La Porte, and other surrounding communities.
- High volumes and signalized intersections at NASA Road 1, FM 2094, and FM 518 contributes to potential rear-end type crashes and bicycle/pedestrian crossing problems.

- Kemah Bridge over Clear Creek is a navigable channel, which has inadequate clearance for marine needs.
- Kemah Bridge has been given emergency remedial strengthening to sustain the life of the structure but has not undergone major rehabilitation since it has been constructed.
- Sub-standard configurations, such as at NASA Road 1, contributing to high accident rates.
- Lack of adequate parallel roadway facilities such as access roads needed during recreational and special event peak travel times.
- Lack of dedicated bicycle/pedestrian facilities.

Environmental Consequences

The No Build Alternative would not change the capacity or geometry of the existing roadway. This alternative would include the necessary maintenance activities for the existing roadway to continue carrying vehicular traffic. Such maintenance activities would include mowing and pavement resurfacing/overlay reconstruction. Additionally, no bicycle/pedestrian facilities are planned under this alternative. The No Build Alternative would not improve existing or predicted safety conditions.

The Build Alternative is anticipated to provide an adequate transportation system with improved traffic operations through the following components:

- Conversion of the existing four-lane divided facility to a six- to 12-lane divided freeway.
- Frontage roads would be added providing improved access for existing and future residents and businesses.
- Construction of express lanes, which would accommodate truck traffic from the Shoal Point Terminal and reduce car/truck interaction on the SH 146 main lanes.
- Removal of at-grade and signalized intersections along the main lanes of SH 146, resulting in the traffic separation and operational improvements such as U-turns and ramps.
- Construction of a grade-separated intersection at Red Bluff, Repsdorph Road, and NASA Road 1, which provides for an elevated crossing of the SH 146 main lanes.
- Addition of bicycle/pedestrian facilities separated from the main lanes.

Population Trends

Existing Environment

The communities within the study area affected by the proposed project include the cities of Kemah and Seabrook. Population estimates and projections indicate substantial growth in the study area over the next several years (**Table 13**). Over a 10-year period from 1990 to 2000, growth patterns in the study area jurisdictions ranged from a significant population increase in Kemah (113.0 percent) to a more moderate increase in Seabrook (41.3 percent). By 2030, the increase in population within these communities is estimated to begin slowing. In Kemah, the 2030 population is projected at 3,885 persons, representing a

9.4 percent increase between 2020 and 2030. In Seabrook, the 2030 population is projected at 16,771 persons, representing a 16.7 percent increase between 2020 and 2030.

At the local level, in 2000, there were 7,331 residents within the 230 Census Blocks that comprise the demographic study area. The distribution of these residents by Census Blocks is summarized in **Table 14**. The population of the cities of Kemah and Seabrook was 2,330 and 9,443 residents, respectively.

Table 13: Population Trends

Geographic Area	Population						
	1980 Census	1990 Census	2000 Census	2010 Census	2020 Projection	2030 Projection	2040 Projection
Kemah	N/A	1,094	2,330	1,773	3,550	3,885	4,021
Seabrook	4,670	6,685	9,443	11,952	14,377	16,771	19,141
Harris County	2,409,547	2,818,199	3,400,578	4,092,459	4,629,335	5,180,439	5,731,543
Galveston County	195,738	217,399	250,158	291,309	284,731	294,218	298,057
Geographic Area	**Percent Change**						
	1980-1990	**1990-2000**	**2000-2010**	**2010-2020**	**2020-2030**	**2030-2040**	
Kemah	N/A	113.0	-23.9	100.2	9.4	3.5	
Seabrook	43.1	41.3	26.6	20.3	16.7	14.1	
Harris County	17.0	20.7	20.4	13.1	11.9	10.6	
Galveston County	11.1	15.1	16.5	-2.3	3.3	1.3	

Source: U.S. Census Bureau, Census 2000 (1980, 1990 and 2000 data), Census 2010 data, and Texas Water Development Board 2011 Projections (2020, 2030, 2040 data).

Environmental Consequences

The No Build Alternative is not anticipated to affect population growth trends in Harris and Galveston Counties.

The Build Alternative would not affect population growth trends. Urban development within the cities of Seabrook and Kemah is expected to change independently of the proposed project. However, improving access and managing congestion along the project corridor would lessen the effect of a growing population and complement associated development.

Environmental Justice

Existing Environment

It is important to take into consideration the effects that the proposed project would have on minority and low-income groups. This is supported by several federal laws and regulations that require the evaluation of the effects of a transportation action on these communities that, historically, have not actively participated in the decision-making process.

Background

Title VI of the Civil Rights Act of 1964 and related statutes require that federal agencies ensure that no person is excluded from participation in, denied the benefit of, or subjected to discrimination under any program or activity that receives federal financial assistance on the basis of race, color, national origin, age, sex, disability, or religion.

The need to identify low-income and minority populations and include them in the project's decision-making process gained greater emphasis as a result of Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994). This order directs all federal agencies to determine whether a proposed action would have a disproportionately high and adverse impact on minority and/or low-income populations. It also requires consideration of whether these populations would share equally in the benefits of the proposed action.

Environmental justice refers to the equitable treatment of people of all races, cultures, and income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Implementation of environmental justice regulations for highway projects is governed by the 1997 USDOT *Order on Environmental Justice to Address Environmental Justice in Minority Populations and Low-Income Populations* (DOT Order 5610.2). The environmental justice guidance particularly emphasizes the importance of the NEPA public participation process, directing that "each federal agency shall provide opportunities for community input in the NEPA process." Agencies are further directed to "identify potential effects and mitigation measures in consultation with affected communities, and improve the accessibility of meetings, crucial documents, and notices." The FHWA guidelines regarding environmental justice are contained in *FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*" (FHWA 1998). This publication requires all programs and activities of FHWA to comply with Executive Order 12898 and DOT Order 5610.2.

There are three fundamental environmental justice principals that are to be considered in the application of this FHWA order:

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations;
- To ensure the full and fair participation by all potentially affected communities in the decision-making process; and
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

For purposes of environmental justice, the USDOT defines "minority" as those persons identifying themselves as: Black or African American, American Indian and Alaska Native, Native Hawaiian and other Pacific Islander, Asian, Hispanic, or other non-white persons including those persons of two or more races. Furthermore, the Department of Health and Human Services (DHHS) defines the poverty threshold (median household income) for low-income populations for a family of four in 2012 as $23,050 (DHHS 2012). "Low-income" is defined as persons with a median household income at or below the DHHS poverty guidelines. The data being examined in this report is the most recent available for the U.S. Census Bureau (2010), although the current poverty threshold is used for comparison. The emphasis on

populations in DOT guidance means that all populations should be identified and given meaningful opportunities for input, and that impacts to these populations should be evaluated and compared to the impacts to non-environmental justice populations; the presence of environmental justice populations or impacts to those populations do not inherently establish disproportionately.

According to FHWA Order 6640.23 and DOT Order 5610.2, disproportionately high and adverse effects on minority or low-income populations are generally defined as adverse effects predominantly borne by a minority population and/or low-income population; or would be suffered by the minority population and/or low-income population, and is appreciably more severe or greater in magnitude than the adverse effect that would be suffered by the non-minority population and/or non-low-income population (FHWA 1998, USDOT 1997).

The environmental justice methodology relies upon a combination of U.S. Census data, input from citizens and local officials, and windshield surveys to identify impacts to environmental justice populations. Locations of environmental justice populations were identified early in the project development process to facilitate avoidance and minimization of adverse impacts. Demographic characteristics pertaining to race and income for the project demographic study area were collected from the US Census 2010 databases and are identified in **Table 14** and **15**, respectively.

Identification of Environmental Justice Populations

Census Block Groups are the smallest Census data unit for which all parameters needed to conduct an environmental justice assessment are available. However, race and ethnicity is available at the Census Block level. This data combined with observations from public outreach and coordination enabled the assessment of community-level racial and ethnic composition.

Minority Populations: The proposed project encompasses a total of 230 blocks adjacent to or within 2,000 feet of the proposed project, which represents the demographic study area for minority populations. The racial and ethnic composition of the demographic area was examined in order to identify the presence or absence of minority populations in the vicinity of the project.

Table 14 shows the racial/ethnic composition of each Census Block within the demographic area and the corresponding Census Block Group in which the block is located. The 230 blocks are located within a total of 11 block groups. Of the 230 blocks, 109 of them contain reported populations and are included in **Table 14** below. The other 111 blocks reported zero people and were therefore excluded from the table. The white population within the 109 Census Blocks is 75.6 percent, which is slightly lower than that of the 11 block group area (77.4 percent). Census Tract 7212.01, Block Group 1, near the southern end of the project on the west side of SH 146, has the largest percentage of minority populations (33.4 percent). Census Tract 7216, Block Group 1, also located at the southern end of the project but on the Eastern side of SH 146, has the second largest minority population (31.2 percent) as well as the largest Hispanic population of 28.4 percent.

Table 14: Minority Populations

Geographic Area	Total Population	Not Hispanic or Latino							% Hispanic or Latino of Any Race	% Total Minority Population
		% White	% Black / African American	% AIAN*	% Asian	% NHPI*	% Some Other Race	% Two or More Races		
Block Group Area										
11 Block Group Area	16,936	77.4%	4.0%	0.4%	4.0%	0.0%	0.2%	1.0%	13.0%	22.6%
Blocks										
Blocks within Block Group 1, Census Tract 7212.02, Galveston County, Texas										
1001	766	76.2	7.0	0.1	3.8	0.0	0.3	2.3	10.2	23.8
Total for BG 1, CT 7212.02	766	76.2	7.0	0.1	3.8	0.0	0.3	2.3	10.2	23.8
Blocks within Block Group 3, Census Tract 7214, Galveston County, Texas										
3005	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total for BG 3, CT 7214	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Blocks within Block Group 1, Census Tract 7212.01, Galveston County, Texas										
1001	527	66.6	7.8	0.6	13.3	0.0	0.4	0.6	10.8	33.4
Total for BG 1, CT 7212.01	527	66.6	7.8	0.6	13.3	0.0	0.4	0.6	10.8	33.4
Blocks within Block Group 1, Census Tract 7216, Galveston County, Texas										
1020	115	93.0	0.9	0.9	0.9	0.0	0.0	0.0	4.3	7.0
1042	109	9.2	0.0	0.0	0.0	0.0	0.0	0.0	90.8	90.8
1014	13	76.9	7.7	0.0	7.7	0.0	0.0	0.0	7.7	23.1
1023	44	88.6	0.0	0.0	0.0	0.0	0.0	0.0	11.4	11.4
1004	10	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1016	7	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1041	48	89.6	0.0	0.0	0.0	0.0	0.0	0.0	10.4	10.4
1018	2	50.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	50.0
1028	10	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1015	4	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0
1019	4	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1043	4	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1017	11	81.8	0.0	0.0	0.0	0.0	0.0	0.0	18.2	18.2
1027	31	90.3	0.0	0.0	0.0	0.0	0.0	6.5	3.2	9.7
1025	14	78.6	0.0	0.0	0.0	0.0	0.0	0.0	21.4	21.4
Total for BG 1, CT 7216	426	68.8	0.5	0.2	1.4	0.0	0.0	0.7	28.4	31.2

Table 14, Cont.: Minority Populations

Geographic Area	Total Population	Not Hispanic or Latino							% Hispanic or Latino of Any Race	% Total Minority Population
		% White	% Black / African American	% AIAN*	% Asian	% NHPI*	% Some Other Race	% Two or More Races		
Blocks within Block Group 4, Census Tract 7215, Galveston County, Texas										
4014	14	85.7	0.0	0.0	0.0	0.0	0.0	0.0	14.3	14.3
4052	20	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4055	21	42.9	0.0	0.0	0.0	0.0	0.0	0.0	57.1	57.1
4018	20	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4062	13	46.2	15.4	0.0	0.0	0.0	0.0	0.0	38.5	53.8
4012	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4063	5	40.0	0.0	0.0	0.0	0.0	0.0	20.0	40.0	60.0
4042	12	91.7	0.0	0.0	0.0	0.0	0.0	0.0	8.3	8.3
4010	36	86.1	0.0	0.0	0.0	0.0	0.0	5.6	8.3	13.9
4013	5	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4019	62	90.3	0.0	0.0	0.0	0.0	0.0	3.2	6.5	9.7
4011	3	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
4058	6	83.3	16.7	0.0	0.0	0.0	0.0	0.0	0.0	16.7
4057	11	63.6	0.0	0.0	0.0	0.0	0.0	0.0	36.4	36.4
4050	22	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4064	16	56.3	0.0	0.0	18.8	0.0	0.0	0.0	25.0	43.8
4016	60	93.3	0.0	0.0	1.7	0.0	0.0	0.0	5.0	6.7
Total for BG 4, CT 7215	327	83.2	1.8	0.0	1.2	0.0	0.0	1.5	12.2	16.8
Blocks within Block Group 1, Census Tract 3416, Harris County, Texas										
1059	5	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1080	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1033	4	50.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	50.0
1010	79	69.6	3.8	1.3	0.0	0.0	0.0	0.0	25.3	30.4
1014	25	68.0	0.0	0.0	20.0	0.0	0.0	8.0	4.0	32.0
1015	66	78.8	7.6	0.0	0.0	0.0	0.0	4.5	9.1	21.2
1013	39	64.1	10.3	0.0	12.8	0.0	0.0	0.0	12.8	35.9
1012	42	59.5	2.4	0.0	11.9	0.0	0.0	0.0	26.2	40.5
1022	10	90.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	10.0
1058	4	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1029	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1011	65	58.5	0.0	0.0	6.2	0.0	0.0	0.0	35.4	41.5
1008	22	86.4	9.1	0.0	0.0	0.0	0.0	0.0	4.5	13.6

Table 14, Cont.: Minority Populations

Geographic Area	Total Population	Not Hispanic or Latino							% Hispanic or Latino of Any Race	% Total Minority Population
		% White	% Black / African American	% AIAN*	% Asian	% NHPI*	% Some Other Race	% Two or More Races		
1016	37	62.2	0.0	0.0	0.0	0.0	0.0	0.0	37.8	37.8
1031	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1052	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0
1072	7	71.4	0.0	0.0	0.0	0.0	0.0	0.0	28.6	28.6
1063	6	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1070	3	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1060	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0
1030	86	74.4	1.2	0.0	0.0	0.0	0.0	5.8	18.6	25.6
1007	77	84.4	7.8	1.3	0.0	0.0	0.0	0.0	6.5	15.6
1057	4	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1062	11	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1020	14	78.6	0.0	0.0	0.0	0.0	0.0	0.0	21.4	21.4
1071	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1069	14	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1056	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1042	9	77.8	0.0	11.1	0.0	0.0	0.0	0.0	11.1	22.2
1053	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1009	18	83.3	0.0	0.0	0.0	0.0	0.0	0.0	16.7	16.7
1079	5	80.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0
1051	4	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1006	51	70.6	0.0	2.0	3.9	0.0	0.0	0.0	23.5	29.4
Total for BG 1, CT 3416	721	74.1	3.1	0.6	2.9	0.0	0.0	1.7	17.8	25.9
Blocks within Block Group 2, Census Tract 3416, Harris County, Texas										
2018	115	68.7	0.0	1.7	18.3	0.0	0.0	0.0	11.3	31.3
2014	28	67.9	3.6	0.0	0.0	0.0	0.0	0.0	28.6	32.1
2012	32	90.6	3.1	0.0	0.0	0.0	0.0	0.0	6.3	9.4
2013	142	72.5	1.4	0.0	8.5	0.0	0.0	0.7	16.9	27.5
2008	303	81.8	3.3	0.3	4.3	0.0	0.0	1.7	8.6	18.2
2019	337	60.8	4.7	0.3	4.7	0.0	0.3	1.5	27.6	39.2
Total for BG 2, CT 3416	957	71.4	3.1	0.4	6.5	0.0	0.1	1.1	17.3	28.6
Blocks within Block Group 1, Census Tract 3415.01, Harris County, Texas										
1017	165	76.4	2.4	0.0	7.3	0.0	0.0	0.6	13.3	23.6

Table 14, Cont.: Minority Populations

Geographic Area	Total Population	Not Hispanic or Latino							% Hispanic or Latino of Any Race	% Total Minority Population
		% White	% Black / African American	% AIAN*	% Asian	% NHPI*	% Some Other Race	% Two or More Races		
1024	24	75.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	25.0
1025	9	88.9	0.0	0.0	0.0	0.0	0.0	0.0	11.1	11.1
1023	33	81.8	0.0	0.0	0.0	0.0	0.0	0.0	18.2	18.2
1018	29	72.4	0.0	0.0	20.7	0.0	0.0	0.0	6.9	27.6
1036	25	92.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0	8.0
1002	74	79.7	1.4	0.0	1.4	0.0	0.0	0.0	17.6	20.3
1037	25	72.0	0.0	0.0	20.0	0.0	0.0	4.0	4.0	28.0
1022	30	70.0	0.0	3.3	0.0	0.0	0.0	0.0	26.7	30.0
1015	38	68.4	0.0	0.0	15.8	0.0	0.0	2.6	13.2	31.6
1019	435	72.0	5.1	0.0	9.9	0.0	0.7	0.5	12.0	28.0
1001	62	71.0	9.7	0.0	9.7	0.0	0.0	4.8	4.8	29.0
1016	39	76.9	0.0	0.0	0.0	0.0	0.0	0.0	23.1	23.1
1021	17	76.5	0.0	0.0	23.5	0.0	0.0	0.0	0.0	23.5
Total for BG 1, CT 3415.01	1005	74.3	3.3	0.1	8.3	0.0	0.3	0.9	12.8	25.7
Blocks within Block Group 3, Census Tract 3416, Harris County, Texas										
3085	25	96.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0
3090	14	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3084	19	89.5	0.0	10.5	0.0	0.0	0.0	0.0	0.0	10.5
Total for BG 3, CT 3416	58	94.8	0.0	3.4	0.0	0.0	0.0	0.0	1.7	5.2
Blocks within Block Group 2, Census Tract 3415.02, Harris County, Texas										
2013	31	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	13	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2011	1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	26	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2014	8	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total for BG 2, CT 3415.02	79	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Blocks within Block Group 1, Census Tract 3415.02, Harris County, Texas										
1016	58	81.0	0.0	3.4	0.0	0.0	0.0	0.0	15.5	19.0
1004	535	78.5	6.2	0.0	4.1	0.0	0.2	1.1	9.9	21.5
1011	88	86.4	1.1	0.0	2.3	0.0	0.0	0.0	10.2	13.6
1001	21	57.1	9.5	0.0	28.6	0.0	0.0	4.8	0.0	42.9

Table 14, Cont.: Minority Populations

Geographic Area	Total Population	Not Hispanic or Latino							% Hispanic or Latino of Any Race	% Total Minority Population
		% White	% Black / African American	% AIAN*	% Asian	% NHPI*	% Some Other Race	% Two or More Races		
1013	583	82.7	1.9	0.2	7.2	0.0	0.0	1.7	6.3	17.3
1009	54	81.5	0.0	0.0	1.9	0.0	0.0	0.0	16.7	18.5
1022	28	92.9	0.0	0.0	3.6	0.0	0.0	0.0	3.6	7.1
1019	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1002	107	73.8	2.8	0.0	16.8	0.0	0.0	2.8	3.7	26.2
1014	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1015	23	91.3	8.7	0.0	0.0	0.0	0.0	0.0	0.0	8.7
1003	45	82.2	0.0	0.0	2.2	0.0	0.0	0.0	15.6	17.8
Total for BG 1, CT 3415.02	1545	80.7	3.4	0.2	6.0	0.0	0.1	1.3	8.3	19.3

Source: U.S. Census Bureau, *Census 2010: Summary Tape File 1*.
Note: Geographic Area was determined to be an 11 block group area that encompasses all blocks (230) adjacent to or within 2,000 feet of the proposed project. Blocks that included reported populations were included in the table while those with zero population were not.

* AIAN - American Indian and Alaska Native, NHPI - Native Hawaiian and Other Pacific Islander, CT - Census Tract, BG - Block Group

Low-Income Populations: The proposed project encompasses a total of 11 Census Block Groups adjacent to or within 2,000 feet of the proposed project, which represents the demographic study area for low-income populations. **Table 15** presents the median household income and persons of poverty status for each of the Census Block Groups within the demographic area as well as the corresponding Census Tract in which each block group is located. The demographic study area was analyzed for persons of poverty status based on the 2012 DHHS poverty threshold of $23,050. The proposed project encompasses a total of 11 Census Block Groups within eight Census Tracts.

Within the eight Census Tract study area, approximately 8.4 percent of the households are below the federal poverty level, which is slightly lower than the households below the poverty level reported for the specific Block Groups (9.8 percent). Census Tract 3415.02, Block Group 1 (19.4 percent) and Census Tract 7216, Block Group 1 (19.2 percent) have the highest percentages of households below the federal poverty level.

Table 15: Median Household Incomes and Poverty Status

Geographic Area	2010 Households*		Median Household Income		Households Below Poverty Level**	
	Estimate	Standard Error (SE)	Estimate	Standard Error (SE)	Estimate	Standard Error (SE)
Census Tracts and Study Area Block Groups						
CT 3415.01	2,219	103	$81,422	9,561	229	11
Block Groups within Census Tract 3415.01, Harris County, Texas						
1	853	66	$128,533	13,103	28	15
CT 3415.02	1,843	103	$49,903	4,962	233	12
Block Groups within Census Tract 3415.02, Harris County, Texas						
1	1,256	94	$83,750	24,729	119	14
2	587	91	$43,750	5,252	114	4
CT 3416	1,965	99	$80,640	10,211	172	10
Block Groups within Census Tract 3416, Harris County, Texas						
1	525	92	$59,196	41,984	44	17
2	1,027	94	$90,650	5,068	105	3
3	413	68	$68,032	3,841	23	15
CT 7212.01	916	61	$72,548	5,751	92	8
Block Groups within Census Tract 7212.01, Galveston County, Texas						
1	563	77	$82,782	26,147	101	6
CT 7212.02	2,882	82	$103,158	7,536	192	12
Block Groups within Census Tract 7212.02, Galveston County, Texas						
1	916	61	$72,548	5,751	92	11
CT 7214	5,371	154	$86,197	3,333	351	12
Block Groups within Census Tract 7214, Galveston County, Texas						
3	999	86	$95,901	12,191	86	4
CT 7215	682	64	$41,786	3,502	131	9
Block Groups within Census Tract 7215, Galveston County, Texas						
4	487	50	$82,125	11,043	69	4
CT 7216	3,287	111	$78,381	3,627	208	10
Block Groups within Census Tract 7216, Galveston County, Texas						
1	682	64	$41,786	3,502	131	12

Source: American Community Survey 5-yr (2006-2010) Estimates.
Notes: Geographic Area was determined to be an eight Census Tract area that encompasses 11 block groups adjacent to or within 2,000 feet of the proposed project.
*Number of Households determined by the ACS 5-yr estimates for the proposed project area.
**Number of Households below the DHHS 2012 Poverty Guideline for a family of four ($23,050) but only includes those households whose estimates are below $20,000.

Environmental Consequences

Minority Populations: As shown in **Table 14**, the total minority population residing in the 11 Census Block Group demographic study area is 22.6 percent. A total of 40 of the 109 blocks with reported

populations have total minority populations greater than 22.6 percent. As indicated in **Table 14**, the percentage of minority and ethnic residents does vary considerably among the Census Blocks within the 11 Census Block Group demographic study area. **Exhibit 6a** illustrates the locations of the minority populations within Census Tracts, Block Groups and Blocks.

Low-Income Populations: The proportion of low-income households varies greatly among the Census Block Groups within the eight Census Tract study area (3.3 to 19.4 percent). **Table 15** shows the number of low-income households for each of the Census Tracts and Census Block Groups in the demographic study area based on American Community Survey five-year estimates (2006-2010) data. Based on this information, eight of 11 Census Block Groups have higher percentages of low income households than the total percentage (8.4) of low income households in the eight Census Tract study area. Six of the 11 Block Groups contain higher percentages of low income households than the corresponding Census Tracts in which they are located. However, only one of the Block Groups (Census Tract 7216, Block Group 1) is substantially higher (e.g., more than two times) in terms of the number of low income households compared to the corresponding Census Tract in which it is located. The percentage of low income households in this particular Census Block Group is 19.2 percent while the percentage of low income households reported in Census Tract 7216 is 6.3 percent. This area is located at the southern end of the project on the east side of SH 146 and also has the second largest minority population (31.2 percent) as well as the largest Hispanic population (28.4 percent) reported at the Block Group level. **Exhibit 6b** illustrates the location of the Census Tracts and Block Groups.

Additional Factors: In order to determine if the proposed project would result in “disproportionately high and adverse effects" on a minority or low-income population, or deny benefits to these populations, several other factors, in addition to the demographic profile of the study area, are also considered.

- Community Cohesion: Based on the preliminary design plans for the proposed project, the Build Alternative would not result in major divisions or isolation of close-knit neighborhoods or cohesive communities within the study area as a result of the proposed project. The Lake Pointe Forest and Harbor Homes neighborhoods as well as other neighborhoods located within the study area would benefit from improved accessibility and additional capacity resulting from the proposed project as well as additional capacity improvements planned on SH 146 that would provide access to community facilities.

- Displacements: The proposed project would result in the potential relocation of 52 businesses (including, at least, 53 commercial buildings) and one residence, as discussed in the Relocations and Right-of-Way Acquisition section of this document. The businesses and residence are identified in **Table 8** and are primarily located along the east and west sides of SH 146 from Repsdorph Road to NASA Road 1 (see **Exhibit 5**). Some of these businesses and the residence may choose to relocate within the community; however, some may chose not to re-open or decide to relocate in the study area. A loss of jobs due to business relocations or closings may occur as a result of the proposed project.

  The two residences that would be affected by the proposed project are located within Census Tract 3416, Block Group 2. As indicated on **Exhibit 6a** and in **Table 14** this particular Census Tract Block Group does include minority populations (mostly Hispanic). As indicated in **Exhibit 6b** the

median household income for this same area ranges from $90,001-$100,000 per year. **Table 15** indicates that approximately 10 percent of the households in this area are considered low income. Based on the Census data evaluated there is a high probability that the affected residences could be minorities and a low probability that they would be low income households. The businesses are primarily located in three of the 11 Block Groups (Census Tract 3415.02, Block Group 1; Census Tract 3416, Block Group 2; and Census Tract 3416, Block Group 3). Based on the Census data evaluated, these areas are likely to have minority populations and less likely to have low income households than other Census Tract Block Groups included in the demographic study area. Areas representing a higher percentage minority population are generally located east of SH 146 just south of Repsdorph Road, west of SH 146 between Marina Bay Drive and Grove Road, and east of SH 146 near FM 518. Additional information on the area's workforce, including minority representation, is provided in the *Business and Employment* section of this document.

As a result of the proposed project, it is possible workers including minority workers with limited transportation options may encounter difficulty maintaining employment with their present employers should businesses relocate. These employees may be forced to seek employment opportunities within or outside the study area. Businesses such as restaurants, entertainment, and/or retail establishments would likely relocate in the general area due to their existing customer base. However, any larger establishments, such as industrial facilities, may need to relocate to areas where land or facilities are available to accommodate their businesses.

The proposed project would not discourage or provide disincentives to commercial development and redevelopment. Improved mobility along SH 146 would be an incentive to future development or redevelopment along the project corridor. Any increase in mobility from the proposed improvements is anticipated to enhance the area's attractiveness to future business development. Over the long-term, the entire community would benefit from the proposed project as a result of improved mobility and reduced traffic congestion. Additionally, access would not be restricted to any existing public or community service, commercial area, business, or employment center. Any inconveniences of the roadway being used for access to residences or businesses would be minimized during project construction.

- Transportation Needs: In addition to establishing locations of minority and low-income residents, transportation needs of these populations must also be considered. Minority and low-income populations are not expected to experience any reductions or significant delays of any benefits associated with increased access, nor are they expected to experience disproportionate adverse effects due to increased capacity.

  Greater access to employment centers, shopping, and the numerous recreational areas located within the vicinity of the project is anticipated to improve with additional capacity resulting from the Build Alternative. Additionally, a safer, more easily accessible and user-friendly shared use path and sidewalks for bicycle and pedestrian travel would adequately serve any population commuting to destinations along the SH 146 Corridor or outlying area.

Summary

Based on field observations and data from the 2010 Census, it is likely that the proposed Build Alternative could affect some portion of the minority population in the demographic study area since approximately 22.6 percent of the area is considered a minority. It is less likely that low income households would be affected since less than 10% of the total households in the demographic study area qualify as low income. Effects could be both adverse (i.e. potential loss of employment opportunities due to direct effects on some adjacent businesses) and beneficial (i.e. drivers would experience fewer delays and less congestion as the result of the improved transportation facility).

As described elsewhere in this section, the direct impacts to minority and low-income populations have been largely avoided, and at the same time, the project has been enhanced to facilitate the sharing of project benefits by minority and low-income populations. Two residential displacements would occur as a result of the project. However, no disproportionately high and adverse impacts, resulting from relocation activities, to low-income and/or minority residents would occur. Similarly, the project is not expected to result in disproportionately high and adverse impacts to the visual environment within the Lake Pointe Forest and Harbor Homes neighborhoods as well as the unnamed neighborhood in the southern portion of the study area, as compared to the visual impacts that would be experienced throughout the project corridor. There may be short-term, localized effects to air quality (i.e. increase in dust) and noise levels (i.e. generated by construction equipment) in the immediate area adjacent to the project during construction. These effects would be temporary and would not be selectively limited to minority or low-income communities, but would potentially affect residential and business communities located in the immediate area adjacent to the proposed project.

In the long-term, the entire community would benefit from the proposed project. These benefits include accessibility and safety improvements, potential economic development opportunities, and decreased traffic congestion. The other project benefits are anticipated to be available to and shared by both environmental justice and non-environmental justice populations in the study area.

Based on the above discussion, the proposed project would not cause disproportionately high and adverse effects on any minority or low-income populations as discussed in the Executive Order 12898 regarding environmental justice.

Limited English Proficiency

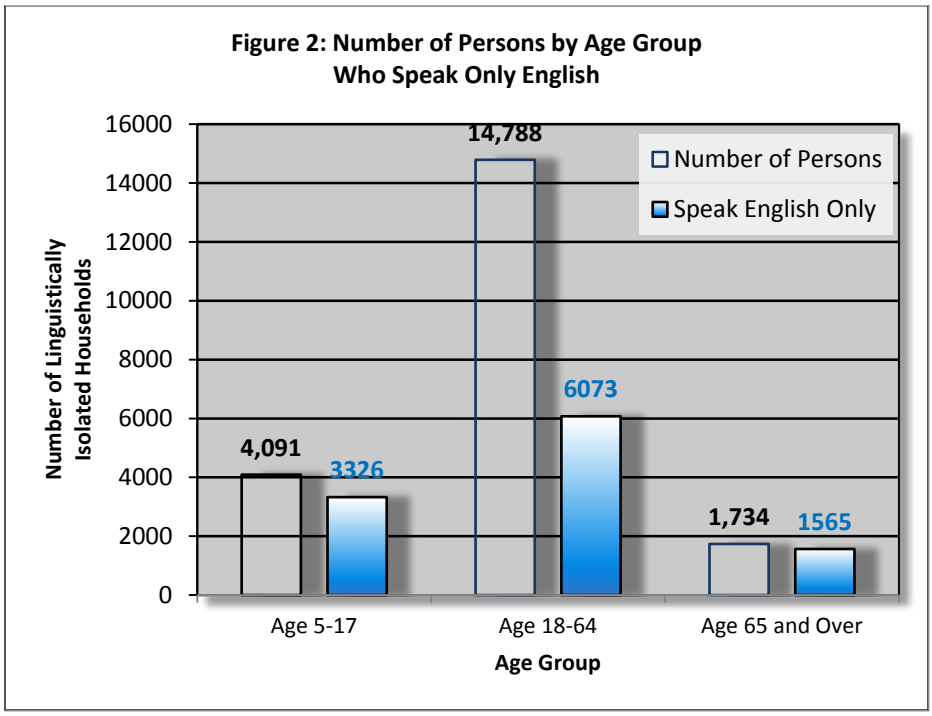
Executive Order 13166, entitled "Improving Access to Services for Persons with Limited English Proficiency," mandates that federal agencies examine the services they provide and develop and implement a system by which Limited English Proficiency (LEP) persons can meaningfully access those services consistent with, and without unduly burdening, the fundamental mission of the agency. Each agency shall also work to ensure that recipients of federal financial assistance (recipients) provide meaningful access to their LEP applicants and beneficiaries (65 Federal Register 50123, August 16, 2000).

Existing Environment

Information on Language Used by 11 Census Block Group Area Residents

- Over 80 percent of the population in the 11 block group area between 5 and 17 years old speak only English (see **Figure 2**). The percentage of the population who speak only English decreases significantly with age, with only 40 percent of individuals between the ages of 18-64 speaking only English. The majority of the population (90+ percent) 65 and older speak only English.

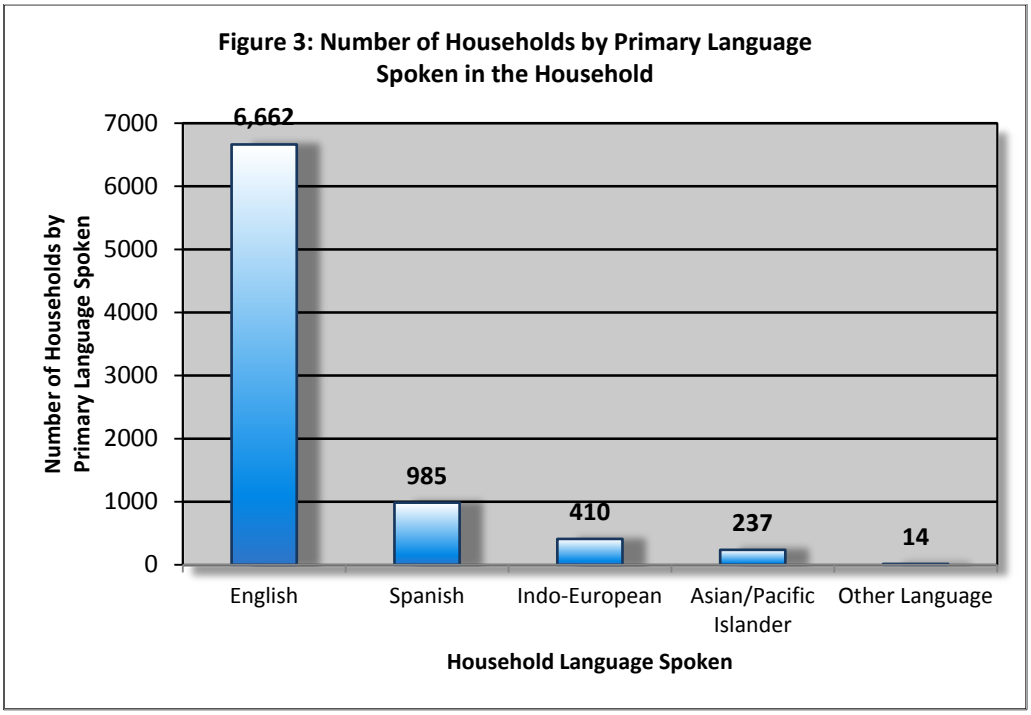
Figure 2: Proportion of population by age group who speak only English



Source: American Community Survey 5-year (2006-2010) Estimates.

- Among households, over 80 percent of those in the 11 Block Group area are predominately English speaking (see **Figure 3**).
- Approximately 12 percent of households in the 11 Block Group area are predominantly Spanish speaking households. Approximately five percent of the households are predominantly Indo-European speaking households. Approximately three percent of the households are predominantly Asian and Pacific Islander speaking households. Households speaking other languages (including languages such as Navajo, Cherokee, Hungarian, Arabic, and Hebrew) accounted for less than one percent of all households in the 11 Block Group area. These numbers represent a person's primary language, but do not necessarily preclude them from speaking English.

Figure 3: Households by predominant language spoken in the household



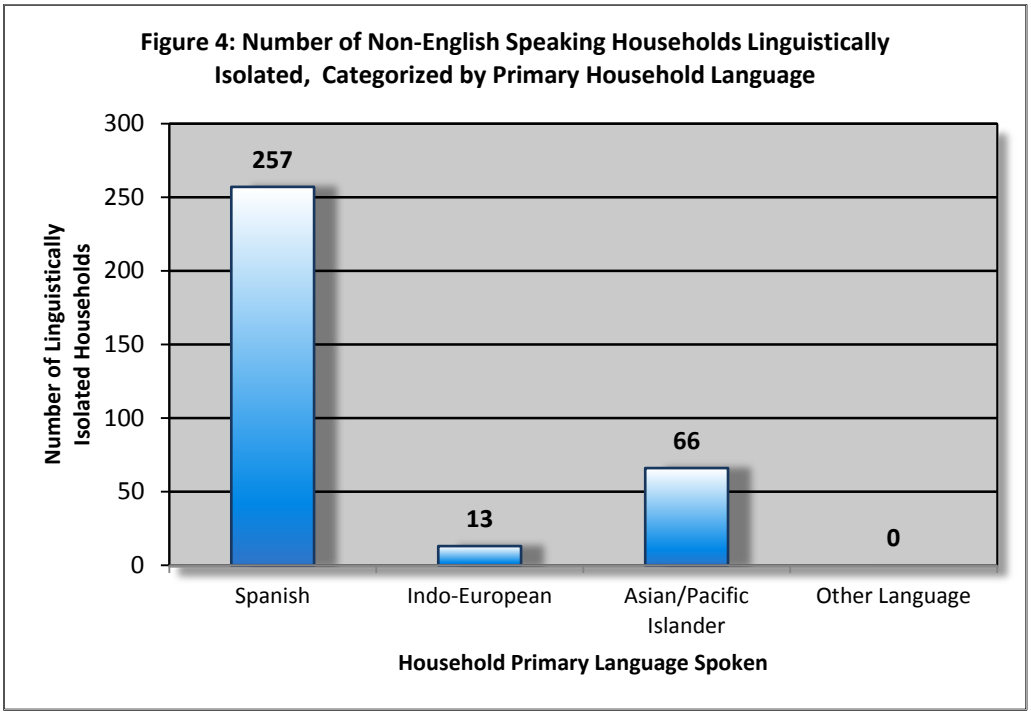
Source: American Community Survey 5-year (2006-2010) Estimates.

The following figure (**Figure 4**) represents the proportion of households that predominantly speak a language other than English and the proportion of those non-English speaking households which are linguistically isolated.

A household is linguistically isolated when no person 14 years old and over speaks only English and no person 14 years old and over who speaks a language other than English speaks English "very well." In other words, a household in which all members 14 years old and over speak a non-English language and also speak English less than “very well” (have difficulty with English and thus is considered LEP) is “linguistically isolated.” All the members of a linguistically isolated household are tabulated as linguistically isolated, including members under 14 years old who may speak only English.

- As a percentage of all households, approximately four percent are linguistically isolated.
- Approximately 26 percent of the Spanish speaking households in the 11 Block Group area are identified as linguistically isolated.
- Approximately 28 percent of the Asian and Pacific Islander specific language speaking households are estimated to be linguistically isolated.
- Less than four percent of households speaking Indo-European predominantly were determined to be linguistically isolated.
- No households speaking other languages (including languages such as Navajo, Cherokee, Hungarian, Arabic, and Hebrew) are considered to be linguistically isolated.

Figure 4: Number of non-English speaking households that are linguistically isolated, categorized by primary household language



Source: American Community Survey 5-year (2006-2010) Estimates.

Environmental Consequences

Data collected from the American Community Survey 5-year (2006-2010) Estimates and a field reconnaissance indicated that English was the main language used for signage on buildings and other forms of posted information/advertisements along the project corridor. No specific area or neighborhood was identified that would likely contain substantial concentrations of persons with LEP.

Based on the percentage of English speaking populations within the study area and the field reconnaissance, public involvement activities (i.e., public meetings) have been conducted in English. However, because the study area consists of a larger percentage of Spanish speaking households that are considered linguistically isolated as compared to other non-English speaking households, announcements for public meetings have been published in a Spanish-language paper, *La Subasta*. Furthermore, reasonable arrangements (e.g. interpreters) have been and would continue to be made for persons who have special communication or accommodation needs upon notification of TxDOT at least two days prior to a meeting or public hearing.

For this project, TxDOT would continue to comply with Executive Order 13166 by offering to meet the needs of persons requiring special communication or accommodations in all public involvement activities and notices. Therefore, the requirements of Executive Order 13166 appear to be satisfied.

Business and Employment

Existing Environment

SH 146 serves as the primary corridor along east Galveston Bay, where the population is expected to grow nearly 57 percent (43,000 people) by 2025 (H-GAC 2005). As identified by the H-GAC, this corridor extends along SH 146 from I-10 East to Galveston Bay. Employment along the Galveston Bay is expected to grow nearly 41 percent by 2025, adding more than 22,000 jobs (H-GAC 2005). Major trip generators and attractors within the vicinity of the proposed project include the numerous business and marinas, recreational facilities such as Armand Bayou Park and Kemah Boardwalk, recent commercial development and sailboat/yacht facilities associated with Clear Lake and Galveston Bay, and transportation facilities such as Bayport Ship Channel Container/Cruise Terminal near La Porte and Shoal Point Terminal in Texas City.

Occupation and Class of Worker

Occupation and class of worker data is shown in **Table 16** for the six Census Tract area. The six Census Tract area adjacent to or within 2,000 feet of the proposed project was determined to be the smallest Census level available to evaluate the study area's workforce, which includes minority representation. Overall, the greatest number of workers in the six Census Tract area is employed as managerial and professional workers (50.6 percent) followed by sales and office workers (23.0 percent). Similarly, the minority representation of the workforce living within the same area is primarily managerial and professional workers (40.7 percent) followed by Service (19.6 percent) and Sales and Office workers (18.9 percent).

With regard to class of worker, the greatest percentage of workers in the six Census Tract area work for private, for-profit employers (72.6 percent). The minority representation of the workforce is similar, where 74.6 percent of the minority population works for private, for-profit employers (74.6 percent). The smallest percentage of paid workers in the six Census Tract area consists of Federal Government workers (4.2 percent) while approximately 2.9 percent of the minority population consists of Federal Government workers. In general, unemployment in the six Census Tract area (2.3 percent) is slightly lower than the unemployment level represented by the area's minority population (4.0 percent).

Table 16: Occupation and Class of Worker

Characteristic	Geographic Area [1]			
	Total Population		Minority Population	
	Number	*Percent*	*Number*	*Percent*
Occupation				
Managerial and Professional	10,519	50.6	960	40.7
Service	1,822	8.8	461	19.6
Sales and Office	4,769	23.0	445	18.9
Farming, Forestry, Fishing	95	0.5	62	2.6
Construction, Extraction, Maintenance	1,691	8.1	172	7.3
Production, Transportation, Materials Moving	1,873	9.0	256	10.9

Table 16, Cont.: Occupation and Class of Worker

Characteristic	Geographic Area [1]			
	Total Population		Minority Population	
	Number	*Percent*	*Number*	*Percent*
Class of Workers				
Private for Profit	15,088	72.6	1,758	74.6
Private, Not for Profit	926	4.5	75	3.2
Local Government	1,161	5.6	117	5.0
State Government	1,066	5.1	99	4.2
Federal Government	871	4.2	69	2.9
Self-Employed	1,250	6.0	141	6.0
Unpaid Family Workers	23	0.1	0	0.0
Unemployed	672	2.3	143	4.0

Source: U.S. Census Bureau, *Census 2000: Summary Tape File 4.*
Note: [1] Geographic Area was determined to be a six Census tract area adjacent to or within 2,000 feet of the proposed project.

Work Location

As shown in **Table 17**, nearly 57 percent of the total population living within the six Census Tract area travels less than 30 minutes to work, which is similar to the minority population living within the same area (59.0 percent). The majority of the population within the six Census Tract area that travels to their employment works outside their place (i.e. community) of residence (85.0 percent), which is also similar to the minority population that travels to their employment (83.8 percent). Within the six Census Tract area, the common means of transportation to work is by car, truck, or van (92.4 percent). The common means of transportation to work by the area's minority population is also by car, truck, or van (88.7 percent). Less than five percent of the population within the six Census Tract area, including the minority population, works from home.

Table 17: Economic Characteristics

Work Location/Other Parameter	Geographic Area [1]			
	Total Population		Minority Population	
	Number	*Percent*	*Number*	*Percent*
Place of Work				
Same Place as Residence	3,066	15.0	381	16.2
Outside Place as Residence	17,382	85.0	1,974	83.8
Travel Time to Work				
Less than 30 minutes	11,679	56.6	1,399	59.0
Less than 5 minutes	444	2.2	33	1.4
5 to 9 minutes	1,389	6.7	193	8.1
10 to 14 minutes	2,064	10.0	275	11.6
15 to 19 minutes	3,200	15.5	366	15.4
20 to 24 minutes	3,229	15.6	380	16.0
25 to 29 minutes	1,353	6.6	152	6.4
More than 30 minutes	8,188	39.7	934	39.4
Work from Home	779	3.8	38	1.6
Means of Transportation to Work				
Car, Truck, or Van	19,075	92.4	2,103	88.7
Public Transportation	223	1.1	25	1.1
Motorcycle	81	0.4	10	0.4
Bicycle	106	0.5	64	2.7
Walked	269	1.3	116	4.9
Other means	113	0.5	15	0.6

Source: U.S. Census Bureau, *Census 2000: Summary Tape File 4.*
Note: [1] Geographic Area was determined to be a six Census tract area adjacent to or within 2,000 feet of the proposed project.

Environmental Consequences

The No Build Alternative is not anticipated to result in a direct economic effect to the local economy. This alternative would neither improve nor change the economic characteristics of the study area.

As discussed in the *Relocations and Right-of-Way Acquisition* section of this document, the Build Alternative would affect 57 businesses, all primarily located along the east and west sides of SH 146 from Repsdorph Road to NASA Road 1. Of these businesses, additional ROW would be acquired from seven commercial properties and therefore, remove some commercial land from the local tax base. A total of 52 businesses (including, at least, 53 commercial buildings) would be displaced as a result of the proposed project. There are available commercial, retail, and industrial properties for sale or for lease to accommodate the relocation of these businesses, as further discussed in **Table 11** (HAR 2009). Twenty-three of the 52 businesses lease property from the Southern Pacific Railroad for the use of their establishment and would not require the same relocation assistance as the remaining 29 businesses.

Overall, the business acquisitions would cause some initial social disruptions; however, it is anticipated that new opportunities for businesses would occur as the area along SH 146 becomes more visible and accessible as a result of the proposed project (Stanton 2007). The resulting land use changes would likely

include the redevelopment of already developed areas and as a result, development within the study area would be expected to be more concentrated in areas already experiencing growth.

The redevelopment opportunities afforded by the improved access and increased safety would offset effects suffered from the loss of businesses and loss of jobs due to business relocations or closings that may occur as a result of the proposed project. In the long-term, increased roadway capacity would reduce congestion on SH 146, accommodate the increase in traffic due to the growing population, and provide easier access to businesses in and around the study area. This would decrease travel time and result in reduced vehicle operating costs for commuters using the highway. Increased accessibility would tend to induce additional land development, which could increase the property value of properties adjacent to the improved roadway and eventually increase the local tax base. Currently, it is not known what businesses plan on relocating within the community, which would become clearer with implementation of TxDOT's ROW Acquisition and Relocation Assistance Program. Acquisition and relocation assistance would be in accordance with the TxDOT ROW Acquisition and Relocation Assistance Program, as mandated by the URARPAA (see the *Relocations and Right-of-Way Acquisition* section of this document for more information).

Air Quality

The proposed project is located within Harris and Galveston Counties, which are designated as "severe" ozone nonattainment areas under the 8-hour National Ambient Air Quality Standards (NAAQS); therefore, the transportation conformity rules apply. Design year (2035) traffic is estimated to be 63,700 vehicles per day; therefore, a Traffic Air Quality Analysis (TAQA) is not required. Though the project is adding capacity, the design year average annual daily traffic (ADT) is less than 140,000 vehicles per day. The 140,000 ADT rate is a threshold based on a TxDOT modeling study which demonstrated that it is highly unlikely that the NAAQS for carbon monoxide (CO) would ever be exceeded on any project with traffic numbers below this level.

All projects in the H-GAC's TIP that are proposed for federal or state funds are initiated in a manner consistent with federal guidelines in Section 450, of Title 23 CFR and Section 613.200, Subpart B, of Title 49 CFR. Energy, environment, air quality, cost, and mobility considerations are addressed in the programming of the TIP. The U.S. Department of Transportation (USDOT, which includes FHWA/Federal Transit Administration {FTA}) found the 2013-2016 TIP to conform to the State Implementation Plan (SIP) on November 1, 2012. The widening of SH 146 from Red Bluff to FM 518 (CSJs: 0389-05-088, 0389-05-116, and 0389-06-095) is listed in the 2035 RTP Update, Appendix E pages 36 and 85.

<u>Congestion Management System</u>

The proposed project is adding SOV capacity; therefore, a CMS analysis is required. The Congestion Management Process (CMP) is a systematic process for managing congestion that provides information on transportation system performance and on alternative strategies for alleviating congestion and enhancing the mobility of persons and goods to levels that meet state and local needs. The project was developed from H-GAC's operational CMP, which meets all requirements of CFR §500.109. The CMP was adopted by H-GAC on January 25, 2013 and incorporated into the 2035 RTP and 2013-2016 TIP.

The region commits to operational improvements and travel demand reduction strategies at two levels of implementation: program level and project level. Program level commitments are inventoried in the regional CMP, which was adopted by H-GAC; they are included in the financially constrained 2035 RTP, and future resources are reserved for their implementation.

The CMP element of the plan carries an inventory of all project commitments (including those resulting from major investment studies) detailing type of strategy, implementing responsibilities, schedules, and expected costs. At the project programming stage, travel demand reduction strategies and commitments will be added to the regional TIP or included in the construction plans. The regional TIP provides for programming of these projects at the appropriate time with respect to the Single Occupancy Vehicle (SOV) facility implementation and project specific elements.

Committed congestion reductions strategies and operational improvements within the study boundary consist of various improvements. Individual projects are listed in **Table 18.**

Table 18: Congestion Management Strategies

Location	Type	Implementation Date
NASA Rd 1 from Space Center Boulevard to SH 146	Smart Street Improvements	1/1/2023
SH 146 at Red Bluff	Intersection Improvement (Construct Grade Separation)	8/1/2008
SH 146 from Red Bluff to Kemah Bridge	Signal Improvements	3/1/2006
Fairmont Parkway/Red Bluff from Beltway 8 to SH 146	Construct 4-lane (2 directions) Tollway in Median	1/1/2009
NASA Rd 1 from FM 270 to SH 146	Install Computerized Transportation Management System	8/1/2007
SH 146 from SH 146 southbound to Southern Access Road	Construct Direct Connector from southbound lanes of SH 146	10/1/2015

Source: H-GAC - 2035 RTP, 2009.

In an effort to reduce congestion and the need for SOV lanes in the region, TxDOT and H-GAC will continue to promote appropriate congestion reduction strategies through the Congestion Mitigation and Air Quality (CMAQ) program, the CMP, and the 2035 RTP. The congestion reduction strategies considered for this project would help alleviate congestion in the SOV study boundary, but would not eliminate it.

Therefore, the proposed project is justified. The CMP analysis for added SOV capacity projects in the TMA is on file and available for review at H-GAC.

PM 2.5 Analysis

The project is not located within a $PM_{2.5}$ nonattainment or maintenance area; therefore, a project level hot spot analysis is not required.

Mobile Source Air Toxic (MSAT) Analysis

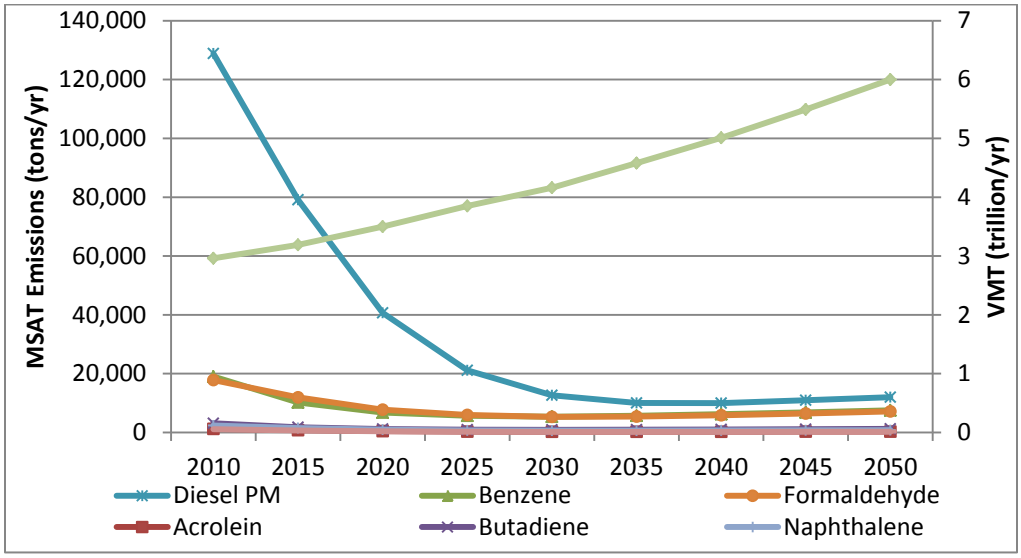
The project is not exempt under 40CFR 93.126 and is adding capacity and has a design year AADT <140,000; therefore, a qualitative analysis is required.

Background

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. Environmental Protection Agency (EPA) regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007) and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (IRIS) (http://www.epa.gov/ncea/iris/index.html). In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA) (http://www.epa.gov/ttn/atw/nata1999/). These are acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future rules.

The 2007 EPA Mobile Source Air Toxics (MSAT) rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. Based on an FHWA analysis using EPA's MOVES2010b model, as shown in **Figure 5** and **Table 1**, even if vehicle-miles travelled (VMT) increases by 102 percent as assumed from 2010 to 2050, a combined reduction of 83 percent in the total annual emissions for the priority MSAT is projected for the same time period.

Figure 5: National MSAT Emission Trends 1999-2050 for Vehicles Operating on Roadways Using EPA's MOVES2010B Model



Source: See Table 19 below.

Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

Table 19: Projected National MSAT Emission Trends 2010 – 2050 for Vehicles Operating on Roadways Using EPA's MOVES2010b Model

Pollutant / VMT	Pollutant Emissions (tons) and Vehicle-Miles Traveled (VMT) by Calendar Year									Change
	2010	2015	2020	2025	2030	2035	2040	2045	2050	2010 to 2050
Acrolein	1,244	805	476	318	258	247	264	292	322	-74%
Benzene	18,995	10,195	6,765	5,669	5,386	5,696	6,216	6,840	7,525	-60%
Butadiene	3,157	1,783	1,163	951	890	934	1,017	1,119	1,231	-61%
Diesel PM	128,847	79,158	40,694	21,155	12,667	10,027	9,978	10,942	11,992	-91%
Formaldehyde	17,848	11,943	7,778	5,938	5,329	5,407	5,847	6,463	7,141	-60%
Naphthalene	2,366	1,502	939	693	607	611	659	727	802	-66%
Polycyclics	1,102	705	414	274	218	207	219	240	262	-76%
Trillions VMT	2.96	3.19	3.5	3.85	4.16	4.58	5.01	5.49	6	102%

Source: EPA MOVES2010b model runs conducted during May – June 2012 by FHWA.

MSAT Research

Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how potential public health risks posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA. Nonetheless, air toxics concerns continue to be raised on highway projects during the NEPA process. Even as the science emerges, we are duly expected by the public and other agencies to address MSAT impacts in our environmental documents. The FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with highway projects. The FHWA will continue to monitor the developing research in this field.

Project-Specific MSAT Information

A qualitative analysis provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives, found at: http://www.fhwa.dot.gov/environment/air_quality/air_toxics/research_and_analysis/mobile_source_air_toxics/msatemissions.pdf

For each alternative in the report, the amount of MSAT emitted would be proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for each alternative. There are no estimated VMT changes between the Build Alternative and the No Build Alternative. This "no-change" in VMT would lead to no change in MSAT emissions for the preferred action alternative along the highway corridor, along with a corresponding change in MSAT emissions along the parallel routes. The emissions will be further offset somewhat by lower MSAT emission rates due to increased speeds; according to EPA's MOVES2010b model, emissions of all of the priority MSAT decrease as speed increases. Because there is only one build alternative, the estimated VMT is the same and there

would be no appreciable difference in overall MSAT emissions. Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by over 80 percent between 2010 and 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

The additional travel lanes contemplated as part of the project alternative will have the effect of moving some traffic closer to nearby homes, schools, and businesses; therefore, under each alternative there may be localized areas where ambient concentrations of MSAT could be higher under the Build Alternative than the No Build Alternative. The localized increases in MSAT concentrations would likely be most pronounced along the expanded roadway sections that would be built along SH 146 under the Build Alternative. However, the magnitude and the duration of these potential increases compared to the No-Build alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts. In sum, when a highway is widened, the localized level of MSAT emissions for the Build Alternative could be higher relative to the No Build Alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSAT will be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be lower than today.

Incomplete or Unavailable Information for Project-Specific MSAT Health Impacts Analysis

In FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The U.S. Environmental Protection Agency (EPA) is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the Clean Air Act and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (EPA, http://www.epa.gov/ncea/iris/index.html). Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). Two HEI studies are summarized in Appendix D of FHWA's 2009 Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents, which can be found at the following address: (http://www.fhwa.dot.gov/environment/air_quality/air_toxics/

policyandguidance/100109guidmem.cfm). This Appendix also discusses a variety of FHWA research initiatives related to air toxics. Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations (HEI, http://pubs.healtheffects.org/view.php?id=282) or in the future as vehicle emissions substantially decrease HEI, http://pubs.healtheffects.org/view.php?id=306).

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts - each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways; to determine the portion of time that people are actually exposed at a specific location; and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (http://pubs.healtheffects.org/view.php?id=282). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA (http://www.epa.gov/risk/basicinformation.htm#g) and the HEI (http://wwwcf.fhwa.dot.gov/exit.cfm?link=http://pubs.healtheffects.org/getfile.php?u=395) have not established a basis for quantitative risk assessment of diesel PM in ambient settings.

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the Clean Air Act to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine a "safe" or "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two step decision framework.

Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than safe or acceptable. Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

Conclusion

In this document, a qualitative MSAT assessment has been provided relative to the various alternatives of MSAT emissions and has acknowledged that the build alternative will not result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be estimated.

Air Quality Construction Emissions Reduction Strategies

During the construction phase of this project, temporary increases in air pollutant emissions may occur from construction activities. The primary construction-related emissions are particulate matter (fugitive dust) from site preparation. These emissions are temporary in nature (only occurring during actual construction); it is not possible to reasonably estimate impacts from these emissions due to limitations of the existing models. However, the potential impacts of particulate matter emissions will be minimized by using fugitive dust control measures such as covering or treating disturbed areas with dust suppression techniques, sprinkling, covering loaded trucks, and other dust abatement controls, as appropriate.

The construction activity phase of this project may generate a temporary increase in MSAT emissions from construction activities, equipment and related vehicles. The primary MSAT construction related emissions are particulate matter from site preparation and diesel particulate matter from diesel powered construction equipment and vehicles.

However, considering the temporary and transient nature of construction-related emissions, as well as the mitigation actions to be utilized (if applicable), it is not anticipated that emissions from construction of this project will have any significant impact on air quality in the area.

Traffic Noise

Existing Environment

This analysis was accomplished in accordance with TxDOT’s (FHWA approved) Guidelines for Analysis and Abatement of Roadway Traffic Noise (TxDOT 2011).

Sound from highway traffic is generated primarily from a vehicle's tires, engine and exhaust. It is commonly measured in decibels and is expressed as "dB."

Sound occurs over a wide range of frequencies. However, not all frequencies are detectable by the human ear; therefore, an adjustment is made to the high and low frequencies to approximate the way an average person hears traffic sounds. This adjustment is called A-weighting and is expressed as "dB(A)."

Also, because traffic sound levels are never constant due to the changing number, type and speed of vehicles, a single value is used to represent the average or equivalent sound level and is expressed as "Leq." **Table 20** shows Common Sound/Noise Levels for both outdoor and indoor sources.

Table 20: Common Sound/Noise Levels

COMMON SOUND/NOISE LEVELS		
Outdoor	**dBA**	**Indoor**
Pneumatic hammer	100	Subway Train
Gas lawn mower at 3 feet		
	90	Food blender at 3 feet
Downtown (large city)	80	Garbage disposal at 3 feet
Lawn mower at 100 feet	70	Vacuum cleaner at 10 feet
		Normal speech at 3 feet
Air conditioning unit	60	Clothes dryer at 3 feet
Babbling brook		Large business office
Quiet urban (daytime)	50	Dishwasher (next room)
Quiet urban (nighttime)	40	Library

The traffic noise analysis typically includes the following elements:

- Identification of land use activity areas that might be impacted by traffic noise.
- Determination of existing noise levels.
- Prediction of future noise levels.
- Identification of possible noise impacts.
- Consideration and evaluation of measures to reduce noise impacts.

The FHWA has established the following Noise Abatement Criteria (NAC) for various land use activity areas that are used as one of two means to determine when a traffic noise impact will occur. These criteria are outlined in **Table 21**.

Table 21: FHWA Noise Abatement Criteria

Activity Category	FHWA (dBA Leq)	TXDOT (dBA Leq)	Description of Land Use Activity Areas
A	57 (exterior)	56 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	66 (Exterior)	Residential.
C	67 (exterior)	66 (Exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings
D	52 (interior)	51 (Interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72 (exterior)	71 (Exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A-D or F.
F	-	-	Agricultural, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	-	-	Undeveloped lands that are not permitted.

Note: Primary consideration is given to exterior areas (Category A, B, C, or E) where frequent human activity occurs. However, interior areas (Category D) are used if exterior areas are physically shielded from the roadway, or if there is little or no human activity in exterior areas adjacent to the roadway.
Source: TXDOT Guidelines for Analysis and Abatement of Highway Traffic Noise (2011), 23CFR772.

Noise Impact Criteria

A noise impact occurs when either the absolute or relative criterion is met:

Absolute criterion: the predicted noise level at a receiver approaches, equals or exceeds the NAC. "Approach" is defined as one dB(A) below the NAC. For example: a noise impact would occur at a Category B residence if the noise level is predicted to be 66 dB(A) or above.

Relative criterion: the predicted noise level substantially exceeds the existing noise level at a receiver even though the predicted noise level does not approach, equal or exceed the NAC. “Substantially exceeds” is defined as more than 10 dBA. For example: a noise impact would occur at a Category B residence if the existing level is 54 dBA and the predicted level is 65 dB(A).

When a traffic noise impact occurs, noise abatement measures must be considered. A noise abatement measure is any positive action taken to reduce the impact of traffic noise on an activity area.

Noise Analysis Summary

The FHWA traffic noise modeling software (TNM) was used to calculate existing and predicted traffic noise levels. The model primarily considers the number, type and speed of vehicles; highway alignment and grade; cuts, fills and natural berms; surrounding terrain features; and the locations of activity areas likely to be impacted by the associated traffic noise.

Existing and predicted traffic noise levels were modeled at receiver locations (see **Table 22** and **Exhibit 4**) that represent the land use activity areas adjacent to the proposed project that might be impacted by traffic noise and potentially benefit from feasible and reasonable noise abatement.

Table 22: Traffic Noise Levels (dBA Leq)

Receiver Number (1)	Description	NAC Category (2)	NAC Level	Modeled Results			
				Existing 2005	Predicted 2025	Change + [-]	Noise Impact
R1	Commercial Park	F	-	-	-	-	No
R1A(3)	Planned Residential Subdivision	B	67	67	70	3	Yes
R2	Commercial Park-Storage	F	-	-	-	-	No
R3	Single-family residence	B	67	65	68	3	Yes
R4	Single-family residence	B	67	66	69	3	Yes
R5	Single-family residence	B	67	54	64	10	No
R6	Single-family residence	B	67	54	64	10	No
R7	Multi-family residence	B	67	64	70	6	Yes
R8	Multi-family residence	B	67	61	67	6	Yes
R9	Single-family residence	B	67	53	63	10	No
R10	Commercial	F	-	-	-	-	No
R11	Single-family residence	B	67	53	63	10	No
R12	Commercial Shopping Center	F	-	-	-	-	No
R13	Single-family residence	B	67	53	63	10	No
R14	Single-family residence	B	67	53	63	10	No
R16	Church	D	52	42	47	5	No
R17	School-Elementary	D	52	40	46	6	No
R18	Commercial	F	-	-	-	-	No
R19	Single-family residence	B	67	68	70	2	Yes
R20	Commercial	F	-	-	-	-	No
R21	Park	C	67	64	72	8	Yes
R22	Commercial	F	-	-	-	-	No
R23	Single-family residence	B	67	67	71	4	Yes
R24	Church/Daycare	D	52	43	48	5	No
R25	Single-family residence	B	67	67	69	2	Yes
R26	Commercial	F	-	-	-	-	No
R27	Single-family residence	B	67	67	69	2	Yes
R28	Commercial	F	-	-	-	-	No
R29	Commercial	F	-	-	-	-	No
R30	Commercial	F	-	-	-	-	No
R31	Single-family residence	B	67	62	69	7	Yes
R32	Single-family residence	B	67	64	70	6	Yes
R33	Single-family residence	B	67	60	68	8	Yes
R34	Single-family residence	B	67	65	70	5	Yes
R35	Commercial	F	-	-	-	-	No
R36	Single-family residence	B	67	65	70	5	Yes

Table 22, Cont.: Traffic Noise Levels (dBA Leq)

Receiver Number [1]	Description	NAC Category [2]	NAC Level	Modeled Results			
				Existing 2005	Predicted 2025	Change + [-]	Noise Impact
R38	Single-family residence	B	67	64	68	4	Yes
R39	Single-family residence	B	67	63	70	7	Yes
R40	Single-family residence	B	67	64	70	6	Yes
R41	Community Center	D	52	45	48	3	No
R42	Commercial	F	-	-	-	-	No
R43	Commercial	F	-	-	-	-	No
R45	Church	D	52	45	46	1	No

[1] Gaps in receiver numbering are due to removal of non-adjacent receivers from the report.
[2] Category F receivers do not have a criteria sound level. The initial report classified these as NAC E as per the previous noise policy. These sites were left in the updated report to maintain the receptor numbering continuity from the previous report.
[3] Receiver 1A added. New subdivision approved since original study.

Environmental Consequences

As indicated in **Table 22**, the proposed project would result in traffic noise impacts and the following noise abatement measures were considered: traffic management, alteration of horizontal and/or vertical alignments, acquisition of undeveloped property to act as a buffer zone, and the construction of noise walls. (The No Build Alternative would not directly result in impacts to noise receivers throughout the study area; however, as projected traffic on SH 146 increases, noise levels would also increase.)

Before any abatement measure can be proposed for incorporation into the project, it must be both feasible and reasonable. In order to be "feasible," the abatement measure must be able to reduce the noise level at greater than 50% of impacted, first row receivers by at least five dB(A); and to be "reasonable," it must not exceed the cost-effectiveness criterion of $25,000 for each receiver that would benefit by a reduction of at least five dB(A) and the abatement measure must be able to reduce the noise level at least one impacted, first row receiver by at least seven dB(A).

For the Category C and D receiver's determination of the "equivalent number of residences to assess cost effectiveness", please note that the "equivalent number" would typically be calculated if the impacted sites pass the feasibility criteria for mitigation, since reasonableness would not need to be assessed as a result of the non-feasible determination. Impacted receivers R7, R8 and R21 did not meet the feasibility criteria as part of the mitigation analysis, so no further study/calculations were necessary.

Traffic management: control devices could be used to reduce the speed of the traffic; however, the minor benefit of one dB(A) per five mph reduction in speed does not outweigh the associated increase in congestion and air pollution. Other measures such as time or use restrictions for certain vehicles are prohibited on state highways.

Alteration of horizontal and/or vertical alignments: any alteration of the existing alignment would displace existing businesses and residences, require additional right of way and not be cost effective/reasonable.

Buffer zone: the acquisition of undeveloped property to act as a buffer zone is designed to avoid rather than abate traffic noise impacts and, therefore, is not feasible.

Noise barriers: this is the most commonly used noise abatement measure. Noise barriers were evaluated for each of the impacted receiver locations. Noise barriers would not be feasible and reasonable for any of the following impacted receivers and, therefore, are not proposed for incorporation into the project:

- Receiver R1A: this receiver represents 15 single family residences (some are not yet constructed). All 15 individual sites were modeled as part of the barrier analysis. A noise barrier was determined to not be reasonable and feasible for this area. Based on preliminary calculations, a noise barrier was sufficient to achieve the minimum, feasible reduction of 5 dB(A) for at least 50% of the first row residences and the design goal of 7 dB(A). However, the cost reasonableness criteria exceeded TXDOT‘s $25,000 per benefited receiver (5 dB(A) minimum). The preliminary cost was approximately $45,900 per benefited receiver.
- Receivers R3 and R4: these receivers are single family residences located between Seabrook Circle and East Meyer Street. A noise barrier was determined to not be both reasonable and feasible for this residence. Based on preliminary calculations, the noise barrier was sufficient to achieve the minimum, feasible reduction of 5 dB(A) for at least 50% of the first row residences and the design goal of 7 dB(A). However, the cost reasonableness criteria exceeded TXDOT‘s $25,000 per benefited receiver (5 dB(A) minimum). The preliminary cost was approximately $87,900 per benefited receiver.
- Receivers R7 and R8: these receivers represent an apartment complex on Miramar Green Street, which has direct access to SH 146. Barrier placement would also be restricted as a result of the need to provide access to Hialeah Drive, located south of the apartment units. A continuous barrier would restrict access to the units and nearby businesses. Gaps in a noise barrier would satisfy access requirements, but the resulting non-continuous barrier segments would not be sufficient to achieve the minimum, feasible reduction of 5 dB(A), nor the design goal of 7 dB(A).
- Receivers R19, R21, R23, R25, and R27: these receivers represent a total of approximately 12 receivers within the city of Seabrook. Two barriers are required in this area to mitigate traffic noise from both the express lanes and the at-grade local network. For the at-grade barrier location, a continuous noise barrier would restrict access to the local SH 146 lanes. There are approximately 7 direct access points. A barrier was also modeled on the express lanes section. However, since a barrier cannot be placed along the at-grade section, the express lanes barrier (which was conservatively modeled as high as 20^{+} feet), would still not be sufficient to achieve the minimum, feasible reduction of 5 dB(A), nor the design goal of 7 dB(A).
- Receivers R31, R32, R33, R34, R36, R38, R39, and R40: these receivers represent a total of 25 residences along Grove Road, Carolyn Avenue and several local cross-streets (West 4th through 8th streets). Two barriers are required in this area. One would be located on the elevated express section and the other would be located at-grade to mitigate for the local highway traffic. Based on preliminary calculations, the noise barrier set was sufficient to achieve the minimum, feasible reduction of 5 dB(A) for at least 50% of the first row residences and the design goal of 7 dB(A). However, the cost reasonableness criteria exceeded TXDOT‘s $25,000 per benefited receiver (5 dB(A) minimum). The preliminary cost was approximately $61,800 per benefited receiver.

None of the above noise abatement measures would be both feasible and reasonable; therefore, no abatement measures are proposed for this project.

Noise Planning Contours

To avoid noise impacts that may result from future development of properties adjacent to the proposed project, local officials responsible for land use control programs should ensure, to the maximum extent possible, that no new activities are planned or constructed along or within the following predicted (2032) noise impact contours in **Table 23**.

Table 23: Design Year Predicted Leq Contour

Roadway Section	Land Use	Impact Contour	Approximate Distances to Contour (feet)*
South of Red Bluff	NAC Category B & C	66 dB(A)	440
	NAC Category E	71 dB(A)	225

*From the edge of the nearest travel lane. The values in the table do not represent predicted levels at every location at a particular distance back from the roadway. Sound levels will vary with changes in terrain and will be affected by the shielding of objects such as buildings. This information is being included to make local officials and planners aware of anticipated highway noise levels so that future development will be compatible with these levels.

Construction Noise

Noise associated with the construction of the project is difficult to predict. Heavy machinery, the major source of noise in construction, is constantly moving in unpredictable patterns. However, construction normally occurs during daylight hours when occasional loud noises are more tolerable. None of the receivers is expected to be exposed to construction noise for a long duration; therefore, any extended disruption of normal activities is not expected. Provisions will be included in the plans and specifications that require the contractor to make every reasonable effort to minimize construction noise through abatement measures such as work-hour controls and proper maintenance of muffler systems.

Local Coordination

A copy of this traffic noise analysis will be made available to local officials to ensure, to the maximum extent possible, future developments are planned, designed, and programmed in a manner that will avoid traffic noise impacts. On the date of approval of this document (Date of Public Knowledge), FHWA and TxDOT are no longer responsible for providing noise abatement for new development adjacent to the project.

Hazardous Materials

Existing Environment

An initial site assessment was conducted to determine the potential for encountering hazardous substances and/or contamination within the vicinity of the proposed project. The preliminary investigation included a review of federal and state databases, historical aerial photographs, and a visual survey of the study area. A visual observation during field reconnaissance was conducted on January 4 and 5, 2005 to verify the findings of the regulatory database report and to observe the general environmental conditions at the listed facilities and on properties located immediately adjacent to the proposed project. The current and

historical land use can be categorized as predominantly undeveloped with a mixture of residential, commercial, industrial, and municipal/transportation uses.

The regulatory databases were searched within a one mile radius of the project corridor in accordance with the American Society for Testing and Materials (ASTM) Standard E 1527-00 and TxDOT standard search radii. The regulatory database listings include only those sites that are known to the regulatory agencies to be contaminated or in the process of evaluation for potential contamination at the time of publication. The database report also shows federal and state regulated sites that could be within the standard search area, but were unplottable due to insufficient address or other locator information. These unplottable sites are called "Orphan Sites" in the regulatory report. The regulatory database lists reviewed and sites identified are indicated in **Table 24**.

Table 24: Regulatory Databases and Search Distances

Regulatory Database	Radius Distance
U.S. Environmental Protection Agency (EPA)	
National Priorities List (NPL)	1.50 mile
Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)	1.00 mile
No Further Remedial Action Planned (NFRAP)	0.75 mile
Resource Conservation and Recovery Act (RCRA) Treatment, Storage and Disposal (TSD) sites Corrective Action Report (COR) Generator (GEN) sites	 1.00 mile 1.50 mile 0.75 mile
Toxic Release Inventory System (TRIS)	0.50 mile
Emergency Response Notification System (ERNS)	0.50 mile
Texas Commission of Environmental Quality (TCEQ)	
State sites - State Superfund, Voluntary Cleanup Program (VCP)	1.00 mile
Solid Waste Facilities/Landfill Sites (SWL)	1.00 mile
Leaking Underground Storage Tanks (LUST)	1.00 mile
Regulatory Underground Storage Tanks/Aboveground Storage Tanks (REG UST/AST)	0.75 mile
Facility Index (FINDS)	0.50 mile
Other - Texas Hazardous Waste Notice of Registration	0.75 mile

The regulatory database search identified 69 sites within the ASTM and TxDOT standard search radii. This includes one CERCLIS, 9 RCRA GEN, 5 ERNS, one STATE, 9 LUST, 30 UST, and 14 OTHER sites. No sites of concern were listed in the NPL, NFRAP, RCRA TSD, RCRA COR, TRIS, SWL, or FINDS databases. A complete listing of the federal and state regulated sites searched is located in the hazardous materials report (Banks Information Solutions, Inc. 2004).

All regulatory database sites listed in the regulatory database report that were observed during the field investigation are listed in **Table 25**. This table includes only those sites listed in the database search that were identified within the vicinity of the proposed project. Their locations are shown in **Exhibit 4**. No additional facilities were observed within the vicinity of the proposed project during field reconnaissance.

Table 25: Regulatory Database Sites

Map ID#	Database Listing(s)	Company Name	Status	Facility ID#	ROW Acquisition	Facility Relocation
1	UST	ATD Equipment	*UST:* in use (2 diesel tanks)	0071366	No	Yes
2	UST, LUST	Exxon SS 63877 / KFC-Taco Bell	*UST:* removed (1-6,000 gal gasoline, 2-8,000 gal gasoline, 1-550 gal oil) *LUST:* case closed	0026706 and 097110	No	Yes
3	STATE	Walgreens	*STATE:* remedy not reported for contaminants (VOCS, TPH)	1400	No	Yes
4	UST, LUST, RCRA-GEN	Bay Texaco Food Mart	*UST:* in use (3-6,000 gal gasoline, 1-6,000 gal oil), removed (1-500 gal oil), not reported (1-6,000 gal tank) *LUST:* Plan B / Risk Assessment *RCRA-GEN:* no violations	0012537, 106169, and TXR00000257	No	Yes
5	UST, OTHER	Circle K 2194 / Ryan's Express Cleaners	*UST:* removed (2-6,000 gal gasoline) *OTHER:* n/a	0005477 and RN103960340	Yes	No
6	OTHER	Seabrook Lawnmower	*OTHER:* inactive	IHW-67217	No	Yes
7	UST	Eagle Gas and Supply	*UST:* in use (1-8,000 gal diesel, 2-8,000 gal gasoline)	0005517	No	Yes
8	RCRA-GEN. OTHER	The Kaferhaus	*RCRA-GEN:* no violations *OTHER:* active	TXD981514276 and IHW-66670	No	Yes
9	UST, LUST	Coastal 334 / Kemah Food Mart	*UST:* removed (2-10,000 gal gasoline, 1-4,000 gal gasoline, 1-6,000 gal unknown, 1-8,000 gal diesel), in use (3-10,000 gal gasoline), not reported (3-10,000 gal tanks) *LUST:* monitoring	0027883 and 115308	Yes	No

Source: Banks Information Solutions, Inc. 2004.

A total of four petroleum pipelines have been identified as crossing within the proposed ROW. There is limited potential for a petroleum pipeline to affect the proposed project. The absence of any TCEQ records of a pipeline rupture from within the study area suggests that there have been no reported incidents of pipeline ruptures or spills. A summary of the petroleum pipelines identified within the study area is presented in **Table 26**.

Table 26: Petroleum Pipelines within the Study Area

Operator	System	Intersects Alignment	Status	T4 Permit	Diameter	Commodity
BP Pipelines (North America), Inc.	Texas City to Pasadena	Yes	Active	00891	18"	Gasoline/Jet Fuel/Diesel
Enterprise Products Operating, LLC	Bayport Export Propylene	Yes	Active	04541	8.63"	Propylene
Legend Natural Gas II, LP	Bracewell – Taylor Lake	Yes	Active	03453	6.63"	Natural Gas
Seadrift Pipeline Corporation	Seabrook – Texas City	Yes	Active	00287	6.63	Propylene/Ethane/Propane

Source: Railroad Commission (RRC) 2007.

Environmental Consequences

The No Build Alternative would not require the disturbance of soils potentially containing hazardous materials. The probability of encountering hazardous materials would remain the same as if no construction were to occur along SH 146.

In order to construct the Build Alternative, property listed as potentially containing hazardous materials from sites 1, 2, 3, 4, 6, 7, and 8 would be acquired. Sites 1, 2, 3, 4, 6, and 7 are located at equal grade with the roadway. Site 8 is also located at equal grade with the roadway; however, a portion of the property is located up gradient from the roadway. These sites are currently in various stages of corrective action and would be addressed during the ROW negotiation and acquisition process. Coordination with property owners, tank owners, operators, and TCEQ on these sites would be an ongoing process up to and during construction.

Sites 5 and 9 are retail/fuel centers located at equal grade with the roadway on the east side of SH 146. A portion of these properties, which include access drives and parking spaces, would be acquired for the proposed ROW of the Build Alternative. Because ROW would be taken from areas that have the potential to be of environmental concern to the project, additional investigations would be required during final design to confirm if contamination would be encountered during construction. If contamination is confirmed, then TxDOT would develop appropriate soils and/or groundwater management plans for activities within these areas.

The contractor would take appropriate measures to prevent, minimize, and control the spill of hazardous materials in the construction area. The use of construction equipment within sensitive areas should be minimized or eliminated. All construction materials used for this project should be removed as soon as the work schedule permits. Any unanticipated hazardous materials and/or petroleum contamination encountered during construction should be handled according to applicable federal and state regulations and TxDOT standard specifications.

Asbestos Management

The proposed project includes the [demolition and/or relocation] of, at least, 53 building structures from 52 business establishments and one residence. Of these 52 businesses, seven were listed as potentially containing hazardous materials (as shown in **Table 8**). The buildings may contain asbestos containing

materials. Asbestos inspections, specifications, notification, license, accreditation, abatement, and disposal, as applicable, would be in compliance with federal and state regulations. Asbestos issues would be addressed during the ROW process prior to construction.

Water Quality

Existing Environment

The proposed project is located in the San Jacinto-Brazos Coastal Basin, which drains a total of 1,440 square miles between the San Jacinto and Brazos Rivers. This flat coastal plain includes numerous small tidal streams draining toward Galveston Bay in the east and directly to the Gulf of Mexico in the west. The principal tributaries in this basin include Clear Creek, Armand Bayou, Dickinson Bayou, Chocolate Bayou, and Oyster Creek (H-GAC 2001). The topography of the region varies from nearly flat terrain immediately along the gulf coast to a gently undulating plane that extends inland 50 miles to 100 miles. Annual precipitation in the study area ranges from 35 to 70 inches (H-GAC 2001).

The proposed project lies within two watersheds of the San Jacinto-Brazos Coastal Basin, which includes the following:

- Upper Galveston Bay Watershed: This watershed extends from the northern portion of the proposed project at Fairmont Parkway to approximately 0.5 mile north of the SH 146 and FM 517 interchange. Several water bodies are located within this area including Taylor Lake, Taylor Bayou, Clear Lake, and a 0.9 square mile navigation channel (Bayport Channel) on the western shore of the watershed.
- Clear Lake Watershed: This watershed extends from the border of Harris and Galveston Counties, along the Clear Lake Channel, to just south of the SH 146 intersection with FM 2094.

Impaired Waters - Stormwater runoff from construction of the proposed project would flow into several creeks which all flow into two classified segments of the San Jacinto-Brazos Coastal Basin. These features are listed in the Texas Commission on Environmental Quality (TCEQ) Water Quality Inventory as follows:

- Segment 2421 (Upper Galveston Bay) is listed on the 2008 Clean Water Act (CWA) Section 303(d) list as impaired for elevated bacteria levels (oyster waters) in the area from Red Bluff to Five Mile Pass to Houston Point to Morgans Point and in the western portion of the bay. This segment is also designated as impaired for dioxin and polychlorinated biphenyls (PCBs) found in edible tissue in the area of Red Bluff to Five Mile Cut to Houston Point to Morgans Point.
- Segment 2425B (Jarbo Bayou) is listed on the 2008 CWA Section 303(d) list as impaired due to elevated bacteria levels from the headwaters to Lawrence Road.

Environmental Consequences

The No Build Alternative would not increase the amount of impervious cover in the study area and would not alter the existing drainage conditions.

The Build Alternative would have a negligible effect with regard to changes in surface runoff quantifies and the amount of impervious cover added to the San Jacinto-Brazos Coastal Basin or its associated

watersheds. The greatest potential for adverse effects to water quality exists during the construction phase of the project due to the quantity of soil being disturbed. In regards to the Build Alternative, every effort would be made to protect the water quality within the study area.

303(d) Listed Waters

Runoff from construction of the Build Alternative would discharge to a threatened or impaired stream segment and is within five miles upstream of a designated segment; therefore, coordination with the TCEQ is required for total maximum daily loads. The primary sources of fecal coliform bacteria to fresh water are wastewater treatment plant discharges, failing septic systems, and animal waste (Global Bioenergy Partnership {GBEP} 2007). Primary sources of dioxin include waste incineration and sources of PCBs include electric transformer oil. The proposed project will not increase the sources of these pollutants within the study area; therefore, this project would not contribute to the constituents of concern with Clear Creek, Upper Galveston Bay, and Jarbo Bayou. The quality of waters in the State would be maintained in accordance with all applicable provisions of the Texas Surface Water Quality Standards including the General, Narrative, and Numerical Criteria.

Section 401 Compliance

The Build Alternative would affect more than the allowable threshold acreages in tidal and non-tidal waters to qualify for a Nationwide Permit; therefore, it is anticipated that a U.S. Army Corps of Engineers (USACE) Section 404 Individual Permit would be required for the proposed project. The proposed project meets the TCEQ Section 401 Water Quality Certification Tier II (Large Projects) requirements since the project would impact more than three acres of waters of the U.S. The Build Alternative would require completion of a Tier II 401 Certification Questionnaire and Alternatives Analysis Checklist.

TCEQ's recommended best management practices (BMPs) would address erosion control, sedimentation control, and post-construction total suspended solids (TSS) control. Erosion control would be addressed by applying temporary reseeding (native vegetation) and mulch in disturbed areas. Sedimentation control would be addressed by installing silt fences combined with rock berms. Post-construction TSS control would be addressed by planting permanent vegetation to create grass-lined drainage. The ditches would accept roadway runoff as sheet flow and filter it along the front slopes and the bottoms of the ditches. Because TCEQ's recommended BMPs would be implemented to prevent any degradation to water quality as a result of the proposed project, long-term water quality effects are not anticipated.

Texas Pollutant Discharge Elimination System

The Build Alternative would disturb more than one acre; therefore, TxDOT would be required to comply with the TCEQ - Texas Pollutant Discharge Elimination System (TPDES) General Permit for Construction Activity. The project would disturb more than five acres; therefore, a Notice of Intent (NOI) would be filed to comply with TCEQ stating that TxDOT would have a Storm Water Pollution Prevention Plan (SW3P) in place during construction of proposed project. This SW3P utilizes the temporary control measures as outlined in the Department's manual "Standard Specifications for the Construction of Highways, Streets, and Bridges". Effects would be minimized by avoiding work by construction equipment directly in the stream channels and/or adjacent areas. No long-term water quality impacts are expected.

In addition, the proposed project operates within a Municipal Separate Storm Sewer System (MS4) (Phase II) area; therefore, a Phase II MS4 Permit is required for construction activity and the contractor would need to coordinate the proposed project with the appropriate MS4 operator and the TCEQ prior to any discharge into the MS4 system.

The contractor would take appropriate measures to prevent, minimize, and control the spill of fuels, lubricants, and hazardous materials in the construction staging area. All materials being removed and/or disposed of by the contractor would be done in accordance to state and federal laws and by the approval of the Project Engineer.

Groundwater

Existing Environment

The Gulf Coast Aquifer underlies the study area. The aquifer consists of alternating beds of clay, sand, silt, and gravel, which are hydrologically connected and form a large, leaky artesian aquifer system. Its principal water-bearing units are the Goliad, Willis, and Lissie Formations (Texas Water Development Board {TWDB} 1995). Water quality is generally good in the shallow portions of the aquifer (TWDB 1995). Years of heavy pumpage for municipal and manufacturing use have resulted in groundwater level declines and subsidence. As a result, structural damage and flooding have occurred in low-lying areas along Galveston Bay. Harris-Galveston Coastal Subsidence District (H-GCSD) does not predict any significant future subsidence as a result of groundwater withdrawals, but changes in other conditions or new activities, such as oil and gas withdrawal, may result in potential subsidence in the study area (H-GCSD 2005).

Coordination with TCEQ found no sensitive groundwater features, including principal or sole-source aquifers and critical aquifer protection areas within one mile of the project corridor (TCEQ 2005a). Well records from TCEQ revealed nine public water wells with 100-year capture zones; however, no wells were identified within the proposed ROW. The screen tops of these wells start at 506 feet and the screen bottoms extend to depths of 670 feet. Coordination with the Source Water Assessment and Protection Program of the TCEQ determined that the proposed ROW encroaches on six source water protection areas for local public water supply wells (TCEQ 2005b).

Environmental Consequences

The No Build Alternative would not result in effects to the quality or quantity of groundwater within the study area.

No adverse effects to the quality and quantity of groundwater in the study area are expected. Subsurface water would not be required. Additionally, any existing wells encountered during construction or located on properties potentially requiring acquisition would be sealed utilizing currently accepted methods to protect local groundwater quality.

Floodplains

Existing Environment

The project corridor was investigated for encroachments into the 100-year floodplain. This information was obtained from the project's Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) numbers for Harris County: 48201C1085L and 48201C1095L (effective June 18, 2007); and for Galveston County: 4854710001B and 4854810003B (effective April 4, 1983) and 4854700027C and 4854700029C (effective May 2, 1983). The 100-year floodplain associated with Clear Creek lies within the area traversed by the proposed project (see **Exhibit 2**). No portion of the proposed project lies within a Regulated Floodway Zone.

Environmental Consequences

The No Build Alternative would not result in further encroachment on the floodplain.

Avoidance of floodplains for the alternative alignment analysis, with the exception of the No Build Alternative, is not possible because the watercourses in the study area run relatively perpendicular to SH 146 and traverse the entire study area. The Build Alternative's four-lane express facility is on bridge structure; therefore impacts to the floodplain are minimal.

The hydraulic design practices for this project would be in accordance with current TxDOT design policy and standards. The hydraulic design of the roadway will be done with the most recent floodplain data that is available for use. The final hydraulic design will be done in accordance with the applicable federal, state, and local policies and in accordance with 23 CFR 650.113. Policy III, in Section 1.3.3 of the HCFCD Policy Criteria and Procedure Manual, October 2004, states that "projects by others shall avoid increasing flood risks or flood hazards or creating new flood hazard areas." The highway facility would permit conveyance of the 100-year flood levels, inundation of the roadway being acceptable, without causing significant damage to the highway, stream, or other property. Harris and Galveston Counties and the communities of Seabrook and Kemah are participants in the National Flood Insurance Program. The distance of floodplain crossed and the approximate area of each floodplain occurring in the proposed ROW are shown in **Table 27**. As a reference, the FEMA floodplains mapped for this project are shown in **Exhibit 2**. Coordination with the local floodplain administrator would be required.

Table 27: 100-Year Floodplains

Feature	Distance of 100-Year Floodplain Crossed (feet)	Approximate Acreage of 100-Year Floodplain within ROW
Clear Creek	10,478 ft	21.78

Note: All calculations were determined within the proposed ROW. The proposed effects calculated are preliminary and subject to revision.

Because the floodplain boundaries of the watercourses in the study area traverse the entire study area, and because the Build Alternative is the only alternative that meets the need for and purpose of the project and minimizes the floodplain encroachment by bridging the floodplains, the Build Alternative is the only practicable alternative for limiting floodplain encroachment.

Coastal Management Program

Existing Environment

The proposed project is located within a coastal county and within the Texas Coastal Management Program (CMP) boundary; therefore, the Texas CMP applies to the proposed project.

Coastal Natural Resource Area

The purpose of the Texas CMP is to improve the management of the state's Coastal Natural Resource Area (CNRA). Portions of CNRAs are located within the vicinity of the proposed project, as identified in **Table 28**.

Table 28: CNRA Locations

Location	Type of CNRA	Description of CNRA
Clear Lake	Coastal Wetlands, Special Hazard Areas, waters under tidal influence	Clear Creek and associated intertidal habitats adjacent to the creek are waters under tidal influence, coastal wetlands, and are special hazard areas.

Environmental Consequences

The No Build Alternative would have no effect on coastal resources or CNRAs.

It is not anticipated that the Build Alternative would have an adverse effect to coastal resources. **Table 29** summarizes each transportation policy and compares each policy to the Build Alternative. Based on the information provided in this table, the Build Alternative is consistent with the goals and policies of the Texas CMP (§501.31 of the Texas Administrative Code {TAC}) and would not constitute a major action.

Table 29: Comparisons of Texas CMP Policies for Transportation Projects

Texas CMP Policy for Transportation Projects	Build Alternative
Pollution prevention procedures incorporated into construction/maintenance	BMPs will be incorporated into the construction/maintenance of the Build Alternative in accordance with TxDOT policies and TCEQ requirements.
Located at sites to avoid/minimize effects from construction/maintenance of additional roads	The Build Alternative is located within or immediately adjacent to the existing facility and is generally located within existing ROW. Additional ROW required for the Build Alternative is immediately adjacent to existing facilities/ROW.
No direct release of pollutants from oil/hazardous substance spills, contaminated sediments, stormwater runoff	No direct release of pollutants or contaminated sediments is anticipated from the Build Alternative.
Located within existing ROW or previous disturbed areas	The Build Alternative is primarily located within existing ROW or previously disturbed areas.

Table 29, Cont.: Comparisons of Texas CMP Policies for Transportation Projects

Texas CMP Policy for Transportation Projects	Build Alternative
Future expansion would not require development of coastal wetlands except for evacuation for natural disaster	Coastal wetlands (Wetland T) would be affected (less than 0.76 acre of permanent and temporary effects) as a result of the Build Alternative.
	Part of the Build Alternative's purpose is to provide hurricane evacuation, which is a natural disaster.
Avoid impounding/draining coastal wetlands	Impounding or draining coastal wetlands is not anticipated from the Build Alternative.
No adverse effects to recreational values, spawning/nesting season, and migratory seasons for terrestrial and aquatic species	The Build Alternative is not anticipated to affect recreational values, spawning/nesting seasons, and migratory seasons for terrestrial and aquatic species. To ensure compliance with the Migratory Bird Treaty Act (MBTA), clearing and grubbing vegetation within the study area would not take place during the migratory bird nesting season (April 1 to July 15) or measures would be taken to discourage birds from nesting in existing structures.
Special Hazard Areas	No effects BFEs beyond those allowed by regulation are anticipated. Coordination with Floodplain Administrators will be conducted as needed.

Sources: TAC Rule Section 501.31, 2006.

Waters of the U.S. including Wetlands

Existing Environment

Pursuant to Executive Order 11990 (Protection of Wetlands) and Section 404 of the CWA, a wetland delineation was conducted to determine the presence of waters of the U.S., including wetlands, within the project area. According to the USACE, the federal agency having authority over waters of the U.S., wetlands are those areas that are inundated or saturated with surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils. Wetlands are transitional areas between terrestrial and aquatic systems resulting from the interaction of hydrophytic vegetation, wetlands hydrology, and hydric soils.

Forty-two aquatic resources were identified, characterized, and delineated to evaluate their jurisdictional status. Of those 42 aquatic resources, six waters of the U.S. and 10 wetlands were verified as jurisdictional by the USACE (see **Appendix E** for the September 8, 2009 USACE verification letter).

Non-jurisdictional Areas

Of the 42 aquatic resources delineated, 26 areas (totaling less than 2.55 acres) were determined to be non-jurisdictional by the USACE. Areas D, E, G, J, K, L, R, S, AC, and AD are man-made depressional wetlands created from uplands that are not adjacent to or connected to waters of the U.S. The man-made depressional wetlands are associated with man-made linear features such as pipelines, roadways, and railroads. Areas A, B, C, F, H, I, M, N, O, P, Q, V, W, Z, AA, and AB are roadside ditches constructed in upland areas that do not extend the ordinary high water mark (OHWM) or mean high tide (MHT) of the receiving waters of the U.S. These non-jurisdictional depressional areas and roadside ditches are not regulated by the USACE pursuant to Section 404 of the CWA.

Jurisdictional Areas

Of the 42 aquatic resources delineated, six waters of the U.S. and 10 wetlands totaling 18.02 acres were verified as jurisdictional by the USACE. The locations of each area are provided in **Exhibit 4**.

Waters of the U.S. – Six jurisdictional tidal waters of the U.S. (totaling 15.66 acres) were identified within the study area and are discussed in **Table 30**. Areas U1, U2, U3, U4, U5, and U6 are comprised of portions of Clear Lake within the study area. These six estuarine areas drain into Galveston Bay approximately 1,500 feet east of the project limits.

Table 30: Waters of the U.S. within the Study Area

Designation	Jurisdictional Type of Crossing	Description	Size (acres)	MHT*
U	Water of the U.S.	Clear Lake	15.66	11' 0"

Note: *Mean High Tide (MHT) was taken above the centerline of feature or from navigational charts.

Wetlands – The 10 jurisdictional wetlands (totaling 2.36 acres) are further described below.

Areas T1, T2, T3, T4, T5, T6, T7, and T8 are brackish water fringe wetlands of Clear Lake and total 2.06 acres. Brackish water fringe wetlands line the shorelines of Clear Lake and support salt tolerant emergent vegetation. These wetlands are located in the 100-year floodplain and have hydrologic connections to Clear Lake.

Areas X and Y (totaling 0.30 acre) are tidally-influenced drainage ditches associated with Clear Lake. These wetlands are located in the 100-year floodplain and have hydrologic connections to Clear Lake.

Environmental Consequences

The No Build Alternative would not affect jurisdictional aquatic resources identified within the study area. **Table 31** summarizes the effects to jurisdictional waters of the U.S., including wetlands, that could result from the Build Alternative, including permanent effects such as fill and temporary effects such as excavation or drainage. Of the 42 aquatic resources identified, the Build Alternative would affect 16 jurisdictional wetlands and waters of the U.S. Less than 12.76 acres would be permanently and temporarily affected by construction of the Build Alternative. The Build Alternative would affect 1.80 acres of non-jurisdictional aquatic resources. It is anticipated that non-jurisdictional areas affected by the project would be effectively restored in the final design and project construction.

Table 31: Potential Effects to Jurisdictional Waters of the U.S., including Wetlands

Designation	Area within ROW (acre)	Estimated Effect (1)
T1	0.34	< 0.33(2)
T2	0.23	< 0.23(2)
T3	0.14	< 0.12(2)
T4	0.93	--(2)
T5	0.04	< 0.04(2)
T6	0.05	< 0.02(2)
T7	0.23	< 0.02(2)
T8	0.10	--

Table 31, Cont.: Potential Effects to Jurisdictional Waters of the U.S., including Wetlands

Designation	Area within ROW (acre)	Estimated Effect [(1)]
U1	2.26	< 2.02[(3)]
U2	0.14	--[(3)]
U3	0.59	--[(3)]
U4	1.03	< 0.45[(3)]
U5	1.76	< 1.31[(3)]
U6	9.88	< 8.22[(3)]
X	0.27	--
Y	0.03	--
Total	**18.02**	**< 12.76**

Note: All effects are estimated and subject to change.
[(1)] Area of permanent and temporary effects within Section 404 jurisdictional limits.
[(2)] It is anticipated that permanent effects to Areas T1-T7 (brackish water fringe wetlands of Clear Lake) would occur from installation of additional bridge columns; however, bridge design is not complete and impacts are not quantifiable.
[(3)] It is anticipated that any permanent effects to Areas U1-U6 (Clear Lake) would occur from installation of additional bridge columns; however, bridge design is not complete and effects are not quantifiable.

The Build Alternative would require USACE authorization under Section 404 of the CWA prior to the discharge of fill materials into waters of the U.S., including wetlands. This alternative would affect more than the allowable threshold acreages in tidal and non-tidal waters to qualify for a Nationwide Permit; therefore, it is anticipated that a USACE Section 404 Individual Permit would be required. It is likely that the proposed project would involve the discharge of dredged or fill materials into greater than 0.33 acre of tidally-influenced water bodies (Areas U1, U4, U5, and U6 [Clear Lake]). Additionally, because a navigable waterway (Clear Creek) lies within an area traversed by the proposed project, permitting under Section 10 (administrated by the USACE) of the Rivers and Harbors Act is anticipated. All appropriate permits would be acquired by TxDOT prior to construction.

A review of USACE requirements would be conducted as design plans are finalized. Compensatory mitigation for Section 404 effects would be coordinated with the USACE and performed in accordance with the terms of the approved permits.

Potential Mitigation

In accordance with the provisions of Section 404(b)(1) Guidelines, an applicant must demonstrate that the proposed project has avoided and minimized effects to waters of the U.S., including wetlands, to the greatest extent practicable before compensatory mitigation can be proposed. A majority of the proposed project has been aligned immediately adjacent to the existing ROW; thus, avoiding and minimizing effects to surrounding areas to the greatest extent practicable.

Restoring minor wetlands within the ROW is not generally compatible with TxDOT goals, where shedding water from the road is essential to prevent hazards during precipitation events. On-site mitigation within the ROW is not feasible due to the long-term commitments associated with mitigation sites; placement of a mitigation area within the proposed ROW would effectively prohibit the use of the site for future projects. Mitigation for effects to non-jurisdictional wetlands is not required by the CWA.

Several mitigation options may be available to compensate for unavoidable effects associated with the proposed project. These options include in-lieu fee (ILF) agreements, mitigation banking, and preservation/conservation off-site. TxDOT and FHWA guidance recommends mitigation banking be used for mitigation as much as practicable, then ILF agreements, and then other options such as restoration, enhancement, creation, preservation, and/or conservation.

Mitigation banking options available include the use of the Coastal Bottomlands Mitigation Bank, available for use by TxDOT, and the Greens Bayou Wetland Mitigation Bank administered by the HCFCD. The ILF options available include the Armand Bayou Nature Center, Galveston Bay Foundation, and The Nature Conservancy of Texas.

Coordination with the USACE and other agencies would be conducted to determine whether any of the options listed above are feasible and reasonable to compensate for the proposed project effects.

Vegetation

Existing Environment

The study area is located in the Gulf Coast Prairies and Marshes natural region of Texas, which includes approximately 20,312 square miles (Gould 1975). Gulf coast prairies are nearly level with slow surface drainage and elevations ranging from sea level to approximately 250 feet above mean sea level (MSL). In addition to wildlife habitat, the prairies are used for crops, livestock grazing, and urban and industrial centers. It is estimated that as much as 99 percent of the coastal prairies in Texas have been converted to agricultural land (Gould, 1975; McMahan, et. al, 1984).

Gulf coast marshes are low, wet, marshy coastal areas commonly inundated with saline water, ranging from sea level to a few feet in elevation above MSL. These marshes support species of sedges, rushes, cordgrasses, reeds, and forbs, which provide beneficial wildlife habitat for numerous birds and marine fisheries. Many areas in the region have been invaded by noxious volunteer species such as honey mesquite (*Prosopis glandulosa*), smut grass (*Sporobolus indicus*), and Chinese tallow (*Triadica sebifera*).

According to the *Vegetation Types of Texas* by the Texas Parks and Wildlife Department (TPWD), the vegetation type within the study area is classified as Bluestem Grassland (McMahan et al., 1984). Bluestem Grassland is prominent throughout the Gulf Prairies and Marshes and is particularly apparent south and west of the Houston area. Species commonly associated with Bluestem Grassland include bushy bluestem (*Andropogon glomeratus*), slender bluestem (*Schizachyrium tenerum*), little bluestem (*S. scoparium*), silver bluestem (*Bothriochloa saccharoides*), buffalograss (*Buchloe dactyloides*), Bermuda grass (*Cynodon dactylon)*, brownseed paspalum (*Paspalum plicatulum*), single-spike paspalum (*Paspalum monostachyum)*, smut grass, sacahuista (*Nolina texana*), windmill grass (*Chloris* spp.), southern dewberry (*Rubus trivialis*), live oak (*Quercus virginiana*), mesquite, huisache (*Acacia farnesiana*), eastern false willow (*Baccharis halimifolia*), and McCartney rose (*Rosa bracteata*).

Local Vegetation Types

In accordance with Provision (4)(A)(i) of the TxDOT-TPWD Memorandum of Understanding (MOU), an investigation was conducted to identify and map vegetation types within the study area. The study area exhibits undeveloped land as well as other areas already used for transportation purposes or urban

development (residential and commercial facilities). Adjacent to the project corridor are natural vegetation communities include aquatic features, tidally influenced marshes, periodically inundated wetlands, and upland forest. Modified vegetation communities include urban land and maintained ROW. Grasslands in varying stages of succession primarily characterize the proposed ROW. These vegetative communities are described below. The local vegetation types are similar to the Bluestem Grassland listed in the *Vegetation Types of Texas* (McMahan et al., 1984), but common Bluestem Grassland species are not prominent within the project vicinity due to historical and current anthropogenic activities.

Aquatic Features – Aquatic features within the study area include six portions of Clear Lake (Areas U1 through U6).

Tidally-Influenced Marshes – Tidally-influenced, brackish marshes (Areas T1-T8) border Clear Lake, which supports saline-tolerant hydrophytic vegetation. Common herbaceous species observed include sea ox-eyed daisy (*Borrichia frutescens*), sticky flatsedge (*Cyperus elegans*), seashore saltgrass (*Distichlis spicata*), saltmarsh cordgrass (*Spartina alterniflora*), and saltmeadow cordgrass (*S. patens*).

Periodically Inundated Wetlands – Areas classified as periodically inundated wetlands meet the three wetlands criteria of hydrophytic vegetation, hydric soils, and wetland hydrology. These types of wetlands include depressional wetlands, roadside ditches, and drainage ditches. Vegetation observed within these areas of the project are dominated by a variety of herbaceous species, including sea ox-eyed daisy (*Borrichia frutescens*), sticky flatsedge (*Cyperus elegans*), seashore saltgrass (*Distichlis spicata*), saltmarsh cordgrass (*Spartina alterniflora*), saltmeadow cordgrass (*S. patens*), alligator weed (*Alternanthera philoxeroides*), erect coinleaf (*Centella erecta*), southern carpet grass (*Axonopus affinis*), flatsedge (*Cyperus entrerianus*), sticky flatsedge (*C. elegans*), chufa (*C. esculentus*), Bermuda grass, sand spikerush (*Eleocharis montevidensis*), coastal-plain penny-wort (*Hydrocotyle bonariensis*), Cherokee sedge (*Carex cherokeensis*), club-head cutgrass (*Leersia hexandra*), soft rush (*Juncus effusus*), jointed rush (*J. articulatus*), marsh seedbox (*Ludwigia palustris*), floating seedbox (*L. peploides*), common frog-fruit (*Phyla nodiflora*), curly dock (*Rumex crispus*), nipple-bract arrow-head (*Sagittaria papillosa*), and broad-leaf cattail (*Typha latifolia*).

Upland Forest – This wooded vegetation type is co-mingled with native and invasive trees. Common tree species include Chinese tallow, sugarberry (*Celtis laevigata*), loblolly pine (*Pinus taeda*), and American elm (*Ulmus americana*). Common herbaceous species observed include naked-spike ragweed (*Ambrosia psilostachya*), bushy bluestem, aster (*Aster lateriflorus*), Cherokee sedge (*Carex cherokeensis*), Paraguayan windmill grass (*Chloris canterai*), Kleberg bluestem (*Dichanthium annulatum*), big-top Lovegrass (*Eragrostis hirsuta*), bushy golden-rod (*Euthamia leptocephala*), swamp sunflower (*Helianthus angustifolius*), annual sumpweed (*Iva annua*), shiny cone-flower (*Rudbeckia nitida*), seaside golden-rod (*Solidago sempervirens*), long-spike tridens (*Tridens strictus*), and Missouri ironweed (*Vernonia missurica*). Common shrubs and vines include eastern false willow, yaupon (*Ilex vomitoria*), Chinese privet (*Ligustrum sinense*), dwarf palmetto (*Sabal minor*), Drummond's rattle-bush (*Sesbania drummondii*), pepper vine (*Ampelopsis arborea*), rattan vine (*Berchemia scandens*), Japanese honeysuckle (*Lonicera japonica*), blackberry (*Rubus argutus*), southern dewberry (*R. trivialis*), and poison ivy (*Toxicodendron radicans*).

Urban Land – Urban areas include residential and commercial properties. Most of this land is highly disturbed and contains man-induced floral assemblages of ornamental trees and shrubs. Common herbaceous species of urban land observed within the study area include southern carpet grass, Bermuda grass, narrow-leaf sumpweed (*Iva angustifolia*), annual sumpweed, crow poison (*Nothoscordum bivalve*), common-evening primrose (*Oenothera biennis*), Vasey grass (*Paspalum urvillei*), knotroot bristle-grass (*Seteria geniculata*), Johnson grass (*Sorghum halepense*), smutgrass, common dandelion (*Taraxacum officinale*), and bur clover (*Medicago polymorpha*). Common shrubs and vines include yaupon, cabbage palmetto (*Sabal palmetto*), wax myrtle (*Myrica cerifera*), crape myrtle (*Lagerstroemia indica*), and southern dewberry. Tree species include Chinese tallow, live oak, water oak (*Quercus nigra*), loblolly pine, and eastern red cedar (*Juniperus virginiana*).

Maintained ROW – Maintained ROW is located adjacent to the existing roadway. These areas are highly disturbed and do not generally support high-quality native floral communities. Herbaceous species observed within the maintained ROW of the study area include southern carpet grass, Bermuda grass, narrow-leaf sumpweed, annual sumpweed, common-evening primrose, Vasey grass, Paraguayan windmill grass (*Chloris canterai*), knotroot bristle-grass, Johnson grass, smutgrass, common dandelion, Carolina geranium ***(****Carolina geranium)*, Brazilian vervain (*Verbena brasiliensis*), and bur clover (*Medicago polymorpha*). Common shrubs and vines include yaupon, wax myrtle, Drummond's rattle-bush, and southern dewberry. Tree species include Chinese tallow, live oak, pecan (*Carya illinoinensis*), loblolly pine, and eastern red cedar.

Environmental Consequences

Under the No Build Alternative, the existing roadway and associated ROW would continue to be maintained. Existing land use changes, including urban development and periodic mowing of the existing ROW, would continue and periodically affect vegetation communities. No adverse affects to vegetation are anticipated under the No Build Alternative.

Clearing, grading, and other roadbed preparation activities associated with the construction of the Build Alternative would permanently or temporarily affect less than 14.63 acres of natural vegetation within the existing and proposed ROW. These natural vegetation communities include aquatic features, tidally influenced marshes, periodically inundated wetlands (including jurisdictional and non-jurisdictional aquatic resources), and upland forest. The vegetated portions of the existing and proposed ROW would be converted to maintained ROW, excavated for the installation of culverts extensions and bridge crossings, or cleared, graded, and paved to accommodate construction. Additional details regarding the effects of these activities to vegetation are presented in **Table 32**.

Table 32: Comparison of Natural Vegetation Types Affected

Natural Vegetation Type	Location/Distribution	Build Alternative	
		Area within ROW (acre)	Estimated Effects (acres)
Aquatic Features	Clear Lake	15.66	< 12.00[(2)]
Tidally Influenced Marshes	Fringe marsh associated with Clear Lake	2.06	0.76[(2)]
Periodically Inundated Wetlands [(1)]	Common and scattered throughout the study area	2.82	1.80
Upland Forest	Located adjacent to the existing eastern ROW south of Red Bluff Road	0.07	0.07
Total		**20.61**	**< 14.63**[(2)]

Note: The proposed effects calculated are preliminary and subject to revision.
[(1)] Effects to periodically inundated wetlands include jurisdictional and non-jurisdictional wetlands.
[(2)] Effects to aquatic features and tidally-influenced marshes will be determined once bridge and culvert designs are finalized.

According to Provision (4)(A)(i) of the TxDOT-TPWD MOU, the upland forest within the study area is not considered unusual vegetation or a special habitat feature; therefore, a tree survey was not performed. No unusually large native trees were observed within the existing and proposed ROW. TxDOT would design, use, and promote construction activities that would avoid and preserve as many trees as practicable.

Potential Mitigation

In accordance with Provision (4)(A)(ii) of the TxDOT-TPWD MOU, some habitats may be given consideration for non-regulatory mitigation during project planning. These habitats may include:

- Habitat for federal candidate species if mitigation would assist in the prevention of the listing of the species;
- Rare vegetation series (S1, S2 or S3) that also locally provide habitat for a state-listed species;
- All vegetation communities listed as S1 or S2, regardless of whether or not the series in question provide habitat for state-listed species;
- Bottomland hardwoods, native prairies, and riparian areas; and,
- Any other habitat feature considered to be locally important.

Because the study area does not meet the habitat requirements stated in the TxDOT-TPWD MOU, non-regulatory mitigation is not required. If applicable, TxDOT would consult with TPWD to determine mitigation requirements for regulated wildlife habitats affected by the proposed project.

Invasive Species – On February 3, 1999, the President issued Executive Order 13112 to prevent the introduction of invasive species and to provide control and to minimize the economic, ecological, and human health impacts caused by the introduction of invasive species. Of the invasive species, the Chinese tallow tree is the most difficult to manage. TxDOT uses prescribed burning periodically on grassland areas to help control this invasive species and is currently sponsoring research with Texas A&M University to identify and implement other weed control mechanisms. Additionally, any landscaping associated with the proposed project would be limited to seeding or planting the ROW with native species

of grasses, shrubs, or trees, where practicable. Soil disturbance would be minimized to ensure that invasive species would not establish in the project ROW.

Beneficial Landscaping Practices – The Executive Memorandum on Beneficial Landscaping directs that native species of plants will be used in the seeding and replanting of roadway ROWs, where possible. A mix of native grasses and native forbs would be used to revegetate the ROW of the proposed project, where practicable. The Executive Memorandum of August 10, 1995 directs that, where cost-effective and to the extent practicable, agencies will (1) use regionally native plants for landscaping; (2) design, use, or promote construction practices that minimize adverse effects on the natural habitat; (3) seed to prevent pollution by, among other things, reducing fertilizer and pesticide use; (4) implement water-efficient and runoff reduction practices; and (5) create outdoor demonstration projects employing the above measures and practices.

Wildlife

Existing Environment

The study area falls in a transitional zone between the Texan and Austroriparian Biotic Provinces (Blair, 1950). The Texan Biotic Province is a broad, ecologically transitional region between the Tamaulipan Province to the west and the Austroriparian Province to the east. The vertebrate community in this area is supported by a mixture of plant and animal species characteristic of both Tamaulipan and Austroriparian Provinces. Rivers and associated riparian strips coursing through the Texan Province provide valuable habitat as well as corridors for migration. The vertebrate community of the Texas Province consists of approximately 49 species of mammals, 16 species of lizards, 39 species of snakes, five species of salamanders (urodeles), two types of land turtles, 18 species of frogs and toads (anurans), and an undetermined number of bird species.

The Austroriparian Province comprises the pine and hardwood forests of the eastern Gulf Coastal Plain. The vertebrate community of the Austroriparian Province consists of approximately 47 species of mammals, 10 species of lizards, 29 species of snakes, 18 species of salamanders (urodeles), two types of land turtles, and 17 species of frogs and toads (anurans).

Local Wildlife

The vegetation types described in this document could support various wildlife species, such as small birds and mammals. Riparian habitats along lakes, small wetlands areas, and ditch crossings are commonly used by mammalian wildlife. Some mammalian species may continue to exist for years in these areas because of their ability to adapt to urban development. Typical mammals that could occur within the study area include Virginia opossum (*Didelphis virginiana*), house mouse (*Mus musculus*), common raccoon (*Procyon lotor*), hispid cotton rat (*Sigmodon hispidus*), and eastern cottontail (*Sylvilagus floridanus*).

Wooded areas and grassy fields located throughout the study area serve as habitat for many avian species, which can range from small game birds to large birds of prey. Birds that could occur within these areas include Cooper's hawk (*Accipiter cooperii*), mallard (*Anas platyrhynchos*), great egret (*Ardea alba*), great blue heron (*A. herodias*), cedar waxwing (*Bombycilla cedrorum*), cattle egret (*Bubulcus ibis*), red-tailed hawk (*Buteo jamaicensis*), green heron (*Butorides virescens*), crested caracara (*Caracara cheriway*),

turkey vulture (*Cathartes aura*), belted kingfisher (*Ceryle alcyon*), killdeer (*Charadrius vociferus*), rock pigeon (*Columba livia*), black vulture (*Coragyps atratus*), American crow (*Corvus brachyrhynchos*), snowy egret (*Egretta thula*), tri-colored heron (*E. tricolor*), white ibis (*Eudocimus albus*), American kestrel (*Falco sparverius*), common snipe (*Gallinago gallinago*), loggerhead shrike (*Lanius ludovicianus*), herring gull (*Larus argentatus*), laughing gull (*L. atricilla*), ring-billed gull (*L. delawarensis*), northern mockingbird (*Mimus polyglottos*), black-crowned night-heron (*Nycticorax nycticorax*), osprey (*Pandion haliaetus*), American white pelican (*Pelecanus erythrorhynchos*), brown pelican (*P. occidentalis*), double-crested cormorant (*Phalacrocorax auritus*), roseate spoonbill (*Platalea ajaja*), pied-billed grebe (*Podilymbus podiceps*), great-tailed grackle (*Quiscalus mexicanus*), eastern meadowlark (*Sturnella magna*), European starling (*Sturnus vulgaris*), brown thrasher (*Toxostoma rufum*), American robin (*Turdus migratorius*) and mourning dove (*Zenaida macroura*). These birds could occur in the study area on a transient basis.

A small roosting site of several wading bird species was observed east of the proposed study area in Clear Lake. No nests were observed in the roosting area.

Reptiles and amphibians are considered common within the study area. Amphibians include the cricket frog (*Acris crepitans*), gulf coast toad (*Bufo valliceps*), gray treefrog (*Hyla versicolor*) and southern leopard frog (*Rana sphenocephala*). Common reptiles include the green anole (*Anolis carolinensis*), ground skink (*Scincella lateralis*), and rough earth snake (*Virginia striatula*).

Environmental Consequences

The No Build Alternative would have no adverse effects to wildlife and no additional ROW would be acquired. Urban development and periodic mowing of the existing ROW would continue, affecting wildlife communities over time.

Given that the proposed project is along an existing transportation corridor, no new barriers to wildlife movement would be introduced. Instead, construction of the project may broaden or widen existing barriers resulting in permanent and temporary effects to wildlife habitat (see **Table 32** in the *Vegetation* section of this document). Temporary effects to wildlife habitat include the decreased attractiveness of habitat adjacent to the project corridor as well as possible disturbances to normal behavior patterns on wildlife as a result of increased noise levels due to construction activities.

The Build Alternative would result in permanent effects on wildlife habitat, including small amounts of habitat loss through its conversion into transportation infrastructure and maintained ROW. Wildlife in the study area has and would continue to be slowly dominated by species that are better able to adapt to a disturbed physical environment and could tolerate possible disturbances from the proposed project. The potential loss or displacement of wildlife populations into adjacent habitats could increase competition for food and shelter for many resident and migratory species. Although construction of the Build Alternative could remove and/or convert habitat and therefore, displace wildlife in certain areas, habitat loss and the resulting effects on wildlife are expected to be less than 14.63 acres.

Potential Mitigation

Adjacent wildlife habitats would be protected from stormwater runoff by implementing BMPs under the SW3P, which would provide erosion and sedimentation control. Additionally, the contractor would be

notified about and be responsible for complying with the Migratory Bird Treaty Act (MBTA) for migratory birds that may inhabit the study area throughout the duration of the construction project (see the *Threatened and Endangered Species* section of this document).

Threatened and Endangered Species

Existing Environment

Databases of sensitive species maintained by the U.S. Fish and Wildlife Service (USFWS) and TPWD were reviewed to determine the state and/or federally listed threatened or endangered species that occur or historically have occurred in Harris and Galveston Counties (TPWD 2006 and USFWS 2007). The potential effects of the proposed project on these species were determined by reviewing the TPWD - Natural Diversity Database (NDD) Element of Occurrence Records (see **Appendix E** for the TPWD coordination letter) and by conducting habitat assessments with qualified biologists. A species list for each county outlining the species and habitat potentially present in the proposed study area is found in **Appendix F, Tables 1 and 2**. No unique, critical, designated, or proposed designated habitat exists in or near the proposed project.

One listed species, brown pelican (*Pelecanus occidentalis*), was observed several times loafing within the project vicinity near Clear Lake. These sightings occurred along the shorelines, remnant support pilings, and open water of Clear Lake. The TPWD-NDD did not reveal any documented occurrences of this species. Brown Pelicans nest on small, isolated coastal islands where they are safe from predators such as raccoons and coyotes. No suitable nesting habitat was observed within the project area for Brown Pelicans.

According to the TPWD-NDD Element of Occurrence Records, no documented occurrences of state and/or federally threatened or endangered species have been recorded within the limits of the proposed project. However, the TPWD-NDD revealed documented occurrences for the following species of concern: Gulf salt marsh snake (*Nerodia clarkii*), Texas diamondback terrapin (*Malaclemys terrapin littoralis*), and Houston daisy (*Rayjacksonia aurea*). None of these species were observed on-site during the site assessment. The National Oceanic and Atmospheric Administration (NOAA) Fisheries Service Protected Resources Division was contacted for a list of federally protected species under their jurisdiction. No specific concerns were raised by NOAA regarding effects to listed species or critical habitat (NOAA 2005).

Environmental Consequences

The No Build Alternative would have no effect on any state and/or federally listed threatened or endangered species. **Table 33** lists all state and/or federally listed threatened or endangered species identified as potentially occurring within Harris and Galveston Counties, a description of suitable habitat, and the effect of the proposed project on each species. The proposed project would not directly or indirectly effect or diminish the value of critical habitat for the survival or recovery of any listed species. The proposed project would have ***no effect*** on any population or individuals of federally listed threatened or endangered species. The proposed project would have ***no impact*** on any population or individuals of state listed threatened or endangered species.

Table 33: Potential Effects to Listed Species Potentially Occurring within the Study Area

Common Name (*Scientific Name*)	State Status	Federal Status	Description of Suitable Habitat	Unique, Critical, or Designated Habitat	Effects Discussion
AMPHIBIANS					
Houston toad (*Bufo houstonensis*)	E	E†	Sandy soil, breeds in ephemeral pools	No	No impact; habitat not present.
BIRDS					
American peregrine falcon (*Falco peregrinus anatum*)	T	DM†	Resident and nests in west Texas, potential migrant, winters along coast	No	No impact; rare transitory migrant
Arctic peregrine falcon (*Falco peregrinus tundrius*)	--	DM†	Potential migrant, winters along coast	No	No impact; rare transitory migrant.
Attwater's greater prairie-chicken (*Tympanuchus cupido attwateri*)	E	E	Thick one to three foot tall grass from 0 to 200 feet above sea level along the coast	No	No effect; habitat not affected by the proposed project. Proposed project does not acquire ROW from the Texas City Prairie Preserve.
Bald eagle [(1)] (*Haliaeetus leucocephalus*)	T	DM	Near water areas, in tall trees	No	No effect; no occurrences observed and no NDD occurrences for this species. No known nesting sites nearby or observed.
Brown pelican (*Pelecanus occidentalis*)	E	E	Roosts and nests on islands and near shore coastal areas	No	No effect; observed in study area feed/loafing, however, no NDD occurrences. No suitable nesting habitat observed.
Eskimo curlew (*Numenius borealis*)	E	E	Historic; non-breeding; grasslands, pastures, plowed fields, and less frequently, marshes and mudflats	No	No effect; habitat not present.
Peregrine falcon (*Falco peregrinus*)	T	DM†	Resident, nests in west Texas	No	No impact; rare transitory migrant.
Piping plover (*Charadrius melodus*)	T	E, T	Wintering in coastal areas, beach and bayside mud or salt flats	No	No effect; habitat not present.
Red-cockaded woodpecker (*Picoides borealis*)	E	E†	Cavity nests in older pine (60+ yrs); forages in younger pine (30+ yrs); prefers longleaf, shortleaf, and loblolly	No	No impact; habitat not present.
Reddish egret (*Egretta rufescens*)	T	*	Brackish marshes and tidal flats	No	No impact; habitat not present.
White-faced ibis (*Plegadis chihi*)	T	*	Freshwater marshes, but some brackish or salt marshes	No	No impact; no occurrences observed and no NDD occurrences for this species.

Table 33, Cont.: Potential Effects to Listed Species Potentially Occurring within the Study Area

Common Name (*Scientific Name*)	State Status	Federal Status	Description of Suitable Habitat	Unique, Critical, or Designated Habitat	Effects Discussion
White-tailed hawk *(Buteo albicaudatus*)	T	*	Coastal prairies; cordgrass flats, scrub-live oak	No	No impact; transitory migrant.
Whooping crane (*Grus Americana*)	E	E†	Winters in Aransas, Calhoun, and Refugio counties; potential migrant	No	No impact; habitat not present.
Wood stork (*Mycteria Americana*)	T	*	Prairie ponds, flooded pastures, mud flats	No	No impact; no occurrences observed and no NDD occurrences for this species.
FISHES					
Creek chubsucker (*Erimyzon oblongus*)	T	*	Variety of small rivers and creeks, prefers headwaters	No	No impact; habitat not present.
Smalltooth sawfish (*Pristis pectinata)*	E	E†	Sheltered bays, on shallow banks, and in estuaries or river mouths, mangrove, reef, seagrass, and coral	No	No impact; habitat not present.
MAMMALS					
Louisiana black bear (*Ursus americanus luteolus*)	T	T†	Bottomland hardwoods; large, undisturbed forested areas	No	No impact; habitat not present.
Rafinesque's big-eared bat (*Corynorhinus rafinesquii*)	T	*	Cavity trees in hardwood forest, concrete culverts, abandoned buildings	No	No impact; no habitat critical to the survival or recovery of this species was observed in the proposed ROW. No occurrences observed and no NDD occurrences for this species.
Red wolf (*Canis rufus*)	E	E†	Extirpated; formerly eastern TX in brushy/forested areas, coastal prairies	No	No impact; extirpated.
West Indian manatee (*Trichechus manatus*)	E	E†	Gulf and bay system	No	No impact; habitat not present.
REPTILES					
Alligator snapping turtle (*Macroclemys temminckii*)	T	*	Deep water of rivers, canals, lakes, swamps, and bayous	No	No impact; habitat not present.
Atlantic hawksbill sea turtle (*Eretmochelys imbricata*)	E	E	Gulf and bay system	No	No effect; no habitat critical to the survival or recovery of this species was observed in the proposed ROW.
Green sea turtle (*Chelonia mydas*)	T	E, T	Gulf and bay system	No	No effect; no habitat critical to the survival or recovery of this species was observed in the proposed ROW.

Table 33, Cont.: Potential Effects to Listed Species Potentially Occurring within the Study Area

Common Name (*Scientific Name*)	State Status	Federal Status	Description of Suitable Habitat	Unique, Critical, or Designated Habitat	Effects Discussion
Kemp's ridley sea turtle (*Lepidochelys kempii*)	E	E	Gulf and bay system	No	No effect; no habitat critical to the survival or recovery of this species was observed in the proposed ROW.
Leatherback sea turtle (*Dermochelys coriacea*)	E	E	Gulf and bay system	No	No effect; no habitat critical to the survival or recovery of this species was observed in the proposed ROW.
Loggerhead sea turtle (*Caretta caretta*)	T	T	Gulf and bay system	No	No effect; no habitat critical to the survival or recovery of this species was observed in the proposed ROW.
Smooth green snake (*Liochlorophis vernalis*)	T	*	Gulf coastal plain, mesic coastal shortgrass prairies, dense vegetation	No	No impact; habitat not present.
Texas horned lizard (*Phrynosoma cornutum*)	T	*	Open, semi-arid regions, with sparse vegetation, grass, cactus, and brush.	No	No impact; habitat not present.
Timber/canebrake rattlesnake (*Crotalus horridus*)	T	*	Swamps/floodplains of hardwood/upland pine	No	No impact; habitat not present.
VASCULAR PLANTS					
Texas prairie dawn (*Hymenoxys texana*)	E	E	Poorly drained areas in open grasslands; pimple mounds	No	No effect; habitat not present. No occurrences observed and no NDD occurrences for this species.

Sources: TPWD 2009, USFWS 2009.

Note:

* These species occur on the TPWD listing of threatened or endangered species (updated May 2009, accessed August 2009); however, they are not federally listed by the Clear Lake office of the USFWS (accessed August 2009).

-- These species occur on the TPWD listing of threatened or endangered species (updated May 2009, accessed August 2009); however, they are not state listed by TPWD (accessed August 2009).

† These species are listed by the U.S. Fish and Wildlife Service; however, they are not listed to occur within Harris County by the Clear Lake office of the USFWS (accessed August 2009).

(1) The bald eagle was delisted by the USFWS on August 8, 2007 and is no longer a federal threatened species; however, it will be monitored closely for at least the next five years, and is still afforded special protection under the MBTA and Eagle Act.

E = endangered, T = threatened, DM = delisted taxon

Migratory Birds

Several of the bird species listed in **Table 33** are considered migratory; however, the Build Alternative would not affect the migration patterns of these species. In the event that migratory birds or their nests are observed prior to construction activities, measures would be taken to avoid harm to migratory birds, their nests, eggs, or young. To ensure compliance with the MBTA, clearing and grubbing vegetation within the

study area would not take place during the migratory bird nesting season (April 1 to July 15) or measures would be taken to discourage birds from nesting in existing structures.

Essential Fish Habitat

Congress enacted amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (October 11, 1996) that established procedures for identifying Essential Fish Habitat (EFH). EFH consists of those habitats necessary for spawning, breeding, feeding, or growth to maturity of species managed by the Regional Fishery Management Council (FMC) and as described in a series of Fishery Management Plans (FMPs). Additionally, all estuaries and estuarine habitats in the northern Gulf of Mexico are considered EFH (Gulf of Mexico Fishery Management Council {GMFMC} 1998). A summary of EFH is presented in **Appendix F**.

Environmental Consequences

The No-Build Alternative would not affect EFH.

Design of the Build Alternative has avoided and minimized effects to Clear Lake to the greatest extent practicable. It is anticipated that the Build Alternative would have only minimal effects to EFH. These effects would occur during the installation or demolition of bridge columns or pilings, embankment fill, or culvert extensions, as appropriate. Construction activities may temporarily increase sedimentation and turbidity of the water bodies in the immediate area and for a short distance downstream. To minimize effects, Best Management Practices (BMPs) would be used to reduce potential turbidity and sedimentation. Since the proposed bridge structures would not change existing channel widths and water bodies would be restored to pre-construction conditions, these effects would be temporary and would not result in long-term effects to EFH.

Construction activities may temporarily disturb bottom sediments increasing turbidity in the water column, which could discourage habitat utilization by the brown shrimp and white shrimp (see **Appendix F**). Following construction, recolonization of the habitats would occur.

Potential Mitigation

Amendments to the MSFCMA specifies that each federal agency shall consult with NOAA Fisheries Service when an activity proposed to be permitted, funded, or undertaken by a federal agency may have adverse effects on designated EFH. The NOAA Fisheries Service Protected Resources Division was contacted for a list of federally protected species under their jurisdiction; no specific concerns were raised regarding effects to listed species or critical habitat (NOAA 2005).

Cultural Resources

Existing Environment

Individual archeological and historical resource investigations were previously coordinated with the Texas State Historic Preservation Officer (SHPO) for a 24-mile section of SH 146 from Fairmont Parkway to SH 3 (CSJs; 0389-05-087, 0389-05-088, 0389-06-088 and 0389-07-029). Texas Antiquities Permit Number 3770 was issued for this project. The findings of these archeological and historic resource investigations are presented in three separate EAs, which includes the current project. This project

discusses those findings for one of three segments of independent utility; a 4.0-mile section of SH 146 from Red Bluff to FM 518.

Archeological Resources

A TxDOT archeologist evaluated the potential for the proposed undertaking to affect archeological historic properties (36 CFR §800.16(l)) or State Archeological Landmarks (13 TAC 26.12) in the area of potential effects (APE). The archeological APE comprises existing and proposed new ROW within the project limits. The APE extends to a maximum depth of 25 feet below the modern ground surface. Section 106 review and consultation proceeded in accordance with the First Amended Programmatic Agreement (PA) among the FHWA, TxDOT, the Texas SHPO, and the Advisory Council on Historic Preservation (ACHP) Regarding the Implementation of Transportation Undertakings (PA-TU), as well as the MOU between TxDOT and the Texas Historical Commission (THC). The following documentation presents TxDOT's findings and explains the basis for those findings.

An intensive survey of the APE was performed by archeological staff of Michael Baker Jr. under Texas Antiquities Permit No. 3770. This survey revealed that most of the APE consists of highly disturbed or geologically unsuitable land with virtually no potential to contain intact archeological deposits. No archeological deposits were encountered within the proposed undertaking's APE.

TxDOT completed its review on April 5, 2006. Section 106 consultation with federally recognized Native American tribes with a demonstrated historic interest in the area was initiated on April 10, 2006. No objections or expressions of concern were received within the comment period. Pursuant to Stipulation VI of the PA-TU, TxDOT finds that the APE does not contain archeological historic properties (36 CFR §800.16(l)), and thus the proposed undertaking would not affect archeological historic properties. The project does not merit further field investigations. Project planning can also proceed, in compliance with 13 TAC 26.20(2) and 43 TAC 2.24(f) (1) (C) of the MOU. If unanticipated archeological deposits are encountered during construction, work in the immediate area will cease, and TxDOT archeological staff will be contacted to initiate post-review discovery procedures under the provisions of the PA and MOU.

Historic Structures

Prior to conducting the historic resource survey of the study area, qualified cultural resource personnel reviewed the THC's Texas Historic Sites Atlas to identify properties listed in the National Register of Historic Places (NRHP), designated Recorded Texas Historical Landmarks (RTHL), or designated State Archeological Landmarks (SAL), and to identify Official State Historical Markers (OSHM) within the project's APE. The statewide historic bridge inventory was also checked to identify any previously documented or designated historic resources. A historic resource survey of the larger 24-mile SH 146 study area (from Fairmont Parkway to SH 3) was performed on February 7 through 10, 2005 by TxDOT-certified professional historians. In consultation with the SHPO it was determined that the project's APE was to extend 300 feet (91.44 meters) beyond the existing and proposed ROW boundaries. The purpose of the survey was to identify and evaluate all buildings, structures, objects, and potential districts constructed in 1966 or earlier that are located within the APE. In addition, the survey included documentation of historic-age resources located outside the APE but clearly associated with other built resources or agricultural fields within the APE.

The historic document and file review determined that there were no previously designated historic resources within the APE including properties listed in or under nomination to the NRHP. In addition, there were no RTHL's, OSHM's, or local historic markers within the APE.

For this proposed 4.0-mile segment of the larger SH 146 project, the survey identified 36 historic-age resources (Resource ID Numbers 7-31e) constructed prior to 1966 within the project's APE. The 36 resources include 13 residences and 5 associated outbuildings, one culvert, and 5 agricultural outbuildings. The survey recommended that all 36 resources were not eligible for NRHP-listing and TxDOT Historians concurred with the survey findings. Coordination with THC in December 2005 resulted in a concurrence of the determinations of eligibility. Additional information on historic structures in the project's APE is provided in the *Historic Resources Survey Report for SH 146: Fairmont Parkway to SH 3* in Harris and Galveston Counties, Texas (TxDOT 2005).

Environmental Consequences

Archeological Resources

The No Build Alternative would have no effect to archeological resources.

In accordance with the PA among TxDOT, SHPO, FHWA, and the ACHP, as well as the MOU between TxDOT and THC, TxDOT will individually coordinate with the SHPO regarding the eligibility of any archeological sites for inclusion in the NRHP. These agreements would also ensure that any archeological materials discovered during construction or from land-disturbing activities associated with the project would be evaluated by TxDOT Environmental Affairs Division (ENV) under the provisions of the PA and MOU.

Historic Structures

The No Build Alternative would have no effect to historic structures.

TxDOT has consulted with the Texas SHPO to finalize the determination of eligibility for historic resources identified within the project's APE. Based on the previously coordinated historical resources survey for the larger SH 146 widening project from Fairmont Parkway to SH 3, the SHPO concurred with the eligibility determinations for historic resources and there would be no adverse effect to historic resources as a result of the current project. The SHPO concurrence letter for historic resources, dated December 29, 2005, is included in **Appendix E**.

In a memorandum dated August 8, 2007, TxDOT Historians determined that pursuant to Stipulation VI "Undertakings with Potential to Cause Effects" of the PA-TU between the FHWA, SHPO, the ACHP, and TxDOT and the MOU, no historic properties are located within the APE for the Red Bluff Road to FM 518 proposed project. Therefore, individual coordination with the SHPO is not required. The Memorandum is included in **Appendix E**.

Parkland and Section 4(f) / 6(f) Properties

Existing Environment

The presence of any potential Section 4(f) and 6(f) lands, including public parks, recreation areas, wildlife and waterfowl refuges, and any historic site of national, state, or local significance, within the vicinity of the proposed project is described below. The parklands and recreational areas were compiled through previous reports and studies cited in this EA and by contacting federal, state, and local agencies. Field reconnaissance was performed to confirm their locations.

- Cameron Festival Park is owned and operated by the Seabrook Association. Also known as the Seabrook Fairgrounds, this park is considered an unofficial recreational use. It is located on Red Bluff Road just east of SH 146 in Seabrook, Texas.
- The Seabrook Sports Complex is a small recreation park containing four softball fields. It is located on Meyer Avenue located between Delabrook Court and NASA Road 1 just east of SH 146 in Seabrook, Texas. The complex is owned and operated by the Harris County Parks Department.
- Miramar, Meador and Hester Parks are owned and operated by the city of Seabrook. Collectively, these parks function as a single park and represent the central park of Seabrook. This complex consists of the city swimming pool, pavilion, playground equipment, a skateboard park, and a nine-hole disc golf course. A hike and bike path extends around the perimeter of Miramar and Meador Parks. The complex is located on Meyer Avenue east of SH 146 and Delabrook Court in Seabrook, Texas.
- McHale Park is a bird observation area owned and operated by the city of Seabrook. This park is located east of SH 146 along Todville Road and the Galveston Bay in Seabrook, Texas. Additionally, this park is located on the Texas Parks and Wildlife Birding Trail.
- Kemah Park is a minor outdoor recreation area consisting of playground equipment, a small pavilion, and a gazebo. This park owned and operated by the city of Kemah. Located off of SH 146 between 8th Street and 9th Street, this park is considered inadequate to meet open space and recreational needs of residents.

Environmental Consequences

The No Build Alternative would have no effect to any Section 4(f) land or resources.

The Build Alternative would not require the use of any publicly owned land from a public park, recreation area, wildlife/waterfowl refuge, or any significant historic site. Therefore, neither a Section 4(f) nor a 6(f) evaluation would be required for the proposed project.

Visual Resources

Existing Environment

Visual resources are experienced from properties adjacent to the roadway and from the traveling public using the roadway. The majority of the project corridor is best described as an urban setting with a variety of commercial uses interspersed with single-family residences/subdivisions. Green space coupled with

various trees provides the landscaping of developed parcels. However, in the northernmost portion of the study area, views are dominated by large tracts of undeveloped land consisting of natural vegetation including grasses and forbs. Views of Clear Lake and the Clear Creek Channel as well as numerous harbors and marinas become apparent near the center of the study area. Enhancing the cultural characteristics are the many historic structures as well as several churches in the project vicinity. Views of the Southern Pacific Railroad as well as power lines are prominent along the entire west side of the project corridor. Overall, the visual quality of the study area is mixed, which is high in natural amenity in some aspects but clearly contains cultural elements of an urban environment.

Environmental Consequences

Under the No Build Alternative, the overall visual character of the study area would continue to change with urban development.

The vertical profile of Build Alternative would be similar to the existing elevations and would not change the overall visual character of the study area. However, this alternative also includes constructing an additional structure for the proposed express lanes which would parallel the Kemah Bridge as the proposed facility proceeds over Clear Creek. The addition of vertical structures in this area would result in a noticeable change to the landscape compared to the existing Kemah Bridge over Clear Creek.

Overall, potential effects on the visual quality of the study area would be related to the scale and extent of the Build Alternative's infrastructure and design elements, which would vary according to the viewer group (such as the motorist or adjacent property owner) and individual preferences within the viewer group. Increased lanes of pavement, a decrease in vegetation, and the closer proximity of the roadway to residences and commercial businesses along the project corridor would reduce the quality of the visual environment to residents and other individuals with, for example, a preference for trees and vegetative cover. In order to preserve and provide a visually pleasing roadway, the construction of the Build Alternative would incorporate revegetation and landscaping in accordance with TxDOT's approved seeding specifications wherever possible (see the *Vegetation* section of this document on Invasive Species and Beneficial Landscaping).

Construction Impacts

The proposed project would have minor short-term adverse effects during the construction phase. The use of construction machinery would temporarily increase fugitive dust, emit other air pollutants, raise ambient noise levels, and cause occasional traffic delays. Construction activities associated with the project would include removing the existing pavement, clearing/grading the surface, preparing a new roadbed, paving the roadway and shoulders, installing new culverts, fencing, and revegetating and restoring portions of the ROW.

Contractors would be required to follow applicable federal, state, and local regulations and ordinances to ensure minimal construction effects in the study area. The following measures would minimize adverse effects during construction:

Water Resources and Erosion Control

- Storm water erosion and surface water runoff would be monitored and controlled during construction. A SW3P and erosion and sedimentation control practices would be implemented.
- The clearing of vegetation along stream channels, wetlands, and forest areas would be kept to a minimum. Where vegetation is removed, watering exposed areas would control dust in the construction area and placing silt fences around construction areas would reduce the amount of silt-laden water from entering waterways.

Transportation Safety

- Measures would be taken to minimize traffic disruptions during the construction phase with detours, alternating closures, and temporary reductions in lane widths.
- Construction at road crossings would be scheduled during off-peak hours whenever possible.
- Construction signs would be posted well in advance to minimize travel delays and provide alternative access to affected residences and businesses in the area. Construction work would be phased in such a manner that would allow the roadway to remain open to two-way traffic during construction.

Air Quality

- Construction contractors would be required to comply with TCEQ regulations on air pollution control.
- Measures would be implemented to control or abate fugitive dust emissions created during construction of the proposed project.

Noise

- Measures would be implemented to minimize noise levels anticipated in areas within and adjacent to the project construction site. Impacts to any given receptor would be relatively short-term in nature and extended disruption of normal activity is not likely.
- Unnecessary idling of construction vehicles would be limited and construction vehicles that are not in use would be shut down to reduce both noise and air pollution.
- Construction activities within residential areas would typically be limited to weekdays during the daylight hours to help reduce disruptions.

CHAPTER 4. INDIRECT IMPACTS

This section presents a project level analysis of the potential indirect impacts (or effects) related to the proposed improvements to SH 146 from Red Bluff to FM 518.

The Council on Environmental Quality (CEQ) defines indirect effects as:

> *"…effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects*

related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 CFR §1508.8).

Indirect impacts differ from the direct impacts associated with the construction and operation of the proposed project, and are caused by other actions that have an established relationship or connection to the proposed project. These induced actions are those that would not or could not occur except for the implementation of the proposed project.

The National Cooperative Highway Research Program (NCHRP) Report 466: *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects* (TRB, 2002), the adjunct NCHRP 25-25, Task 22: *Forecasting Indirect Land Use Effects of Transportation Projects* (TRB, 2007), and TxDOT's Revised *Guidance on Preparing Indirect and Cumulative Impacts Analyses* (June 2009) were used to prescreen and/or analyze potential indirect impacts associated with the proposed SH 146 project.

Because the proposed transportation improvements are in an existing transportation corridor and the additional project ROW would be directly adjacent to existing roadway ROW, encroachment due to ROW acquisition would have minor indirect effects to the adjacent natural environment. Encroachment due to ROW acquisition in developed areas would have the potential to affect community cohesion and access to facilities and services. In regards to potential indirect effects of the project on land development, the NCHRP Report 466, on page 62, states that "development effects are most often found up to one mile around a freeway interchange, up to two to five miles along major feeder roadways to the interchange, and up to one-half mile around a transit station." The NCHRP Report 466 goes on to say that these boundaries serve as a guideline, and individual projects must be analyzed case-by-case.

The indirect impacts analysis was conducted in accordance with the seven-step process suggested in TxDOT's *Guidance* for assessing indirect impacts. **Table 34** details the seven steps.

Table 34: Seven Step Approach to Estimate Indirect Impacts

Step	Guidelines
1	Scoping
2	Identify the Study Area's Goals and Trends
3	Inventory the Study Area's Notable Features
4	Identify Impact-Causing Activities of Proposed Action and Alternatives
5	Identify Potentially Substantial Indirect Effects for Analysis
6	Analyze Indirect Effects and Evaluate Results
7	Assess Consequences and Consider/Develop Mitigation, (as Appropriate)

Source: TxDOT 2009.

Step 1. Scoping

Approach

Analyzing the likelihood of development in the study area once construction is completed is a key component of evaluating the potential for indirect impacts. Review of comprehensive plans, land use plans, and interviews with local planners are a few tools that can assist in determining whether the project is expected to spur development.

Because of the project variables associated with the proposed project, the indirect impacts analysis will be a qualitative analysis with some quantitative data provided, if available. A variety of methods such as ArcMap GIS files, city land use plans, and reviews of planning websites and published documents were used to obtain information in support of the evaluation of the proposed project and its potential to generate project-induced development activities. In addition to mapping and quantitative computations, review of qualitative information from the City of Seabrook's Comprehensive Master Plan City, the City of Kemah's Comprehensive Plan, CEQ, NEPA, and FHWA guidance papers and regulations, the SH 146 MIS and the project's EA was completed.

Area of Influence (AOI)

For this analysis, the geographic boundary defined as the Area of Influence (AOI) was identified to include an area where the proposed project could influence in regard to local traffic patterns or land development. The AOI is bounded by Galveston Bay to the east, SH 3 to the west, Bay Area Boulevard/Port Road to the north, and League City Parkway to the south. As development east of Galveston Bay is not possible, the limits of the bay serve as a reasonable choice for an indirect impacts study boundary. In addition, because of the similarity of their respective indirect impacts, it is reasonable to assume that the indirect impacts of one roadway would be eclipsed by those of a nearby roadway as one nears that nearby roadway. Therefore, the split distance between two major roadways is also a reasonable choice for an indirect impacts study area boundary. The AOI, as shown in **Exhibit 10**, encompasses approximately 26,726 total acres and is located within portions of Harris and Galveston counties. **Table 35** provides details on city and unincorporated county land areas included in the AOI.

Table 35: Communities within the Area of Influence

Location	Acres	Percent of AOI
El Lago	509	2.0
Houston	2433	9.1
Pasadena	4108	15.4
Seabrook	3981	14.9
Taylor Lake Village	894	3.4
Webster	1511	5.7
Harris County (Unincorporated)	3038	11.4
League City	8223	30.8
Clear Lake Shores	370	1.4
Bacliff	84	0.03
Kemah	904	3.4
Galveston County (Unincorporated)	671	2.5
TOTAL	26,726	100%

Timeframe

Indirect impacts from the proposed project would be analyzed until 2035. The year 2035 corresponds with the design year for project and the horizon dates for long-range planning documents and demographic forecasts that were made available for this study.

Step 2. Identify the Study Area's Goals and Trends

Local/Regional Trend Data

SH 146 serves as the primary corridor along east Galveston Bay, where the population is expected to grow nearly 57 percent (43,000 people) by 2025 (H-GAC 2005). As identified by the H-GAC, this corridor extends along SH 146 from I-10 East to Galveston Bay. Employment in the Galveston Bay area is expected to grow nearly 41 percent by 2025, adding more than 22,000 jobs (H-GAC 2005).

Major trip generators as well as attractors within the AOI include the numerous businesses, marinas, recreational facilities, such as Armand Bayou Park and Kemah Boardwalk, recent commercial development, sailboat/yacht facilities associated with Clear Lake and Galveston Bay, and transportation facilities such as Bayport Ship Channel Container/Cruise Terminal near La Porte and Shoal Point Terminal in Texas City.

The proposed project is located within Harris and Galveston Counties and extends through the cities of Seabrook and Kemah. Demographic growth data for these areas was obtained from the H-GAC for Year 2005 and projections to 2035 (**Table 36**). Limited demographic data for other communities within the AOI for Year 2000 and projections to 2030 are included in **Table 37** in order to substantiate similar trends for the communities surrounding the project area**.** As indicated in these tables, Harris and Galveston Counties as well as the cities of Seabrook, Kemah and other AOI communities are predicted to have increased growth in population, households, and employment from 2000 to 2035.

Subsequently, the AOI shares many of the same characteristics as other areas in the region. A trend towards suburbanization coupled with an increasing attraction to metropolitan areas has placed pressure on municipalities within the Consolidated Metropolitan Statistical Area (CMSA) to provide critical infrastructure such as schools, transportation facilities, and water/sewer service. Planning documents provide the best indication of future land uses to promote, guide, and monitor development activities. A brief description of the most influential aspects of regional and local plans in relation to the study area is provided in the following subsection**.**

Table 36: Year 2005 – 2035 Demographic Data

Area	Population		
	Actual 2005	**Estimated 2035**	**% Growth**
Kemah	2,057	3,216	56.3%
Seabrook	11,099	19,616	77%
Harris County	3,727,592	5,769,193	54.8%
Galveston County	272,016	404,471	48.9%
Area	**Households**		
	Actual 2005	**Estimated 2035**	**% Growth**
Kemah	823	1,406	70.8%
Seabrook	4,673	8,194	75.3%
Harris County	1,337,794	2,173,395	62.5%
Galveston County	105,619	168,850	59.9%
Area	**Employment**		
	Actual 2005	**Estimated 2035**	**% Growth**
Kemah	2,451	4,669	90.5%
Seabrook	4,448	6,663	49.8%
Harris County	2,060,243	3,144,992	52.7%
Galveston County	105,884	169,492	60.1%

Source: H-GAC 2008.

Table 37: AOI Communities Year 2000 – 2030 Demographic Data

Area	Population		
	Actual 2000	**Estimated 2030**	**% Growth**
El Lago	3,075	5,506	79%
Houston	1,953,631	2,675,967	36.9%
Pasadena	141,674	199,019	40%
Taylor Lake Village	3,694	6,057	63.9%
Webster	6,242	8,997	44.1%
Harris County	3,400,578	4,796,682	41%
Clear Lake Shores	1,205	2,500	100.07%
League City	45,444	72,390	59.2%
Galveston County	250,158	399,936	59.9%

Source: U.S. Census, 2000; Texas State Water Board, 1990-2050 Population Projections, 2002.

Regional and Local Plans

A variety of plans exist to promote, guide, and monitor various development activities ranging from regional transportation infrastructure to residential, commercial, or industrial activities. A description of the most influential aspects of regional and local plans in relation to the study area is provided below.

2035 Regional Transportation Plan

The H-GAC's 2035 RTP is a long-range plan that identifies mobility and access goals for the Houston-Galveston region, provides strategies to meet these goals, and prioritizes actions to be implemented in 2035. The RTP is a requirement of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and Transportation Efficiency Act for the 21st Century (TEA-21), and was developed to enhance mobility by providing an efficient, affordable, safe, and environmentally responsible transportation system for both people and goods. The RTP considers the transportation needs within the eight-county region of the CMSA which is also the Transportation Management Area (TMA) for the region. This region, which includes Harris and Galveston Counties encompasses more than 7,000 square miles and includes almost 5 million residents. The RTP, as prepared by the H-GAC, is designed to:

- Reduce congestion and improve access to jobs, markets, and services;
- Preserve and maintain the existing transportation infrastructure;
- Improve transportation and safety; and
- Be environmentally responsible.

In accordance with the 2035 RTP, expected future revenue for transportation improvements will not keep pace with future demands. Congestion levels will grow by 10 percent over today's levels even with the implementation of the 2035 RTP. However, if the RTP were not implemented, future congestion would more than double by year 2035. Due to limited growth in conventional funding, the use of toll roads as an additional funding source will play a strategic role in expanding the region's roadway system. Similarly, as reported in the 2025 RTP, if new roads financed by user tolls were not included, congestion would grow by 26 percent.

The RTP Update was adopted by the Transportation Policy Council on October 29, 2010. The U.S. Department of Transportation (USDOT, which includes FHWA/Federal Transit Administration {FTA}) found the 2013-2016 TIP to conform to the State Implementation Plan (SIP) on November 1, 2012. The widening of SH 146 from Red Bluff to FM 518 (CSJs: 0389-05-088, 0389-05-116, and 0389-06-095) is listed in the 2035 RTP Update, Appendix E pages 36 and 85.

With the predicted added congestion to the region, it would be increasingly difficult for businesses to function efficiently. The rate and distribution of population and employment growth within the project study area influences travel demand and thus the need for practicality of transportation improvements and alternative solutions. In the 2035 RTP, H-GAC predicts that because of the size of the projected increase in traffic, serious and severe levels of future congestion would not be relieved solely though current recommendations for increased public transportation and traffic management. The proposed project would provide necessary additional roadway capacity for the movement of goods and services in the region.

2013-2016 Transportation Improvement Program

The 2013-2016 TIP is a cooperatively developed four-year program for transportation investments in public transit, highways, traffic management, and other transportation and air quality related activities. It is formulated for the H-GAC Traffic Management System (TMS), which is comprised of the eight-county TMA. The EPA has designated all eight counties as a "severe" nonattainment area for the pollutant ozone.

Therefore, the transportation improvements contained in the 2008-2011 TIP must comply with air quality regulations for vehicle emissions that contribute to the formation of ground-level ozone.

The 2013-2016 TIP identifies priority roadway and transit projects scheduled for implementation between September 1, 2002 and August 31, 2016. All roadway and transit projects funded under Title 23 and Title 49 by the USDOT are required to be listed in the TIP. In addition, locally funded transportation improvements of regional significance are inventoried and included in the TIP for the conformity analysis requirements of the CAA Amendments of 1990.

The widening of SH 146 from Red Bluff to FM 518 (CSJs: 0389-05-088, 0389-05-116, and 0389-06-095) is listed in the 2035 RTP Update, Appendix E pages 36 and 85.

Seabrook Comprehensive Master Plan ~ 2025

The city of Seabrook guides future growth and development based on their 1998 Comprehensive Master Plan as well as previous planning efforts dating back to 1968. This plan discusses goals and objectives as a way for the city to "enhance the quality of life in a safe environment employing Seabrook's unique waterfront resources" (Seabrook 2004). The goals and objectives for the city focus on the following:

- Maintain and expand land allocated for single-family owner occupied homes in order to provide a range of income and age groups;
- Encourage growth of employment though use of areas presently zoned for commerce and industry as a way to balance residential, employment, and recreational activities;
- Enhance special characteristics of the city such as conserving Seabrook's shoreline, encouraging maritime activities, linking existing and future parks with schools, creating a pedestrian, bike and hike network; and
- Improve and maintain regional and local transportation systems allowing for efficient movement of traffic serving the city and adjacent uses.

The resulting land use map establishes several land use categories including three residential categories as well as mixed-use, commercial, and light industry categories. With respect to the SH 146 Corridor, land is zoned as 'Commercial' along the east side of SH 146 from the northern city limits to Delabrook Court and 'Mixed-Use' from Delabrook Court to the southern city limits. Also, land along the west side of SH 146 is zoned as a mix of 'Commercial', 'Single-Family Housing', 'Medium Density Single-Family Housing', and 'Mixed-Use'. These designations and accompanying zoning are largely consistent with existing land use patterns in the study area.

Kemah Comprehensive Plan ~ 2015

Kemah is characterized as a "tourist attraction as well as a bedroom community for workers" who live in Kemah and commute to nearby cities such as Clear Lake and Houston (Kemah 1997). Kemah's development is centered on commercial aspects through leisure activities including boating and fishing. The city is experiencing slow but steady growth. To make Kemah a desirable place to live and work, goals have been established through the city's comprehensive plan:

- Adopt and implement the central business district and thoroughfare elements;

- Adopt and implement the water, wastewater, drainage, and street elements;
- Promote an aesthetically pleasing, durable, and safe living environment for present and future residents; and
- Consider zoning as initial stepping stone for future land use planning.

With high growth communities such as League City and Clear Lake located to the west of Kemah, the city is anticipating significant development of vacant and unused agricultural land. The city's land use plan and associated maps indicate a considerable increase in commercial and residentially zoned land. With respect to the SH 146 Corridor, land is planned for commercial uses along the east side SH 146 from the Clear Creek Channel to FM 2094 and along the east and west sides of SH 146 south of FM 518. In addition, public land use is planned for the west side of SH 146 north of FM 2094. An increase in residential and public land use is also indicated adjacent to or behind the commercial properties.

Step 3. Inventory the Study Area's Notable Features

The third step in the indirect impacts assessment framework involves conducting an inventory of notable environmental and community features, and to identify specific environmental issues by which to assess the project.

Commercial land use is scattered along the project corridor and is especially prevalent near the SH 146 intersections with Repsdorph Road, NASA Road 1, FM 2094, and FM 518. These commercial uses include restaurants, banks, small retail centers, auto repair stores, and fueling stations. Tourism and recreational activities are highly visible in the cities of Seabrook and Kemah with the recent commercial development and sailboat/yacht facilities associated with Clear Lake and Galveston Bay. Public facilities within the study area also include several churches, parks, the Kemah Boardwalk, and Seabrook and Kemah's city hall, police department, and fire station.

Residential development has been keeping pace with the increased employment in the project area and along the east/west roadways connecting to SH 146 and the Galveston Bay communities, such as Shoreacres and Bacliff. Residential developments near the project corridor include Lake Pointe Forest, Lake Cove Estates, Harbor Cove Estates, and Harbor Homes.

The shipping industry has made substantial investments to existing and new container port facilities for the Bayport Ship Channel Container/Cruise Terminal near La Porte (located north of the study area) and Shoal Point Terminal in Texas City (located south of the study area).

The proposed project lies within two watersheds of the San Jacinto-Brazos Coastal Basin, which includes the Upper Galveston Bay and Clear Lake watersheds. Additionally, the 100-year floodplain associated with Clear Creek lies within the area traversed by the proposed project.

Step 4. Identify Impact-Causing Activities of Proposed Action and Alternatives

The proposed project would add new lanes to the existing roadway by widening the existing facility from a four-lane divided roadway to a six- to 12-lane freeway with grade separations at major intersections, access roads at selected locations, and express lanes over Clear Creek. Impact-causing activities associated with the proposed project improvements are described in **Table 38**.

Table 38: Impact-Causing Activities

Type of Activity	Project Specific Activity	Relevant Details
Modification of Regime	Modification of Aquatic Habitat	Approximately 18.02 acres of aquatic habitat (i.e. jurisdictional wetlands and waters of the U.S.) would be permanently and temporarily affected by construction of the project. Approximately 2.55 acres of non-jurisdictional aquatic resources would be affected.
Modification of Regime	Alteration of Ground Cover / Landscaping and Erosion Control	Approximately 45 acres of ground cover adjacent to the roadway and bridges would be affected. BMPs will be in place to control soil erosion. When construction is complete, ground cover will be reestablished, where practicable, with a similar species composition to what is currently present.
Land Transformation and Construction	Expanded Transportation Facility	The project would require approximately 45 acres of additional ROW and would affect 57 businesses, two single-family residences, one multi-family housing unit, two churches, and a municipal facility. Of these uses, 52 businesses and one residence would be displaced.
Changes in Traffic	Traffic Patterns on Project and Adjoining Facilities	Expansion of the transportation facility is expected to affect traffic patterns throughout the area. At the present time, SH 146 carries all northbound and southbound through traffic on four lanes. The expanded roadway would improve mobility and improve cross-traffic turning movements.
Access Alterations	Changes in access, circulation patterns, and travel times to major attractors	Expansion of the transportation facility would improve access and provide improved travel times to and from regional shopping districts, recreational facilities and employment centers, including the Kemah Boardwalk, the numerous marina's and shipyards located along the SH 146 Corridor, and Galveston Island. Additionally, the expanded roadway would improve access and traffic patterns to the Shoal Point Container Terminal in Texas City as well as the Bayport Ship Channel Container/Cruise Terminal near La Porte.

Step 5. Identify Potentially Substantial Indirect Effects for Analysis

Step 5 evaluates project impact-causing actions in regards to the study area's goals and notable features in order to explore potential cause-effect relationships and identify potentially substantial effects. The analysis focuses on the following:

1. Encroachment-Alteration Effects - Alteration of the behavior and functioning of the affected environment caused by project encroachment (e.g., physical, chemical, biological);
2. Induced Growth Effects - Project-influenced development impacts (i.e., the land use effect); and

3. Effects Related to Induced Growth - Effects related to project-influenced development impacts, (i.e., effects of the change of land use on the human and natural environment).

For transportation projects, Category 1 includes project impacts such as fragmentation of habitat by a roadway or dispersal of pollutants onto adjacent lands. Indirect impacts from Categories 2 and 3 are typically encountered outside of the project ROW and may result from actions taken by other parties, such as private land developers not directly associated with this project. Indirect impacts are therefore subject to some level of conjecture as to the extent of changes that might be expected in the project area and within the AOI with respect to the Build and No Build Alternatives. The CEQ regulations state that the EA must identify all the indirect impacts that are known and make a good faith effort to explain the effects that are not known but which are "reasonably foreseeable." CEQ has issued guidance that further explains "reasonably foreseeable" as events that must be "probable."

Encroachment-Alteration Effects

The alteration of the behavior and functioning of the affected environment caused by project encroachment can be characterized in two broad categories: ecological effects and socioeconomic effects.

Ecological effects could be evidenced within the AOI as transportation corridors function as specialized habitats, conduits of movement, barriers or filters to movement, or sources of effects on surrounding habitats (NCHRP 466). Improvements within these corridors, including future development on vacant land or redevelopment associated with the proposed project, can have consequences to habitats removed in time and distance from the project. Behavioral or functional alterations caused by project encroachment can lead to indirect ecological effects including habitat fragmentation from physically altering the environment, hydrologic disruption, and degradation of habitat from an increase in pollutants. These indirect impacts can have important consequences on an ecosystem including reduced biological diversity and increased abundance of weedy species.

Direct, socioeconomic effects within the AOI could result as project encroachment and can directly affect the surrounding area from the alternation of travel patterns and alter access to the 52 businesses and one single-family residence that would be displaced. These direct impacts could lead to indirect impacts on neighborhood cohesion, travel patterns, changes in the local economy, changes in access to specific services and recreation or public facilities, perceived quality of the natural environment, and aesthetic values. Changes in access may include driveway changes, addition of ramps, introduction of raised medians, and alterations of the Clear Creek Bridge which could result in changes in travel patterns throughout the area.

Additional indirect socioeconomic effects would be attributable to travel patterns of visitors and locals. The proposed project would offer additional travel lanes and better pedestrian facilities than currently provided with the existing alignment. Also, the dedicated right- and left-turn bays at intersections would allow for safer turning movements in the area. The combination of improved traffic flow, additional travel lanes, better pedestrian facilities and potential new development could lead to an increase of vehicular and pedestrian traffic within the AOI. It is expected that this change would benefit the social and economic conditions in Seabrook, Kemah, League City, Webster and surrounding areas.

Induced Growth Effects

The proposed project would improve access and reduce the time-cost of travel, enhancing the attractiveness of the surrounding area to developers and consumers. Although several commercial businesses would be displaced by the proposed project, as indicated by the Seabrook City Councilman Tom Diegelman, it is anticipated that new opportunities for businesses would occur as the area along SH 146 becomes more visible and accessible as a result of the proposed project improvements (Stanton 2007). Development on vacant land or conversion of the built environment to more intensive uses is often a consequence of highway projects (NCHRP 466). Land use changes within the AOI may occur in the form of convenience stores, gas stations, retail strip centers, restaurants, office buildings, and residences, including apartments. Induced changes in land use, specifically residential development, could be enhanced due to improved access to nearby job markets.

Taking into consideration current development patterns, future land use and the presence of constraining factors (i.e., floodway), the area of potential project-induced land development activity is concentrated along SH 146, at improved interchanges/intersections and along major feeder roadways to these interchanges/intersections. This area accounts for approximately 42acres of the AOI, of which, 15 acres is attributable to waterways and existing streets leaving a balance of 27 acres available to direct project-induced impacts.

- Project-induced development and redevelopment is anticipated in the area generally located adjacent to SH 146 from Repsdorph Road to NASA Road 1 due to the displacement of 52 businesses and one residence. It is anticipated that the redevelopment of the businesses and residence affected would occur in this same general area along with the addition of new commercial and residential development.
- Other properties in the immediate vicinity of SH 146 are either inhabited by established businesses or residences that would not be displaced by the project and are unlikely to experience redevelopment or are properties that are leased from the Southern Pacific Railroad.
- GIS analysis determined that of the approximate 26,726 acres within the AOI, approximately 5,840 acres are undeveloped land. These undeveloped lands are comprised of approximately 1,493 acres (25 percent) of floodway, 1,896 acres (32.2 percent) of parkland, which includes 1,665 acres of the Armand Bayou Nature Center, and 2,451 acres (9.2 percent) of water resources. All of these areas present constraints to current and future development or land use.

This data provides a benchmark, but does not account for other future market factors favoring accelerated development or future revisions to the comprehensive plans of the neighboring communities.

Effects Related to Induced Growth

Lakes, Rivers, and Streams

None of the induced property development or redevelopment associated with the proposed project is anticipated to result in filling or otherwise altering any water bodies located within the AOI. Any possible sedimentation from future developments or redevelopment would be subject to the TPDES storm water management plan supervised by the cities of Seabrook and Kemah, which should serve to control and minimize sedimentation effects. The regulatory programs supervised by the USACE are also designed to

protect and preserve these features. Based on the above reasons, no additional discussion of indirect impacts to lakes, rivers, and streams is necessary in Steps 6-7 below.

Impacts to Waters of the U.S., Including Wetlands

Under the Build and No Build Alternatives, some degradation to waters of the U.S, including wetlands could occur within the AOI. Potential effects to waters of the U.S. from development include placement of fill and degradation of function through encroachment and increased runoff. A total of 5,345 acres of wetlands, as defined by the National Wetland Inventory (NWI) maps, exist within the AOI. Not all surface waters or wetlands identified would be considered jurisdictional by the USACE and subject to protection under Section 404 of the Clean Water Act. Regardless of whether the forecasted development would be public or private, these activities are subject to Sections 404 and 401 of the Clean Water Act which regulates the fill or encroachment of these resources. The proposed project improvements would not result in substantial encroachment effects and the potential for induced land use changes within the AOI is minimal. Accordingly, indirect impacts on waters of the U.S., including wetlands are not anticipated. For these reasons, indirect impacts to jurisdictional waters and wetlands are not discussed in Steps 6-7.

Vegetation and Wildlife Habitat and Threatened and Endangered Species

The activities associated with urbanization (including agricultural, residential, and commercial uses) have permanently and irreversibly changed vegetation and wildlife habitat within the AOI. Consequently, only wildlife species that have been able to adapt to the effects of human encroachments have survived the area and species abundance and diversity has declined and would be expected to decline further as natural habitat is replaced by urban development.

The AOI is comprised of approximately 16,216 acres of urbanized area, 3,389 acres of undeveloped land and 2,451 acres of water. As previously discussed approximately 27 acres (0.10 percent) of the AOI could be potentially impacted by project-induced land use change. Estimated indirect impacts to vegetation and wildlife habitat are shown in **Table 39**. Approximately 2,168 acres (8.1 percent) of the AOI is forested and considered of high value for wildlife habitat; the remainder consists of grassland and urbanized area, both of which provide little value for wildlife habitat.

Table 39: Summary of Estimated Indirect Impacts to Vegetation and Wildlife Habitat

Resources	Total Areas Affects (acres)
Upland Forest	2,168
Grassland	3,784
Total	**5,952**

The AOI does not contain appropriate habitat for state and/or federally listed threatened or endangered species. However, one listed species, brown pelican (*Pelecanus occidentalis*), was observed several times loafing within the project vicinity near Clear Lake. These sightings occurred along the shorelines, remnant support pilings, and open water of Clear Lake. The TPWD-NDD did not reveal any documented occurrences of this species. Additionally, the TPWD-NDD revealed documented occurrences for the following species of concern: Gulf salt marsh snake (*Nerodia clarkii*), Texas diamondback terrapin

(*Malaclemys terrapin littoralis*), and Houston daisy (*Rayjacksonia aurea*). None of these species were observed on-site during the site assessment.

The proposed project potential induced development/redevelopment would not change the capacity of the environment to support species within the AOI. In addition, it is expected that the cities of Seabrook and Kemah landscaping requirements for site development would mitigate the loss of grassland areas and may benefit wildlife with the addition of landscaping trees. As the proposed project improvements would not result in substantial encroachment (i.e., habitat fragmentation) to these natural resources, it is anticipated that an overall minor potential for induced land use change would result. Substantial indirect impacts on vegetation, habitat, and threatened and endangered species are not anticipated nor discussed further in Steps 6-7 below.

Topography, geology, and soils

No indirect impacts would be expected to mineral resources. Soils would be exposed during construction activities associated with induced development/redevelopment and the potential for soil erosion to occur would exist. Due to the small area of induced development resulting from project improvements, indirect impacts to soils are anticipated to be minor. Furthermore, erosion and sedimentation control measures implemented in accordance with the TPDES program should serve to control any minimal soil erosion that might occur due to construction. No substantial indirect impacts to topography, geology, and soils would be expected. As such, further discussion in Steps 6-7 below is unnecessary.

Land Use

As described in Step 4, possible areas of induced development/redevelopment are limited by a number of land use constraints located within the AOI. Single-family residential land use comprises a majority of land use type. Approximately 2,124 acres (8.0 percent) of the AOI is associated with the Lyndon B. Johnson Space Center and the University of Houston – Clear Lake campus. Both facilities are located in the northwestern portion of the AOI and substantial impacts to land use in this area are unlikely.

The Bayport Industrial Center (Center) is located in the northeastern portion of the AOI. Although a small area of the 8,500 acre center is located within the AOI for this project, a larger portion of Center lands are the Chapter 1 of this EA, Project Background Discussion, Planning Process Section). Induced development would be more likely to occur to lands of the Center due to the addition of travel lanes, improved mobility and safety and reduced traffic congestion that will result from improvements associated with this project and Segment 4 improvements. Improvements to the center will contribute employment opportunities further supporting an increase in residential and commercial land use changes. Due to the contiguous nature of Segment 4 and this project, and the suggested build-out that is occurring in the Segment 4 AOI, induced commercial, residential and industrial development of available, developable land within the AOI for this proposed project is likely.

Development of the communities within the AOI is limited by a large amount of undevelopable land including 1,493 acres of floodway, 2,451 acres of water resources and 1,896 acres of parkland and nature preserve. Together, developed and undevelopable land and water areas within the AOI total 24,556 acres (91.9 percent). The City of Seabrook identified the industrial zoned land in the northern part of the city as the most land available for development. Surrounding communities including El Lago, Taylor Lake

Village, Clear Lake Shores, Pasadena, League City and Kemah generally have areas of residential and commercial land available for development.

A closer examination of land use capacity in the AOI is provided in **Table 40**.

Table 40: Future Land Use Capacity within the AOI

Description	Acres within AOI	Percent of Total AOI
Developed Land	16,216	60.7
Undeveloped Land	3,389	12.7
Water	2,451	9.2
Developable Land	4,670	17.4

Over the time period from 2000 through 2007, communities within the AOI experienced steady growth with residential building permit activity. League City averaged 1,357 permits per year followed by Pasadena and Seabrook averaging 381 and 126 permits per year respectively. Clear Lake Shores, Kemah and Webster averaged 15 permits per year over the period and El Lago and Taylor Lake Village averaged 1 permit per year. Harris County averaged 25,670 permits per year and Galveston County averaged 2,695 permits per year. Harris County experienced a 31 percent increase in building permit activity while Galveston County experienced a 16 percent increase. Although county totals include areas outside the AOI, this trend is repeated for both incorporated and unincorporated county areas and for the communities within the AOI (US Census 20005-2007). Factors that influence such increases traditionally include employment, ease of mobility, overall economic conditions and lending criteria.

Beyond 2007 an average 57 percent decline in residential building permit activity is evidenced for communities within the AOI and their associated counties (US Census 2005-2009). Along with unemployment and overall economic conditions, additional factors that influence such decline include a decrease in mobility and increase in congestion along area roadways and at major intersections. These factors contribute to the decline of overall development activity in an area or region.

Projected growth within the SH 146 corridor suggests a significant increase in urban and suburban growth at the northern end of the corridor, Segment 4, in Harris County. Increased growth at the Harris/Galveston County Line, Segment 3, is projected suggesting that communities located within Segment 4, such as La Porte, are reaching build-out (SH 146 MIS, 2003). This increase in growth at and near the middle of the SH 146 corridor will affect travel patterns and further contribute to a temporary decline in development activity.

The proposed improvements associated with this project could increase land development activities at a moderate pace along the corridor. Within the AOI, the most likely increase in land use types would be associated with residential and commercial development within Segments 4 and 3 and industrial development within Segment 2 to the south (SH 146 MIS, 2003). It is anticipated that increases in development within the AOI would occur at a moderate pace following improvements to the overall economy.

The cities of Seabrook and Kemah acknowledge the likelihood that induced development/redevelopment would primarily occur at points of new/increased access and that existing development and the surrounding terrain of the floodway would serve as constraints to development. This additional development would have some impact on surrounding communities and natural resources (SH 146 MIS, 2003). The re-distribution in heavy traffic patterns is also anticipated from an overall shift in traffic load due to the proposed express lanes over Clear Creek. In addition to the cities of Seabrook and Kemah, the communities located with the AOI have a strong commitment to upholding, implementing, and enforcing the goals and objectives of their Comprehensive Plans. It is possible that the transportation improvements associated with the proposed project could influence the rate or pace of land development/conversion within the AOI; however, it is unlikely that the proposed project would induce changes in the pattern or amount of land use in a manner that would be inconsistent with local and regional land use documents.

Based on the aforementioned conclusions, the indirect land use impacts assessment (see Step 4) found that the proposed project would not substantially alter future land use patterns within the AOI. This is evidenced in that none of the change indicators (changes in accessibility, changes in property value, expected growth, the relationship between land supply and demand, availability of non-transportation services, other market factors, and public policy) suggests a substantial change between the build and no build scenarios. The analysis found that the proposed project has, overall, somewhat moderate potential for land use change and, as such, is not discussed further in Steps 6-7 below.

Socio-Economic Impacts

The evaluation of indirect land use impacts determined that a minimal amount of land, (approximately 27 acres of the AOI) immediately adjacent to the proposed or existing ROW could potentially be affected by project-induced development. As detailed in Step 4, the multitude of single-family residences within the AOI is unlikely to be influenced by induced land use change. It is anticipated that neighborhoods would remain cohesive units and that possible improvements to property values resulting from induced development/redevelopment could occur. However, changes to property value within the AOI would be primarily driven by market forces and local planning documents, as opposed to the proposed project. In addition, the increased accessibility to local transit services and emergency services resulting from the proposed project would benefit all populations equally. Any possible redevelopment or relocation of retail and commercial facilities servicing environmental justice communities and the general population could be off-set by future planning efforts determined by the cities of Seabrook and Kemah along with favorable economic conditions. Due to these factors, the proposed project is not anticipated to result in encroachment (alteration effects to nearby lands), and the overall minor potential for induced land use change would not result in an effect that is appreciably more severe, or greater in magnitude, than the effect to non-minority or non-low-income populations. Additionally, no disproportionately high or adverse effects on minority or low-income populations are anticipated. Further discussion in Steps 6-7 below is not warranted.

Historic and Section 4(f) Resources

Historic Structures – As stated in Step 4, historic structures were identified as being unlikely sites for future development/redevelopment activities; thus, potential indirect impacts to historic resources are limited to proximity impacts (e.g., increases in noise levels) driven by changes in land use. The proposed

project has an overall minor potential to change the pattern, type, or amount of land use and project-induced development/redevelopment is only anticipated to affect approximately 27 total acres (or 0.10 percent) of the AOI. No sites within the proposed project's APE were identified as being potentially eligible for inclusion in the National Register and therefore, no historic structures are located close enough to the potential areas of project-induced land use change such that proximity impacts would be anticipated. Further, any development which would take place within the AOI would comply with guidelines set forth by the cities of Seabrook and Kemah. For the above reasons, indirect impacts to historic resources are not anticipated and further discussion is not warranted in Steps 6-7 below.

Section 4(f) Property – As parklands were also identified as being unlikely sites for future development/redevelopment activities, potential indirect impacts to parklands would be limited to proximity impacts (i.e., constructive use) driven by changes in land use. A constructive use occurs when a project's proximity impacts are so severe that the protected activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired (23 CFR §774.15). The proposed project, determined to have an overall minor potential for land use change, would result in minimal alterations to land use, impacting approximately 27 acres. There are approximately 11 parks associated with the AOI. Collectively, these parks total approximately 1,896 acres. However, no Section 4(f) properties are located within close proximity of the potential sites of project-induced land use change within the AOI. Any development which would take place within the AOI would comply with guidelines set forth by the cities of Seabrook and Kemah. Given the reasons discussed above, indirect impacts to Section 4(f) resources are not expected to occur and are not further addressed in Steps 6-7 below.

Air Quality

The AOI is part of the EPA designated eight-county "severe" nonattainment area for the 8-hour standard for the pollutant ozone. The AOI is currently in attainment for all other NAAQS pollutants, including CO. No change in attainment status is anticipated within the AOI as the result of expected project-induced development/redevelopment of property. As determined in the indirect land use impacts assessment (see Step 4), induced changes in land use are expected to primarily include development/redevelopment of areas adjacent to the SH 146 mainline as a result of roadway widening and ROW acquisition. Approximately 27 acres of the AOI is anticipated to be impacted. This amount is not expected to provide enough change, if any, on its own to alter the nonattainment status of ozone or the attainment status of all other NAAQS criteria pollutants, including CO. In order for the region to achieve ozone attainment, a variety of point, non-point, and mobile source emission reduction strategies must be implemented for the entire Houston-Galveston-Brazoria (HGB) area as outlined in the SIP. Indirect air quality impacts from MSATs are unquantifiable due to existing limitations to determine pollutant emissions, dispersion, and effects to human health. Emissions would likely be lower than present levels in future years as a result of the EPA's national control regulations (i.e., new light-duty and heavy duty on road fuel and vehicle rules, the use of low sulfur diesel fuel). Even with an increase in VMT and possible temporary emission increases related to construction activities, the EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions of on road emissions, including CO, MSATs, and the ozone precursors VOC and NOx. The proposed project is not anticipated to result in indirect air quality impacts and further discussion in Steps 6-7 below is not necessary.

Noise Impacts

Direct noise impacts from the proposed project and mitigation are discussed in the *Traffic Noise* section of this EA. The direct noise impacts take into account predicted future traffic on the SH 146 mainline, proposed ramps, express lanes, and proposed frontage roads. Urban noise levels within the AOI may increase in the future due to increased human activity resulting from induced development. However, substantial increases in noise are not anticipated as a result of the proposed project. The proposed improvements have a slightly moderate potential for land use change and only 0.10 percent of the AOI is expected to undergo project-induced development/redevelopment. It is more likely that noise producing human activity and traffic would result from other proposed public and private development projects constructed in response to aging land uses, community change, and other market factors. For these reasons, the proposed project would not cause indirect noise impacts and is not discussed in Steps 6-7 below.

Utilities and City Services

Indirect impacts in general and from induced development may result in increased demand on utilities and city services. However, as the area affected by induced development would be small, no substantial demand on utilities and city services are expected. As no substantial indirect impact to utilities and city services is expected, further discussion in Steps 6-7 below is not warranted.

<u>Steps 6-8. Analyze Indirect Effects, Evaluate Results, and Assess Consequences and Consider/Develop Mitigation (When Appropriate)</u>

The purpose of Steps 6-8 is to achieve the following objectives:

- To assess the significance of the impacts identified in Step 5 by determining magnitude, probability of occurrence, timing and duration, and the degree to which the impact can be controlled or mitigated (Step 6 NCHRP 466, page 71).
- To reconsider key assumptions used in the indirect impacts analysis and evaluate the extent to which uncertainty associated with these assumptions may affect the results of the analysis. As indicated in NCHRP Report 466 (page 92), "[t]here is inherent uncertainty in estimating indirect effects." With this challenge in mind, Step 7 explores how sensitive the process of identifying indirect impacts is to the assumptions that served as a guide to defining the cause-effect relationships associated with potential project-induced land use changes.
- To assess the consequences of the analyzed indirect impacts and develop strategies to address unacceptable indirect impacts (Step 8 NCHRP 466, page 94). Step 8 compares indirect impacts to the relevant goals and notable features, develops a mitigation strategy to address any unacceptable indirect impact, and determines why, if necessary, mitigation is not practicable.

As was established by Step 5, no substantial project-induced indirect impacts are anticipated to the environmental resources or issues assessed for indirect impacts. Although the proposed project crosses Clear Creek and would displace several commercial businesses, the encroachment-alteration effects would not affect the existing function of the creek or substantially impair the character of the Seabrook and Kemah communities. Several commercial businesses would be displaced by the proposed project,

and, as indicated by the Seabrook City Councilman Tom Diegelman, it is anticipated that new opportunities for businesses would occur as the area along SH 146 becomes more visible and accessible as a result of the proposed project improvements (Stanton 2007). Overall, the basic assumption guiding the indirect impacts analysis indicated that future land use development within the AOI would occur in accordance with Seabrook's Comprehensive Master Plan and Kemah's Comprehensive Plan and the development objectives of other communities within the AOI. These planned activities involve the sustainability of residential neighborhoods and highlight anticipated growth within the communities, and anticipate an overall shift in traffic load due to the proposed express lanes over Clear Creek. Development within Seabrook and Kemah is limited by undevelopable land, including floodways and water resources. Undevelopable land also constrains the AOI, of which 1,493 acres are located within the floodway. Approximately 27 total acres of the AOI are anticipated to be influenced by project-induced land use change. Efforts to enhance beneficial aspects and minimize adverse effects of development are subject to municipal land use plans/policies and development controls. This includes adherence to various rules and regulations associated with comprehensive land use planning, zoning, subdivision regulations, site plan approval, and building permitting. In light of these factors, and taking into consideration the inherent uncertainty in estimating indirect impacts, the influence of the proposed improvements along SH 146 as an economic engine for induced land use changes would appear to be minimal or slightly moderate, as established in Step 4 of this indirect impacts analysis.

Land development activities would generally be private ventures that would be regulated by Seabrook and Kemah's land development ordinances. The local government regulation of land development addresses environmental and social impacts by requiring mitigation as part of site design and construction. Ultimately, since the proposed project would not cause substantial indirect impacts, the requirement for mitigation of environmental impacts would be limited to mitigating only the direct impacts associated with this proposed project. Therefore, mitigation for indirect impacts would not be required.

CHAPTER 5. CUMULATIVE IMPACTS

Introduction and Methodology

CEQ regulations (40 CFR §1508.7) define cumulative impacts (i.e., effects) as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions." As this regulation suggests, the purpose of this cumulative impacts analysis is to view the direct and indirect impacts of the proposed project within the larger context of past, present, and future activities that are independent of the proposed project, but which are likely to affect the same resources in the future. This approach allows the decision maker to evaluate the incremental effects of the proposed project in light of the overall health and abundance of selected resources. In essence, a cumulative impacts analysis creates a model of the predicted condition of each resource that is independent of the proposed project, and then analyzes the expected direct and indirect impacts of the project within that context to determine if there is a cumulative effect. The evaluation process for each resource considered may be expressed in shorthand form as follows:

BASELINE CONDITION + FUTURE EFFECTS + PROJECT IMPACTS = CUMULATIVE EFFECTS
(historical and current) (expected projects) (direct and indirect)

The evaluation of cumulative effects discussed in this report follows the eight steps in TxDOT's Revised *Guidance on Preparing Indirect and Cumulative Impacts Analysis* (June 2009). Each of the eight steps from TxDOT's *Guidance* is identified in the evaluation that follows, but the steps have been grouped to allow most aspects of the analysis to be consolidated by each resource studied. The methodology used to prepare this evaluation is also in accordance with guidance from CEQ's *Considering Cumulative Effects Under the National Environmental Policy Act* (1997). The following eight steps of TxDOT's *Guidance* serve as guidelines for identifying and assessing cumulative impacts (**Table 41**).

Table 41: Guidelines for Identifying and Assessing Cumulative Impacts

Step	Guidelines
1	Identify the Resources to Consider in the Analysis
2	Define the Study Area for Each Resource
3	Describe the Current Status/Viability and Historical Context for Each Resource
4	Identify Direct and Indirect Impacts of the Project that Might Contribute to a Cumulative Impact
5	Identify Other Reasonably Foreseeable Future Effects
6	Identify and Assess Cumulative Impacts
7	Report the Results
8	Assess the Need for Mitigation

Source: TxDOT 2009.

Step 1. Identify the Resources to Consider in the Analysis

The initial step of the cumulative impacts analysis uses information from the evaluation of direct and indirect impacts in the selection of environmental resources that should be evaluated for cumulative impacts. TxDOT's *Guidance* states: "If a project would not cause direct or indirect impacts on a resource, it would not contribute to a cumulative impact on the resource. The cumulative impacts analysis should focus only on: (1) those resources significantly impacted by the project; and (2) resources currently in poor or declining health or at risk even if project impacts are relatively small (less than significant)." Similarly, the CEQ Guidance recommends narrowing the focus of the cumulative impacts analysis to important issues of national, regional, or local significance so as to "'count what counts', not produce superficial analysis of a long list of issues that have little relevance to the impacts of the proposed action or the eventual decisions." Thus, the cumulative impacts analysis should focus only on those resources that are substantially affected by the proposed project by direct and/or indirect impacts. Whether a resource is substantially affected is a function of the existing abundance and condition of the resource, and would include resources that are currently in poor or declining health, or are at risk even if the proposed project's effects are not major.

Applying the foregoing criteria, the resources or environmental issues related to the proposed project with the potential for cumulative impacts are listed in **Table 42**. As recommended by the CEQ Guidance, specific indicators of each resource's condition have been identified and are shown in this table. The use of indicators of a resource's health, abundance, and/or integrity is helpful in formulating quantitative or qualitative metrics for characterizing overall effects to resources. These indicators are also key aspects of

each resource that have already been evaluated in terms of the project's direct and indirect impacts, and facilitate greater consistency and objectivity in the analysis of cumulative impacts.

Table 42: Resources and Indicators for the Cumulative Impacts Analysis

Resource Category	Indicators of Resource Condition and Potential Impacts	Resource Study Area (RSA)
Biological Resources	Wildlife Habitat: the amount and quality of impacts to high quality habitat and maintained grassland habitat	Adjacent watershed areas (Upper Galveston Bay and Clear Lake)
Water Resources	Water Quality: expected change in water quality in nearby water bodies	Adjacent watershed areas (Upper Galveston Bay and Clear Lake)
Waters of the U.S., including Wetlands	Associated Wetlands: Upper Galveston Bay, Jarbou Bayou, Clear Creek, and intermittent tributaries	Adjacent watershed areas (Upper Galveston Bay and Clear Lake)
Land Use	Land Use Change: differences between existing and future land use in the RSA	Area of Influence
Air Quality	8-Hour Ozone Standard: ability of the region to meet this air quality standard	Eight-county nonattainment area

Step 2. Define the Study Area for Each Resource

The second step of this analysis seeks to evaluate the direct and indirect impacts of the proposed project as far away from the study area as the impacts are expected to be felt based on each of the resources and issues studied. Because the various resources/issues vary widely, the appropriate geographical "context" for evaluating cumulative impacts depends upon a myriad of factors. The setting of spatial limits was established using TxDOT/CEQ criteria, and considered factors such as each resource's physical characteristics, biological relationships, and affected institutional jurisdictions.

Geographic Resource Study Area (RSA)

RSA for Biological Resources and Water Resources

The resource study area (RSA) evaluated for biological and water resources is the Upper Galveston Bay and Clear Lake watersheds upstream and downstream of the proposed project (see **Exhibit 11**). It was determined that this RSA would provide a suitable frame of reference for examining the availability of biological and water resources in the surrounding area, and for serving as a baseline for assessing cumulative impacts. The entire study area drains into Segment 2421 of the Upper Galveston Bay and Segment 2425B of the Jarbo Bayou. A watershed represents a bounded hydrologic system wherein natural resources are interconnected and integrated through a common water course. This water-centered integration of resources is linked directly to the indicators of water resources noted above, as well as the biological resources. Moreover, as a practical matter, while little detailed information is available on wildlife populations in the RSA, inferences may be drawn from a study of habitat that is known to support a diversity of animal species; key wildlife habitat, in turn, is often proximate to water sources that characterize local watersheds.

RSA for Land Use

The cumulative impacts of the proposed project to current and future land use within the cities of Seabrook and Kemah were evaluated with reference to the existing city boundaries. Although land use is not a resource in the traditional sense, it is considered an important characteristic of an urbanizing landscape that is unavoidably affected when transportation and other projects remove land from existing uses. As the overall management of land use is within the province of local municipalities, the city limits of Seabrook and Kemah were considered an appropriate RSA for evaluating cumulative impacts of the proposed project on land use, and the potential difference between existing and future land use was selected as the indicator of resource condition (**Exhibit 12**).

RSA for Air Quality

The RSA for evaluating air quality associated with the NAAQS and transportation conformity is located within the EPA designated eight-county "severe" nonattainment area for the 8-hour ozone standard, which includes Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties (**Exhibit 13**). This large area represents the management unit for mobile source pollutants as regulated by federal, state, and local government agencies. The NAAQS criteria pollutants include ozone, carbon monoxide, particulate matter, nitrogen dioxide, sulfur dioxide, and lead. Unlike the other resources evaluated, air quality effects from mobile sources are evaluated and managed on a regional basis primarily through the H-GAC, in coordination with the EPA, TCEQ, TxDOT, and FHWA.

Temporal Boundaries for All Resources

In addition the geographic limits defined for each of the RSAs considered in this analysis, a time frame is needed for the discussion of each resource's condition. In terms of considering relevant past events, the focus was on events that have occurred since late 1920s, when the original roadway was purchased from Galveston County and the mid 1930s, when the original roadway was purchased from Harris County. This approximates the beginning of the urbanization that has occurred within the area. While settlement of the area prior to the 1920s and 1930s produced changes in land use as acreages were modified for agricultural use, urbanization and its effects on the agricultural landscape provide a more relevant historical context for evaluating cumulative impacts. Specific historical information was not always available for each resource; therefore, unless otherwise noted, the temporal boundary for data sources, providing key patterns that date back to 1980, were accessible for this report.

The proposed project's design year (2035) was used as the future temporal limit for considering the state of each of the resources analyzed. The use of this future reference point was considered to capture the primary effects that would be realized by the proposed project as well as the expected implementation of local land use plans. The time frame of 1920-1980 to 2035 was used in considering cumulative impacts for the resources noted in **Table 38**, as the modern urbanization process is considered a principal influence for effecting change in the resource's condition.

<u>Step 3. Describe the Current Status/Viability and Historical Context for Each Resource</u>

For the resource categories of special interest identified earlier, each resource's abundance and quality at the present time was evaluated considering the effects of historical activities, the resource's response to change, and the continuing stresses imposed on the resource and its capacity to withstand these stresses.

Collectively, these factors capture the influences that have shaped and are shaping the amount and quality of each resource and which would continue to shape each resource into the future.

A summary of existing conditions is included in **Table 40**, which serves as a point of reference for effects from the proposed project and from other future projects within each resource's RSA. The information in **Table 40** was developed from available information from the following sources: demographic and land use information, and the interpretation of detailed color aerial photographs (i.e., wildlife habitat and impervious surfaces). Information on the various resources studied was digitized and evaluated by integrating spatial data through the use of GIS software and maps. The discussion of each resource/issue, located in Steps 7 and 8, describes the historical and current condition of the resource/issue in greater detail and is followed by a discussion of cumulative impacts and mitigation for each resource/issue within the context of its RSA.

Biological Resources

The Upper Galveston Bay and Clear Lake watershed RSA is located within the Gulf Coast Prairies and Marshes natural region of Texas, an ecosystem initially dominated by a diversity of coastal prairies interspersed by upland forests as well as a tapestry of shallow bays, estuaries, salt marshes, dunes, and tidal flats. Over the course of a century (i.e., late 1800s to late 1900s), the majority of the native environment was dramatically altered by the conversion of native grasslands and many forested areas to croplands and subsequently, some of the croplands have been converted to grazing land or have been left fallow. In recent decades, urban expansion has converted many agricultural lands and much of the surviving native areas to residential, commercial, and other urban uses, resulting in a loss of natural habitat and habitat fragmentation.

Although urbanized areas within the watershed contain vegetation associated with landscaping and some fencerows, these areas are not included in this discussion because they do not represent preferred habitat for many wildlife species. Consequently, only wildlife species that have been able to adapt to the effects of these human encroachments have survived in the area, and species abundance and diversity has declined and would be expected to decline further as natural habitat is replaced by urban development. The current health of biological resources within the RSA is considered in decline.

<u>Vegetation</u>: Changes in land use and related effects on vegetative communities would occur with project construction; however, the impacts of the indirect effects would be greatly accelerated under the Build Alternative and Elevated Intersection Option as growth and development occurs. New induced development and roadway construction could result in the clearing of prairies and grassland, as well as the fragmentation of habitat. Planned development projects within the project area would convert an estimated five acres of managed pastureland to church property. The No Build and Build Alternatives would indirectly effect undeveloped land (which accounts for approximately 60 percent of the existing land use), or potential wildlife habitat.

Water Resources

Changes in land use and related effects on wetlands and waters of the U.S. would occur with project construction. New induced development and corresponding excavation could cause increases in stormwater flow and could encroach upon and affect aquatic resources by changing vegetation, wildlife

habitat or hydrology and could impact the size, functions, or value of the resources. With construction of the Build Alternative, these impacts would be greatly accelerated as growth and development occurs.

Waters of the U.S., Including Wetlands

Waters of the U.S., including wetlands are resources that serve a variety of functions including sediment filtering, upland and aquatic wildlife habitat, and reduction of flood water velocity. Local waterways have been affected both directly by urban and rural land development within flood conveyance areas, and indirectly by increased storm water runoff from impervious surfaces as well as past agricultural and drainage activities. Land clearing, soil compaction, riparian corridor encroachment, and modifications to the surface water drainage network have all accompanied urbanization in the HGB area, and, to a lesser degree, the Upper Galveston Bay and Clear Lake watersheds. In the Upper Galveston Bay and Clear Lake watersheds, the conversion of prairies and some forested areas to urban uses has resulted in the impoundment, excavation, and filling of some of the area's natural streams and wetlands.

According to the Texas Environmental Almanac (1995), coastal wetlands account for 20 percent of the total wetland acreage in Texas, mainly along the Gulf Coast. In 1956, the USFWS estimated that Texas had 937,400 acres of coastal wetlands. By 1980, the TPWD estimated there were 611,760 acres, a 35 percent decrease in less than 25 years. The loss in coastal wetlands is due primarily from saltwater intrusion caused by canals, land subsidence (sinking), and drainage ditches. The current health of waters of the U.S. within the RSA is considered "in decline".

Water Quality

Agricultural activities and urbanization in the watershed area have likely contributed to degradation of water quality from prehistoric Gulf Coast Prairie and Marsh conditions by contributing pollutants such as sediment from disturbed areas, herbicides/pesticides from agricultural fields and lawns, and petrochemicals from parking lots and streets. Urban development threatens water quality during the construction phase by increasing the amount of disturbed soil and thereby, contributing to windblown and water borne addition of soil to water bodies. After development, the increases in impervious surfaces that occur may be expected to affect water quality by increasing runoff, and by conveying residual debris and chemicals from road surfaces and other areas of human activity. Such potential degradation of water quality further affects the aquatic and upland wildlife that depend on surface waters, as well as human use and enjoyment of aquatic resources.

Storm water and other runoff from the proposed project watershed RSA flows into the Upper Galveston Bay and Jarbo Bayou, which have designated uses for contact recreation, public water supply, and aquatic life. However, the Upper Galveston Bay (Segment 2421) has also been designated as threatened or impaired for elevated bacteria levels (oyster waters) and for dioxin and PCBs found in edible tissue in the 2008 CWA Section 303(d) list. Jarbo Bayou (Segment 2425B) has also been designated as threatened or impaired for elevated bacteria levels in the 2008 CWA Section 303(d) list. The suite of designated water uses and current status as threatened or impaired increases the importance of maintaining water quality within the watersheds, particularly within the floodplains.

Commercial, industrial, residential, and municipal discharges, along with storm water runoff from construction locations, developed areas, lawns, agricultural fields, and impervious surfaces such as roads and parking lots are the primary contributors to impairment of area water quality. The continued

urbanization of the watersheds in light of the uses for water in the Upper Galveston Bay and Jarbo Bayou may heighten the need to mitigate adverse effects on water quality.

Land Use

The land use RSA was once a coastal prairie on the Gulf Coast but with growth in industry and population along Clear Lake, Galveston Bay, and other estuaries, development changed the rural aspect of the area. Smaller towns, including Kemah and Seabrook, sprang up and the area began to suburbanize.

In the late 1890s Kemah, originally called Evergreen, was established and was officially renamed Kemah in 1907. By 1914, the population of Kemah was recorded as 200. Historically, Kemah's development has been associated with the Texas and New Orleans Railroad (today known at the Southern Pacific Railroad), summer homes belonging to residents of Galveston and Houston, commercial fishing, and by 1965, the oil and ship-building industries. By 2000, the population had increased to 2,330. In recent years, Kemah has been influenced by the construction of the Kemah Boardwalk and its strategic location on Clear Creek and Galveston Bay providing Houstonians a destination for boating, fishing, dining, and shopping. Today, Kemah encompasses a total land area of over 1.8 square miles with an estimated 357 developable acres remaining within the limits of the city.

Around 1900 Seabrook was established attracting fisherman, mechanists, and residents. The population of Seabrook rose from 200 to 560 before the Great Depression, but fell to 200 in 1936, and remained at 400 from 1940 until 1947. During this time, the Albert and Ernest Fay shipyard opened which increased jobs and Seabrook's population. By 1961, Seabrook became incorporated. Reconstruction of the Clear Creek Bridge as a fixed-span bridge linking Seabrook and Kemah was completed in 1986, which highly increased the population of Seabrook and by 2000, the population had increased to 9,443. In recent years, Seabrook has been influenced by the surrounding chemical and petrochemical plants, NASA, available water attractions and fish markets, and the area's large boating community. Today, Seabrook encompasses a total land area of over 21.5 square miles with an estimated 1,082 developable acres remaining within the limits of the city.

Air Quality

The amount of pollution emitted into the local atmosphere has been the net effect of population growth. The HGB area has seen significant population growth in recent decades and the trend is for that growth to continue. With growth comes increased development, an increase in vehicles, and an increase in the daily VMT on the area's transportation systems. Traffic congestion on the transportation system has become one of the greatest challenges facing the HGB area, and is a primary contributor to regional air quality. Throughout recent decades, multiple regional and local initiatives have been planned and implemented in an effort to reduce emission of pollutants into the air. Several of these initiatives specific to the area's transportation system included increased capacity highways and roadways (through construction of additional travel lanes and bottleneck improvements), construction of high-occupancy vehicle lanes, and the promoting of alternative transportation (e.g., hike and bike trails, bus, and light rail).

The EPA establishes limits on atmospheric pollutant concentrations through enactment of the NAAQS for six principal ("criteria") pollutants. The HGB area is currently classified as a "severe" 8-hour ozone nonattainment area with respect to the NAAQS. This region (including Harris and Galveston Counties) is currently in "attainment" for all criteria pollutants, with the exception of ozone. Even though the number of daily exceedances of the federal standards for ozone has decreased within the past decade, the HGB

region remains in nonattainment for ozone. Although there have been year-to-year fluctuations, the ozone trend continues to show improvement. The trend of improving air quality in the HGB region is attributable in part to the effective integration of highway and alternative modes of transportation, cleaner fuels, improved emission control technologies, and H-GAC's regional clean air initiatives.

Step 4. Identify Direct and Indirect Impacts of the Project that Might Contribute to a Cumulative Impact

The results of the study of direct and indirect impacts are summarized in **Table 45** where they may be viewed alongside the expected impacts from reasonably foreseeable future projects (Step 5) for the resources that were selected for this cumulative impacts analysis.

Step 5. Identify Other Reasonably Foreseeable Future Effects

CEQ regulations indicate that cumulative impacts analyses must add an assessment of "reasonably foreseeable future actions" affecting the resources studied (40 CFR §1508.7). This portion of the cumulative impacts analysis sought out other transportation projects and planned or platted public/private developments within the vicinity of the proposed project. These actions are summarized in **Table 43**.

Table 43: List of Actions by Federal, State, and Local Agencies/Other Interests

Action	Type of Action	Estimated Effect
Harris County		
Port Road from Bay Area Boulevard to SH 146	Construct 4-lane concrete section with curb and gutter, storm sewer, bridges and related work.	5 acres
Repsdorph Road from NASA Parkway to 500-ft east of SH 146	Reconstruct and widen to 4-lane concrete undivided Blvd with curb and gutter and storm sewer (partially on new location).	4 acres
SH 146 from Fairmont Parkway to Red Bluff	Widen to 6 lanes with 2 2-lane access roads.	6 acres
Galveston County		
FM 270 from FM 518 to FM 646	Widen to 4-lane divided.	(within existing ROW)
FM 518 Bypass from FM 518 to Hewitt Street	Improve Louisianna Street to 2-lane median divided roadway with parallel 10 ft multi-use path along the east side of the road. 8976	5 acres
FM 518 Bypass Bikeway from FM 270 to South Shore Blvd.	FM 518 Bypass Bikeway – 10-ft wide shared use path adjacent to Hot Water Canal with a "T" intersection just east of FM 2094 and path to FM 518. 12144	4 acres
Other Actions		
Bayport Container and Cruise Terminal	Project underway. The Port of Houston Authority is constructing a container and cruise ship terminal and infrastructure associated with the port, including a new rail line from the Strang Railyard to the Bayport Terminal and widen Port Road to a 6-lane divided highway from SH 146 to Todville Road. The rail line would parallel the existing railroad and cross under SH 146 north of Red Bluff. This intermodal facility is anticipated to generate increasing amounts of traffic over time as the facility is constructed in phases.	1,043 acres

Table 43, Cont.: List of Actions by Federal, State, and Local Agencies/Other Interests

Action	Type of Action	Estimated Effect
Shoal Point Container Terminal (Texas City)	Project underway. The Texas City International Terminal (TCIT) in agreement with Texas City will construct a container terminal on Shoal Point, adjacent to the Texas City Channel and Galveston Bay. The site of the container terminal is a dredged material disposal area for the Texas City Channel and the Port of Texas City. Features will include a 400-acre, 6-berth terminal, a new turning basin, a landside access corridor, and the deepening of the existing Texas City Channel from 40 to 45 feet.	600 acres
	Total Reasonably Foreseeable Actions	**1,667 acres**

Source: TxDOT – 2013-2016 TIP, 2012; H-GAC - 2035 RTP Update, 2012.

Potential effects from the reasonably foreseeable actions were also qualitatively assessed based on available information. Overall, it was found that effects from the actions could include the following:

- The conversion of vacant and unused agricultural land for residential, commercial, institutional, industrial, and/ or recreational use;
- Potential temporary and permanent degradation or loss of water resources from surface runoff;
- A change in the economic and social environment due to increased employment and housing opportunities;
- An increase in usage of park and recreational activities related to development; and
- Potential degradation of habitats for listed species and wildlife populations from construction and ongoing operation.

The results of reviewing reasonably foreseeable future actions for potential effects within the respective RSAs are further summarized in **Table 44**. Note that the anticipated direct and indirect impacts from the proposed project and the anticipated impacts from reasonably foreseeable future actions shown in the table reflect "potential" impacts; that is, the analysis to this point does not consider the mitigation measures that would be required as part of federal, state, and local regulatory programs. These programs are discussed further in Steps 7 and 8 of the cumulative impacts analysis.

Step 6. Identify and Assess Cumulative Impacts

The information contained in **Table 44** represents the starting point for assessing the potential cumulative impacts to the condition and trend of each resource/issue (Step 6). This analysis considers the available information on direct/indirect impacts of the proposed project in addition to impacts of expected future actions in drawing conclusions as to whether there would be cumulative impacts, as well as whether the proposed project would contribute substantially to any cumulative impacts. **Table 44** summarizes the information gathered in Step 1 through Step 5 and represents the potential cumulative impacts to each resource (Step 6), which are further discussed in the next section.

Table 44: Summary of Existing Resource Conditions and Potential Impacts

Indicator of Resource Condition (Step 1)	Resource Study Area (Step 2)	Summary of Existing Resource Condition and Potential Impacts (Analysis Step #)				
		Existing Condition (Step 3)	**Direct Effects (Step 4)** [1]	**Indirect Effects (Step 4)** [1]	**Impacts from Other Foreseeable Projects (Step 5)** [1]	**Potential Cumulative Impacts Step 4+Step 5 (Step 6)** [1]
Biological Resources Wildlife Habitat	Adjacent Watershed Areas	Area consists of prairie grasses interspersed with upland forests	Loss of 0.07 acres of upland forest	Approximately 2,168 acres of upland forest are located within the AOI of which approximately 1,200 aces are associated with parks, nature preserves or areas with other environmental constraints is unlikely to be developed leaving approximately 968 acres of forested area available for potential development (not considering all environmental or other constraints)	Estimated loss of 174 acres of upland forest	Potential loss of approximately 174 acres of upland forest Continued growth and development associated with urbanization as well as new transportation facilities would bring a corresponding effect and possibly increased effect to upland forested areas
Water Resources Waters of the U.S., including Wetlands	Adjacent Watershed Areas	Upper Galveston Bay, Jarbo Bayou, Clear Creek, intermittent tributaries, and associated wetlands	The Build Alternative would affect ten jurisdictional wetlands totaling 2.36 acres and six waters of the U.S. totaling 15.66 acres. This alternative would also affect 26 non-jurisdictional wetlands, totaling 2.55 acres.	Changes in land use and related effects on wetlands and waters of the U.S. would occur under the No Build Alternative and Build Alternative. New induced development and corresponding excavation or increases in stormwater flow could encroach upon and/or affect aquatic resources by changing vegetation/wildlife habitat or hydrology and therefore, potentially the size, functions, or value of the resources.	194 waters of the U.S. (jurisdictional and non-jurisdictional) and 91 acres of wetlands	209 waters of the U.S. (jurisdictional and non-jurisdictional) and 93 acres of wetlands Continued growth and development associated with urbanization as well as new transportation facilities would bring a corresponding effect and possibly increased effect to aquatic resources. The cumulative impact would include long-term effects to waters of the U.S., wetlands, and riparian areas, thereby affecting the quality, function, and value of these resources. Over the planning period of this project, these changes are anticipated to affect a relatively small area of aquatic resources.

Table 44, Cont.: Summary of Existing Resource Conditions and Potential Impacts

Indicator of Resource Condition (Step 1)	Resource Study Area (Step 2)	Summary of Existing Resource Condition and Potential Impacts (Analysis Step #)				
		Existing Condition (Step 3)	**Direct Effects (Step 4)** [1]	**Indirect Effects (Step 4)** [1]	**Impacts from Other Foreseeable Projects (Step 5)** [1]	**Potential Cumulative Impacts Step 4+Step 5 (Step 6)** [1]
Water Resources Water Quality	Adjacent Watershed Areas	The Upper Galveston Bay is threatened or impaired for elevated bacteria levels (oyster waters) and for dioxin and PCBs found in edible tissue. Jarbo Bayou is threatened or impaired for elevated bacteria levels.	45 acres due to pavement increase resulting in larger volume of pollutant carrying runoff	27 acres of project-induced development	1,667 acres of disturbed ground, expect 70 percent of 1,667 acres would be impervious (1,167 acres)	1,738 acres of disturbed ground, of which 1,238 acres would be impervious surface
Land Use Changes in Land Use	Cities of Seabrook and Kemah	Seabrook and Kemah current population estimated at 14,130	45 acres for transportation	27 acres project-induced development	Build-out population within Seabrook and Kemah estimated at 22,832 by 2035; almost all of the existing undeveloped land without constraints, including 1,493 acres of floodway, is developable land.	Potential area available for changes in land use: 4,670 acres
Air Quality Impacts on 8-hour Ozone Standard	8-County Non-attainment Area for HGB Region	Air Quality Control Region is currently nonattainment for ozone.	Projected traffic volumes expected to result in minimal or no impacts on air quality; improved mobility and circulation may benefit air quality.		Increase in urbanization would likely have a negative impact on air quality.	Projected traffic volumes expected to result in minimal or no impacts on air quality; improved mobility and circulation may benefit air quality. Increase in urbanization would likely have a negative impact on air quality. Planned transportation improvements in the study area are anticipated to have a cumulatively beneficial impact on air quality.

Note:
[1] The information presented reflects approximate estimates of potential impacts, and does not take into consideration potential mitigation or other measures stipulated / required by regulatory authorities; the influence of these factors is discussed in the following section.

Step 7. Report the Results

Potential cumulative impacts (i.e., those impacts expected in the absence of any regulatory controls or other actions to mitigate impacts) were evaluated by combining the information in **Table 44** with the following factors: the historical context of each resource, current conditions and trends, and future land use plans. These factors capture the influences that have shaped and are shaping the amount and quality of each resource, and which would be expected to continue to shape each of the resources into the future. The following discussion describes the potential cumulative impacts.

Biological Resources

As summarized in **Table 44**, the proposed project's direct and indirect impacts to forested habitat would be the loss of up to approximately 968 acres of woody vegetation. Reviews of reasonably foreseeable projects in the RSA indicate an expected loss of 174 acres of forested habitat. In light of high quality forested habitat that is expected to be preserved within floodplains and parks, the proposed project's impacts to forested resources would not substantially contribute to a cumulative impact on wildlife habitat in the area.

Water Resources

Waters of the U.S. including Wetlands

The proposed project would have direct impacts to a water of the U.S. (15.66 acres) and jurisdictional wetlands (2.36 acres) totaling approximately 18.02 acres. Induced development and changes in land use could impact wetlands and waters of the U.S. A review of available information indicates the reasonably foreseeable projects in the RSA would have an impact to 194 waters of the U.S. and approximately 91 acres of wetlands.

Water Quality

As noted in **Table 44**, the amount of area that would be disturbed by the proposed project, indirect impacts, and other foreseeable projects would be approximately 1,738 acres. Of the 1,738 acres, impervious area created by the proposed project and other foreseeable projects would increase by approximately 1,238 acres.

Land Use

As noted above, the cities of Seabrook and Kemah have grown in recent years and growth trends are expected to continue. The continued population growth in the area is reflected in the city's Comprehensive Plans to ultimately result in increases in urban land uses. The majority of the land use changes indicated by the Comprehensive Plans are expected to be the result of urban development of vacant land. The Comprehensive Plans preserves existing transportation corridors and creates new corridors in anticipation of the travel demands of a quickly growing population. The proposed improvements are driven by existing traffic demands and traffic conditions expected in the future. Similarly, there are numerous ongoing and planned improvements to transportation corridors throughout the communities.

The proposed project requires approximately 45 acres of land for new ROW that would otherwise be available for other land uses. The land required for ROW is necessary for the communities within the AOI, especially Seabrook and Kemah, to keep pace with transportation demands of the area. This need is

a crucial part of the land use planning efforts by these cities and this conclusion would apply to all transportation projects supported by the communities within the AOI. Transportation projects play a major role in the process of achieving the appropriate balance of land uses to meet the needs of local residents and businesses. In addition to the 27 acres of project-induced land use change, much of the planned future growth and urbanization in the RSA would occur with or without implementation of the proposed project. The Build and No Build Alternative would generally not change existing or future planned land use and development patterns of the AOI, and would not result in substantial induced changes in the pattern of land use or within the RSA.

Air Quality

The cumulative impact on air quality from the proposed project and other reasonably foreseeable transportation projects are addressed at the regional level by analyzing the air quality impacts of transportation projects in the RTP and the TIP. The proposed project and the other reasonably foreseeable transportation projects were included in the RTP and the TIP, and have been determined to conform to the SIP. Planned transportation improvements are intended to cumulatively reduce congestion on a regional scale, with a resultant decrease in pollutant emissions. Therefore, when combined, the proposed transportation improvements in the RSA are anticipated to have a cumulatively beneficial impact on air quality.

Step 8. Assess the Need for Mitigation

Each of the resources examined is discussed below with respect to regulatory controls and mitigation.

The expected actual cumulative impacts to each resource discussed in Step 7 are further evaluated by considering the institutional policies (i.e., "Regulatory Controls") and expected mitigating actions ("Mitigation") that would further shape cumulative impacts. Implicit in the approach to predicting the future condition of resources are several key assumptions:

- All reasonably foreseeable actions would be completed as currently planned;
- The relationships between the resources, ecosystems, and human communities that have been identified from historical experience would continue into the future; and
- The sponsors of government and private projects would abide by relevant federal, state, and local laws designed to protect each resource, and regulatory agencies would perform their duties in accordance with legal requirements and internal guidelines.

Of particular importance is the assumption concerning compliance with relevant environmental laws designed to ensure the sustainability of resources. Over the past several decades federal, state, and local lawmaking bodies have enacted statutes, regulations, and ordinances designed to preserve and enhance the abundance and quality of natural resources by requiring project sponsors to avoid, minimize, and mitigate the environmental impacts of their projects or actions. The cumulative impacts analysis focuses on the expected impacts to each resource that would remain after full compliance with the regulatory requirements at all levels and reflect long-term impacts in light of mitigation that would likely be applied.

The following discussion of cumulative impacts outlines key regulatory measures government leaders and agencies have implemented to manage and sustain the resource for long-term use. Mitigation issues for each of the resources are then analyzed.

Biological Resources

The Texas Transportation Code (§201.607) directs TxDOT to adopt Memoranda of Understanding (MOU) with appropriate environmental resource agencies, including TPWD. The responsibilities of TPWD relate primarily to its function as a natural resource agency, including its resource protection functions designated by Parks and Wildlife Code. The TPWD acts as the state agency with primary responsibility to protect the states fish and wildlife resources. The MOU between TxDOT and TPWD (see Texas Administrative Code) provides an efficient and consistent methodology for describing habitats, transportation impacts to those habitats after avoidance and minimization efforts, and mitigation to be considered as a result of those impacts. The MOU sets forth resources that would be given consideration for compensatory mitigation. With regard to the protection of state-listed threatened or endangered species, the TPWD implements regulatory controls for the State of Texas.

Municipal governments have the authority to avoid, minimize, and mitigate the impacts of private property development to habitat within their jurisdictions through application of regulations that guide the intensity, type, and location of new development. Land use regulations of the cities of Seabrook and Kemah are designed to minimize the adverse effects of growth and urbanization within their municipal boundaries.

The impacts of the proposed project and other transportation projects to riparian or floodplain forests would be avoided and minimized in compliance with the TxDOT / TPWD MOU. The impacts of reasonably foreseeable private development to vegetation and habitat would be avoided, minimized, and mitigated through enforcement of applicable municipal zoning and land use regulations. Additionally, USFWS and TPWD regulations would apply for those actions that are subject to state and federal jurisdiction.

Preferred habitat would, as a whole, be preserved under local, state, and federal agency policies and regulations concerning development within floodplains. Based on the availability of park and floodplain/riparian forested habitat in the RSA, and assuming appropriate implementation of regulated avoidance, minimization, and mitigation strategies for vegetation and habitat impacts, the proposed project would not contribute to substantial cumulative impacts to the area's vegetation and habitat, nor would it adversely affect threatened or endangered species.

Water Resources

Waters of the U.S. including Wetlands

Waters of the U.S. are regulated by the USACE under authority of Section 404 of the CWA. Section 404 of the CWA authorizes the USACE to issue permits for the discharge of dredged or fill material into waters of the U.S., including wetlands. The intent of this law is to protect the nation's waters from the indiscriminate discharge of material capable of causing pollution, and to restore and maintain their chemical, physical, and biological integrity. Any discharge into waters of the U.S. must be in accordance with Section 404(b)(1) guidelines developed by the EPA in conjunction with the USACE.

In 1991, Texas adopted state goals for "no net loss" of acreage or aquatic function of wetlands. These goals reflect the regulatory program in the CWA legislation that prohibits the discharge of soil into waters of the U.S. unless authorized by a permit issued under CWA Section 404. The USACE has authority over such actions and may require the permittee to restore, create, enhance, or preserve nearby aquatic features as compensation to offset unavoidable adverse impacts to the aquatic environment. This means compensatory mitigation is intended to comply with the general goals of the CWA and the specific goal of "no net loss" of aquatic functions. Future trends in the regulation of waters of the U.S., including wetlands, are likely to focus on compensatory mitigation requirements. Regulatory agencies are expected to develop procedures to track the success and completion of mitigation efforts as the focus moves toward replacement of specific aquatic functions, rather than replacement of total area. Consequently, regulatory controls are expected to continue the trend of stabilizing the amount of existing waters of the U.S., including wetlands, through vigorous application of mitigation requirements under the CWA.

The proposed project's impact to waters of the U.S., including wetlands, would be avoided or minimized by compliance with the USACE Permit program. The cumulative impact of reasonably foreseeable future actions to waters of the U.S. would be minimized by enforcement of applicable USACE, USFWS, TPWD, and USCG regulations for projects subject to state and federal jurisdiction.

Assuming appropriate implementation of regulation control strategies and policies, future potential impacts to the area's waters of the U.S., including wetlands could be expected to be reduced, or at a minimum have no net loss. The proposed project would not contribute to significant cumulative impacts to the area's waters of the U.S.

Water Quality

As noted above, control of construction locations to reduce erosion and engineering projects to accommodate storm water are standard requirements of local, state, and federal regulatory programs. The measures to prevent degradation of water bodies are also part of the function served by local government policies to preserve floodplains and riparian corridors.

Under Section 401 of the CWA, the TCEQ is authorized to certify that federally issued permits would meet the state's water quality standards. The TCEQ regulates this section under the USACE permit programs and requires the installation of temporary and permanent storm water BMPs. As noted above, the USACE regulates impacts to jurisdictional waters and wetlands through implementation of the permitting process under Section 404 of the CWA. Projects that disturb more than one acre are required to comply with the TPDES permit requirements.

Controlling storm water pollution in urban areas and from industrial activity runoff is viewed by the EPA as a key to maintaining and improving the quality of the nation's waterways.

The proposed project's impact to water quality would be avoided or minimized by implementing storm water BMPs to control the discharge of pollutants as required by the CWA and federal and state storm water regulations. These measures include compliance with Section 401 and Section 404 permit requirements, TPDES requirements, and the preparation and implementation of a SW3P. Similarly, the cumulative impact of reasonably foreseeable private development projects to water quality would be minimized by enforcement of applicable federal and state storm water regulations as required by the CWA. These include EPA/TCEQ regulation of large-scale construction activities under the TPDES

permit program. TCEQ provides water quality certification under Section 401 of the CWA, which is mandatory for all projects requiring Section 404 permits.

Assuming appropriate implementation of regulation and control strategies, future potential impacts to the area's water quality could be expected to be substantially reduced. The proposed project would not contribute to substantial cumulative impacts to the area's water quality.

Land Use

Local city and county governments have the authority to avoid, minimize, and mitigate the impacts of development and urbanization through comprehensive land use planning. Land use is regulated by the cities of Seabrook and Kemah land use ordinances designed to minimize the adverse effects of growth and urbanization. The municipal land use regulations control the intensity and type of development and control where land should be developed and where land should be preserved. The cities of Seabrook and Kemah focuses on preserving and enhancing the socio-economic conditions and natural resources within the municipal boundaries, and has adopted other measures to balance future development with preservation of resources (e.g., plans for parks and open space, floodplain protection, and landscaping ordinances).

Assuming appropriate implementation of applicable land use planning regulations and control strategies, related effects on air and water and other natural systems, including ecosystems, would be avoided and minimized. The proposed project would not contribute to substantial adverse cumulative impacts to the planned growth in the area.

Air Quality

A variety of federal, state, and local regulatory controls as well as local plans and projects have had a beneficial impact on regional air quality. The CAA, as amended, provides the framework for federal, state, tribal, and local rules and regulations to protect air quality. The CAA required the EPA to establish NAAQS for pollutants considered harmful to public health and the environment. In Texas, the TCEQ has the legal authority to implement, maintain, and enforce the NAAQS. The TCEQ establishes the level of quality to be maintained in the state's air and to control the quality of the state's air by preparing and developing a general comprehensive plan. Authorization in the Texas Clean Air Act (TCAA) allows the TCEQ to do the following: collect information and develop an inventory of emissions; conduct research and investigations; prescribe monitoring requirements; institute enforcement; formulate rules; establish air quality control regions; encourage cooperation with citizens' groups and other agencies and political subdivisions of the state as well as with industries and the federal government; and to establish and operate a system of permits for construction or modification of facilities. Local governments having some of the same powers as the TCEQ can make recommendations to the commission concerning any action of the TCEQ that may affect their territorial jurisdiction, and can execute cooperative agreements with the TCEQ or other local governments. In addition, a city or town may enact and enforce ordinances for the control and abatement of air pollution not inconsistent with the provisions of the TCAA or the rules or orders of the TCEQ.

The CAA also requires states with areas that fail to meet the NAAQS prescribed for criteria pollutants to develop a SIP. The SIP describes how the state would reduce and maintain air pollution emissions in order to comply with the federal standards. Important components of a SIP include emission inventories,

motor vehicle emission budgets, control strategies, and an attainment demonstration. The TCEQ develops the Texas SIP for submittal to the EPA. One SIP is created for each state, but portions of the plan are specifically written to address each of the nonattainment areas. These regulatory controls, as well as other local transportation and development initiatives implemented throughout the HGB area by local governments (and others) provide the framework for growth throughout the area consistent with air quality goals. As part of this framework, all major transportation projects (including the proposed project) are evaluated at the regional level by the H-GAC for conformity with the SIP.

The HGB region is expected to continue to experience substantial population growth, urbanization and economic development. The cumulative impact of reasonably foreseeable future growth and urbanization on air quality would be minimized by enforcement of federal and state regulations, including the EPA and TCEQ, which are mandated to ensure that such growth and urbanization would not prevent compliance with the ozone standard or threaten the maintenance of the other air quality standards.

CHAPTER 6. REFERENCES

Abbott, James. 2001. *Houston Area Geoarchaeology: A Framework for Archeological Investigation, Interpretation, and Cultural Resource Management in the Houston District.* Texas Department of Transportation (TxDOT), Environmental Affairs Division (ENV), Archeological Studies Program (ASP), Austin.

Alsop, Fred J. 2002. *Birds of Texas*. New York, New York: DK Publishing, Inc.

Ashworth, John B and J. Hopkins. 1995. Texas Water Development Board. Report 345. *Aquifers of Texas*. 69 pp.

Banks Information Solutions, Inc. *Environmental FirstSearch Report Target Property: SH 146 La Porte, Texas 77571*. 2004. Austin, Texas.

Blair, W. F. 1950. *The Biotic Provinces of Texas*. Texas Journal of Science 2:93-117.

Brown, S.D. and T.M. Bert. 1993. The effects of temperature and salinity on molting and survival of *Menippe adina* and *M. mercenaria* (Crustacea, Decapoda) post-settlement juveniles. Marine Ecology Progress Series 99: 41-49.

California Department of Transportation (Caltrans).2006. *Guidance for Preparers of Growth-related, Indirect Impact Analyses*.
_____. 2005. *Guidance for Preparers of Indirect and Cumulative Impact Assessments*.

Civil Rights Act of 1964. 42 USC 2000.

Civil Rights Restoration Act of 1987. 100 P.L. 259.

Council on Environmental Quality (CEQ). 1997. *Considering Cumulative Effects Under the National Environmental Policy Act*.
_____. 2005. *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis.*

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRue. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service FWS/OBS-79/31. 131 pp.

Dixon, J. R. 2000. *Amphibians and Reptiles of Texas*, 2nd ed. Texas A&M University Press, College Station, Texas. 421 pp.

Executive Office of the President. February 11, 1994 (issue date). *Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.* Federal Register, Vol. 59. No. 32 (February 16, 1994).

Federal Emergency Management Agency (FEMA). 1996. *Flood Insurance Rate Maps*, Harris County, Texas and Incorporated Areas, Community Panel Numbers 48201C1085J and 48201C1095J (effective November 6, 1996)

_____. 1983. *Flood Insurance Rate Maps*, Galveston County, Texas and Incorporated Areas, Community Panel Numbers 4854710001B and 4854810003B (effective April 4, 1983) and 4854700027C and 4854700029C (effective May 2, 1983).

Federal Highway Administration (FHWA). 1987. *Guidance for Preparing and Processing Environmental and Section 4(f) Documents*. Technical Advisory T 6640.8A.

_____. 1990. *Visual Impact Assessment for Highway Projects*. [Pub no. FHWA-HI-99-054]. Washington, D.C.: Office of Environmental Policy.

_____. 1996. *Community Impact Assessment, A Quick Reference for Transportation*.

_____. 1999. *Memorandum on Beneficial Landscaping*.

_____. 2003. *Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process*.

Federal Register. 1995. *Endangered and Threatened Wildlife and Plants; Final Rule to Reclassify the Bald Eagle From Endangered to Threatened in All of the Lower 48 States*. Volume 60, No. 133.

_____. 2003. *Endangered and Threatened Wildlife and Plants; Withdrawal of the Proposed Rule to List the Mountain Plover as Threatened*. Volume 68, No. 174.

Finucane, J. H., C. B. Grimes, and S. P. Naughton. 1990. *Diets of Young King and Spanish Mackerel off the Southeast United States*. Northeast Gulf Science 11 (2): 145-153.

Galveston Bay Estuary Program (GPEP). 2007 *Galveston Bay*. GI-369 05/07.

General Land Office (GLO). 1940. Harris County, Texas. On file at Michael Baker Jr., Inc, Austin.

Gould, F.W. 1975. *The Grasses of Texas*. The Texas Agricultural Experiment Station. College Station, Texas. 653 pp.

Greenwade, James, USDA-NRCS Soil Scientist. 2007. Agency Response to letter request on 21 February 2007.

Gulf of Mexico Fishery Management Council (GMFMC). 1998. *Generic Amendment for Addressing Essential Fish Habitat Requirements in the Fishery Management Plans of the Gulf of Mexico*. October 1998.

Gunda Corporation, Inc. 2005. *Final SH 146 Projected Traffic Report*.

Harris County Toll Road Authority (HCTRA). February 2003. *Bayport Toll Road Alternative Corridor Assessment*.

Hill, K. 2002. Smithsonian Marine Station at Fort Pierce, Species Inventory: *Penaeus duorarum*. http://www.sms.si.edu/irlspec/index.htm. Accessed 27 January 2005.

Houston-Galveston Area Council (H-GAC). 2001. *Basin Summary Report*. http://www.h-gac.com/HGAC/Programs/Water+Resources/Publications+and+Media/Basin+Summary+Reports/default.htm.

_____. 2005. *2025 Regional Transportation Plan (RTP)*. Approved June 2005.

_____. 2007. *2035 Regional Transportation Plan (RTP)*. Approved August 2007.

_____. 2009. *2035 Regional Transportation Plan (RTP)*. Appendix E (RTP) / Appendix 12 (Conformity): Project Listing. Revised July 2009.

_____. 2012. *2035 Regional Transportation Plan (RTP) Update.* Appendix E (RTP) / Appendix 12 (Conformity): Project Listing. Revised December 2012.

Houston-Galveston Coastal Subsidence District (HGCSD). 2005. Agency Response to letter request on 12 January 2005.

Houston Association of Realtors (HAR), Commercial Gateway.2007. http://www.commgate.com

Howard, Margaret A., Martha Doty Freeman, and C. Britt Bousman. 1992. *Archeological Reconnaissance in the Third Reach of the Clear Creek Flood Control Project, Galveston and Harris Counties, Texas*. Reports of Investigations Number 85. Prewitt and Associates, Inc., Austin.

Jones, S. D., J. K. Wipff, and P. M. Montgomery. 1997. *Vascular Plants of Texas: A Comprehensive Synonymy, Bibliography, and Index*. University of Texas Press, Austin.

Kemah. 1997. *Kemah Comprehensive Plan 2015*. City of Kemah, Texas.

Lockwood, M. W. and B. Freeman. *The Texas Ornithological Society Handbook of Texas Birds*. No. 36. Texas A&M University Press, College Station, TX.

Mabie. 1990. *Bald eagle nest survey and management*. Performance report, Federal Aid Project No. W-125-R-1, Job No. 30. Texas Parks and Wildlife, Austin, Texas. 1 November 1990.

McMahan, C.A., R.G. Frye, and K.L. Brown. 1984. *The Vegetation Types of Texas, Including Cropland.* Texas Parks and Wildlife Department Wildlife Division, Austin, Texas.

Muncy, R. J. 1984. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (South Atlantic): White Shrimp*. U.S. Fish and Wildlife Service FWS/OBS-82/11.27. U.S. Army Corps of Engineers, TR EL-82-84. 19 pp.

National Oceanic and Atmospheric Associations (NOAA). 2002. *Endangered Species Conservation.* http://www.nmfs.noaa.gov/prot_res/PR3/Turtles/turtles.html. Accessed 4 January 2005.

_____. 2002. *Essential Fish Habitat: A Marine Fish Habitat Conservation Mandate for Federal Agencies, Gulf of Mexico Region*. February 2002.

_____. 2005. Response to letter request on 2 March 2005.

National Park Service. 2006. *Land and Water Conservation Fund: Detailed Listings of Grants – With County Totals*. http://waso-lwcf.ncrc.nps.gov/public/index.cfm. Accessed February 2005 and March 2006.

National Oceanic and Atmospheric Administration (NOAA) Fisheries Service. 1992. *Recovery Plan for Leatherback Turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico*. National Marine Fisheries Service, Washington, D.C.

_____. 1993. *Recovery Plan for Hawksbill Turtles in the U.S. Caribbean Sea, Atlantic Ocean, and Gulf of Mexico*. National Marine Fisheries Service, St. Petersburg, Florida.

Ogren, L.H. 1992. Atlantic Ridley sea turtle, *Lepidochelys kempii* (Garman). Pages 100-104 in P.E. Moler, editor. Rare and Endangered Biota of Florida. Volume III. Amphibians and Reptiles. University Press of Florida. Gainesville, Fl.

Perez-Farfante, I. 1969. Western Atlantic Shrimps of the *Genus Panaeus.* Fishery Bulletin, 67 (3): 461-591.

Peterson, R. T. 1963. *A field guide to the Birds of Texas and Adjacent States.* Boston: Houghton Mifflin Company.

_____. 1988. *A field guide to the Birds of Texas and Adjacent States.* Boston: Houghton Mifflin Company.

Powell, J. A. and G. B. Rathbun. 1984. *Distribution and abundance of manatees along the northern coast of the Gulf of Mexico*. Northeast Gulf Science. Vol. 7. No. 1, p. 1-28.

Railroad Commision. 2007. *Railroad Commission of Texas Public GIS Map Viewer*. http://gis2.rrc.state.tx.us/public/

Schmidly, D. J. 2004. *The Mammals of Texas.* University of Texas Press, Austin, Texas, p. 87.

Seabrook. 2004. *Seabrook Comprehensive Master Plan 2025*. Seabrook, Texas.

Shackelford, C. E. and G. G. Simons. 2000. *A Two-Year Report of the Swallow-Tailed Kite in Texas: A Survey and Monitoring Project for 1998 and 1999*. Texas Parks and Wildlife PWD BK W7000-496 (6/00). Austin, Texas.

Shaver-Miller, D. 2002. Personal Communication between Kerry Flaherty, Ecology and Environment, Inc. and Dr. Donna Shaver-Miller. National Park Service, North Padre Island National Seashore, Texas.

Stanton, Robert. March 2007. *Residents voice concern over Texas 146 expansion / TxDOT receives input on planned project at meeting in Seabrook*. Houston Chronicle: Edition 2 Star.

Stebbins, R. C. 2003. *A Field Guide to Western Reptiles and Amphibians*. 3rd ed. Houghton Mifflan Company, Boston, Massachusetts, 533 p.

Story, De Ann, Janice A. Guy, Barbara A. Burnett, Martha Doty Freeman, Jerome C. Rose, D. Gentry Steele, Ben W. Olive, and Karl J. Reinhard. 1990. *The Archeology and Bioarcheology of the Gulf Coastal Plain*. Arkansas Archeological Survey Research Series No. 38. Arkansas Archeological Survey, University of Arkansas, Fayetteville.

Stuck, K.C. and H.M. Perry. 1992. Life history of *Menippe adina* in Mississippi coastal waters. Pages 295-360. In: T.M. Bert (editor), Proceedings of a Symposium on Stone Crab (genus *Menippe*), Biology and Fisheries. Florida Department of Natural Resources, Marine Research Publication Number 50.

Stutzenbaker, C. D. 1999. *Aquatic and Wetland Plants of the Western Gulf Coast.* Texas Parks and Wildlife Press, Austin, Texas. 465 pp.

Swafford, R. 2005. Personal Communication between Becky Murray, Crouch Environmental Services, Inc. and Mr. Rusty Swafford. National Marine Fisheries Service, National Oceanographic and Atmospheric Administration, Galveston, Texas.

Tennant, A. 1998. *A Field Guide to Texas Snakes*. 2nd ed. Gulf Publishing, Lanham, Maryland, p. 291.

Terres, J. K. 1996. *The Audubon Society encyclopedia of North American Birds*. Wings Books, a division of Random House Value Publishing, Inc. New York. 1109 p.

Texas Commission of Environmental Quality (TCEQ). 2009. *2008 Texas Water Quality Inventory and 303(d) lists*. www.tceq.state.tx.us. Accessed April 2009.
_____. 2005. *Water Quality System, Selective Data Report*. Accessed 4 December 2006.
_____. 2002a. Response to letter request on 27 January 2005.
_____. 2002b. Response to letter request on 14 February 2005.

Texas Department of Transportation (TxDOT). 1973. *Final Environmental Impact Statement: SH 146 (Red Bluff Road to Dickinson Bayou)* in Harris and Galveston Counties.
_____. 1997. *Guidelines for Analysis and Abatement of Highway Traffic Noise.*
_____. 1999. *Hazardous Materials in Project Development: Guidance Document.* http://www.dot.state.tx.us/env/hazmatprojguide.htm. Accessed March 2005.
_____. 2003. *SH 146 Corridor Major Investment Study*. Harris and Galveston Counties.
_____. 2005. *Historic Resources Survey Report, SH 146: Fairmont Parkway to SH 3* in Harris and Galveston Counties, Texas. Prepared by Michael Baker, Jr. Inc. and Hardy Heck Moore, Inc (HHM, Inc.)
_____. 2006a. *Archeological Investigations of SH 146 (Fairmont Parkway to SH 3)* in Harris and Galveston Counties, Texas. Prepared by Michael Baker Jr. Inc.
_____. 2008. *2008-2011 Transportation Improvement Program (TIP).*
_____. 2009. Revised *Guidance on Preparing Indirect and Cumulative Impacts Analyses*. June.
_____. 2011. *Guidelines for Analysis and Abatement of Highway Traffic Noise.*
_____. 2012. *2013-2016 Transportation Improvement Program (TIP).*

Texas Parks and Wildlife Department (TPWD). 2005. *Natural History – Black Bears.* http://www.tpwd.state.tx.us/nature/wild/vertebrate/mammals/bears/plan/naturalhistory/#texas. Accessed 24 January 2005. Last updated 12 January 2005.
_____. 2006. *Annotated County Lists of Rare Species*, Harris *County*. Revision: 7/6/2006. http://www.tpwd.state.tx.us/landwater/land/maps/gis/ris/endangered_species.p/. Accessed February 2007.
_____. 2006. *Annotated County Lists of Rare Species, Galveston County*. Revision: 7/6/2006. http://www. tpwd.state.tx.us/landwater/land/maps/gis/ris/endangered_species.p/. Accessed February 2007.

Texas State Data Center. 2004. *Texas Population Projections Program. Race/Ethnicity by Migration Scenario for 2000-2040 in 5 year increments*. http://txsdc.utsa.edu/tpepp/2004projections/. Accessed October 2004 and December 2005.

Texas State Highway Department. 1936a. *General Highway Map*, Harris County, Texas.
_____. 1936b *General Highway Map*, Galveston County, Texas.

Texas Tech University (TTU). 2005. *The Mammals of Texas – Online Edition.* http://www.nsrl.ttu.edu/tmot1/Default.htm. Accessed 4 January 2005. Last updated 1997.

Texas Water Development Board. *2002 State Water Plan Population Projects for 1990 – 2050 by City.* http://www/twdb.state.tx.us/data/popwaterdemand/2002%20Projections/citypopulation.htm. Accessed May 2010.

Transportation Research Board (TRB). 2002. National Cooperative Highway Research Program (NCHRP) *Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects.*

Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. 42 USC 4601.

U.S. Army Corps of Engineers. 1987. *Corps of Engineers Wetlands Delineation Manual.* Technical Report Y-87-1. Department of the Army. Waterways Experiment Station. Corps of Engineers. Vicksburg, Mississippi.

U.S. Census Bureau. 1990. *Census of Population and Housing*. http://factfinder.census.gov/servlet/BasicFactsServlet?_lang=en. Accessed October 2004 and December 2005.

_____. 2000. *Census of Population and Housing*. http://factfinder.census.gov/servlet/BasicFactsServlet?_lang=en. Accessed October 2004 and July 2006.

U.S. Census Bureau. 2000 – 2009. *Building Permits.* http://censtats.census.gove/cgi-bin/bldgprmt/bldgdisp.pl. Accessed May 2010.

U.S. Department of Agriculture (USDA). 1976. *Soil Survey of* Harris *County, Texas.*

_____. 1988. *Soil Survey of Galveston County, Texas.*

U.S. Department of Commerce. 2003. *Bureau of Economic Analysis. Local Area Personal Income.* http://www.bea.doc.gov/bea/regional/reis/. Accessed October 2004 and July 2006.

U.S. Department of Labor. 2004. *Bureau of Labor Statistics. Local Area Unemployment Statistics.* http://www.bls.gov/data/home.htm. Accessed October 2004 and July 2006.

U.S. Department of Transportation (USDOT), FHWA, Federal Transit Administration (FTA). 2007. *Statewide Transportation Planning; Metropolitan Transportation Planning: Final Rule*. Federal Register, Vol. 72 No. 30, pp. 7224-7286. February 14.

U.S. Fish and Wildlife Services (USFWS). 1987. *Habitat Management Guidelines for the Bald Eagle in the Southeast Region*. Atlanta, Georgia.

_____. 1989. *Florida Manatee Recovery Plan*. Atlanta, Georgia. 98 pp.

_____. 1991. *Endangered and Threatened Species of the Southeastern United States (The Red Book),* USFWS Region 4, Atlanta, Georgia.

_____. 1993. *Habitat Management Guidelines for Bald Eagles in Texas*. Clear Lake, Texas.

_____. 1995. *Endangered and Threatened Species of the Southeastern Unites States (The Red Book). Brown Pelican*, USFWS Region 4. http://ecos.fws.gov/tess_public/TESSSpeciesReport. Accessed 4 January 2005.

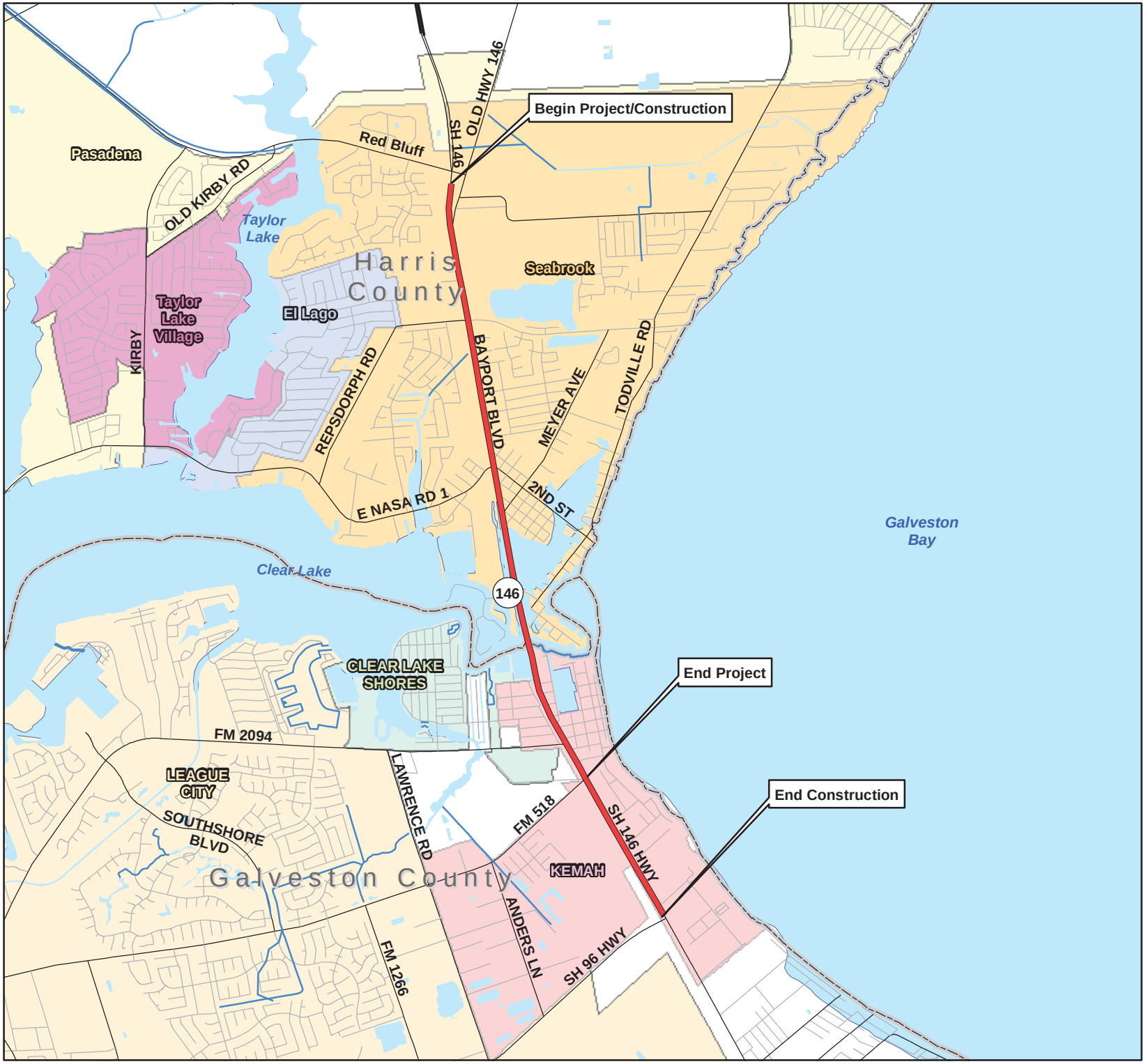
_____. 2007. *Endangered Species List by County for Harris County*. http://www.fws.gov/southwest/es/EndangeredSpecies/lists/. Accessed February 2007.

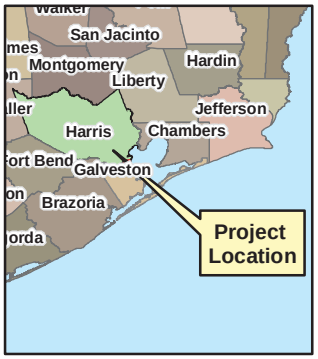
_____. 2007. *Endangered Species List by County for Galveston County*. http://www.fws.gov/southwest/es/EndangeredSpecies/lists/. Accessed February 2007.

United States Geological Survey (USGS). 1982b. League City, TX Quad. 7.5' map on file at Michael Baker Jr., Inc, Austin, TX.

Venkataramariah, A., G. J. Lakshmi, and G. Gunter. 1972. *The Effects of Salinity, Temperature, and Feeding Levels on the Food Conversion, Growth, and Survival Rates of the Shrimp Penaeus aztecus*. Proceedings of the Marine Technology Society, Food –Drugs from the Sea.

This page intentionally left blank.





Legend

- Project Location
- Highways
- Major Roads
- Local
- County Boundaries
- Water Bodies

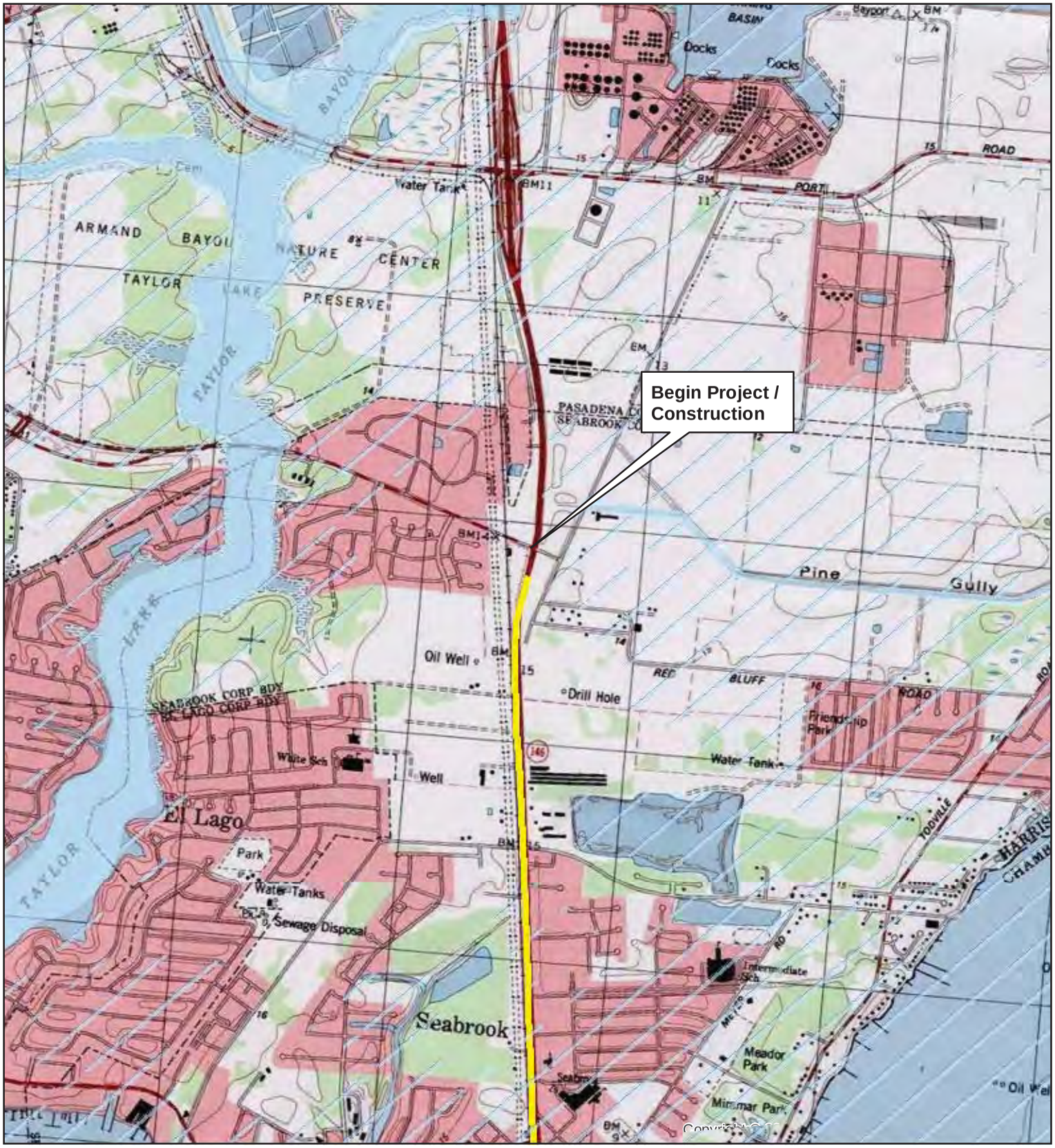
N
W E
S

0 2,000 4,000 Feet

Texas Department of Transportation

EXHIBIT 1:
PROJECT LOCATION

SH 146
(Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJs: 0389-05-088



Legend

- Project Location
- Floodway
- 100-Year Floodplain

N W E S

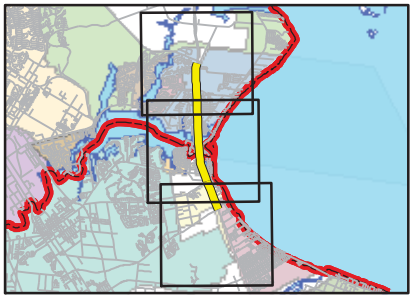
0 1,000 2,000 Feet

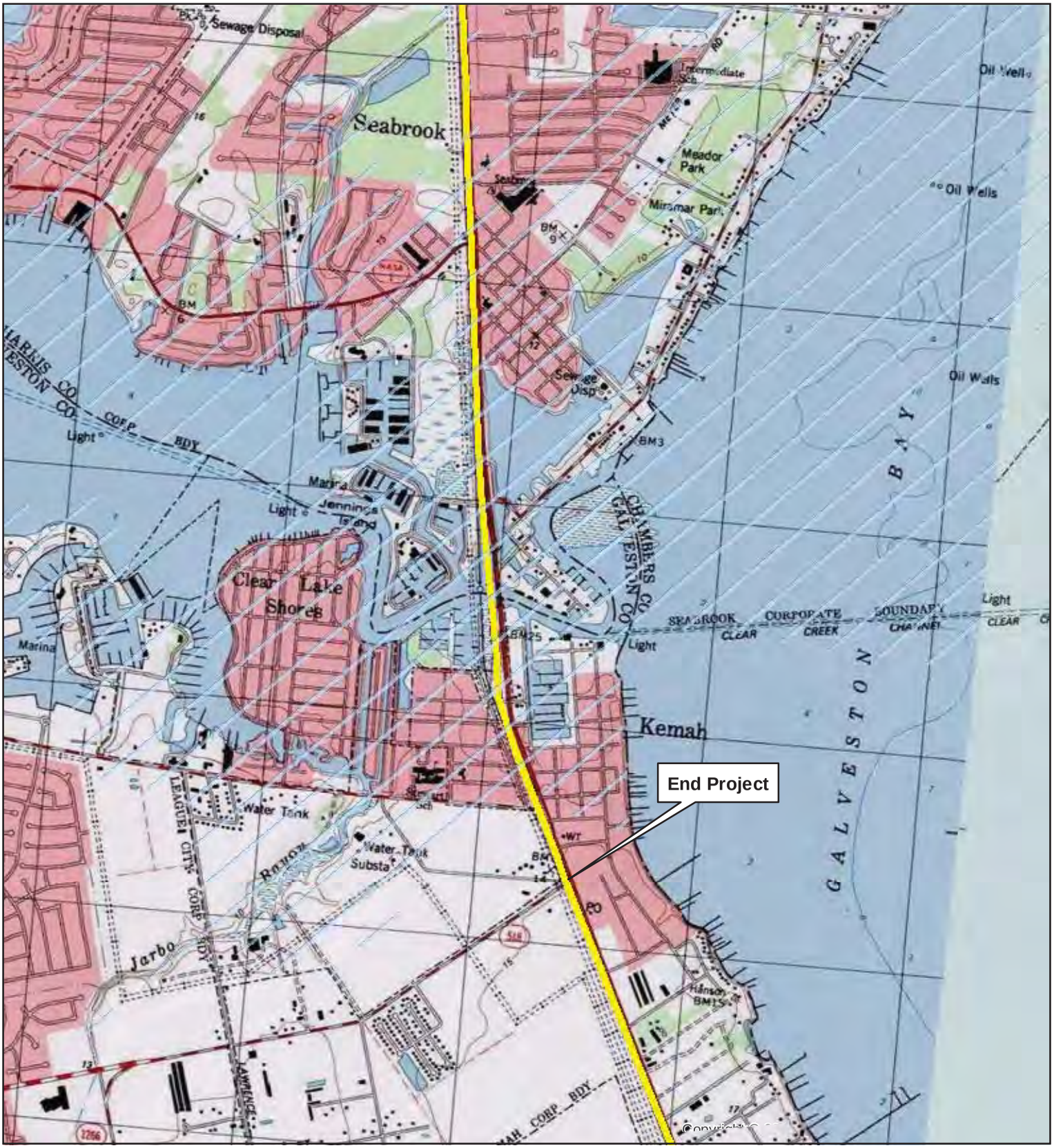
Quad Name: League City

EXHIBIT 2:
FEMA FLOODPLAIN AND
USGS TOPOGRAPHIC MAP
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Map 1 of 3





Legend

- Project Location
- Floodway
- 100-Year Floodplain

N W E S

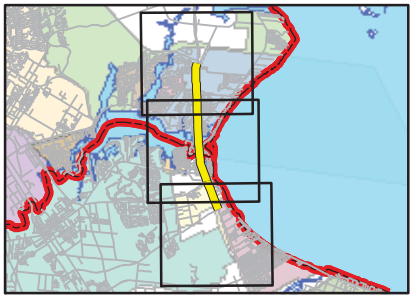
0 1,000 2,000 Feet

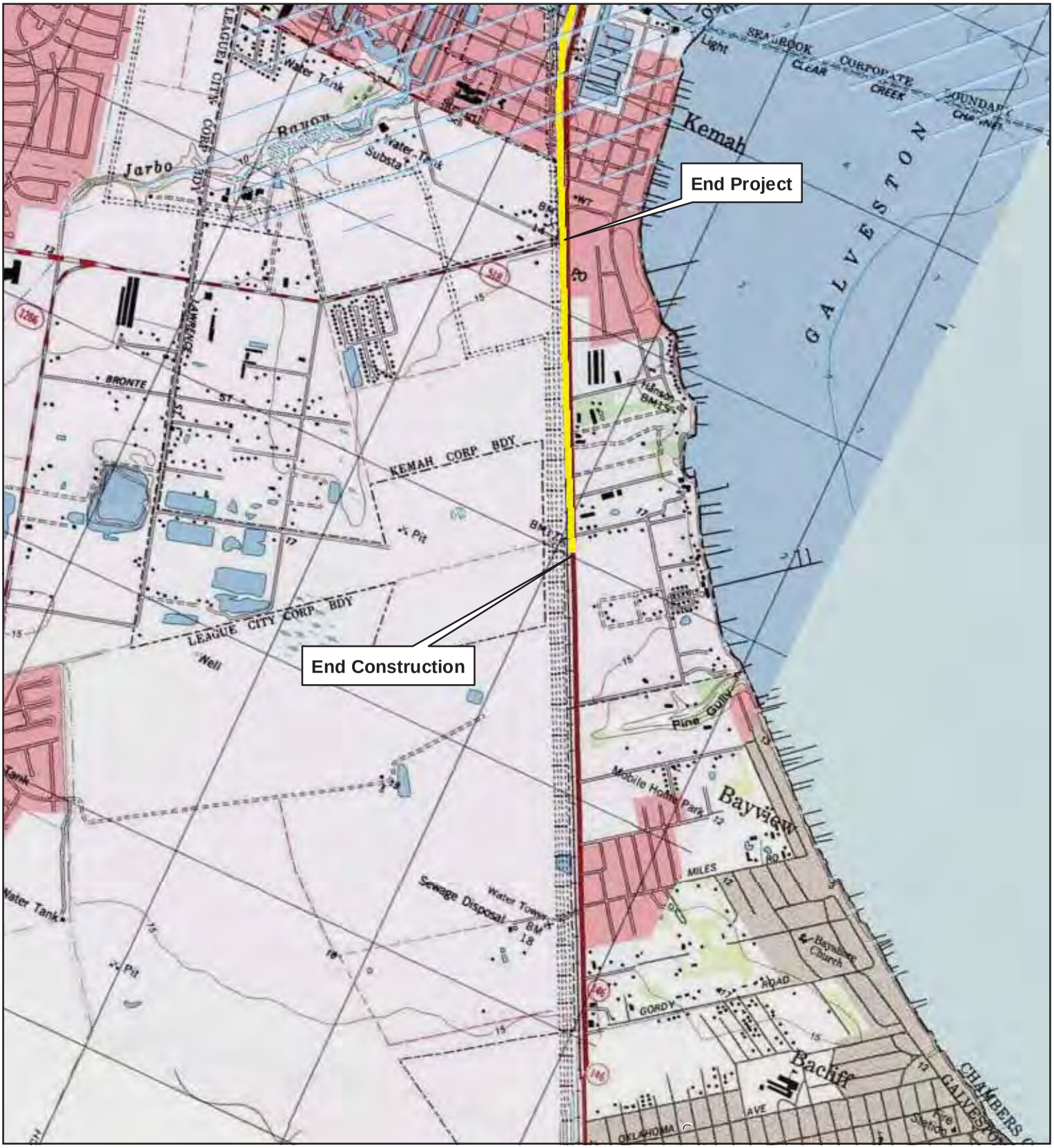
Quad Name: League City

EXHIBIT 2:
FEMA FLOODPLAIN AND
USGS TOPOGRAPHIC MAP
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Map 2 of 3





Legend

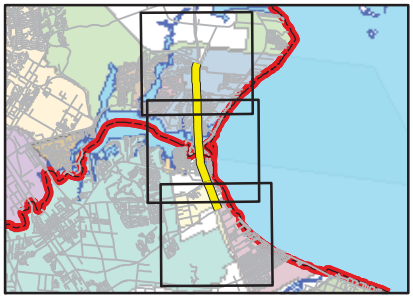
- Project Location
- Floodway
- 100-Year Floodplain

Feet
0 1,000 2,000

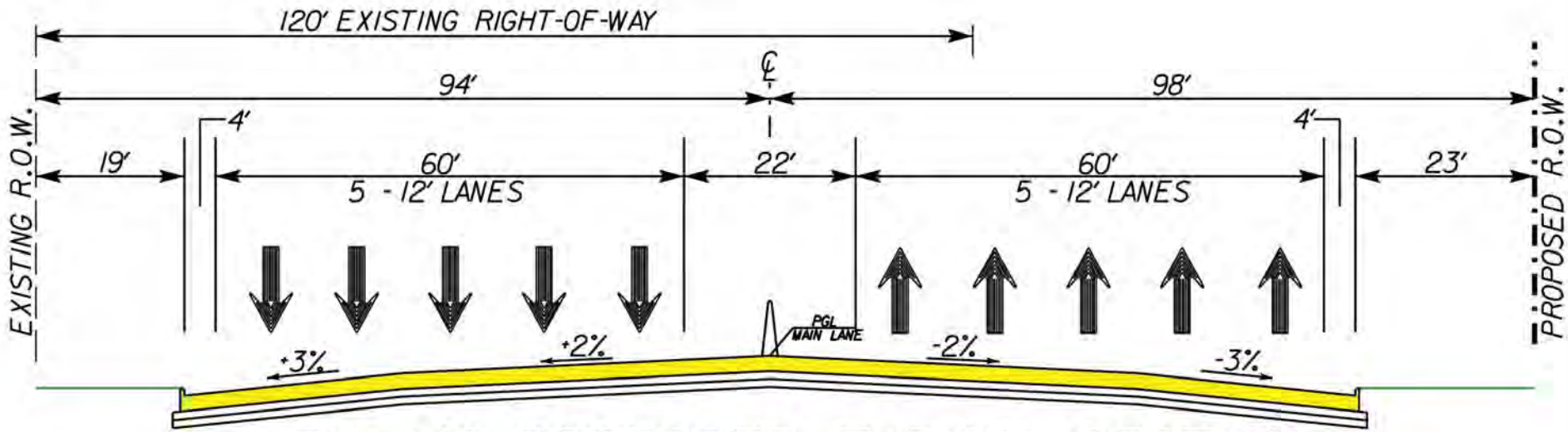
Quad Name: League City

EXHIBIT 2:
FEMA FLOODPLAIN AND
USGS TOPOGRAPHIC MAP
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation



Map 3 of 3

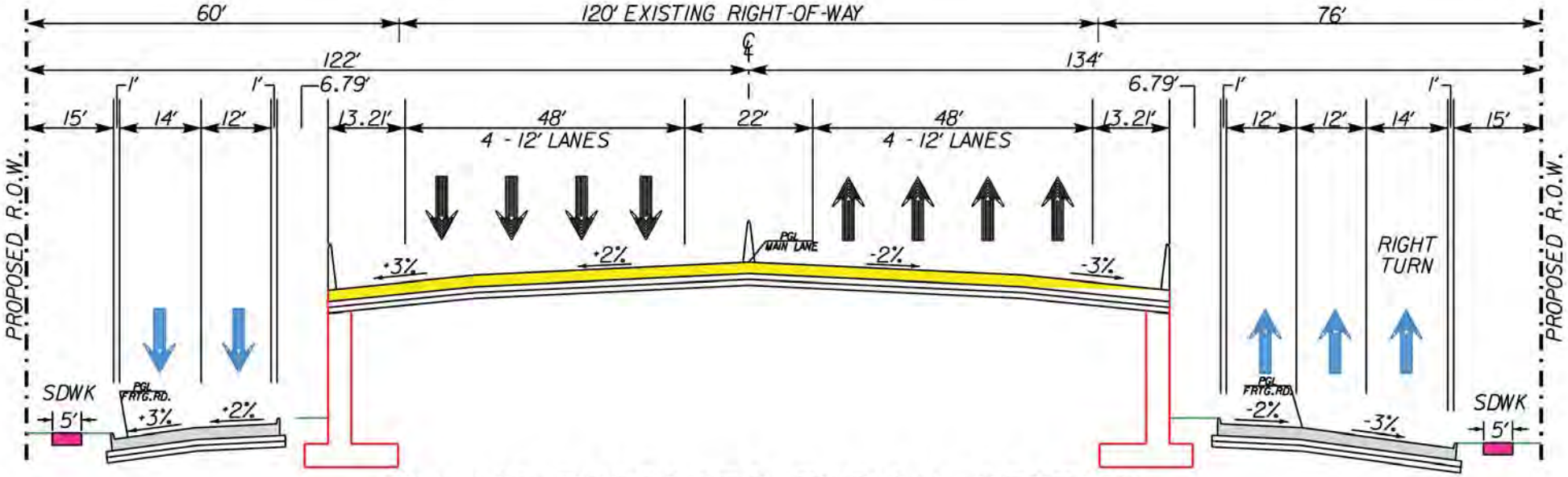


SH 146 PROPOSED TYPICAL SECTION
A - A
SUBURBAN ARTERIAL ROADWAY

EXHIBIT 3:
TYPICAL SECTIONS

SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

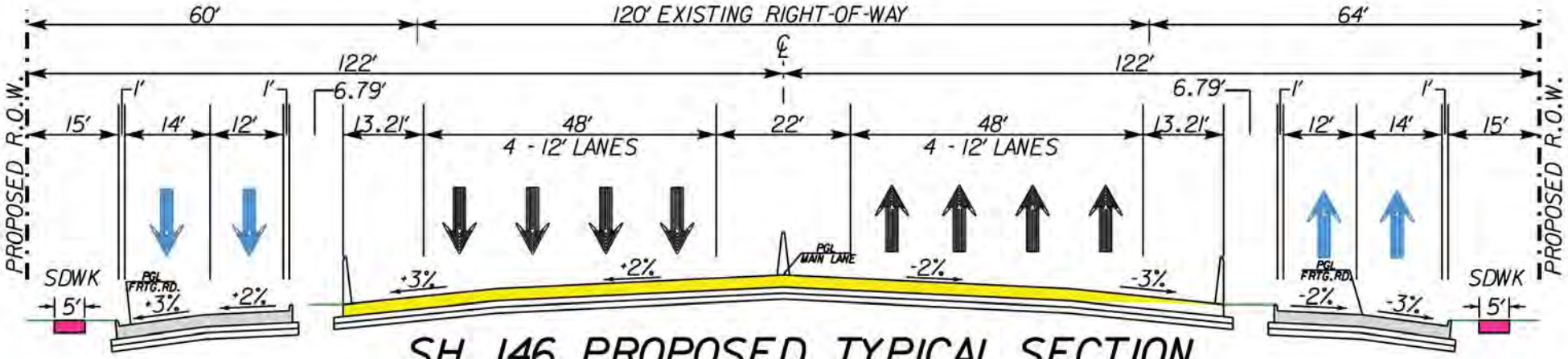


SH 146 PROPOSED TYPICAL SECTION
B - B
PROPOSED REPSDORPH GRADE SEPARATION

EXHIBIT 3:
TYPICAL SECTIONS

SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

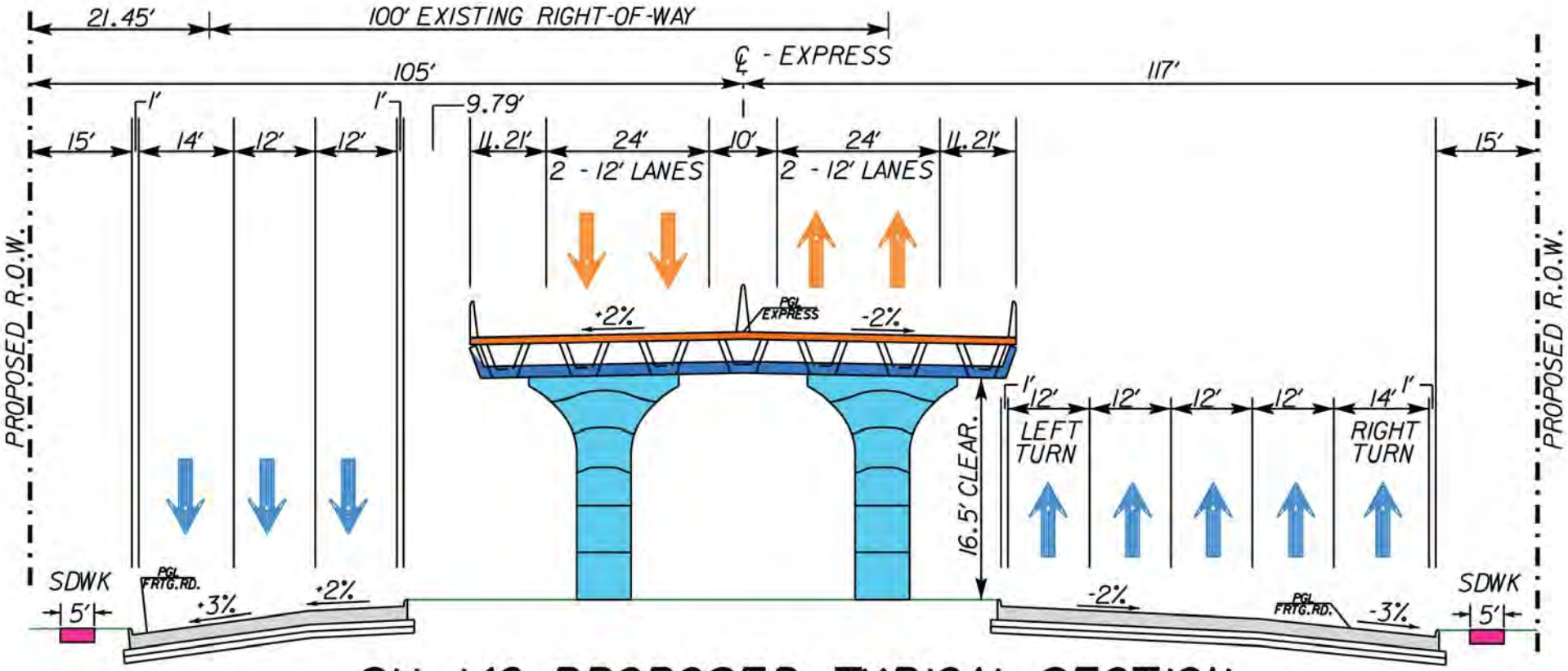


SH 146 PROPOSED TYPICAL SECTION
C - C

EXHIBIT 3:
TYPICAL SECTIONS

SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

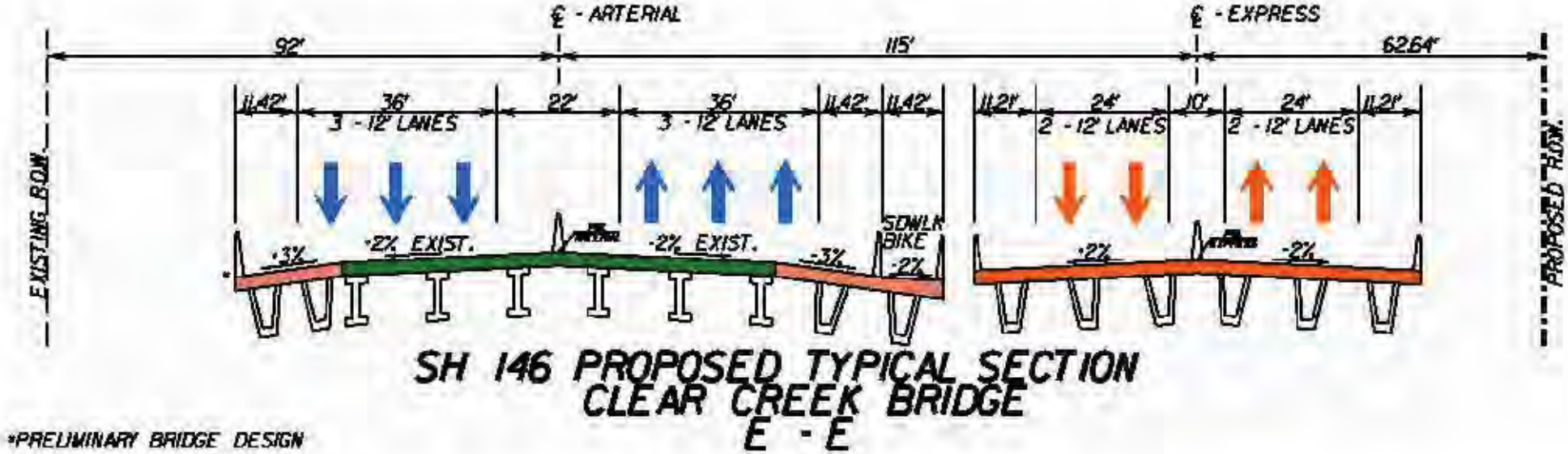


SH 146 PROPOSED TYPICAL SECTION
D - D
PROPOSED NASA 1 GRADE SEPARATION

EXHIBIT 3:
TYPICAL SECTIONS

SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

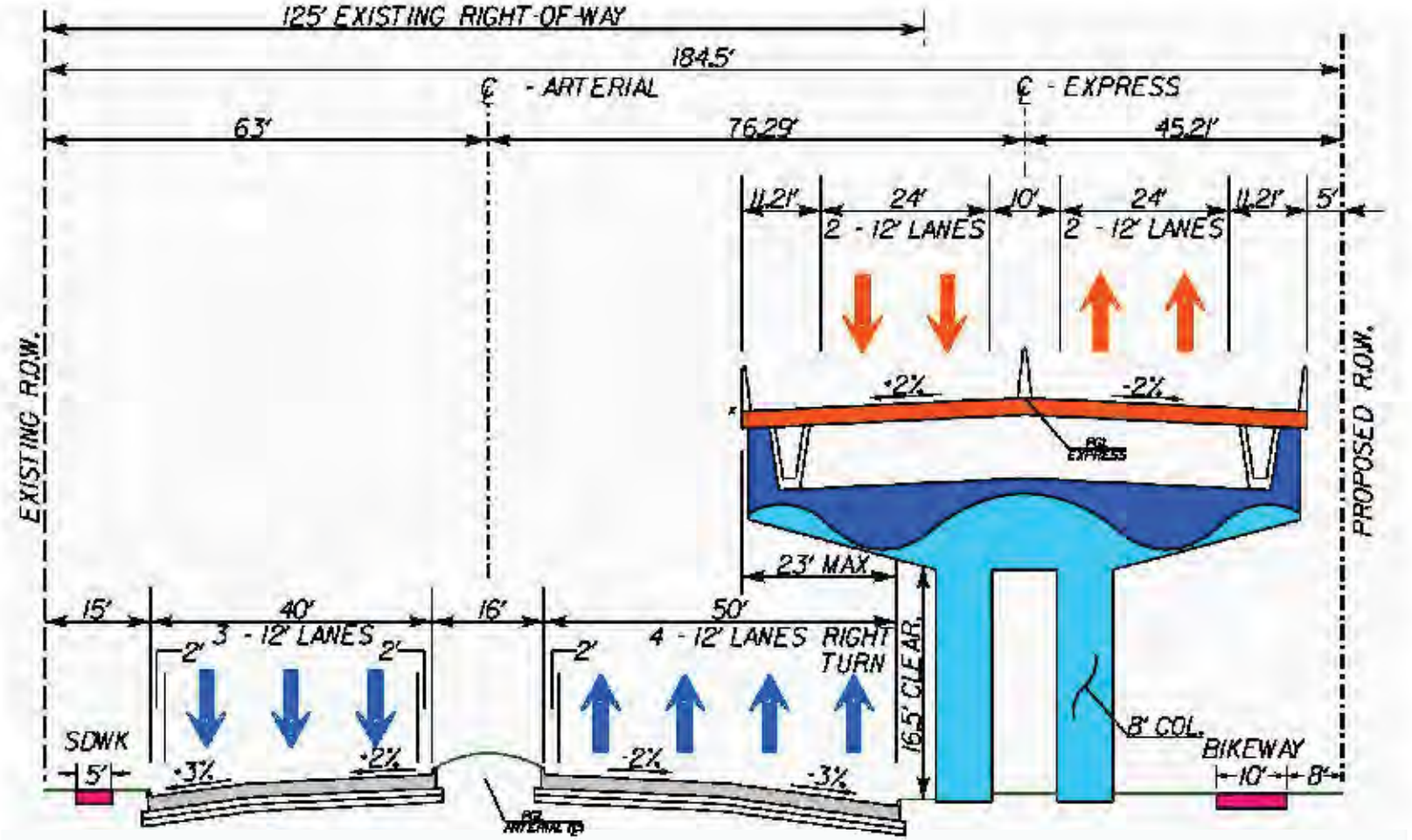


SH 146 PROPOSED TYPICAL SECTION
CLEAR CREEK BRIDGE
E - E

*PRELIMINARY BRIDGE DESIGN

EXHIBIT 3:
TYPICAL SECTIONS

SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

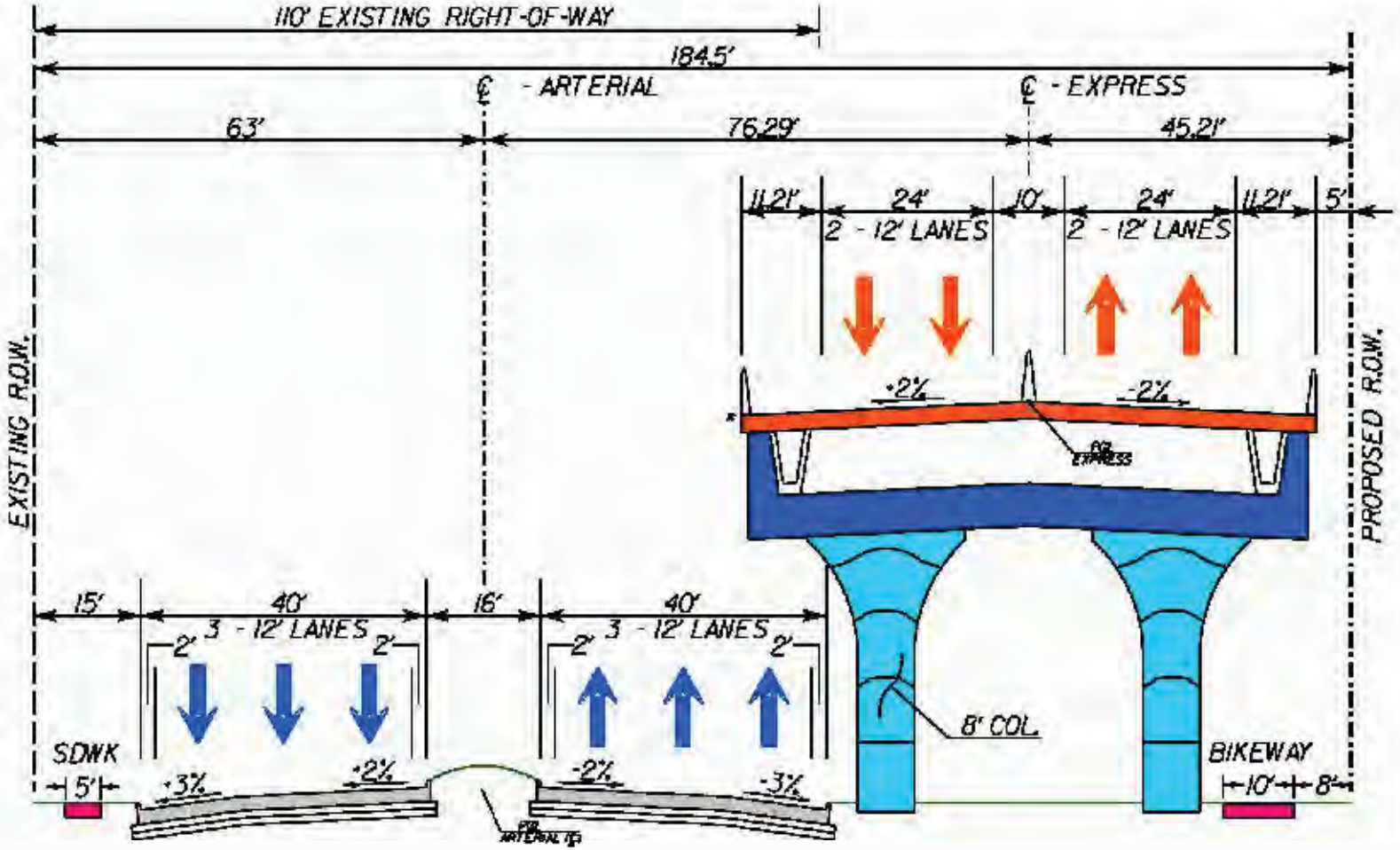


SH 146 PROPOSED TYPICAL SECTION
KEMAH - ARTERIAL WITH EXPRESS LANES
F - F

*PRELIMINARY BRIDGE DESIGN

EXHIBIT 3:
TYPICAL SECTIONS

SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

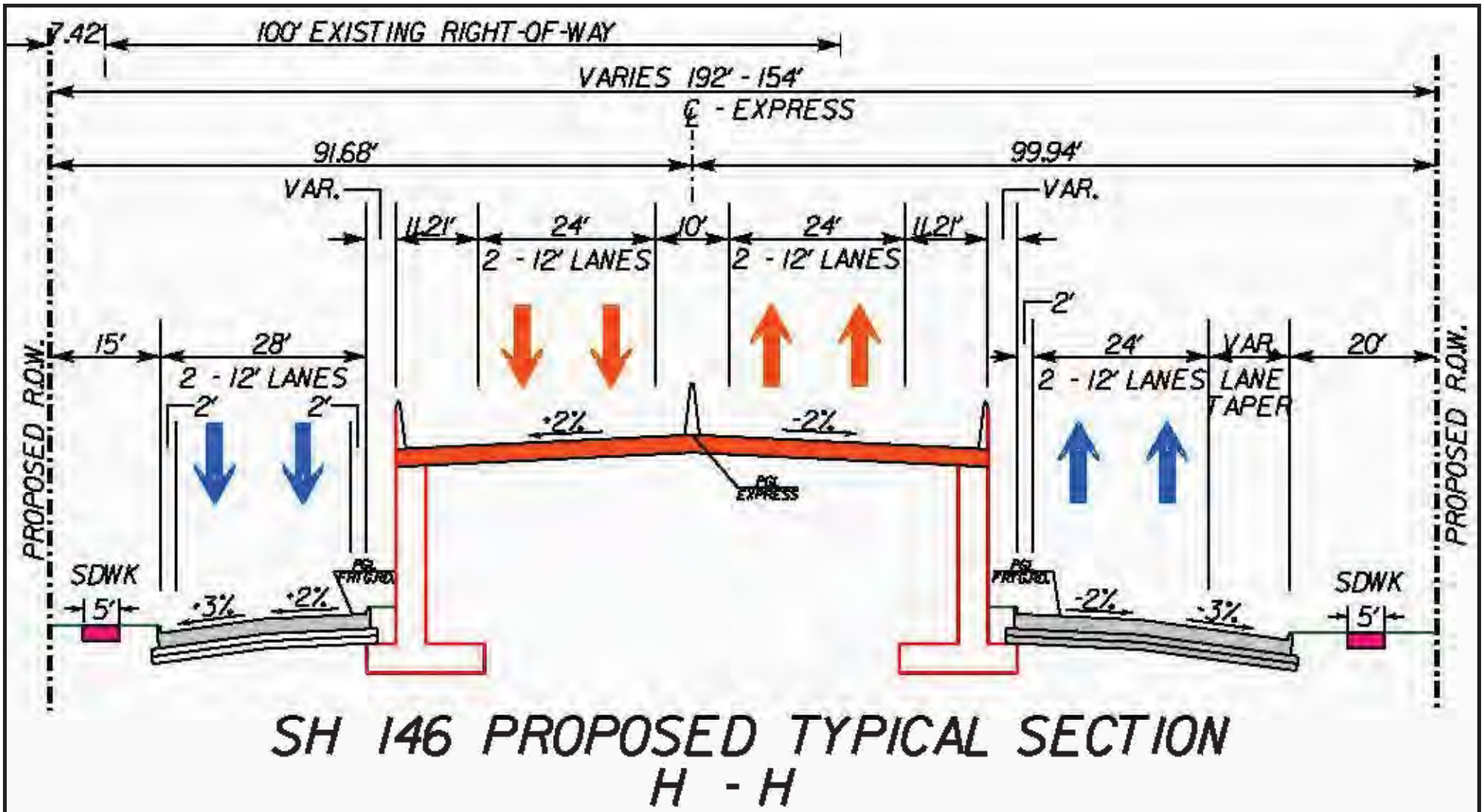


SH 146 PROPOSED TYPICAL SECTION
KEMAH - ARTERIAL WITH EXPRESS LANES
G - G

*PRELIMINARY BRIDGE DESIGN

EXHIBIT 3:
TYPICAL SECTIONS

SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088



SH 146 PROPOSED TYPICAL SECTION
H - H

EXHIBIT 3:
TYPICAL SECTIONS

SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Legend

- Existing ROW
- Proposed ROW
- Retaining Wall
- Express Lanes
- Mainlane EOP
- Frontage EOP
- Shared Use Path
- Sidewalk
- Cross Street EOP

Noise Receivers

- Non-Impacted Receivers
- Impacted Receivers

- Identified HazMAT Site
- Place of Worship
- Fire Station
- ABC Commercial
- ABC Residential
- ABC Water

- Potentially Jurisdictional Waters of the U.S., including Wetlands
- Potentially Non-jurisdictional Wetlands
- Floodway
- 100-Year Floodplain

N E S W

0 100 200 Feet

EXHIBIT 4:
PROPOSED PROJECT AND ENVIRONMENTAL CONSTRAINTS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- Retaining Wall
- Express Lanes
- Mainlane EOP
- Frontage EOP
- Shared Use Path
- Sidewalk
- Cross Street EOP

Noise Receivers

- Non-Impacted Receivers
- Impacted Receivers
- Identified HazMAT Site
- Place of Worship
- Fire Station
- Commercial
- Residential
- Water
- Potentially Jurisdictional Waters of the U.S., including Wetlands
- Potentially Non-jurisdictional Wetlands
- Floodway
- 100-Year Floodplain

N E S W

0 100 200 Feet

EXHIBIT 4:
PROPOSED PROJECT AND ENVIRONMENTAL CONSTRAINTS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- Retaining Wall
- Express Lanes
- Mainlane EOP
- Frontage EOP
- Shared Use Path
- Sidewalk
- Cross Street EOP

Noise Receivers

- Non-Impacted Receivers
- Impacted Receivers

- Identified HazMAT Site
- Place of Worship
- Fire Station
- Commercial
- Residential
- Water

- Potentially Jurisdictional Waters of the U.S., including Wetlands
- Potentially Non-jurisdictional Wetlands
- Floodway
- 100-Year Floodplain

N E S W

0 100 200 Feet

EXHIBIT 4:
PROPOSED PROJECT AND ENVIRONMENTAL CONSTRAINTS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- Retaining Wall
- Express Lanes
- Mainlane EOP
- Frontage EOP
- Shared Use Path
- Sidewalk
- Cross Street EOP

Noise Receivers

- Non-Impacted Receivers
- Impacted Receivers

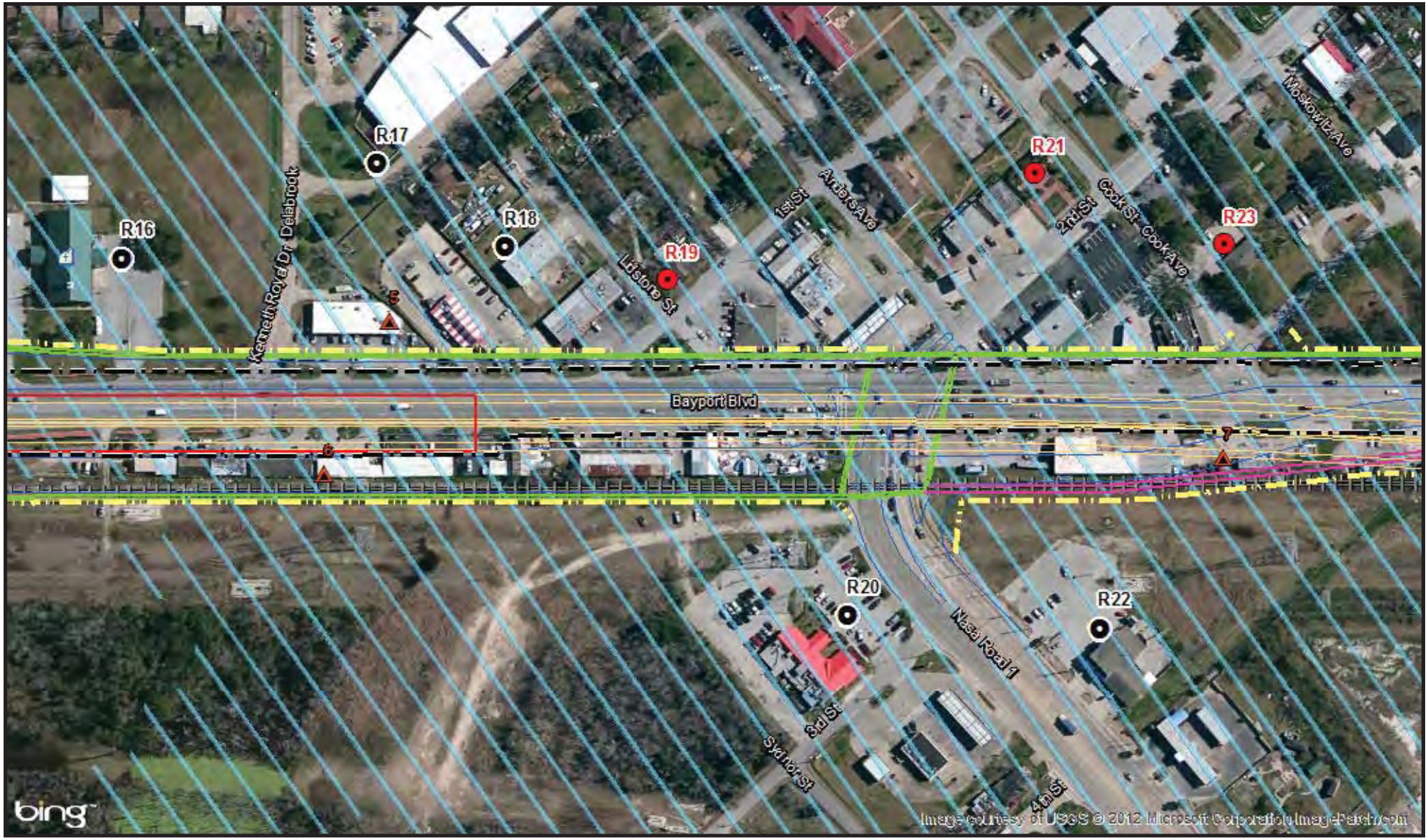
- Identified HazMAT Site
- Place of Worship
- Fire Station
- Commercial
- Residential
- Water
- Potentially Jurisdictional Waters of the U.S., including Wetlands
- Potentially Non-jurisdictional Wetlands
- Floodway
- 100-Year Floodplain

N E S W

0 100 200 Feet

EXHIBIT 4:
PROPOSED PROJECT AND ENVIRONMENTAL CONSTRAINTS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation



Legend

- Existing ROW
- Proposed ROW
- Retaining Wall
- Express Lanes
- Mainlane EOP
- Frontage EOP
- Shared Use Path
- Sidewalk
- Cross Street EOP

Noise Receivers

- Non-Impacted Receivers
- Impacted Receivers

- Identified HazMAT Site
- Place of Worship
- Fire Station
- Commercial
- Residential
- Water
- Potentially Jurisdictional Waters of the U.S., including Wetlands
- Potentially Non-jurisdictional Wetlands
- Floodway
- 100-Year Floodplain

N E S W

0 100 200 Feet

EXHIBIT 4:
PROPOSED PROJECT AND ENVIRONMENTAL CONSTRAINTS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- Retaining Wall
- Express Lanes
- Mainlane EOP
- Frontage EOP
- Shared Use Path
- Sidewalk
- Cross Street EOP

Noise Receivers

- Non-Impacted Receivers
- Impacted Receivers

- Identified HazMAT Site
- Place of Worship
- Fire Station
- Commercial
- Residential
- Water

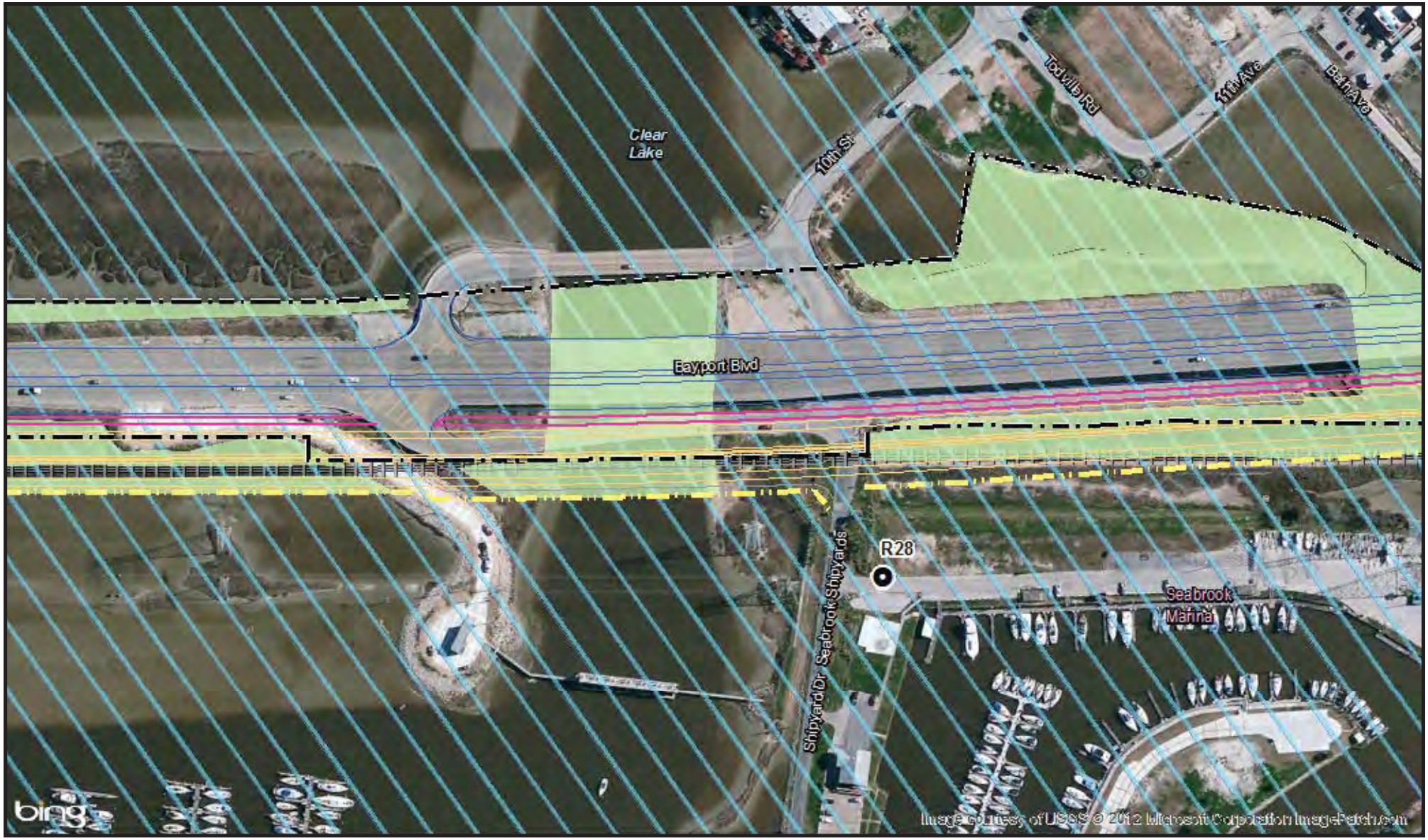
- Potentially Jurisdictional Waters of the U.S., including Wetlands
- Potentially Non-jurisdictional Wetlands
- Floodway
- 100-Year Floodplain

N E S W

0 100 200 Feet

EXHIBIT 4:
PROPOSED PROJECT AND ENVIRONMENTAL CONSTRAINTS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation



Legend

- Existing ROW
- Proposed ROW
- Retaining Wall
- Express Lanes
- Mainlane EOP
- Frontage EOP
- Shared Use Path
- Sidewalk
- Cross Street EOP

Noise Receivers

- Non-Impacted Receivers
- Impacted Receivers

- Identified HazMAT Site
- Place of Worship
- Fire Station
- ABC Commercial
- ABC Residential
- ABC Water

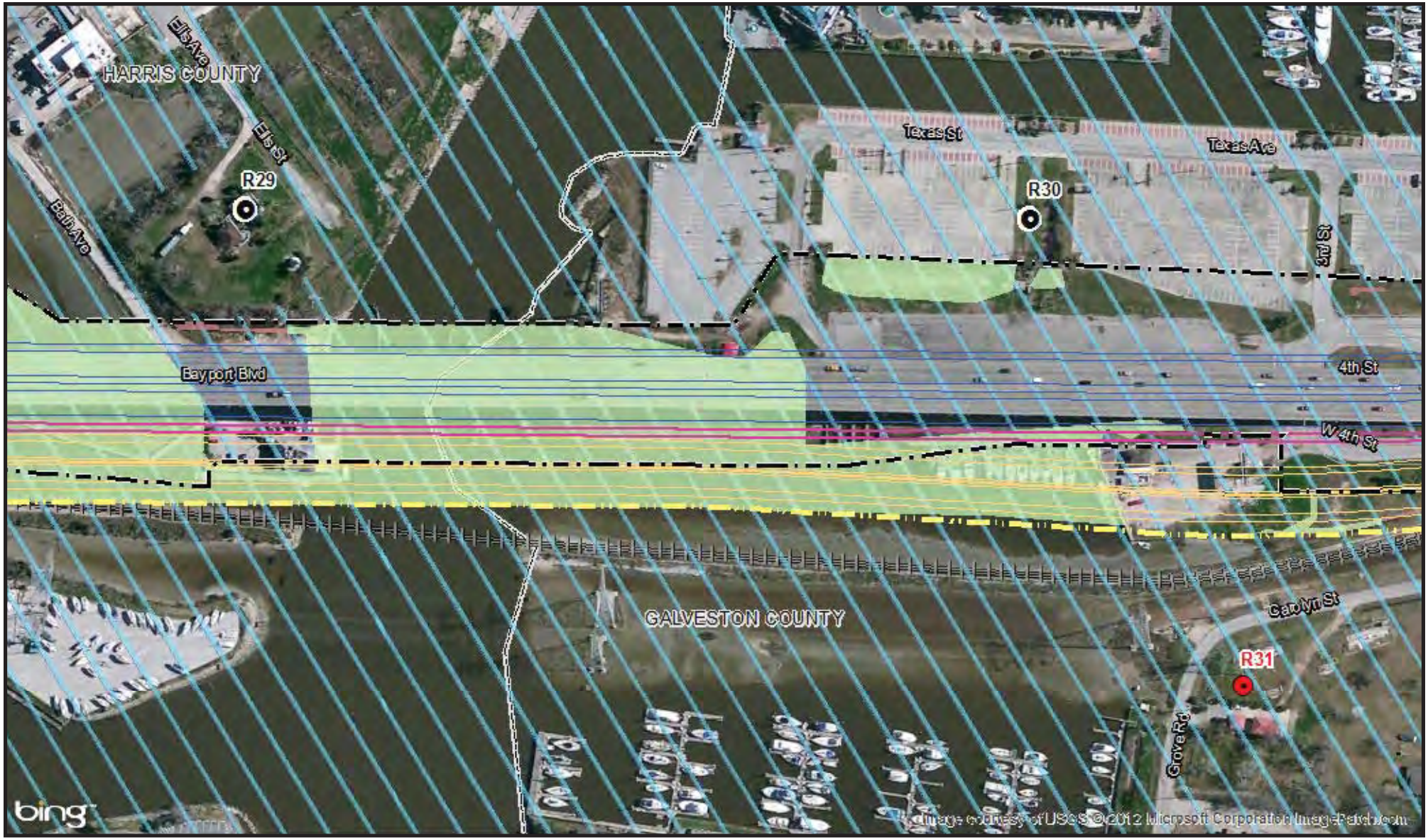
- Potentially Jurisdictional Waters of the U.S., including Wetlands
- Potentially Non-jurisdictional Wetlands
- Floodway
- 100-Year Floodplain

N E S W

0 100 200 Feet

EXHIBIT 4:
PROPOSED PROJECT AND ENVIRONMENTAL CONSTRAINTS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation



Legend

- Existing ROW
- Proposed ROW
- Retaining Wall
- Express Lanes
- Mainlane EOP
- Frontage EOP
- Shared Use Path
- Sidewalk
- Cross Street EOP

Noise Receivers

- Non-Impacted Receivers
- Impacted Receivers

- Identified HazMAT Site
- Place of Worship
- Fire Station
- Commercial
- Residential
- Water
- Potentially Jurisdictional Waters of the U.S., including Wetlands
- Potentially Non-jurisdictional Wetlands
- Floodway
- 100-Year Floodplain

N E S W

0 100 200 Feet

EXHIBIT 4:
PROPOSED PROJECT AND ENVIRONMENTAL CONSTRAINTS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- Retaining Wall
- Express Lanes
- Mainlane EOP
- Frontage EOP
- Shared Use Path
- Sidewalk
- Cross Street EOP

Noise Receivers

- Non-Impacted Receivers
- Impacted Receivers

- Identified HazMAT Site
- Place of Worship
- Fire Station
- ABC Commercial
- ABC Residential
- ABC Water
- Potentially Jurisdictional Waters of the U.S., including Wetlands
- Potentially Non-jurisdictional Wetlands
- Floodway
- 100-Year Floodplain

N E S W

0 100 200 Feet

EXHIBIT 4:
PROPOSED PROJECT AND ENVIRONMENTAL CONSTRAINTS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- Retaining Wall
- Express Lanes
- Mainlane EOP
- Frontage EOP
- Shared Use Path
- Sidewalk
- Cross Street EOP

Noise Receivers

- Non-Impacted Receivers
- Impacted Receivers

- Identified HazMAT Site
- Place of Worship
- Fire Station
- Commercial
- Residential
- Water
- Potentially Jurisdictional Waters of the U.S., including Wetlands
- Potentially Non-jurisdictional Wetlands
- Floodway
- 100-Year Floodplain

N E S W

0 100 200 Feet

EXHIBIT 4:
PROPOSED PROJECT AND ENVIRONMENTAL CONSTRAINTS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- Retaining Wall
- Express Lanes
- Mainlane EOP
- Frontage EOP
- Shared Use Path
- Sidewalk
- Cross Street EOP

Noise Receivers

- Non-Impacted Receivers
- Impacted Receivers

- Identified HazMAT Site
- Place of Worship
- Fire Station
- Commercial
- Residential
- Water

- Potentially Jurisdictional Waters of the U.S., including Wetlands
- Potentially Non-jurisdictional Wetlands
- Floodway
- 100-Year Floodplain

N E S W

0 100 200 Feet

EXHIBIT 4:
PROPOSED PROJECT AND ENVIRONMENTAL CONSTRAINTS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- Retaining Wall
- Express Lanes
- Mainlane EOP
- Frontage EOP
- Shared Use Path
- Sidewalk
- Cross Street EOP

Noise Receivers

- Non-Impacted Receivers
- Impacted Receivers

- Identified HazMAT Site
- Place of Worship
- Fire Station
- Commercial
- Residential
- Water

- Potentially Jurisdictional Waters of the U.S., including Wetlands
- Potentially Non-jurisdictional Wetlands
- Floodway
- 100-Year Floodplain

N E S W

Feet
0 100 200

EXHIBIT 4:
PROPOSED PROJECT AND ENVIRONMENTAL CONSTRAINTS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- **Potential Relocation Property**
- Business
- Residential
- Unclassified
- Commercial
- Industrial
- Municipal
- Place of Worship
- Residential
- School

Feet
0 100 200

EXHIBIT 5:
POTENTIAL RELOCATION PROPERTIES
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- **Potential Relocation Property**
- # Business
- ABC Residential
- Unclassified
- Commercial
- Industrial
- Municipal
- Place of Worship
- Residential
- School

N E S W

0 100 200 Feet

EXHIBIT 5:
POTENTIAL RELOCATION PROPERTIES
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

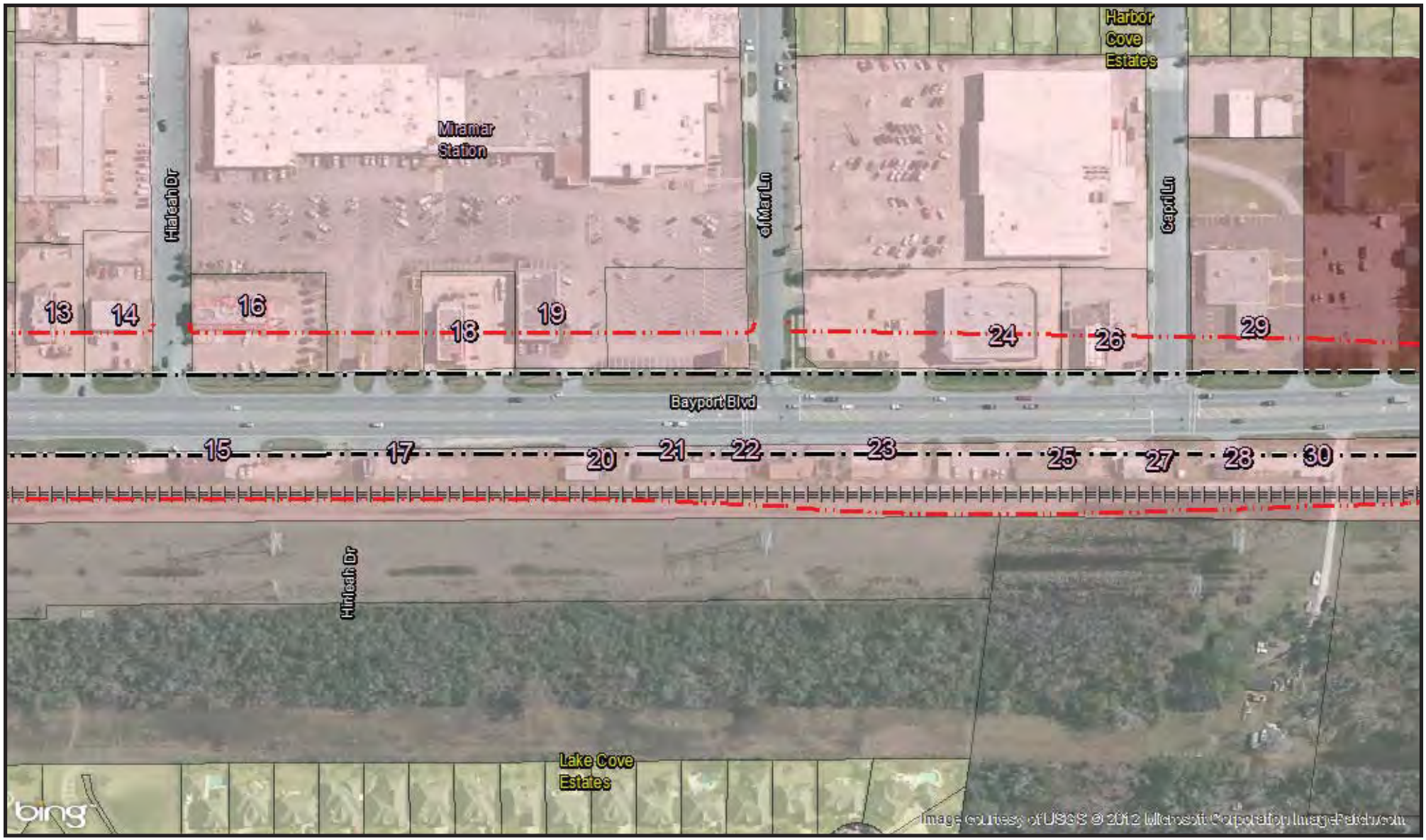
- Existing ROW
- Proposed ROW
- **Potential Relocation Property**
- # Business
- ABC Residential
- Unclassified
- Commercial
- Industrial
- Municipal
- Place of Worship
- Residential
- School

N E S W

0 100 200 Feet

EXHIBIT 5:
POTENTIAL RELOCATION PROPERTIES
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation



Legend

- Existing ROW
- Proposed ROW
- **Potential Relocation Property**
- # Business
- ABC Residential
- Unclassified
- Commercial
- Industrial
- Municipal
- Place of Worship
- Residential
- School

Feet
0 100 200

EXHIBIT 5:
POTENTIAL RELOCATION PROPERTIES
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- **Potential Relocation Property**
- # Business
- ABC Residential
- Unclassified
- Commercial
- Industrial
- Municipal
- Place of Worship
- Residential
- School

Feet
0 100 200

EXHIBIT 5:
POTENTIAL RELOCATION PROPERTIES
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- **Potential Relocation Property**
- Business
- Residential
- Unclassified
- Commercial
- Industrial
- Municipal
- Place of Worship
- Residential
- School

Feet
0 100 200

EXHIBIT 5:
POTENTIAL RELOCATION PROPERTIES
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

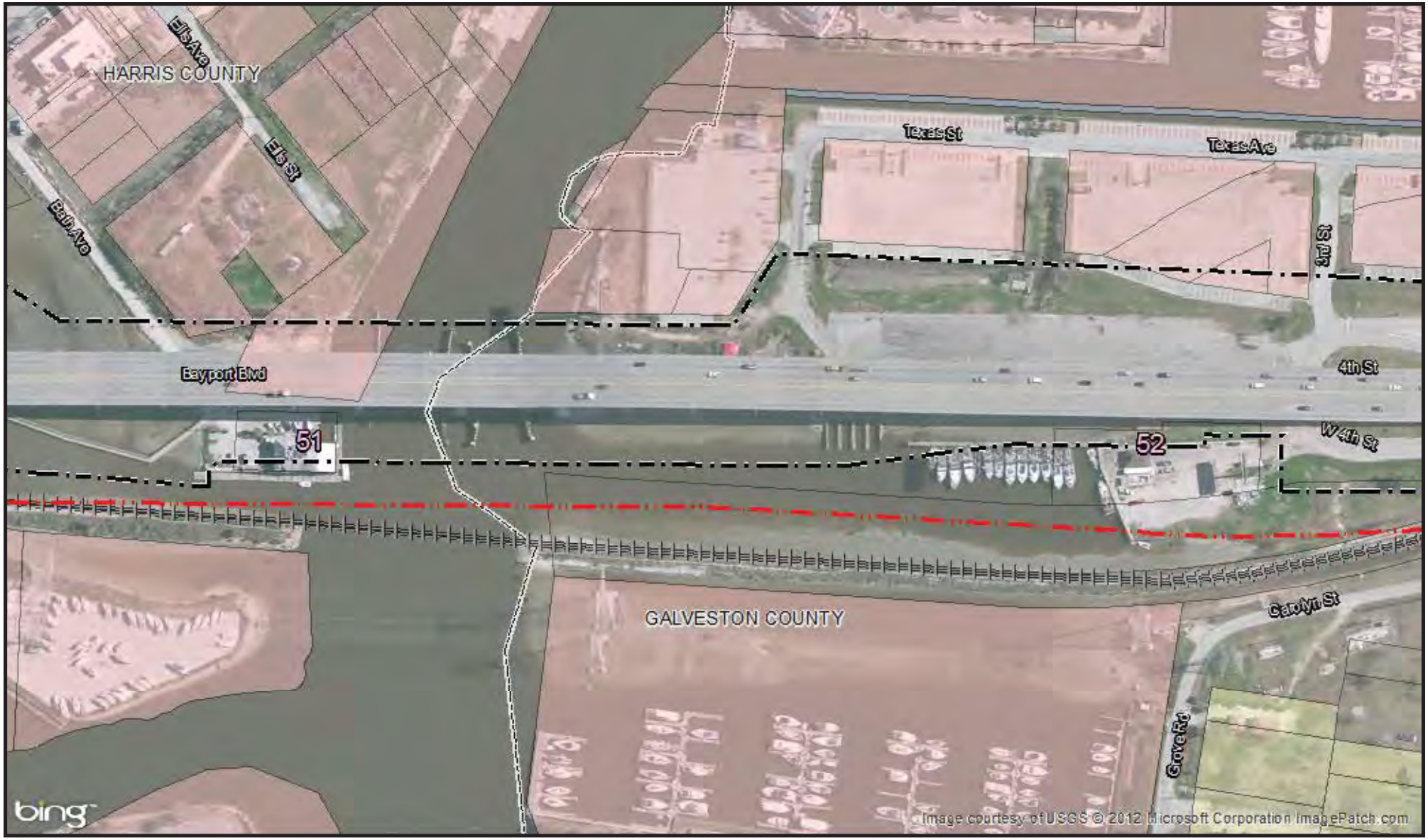
- Existing ROW
- Proposed ROW
- **Potential Relocation Property**
- Business
- Residential
- Unclassified
- Commercial
- Industrial
- Municipal
- Place of Worship
- Residential
- School

N E S W

0 100 200 Feet

EXHIBIT 5:
POTENTIAL RELOCATION PROPERTIES
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation



Legend

- Existing ROW
- Proposed ROW
- **Potential Relocation Property**
- # Business
- ABC Residential
- Unclassified
- Commercial
- Industrial
- Municipal
- Place of Worship
- Residential
- School

N E S W

0 100 200 Feet

EXHIBIT 5:
POTENTIAL RELOCATION PROPERTIES
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- **Potential Relocation Property**
- Business
- Residential
- Unclassified
- Commercial
- Industrial
- Municipal
- Place of Worship
- Residential
- School

Feet
0 100 200

EXHIBIT 5:
POTENTIAL RELOCATION PROPERTIES
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

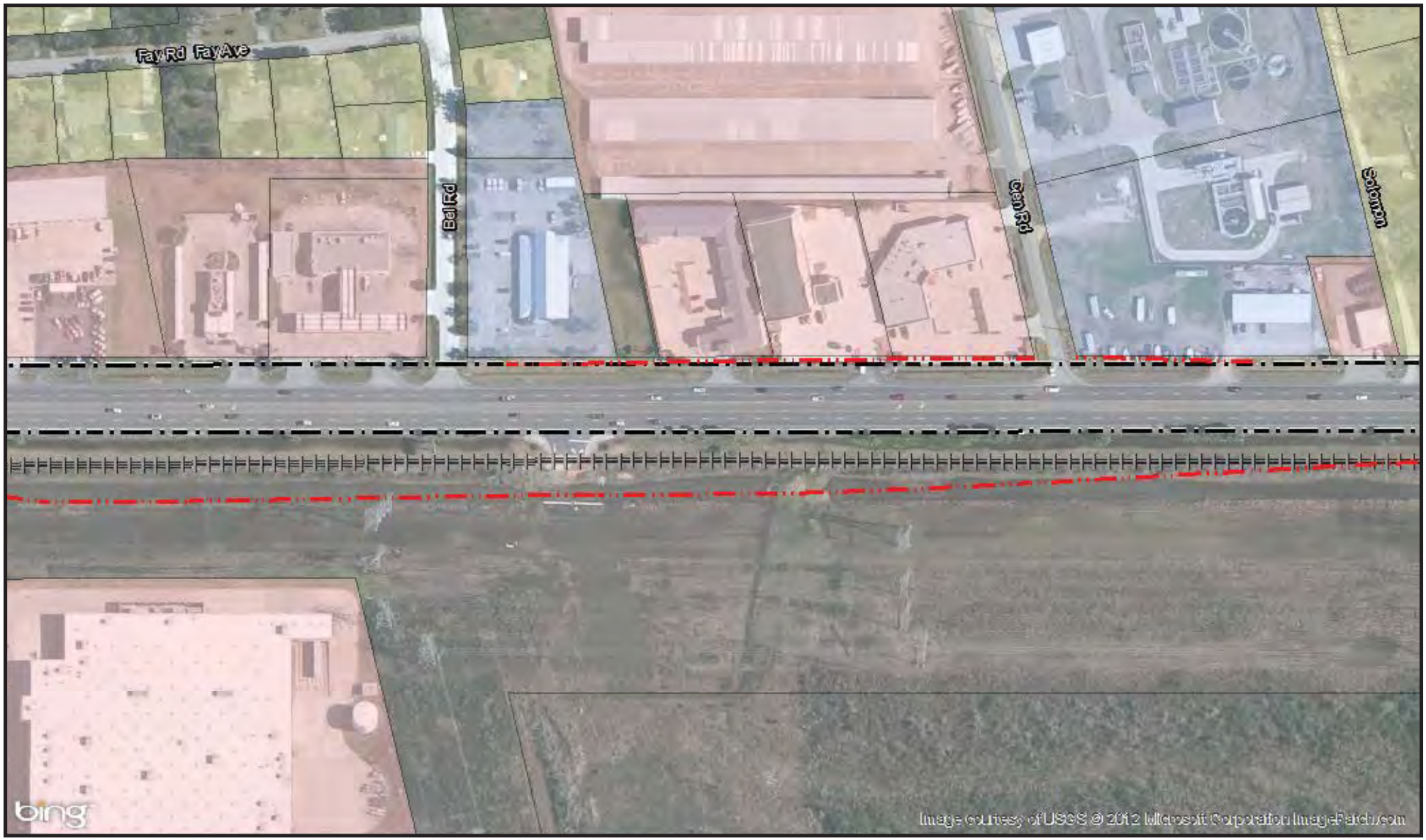
Legend

- Existing ROW
- Proposed ROW
- **Potential Relocation Property**
- Business
- Residential
- Unclassified
- Commercial
- Industrial
- Municipal
- Place of Worship
- Residential
- School

Feet
0 100 200

EXHIBIT 5:
POTENTIAL RELOCATION PROPERTIES
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation



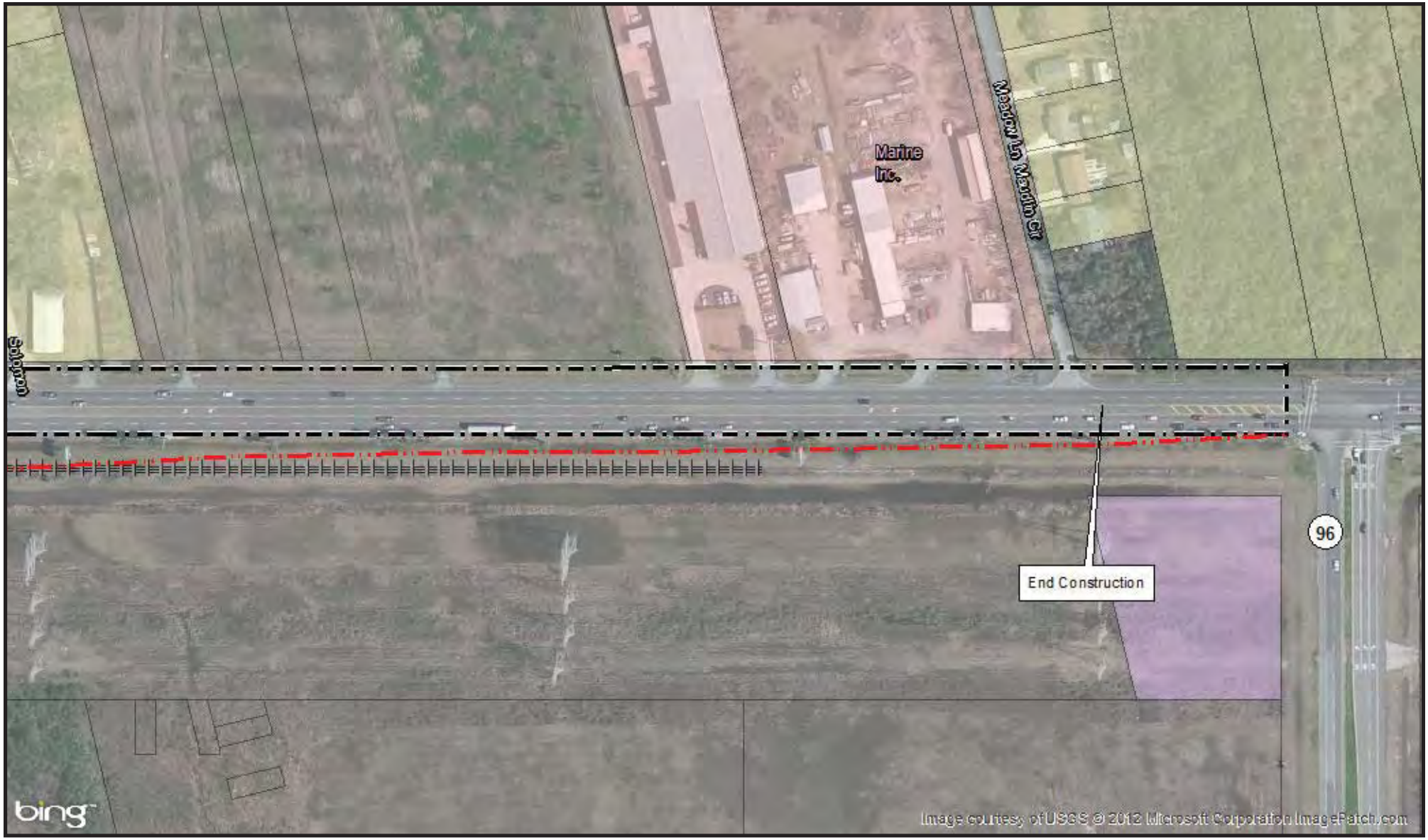
Legend

- Existing ROW
- Proposed ROW
- **Potential Relocation Property**
- Business
- Residential
- Unclassified
- Commercial
- Industrial
- Municipal
- Place of Worship
- Residential
- School

Feet
0 100 200

EXHIBIT 5:
POTENTIAL RELOCATION PROPERTIES
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation



Legend

- Existing ROW
- Proposed ROW
- **Potential Relocation Property**
- # Business
- ABC Residential
- Unclassified
- Commercial
- Industrial
- Municipal
- Place of Worship
- Residential
- School

N E S W

Feet
0 100 200

EXHIBIT 5:
POTENTIAL RELOCATION PROPERTIES
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

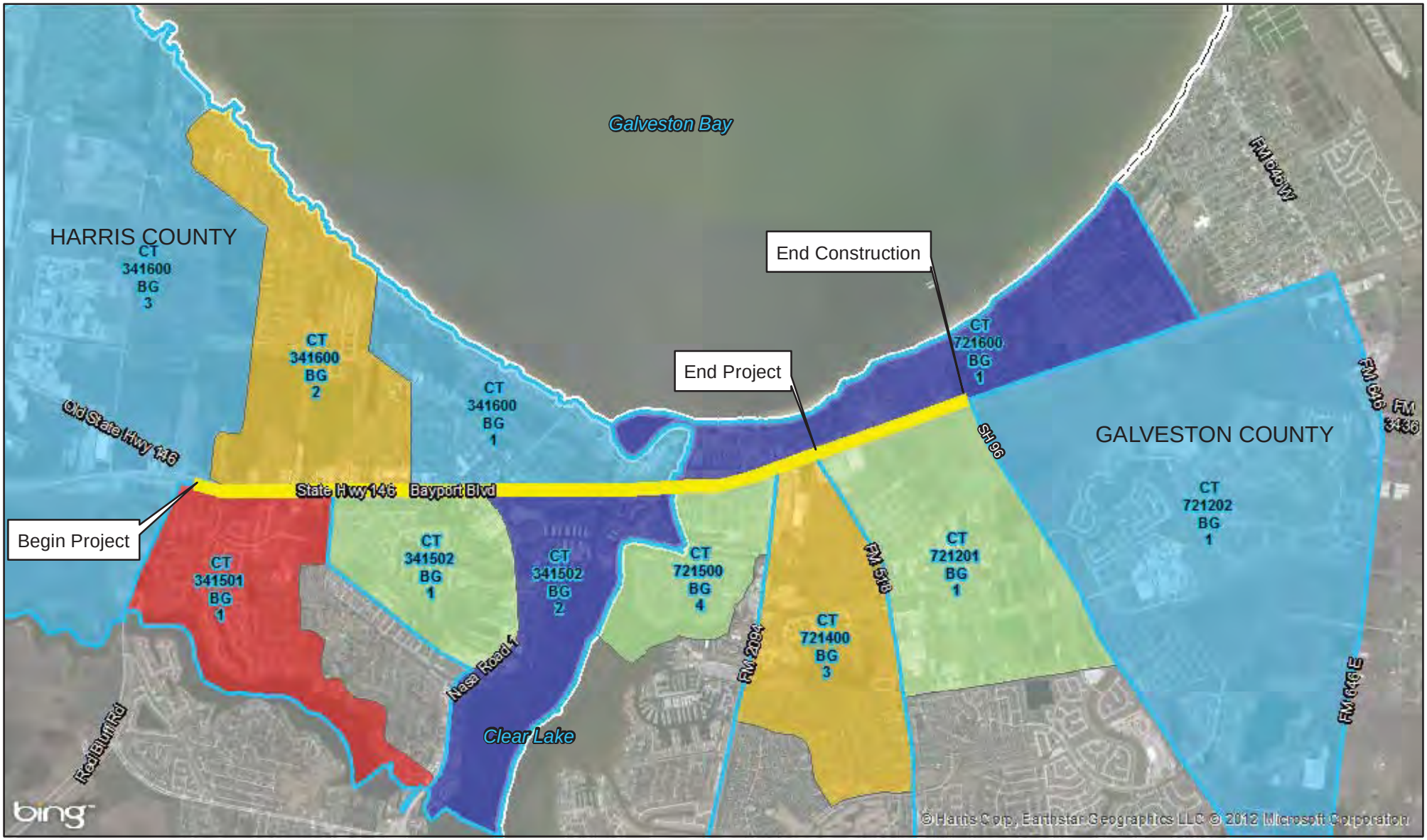
- Project Location
- County Boundary
- U.S. Census 2010 Block Groups
- U.S. Census 2010 Blocks
- 1 Dot = 1 Minority Individual

N E S W

0 2,000 4,000 Feet

EXHIBIT 6a:
CENSUS 2010 MINORITY POPULATION DENSITY MAP
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation



Legend

Project Location

County Boundary

U.S. Census 2010 Tracts

Household Median Income (2010)

<$55,000

$55,001 - $80,000

$80,001 - $90,000

$90,001 - $100,000

>$100,000

N E S W

0 2,000 4,000 Feet

EXHIBIT 6b:
CENSUS 2010 MEDIAN HOUSEHOLD INCOME MAP
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- County Boundary
- 100 meter Project Buffer
- 500 meter Project Buffer
- School
- Daycare Facility
- Senior Citizen Facility

N E S W

0 400 800 Feet

EXHIBIT 7:
MOBILE SOURCE AIR TOXICS (MSAT)
SENSITIVE RECEPTORS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Legend

- Existing ROW
- Proposed ROW
- County Boundary
- 100 meter Project Buffer
- 500 meter Project Buffer
- School
- Daycare Facility
- Senior Citizen Facility

N E S W

0 400 800 Feet

EXHIBIT 7:
MOBILE SOURCE AIR TOXICS (MSAT)
SENSITIVE RECEPTORS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

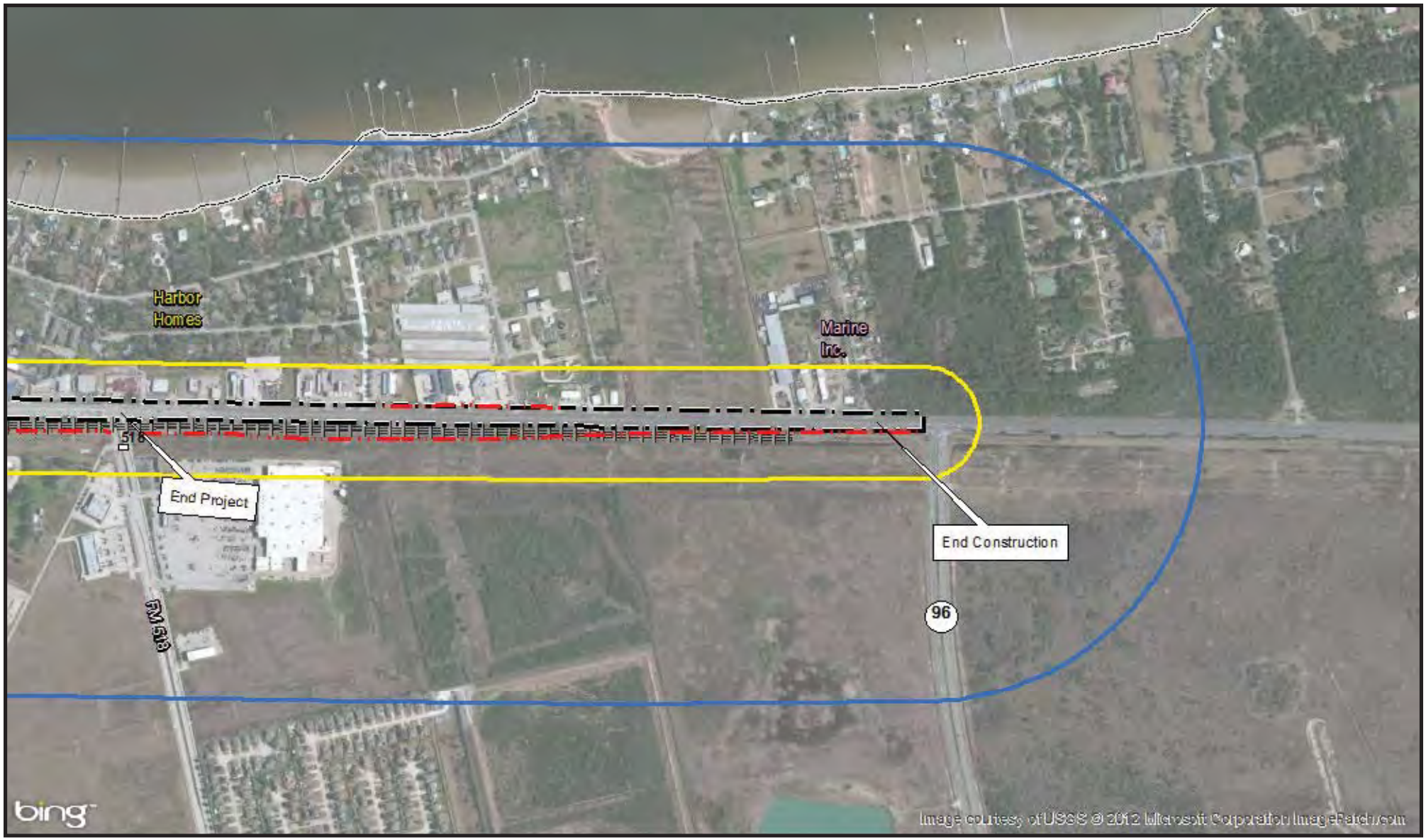
Legend

- Existing ROW
- Proposed ROW
- County Boundary
- 100 meter Project Buffer
- 500 meter Project Buffer
- School
- Daycare Facility
- Senior Citizen Facility

Feet
0 400 800

EXHIBIT 7:
MOBILE SOURCE AIR TOXICS (MSAT)
SENSITIVE RECEPTORS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation



Legend

- Existing ROW
- Proposed ROW
- County Boundary
- 100 meter Project Buffer
- 500 meter Project Buffer
- School
- Daycare Facility
- Senior Citizen Facility

Feet
0 400 800

EXHIBIT 7:
MOBILE SOURCE AIR TOXICS (MSAT)
SENSITIVE RECEPTORS
SH 146 (Red Bluff to FM 518)
Harris and Galveston Counties, Texas
CSJ: 0389-05-088

Texas Department of Transportation

Potential Archeological Liability Map
SH 146 from Fairmont Parkway to Galveston "Y"

League City 7.5 min Topographic Quadrangle Maps

5,000 2,500 0 5,000 Feet

Legend

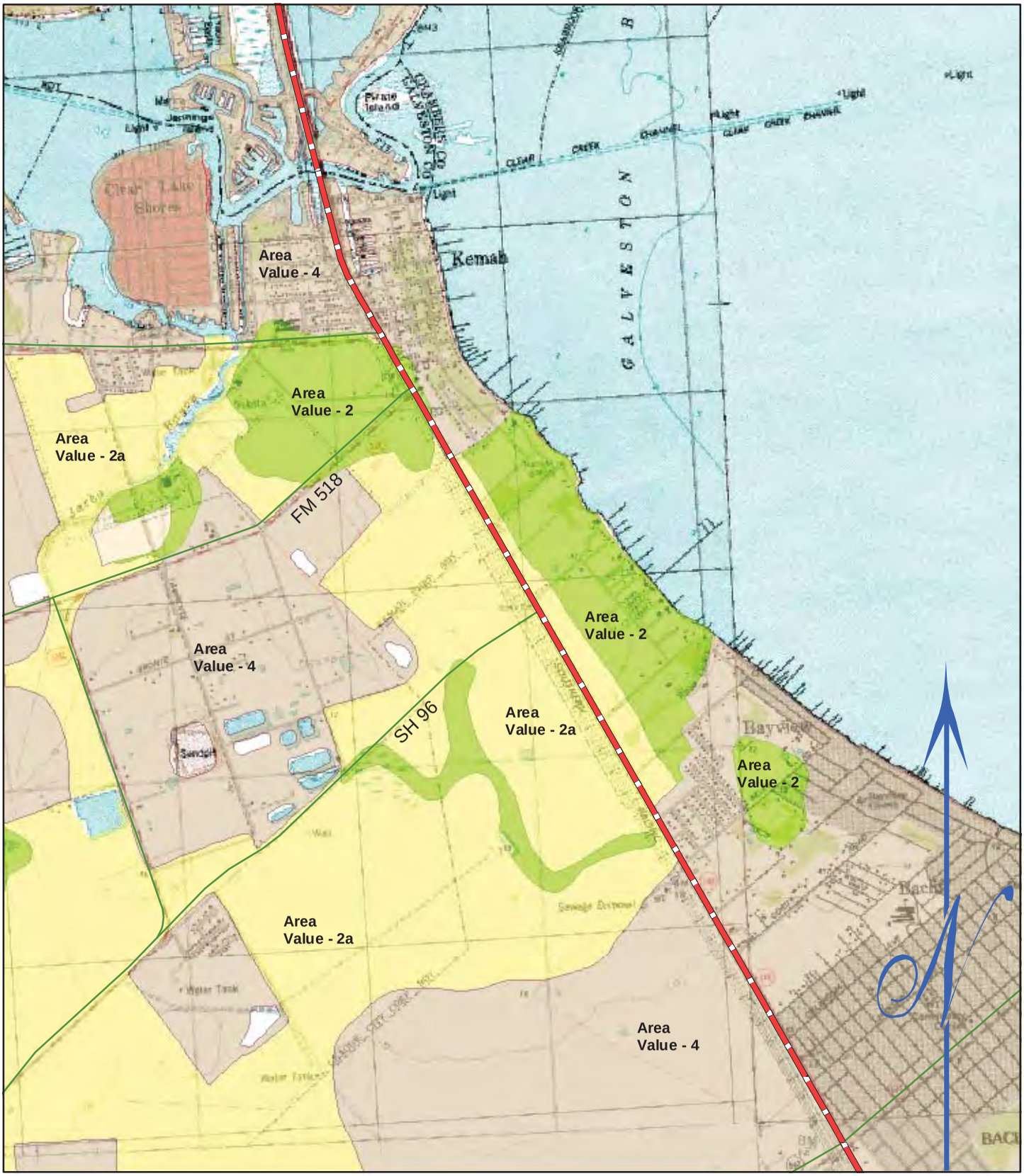
SH 146

PALM Data Area Values

- 1 - Surface survey recommended, Deep reconnaissance recommended if deep impacts are anticipated
- 2 - Surface survey recommended
- 2a - Surface survey of pimple mounds recommended
- 3 - Deep reconnaissance recommended if deep impacts are anticipated
- 3a - Deep reconnaissance recomended if severe deep impacts are anticipated
- 4 - No survey recommended

Potential Archeological Liability Map
(Sheet 2)
Texas Department of Transportation
SH 146 from Fairmont Parkway
to Galveston "Y"
Harris County, Texas
CSJ 0389-05-087

Potential Archeological Liability Map
SH 146 from Fairmont Parkway to Galveston "Y" (Sheet)



League City, Bacliff, Dickinson and Texas City 7.5 min Topographic Quadrangle Maps

Legend

SH 146

3,700 1,850 0 3,700 Feet

PALM Data Area Values

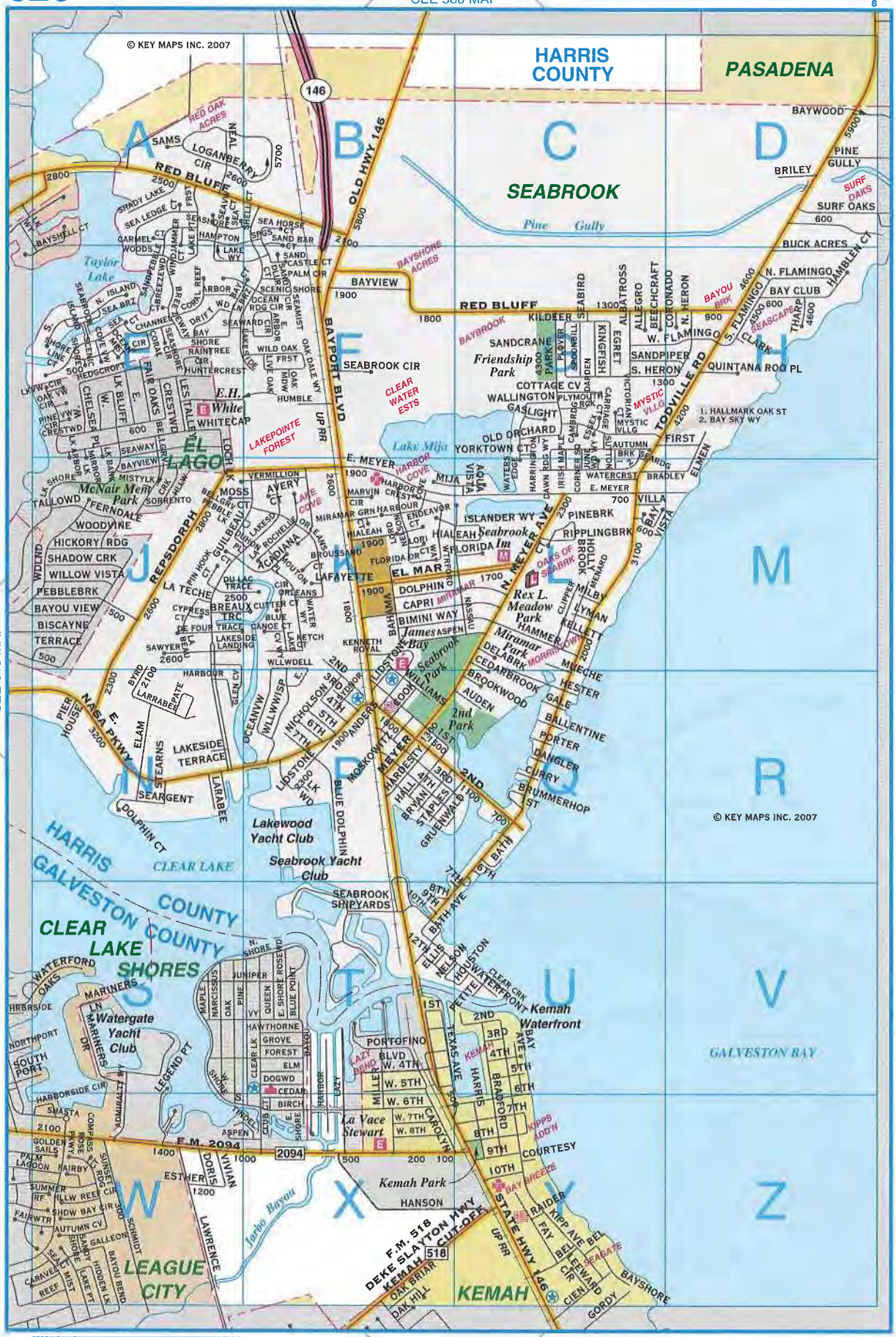
- 1 - Surface survey recommended, Deep reconnaissance recommended if deep impacts are anticipated
- 2 - Surface survey recommended
- 2a - Surface survey of pimple mounds recommended
- 3 - Deep reconnaissance recommended if deep impacts are anticipated
- 3a - Deep reconnaissance recomended if severe deep impacts are anticipated
- 4 - No survey recommended

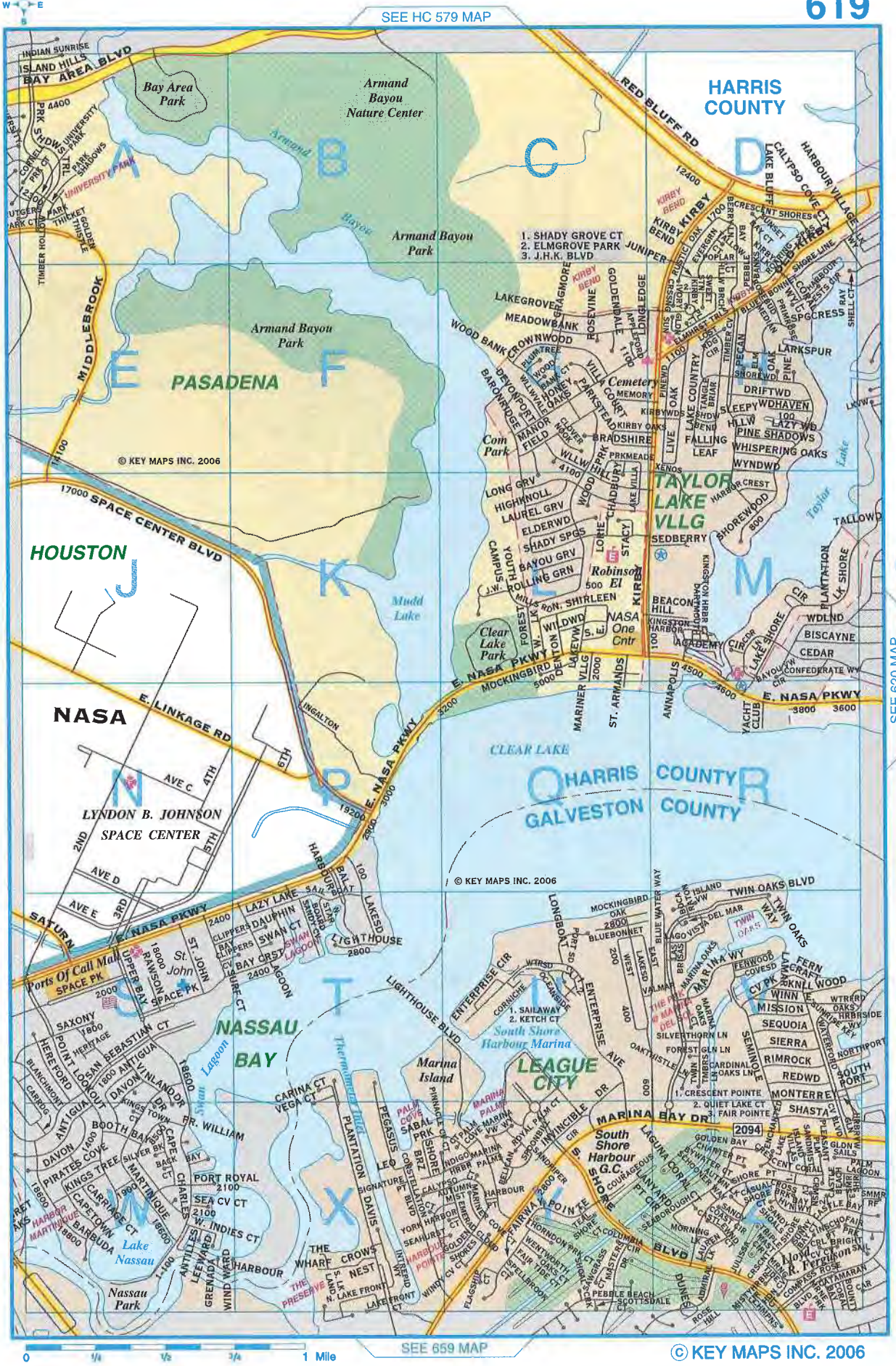
Potential Archeological Liability Map
(Sheet 3)
Texas Department of Transportation
SH 146 from Fairmont Parkway
to Galveston "Y"
Harris County, Texas
CSJ 0389-05-087

© KEY MAPS INC. 2007

xhibit 9a ey Map - 580

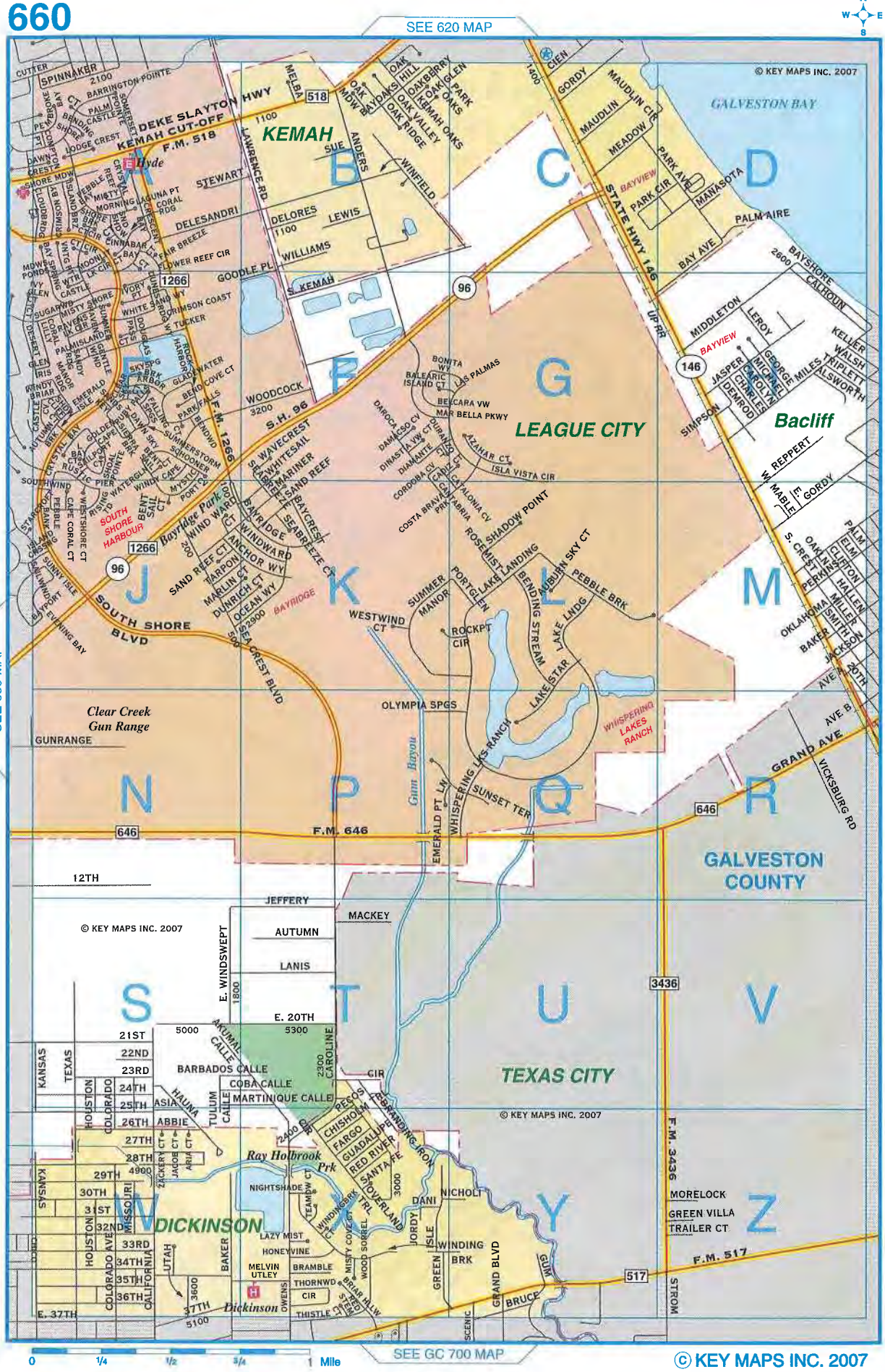
SEE 580 MAP

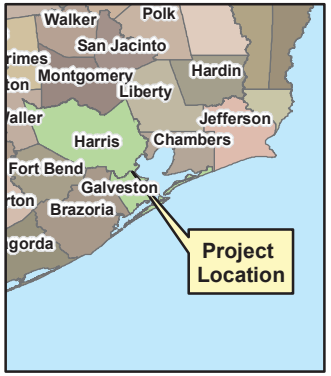

© KEY MAPS INC. 2007
HARRIS COUNTY
PASADENA
SEABROOK
Pine Gully
Taylor Lake
Lake Mija
Friendship Park
Rex L. Meadow Park
Mirama Park
James Bay
Seabrook Park
2nd Park
Lakewood Yacht Club
Seabrook Yacht Club
CLEAR LAKE
SEABROOK SHIPYARDS
HARRIS COUNTY
GALVESTON COUNTY
CLEAR LAKE SHORES
Watergate Yacht Club
Kemah Waterfront
GALVESTON BAY
Kemah Park
La Vace Stewart
LEAGUE CITY
KEMAH
McNair Mem Park
E.H. White
EL LAGO
RED BLUFF
OLD HWY 146
BAYPORT BLVD
TODVILLE RD
N. MEYER AVE
REPSDORPH
NASA PKWY
E. MEYER
BAYVIEW
SEABROOK CIR
EL MAR
DOLPHIN
CAPRI
BIMINI WAY
LAFAYETTE
LA TECHE
BREAUX
ACADIANA
LAKESIDE TERRACE
LAKESIDE LANDING
SEARGENT
DOLPHIN CT
BLUE DOLPHIN
MOSKOWITZ
MEYER
HARDESTY
HALL
BRYANT
STAPLES
GRUENWALD
BRUMMERHOP
BATH AVE
PORTOFINO BLVD
W. 4TH
W. 5TH
W. 6TH
W. 7TH
W. 8TH
COURTESY
HANSON
F.M. 2094
DEKE SLAYTON HWY
KEMAH CUT-OFF
F.M. 518
STATE HWY 146
UP RR
Turbo Bayou
BAYSHORE
GORDY
SEA HORSE CT
SAND BAR CT
SAND CASTLE CT
PALM CIR
SCENIC
OCEAN RDG CIR
SEAMIST
OAK DALE WY
WILD OAK
HUMBLE
WHITECAP
LAKEPOINTE FOREST
CLEAR WATER ESTS
BAYSHORE ACRES
BAYBROOK
SANDCRANE
COTTAGE CV
WALLINGTON
GASLIGHT
OLD ORCHARD
YORKTOWN CT
ISLANDER WY
PINEBRK
RIPPLINGBRK
HIALEAH
FLORIDA
MIRAMAR
VERMILLION
AVERY
MOSS
MARVIN CREST
HARBOR GRN
ENDEAVOR
BROUSSARD
ORLEANS
DU LAC TRACE
CUTTER CT
BLUE CANOE CT
KENNETH ROYAL
WILLWDELL
WILLWWISP
NICHOLSON
LIDSTONE
OCEANVW
GLEN CV
HARBOUR
LARRABEE
PATE
BYRD
ELAM
STEARNS
PIER HOUSE
E. NASA PKWY
N. SHORE
JUNIPER
MAPLE
NARCISSUS
OAK
PINE
QUEEN
E. SHORE ROSEWD
BLUE POINT
HAWTHORNE
GROVE
FOREST
ELM
DOGWD
CEDAR
BIRCH
ASPEN
CLEAR LK
HARBOR
EAZY
TIDEL
MARINERS
WATERFORD OAKS
HRBRSIDE
NORTHPORT
SOUTH PORT
HARBORSIDE CIR
SHASTA
GOLDEN SAILS
PALM LAGOON
FAIRBY
SUMMER
FLLW REEF CIR
SHDW BAY CIR
FAIRWTR
AUTUMN CV
GALLEON
CARAVEL
REEF
SEA MIST
LAKE PT
HIDDEN LK
BAYOU BEND
SCHMIDT
LAWRENCE
VIVIAN
DORIS
ESTHER
LEGEND PT
COMPASS
ROSE
SUNSET
BAY BREEZE
RAIDER
KIPP AVE
FAY
BEL
BELEWARD
SEAGATE
CIEN
OAK BRIAR
OAK HILL
BAYWOOD
PINE GULLY
BRILEY
SURF OAKS
BUCK ACRES
N. FLAMINGO
BAY CLUB
W. FLAMINGO
S. FLAMINGO
SEASCAPE
THARP
CLARK
HAMBLEN CT
QUINTANA ROO PL
SANDPIPER
S. HERON
N. HERON
CORONADO
BEECHCRAFT
ALLEGRO
ALBATROSS
EGRET
KINGFISH
SEABIRD
KILDEER
PLOVER
SNOWBILL
DARDEN
CARRIAGE
VICTORIAN
MYSTIC VLLG
PLYMOUTH
CAMBRIDGE
ESSEX
SUTTON
AUTUMN BRK
WATERCRST
BRADLEY
E. MEYER
FIRST
VILLA
ELMEN
BAYOU BRK
1. HALLMARK OAK ST
2. BAY SKY WY
HICKORY RDG
SHADOW CRK
WILLOW VISTA
PEBBLEBRK
BAYOU VIEW
BISCAYNE
TERRACE
TALLOWD
FERNDALE
WOODVINE
SEA LEDGE CT
SHADY LAKE
CARMEL
WOODS
HAMPTON
LAKE WY
BAYSHELL CT
N. ISLAND
SEA BRZ
CORAL REEF
ARBOR
BAY SHORE
RAINTREE CIR
HUNTERCREST
REDSCROFT
CHELSEA
FAIR OAKS
CRESTWD
LES TALLES
SEAWAY
BAYVIEW
MISTYLK
SOBRENTO
LAKE ROCHELLE
DUCHESNE
PIN HOOK
GUILBEAU
BELLEGRV
PEBBLE
WDLND
SAWYER
CYPRESS
DE FOUR TRACE
LAKESIDE LANDING
RED OAK ACRES
SAMS
LOGANBERRY CIR
NEAL
SEA HORSE
SEAGRENT
LAKESIDE TERRACE
LAKE PT
LAKE WY
SEA BRZ
SEA CT
CHANNEL
DRIFT
SEAWARD
SEAGULL
SEASHORE
SEA PORT
SEA LINE
SHORE LINE
S. ISLAND
SEA BRZ
LK BLUFF
E. LK BLUFF
W. LK BLUFF
LK VW
OAK VW CIR
PINE VW CIR
CRESTWD
LK ASBRY
LK MIRROR
LK SHORE
LK BAY
LK WLW
WLW
WDLND
LK ROCHELLE
DUCHESNE
PIN HOOK
GUILBEAU
BELLEGRV
PEBBLE
LAKE PT
LAKE WY
LAKE CT
LAKE CV
LAKE WD
LK WD
NETCH
WATER WY
WATER CT
CANOE CT
BLUE CT
CUTTER CT
CIR ORLEANS
DU LAC TRACE
TRC
CYPRESS CT
DE FOUR TRACE
SAWYER



© KEY MAPS INC. 2006

xhibit 9c ey Map - 619


SEE 620 MAP
SEE 659 MAP
SEE GC 700 MAP
© KEY MAPS INC. 2007
GALVESTON BAY
KEMAH
LEAGUE CITY
Bacliff
Bayridge Park
Clear Creek Gun Range
GUNRANGE
TEXAS CITY
GALVESTON COUNTY
DICKINSON
Ray Holbrook Prk
Dickinson
Gum Bayou
DEKE SLAYTON HWY
KEMAH CUT-OFF
F.M. 518
STATE HWY 146
S.H. 96
F.M. 1266
SOUTH SHORE BLVD
F.M. 646
GRAND AVE
F.M. 3436
F.M. 517
WHISPERING LAKES RANCH
SOUTH SHORE HARBOUR
0 1/4 1/2 3/4 1 Mile



Legend

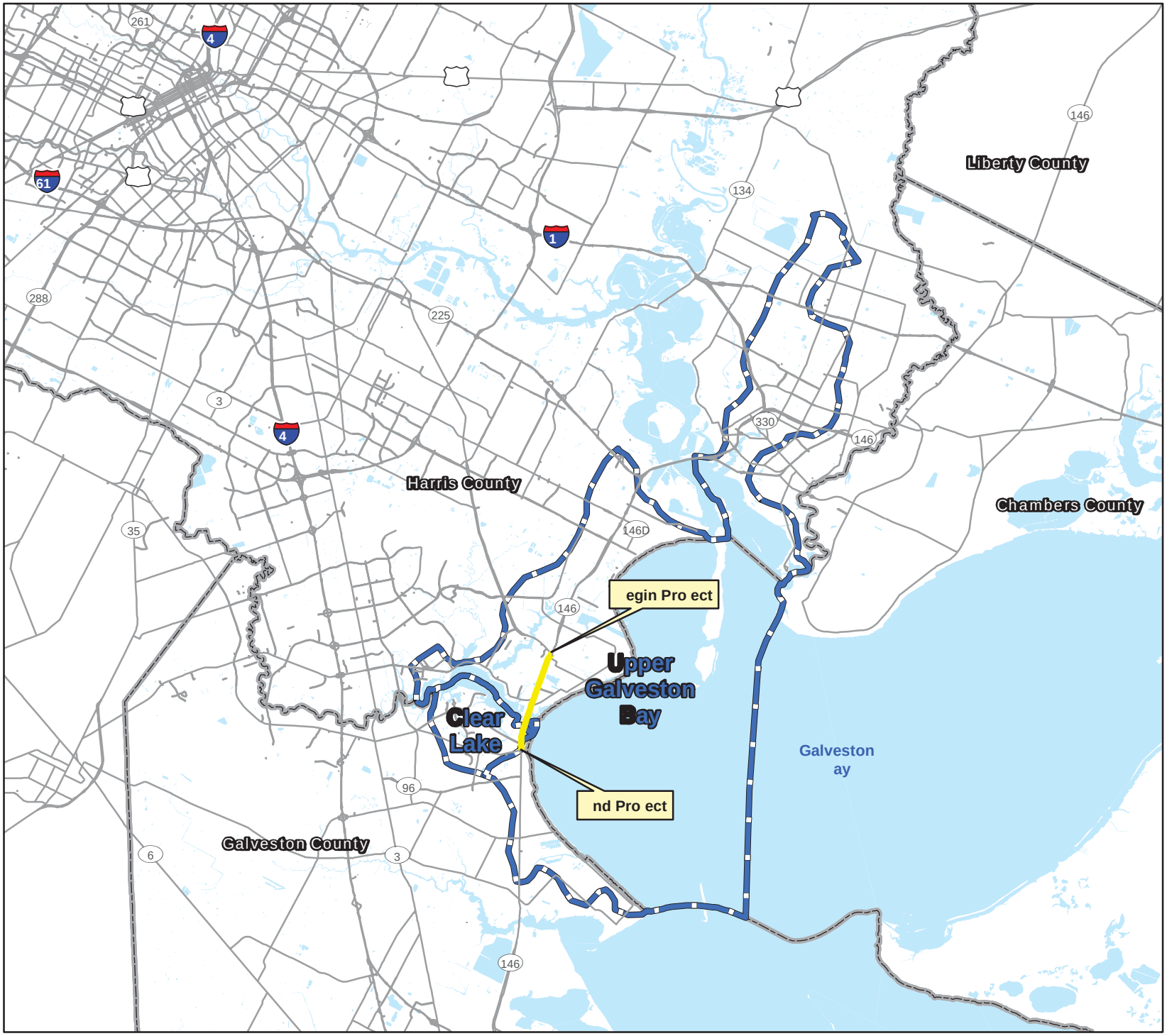
- Freeway
- Ma or Roads
- Local Roads
- Highways
- Area of nfluence
- County Boundaries
- Streams
- aterbodies

0 0.5 1 2 Miles

Texas Department of Transportation

EXHIBIT 10:
AREA OF INFLUENCE

SH 146 (Red Bluff to FM 518)
Harris and
Galveston Counties, Texas
CSJ: 0389-05-088



Legend

- Pro ect Location
- Resource Study Area
- County Boundaries
- aterbodies

0 1.5 3 6 Miles

Texas Department of Transportation

H 11
S S Y A A F
L G AL A A
S S

SH 146 (ed luff to FM 1)
Harris and
Galveston ounties e as
S - -

Legend

- Pro ect Location
- Resource Study Area
- County Boundaries
- aterbodies

0 1.25 2.5 Miles

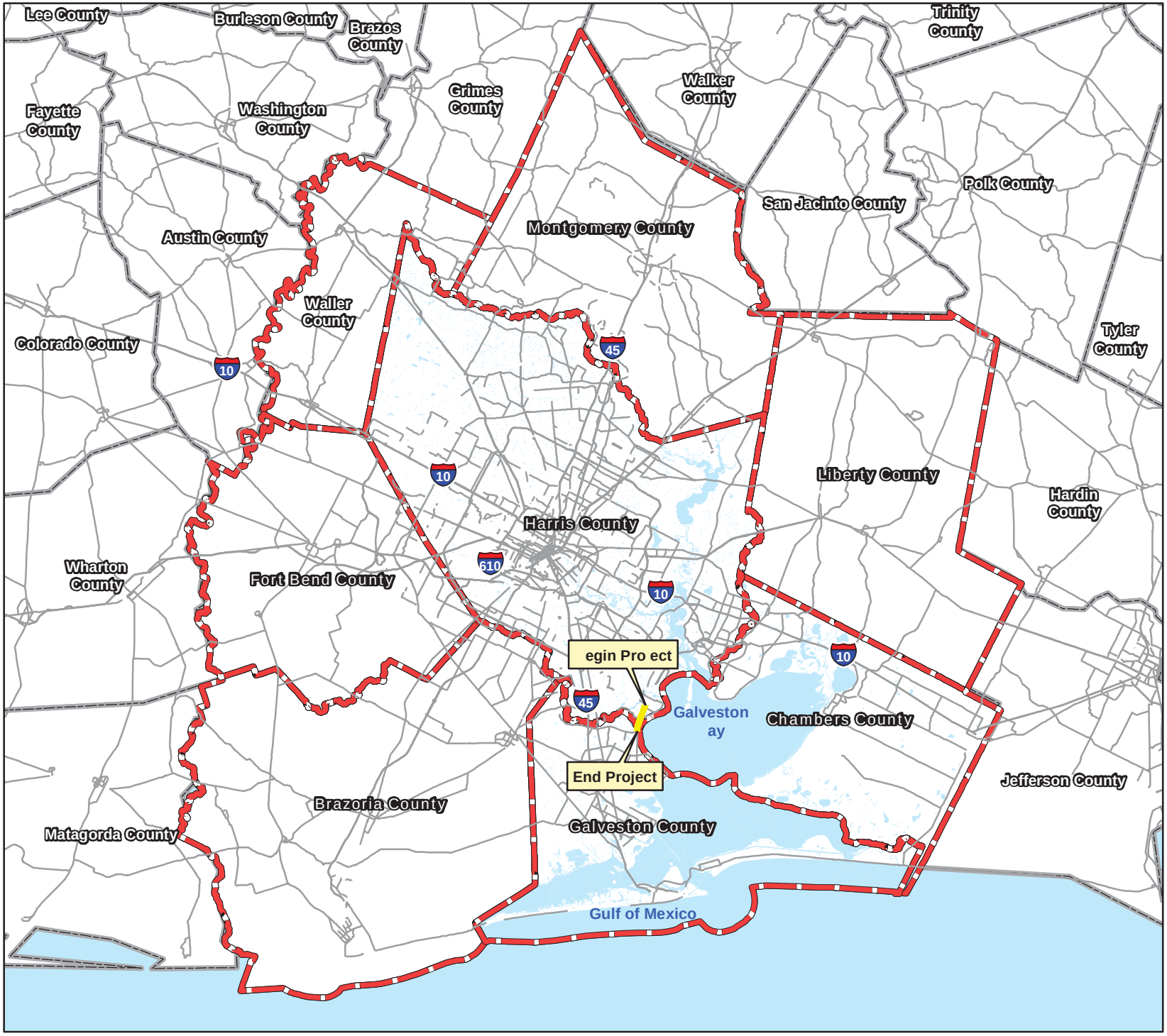
Texas Department of Transportation

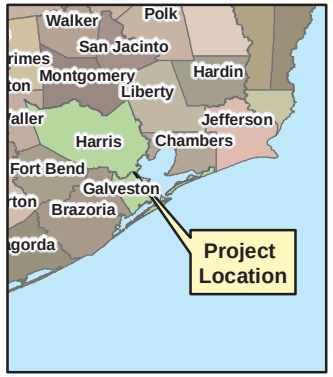
H 12

S S Y A A

F LA S

SH 146 (ed luff to FM 1)
Harris and
Galveston ounties e as
S - -





Legend

- Project Location
- Resource Study Area
- County Boundaries
- Waterbodies

0 5 10 20 Miles

Texas Department of Transportation

EXHIBIT 13:
RESOURCE STUDY AREA FOR AIR QUALITY

SH 146 (Red Bluff to FM 518)
Harris and
Galveston Counties, Texas
CSJ: 0389-05-088

APPENDIX A:
Representative Photographs of the Project Area

Photo 1: Looking north towards the SH 146 intersection with Red Bluff.
Beginning of the proposed project.

Photo 2: Looking south along SH 146 just south of Red Bluff.

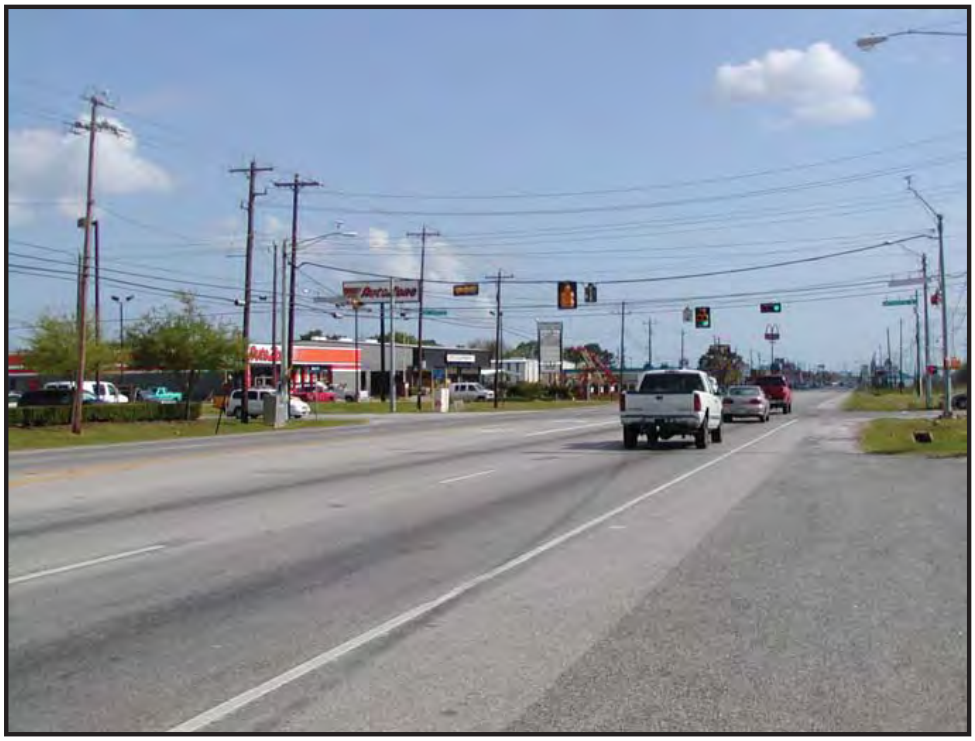


Photo 3: Looking south towards the SH 146 intersection with Repsdorph Road.

Photo 4: Looking south along SH 146 just south of Repsdorph Road.

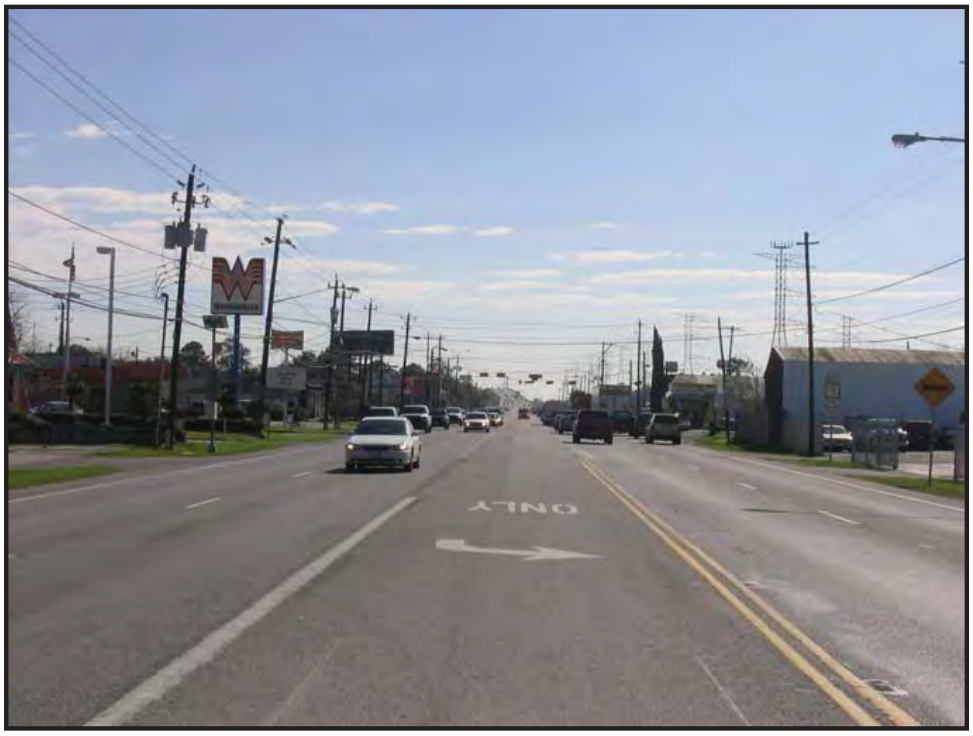


Photo 5: Looking south along SH 146 just north of NASA Road 1.

Photo 6: Looking northwest at SH 146 just north of NASA Road 1.

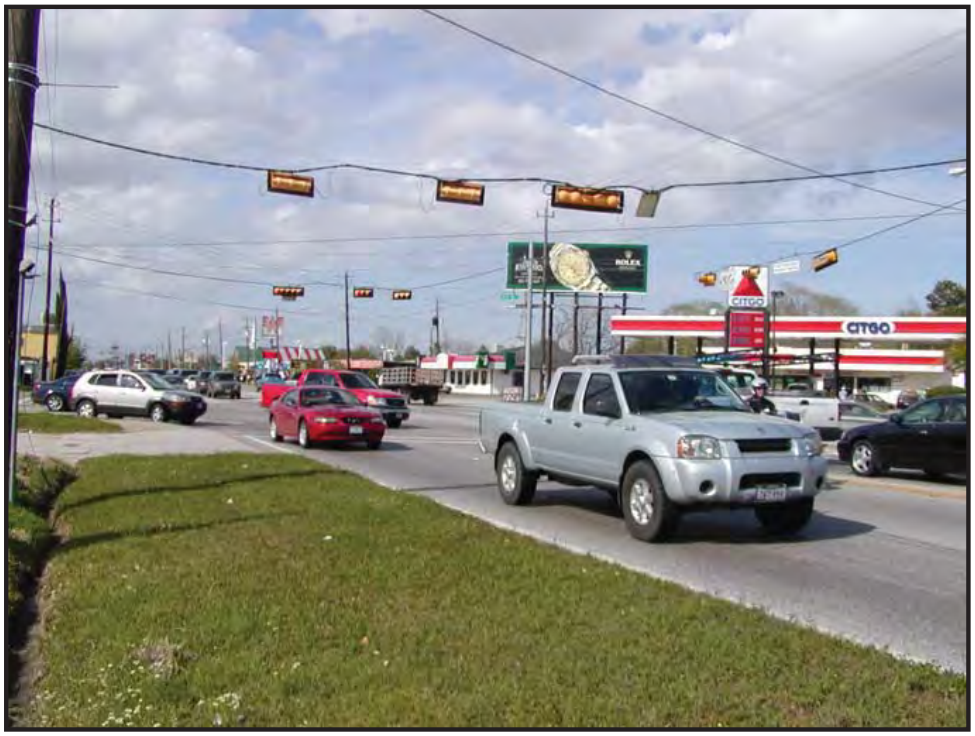


Photo 7: Looking northeast towards the SH 146 intersection with NASA Road 1.

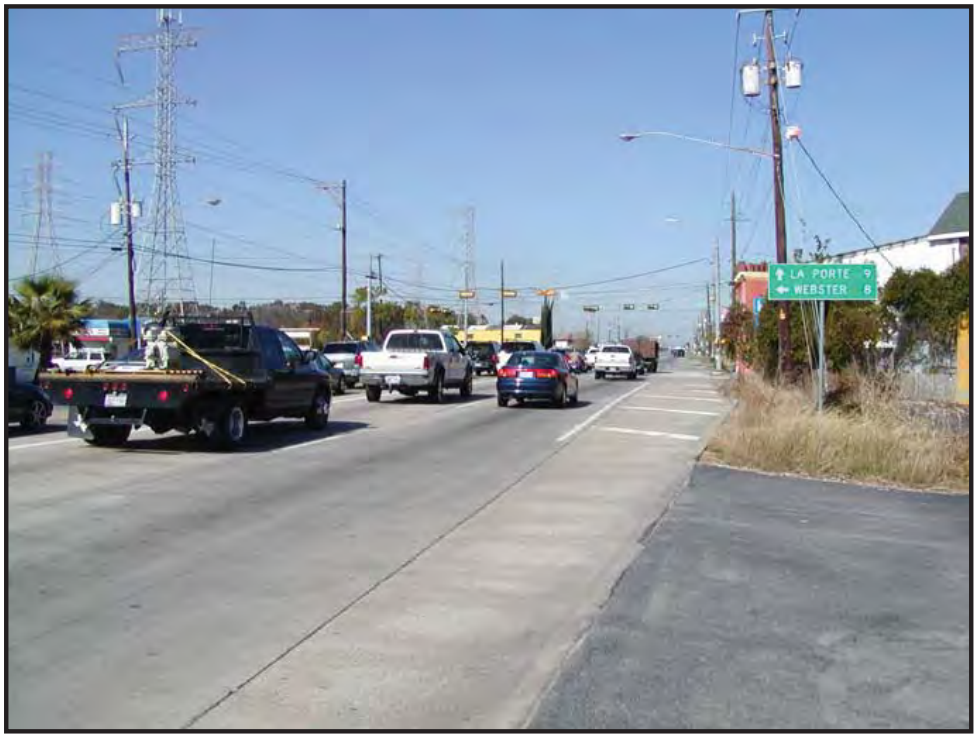


Photo 8: Looking north towards the SH 146 intersection with NASA Road 1.

Photo 9: Looking north along SH 146 just north of the Kemah Bridge.

Photo 10: Looking south along SH 146 towards the Kemah Bridge over Clear Creek.

Photo 11: Looking north along SH 146 towards the Kemah Bridge over Clear Creek.

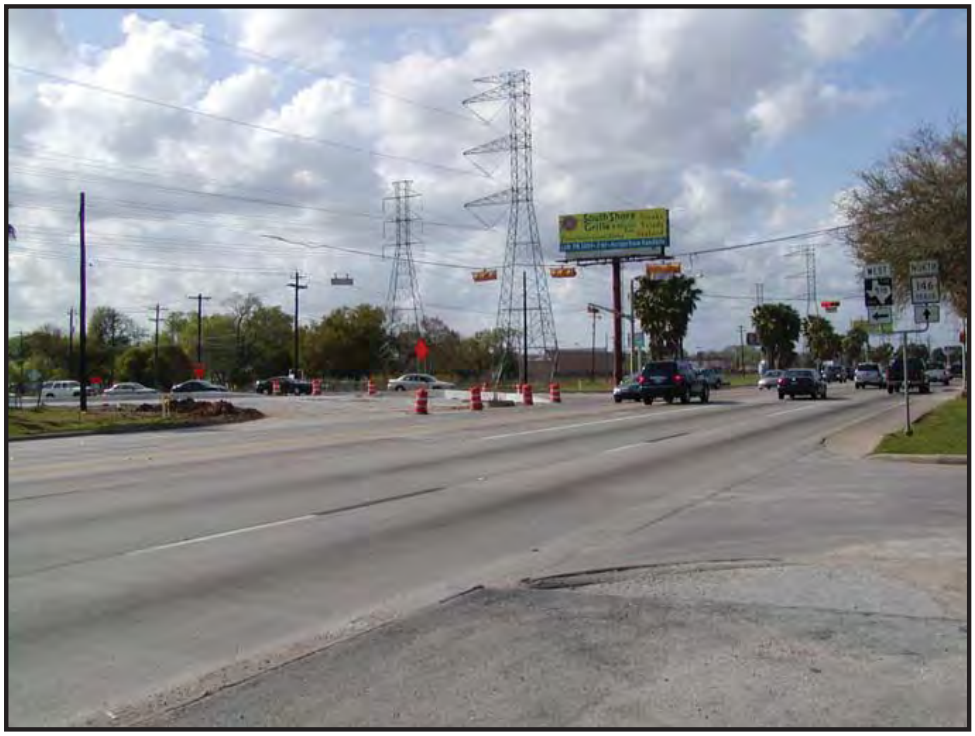


Photo 12: Looking north towards the SH 146 intersection with FM 518. End of the proposed project.

APPENDIX B:
SH 146 Corridor Major Investment Study, Executive Summary

State Highway 146

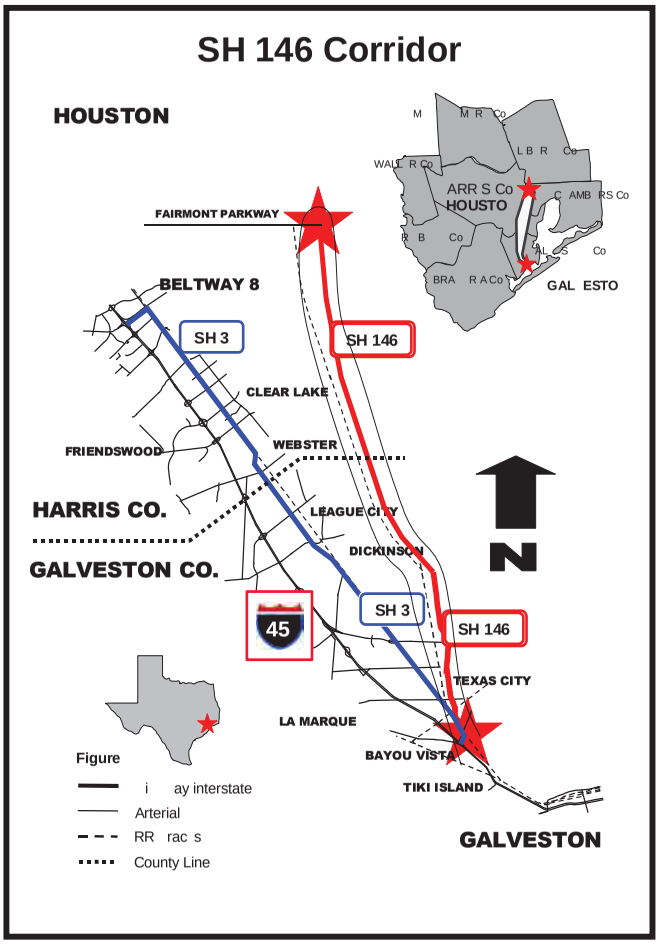
State Highway 146 Corridor

Major Investment Study

Executive Summary

Overview

The SH 146 Corridor Major Investment Study (MIS) was initiated in December 1999 to evaluate the transportation needs of the SH 146 Corridor. The purpose of the study was to define the scope and characteristics of the transportation investment to be made in the SH 146 Corridor over the next 20-year period. The overall goal of the study was to identify the transportation needs of the corridor and to determine the improvements which best address those identified needs.



The study corridor consisting of portions of both Harris and Galveston Counties, extends along SH 146 and serves the communities of Houston, Bayou Vista, Clear Lake Shores, El Lago, Hitchcock, Kemah, Galveston, La Porte, La Marque League City, Pasadena, Seabrook, Shoreacres, Taylor Lake Village, Texas City, Baytown, and Dear Park. The study corridor is approximately 24 miles long and extends from one-half mile east of SH 146 to one-half mile west of SH 146.

The underlying characteristics of the SH 146 Corridor vary throughout the project limits in terms of observed traffic conditions, development patterns, mobility needs and environmental concerns. For this reason, the corridor was divided into four segments for development and evaluation of conceptual alternatives. The segments are defined as Segment 1 (IH 45 to FM 517), Segment 2 (FM 517 to FM 518), Segment 3 (FM 518 to Red Bluff road), and Segment 4 (Red Bluff road to Fairmont Parkway). These segments define areas with similar land uses, demographics, traffic characteristics, and public concerns.

Problems and Needs

A set of problems and needs within the SH 146 corridor was identified early in the MIS study process. These identified issues were based on an analysis of the existing traffic conditions, forecasts of future travel demand 20 years hence, projected population and employment growth tends, extensive dialogue with concerned citizens and stakeholders within the corridor, and public input and discussions with federal, state, and local agencies. The identified problems and needs helped refine the scope of the MIS and highlighted those issues to be addressed. Identified problems and needs included:

Traffic Congestion

- On the north end and mid section of the corridor, demand exceeds capacity during both a.m. and p.m. daily commute periods. In addition, during seasonal recreational and special events, demand exceeds capacity on a regular basis in the mid section of the corridor

SH 146 Facility Improvement Needs

- Many sections of SH 146 need major pavement maintenance or overlay reconstruction.
- Operational and safety improvements are needed at various locations throughout the SH 146 corridor due to accident rates and non-standard design configurations.

Parallel Route and Evacuation Needs

- Provide for additional modes of transportation such as bicycle and pedestrian facilities.
- The lack of hurricane and other evacuation options along the SH 146 corridor is a safety concern that needs to be addressed.
- Roadway flooding along SH 146 and at the Texas City Wye contributes to reduced highway capacity and increased level of congestion.
- When incidents obstruct many sections of the corridor, there are very limited alternative routes and this results in a breakdown of the SH 146 highway.

Community/ Environmental Concerns

- There is a need to improve access to the recreational and scenic resources within the SH 146 corridor.
- When considering alternative solutions, address the status of the Houston and Galveston as ozone “non-attainment” areas.
- Some intersections along SH 146 and various port access roads do not meet the requirements for truck turning movements.

- A substantial number of trains traveling into and out of ports of Texas City and Houston utilize rail lines having numerous at-grade crossings. These crossings not only require slower train speeds, but also cause bottlenecks and congestion on the crossing roadways.

- Growth in port activities will contribute to the need to improve freight movement to and from ports of Houston, Texas City, Galveston, and within freight corridors in the SH 146 study area.

- A number of attractions, businesses, and events are important to the economy of the corridor and the improvement alternatives must provide adequate accessibility.

- Improvements are needed to provide better access to the major employment generators such as Kemah/Seaabrook entertainment center, NASA corridor communities and ports.

- Traffic, population and employment trends reveal the existence of variety of travel needs throughout the corridor.

Study Goals

In evaluation of the Problems and Needs, comprehensive goals were developed to provide guidance for the development and evaluation of the transportation alternatives to be considered. These goals were adopted by the Steering Committee and served as the guiding principals for the MIS:

Goal 1: Reduce Traffic Congestion

Goal 2: Improve Hurricane Evacuation

Goal 3: Improve Safety

Goal 4: Provide Travel Options

Goal 5: Protect Natural and Social Environment.

Roadway Alternatives Considered

Based on the adopted study goals and objectives, a range of conceptual alternatives was developed to meet the needs of the corridor. These conceptual alternatives ranged in scope and focus from a No-Build Alternative to various build alternatives that represented various levels of investment.

Utilizing a “mix-n-match’ process, combination of planning concepts were defined, resulting in twelve conceptual alternatives. These were then screened using a “fatal flaw” type analysis to arrive at six alternatives that were considered to be viable for the various corridor segments. The twelve conceptual alternatives include:

1. No-Build Alternative

The No-Build Alternative assumes the current roadway configuration plus enhancements of regional significance that are already under construction or that are planned and have committed funding sources. The enhancements included in the no-build alternative are expected to be in place by the year 2022 and they represent the future base system against which all other alternatives are compared.

2. Transportation System Management (TSM) Alternative

This alternative included the existing and committed improvements in the no-build alternative plus traffic operational improvements and travel demand programs designed to relieve congestion. The elements of the TSM alternative would also be included in all build alternatives. The following are the TSM elements:

- Improved traffic signal systems
- Operational and circulation improvements
- Increased bus transit services
- Bicycle/Pedestrian facilities
- Expansion of park-and-ride/park-and-pool facilities
- Motorist information systems
- Intersection improvements
- Rideshare support programs

3. Arterial Alternative

Arterial roadway consists of expansion of roadway depending upon design year 2022 traffic projections.

4. Arterial with grade separation at major intersections Alternative

This alternative is similar to arterial alternative, except grade separation would be provided at major connecting roadways.

5. Arterial with access road Alternative

This alternative is similar to arterial alternative but also includes an adjacent road, which would provide access to local businesses in between connecting roadways.

6. Arterial with Express Lanes grade separated at major intersections Alternative

Arterial with express lanes consists of express lanes immediately adjacent to the existing arterial or expanded arterial with grade separations at connecting roadways.

7. Freeway with Frontage Roads and potential future HOV lanes Alternative

This alternative would provide a facility with one-way frontage roads on both side of the freeway and potential future HOV lanes. This alternative includes the standard TxDOT freeway design elements.

8. Alignment option Alternative

This alternative would consist of moving the existing SH 146 alignment either to the east or to the west or in combination.

9. Truck Lanes Alternative

Exclusive truck lanes could be provided in the median of the freeway, included in the express lanes, or be on an elevated structure in the median or on either side of the arterial roadway. Exclusive truck lanes is an alternative in selected segments of SH 146 to provide better mobility for non-truck traveling motorists.

10. Transit Alternative

The potential for this alternative (high performance bus or rail) is related to the nature of travel demand in the corridor. This includes the purpose of the trip, the time of the day, and the trip's origin and destination. For the purpose of this particular MIS, highway and transit demand forecasting were done separately, with H-GAC playing the lead role.

11. HOV Lanes Alternative

HOV lanes would likely be constructed within the median of a freeway section, to compliment Park and Ride facilities. Like the transit alternative, demand is largely dependent upon potential users having similar origin and destinations.

12. Non-Motorized Modes Alternative (Alternate Modes)

This alternative would provide improvements to both bicycle accommodations and pedestrian access.

Emergency Evacuation

The No-Build, TSM, and Non-Motorized Modes Alternatives could not provide a 100 percent evacuation of the affected areas of Harris and Galveston Counties within the acceptable 48-hour time period. However, all of the other build Alternatives are able to accommodate the evacuation more efficiently with a 100 percent evacuation of the affected areas within the 48-hours. Therefore, it can be concluded that any of the build alternatives can easily meet the evacuation needs.

Corridor safety Concerns

Safety of the future transportation system within the SH 146 was a major concern of the citizens who participated in the public meetings. In response to these concerns, safety concepts related to the design of facilities in the corridor were incorporated in all the build alternatives. Major elements of these concepts included:

- Re-Design of major intersections to meet current TxDOT design standards.
- Increased motorist assistance patrols in the corridor.
- Provide relief of the congested areas in the corridor.
- Ability to reverse one lane of traffic between the Texas City Wye and Fairmont Parkway.

The implementation of these elements will improve the safety within the corridor and respond to the concerns that have been raised.

Environmental Analysis

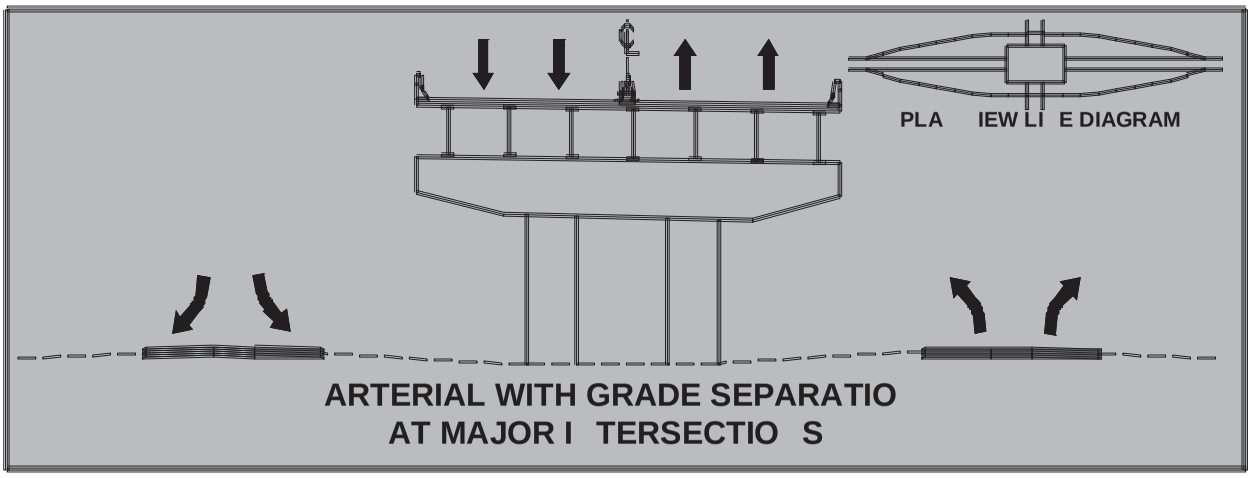
As part of the MIS evaluation, a full range of environmental impact concerns was discussed for their potential affect on the viable alternatives. These concerns include Noise, Air Quality, Water Quality, Wetlands, Floodplains, Wildlife Habitat, Endangered Species, and Hazardous Materials. The evaluation indicated that there are relatively few environmental or community constraints within the corridor that would be adversely affected with the implementation of one of the viable build alternatives. Therefore, if the No-Build and TSM Alternatives are determined to be inadequate to meet the goals of the SH 146 corridor MIS, the resulting environmental impacts from selecting a build alternative will be similar, regardless of which build alternative is selected.

Recommended Preferred Alternative

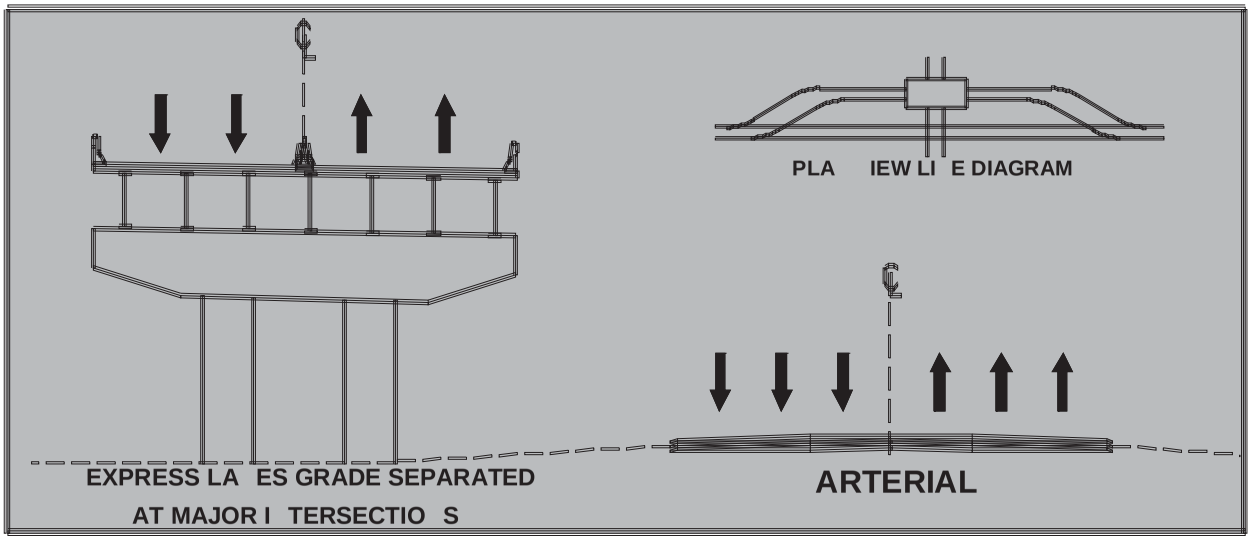
Based on findings of the technical evaluation of the alternatives, a recommendation for locally preferred alternative was developed. This recommendation was based on the five goals established early in the study.

Based on these five key findings, TxDOT and the Steering Committee recommended that following Alternatives be selected as the Locally Preferred Alternatives for the four segments of the corridor.

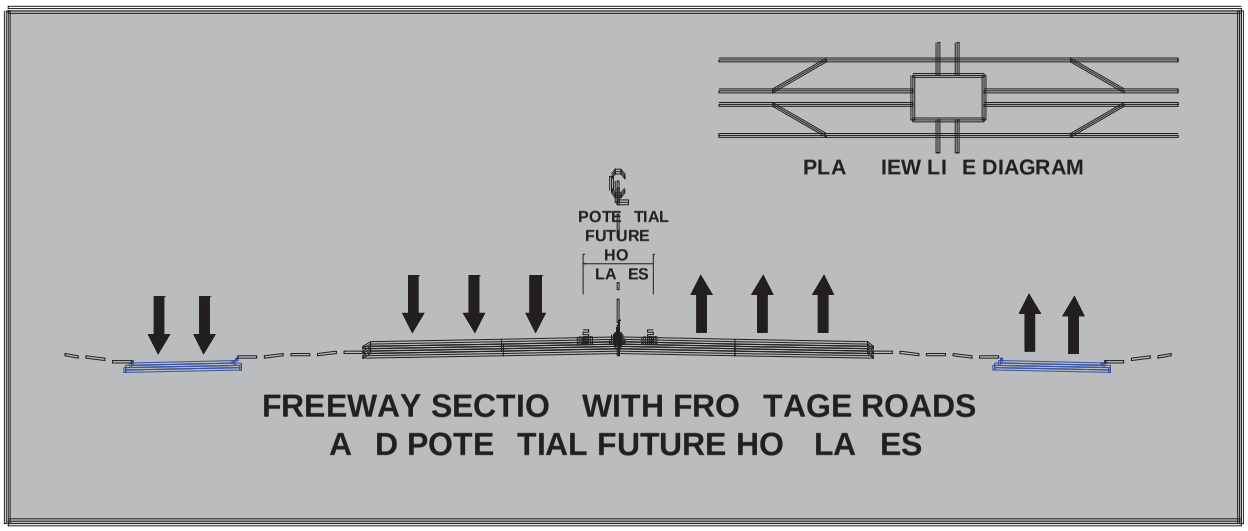
1) Alternative #4 for Segments #1 and 2.

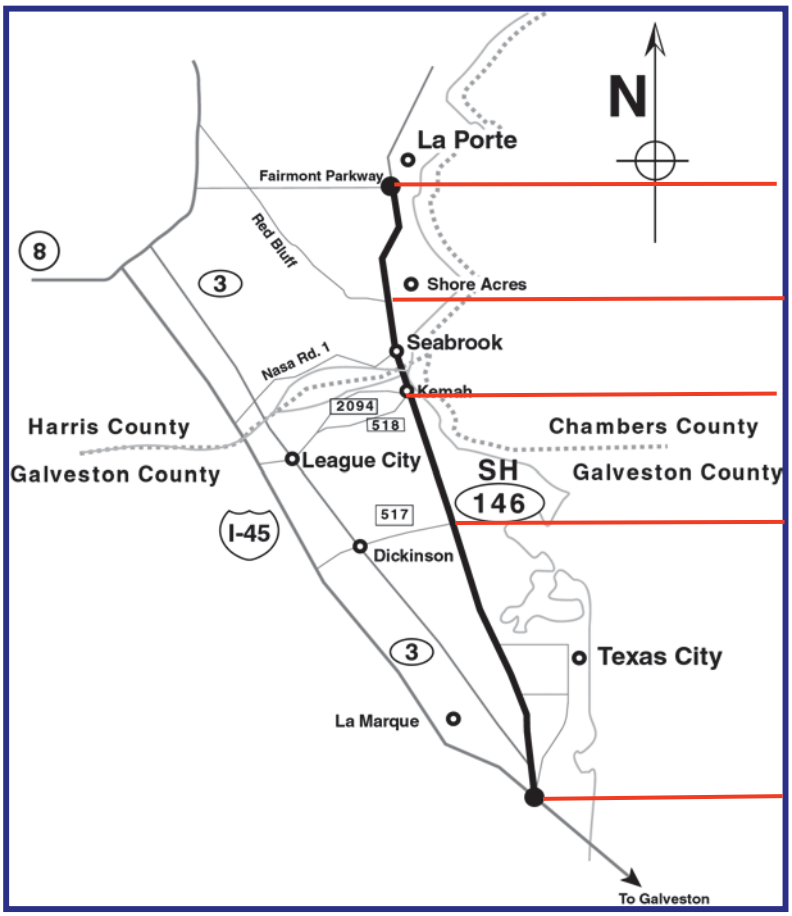


2) Alternative #6 for Segment #3.



3) Alternative #7 for Segment #4.





Fairmont Pk y

Segment 4 - Provide 6 Freeway lanes with Frontage Roads and potential future HOV lanes.

Red Bluff

Segment 3 - Provide 6 Arterial Lanes with Express lanes grade separated at major intersections.

FM 518

Segment 2 - Provide 6 Arterial lanes with grade separation at major intersections.

FM 51

Segment 1 - Provide 4 Arterial lanes with grade separation at major intersections.

I45

Next Step

The recommended locally preferred alternative would be considered in July 2002 by the Metropolitan Planning organization (MPO) for adoption into the Regional Transportation Plan (VISION 2022). Following its adoption into the regional plan, the amended VISION 2022 will be evaluated for conformity with regional air quality requirements. Preliminary design, environmental documentation and final design will then follow.

APPENDIX C:
Applicable Laws and Regulations

Applicable Regulatory Requirements and Required Coordination
SH 146 (Red Bluff to FM 518)

The following regulatory requirements are applicable to the proposed project:

- *Clean Air Act (CAA) of 1970* - (42 U.S.C. s/s 7401 et seq.). This act is the comprehensive Federal law that regulates air emissions from area, stationary, and mobile sources. This law authorizes the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment.
- *Clean Water Act (CWA) of 1977* - (33 U.S.C. s/s 1251 et seq.). This Act is an amendment to the Federal Water Pollution Control Act of 1972 and it sets the basic structure for regulating discharges of pollutants to waters of the U.S. Section 401 of the CWA requires that an applicant for a federal permit provide a State certification that any discharges from the facility would comply with the Act, including water quality standard requirements.
- *Coastal Zone Management Plan* - The Federal Coastal Zone Management Act of 1972, as amended, authorized a Federal program to encourage coastal states and territories to develop comprehensive coastal management programs. Participation in this program will make these states and territories eligible for grants to carry out certain activities. This led to the Texas Coastal Coordination Act of 1991, which called for the development of a comprehensive coastal program based on existing statutes and regulations. Projects that are proposed with the Coastal Zone Management Program (CZMP) must comply with the goals and objectives of the CZMP.
- *Floodplain Management* - (Executive Order 11988). This order requires agencies to take action to reduce the risk of flood loss, to minimize the effect of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.
- *Protection of Wetlands* - (Executive Order 11990). This order requires agencies to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.
- *Section 9 of the Rivers and Harbors Act of 1899* - This section requires that the United States Coast Guard approve the location and plans for bridges and causeways over navigable waters of the U.S.
- *Section 10 of the Rivers and Harbors Act of 1899* - This section prohibits the obstruction or alteration of navigable waters (coastal/inland) of the U.S. without a permit from the United States Army Corps of Engineers (USACE).
- *Pollution Prevention Act (P2) of 1990* - (42 U.S.C. 13101 and 13102, s/s et seq.). This Act focused industry, government, and public attention on reducing the amount of pollution through cost-effective changes in production, operation, and raw materials use.
- *Archeological Resources Protection Act (ARPA) of 1979* - (16 USC 470aa et seq., P.L. 96-95). This Act supplements the provisions of the 1906 Antiquities Act. The law makes it illegal to excavate or remove from federal or Native American lands any archeological resources without a permit from the land manager. (TxDOT Environmental Affairs Division to verify cultural resources.)

- *National Historic Preservation Act (NHPA) of 1966*, as amended - (16 USC 470, P.L. 95-515). This Act establishes as federal policy the protection of historic properties or places and their values in cooperation with other nations and with state and local governments. It establishes a program of grants-in-aid to state governments for historic preservation activities. Subsequent amendments designated the State Historic Preservation Officer (SHPO) or the Tribal Historic Preservation Officer (THPO) as the individual responsible for administering programs in the states or reservations. The Act also creates the Advisory Council on Historic Preservation (ACHP). (TxDOT Environmental Affairs Division to verify cultural resources.)
- *Native American Graves Protection and Repatriation Act (NAGPRA) of 1990* - (25 USC 3001, P.L. 101-601). This act sets forth rules for intentional excavation and removal of Native American cultural items, including human remains and funerary objects, and for inadvertent discovery of such items. (TxDOT Environmental Affairs Division to verify cultural resources.)
- *Native American Graves Protection and Repatriation Act Regulations, Final Rule, 1996* - (43 CFR Part 10). This final rule establishes definitions and procedures for lineal descendants, Indian tribes, Native Hawaiian organizations, museums, and Federal agencies to carry out the Native American Graves Protection and Repatriation Act of 1990. (TxDOT Environmental Affairs Division to verify cultural resources.)
- *Memorandum of Understanding (MOU) between TxDOT and TPWD* - This MOU requires TxDOT to provide TPWD with pertinent information regarding potential effects to natural resources and measures to minimize and/or compensate for unavoidable losses of unregulated but sensitive habitats. TPWD must coordinate with TxDOT to assist with the decision-making process.
- *Memorandum of Agreement (MOA) between TxDOT and TPWD* - The MOA provides procedures and methodologies for habitat characteristics and impact descriptions, and criteria for compensatory mitigation.
- *Fish and Wildlife Coordination Act (FWCA)* - (16 U.S.C. 661 et seq.). This law was enacted to protect fish and wildlife when federal actions result in a modification of a natural stream or body of water. If a modification to a natural stream or water body is expected, coordination with the United States Fish and Wildlife Service (USFWS) is required.
- *Endangered Species Act (ESA) of 1973* - (16 USC 1531 et seq., P.L. 93-205). This law provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found.
- *Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations* - (Executive Order 12898). This order requires agencies to ensure that achieving environmental justice is part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.
- *Uniform Relocation Assistance and Real Property Acquisitions Policies Act* - (42 U.S.C. 4601-4605, 4621-4633, 4635-4636, 4638, 4651-4655). This title establishes a uniform policy for the fair and

equitable treatment of persons displaced as a direct result of programs or proposals undertaken by a Federal agency or with Federal financial assistance.

- *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980* - (42 U.S.C. s/s 9601 et seq.). This Act provides a Federal "Superfund" to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment. Through the Act, EPA was given power to seek out those parties responsible for any release and assure their cooperation in the cleanup.
- *Resource Conservation and Recovery Act (RCRA)* - (42 U.S.C. s/s 6901 et seq.). This Act gives the EPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous wastes.
- *Superfund Amendments and Reauthorization Act (SARA) of 1986* - (42 U.S.C.9601 et seq.). This Act reauthorized CERCLA to continue cleanup activities around the country. Several site-specific amendments, definitions clarifications, and technical requirements were added to the legislation, including additional enforcement authorities. Title III of SARA also authorized the Emergency Planning and Community Right-to-Know Act (EPCRA).
- *Farmland Protection Policy Act (FPPA)* - (7 USC 4201 et seq.). This Act minimizes the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses, and to assure the Federal programs are administered in a manner that, to the extent practicable, will be compatible with State, unit of local government, and private programs and policies to protect farmland.
- *The Wild and Scenic River Act (16 USC 1271-1287)* This Act outlines that selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.
- *The Migratory Bird Treaty Act of 1918* (*16 USC 703-712)* This Act states that it is unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, or barter any migratory birds, including the feathers or other parts, nests, eggs, or migratory bird parts.
- *Protection of Children from Environmental Health Risks and Safety Risks* - (Executive Order 13045). This order requires each Federal agency to make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children. It also requires agencies to ensure that policies, programs, activities and standards address disproportionate risks to children that result from environmental health risks or safety risks.
- *Executive Memorandum on Environmentally and Economically Beneficial Landscape Practices* - This memorandum requires agencies to (where cost effective and to the extent practicable) use beneficial landscaping practices such as regionally native plants for landscaping and designing and to use or promote construction practices that minimize adverse effects on the natural habitat.

- *Executive Order 13112 on Invasive Species* - This order requires Federal agencies to prevent the introduction of invasive species and provide for their control and then to minimize the economic, ecological, and human health effects that invasive species cause.
- *Improving Access to Services for Persons with Limited English Proficiency* - (Executive Order 13166). This order mandates that federal agencies examine the services it provides and develop and implement a system by which Limited English Proficiency (LEP) persons can meaningfully access those services consistent with, and without unduly burdening, the fundamental mission of the agency. Each agency shall also work to ensure that recipients of federal financial assistance (recipients) provide meaningful access to their LEP applicants and beneficiaries (65 Federal Register 50123, August 16, 2000). TxDOT complies with Executive Order 13166 by offering to meet the needs of persons requiring special communication accommodations in all public involvement activities and notices.
- *Section 4(f) of the Department of Transportation Act of 1966* - (49 USC 1653[f]). This section was designed to reserve the natural beauty of the countryside. Property eligible for Section 4(f) must be a publicly owned public park, or wildlife and waterfowl refuge, or any significant historic site. Section 4(f) eligible sites may not be approved unless a determination is made that there is no feasible and prudent alternative to the use of land from the property. If the project includes such lands, the selected alternative must include all possible planning to minimize harm to the property resulting from such use.
- *Section 6(f) of the Land and Water Conservation Fund (LWCF) Act* – This Act provides restrictions for public recreation facilities funded with LWCF money. The LWCF Act provides funds for the acquisition and development of public outdoor recreation facilities that could include community, county, and state parks, trails, fairgrounds, conservation areas, boat ramps, shooting ranges, etc. Facilities that are LWCF assisted must be maintained for outdoor recreation in perpetuity and therefore, require mitigation that includes replacement land of at least equal value and recreation utility.

Galveston County Projects in the 2035 RTP Update - 'US 290/SH 288' Conformity

MPOID Fiscal Yr Status Sponsor	CSJ # CIP ID	Street From Limit To Limit	Project Description	Total Project Cost Conformity Year Length Lanes*
15497 2012 TIP CITY OF GALVESTON		**SEAWALL BLVD** 4TH ST 83RD ST	**SEAWALL BLVD TRANSIT/PEDESTRIAN ACCESS BEAUTIFICATION PLAN**	**$2,500,000** N/A 5.75 (0, 0) , (0, 0)
16030 2013 TIP CITY OF GALVESTON		**SEAWALL BLVD** VA VA	**SEAWALL BLVD TRANSIT/PEDESTRIAN ACCESS PLAN FY 2013**	**$2,500,000** N/A 5.5 (0, 0) , (0, 0)
11206 [2012] Let ISLAND TRANSIT	0912-73-141 GALSTEP-4	**SEAWALL BLVD** 4TH ST 83RD ST	**SEAWALL BLVD TRANSIT/PEDESTRIAN ACCESS AND BEAUTIFICATION**	**$2,393,028** N/A 7 (4, 4) , (0, 0)
13842 2034 RTP TXDOT HOUSTON DISTRICT	0389-06-095	**SH 146** HARRIS/GALVESTON C/L FM 518	**WIDEN TO 6-LANES ARTERIAL WITH 4-LANE EXPRESS LANES**	**$226,200,432** 2035 1.69 (4, 6) , (0, 4)
467 2017 RTP TXDOT HOUSTON DISTRICT	0389-07-025	**SH 146** FM 519 LP 197	**CONSTRUCT RR OVERPASS**	**$55,225,258** 2025 0.7 (2, 4) , (0, 0)
1025 [2011] Let TXDOT HOUSTON DISTRICT	0367-06-058	**SH 87** HARBOR VIEW DR E OF 6TH ST	**INSTALL ARTERIAL TRAFFIC MANAGEMENT SYSTEM**	**$433,212** N/A 1.412 (8, 8) , (0, 0)
15335 [2011] Let TXDOT HOUSTON DISTRICT	0367-06-061	**SH 87** GALVESTON ISLAND BOLIVAR ISLAND	**FERRY BOAT ENGINE OVERHAUL TO MEET EPA TIER 0+ EMISSIONS STANDARD**	**$1,800,000** N/A 3 (6, 6) , (0, 0)
393 2018 RTP CITY OF LEAGUE CITY		**SH 96** AT SH 3	**CONSTRUCT GRADE SEPARATION**	**$7,700,455** N/A 0.1 (,) , (,)
395 2018 RTP CITY OF LEAGUE CITY		**SH 96** AT FM 270	**CONSTRUCT GRADE SEPARATION**	**$7,700,455** N/A 0.1 (,) , (,)
5056 2021 RTP CITY OF LEAGUE CITY	0976-07-006	**SH 96** 0.26 MI E OF IH 45 FM 1266	**CONSTRUCT HIKE/BIKE TRAIL ALONG SH 96**	**$1,074,721** N/A 4.75 (0, 0) , (0, 0)
283 2020 RTP GALVESTON COUNTY	3510-01-001	**SH 99** IH 45 S BRAZORIA C/L	**SEG B: CONSTRUCT 4-LANE TOLLWAY WITH INTERCHANGES AND TWO NON-CONTINUOUS 2-LANE FRONTAGE RDS**	**$231,500,000** 2025 8.38 (0, 4) , (0, 4)
14249 2020 RTP GALVESTON COUNTY	3510-01-900	**SH 99** AT IH 45 S	**CONSTRUCT 4 DIRECT CONNECTORS (TOLL)**	**$80,800,000** 2025 0.75 (2, 2) , (0, 0)

*** (Existing, Proposed) Main Lanes then Frontage Roads.**

Sorted by: Street, CSJ Number, then MPOID

Harris County Projects in the 2035 RTP Update - 'US 290/SH 288' Conformity

MPOID Fiscal Yr Status Sponsor	CSJ # CIP ID	Street From Limit To Limit	Project Description	Total Project Cost Conformity Year Length Lanes*
7649 [2012] Let HARRIS COUNTY	B30503	**SAUMS RD** W OF HCFD UNIT U101-02-00 (W OF GREENHOUSE) COH C/L	**WIDEN TO 5-LANE ASPHALT PAVEMENT SECTION W/ STORM SEWER**	**$1,750,000** 2014 0.45 (2, 5) , (0, 0)
11054 2015 TIP CITY OF PASADENA		**SCARBOROUGH LN** SOUTHMORE ST W ALLENDALE ST W	**DESIGN, ACQUIRE ROW AND WIDEN TO 4-LANE UNDIVIDED ROADWAY INCL DRAINAGE WITH SIGNALS & LEFT TURN LANES AT ALLENDALE**	**$4,825,855** 2017 0.49 (2, 4) , (0, 0)
15522 2013 TIP HARRIS COUNTY	B30803,B30901	**SCHIEL RD** MASON RD MUESCHKE RD	**WIDEN 2 LANE ASPHALT TO 4 LANE CONCRETE RD**	**$3,300,000** 2014 1.5 (2, 4) , (0, 0)
15523 2013 TIP HARRIS COUNTY	B10901	**SCOTT ST** BW 8 ALMEDA GENOA	**WIDEN 2 LANE ASPHALT TO 4 LANE CONCRETE**	**$3,800,000** 2017 1.04 (2, 4) , (0, 0)
4000 [2011] Let HARRIS COUNTY	B20211	**SENS RD** N H ST SPENCER HWY	**WIDEN TO 5-LANE CONCRETE PAVEMENT W/STORM SEWER DRAINAGE WITH OFFSITE DRAINAGE**	**$8,300,000** 2014 0.7 (2, 5) , (0, 0)
13873 2012 TIP HARRIS COUNTY	B20212	**SENS RD** SH 225 N H ST	**WIDEN TO 5-LANE CONCRETE PAVEMENT W/STORM SEWER DRAINAGE**	**$2,768,310** 2014 1.01 (2, 5) , (0, 0)
7521 2017 RTP PORT OF HOUSTON AUTHORITY	3.14	**SH 146** SH 146 SB SOUTHERN ACCESS RD	**CONSTRUCT DIRECT CONNECTOR FROM SB LANES OF SH 146**	**$13,915,000** N/A 0.53 (0, 0) , (0, 0)
10456 2011 TIP PORT OF HOUSTON AUTHORITY	3.9 OPT 1	**SH 146** PORT RD ACCESS RD & OLD SH 146	**CONSTRUCT EB EXIT**	**$2,943,369** N/A 0.8 (2, 2) , (0, 0)
137 2025 RTP TXDOT HOUSTON DISTRICT	0389-05-087	**SH 146** FAIRMONT PARKWAY RED BLUFF RD	**WIDEN TO 6-LANES WITH TWO 2-LANE FRONTAGE ROADS**	**$100,426,000** 2035 4.6 (4, 6) , (0, 4)
139 2034 RTP TXDOT HOUSTON DISTRICT	0389-05-088	**SH 146** RED BLUFF NASA 1	**WIDEN TO 8-LANES, GS AT MAJOR INTERSECTIONS AND 2 2-LANE FRONTAGE ROADS**	**$98,077,222** 2035 1.75 (4, 8) , (0, 4)
14632 2031 RTP TXDOT HOUSTON DISTRICT	0389-05-116	**SH 146** NASA RD 1 GALVESTON/HARRIS CL	**WIDEN TO 6-LANE ARTERIAL WITH 4-LANE EXPRESS LANES**	**$186,624,509** 2035 1.02 (4, 6) , (0, 4)
14621 [2012] Let TXDOT HOUSTON DISTRICT	0389-05-119	**SH 146** AT BNSF RR/PORT RD	**CONSTRUCT NORTHBOUND DIRECT CONNECTOR**	**$14,763,959** 2014 0.54 (0, 4) , (0, 0)

*** (Existing, Proposed) Main Lanes then Frontage Roads.**

Sorted by: Street, CSJ Number, then MPOID

APPENDIX D:
Congestion Mitigation Analysis

CONGESTION MITIGATION ANALYSIS (CMA)

SH 146 CORRIDOR

Findings

By year 2010, the Level of Mobility (LOM) for SH 146 between Fairmont Parkway in Harris County and IH 45 South in Galveston County will have deteriorated enough to justify added capacity. The implementation of Transportation Control Measures (TCM), such as Intelligent Transportation System (ITS) and freeway High Occupancy Vehicle (HOV) lanes within the study area, would not have sufficient impact to negate the added capacity justification. It can be concluded that the widening of SH 146 between Fairmont Parkway in Harris County and IH 45 South in Galveston County is consistent with the Congestion Management System (CMS) Plan of Houston-Galveston Area Council (H-GAC) and is contingent on the considerations described below.

Background

H-GAC's current CMP evolved from the H-GAC Congestion Management System (CMS) Plan originating in the mid-1990s. The H-GAC CMS Plan was adopted in 1997, and revised in 1998 and 2005. The CMP was adopted by H-GAC on January 25, 2013 and incorporated into the 2035 RTP and 2013-2016 TIP.

The H–GAC is currently developing the 2040 RTP while concurrently updating the CMP. The 2040 RTP and revised CMP are scheduled for completion by September 2014.

The CMS requires the performance of a Congestion Mitigation Analysis (CMA), which was formerly known as Single Occupancy Vehicle Analysis (SOV), on significant added capacity roadway projects. It is the stated policy of the CMS to apply cost-effective Transportation System Management (TSM) measures and Travel Demand Management (TDM) as the first component of all congestion reduction strategies. Added capacity roadway projects, such as those being considered for this SH 36 are justified only if cost-effective demand and system management strategies fail to reduce vehicular congestion to acceptable (or tolerable) levels.

Project Description

The study area for the SH 146 MIS is located in Harris and Galveston Counties. The Corridor extends along State Highway 146 between Fairmont Parkway in La Porte and IH 45 south in Galveston, and lies in the southeast portion of the Houston-Galveston region, stretching approximately 24 miles in length. For the purpose of this analysis, the corridor is defined to extend one-half mile to the east of SH 146 and one-half mile to the west of SH 146.

The corridor supports significant urban and suburban development on its north end, passing through fourteen municipalities. The corridor also passes through several significant natural and

environmental resources such as Clear Creek and Galveston Bay. These and other natural resources make the corridor an important ecological corridor, which must be protected against adverse impacts from infrastructure improvements.

Relatively high population and employment levels for a primarily suburban corridor are reflected by the estimated trip characteristics observed within the corridor. In year 2000, the Average Daily Traffic (ADT) on the northern portion of the corridor was approximately 50,000 vehicles per day (VPD). By 2025, ADT is expected to grow to approximately 80,000. This represents an increase in traffic of about 50% in the next 20 years. Traffic in other sections of the corridor is also expected to increase.

Furthermore, examining the projected growth within the corridor (population, employment, and trips), the greatest growth is expected near the middle of the corridor at the Harris/Galveston County Line. This suggests that the northern portion of the corridor (La Porte) is reaching build-out and that the next ring of sub-urbanization is rapidly occurring near the middle of the corridor. This new ring of growth affects travel patterns within the corridor and further contributes to the increasing congestion levels observed on SH 146.

Travel patterns within the corridor reinforce the need to plan for improved roadway facilities. In the year 2000, weekday trips remaining within the corridor represented approximately 65 percent of the total trips generated by the corridor. Only 35 percent of the total daily trips either left the corridor or entered the corridor from outside the study area. This does not hold true for weekends and holidays, when tourist attractions brought in a large percentage of trips from outside the study area. These travel patterns are expected to be maintained through the year 2025, suggesting that the regional travel facilities, such as SH 146, will continue to be used for shorter intra-corridor type trips as well as the regional ones.

Existing north-south roadways serving the corridor consist exclusively of SH 146. Other roadways such as SH 3 and IH 45 provide limited relief to this primary route.

SH 146 is an older facility. Many structures along its route will require reconstruction within the next 20 years.

Traffic and Level of Mobility (LOM)

Table 1 illustrates Levels of Mobility (LOM) used to define congestion by H-GAC. These LOMs were developed by the H-GAC Travel Modeling Committee in 1997 and approved by the Technical Advisory Committee (TAC). Roadway segments that fall above the tolerable level (i.e. volume/capacity ratio ≥ 0.85) are considered congested, thus added-capacity is considered to be justified.

Table 1: Summary of Levels of Mobility (LOM)

LOM	Volume/Capacity (V/C) Ratio
Tolerable	< 0.85
Moderate	≥ 0.85 to <1.00
Serious	≥ 1.00 to <1.25
Severe	≥ 1.25

For the purpose of this CMA, the v/c ratios or LOMs were calculated for four segments along SH 146 as follows: Fairmont Parkway to Red Bluff Road; Red Bluff Road to FM 518, FM 518 to FM 517, and FM 517 to Texas City Wye. The first segment is characterized as a suburban fringe four-lane freeway, while the second, third, and fourth segments are characterized as a four-lane arterial. Volume/capacity (v/c) ratios or LOMs were calculated for the four segments of SH 146, using the year 2000 volumes and capacities developed by H-GAC, verified against the actual 24-hour traffic counts from TxDOT, and projected traffic volumes from H-GAC. Adjusted capacities were determined using H-GAC's capacity tables, which are based on the standard *Highway Capacity Manual* procedures for different facility types and number of lanes as well as other traffic-related factors.

These factors include:

- Percent Trucks
- Percent Left-Turns
- Number of Lanes
- Peak Hour Factor
- Lane Utilization Factor
- Peak-Hour Directional Factors
- Traffic Signal Timing (Green/Cycle Length (g/c) Ratio)

In order to reduce the cost of data collection and presentation for this project, it was determined to only collect information on factors that have sufficient impact on the flow rate and capacity of the four roadway segments of this project. All the above mentioned factors were used except the lane utilization factor, traffic signal timing, and percent left-turns. Once the adjusted capacities were calculated, v/c ratios for 2000, 2010, 2015 and 2025 were determined using H-GAC's modeled 24- hour volumes for those years, respectively, for each of the four segments along the SH 146. Using the different segment lengths, a weighted average v/c ratio was determined for the entire project and is listed in **Table 2 (Column 2)**. It is evident that the LOM within the project limits will be serious by year 2010, and severe by 2025.

Table 2: Level of Mobility for Year 2000, 2010, 2015, and 2025

SH 146 from Fairmont Parkway to Texas City Wye		
	V/C ratio (LOM) **Before** implementation of TCM projects	V/C ratio (LOM) **After** implementation of TCM projects
2000 Adjusted LOM	0.74 (Tolerable)	0.72 (Tolerable)
2010 Adjusted LOM	0.93 (Serious)	0.91 (Serious)
2015 Adjusted LOM	1.08 (Serious)	1.05 (Serious)
2025 Adjusted LOM	1.29 (Serious)	1.24 (Serious)

Congestion Reduction Strategies

It is the stated policy of the Congestion Management System to apply cost-effective demand and system management measures as the first component of all congestion reduction strategies. Added capacity roadway projects are justified only if cost-effective demand management and system management strategies fail to reduce vehicular congestion to acceptable levels. Where demand or system management projects are feasible and cost-effective, project sponsors, or relevant implementing agencies and the MPO must commit to their implementation or incorporation into a proposed added- capacity project as a pre-condition to federal funding assistance. Project design, concept, and scope must also be consistent with any selected management strategies. Committed TCMs for SH 146 includes the installation of Computerized Transportation Management Systems (CTMS) throughout the project length and the development of HOV lanes up to Red Bluff Road.

Analysis and Results

Weighted average v/c ratios for the entire project were developed for the years 2000, 2010, 2015, and 2025. Using TCM analysis tool, the combined congestion mitigation impacts for the committed and recommended TCM projects were estimated for SH 146. A trip reduction of 4.02 % was estimated for the project from 2000 to 2010, and 4.16% was estimated from 2010 to 2025. Each reduction was applied to the weighted v/c average to determine the adjusted v/c ratio, which reflects the impacts of the TCM projects. **Table 2 (Column 3)** showed the adjusted v/c ratios for this project.

The LOM within the project limits will improve because of implementation of these TCM projects; however, LOM will still be **SERIOUS** by year 2010 and **SEVERE** by year 2025. Therefore; the widening of SH 146 between Fairmont Parkway in Harris County and IH 45 South in Galveston County is justifiable even after the implementation of TCM projects and should be further studied.

The result of this analysis also suggests that the implementation of TCMs on this corridor have a degree of impact on the congestion mitigation; therefore, they are considered "significant" and they include, Intelligent Transportation System throughout the corridor and freeway High Occupancy Vehicle Lanes between Fairmont parkway and Red Bluff Road.

The CMS Plan stipulates that the implementing agencies must demonstrate their commitment to construction of any TCMs identified as having significant impact to the traffic flow on a candidate roadway project. A Letter of Commitment will be required, which shall include a firm assurance that the implementing agencies will execute these TCM projects along with or incremental to the added capacity project.

H-GAC requires that the Letter of Commitment include the projected start/end dates of these TCM projects if possible and the incremental (total added cost) associated with their implementation. It is recommended that the start/end date to the TCM projects should be in close proximity to the implementation date of the added-capacity project. This information is requested because H-GAC is responsible for evaluating the before-and-after performance of the TCMs. Please note if the information regarding the exact dates for implementation of these TCMs are not available, then the letter should provide the dates when such data would be obtainable.

The above actions may call for an increase in the priority of the TCM projects which would require Transportation Policy Council amendments to the current Transportation Improvement Plan and Metropolitan Transportation Plan.

APPENDIX E:
Resource Agency and Local Official Coordination

Baker

Michael Baker Jr., Inc.

16225 Park Ten Place, Suite 420
Houston, TX 77084
(281) 579-4579
FAX (281) 579-4646

January 7, 2005

Mr. Brent Ortego
Texas Parks and Wildlife Department
2805 North Novarro, Suite 600B
Victoria, TX 77901

RE: **State Highway (SH) 146 (Fairmont Parkway to SH 3)**
Harris and Galveston Counties, Texas
Environmental Assessment

Dear Mr. Ortego:

The Texas Department of Transportation (TxDOT) has retained the services of Michael Baker Jr., Inc. (Baker) to perform environmental studies required by the National Environmental Policy Act (NEPA) to improve SH 146 from Fairmont Parkway to SH 3 in Harris and Galveston Counties, Texas. Baker will be directly responsible for environmental studies including an Environmental Assessment (EA), permitting and mitigation planning, and public involvement.

The proposed action is located along an approximate 23-mile section of SH 146 in Harris and Galveston Counties that begins at Fairmont Parkway in Harris County and ends at SH 3 in Galveston County. The studies will address the proposed improvements to SH 146 including the addition of grade separated intersections and frontage roads in various locations. The proposed improvements are based on the recommendations of the SH 146 Corridor Major Investment Study completed by TxDOT in 2003. A map showing the project limits is enclosed.

An EA is a detailed environmental study that utilizes a systematic interdisciplinary approach to project planning to assure that full consideration is given to all appropriate social, economic, and environmental effects of proposed project. Specifically, Baker will perform, among other tasks, the social, economic and environmental studies for the proposed action and implement coordination of the public and agency involvement program during the study process.

The purpose of this project is to reduce traffic congestion, improve hurricane evacuation, improve safety and mobility, and provide travel options while maintaining minimal impacts to the environment in a cost-effective manner. This study will help to achieve safe and efficient transportation needs and also to achieve national, state, and local environmental protection goals.

In order to ensure that pertinent environmental issues relating to this project have been adequately addressed, we request your input and concerns, regarding bald eagle nesting sites and potential bald eagle occurences within the project vicinty (see attached site map). We also request information about current

or previous environmental studies in the region that may be relevant to this project. This request is required at your earliest convenience to facilitate timely completion of the project.

The requested input, as well as the name of an appropriate contact within your staff for future coordination, should be mailed to Michael Baker Jr., Inc., 16225 Park Ten Place, Suite 420, Houston, Texas 77084. If additional information is needed or you have any questions or comments regarding this request, please call Mr. Eddie George at (281) 579-4541, or me at (281) 579-4597.

Sincerely,

MICHAEL BAKER JR., INC.

Jason E. Thomas
Project Manager

Attachment

I am not aware of any eagle nests in the vicinity of your project.

Brent Ortego

THE Subsidence DISTRICT

January 12, 2005

Mr. Jason Thomas
Michael Baker Jr., Inc.
16225 Park Ten Place, Suite 420
Houston, TX 77084

Re: SH 146 Project Environmental Assessment

Dear Mr. Thomas:

SH 146 is located in an area where historical subsidence, the sinking of the land, has been significant. From the year 1906 to 2000, as much as 8 feet of subsidence has occurred on the northern end and 4 feet on the southern end of the project segment. The Subsidence District was created in 1975 to regulate groundwater withdrawal, which is the cause for the overwhelming majority of subsidence in the greater Houston area. Major public works projects have been completed to allow for the conversion from groundwater sources to surface water sources. From the year 1978 to 2000 very little subsidence has occurred in SH 146 area (less than ½ foot). We do not predict any significant subsidence in the future (through the year 2030) from groundwater withdrawals, but there is always a possibility of changed conditions or even other causes of subsidence, such as shallow oil and gas withdrawal.

If you have any questions about historical or predicted subsidence, please do not hesitate to contact me or our staff.

Sincerely,

Tom Michel
Asst. General Manager

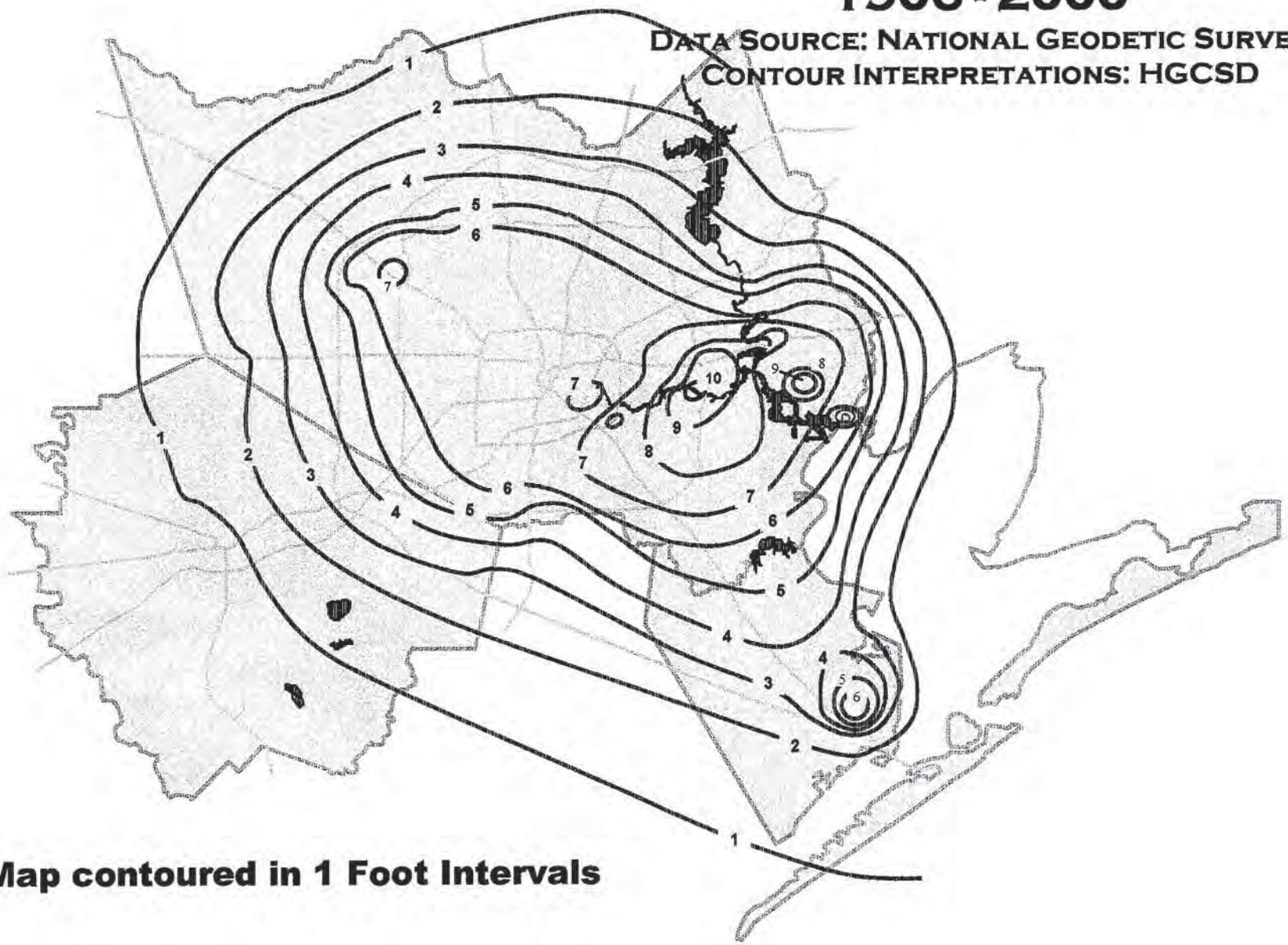
Attachments: Subsidence Map 1906-2000
Subsidence Map 1978-2000
Predicted Subsidence 1995-2030

HARRIS-GALVESTON
COASTAL SUBSIDENCE DISTRICT
281-486-1105
Fax: 281-218-3700
postmaster@subsidence.org
1660 WEST BAY AREA BOULEVARD
FRIENDSWOOD, TEXAS 77546-2640
www.subsidence.org

Subsidence

1906 - 2000

Data Source: National Geodetic Survey
Contour Interpretations: HGCSD

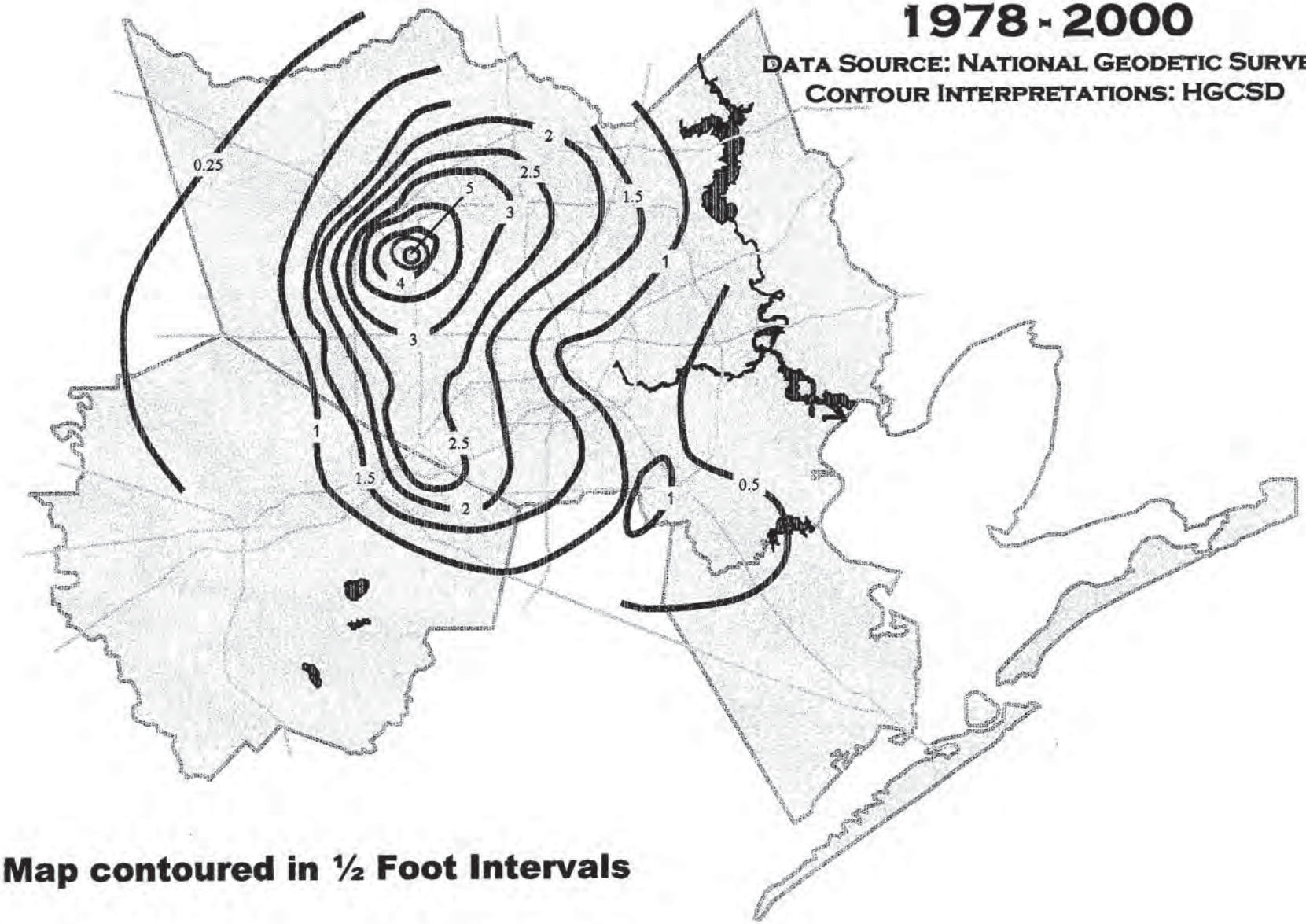


Map contoured in 1 Foot Intervals

Subsidence in Feet

1978 - 2000

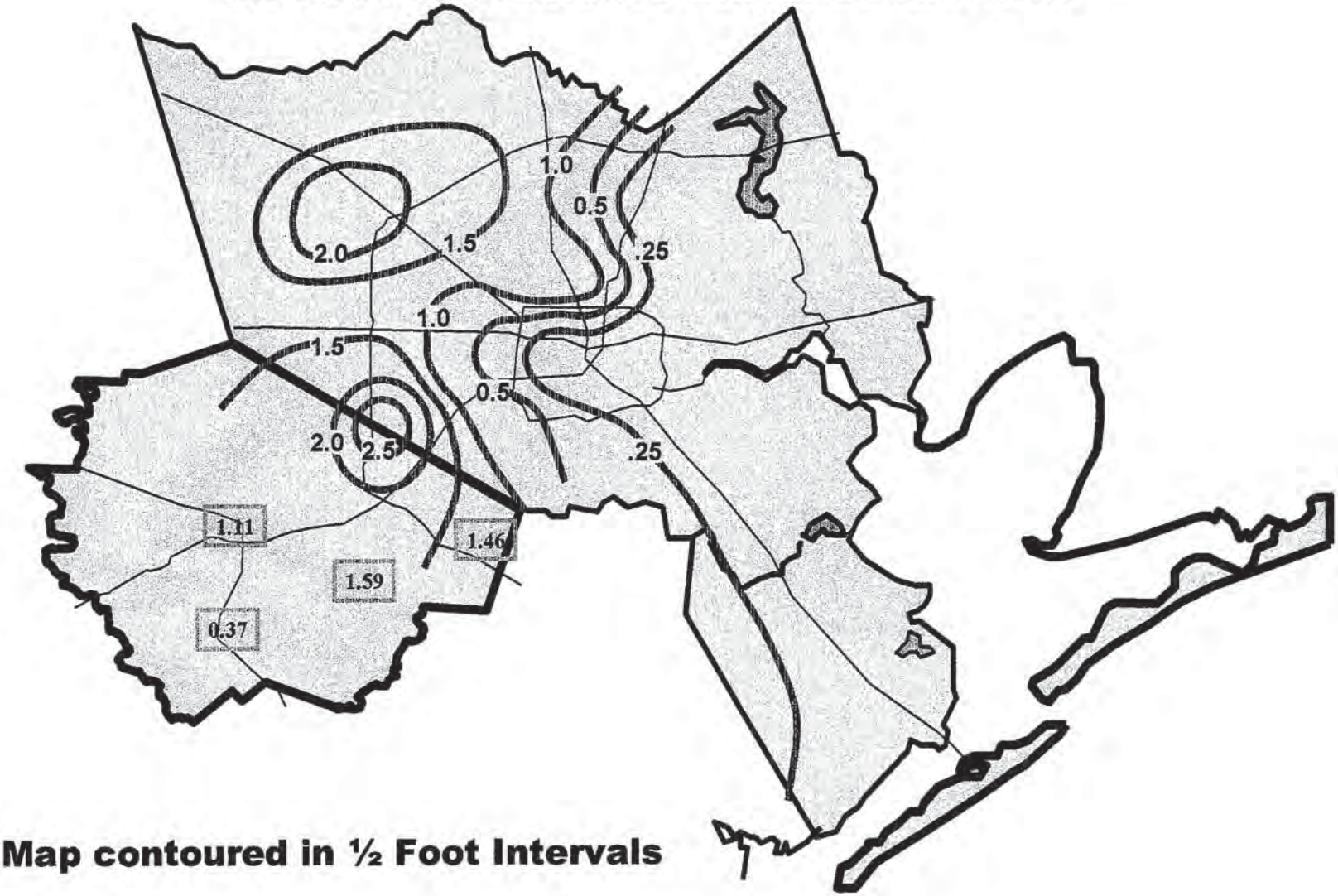
Data Source: National Geodetic Survey
Contour Interpretations: HGCSD



Map contoured in ½ Foot Intervals

PREDICTED SUBSIDENCE 1995 - 2030

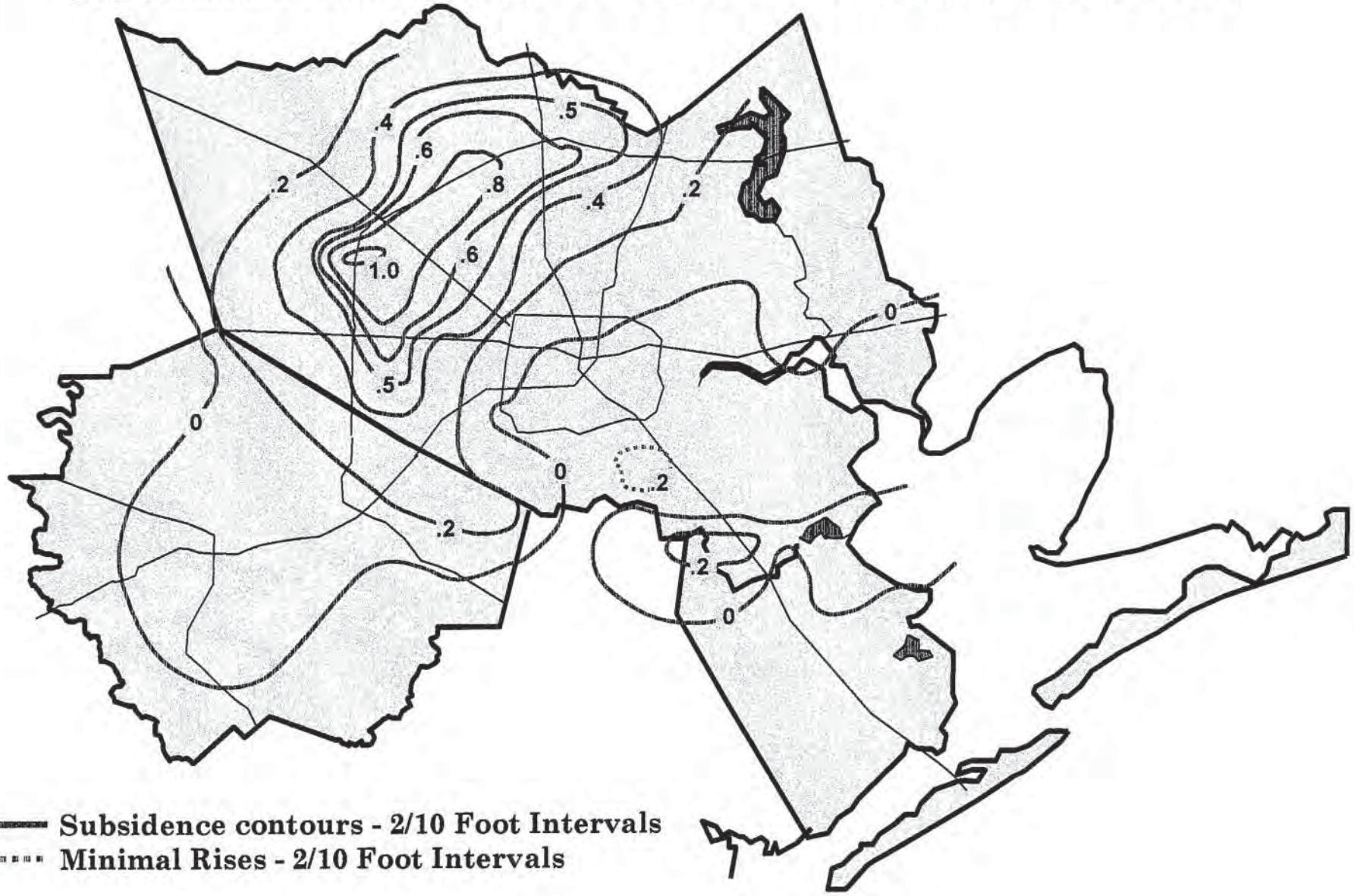
WITH SUCCESSFUL HGCSD REGULATORY PLAN IMPLEMENTATION
NO FBSD REGULATORY PLAN IMPLEMENTATION



Map contoured in ½ Foot Intervals

SUBSIDENCE : MAY 1995 – OCTOBER 2000

(NGS BENCHMARK DATA POINTS – HGCSD CONTOUR INTERPRETATIONS)



TEXAS GENERAL LAND OFFICE

JERRY PATTERSON, COMMISSIONER

January 13, 2005

Mr. Jason E. Thomas
Michael Baker Jr., Inc.
16225 Park Ten Place
Suite 420
Houston, TX 77084

Dear Mr. Thomas:

I am responding to your letter to Christina Conner with the Permit Service Center. You asked about tidal limits in several bayous and asked for a contact person with the General Land Office (GLO).

All of the streams you mentioned in your letter are tidal where they cross HWY 146 in Harris and Galveston Counties. There are also two unnamed streams that empty into Moses Lake in Galveston County that may be tidal. A survey of these streams may be necessary. In Harris County, Seabrook Lagoon (Slough), is also tidal and claimed by the State. Little Cedar Bayou in La Porte does not cross HWY 146 but could be impacted by the project depending on design plans.

I will be your contact for future coordination with the GLO on this project. I can be reached at:
11811 North D Street
La Porte, TX 77571
(281) 471-0391 ext. 113

If I can be of any further assistance please feel free to contact me at the above number.

Sincerely,

Garry McMahan

Garry McMahan
Regional Director
Upper Coast Field Office

Asset Inspection–Upper Coast Field Office
11811 North D Street • La Porte, Texas 77571-9135
Phone: 281-470-1191 • Fax: 281-470-8071
www.glo.state.tx.us

Kathleen Hartnett White, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
Larry R. Soward, *Commissioner*
Glenn Shankle, *Executive Director*

RECEIVED
FEB 0 2 2005
BY:

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

January 27, 2005

Mr. Jason E. Thomas
Michael Baker, Jr., Inc.
16225 Park Ten Place
Suite 420
Houston, Texas 77084-5142

Re: Public Information Request #05.01.10.06
State Highway 146 Environmental Assessment

Dear Mr. Thomas:

This letter is written in response to an open records request received by the Texas Commission on Environmental Quality (TCEQ), posted as Public Information Request #05.01.10.06. The information requested is maintained by this agency and is a matter of public record under the Public Information Act, Texas Government Code Chapter 552. The following responses to your questions have been compiled by agency staff.

- The Gulf Coast Aquifer is located within one-mile of the proposed project. The Gulf Coast Aquifer has not received sole nor principle source designation by the United States Environmental Protection Agency. The Gulf Coast Aquifer has been identified as a major aquifer by the Texas Water Development Board, as it supplies water to all or part of 54 counties in Texas. The aquifer consists of complex interbedded clays, silts, sands, and gravels of Cenozoic era, which are hydrologically connected to form a large, leaky artesian system. The aquifer outcrops in the Harris and Galveston county area and consists of two Formations. The Pleistocene age Lissie Formation consists of sand, silt, clay, and minor amounts of gravel. The Pleistocene age Beaumont Formation consists of clay, silt, and fine-grained sand.

- There are currently no critical aquifer protection areas or aquifer protection zones within one-mile of the site described in the project provided. A helpful publication for identifying additional information about the project area described would be the *Joint Groundwater Monitoring and Contamination Report*, 2003, TCEQ Publication No. SFR-056/03, located online at http://www.tceq.state.tx.us/comm_exec/forms_pubs/search_pubs.html. This report contains descriptions of groundwater contamination documented in previous years along with the status of voluntary clean up actions.

- The TCEQ Region 12 Field Offices located in Houston, Texas, maintains some maps of the project area. Following is a point of contact and address for the TCEQ's Region 12 Field Office:

  Don A. Thompson
  Regional Director
  TCEQ Region 12
  5425 Polk Ave., Ste. H
  Houston, Texas 77023-1486
  Phone: 713-767-3500
  Fax: 713-767-3520

The information pertaining to locations of public water supplies and protection areas requested is available in digital format. Please do contact Mr. Sean Ables, Geologist, TCEQ, at 512-239-1758, or via e-mail at sables@tceq.state.tx.us , to discuss further the format preferred.

If you require further assistance, please call me at 512-239-6200, or contact me via e-mail at kmay@tceq.state.tx.us .

Sincerely,

Kenneth D. May

Kenneth D. May
Drinking Water Protection Program
Public Drinking Water Section
Water Supply Division
512-239-6200
kmay@tceq.state.tx.us

SA:km

CC: Mrs. Viola Gomez, MC-155
Mrs. Hazel Jones, MC-161
Mr. Jim Hay, MC-197

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF:

February 25, 2005

Evaluation Section

SUBJECT: D-16904; Texas Department of Transportation State Highway (SH) 146 Environmental Assessment

RECEIVED
MAR 0 8 2005
BY:

Michael Baker Jr., Inc.
Attn: Eddie George
16225 Park Ten Place, Suite 420
Houston, Texas 77084-5155

Dear Mr. George:

This letter is in regard to your January 7, 2005 letter requesting comments pertaining to the proposed improvements to SH 146 from Fairmont Parkway to SH 3, in Harris and Galveston Counties, Texas.

The Corps of Engineers regulates activities in waters of the U.S., including wetlands, under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. As stated in your letter, the Corps is already processing a permit application for the SH 146 Bridge at Dickinson Bayou. For the remaining portions of the project, we recommend a wetland delineation be conducted and submitted to the Corps for verification to determine further permitting requirements.

If you have any questions concerning this matter, please contact Ryan Fordyce at the letterhead address or by telephone at 409-766-3114.

Sincerely,

Bruce H. Bennett

Bruce H. Bennett
Leader, North Evaluation Unit

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, FL 33702
(727) 570-5312, FAX 570-5517
http://sero.nmfs.noaa.gov

RECEIVED
MAR 08 2005
BY:

MAR 2 2005

Dear Colleague:

The National Marine Fisheries Service (NOAA Fisheries) Protected Resources Division has reviewed your letter pursuant to section 7(a)(2) of the Endangered Species Act (ESA) concerning an Environmental Assessment for State Highway 146, Harris and Galveston Counties, Texas.

_____**There are no ESA-listed species** or designated critical habitat under our purview in the action area.

_____**We cannot determine** impacts to threatened or endangered species, or designated critical habitat, under NOAA Fisheries' purview because the letter lacks sufficient information to evaluate the project. **Enclosed are guidelines** to conduct a proper biological evaluation.

_____**Please provide a letter** from the lead federal action agency designating you to conduct ESA section 7 consultation with this office.

__X__ **Enclosed is a list** of federally-protected species under the jurisdiction of NOAA Fisheries for the state of **Texas.** Biological information on federally-protected species and candidate species can be found at the following website addresses: http://www.nmfs.noaa.gov/prot_res/prot_res.html; http://noflorida.fws.gov/SeaTurtles/seaturtle-info.htm); http://endangered.fws.gov/wildlife.html#Species; http://www.cmc-ocean.org/main.php3; http://floridaconservation.org/psm/turtles/turtle.htm; http://obis.env.duke.edu/data/sp_profiles.php; www.mote.org/~colins/Sawfish/SawfishHomePage.html; www.floridasawfish.com; www.flmnh.ufl.edu/fish/sharks/InNews/sawprop.htm;.Gulf sturgeon critical habitat rule and maps (http://alabama.fws.gov/gs/); http://www.cccturtle.org;. Guidelines for preparing a biological assessment are also enclosed.

_____**It is NOAA Fisheries opinion that the project will have no effect** on listed species or critical habitat protected by the ESA under NOAA Fisheries' purview. No further consultation with NOAA Fisheries pursuant to section 7(a)(2) of the ESA is required unless the project description changes.

Consultation with NOAA Fisheries, Habitat Conservation Division (HCD), pursuant to the Magnuson-Stevens Fishery Conservation and Management Act's requirements for essential fish habitat consultation may be required. Please contact HCD at (727) 570-5317. If you have any ESA questions, please contact our ESA section 7 coordinator, Eric Hawk, at (727) 570-5312, or by e-mail at eric.hawk@noaa.gov.

Sincerely,

David M. Bernhart
Assistant Regional Administrator
for Protected Resources

Enclosures
File:1514-22.b
O:\FORMS\Form letters\specieslist.ba0218056.wpd

Endangered and Threatened Species and Critical Habitats under the Jurisdiction of the National Marine Fisheries Service

Texas

Listed Species	Scientific Name	Status	Date Listed
Marine Mammals			
blue whale	*Balaenoptera musculus*	Endangered	12/02/70
finback whale	*Balaenoptera physalus*	Endangered	12/02/70
humpback whale	*Megaptera novaeangliae*	Endangered	12/02/70
sei whale	*Balaenoptera borealis*	Endangered	12/02/70
sperm whale	*Physeter macrocephalus*	Endangered	12/02/70
Turtles			
green sea turtle	*Chelonia mydas*	Threatened[1]	07/28/78
hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	06/02/70
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	12/02/70
leatherback sea turtle	*Dermochelys coriacea*	Endangered	06/02/70
loggerhead sea turtle	*Caretta caretta*	Threatened	07/28/78

Species Proposed for Listing

None

Designated Critical Habitat

None

Proposed Critical Habitat

None

Candidate Species[2]	Scientific Name
Fish	
dusky shark	*Carcharhinus obscurus*
sand tiger shark	*Odontaspis taurus*
night shark	*Carcharinus signatus*
speckled hind	*Epinephelus drummondhayi*
saltmarsh topminnow	*Fundulus jenkensi*
Goliath grouper	*Epinephelus itajara*
Warsaw grouper	*Epinephelus nigritus*

1. Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered.

2. Candidate species are not protected under the Endangered Species Act, but concerns about their status indicate that they may warrant listing in the future. Federal agencies and the public are encouraged to consider these species during project planning so that future listings may be avoided.

National Marine Fisheries Service
Recommendations for the Contents of
Biological Assessments and Biological Evaluations

When preparing a Biological Assessment (BA) or Biological Evaluation (BE), keep in mind that the people who read or review this document may not be familiar with the project area or what is proposed by the project. Therefore your BA or BE should present a clear line of reasoning that explains the proposed project and how you determined the effects of the project on each threatened or endangered species in the project area. Try to avoid technical jargon not readily understandable to people outside your agency or area of expertise. Remember, this is a **public document**. Some things to consider and, if appropriate, to include in your BA or BE follow.

1. What is the difference between a Biological Evaluation and a Biological Assessment?

By regulation, a Biological Assessment is prepared for "major construction activities" considered to be Federal actions significantly affecting the quality of the human environment as referred to in the National Environmental Policy Act of 1969 (NEPA) [(42 U.S.C. 4332(2)(C)]. A BA is required if listed species or critical habitat may be present in the action area. A BA also may be recommended for other activities to ensure the agency's early involvement and increase the chances for resolution during informal consultation. Recommended contents for a BA are described in 50 CFR §402.12(f).

Biological Evaluation is a generic term for all other types of analyses. Although agencies are not required to prepare a Biological Assessment for non-construction activities, **if a listed species or critical habitat is likely to be affected, the agency must provide the Service with an evaluation on the likely effects of the action.** Often this information is referred to as a BE. The Service uses this documentation along with any other available information to decide if concurrence with the agency's determination is warranted. Recommended contents are the same as for a BA, as referenced above.

The BAs and BEs should not be confused with Environmental Assessments (EA) or Environmental Impact Statements (EIS) which may be required for NEPA projects. These EAs and EISs are designed to provide an analysis of multiple possible alternative actions on a variety of environmental, cultural, and social resources, and often use different definitions or standards.

2. What are you proposing to do?

- Describe the project. A project description will vary, depending on the complexity of the project. For example, describing the placement and construction of a new microwave tower may be relatively simple, but describing an alternative for improving range management likely would be more detailed and complex. Include sketches if they will help others understand your proposed action and its relationship with the species' habitat.

- How are you (or the project proponent) planning on carrying out the project? What tools or methods may be used? How will the site be accessed?

- Describe the project area. Always include a map (topographic maps are particularly helpful). Provide photographs including aerials, if available. Describe the project area (i.e., topography, vegetation, condition/trend).

- Describe current management or activities relevant to the project area. How will your project change the area?

- Supporting documents are very helpful. If you have a mining plan, research proposal, NEPA or other planning document or any other documents regarding the project, attach them to the BA or BE.

3. What threatened or endangered species may occur in the project area?

A request for a species list may be submitted to the Service, or the Federal action agency or its designated representative may develop the list. If you have information to develop your own lists, the Service should be contacted periodically to ensure that changes in species' status or additions/deletions to the list are included. Sources of information include, but are not limited to, the Forest Service or Bureau of Land Management, this office for marine species, members of the public or academic community, and books and various informational booklets. Due to budget constraints and staff shortages, we are only able to provide general, state-wide, or country-wide (territory-wide) species lists.

Use your familiarity with the project area when you develop your species lists. Sometimes a species may occur in the larger regional area near your project, but the habitat necessary to support the species is not in the project area (including areas that may be beyond the immediate project boundaries, but within the area of influence of the project). If, for example, you know that the specific habitat type used by a species does not occur in the project area, it does not need to appear on the species list for the project. However, documentation of your reasoning is helpful for Service biologists or anyone else that may review the document.

4. Have you surveyed for species that are known to occur or have potential habitat in the proposed project area?

The "not known to occur here" approach is a common flaw in many BA/BEs. The operative word here is "known." Unless adequate surveys have been conducted or adequate information sources have been referenced, this statement is difficult to interpret. It begs the questions "Have you looked?" and "How have you looked?" Always reference your information sources.

Include a clear description of your survey methods so the reader can have confidence in your results. Answer such questions as:

- How intensive was the survey? Did you look for suitable habitat or did you look for individuals? Did the survey cover the entire project area or only part of it? Include maps of areas surveyed if appropriate.

- Who did the surveys and when? Was the survey done during the time of year/day when the plant is growing or when the animal can be found (its active period)? Did the survey follow accepted protocols?

- If you are not sure how to do a good survey for the species, the Service recommends contacting species experts. Specialized training is required before you can obtain a permit to survey for some species.

- *Remember that your evaluation of potential impacts from a project does not end if the species is/are not found in the project area. You must still evaluate what effects would be expected to the habitat, even if it is not known to be occupied.*

5. Provide background information on the threatened or endangered species in the project area.

Describe the species in terms of overall range and population status. How many populations are known? How many occur in the project area? What part of the population will be affected by this project? Will the population's viability be affected? What is the current habitat condition and population size and status? Describe related items of past management for the species, such as stocking programs, habitat improvements, or loss of habitat or individuals caused by previous projects.

6. How will the project affect the threatened or endangered species or critical habitat that occurs in the project area?

- If you believe the project will not affect the species, explain why.

- If you think the project may affect the species, explain what the effects might be. The Endangered Species Act requires you consider <u>all</u> effects when determining if an action funded, permitted, or carried out by a Federal agency may affect listed species. Effects you must consider include direct, indirect, and cumulative effects. Effects include those caused by interrelated and interdependent actions, not just the proposed action. Direct effects are those caused by the action and occur at the same time and place as the action. Indirect effects are caused by the action and are later in time but are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no significant independent utility apart from the action under consideration. Cumulative effects are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal actions

subject to consultation.

- Describe measures taken to avoid, reduce, or eliminate adverse effects or enhance beneficial effects to the species. Refer to conversations you had with species experts to achieve these results.

- Consider recovery potential if the project area contains historic range for a species.

- Evaluate designated critical habitat areas by reviewing the physical or biological features essential to the conservation of the species. *Even if no critical habitat has been designated for a species, the evaluation of the project effects must include effects to the habitat, not just the species.*

7. What is your decision? The Federal action agency must make a determination of effect.

Quite frequently, effect determinations are not necessarily *wrong;* they simply are not justified in the assessment. The assessment should lead the reviewer through a discussion of effects to a logical, well-supported conclusion. Do not assume that the Service biologist is familiar with the project and/or its location and that there is no need to fully explain the impact the project may have on listed species. If there is little or no connection or rationale provided to lead the reader from the project description to the effect determination, we cannot assume conditions that are not presented in the assessment. Decisions must be justified biologically. The responsibility for making the determination of effect falls on the Federal action agency; however, the Service may ask the agency to revisit its decision or provide more data if the conclusion is not adequately supported by biological information.

You have three choices for each listed species or area of critical habitat:

1. "No effect" means there are absolutely no effects of the project, positive or negative. "No effect" does not include a *small* effect or an effect that is *unlikely* to occur. If effects are insignificant (in size) or discountable (extremely unlikely), a "may affect, but not likely to adversely affect" determination is appropriate.

2. "May affect - is not likely to adversely affect" means that all effects are beneficial, insignificant, or discountable. Beneficial effects have concurrent positive effects without any adverse effects to the species or habitat (i.e., there can not be "balancing," wherein the benefits of the project would be expected to outweigh the adverse effects - see #3 below). Insignificant effects relate to the size of the impact (and should not reach the scale where take occurs). Discountable effects are those extremely unlikely to occur. These determinations require **written** concurrence from the Service. Based on best judgement, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.

3. "May affect - is likely to adversely affect" means that all adverse effects can not be avoided. A combination of beneficial and adverse effects is still "likely to adversely affect," even if the net effect is neutral or positive. Adverse effects do not qualify as discountable simply because we are not certain they will occur. The probability of occurrence must be extremely small to achieve discountability. Likewise, adverse effects do not meet the definition of insignificant because they are less than major. If the adverse effect can be detected in any way or if it can be meaningfully articulated in a discussion of the results, then it is not insignificant, it is likely to adversely affect. This requires formal consultation with the Service.

A fourth finding is possible for proposed species or proposed critical habitat:

4. "Is likely to jeopardize/adversely modify proposed species/critical habitat" is the appropriate conclusion when the action agency identifies situations in which the proposed action is likely to jeopardize the proposed species, or destroy or adversely modify the proposed critical habitat. If this conclusion is reached, conference is required.

List the species experts you contacted when preparing the BE or BA but avoid statements that place the responsibility for the decision of "may affect" or "no effect" on the shoulders of the species experts. Remember, this decision is made by the Federal action agency.

Provide supporting documentation, especially any agency reports or data that may not be available to the Service. Include a list of literature cited.

Prepared by:
U.S. Fish and Wildlife Service
Arizona Ecological Services Field Office
January 1997

Revised by:
U.S. Fish and Wildlife Service
New Mexico Ecological Services Field Office
2105 Osuña NE
Albuquerque, New Mexico 87113
(505) 761-4525
April 1997

Revised by:
National Marine Fisheries Service
Southeast Regional Office
Protected Resources Division
9721 Executive Center Dr. N.
St. Petersburg, FL 33702

(727) 570-5312
November 1998

OUTLINE EXAMPLE
FOR A
BIOLOGICAL ASSESSMENT OR BIOLOGICAL EVALUATION

A. Cover Letter - **VERY IMPORTANT** - Include purpose of consultation, project title, and consultation number (if available). A determination needs to be made for each species. You have three options: 1) a "no effect" determination; 2) requesting concurrence with an "is not likely to adversely affect" determination; 3) a "may affect, is likely to adversely affect" determination, and a request for formal consultation. If proposed species or critical habitat are included, state whether the project is likely to result in jeopardy to proposed species, or the destruction or adverse modification of proposed critical habitat.

B. Project Description - Describe the proposed action and the project area. Be specific and quantify whenever possible.

C. For Each Species
1. Description of affected environment (quantify whenever possible)
2. Description of species biology
3. Describe current conditions for each species
   a. Rangewide
   b. In project area
   c. Cumulative effects of State and private actions in project area
   d. Other consultations of Federal action agency in area to date
4. Describe critical habitat (if applicable)
5. Describe effects of proposed action on each species and/or critical habitat.
   a. Direct
   b. Indirect
   c. Interrelated and interdependent actions
   d. Incidental take

D. Conservation Measures (protective measures to minimize effects for each species)

E. Conclusions (effects determination for each species)

F. Literature Cited

G. List of Contacts Made/Preparers

H. Maps/ Photographs

UPDATES

Endangered and Threatened Species and Critical Habitats under the Jurisdiction of the National Marine Fisheries Service

Texas

Listed Species	Scientific Name	Status	Date Listed
Marine Mammals			
blue whale	*Balaenoptera musculus*	Endangered	12/02/70
finback whale	*Balaenoptera physalus*	Endangered	12/02/70
humpback whale	*Megaptera novaeangliae*	Endangered	12/02/70
sei whale	*Balaenoptera borealis*	Endangered	12/02/70
sperm whale	*Physeter macrocephalus*	Endangered	12/02/70
Turtles			
green sea turtle	*Chelonia mydas*	Threatened[1]	07/28/78
hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	06/02/70
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	12/02/70
leatherback sea turtle	*Dermochelys coriacea*	Endangered	06/02/70
loggerhead sea turtle	*Caretta caretta*	Threatened	07/28/78

Species Proposed for Listing

None

Designated Critical Habitat

None

Proposed Critical Habitat

None

Candidate Species[2]	Scientific Name
Fish	
dusky shark	*Carcharhinus obscurus*
sand tiger shark	*Odontaspis taurus*
night shark	*Carcharinus signatus*
speckled hind	*Epinephelus drummondhayi*
saltmarsh topminnow	*Fundulus jenkensi*
Goliath grouper	*Epinephelus itajara*
Warsaw grouper	*Epinephelus nigritus*

1. Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered.

2. Candidate species are not protected under the Endangered Species Act, but concerns about their status indicate that they may warrant listing in the future. Federal agencies and the public are encouraged to consider these species during project planning so that future listings may be avoided.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
17629 El Camino Real #211
Houston, Texas 77058-3051
281/286-8282 / (FAX) 281/488-5882

RECEIVED
MAR 11 2005
BY:

March 8, 2005

Jason E. Thomas
Michael Baker Jr., Inc.
16225 Park Ten Place, Suite 420
Houston, Texas 77084

Dear Mr. Thomas:

This responds to your letter dated January 7, 2005, requesting information for the Texas Department of Transportation's proposed improvements to State Highway 146 from Fairmont Parkway in Harris County to State Highway 3 in Galveston County, Texas. The study will address proposed improvements to approximately 23 miles of SH 146 including the addition of grade separated intersections and frontage roads.

A review of U.S. Fish and Wildlife Service files and your project map indicates that one of the few remaining populations of the endangered Attwater's prairie chicken (*Tympanuchus cupido attwateri*) occurs to the east of SH 146 in Galveston County, in the area bounded by SH 146, Moses Lake and the levee. Attwater's prairie chickens live in coastal prairie grasslands, and prefer a variety of tall and short grasses in their habitat. Males aggregate in groups called "leks" to attract mates, where they dance and make a booming noise to attract the females. Hens build their nest in tall grass, and the eggs hatch in April or May. All proposed activity should be evaluated for potential effects to the Attwater's prairie chicken.

In addition, populations of the endangered plant Texas prairie dawn (*Hymenoxys texana*) may occur in or near the SH 146 Corridor. Prairie dawn is a small annual reaching a height of up to 4 inches that is traditionally found in poorly drained depressions or saline swales around the periphery of low natural pimple (mima) mounds in open grasslands. However, many of the prairie dawn sites around rapidly developing urban areas have been disturbed by the leveling of the mounds. Often brush and other woody vegetation have invaded the area surrounding the small, mostly barren areas where prairie dawn occurs. Normally, these small areas are sparsely vegetated and the soil is covered with a blue-green alga but prairie dawn has also been found in the mowed areas of public parks. If suitable habitat occurs within or near the study area, a qualified individual would need to conduct a survey to determine the presence or absence of prairie dawn at this site. The best time to conduct the survey is late March to early April. The plants are flowering at this time and thus are more conspicuous. Additional information on prairie dawn can be obtained from Dr. Larry Brown at 713/365-4175, or the recovery plan available on-line at http://ecos.fws.gov/docs/recovery_plans/1990/900413a.pdf.

The SH 146 corridor contains remnant coastal prairie and prairie pimple mound complexes, particularly in undeveloped areas. These prairies may contain suitable habitat for rare prairie plant species such as Houston camphor daisy (*Rayjacksonia aurea*) and Texas windmill grass (*Chloris texana*) that are often

TAKE PRIDE IN AMERICA

found in association with Texas prairie dawn. Contemporary literature and Service studies document an alarming decline of these habitat types due to urban expansion and conversion to agriculture. Less than 1 percent of the original acreage of this habitat type remains. Prairie complexes provide habitat for many species of mammals, reptiles, amphibians, and invertebrates, in addition to providing nesting, foraging, and wintering habitat for waterfowl, and a variety of resident and migratory birds.

This information constitutes our present knowledge of threatened and endangered species which may occur in the study area. Over time, additional species may be listed, new individuals of listed species may be found, additional information may become available, etc. Therefore, you should consult the Service's county by county listing of federally listed threatened and endangered species at http://ifw2es.fws.gov/endangeredspecies/lists/ListSpecies.cfm periodically to ensure that the latest information is used in evaluating potential impacts of the project upon federally listed species.

According to Section 7(a)(2) of the Endangered Species Act and the implementing regulations, it is the responsibility of each federal agency to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any federally listed species. The Service's Consultation Handbook is available online at http://endangered.fws.gov/consultations/s7hndbk/s7hndbk.htm to assist you with further information on definitions, process, and fulfilling Endangered Species Act requirements for your projects.

If you have any questions, or if we can be of further assistance, please contact Catherine Yeargan at 281/286-8282.

Sincerely,

Frederick T. Werner
Assistant Field Supervisor, Clear Lake Field Office

TEXAS
PARKS &
WILDLIFE

COMMISSIONERS

JOSEPH B.C. FITZSIMONS
CHAIRMAN
SAN ANTONIO

ALVIN L. HENRY
VICE-CHAIRMAN
HOUSTON

J. ROBERT BROWN
EL PASO

NED S. HOLMES
HOUSTON

PETER M. HOLT
SAN ANTONIO

PHILIP MONTGOMERY
DALLAS

JOHN D. PARKER
LUFKIN

DONATO D. RAMOS
LAREDO

MARK E. WATSON, JR.
SAN ANTONIO

LEE M. BASS
CHAIRMAN-EMERITUS
FORT WORTH

ROBERT L. COOK
EXECUTIVE DIRECTOR

June 23, 2005

Mr. Jason Thomas
Michael Baker Jr., Inc.
16225 Park Ten Place, Suite 420
Houston, Texas 77084

Dear Mr. Thomas:

This letter is in response to your information request, dated January 7, 2005, for rare, threatened, and endangered species within or near the study area for the SH 146 project extending from Fairmont Parkway to SH 3 in Harris and Galveston counties.

The following species have been documented in the general proposed project area:

Federal and State Listed Endangered
*Attwater's Prairie-chicken (*Tympanuchus cupido attwateri*)
Houston Toad (*Bufo houstonensis*)
Texas prairie dawn (*Hymenoxys texensis*)

Federal and State Listed Threatened
Piping Plover (*Charadrius melodus*)

Species of Concern
*Gulf Saltmarsh Snake (*Nerodia clarkii*)
*Texas Diamondback Terrapin (*Malaclemys terrapin littoralis*)
*Coastal gay-feather (*Liatris bracteata*)
Grand Prairie Evening primrose (*Oenothera pilosella* ssp. *sessilis*)
*Houston daisy (*Rayjacksonia aurea*) (Formerly *Machaeranthera a.*)
*Texas windmill-grass (*Chloris texensis*)
Threeflower broomweed (*Thurovia triflora*)

Special Features and Natural Communities
*Colonial Waterbird Rookeries
Migratory Songbird Fallout Areas
*Little Bluestem-Brownseed Paspalum (*Schizachyrium scoparium-Paspalum plicatulum*) Series

Species, special features, and natural communities preceded by an asterisk in the above list have been documented possibly within 1.5 miles of the project route.

ENJOY THE TEXAS OUTDOORS!

Take a kid hunting or fishing

Visit a state park or historic site

Printouts for these occurrence records are included for your planning reference. **Please do not include NDD printouts in your draft or final documents.** Because some species are especially sensitive to collection or harassment, these records are for your reference only.

Given the small proportion of public versus private land in Texas, the TPWD Natural Diversity Database (NDD) (formerly Biological and Conservation Data System) does not include a representative inventory of rare resources in the state. Although it is based on the best data available to TPWD regarding rare species, the data from the NDD do not provide a definitive statement as to the presence, absence, or condition of special species, natural communities, or other significant features within your project areas. These data cannot substitute for an on-site evaluation by your qualified biologists.

TPWD recommends you review the enclosed county list, as other rare species could be present depending upon habitat availability. Also, the US Fish and Wildlife Service should be contacted for additional species occurrence data, guidance, permitting, survey protocols, and mitigation for federally listed species.

This letter does not include a review of threatened or endangered species impacts or general fish and wildlife habitat impacts. Thank you for the opportunity to provide you preliminary information for your environmental documentation preparation.

You also requested clarification for contact information. Enclosed is a Rare Resources Review Request form which includes our guide for submitting review requests. Information requests for threatened and endangered species information should be sent to the same address as review requests to my attention. Name and address contact information is included on the enclosed form. Please contact me if you have any questions or need additional assistance (512/912-7021).

Sincerely,

Celeste Brancel, Environmental Review Coordinator
Wildlife Habitat Assessment Program, Wildlife Division
Threatened and Endangered Species

Enclosures (2)

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
101 South Main Street
Temple, TX 76501-7602

February 21, 2007

Michael Baker Jr. Inc.
785 Greens Parkway,
Suite 100
Houston, Texas 77067

Attention: Mindi Nielsen, Environmental Planner

Subject: LNU-Farmland Protection-
SH 146 Roadway Widening
Harris and Galveston County, Texas

We have reviewed the information provided concerning the proposed improvements to SH 146 (Red Bluff Road to FM 518) in Harris and Galveston Counties, Texas as outlined in your letter of February 9, 2007. This is part of NEPA evaluation for TxDOT and FHWA. We have evaluated the proposed area as required by the Farmland Protection Policy Act (FPPA).

The proposed project does contain soils classified as Important Farmland and is subject to the FPPA. We have developed a composite rating for the soils in the project area and completed the CPA-106 you submitted. The project had a total point score in Part VII of 48. The FPPA law states that sites with a rating less than 160 will need no further consideration. Much of the project area is considered as already converted by the FPPA because you are widening an existing road in an urban area. We urge you to use accepted erosion control methods during construction.

I have attached the completed CPA-106 (Farmland Conversion Impact Rating) form for this project indicating the approval status. Thanks for the resource materials you submitted to evaluate this project. If you have any questions please call James Greenwade at (254)-742-9960, Fax (254)-742-9859.

Thanks,

James M. Greenwade
Soil Scientist
Soil Survey Section
USDA-NRCS, Temple, Texas

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

An Equal Opportunity Provider and Employer

U.S. DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service

NRCS-CPA-106
(Rev. 1-91)

FARMLAND CONVERSION IMPACT RATING FOR CORRIDOR TYPE PROJECTS

PART I *(To be completed by Federal Agency)*	3. Date of Land Evaluation Request 2/8/07	4. Sheet 1 of 1
1. Name of Project SH 146 (Red Bluff Road to FM 518)	5. Federal Agency Involved FHWA	
2. Type of Project Highway Expansion	6. County and State Harris and Galveston County, Texas	
PART II *(To be completed by NRCS)*	1. Date Request Received by NRCS 2-12-07	2. Person Completing Form James Greenwade
3. Does the corridor contain prime, unique statewide or local important farmland? (If no, the FPPA does not apply - Do not complete additional parts of this form). YES ☒ NO ☐		4. Acres Irrigated / Average Farm Size
5. Major Crop(s) Grain Sorghum	6. Farmable Land in Government Jurisdiction Acres: 820,200 % 73	7. Amount of Farmland As Defined in FPPA Acres: 769,800 % 69
8. Name Of Land Evaluation System Used LESA	9. Name of Local Site Assessment System NONE	10. Date Land Evaluation Returned by NRCS 2-21-07

PART III *(To be completed by Federal Agency)*		Alternative Corridor For Segment			
		Corridor A	Corridor B	Corridor C	Corridor D
A. Total Acres To Be Converted Directly		39			
B. Total Acres To Be Converted Indirectly, Or To Receive Services					
C. Total Acres In Corridor		39	0	0	0
PART IV *(To be completed by NRCS) Land Evaluation Information*					
A. Total Acres Prime And Unique Farmland		0			
B. Total Acres Statewide And Local Important Farmland		16.4			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted		0.001			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value		85			
PART V *(To be completed by NRCS) Land Evaluation Information Criterion Relative value of Farmland to Be Serviced or Converted (Scale of 0 - 100 Points)*		45			
PART VI *(To be completed by Federal Agency) Corridor Assessment Criteria (These criteria are explained in 7 CFR 658.5(c))*	Maximum Points				
1. Area in Nonurban Use	15	1			
2. Perimeter in Nonurban Use	10	2			
3. Percent Of Corridor Being Farmed	20	0			
4. Protection Provided By State And Local Government	20	0			
5. Size of Present Farm Unit Compared To Average	10	0			
6. Creation Of Nonfarmable Farmland	25	0			
7. Availablility Of Farm Support Services	5	0			
8. On-Farm Investments	20	0			
9. Effects Of Conversion On Farm Support Services	25	0			
10. Compatibility With Existing Agricultural Use	10	0			
TOTAL CORRIDOR ASSESSMENT POINTS	160	3	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland (From Part V)	100	45			
Total Corridor Assessment (From Part VI above or a local site assessment)	160	3	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	48	0	0	0

1. Corridor Selected:	2. Total Acres of Farmlands to be Converted by Project:	3. Date Of Selection:	4. Was A Local Site Assessment Used? YES ☐ NO ☐

5. Reason For Selection:

Signature of Person Completing this Part: | DATE

NOTE: Complete a form for each segment with more than one Alternate Corridor

Texas Department of Transportation
DEWITT C. GREER STATE HIGHWAY BLDG. • 125 E. 11TH STREET • AUSTIN, TEXAS 78701-2483 • (512) 463-8585

December 6, 2005

SECTION 106: DETERMINATION OF NATIONAL REGISTER ELIGIBILITY/
NO ADVERSE EFFECT

Harris and Galveston Counties (Houston District)
CSJ# 0389-05-087, 0389-05-088, 0389-06-088, and 0389-07-029

State Highway 146 from Fairmont Parkway to State Highway 3

DEC 08 2005

Ms. Adrienne Campbell
History Programs
Texas Historical Commission
Austin, Texas 78711

Dear Ms. Campbell:

In accordance with 36 CFR 800 and the Statewide Programmatic Agreement for Cultural Resources, we are initiating Section 106 consultation for the above reference project, which will be carried out with federal funding. We request agency review regarding the National Register of Historic Places (NRHP) eligibility of properties located within the proposed project's area of potential effects (APE) and the finding of effects to NRHP-listed and/or NRHP-eligible properties within the APE.

INTRODUCTION

The Texas Department of Transportation (TxDOT), Houston District, proposes to upgrade a 23-mile long section of State Highway (SH) 146 from Fairmont Parkway to SH 3 in Harris and Galveston Counties. The existing SH 146 roadway currently consists of four travel lanes, with some portions divided and undivided. The current road also has varying shoulder widths, from 12-foot to 3-foot wide, and some portions have curb and gutter. The proposed project calls for the widening of the road to a maximum of a ten lane roadway with no frontage roads or an eight lane highway with frontage roads. Like the varying widths of the current roadway, the proposed road will have varying widths and sections. The proposed project requires **ninety-four acres of new right-of-way**. An attached map shows the project location.

IDENTIFICATION EFFORTS TO IDENTIFY HISTORIC PROPERTIES

The methodology used to identify recorded and potentially eligible properties located in the Area of Potential Effect (APE) included a records search of public records and a windshield survey. Background research was conducted at the Texas Historical Commission's (THC) *Texas Historic Sites Atlas* to identify properties listed on the National Register of Historic places (NRHP) and State Archeological Landmarks (SAL), Recorded Texas Historic Landmarks (RTHL) as well as Official State Historical Markers (OSHM). The record search revealed no previously recorded NRHP properties, SALs, RTHLs, or OSHMs were identified located within the project APE. The APE for the project was determined to be 300-feet from the proposed right-of-way. A site visit conducted by TxDOT personnel revealed **eighty-seven** historic-age sites (built in or before 1965) are located within the APE. Included in these eighty-seven locations, there

are ninety-three buildings, sixteen structures, and one multiple-component non-archeological site.

DETERMINATIONS OF NATIONAL REGISTER ELIGIBILITY

I have evaluated eighty-seven sites through application of the Criteria of Eligibility for listing in the NRHP and I have determined that all the inventoried resources, with the exception of Resource ID# 48 and 85, are **not eligible** for the NRHP. These properties are **not eligible** for inclusion in the register, as they do not have associations with significant historical figures or events. These resources are ubiquitous and they do not clearly reflect the distinctive characteristic of type, period, method of construction, work of a master, or high artistic value. Additionally, several of the properties evidence unsympathetic alterations and general neglect, which have compromised their integrity, such as Resource ID# 22, 25, 46, and 59.

As mentioned in the attached report, the architectural historians investigated the potential for NRHP-eligible subdivisions within or partially within the APE. Yet, the residential neighborhoods are mundane examples of housing developments that were ubiquitous in the 1950s and 1960s. No architectural style, landscape design, or an important link to a significant trend or event was discovered in any of these nondescript housing developments. Furthermore, the technical experts examined the neighborhoods for possible connections between these homes and the chemical plant nearby. Yet, these developments do not exhibit characteristics of industry-sponsored housing, such as public spaces (particularly that separate the houses from the industrial complex), that focused on community growth and unity. Thus, these neighborhoods are not representative of important post-war community development as specifically outlined in the *Historic Residential Suburbs: Guidelines for Evaluation and Documentation for the National Register of Historic Places*, and they are therefore not eligible for the NRHP.

THE ELIGIBILE SITES:

Resource ID #48 is a railroad swing bridge that was built in 1938 across the Dickinson Bayou. This structure is parallel to the vehicular structure that carries SH 146 over the Dickinson Bayou. The railroad structure is no longer in use as the railroad tracks are no longer extant leading to it. As a result, the bridge is now locked permanently in the open position to allow passing boats and to deter potential vandals. Although the structure's association has been compromised by the lack of an extant rail line, the railroad bridge is a representative example of a railroad thru girder, swing bridge, and for the purposes of this project is assumed eligible under Criterion C for its engineering significance.

Resource ID #85 is the Dow Chemical Plant located on the east side of SH 146 between FM 1765 and FM 519. The plant was first opened in 1941 by the Union Carbide Corporation (now a Dow Chemical subsidiary) and was expanded throughout the 1960s. The approximately 1,000 acre facility produces petrochemicals-based industrial products. Presumably due to security issues, the architectural historians were denied access to the plant during the inventory and as a result, no photographs of the buildings or structures are included in the attached report. Since the proposed project does not require right-of-way from this property, *we assume that this site is eligible for the NRHP under Criterion A in the area of Industry for the purposes of this project only*. Please note, should the scope of the project change, or if right-of-way will be required from this property, we will reevaluate the site and do an intensive survey to see if the property is truly eligible for the NRHP.

Aerial photographs and topographic maps were used to determine an appropriate boundary for Resource ID #85, as it relates to SH 146. Since we are assuming this property's eligibility due to its significance in the development of the local and regional petrochemical processing industry, only those portions of the property that directly associated with these activities are included in the NRHP-eligible boundary. Therefore, those portions that do not reflect the fundamental function of

the facility's industrial nucleus are excluded from the boundary, including parking lots, buffer zones, landscaping, and boundary fencing (see boundary map in attached report).

DETERMINATION OF EFFECTS

In accordance with CFR 800.5, we have applied the *Criteria of Adverse Effect* and we have determined that the proposed SH 146 project will have **no adverse effect** to the above reference NRHP-eligible bridge and industrial facility.

- The proposed undertaking will have **no adverse effect** to Resource ID# 48. Since the railroad bridge is locked in the open position, it is now barely located within the TxDOT's existing right-of-way, which is nearly 500 feet wide at this crossing. Yet, there are no plans to purchase additional right-of-way at this location; likewise, there are no plans to have the bridge removed or replaced. Thus, there will be no direct impacts to the property as a result of the project. Additionally, there are no foreseen secondary or cumulative impacts associated with this project as the construction of more bridges at the crossing will not impede or impact the engineering significance that makes this railroad bridge eligible for the NRHP.
- The proposed undertaking will also have **no adverse effect** to Resource ID #85, the Dow Chemical Plant. As previously stated, the project will not require right-of-way from this property; therefore there will be no direct impact. Additionally, since the property, by its very nature, is a mechanized microcosm that produces its own air quality, visual, audio, and atmospheric issues, the widening of an existing roadway adjacent to the property poses no foreseeable secondary or cumulative adverse effects to the property's eligibility.

CONCLUSION

In accordance with 36 CFR 800 and the Programmatic Agreement, I hereby request your signed concurrence with these determinations of eligibility and effect.

Thank you for your cooperation in this federal review process. If you have any questions or comments concerning these evaluations, please call me at 416-2628.

Sincerely,

Lisa J. Hart, Supervisor
Historical Studies Branch
Environmental Affairs Division

LJH: mrf

Attachments

CONCUR
NO ADVERSE EFFECT

NAME: _____ DATE: 12-29-05
for F. Lawerence Oaks, State Historic Preservation Officer

MEMORANDUM

Texas Department of Transportation

TO: 850 File, State Highway 146; from Fairmont Parkway to SH 3, CSJ: 0389-05-087, Harris and Galveston Counties, Houston District

re: Survey, No Sites Encountered

FROM: G. Lain Ellis, Ph.D. **DATE:** 04/5/2006

SUBJECT: Internal review under the Programmatic Agreement (PA) Among the Federal Highway Administration, Texas Historical Commission, Advisory Council on Historic Preservation, and the Texas Department of Transportation; and the Memorandum of Understanding (MOU) Between the Texas Historical Commission and the Texas Department of Transportation

---

The above referenced proposed project would use federal funds to widen State Highway (SH) 146 between Fairmont Parkway and SH 3 in Harris and Galveston Counties. In accordance with the terms of the PA and MOU; we are initiating documentation for internal review of this project.

The proposed project would widen SH 146 between Fairmont Parkway and SH 3 in Harris and Galveston Counties, Texas. Project is approximately 25.0 miles in length. New right-of-way (ROW) would be acquired on either side of the roadway throughout the area of potential effect (APE) for this project. The proposed ROW would be acquired from privately-owned property.

Michael Baker, Jr., Inc., a consultant for the Houston District, conducted a records review for the proposed project. No archeological historic properties, State Archeological Landmarks, State Historical Landmarks, nor properties eligible for listing on the National Record of Historic Places have been recorded within the APE of this proposed project. With the exception of some small slivers of Holocene Alluvium along the major drainages crossing the APE, the Geologic Atlas of Texas, Houston Sheet, depicts the proposed project APE entirely within an area mapped almost exclusively as Pleistocene Beaumont Formation. The Beaumont surface has negligible potential to contain artifacts dating from demonstrated, culturally relevant periods. The Soil Survey of Harris County, Texas and the Soil Survey of Galveston County, Texas depicts the APE as crossing an area that includes Bernard-Verland and Midland-Beaumont associated soils. These soils also include Edna, Lake Charles, Mocarey, and Morey soils. The Beaumont geologic formation is the parent material for these soils. The Houston PALM mapped the APE as predominately Map Unit #4 recommending no archeological survey needed. The remainder of the APE is mapped as Units #2 and #2a, recommending a surface survey and a survey of intact pimple mounds, respectively. The records review resulted in the identification of eighteen high probability areas (HPA) within the APE needing an intensive survey. Nine of these HPA required shovel-testing. Michael Baker, Jr., Inc. conducted the intensive survey during June 16-23, 2005.

Michael Baker, Jr., Inc. reported that no previously recorded sites are located within the APE for the proposed project and no archeological materials were encountered during the intensive survey. The consultant found the APE to be extensively disturbed. The consultant

recommended that no further archeological survey is warranted and the proposed project should be allowed to proceed to construction; a copy of their report is attached. TxDOT agrees with the consultant's recommendation.

The proposed project can proceed to construction.

Approved by _____ Date 4/5/06
For FHWA and TxDOT

Attachments

Original for 850: Colleen Harvey
Cc w/ attachments: PA project file; Stephen Shaw
Cc w/out attachments: ACB

HARRIS COUNTY

AMPHIBIANS

		Federal Status	State Status
Houston toad	*Bufo houstonensis*	LE	E

endemic; species sandy substrate, water in pools, ephemeral pools, stock tanks; breeds in spring especially after rains; burrows in soil when inactive; breeds February-June; associated with soils of the Sparta, Carrizo, Goliad, Queen City, Recklaw, Weches, and Willis geologic formations

BIRDS

		Federal Status	State Status
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	T

currently potential migrant through most of state, winters along gulf coast

Bald Eagle	*Haliaeetus leucocephalus*	LT-PDL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Black Rail *Laterallus jamaicensis*

salt, brackish, and freshwater marshes, pond borders, wet meadows, and grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia

Brown Pelican	*Pelecanus occidentalis*	LE	E

largely coastal and near shore areas, where it roosts and nests on islands and spoil banks

Henslow's Sparrow *Ammodramus henslowii*

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Mountain Plover *Charadrius montanus*

breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous

Peregrine Falcon	*Falco peregrinus*	DL	E T

subspecies (F p tundrius) potential migrant through most of state, winters along coast; subspecies (F p anatum) resident, nests in west Texas

Red-cockaded Woodpecker	*Picoides borealis*	LE	E

cavity nests in older pine (60+ years); forages in younger pine (30+ years); prefers longleaf, shortleaf, and loblolly

Southeastern Snowy Plover *Charadrius alexandrinus tenuirostris*

wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats

White-Faced Ibis	*Plegadis chihi*		T

prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

HARRIS COUNTY

BIRDS

		Federal Status	State Status
White-Tailed Hawk	*Buteo albicaudatus*		T

near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May

Whooping Crane	*rus americana*	LE	E

potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties

Wood Stork	*cteria americana*		T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

FISHES

		Federal Status	State Status
American eel	*Anguilla rostrata*		

coastal waterways below reservoirs to gulf; spawns January to February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; most aquatic habitats with access to ocean, muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries; diet varies widely, geographically, and seasonally

Creek chubsucker	*rim on oblongus*		T

tributaries of the Red, Sabine, Neches, Trinity, and San Jacinto rivers; small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in headwater rivulets or marshes; spawns in river mouths or pools, riffles, lake outlets, upstream creeks

MAMMALS

		Federal Status	State Status
Louisiana black bear	*rsus americanus luteolus*	LT	T

possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas

Plains spotted skunk	*plogale putorius interrupta*		

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

Rafinesque's big-eared bat	*Cor norhinus rafines uii*		T

roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

Red wolf	*Canis rufus*	LE	E

extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies

Southeastern myotis bat	*otis austroriparius*		

HARRIS COUNTY

MAMMALS

Federal Status State Status

roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

MOLLUSKS

Federal Status State Status

Little spectaclecase *illosa lienosa*

creeks, rivers, and reservoirs, sandy substrates in slight to moderate current, usually along the banks in slower currents; east Texas, Cypress through San Jacinto River basins

Louisiana pigtoe *Pleurobema riddellii*

streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins

Pistolgrip *ritogonia errucosa*

stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins

Rock-pocketbook *Arcidens confragosus*

mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins

Sandbank pocketbook *Lampsilis satura*

small to large rivers with moderate flows and swift current on gravel, gravel-sand, and sand bottoms; east Texas, Big Cypress Bayou south through San Jacinto River basins; Neches River

Texas pigtoe *Fusconaia as ewi*

rivers with mixed mud, sand, and fine gravel in protected areas associated with fallen trees or other structures; east Texas River basins, Sabine through Trinity rivers as well as San Jacinto River

Wabash pigtoe *Fusconaia fla a*

creeks to large rivers on mud, sand, and gravel from all habitats except deep shifting sands; found in moderate to swift current velocities; east Texas River basins, Red through San Jacinto River basins; elsewhere occurs in reservoirs and lakes with no flow

REPTILES

Federal Status State Status

Alligator snapping turtle *acrochel s temminc ii* T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Green sea turtle *Chelonia m das* LT T

Gulf and bay system

Leatherback sea turtle *ermochel s coriacea* LE E

Gulf and bay system

HARRIS COUNTY

REPTILES

		Federal Status	State Status
Loggerhead sea turtle	*Caretta caretta*	LT	T

Gulf and bay system

Smooth green snake	*Liochlorophis ernalis*		T

Gulf Coastal Plain; mesic coastal shortgrass prairie vegetation; prefers dense vegetation

Texas horned lizard	*Phr nosoma cornutum*		T

open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September

Timber/Canebrake rattlesnake	*Crotalus horridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

PLANTS

		Federal Status	State Status
Coastal gay-feather	*Liatris bracteata*		

endemic; black clay soils of prairie remnants; flowering in fall

Houston daisy	*a jac sonia aurea*		

endemic; seasonally wet, saline barren areas, around the base of mima mounds in coastal prairies, or barren to somewhat vegetated openings in grasslands, including pastures and roadsides, on loamy to sandy loam soils; flowering October-November

Texas meadow-rue	*halictrum texanum*		

endemic; mesic woodlands or forests, including wet ditches on partially shaded roadsides; flowering March-May

Texas prairie dawn	*H menox s texana*	LE	E

endemic; in poorly drained depressions or base of mima mounds in open grasslands or almost barren areas on slightly saline soils; flowering March-early April

Texas windmill-grass	*Chloris texensis*		

endemic; sandy to sandy loam soils in open to sometimes barren areas in prairies and grasslands, including ditches and roadsides; flowering in fall

Threeflower broomweed	*huro ia triflora*		

endemic; black clay soils of remnant grasslands, also tidal flats; flowering July-November

U.S. Fish & Wildlife Service

Endangered Species List

Back to Start

List of species by county for Texas:

Counties Selected: Harris

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Harris County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critical Habitat	More Info
bald eagle	*Haliaeetus leucocephalus*	Birds	AD, T				P
Texas prairie dawn-flower	*Hymenoxys texana*	Flowering Plants	E				P

GALVESTON COUNTY

BIRDS

		Federal Status	State Status
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	T

currently potential migrant through most of state, winters along gulf coast

Attwater's Greater Prairie-chicken	*mpanuchus cupido attwateri*	LE	E

this county within historic range; endemic; open prairies of mostly thick grass one to three feet tall; from near sea level to 200 feet along coastal plain on upper two-thirds of Texas coast; males form communal display flocks during late winter-early spring; booming grounds important; breeding February-July

Bald Eagle	*Haliaeetus leucocephalus*	LT-PDL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Black Rail *Laterallus jamaicensis*

salt, brackish, and freshwater marshes, pond borders, wet meadows, and grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia

Brown Pelican	*Pelecanus occidentalis*	LE	E

largely coastal and near shore areas, where it roosts and nests on islands and spoil banks

Eskimo Curlew	*umenius borealis*	LE	E

historic; nonbreeding: grasslands, pastures, plowed fields, and less frequently, marshes and mudflats

Henslow's Sparrow *Ammodramus henslowii*

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Mountain Plover *Charadrius montanus*

breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous

Peregrine Falcon	*Falco peregrinus*	DL	E T

subspecies (F p tundrius) potential migrant through most of state, winters along coast; subspecies (F p anatum) resident, nests in west Texas

Piping Plover	*Charadrius melodus*	LT	T

wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats

Reddish Egret	*gretta rufescens*		T

resident of the Texas Gulf Coast; brackish marshes and shallow salt ponds and tidal flats; nests on ground or in trees or bushes, on dry coastal islands in brushy thickets of yucca and prickly pear

Snowy Plover *Charadrius alexandrinus*

formerly an uncommon breeder in the Panhandle; potential migrant

GALVESTON COUNTY

BIRDS

		Federal Status	State Status
Southeastern Snowy Plover	*Charadrius alexandrinus tenuirostris*		

wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats

White-Faced Ibis	*Plegadis chihi*		T

prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

White-Tailed Hawk	*Buteo albicaudatus*		T

near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May

Whooping Crane	*rus americana*	LE	E

potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties

Wood Stork	*cteria americana*		T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

FISHES

		Federal Status	State Status
American eel	*Anguilla rostrata*		

coastal waterways below reservoirs to gulf; spawns January to February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; most aquatic habitats with access to ocean, muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries; diet varies widely, geographically, and seasonally

MAMMALS

		Federal Status	State Status
Louisiana black bear	*rsus americanus luteolus*	LT	T

possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas

Plains spotted skunk	*plogale putorius interrupta*		

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

Red wolf	*Canis rufus*	LE	E

extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies

West Indian manatee	*richechus manatus*	LE	E

Gulf and bay system; opportunistic, aquatic herbivore

GALVESTON COUNTY

MOLLUSKS

		Federal Status	State Status
Pistolgrip	*ritogonia errucosa*		

stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins

REPTILES

		Federal Status	State Status
Alligator snapping turtle	*acrochel s temminc ii*		T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Atlantic hawksbill sea turtle	*retmochel s imbricata*	LE	E

Gulf and bay system

Green sea turtle	*Chelonia m das*	LT	T

Gulf and bay system

Gulf Saltmarsh snake	*erodia clar ii*		

saline flats, coastal bays, and brackish river mouths

Kemp's Ridley sea turtle	*Lepidochel s empii*	LE	E

Gulf and bay system

Leatherback sea turtle	*ermochel s coriacea*	LE	E

Gulf and bay system

Loggerhead sea turtle	*Caretta caretta*	LT	T

Gulf and bay system

Texas diamondback terrapin	*alaclem s terrapin littoralis*		

coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier beaches; brackish and salt water; burrows into mud when inactive; may venture into lowlands at high tide

Texas horned lizard	*Phr nosoma cornutum*		T

open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September

Timber/Canebrake rattlesnake	*Crotalus horridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

PLANTS

		Federal Status	State Status
Coastal gay-feather	*Liatris bracteata*		

GALVESTON COUNTY

PLANTS

Federal Status State Status

endemic; black clay soils of prairie remnants; flowering in fall

Correll's false dragon-head *Ph sostegia correllii*

wet soils including riverbanks, streamsides, creekbeds, roadside ditches and irrigation channels; flowering June-July

Grand Prairie evening primrose *enothera pilosella ssp sessilis*

known in Texas from a single collection made in the 1850's from Galveston Island; elsewhere known from sandy soils in low rises in Mississippi Delta; flowering May-June

Houston daisy *a jac sonia aurea*

endemic; seasonally wet, saline barren areas, around the base of mima mounds in coastal prairies, or barren to somewhat vegetated openings in grasslands, including pastures and roadsides, on loamy to sandy loam soils; flowering October-November

Texas windmill-grass *Chloris texensis*

endemic; sandy to sandy loam soils in open to sometimes barren areas in prairies and grasslands, including ditches and roadsides; flowering in fall

Threeflower broomweed *huro ia triflora*

endemic; black clay soils of remnant grasslands, also tidal flats; flowering July-November

U.S. Fish & Wildlife Service

Endangered Species List

Back to Start

List of species by county for Texas:

Counties Selected: Galveston

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Galveston County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critical Habitat	More Info
Attwater's greater prairie-chicken	*Tympanuchus cupido attwateri*	Birds	E				
brown pelican	*Pelecanus occidentalis*	Birds	DM, E				
Eskimo curlew	*Numenius borealis*	Birds	E				
green sea turtle	*Chelonia mydas*	Reptiles	E, T				
hawksbill sea turtle	*Eretmochelys imbricata*	Reptiles	E				
Kemp's ridley sea turtle	*Lepidochelys kempii*	Reptiles	E				
leatherback sea turtle	*Dermochelys coriacea*	Reptiles	E				
loggerhead sea turtle	*Caretta caretta*	Reptiles	T				
piping Plover	*Charadrius melodus*	Birds	E, T			Final	

MEMORANDUM

Texas Department of Transportation

TO: Project Management 850 File
District: **Houston**
County: **Harris**
CSJ #: **0389-05-088**
Highway: **SH 146**
Project Limits: **From Red Bluff Road to FM 518**

Project Description: **Widen and improve 3.0 miles of SH 146 to include six-to ten-lane divided freeway with two three-lane frontage roads and express lanes in select locations, construct Shared Use bicycle/pedestrian path and 10-foot median separating path from SH 146 facility, approximately 39 acres of new ROW, no historic properties in APE**

FROM: **Heather D. Goodson** **DATE:** August 8, 2007

SUBJECT: Internal review under the Programmatic Agreement for Transportation Undertakings (PA-TU) among the Federal Highway Administration, Texas State Historic Preservation Officer, Advisory Council on Historic Preservation, and the Texas Department of Transportation; and the Memorandum of Understanding (MOU) between the Texas Historical Commission and the Texas Department of Transportation

---

The purpose of this memorandum is to document ENV Historians' determination that no additional Section 106 coordination is required for the proposed design change.

The Texas Department of Transportation (TxDOT), Harris District, proposes to widen a 3.0 mile segment of SH 146 from Red Bluff Road to FM 518 in Harris County, Texas. At its maximum width, the roadway would have four 12-foot travel lanes, 10-foot inside shoulders and 12-foot outside shoulders, five 12-foot frontage roads, and a Shared Use bike/ped path. The project would require approximately **39 acres of new ROW.** We previously consulted with THC regarding this project on December 6, 2005 (see attached letter) as part of a larger 23 mile widening project for SH 146. This segment of the project constitutes a northern section of the larger widening project. Since that consultation, a 10-foot Shared Use bicycle and pedestrian path has been added to the project. The path would extend the entire length of the segment on the west side of the facility. It would require **additional new ROW of 20 feet** between Red Bluff Road and FM 518. Please see attached typicals for detailed information.

Consultation with THC identified eighty-seven historic-age resources (pre-1966) within the limits of the APE for the larger 23-mile widening project. The APE for the project is 300 feet from the proposed right-of-way. Two of the sites were determined NRHP-eligible: Resource ID #48, a thru girder, swing bridge located over Dickinson Bayou and Resource ID #85, the Dow Chemical Plant in Texas City. The proposed project received a determination of **no adverse effect** to the eligible properties.

The addition of the Shared Use path and new ROW acquisitions for this segment of the project required an examination of whether the previous 300-foot APE should be extended to account for the new ROW requirements. TxDOT Historians determined that a larger APE was not required as it would not encompass any parcels that were not previously surveyed. As a result, the 300- foot APE used in the existing survey was deemed adequate for the purposes of this segment of the proposed project.

Additionally, the NRHP-eligible resources are outside of the APE for this 3.0 mile segment of the project; therefore, re-evaluation of effects to the eligible resources is not necessary.

Consequently, no additional Section 106 coordination is necessary because the 2005 survey adequately encompassed all parcels within the APE and the NRHP-eligible resources are outside of the APE for this 3.0-mile project segment.

cc:	District:	Houston	Attn: Joe Liggio
	ENV/CRM:	Reading File	
		Project File	
	~~THC:~~	~~Adrienne Campbell~~	

SEABROOK

18 September 2012

Mr. Pat Henry, PE
Director of Project Development
Texas Department of Transportation
P.O. Box 1386
Houston, TX 77251-1386

RE: **Alternative Bicycle Facility**

Dear Mr. Henry:

As you are aware, the City of Seabrook has requested that a bike lane not be included in the plans for State Highway 146 through the City of Seabrook. The reasons for this are two-fold.

First, the City believes that a bike lane located adjacent to thousands of commuter and commercial vehicles will not complement our existing system. Seabrook has an extensive 10-mile network of hike and bike trails that has become a major attraction for the City. Our trails connect the larger city to the Galveston Bay shoreline at Pine Gully Park, where we also have a 900-foot fishing pier. The trail system is home to the annual Lucky Trails Marathon and is prized by cyclists, tri-athletes, hikers, casual joggers, naturalists and bird-watchers. The City will eventually connect our trail system to that of the City of Pasadena along Red Bluff Road and the trails within the Armand Bayou Nature Center. Seabrook's trails accentuate the natural environment and provide recreation for residents and tourists; therefore, the City seeks a trail that would ideally be separated from the Highway, similar to our existing network.

Second, the elimination of the bike lane from the highway project will lessen the right-of-way taking. We hope that this will reduce project costs to the State and the impact to the local economy.

I have enclosed a map of the alternatives to a bike lane within the State right-of-way. The option represented by the red line can be implemented immediately at minimal costs. The option represented in yellow will require the cooperation of Centerpointe Energy as the route is illustrated within their easement.

Please let me know if can assist you with this or any other aspect of the SH 146 project.

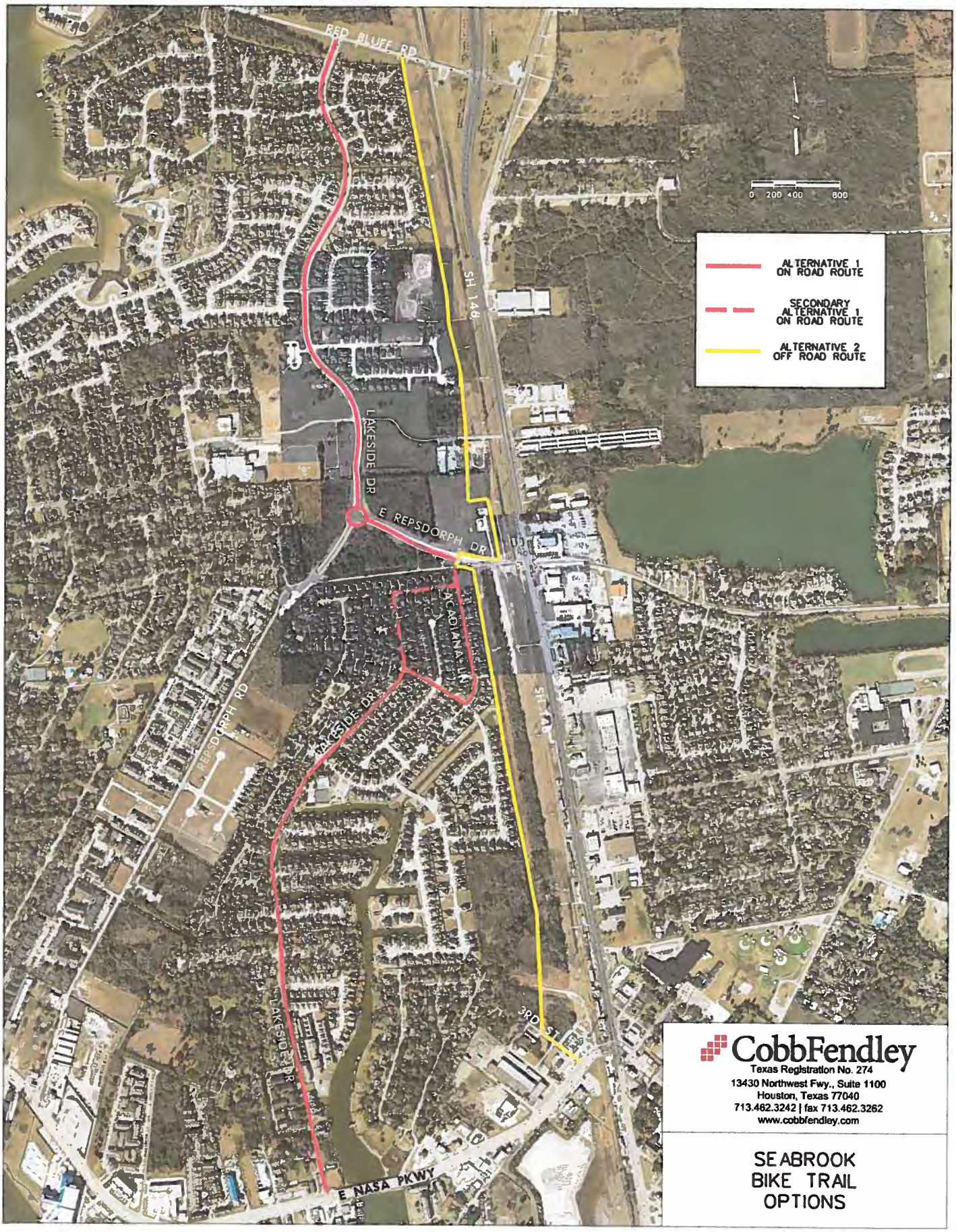
Sincerely,

Kelly E. Templin
City Manager

cc: Dale Conger, PE, City Engineer

Enclosure

1700 First Street, Seabrook TX 77586 281.291.5688 ph 281.291.5690 fax www.ci.seabrook.tx.us



CobbFendley
Texas Registration No. 274
13430 Northwest Fwy., Suite 1100
Houston, Texas 77040
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SEABROOK
BIKE TRAIL
OPTIONS

APPENDIX F
Supplemental Data

Table 1: Threatened and Endangered Species of Potential Occurrence in Harris County
Table 2: Threatened and Endangered Species of Potential Occurrence in Galveston County
Essential Fish Habitat and Relative Abundance of Managed Species within the Project Area

Table 1: Threatened and Endangered Species of Potential Occurrence in Harris County

Common Name (*Scientific Name*)	State Status	Federal Status	Description of Suitable Habitat	Unique, Critical, or Designated Habitat Present
AMPHIBIANS				
Houston toad (*Bufo houstonensis*)	E	E†	Sandy soil, breeds in ephemeral pools	No
BIRDS				
Arctic peregrine falcon (*Falco peregrinus tundrius*)	T	DM†	Potential migrant, winters along coast	No
Bald eagle [(1)] (*Haliaeetus leucocephalus*)	T	DM	Near water areas, in tall trees	No
Brown pelican (*Pelecanus occidentalis*)	E	E†	Roosts and nests on islands and near shore coastal areas	No
Peregrine falcon (*Falco peregrinus*)	E,T	DM†	Resident, nests in west Texas	No
Red-cockaded woodpecker (*Picoides borealis*)	E	E†	Cavity nests in older pine (60+ yrs); forages in younger pine (30+ yrs); prefers longleaf, shortleaf, and loblolly	No
White-faced ibis (*Plegadis chihi*)	T	*	Freshwater marshes, but some brackish or salt marshes	No
White-tailed hawk (*Buteo albicaudatus*)	T	*	Coastal prairies; cordgrass flats, scrub-live oak	No
Whooping crane (*rus Americana*)	E	E†	Winters in Aransas, Calhoun, and Refugio counties; potential migrant	No
Wood stork (*cteria Americana*)	T	*	Prairie ponds, flooded pastures, mud flats	No
FISHES				
Creek chubsucker (*rim on oblongus*	T	*	Variety of small rivers and creeks, prefers headwaters	No
MAMMALS				
Louisiana black bear (*Ursus americanus luteolus)*	T	T†	Bottomland hardwoods; large, undisturbed forested areas	No
Rafinesque's big-eared bat (*Corynorhinus rafinesquii)*	T	*	Cavity trees in hardwood forest, concrete culverts, abandoned buildings	No
Red wolf (*Canis rufus)*	E	E†	Extirpated; formerly eastern TX in brushy/forested areas, coastal prairies	No
REPTILES				
Alligator snapping turtle (*Macroclemys temminckii)*	T	*	Deep water of rivers, canals, lakes, swamps, and bayous	No
Green sea turtle (*Chelonia mydas)*	T	T†	Gulf and bay system	No
Leatherback sea turtle (*Dermochelys coriacea)*	E	E†	Gulf and bay system	No
Loggerhead sea turtle (*Caretta caretta)*	T	T†	Gulf and bay system	No
Smooth green snake (*Liochlorophis vernalis)*	T	*	Gulf coastal plain, mesic coastal shortgrass prairies, dense vegetation	No

Table 1, Cont.: Threatened and Endangered Species of Potential Occurrence in Harris County

Common Name (*Scientific Name*)	State Status	Federal Status	Description of Suitable Habitat	Unique, Critical, or Designated Habitat Present
REPTILES, cont.				
Texas horned lizard (*hrynosoma cornutum)*	T	*	Open, semi-arid regions, with sparse vegetation, grass, cactus, and brush.	No
Timber/canebrake rattlesnake (*Crotalus horridus)*	T	*	Swamps/floodplains of hardwood/upland pine	No
VASCULAR PLANTS				
Texas prairie dawn (*ymeno ys te ana)*	E	E	Poorly drained areas in open grasslands; pimple mounds	No

Sources: TPWD 2006, USFWS 2007.
Note:
* These species occur on the state listing of threatened or endangered species; however, they are not federally listed at this time by the U.S. Fish and Wildlife Service (accessed February 2007).
† These species are listed by the U.S. Wildlife Service, however, they are not listed to occur within this county by the Clear Lake office of the U.S. Fish and Wildlife Service (accessed February 2007).

(1) The bald eagle was delisted by the USFWS on August 8, 2007 and is no longer a federal threatened species; however, it will be monitored closely for at least the next five years, and is still afforded special protection under the MBTA and Eagle Act.

E = endangered, T = threatened, DM = delisted taxon, recovered, being monitored first five years

Table 2: Threatened and Endangered Species of Potential Occurrence in Galveston County

Common Name (*Scientific Name*)	State Status	Federal Status	Description of Suitable Habitat	Unique, Critical, or Designated Habitat Present
BIRDS				
Arctic peregrine falcon (*alco pere rinus tundrius*)	T	DM†	Potential migrant, winters along coast	No
Attwater's greater prairie-chicken (*ympanuchus cupido att ateri*)	E	E	Thick 1-3' tall grass from 0'-200' above sea level along coast	No
Bald eagle (1) (*aliaeetus leucocephalus*)	T	DM	Near water areas, in tall trees	No
Brown pelican (*elecanus occidentalis*)	E	DM, E	Island near coastal areas	No
Eskimo curlew (*umenius orealis*)	E	E	Nonbreeding; grasslands and pastures	No
Peregrine falcon (*alco pere rinus*)	E,T	DM†	Resident, nests in west Texas	No
Piping plover (*Charadrius melodus*)	T	E, T	Beach and bayside mud or salt flats	No
Reddish egret (*retta rufescens*)	T	*	Brackish marshes and tidal flats	No
White-faced ibis (*le adis chihi*)	T	*	Freshwater marshes, but some brackish or salt marshes	No
White-tailed hawk (*uteo al icaudatus*)	T	*	Coastal Prairies	No
Whooping crane (*rus americana*)	E	E†	Winters in Aransas NWR	No
Wood stork (*Mycteria americana*)	T	*	Prairie ponds and flooded pastures	No

Table 2, Cont.: Threatened and Endangered Species of Potential Occurrence in Galveston County

Common Name (*Scientific Name*)	State Status	Federal Status	Description of Suitable Habitat	Unique, Critical, or Designated Habitat Present
MAMMALS				
Louisiana black bear (*Ursus americanus luteolus*)	T	T†	Bottomland hardwoods; large, undisturbed forested areas	No
Red wolf (*Canis rufus*)	E	E†	Extirpated, eastern half of Texas in brushy and forested areas, coastal prairies	No
West Indian manatee (*richechus manatus*)	E	E†	Gulf and bay system	No
REPTILES				
Alligator snapping turtle (*Macroclemys temminckii*)	T	*	Deep water of rivers and canals	No
Atlantic hawksbill sea turtle (*retmochelys im ricata*)	E	E	Gulf and bay system	No
Green sea turtle (*Chelonia mydas*)	T	E, T	Gulf and bay system	No
Kemp's ridley sea turtle (*Lepidochelys kempii*)	E	E	Gulf and bay system	No
Leatherback sea turtle (*Dermochelys coriacea*)	E	E	Gulf and bay system	No
Loggerhead sea turtle (*Caretta caretta*)	T	T	Gulf and bay system	No
Texas horned lizard (*hrynosoma cornutum*)	T	*	Open, semi-arid regions, with bunch grass	No
Timber/canebrake rattlesnake (*Crotalus horridus*)	T	*	Swamps/floodplains of hardwood/upland pine	No

Sources: TPWD 2006, USFWS 2007.
Note:
* These species occur on the state listing of threatened or endangered species; however, they are not federally listed at this time by the U.S. Fish and Wildlife Service (accessed February 2007).
† These species are listed by the U.S. Wildlife Service, however, they are not listed to occur within this county by the Clear Lake office of the U.S. Fish and Wildlife Service (accessed February 2007).

(1) The bald eagle was delisted by the USFWS on August 8, 2007 and is no longer a federal threatened species; however, it will be monitored closely for at least the next five years, and is still afforded special protection under the MBTA and Eagle Act.

E = endangered, T = threatened, DM = delisted taxon, recovered, being monitored first five years

ESSENTIAL FISH HABITAT

Assessment of Managed Species

According to the Fishery Management Plans (FMPs), suitable habitats for postlarvae/juvenile and subadult brown shrimp (*arfantepenaeus a tecus*), juvenile pink shrimp (*arfantepenaeus duorarum*), postlarvae/juvenile and subadult white shrimp (*Litopenaeus setiferus*), postlarvae/juvenile, subadult and adult red drum (*Sciaenops ocellatus*), and juvenile Spanish mackerel (*Scom eromorus maculatus*) may be present within the vicinity of the proposed project.

The National Oceanic and Atmospheric Administration (NOAA) Fisheries Service developed relative abundance distribution maps of managed fishery species in the Gulf of Mexico and these maps were used to determine if a species would occur within Galveston Bay (Gulf of Mexico Fishery Management Council {GMFMC} 1998). **Table 1** summarizes relative abundance map information for each managed species within the project area with life stage and salinity season information (GMFMC 1998). The life stages are separated into juveniles and adults.

Table 1: Relative Abundance of Managed Species within the Proposed Project

Common Name	Scientific Name	Life Stage	Salinity Season	Relative Abundance
Brown shrimp	*arfantepenaeus a tecus*	Juvenile	April-June	Highly abundant
			July	Highly abundant
			August-October	Highly abundant
			November-March	Abundant
Brown shrimp	*arfantepenaeus a tecus*	Adult	April-June	Common
			July	Common
			August-October	Common
			November-March	Rare
White shrimp	*Litopenaeus setiferus*	Juvenile	April-June	Abundant
			July	Highly abundant
			August-October	Highly abundant
			November-March	Highly abundant
White shrimp	*Litopenaeus setiferus*	Adult	April-June	Rare
			July	Common
			August-October	Common
			November-March	Common
Pink shrimp	*arfantepenaeus duorarum*	Juvenile	April-June	Rare
			July	Not present
			August-October	Rare
			November-March	Rare
Pink shrimp	*arfantepenaeus duorarum*	Adult	April-June	Not present
			July	Not present
			August-October	Not present
			November-March	Not present
Red drum	*Sciaenops ocellatus*	Juvenile	April-June	Common
			July	Common
			August-October	Common
			November-March	Common
Red drum	*Sciaenops ocellatus*	Adult	April-June	Common
			July	Common
			August-October	Common
			November-March	Common

Table 1, Cont.: Relative Abundance of Managed Species within the Proposed Project

Common Name	Scientific Name	Life Stage	Salinity Season	Relative Abundance
Spanish mackerel	*Scom eromorus maculatus*	Juvenile	April-June	Common
			July	Common
			August-October	Common
			November-March	Not present
Spanish mackerel	*Scom eromorus maculatus*	Adult	April-June	Common
			July	Common
			August-October	Common
			November-March	Rare

According to the 2004 Texas Water Quality Inventory Status and Category of All Waters (Texas Commission of Environmental Quality {TCEQ}, May 13, 2005), Clear Lake is tidally influenced and was reviewed for potential effects to Essential Fish Habitat (EFH). This water body is hydrologically connected to the Galveston Bay system and has a silt mud bottom substrate. **Table 2** contains salinity range information collected for Clear Lake (TCEQ 2005).

Table 2: Salinity Range and Average Information Collected by TCEQ

Waterway	Location of Data Collection	Salinity Range (ppt)	Average Salinity (ppt)
Clear Lake	SH 146 Bridge	2-23	12

Source: TCEQ 2005. Collected October 1987 – July 2004
Note: ppt = parts per thousand

Marsh habitats adjacent to these waters are estuarine in nature. Typical vegetation observed includes saltgrass (*Distichlis spicata*), sea oxeye daisy (*orrichia frutescens*), saltmarsh cordgrass (*Spartina alterniflora*), saltmeadow cordgrass (*S patens*), gulf cordgrass (*S spartinae*), sticky flatsedge (*Cyperus ele ans*), perennial saltmarsh aster (*ster tenuifolius*), eastern false willow (*accharis halimifolia*), coastal water-hyssop (*acopa monnieri*), seacoast bulrush (*ol oschoenus ro ustus*), King Ranch bluestem (*othriochloa ischaemum*), Paraguayan windmill grass (*Chloris canterai*), erect dayflower (*Commelina erecta*), white spikerush (*leocharis al ida*), big-leaf sumpweed (*va frutescens*), Carolina sea lavender (*Limonium carolinianum*), loosestrife (*Lythrum lineare*), seashore paspalum (*aspalum va inatum*), common reed (*hra mites australis*), seaside goldenrod (*Solida o sempervirens*), seashore dropseed (*Sporo olus vir inicus*), and seepweed (*Suaeda conferta*). No submerged aquatic vegetation (seagrasses), algal meadows, or oyster reefs/beds were observed within the project area.

Brown shrimp are found in estuaries and offshore up to depths of 110 meters throughout the Gulf of Mexico and are most abundant in the central and western Gulf of Mexico. Brown shrimp larvae are demersal and occur offshore, migrate to shallow vegetated habitats and silty sand and non-vegetated mud bottoms in estuaries at the postlarval stage. Although brown shrimp have been collected at salinities as low as 0.2 parts per thousand (ppt), Venkatamariah et al. (1972) noted that at salinities under two ppt, brown shrimp are prone to disorientation and convulsive movements. Post-larval brown shrimp migrate toward estuaries in the early spring between February and April, with a minor peak in the fall. Although juvenile and sub-adult brown shrimp extend from secondary estuary channels out to the continental shelf, they prefer shallow estuarine areas, particularly the soft muddy areas associated with the plant-water interface. Habitats important to the juvenile brown shrimp are tidal marshes, particularly those with saltmarsh cordgrass (GMFMC 1998). Adult brown shrimp occur in water extending from mean-low tide

to the edge of the continental shelf and are associated with silt, muddy sand, and sandy substrate. Based on the relative abundance maps (see **Table 1**), EFH requirements, and habitats available in Clear Lake, postlarvae/juvenile and subadult brown shrimp may be present within the project area.

White shrimp are found in estuaries and out to depths of approximately 40 meters offshore in coastal waters extending from Florida's Big Bend area through Texas and are most abundant in the central and western Gulf of Mexico. Spawning takes place in offshore waters when salinities are at least 27 ppt (Perez-Farfante 1969). White shrimp eggs are demersal and larvae stages are planktonic, occurring in nearshore habitats. Peak recruitment of post-larvae into estuaries occurs from June through September. Postlarval white shrimp are benthic in the estuaries, where they seek muddy-sand bottoms and marshes with large quantities of decaying organic matter or vegetation. Juveniles are commonly found in all Gulf of Mexico estuaries from Texas to the Suwannee River in Florida. Laboratory experiments have shown that larvae can be successfully reared at a salinity range between 18 to 34 ppt (Perez-Farfante 1969). However, Muncy (1984) reported white shrimp in the northern Gulf of Mexico at a salinity of 0.42 ppt. As juvenile white shrimp mature, they migrate in late August and September from the estuaries to coastal areas. The adult white shrimp are benthic and inhabit nearshore gulf waters to depths less than 30 meters in soft mud or silt bottoms. Based on relative abundance maps (see **Table 1**), EFH requirements, and habitats available in Clear Lake, both postlarvae/juvenile and subadult white shrimp may be present within the project area. Due to the salinity range in Clear Lake, postlarvae/juvenile white shrimp are more likely to be present within the project area than subadult white shrimp.

Pink shrimp begin life as eggs in the Gulf of Mexico and migrate to estuaries as post larvae. As juveniles, they are commonly found in estuarine areas supporting seagrasses. Here they burrow into the substrate by day and emerge at night. Preferred substrates include coarse sand/shell/mud mixtures. Adults inhabit offshore marine waters with highest concentrations being found at depths of nine to 44 meters. Preferred substrates for adults are coarse sand and shell with a mixture of less than one percent organic matter. Throughout Texas, the pink shrimp is abundant in seagrass beds where salinity exceeds 20 ppt (Hill 2002). Seagrass habitat preferred by postlarvae/juvenile and subadult pink shrimp is absent in the proposed project area (GMFMC 1998). Based on the relative abundance maps (see **Table 1**), EFH requirements, and habitats available in Clear Lake, it is unlikely that postlarvae/juvenile or subadult pink shrimp will be present within the project area.

The red drum commonly occurs in all Gulf of Mexico estuaries in a variety of habitats and substrates. Habitats range from depths of 40 meters offshore to very shallow estuarine wetlands and substrates that include sand, mud, and oyster reefs, varying by life stage. The red drum tolerates salinity ranges from freshwater to highly saline water. Spawning occurs in deeper water near the mouths of bays and inlets and on the gulf side of barrier islands. Eggs hatch primarily in Gulf of Mexico waters and larvae are transported into estuaries where the fish mature before moving back to the Gulf of Mexico. Larval red drum are most abundant in estuaries from mid-August through November. Within the nursery areas of estuaries, larval, postlarval, and juveniles prefer areas protected from currents with submerged vegetation and a muddy bottom, but tolerate non-vegetated hard and soft bottom areas. Subadult red drum prefers the muddy bottoms or oyster reefs found in estuarine systems. The adult red drum can be found in estuaries but generally spend more time offshore as they age, existing with schools of fish in deep gulf waters. Optimum red drum habitat has been identified as shallow water with 50 to 75 percent submerged

vegetation growing on mud bottoms and fringed with emergent vegetation. Based on relative abundance maps (see **Table 1**), EFH requirements, and habitats available in Clear Lake, postlarvae/juvenile, subadult, and adult red drum may occur within the project area. However, the available habitat is suboptimal for postlarvae/juvenile red drum since submerged vegetation is not present.

The Spanish mackerel is a pelagic species occurring in depths up to 50 meters throughout the coastal zone of the Gulf of Mexico. Adults spawn offshore and larvae and juveniles are found offshore and occasionally in estuaries. Although they occur in waters of varying salinity, larvae and adults prefer areas of marine salinity and are not considered estuarine dependent. Adults are usually found in neritic waters and occasionally along coastal areas. Clean sand appears to be the substrate of preference for juveniles, which can be found offshore, in a beach system, or in estuaries. Both juveniles and adults feed on bony fish, such as anchovies (*nchoa* spp.), herrings (*pisthonema* spp.), menhaden (*revoortia* spp.), and squids (*Cephalopoda*) (Finucane et al. 1990). These prey are found mainly in marine environments, and it is unlikely that the Spanish mackerel will find food sources within the proposed project area. Based on relative abundance maps (see **Table 1**), EFH requirements, and habitats available in Clear Lake, juvenile Spanish mackerel may occur within the project area. However, there are limited food sources for juvenile Spanish mackerel, making it unlikely that the species will be found in the project area.

Based on the relative abundance maps (see **Table 1**), EFH requirements, and habitats available in Clear Lake, postlarvae/juvenile and subadult brown shrimp, postlarvae/juvenile, subadult, and adult red drum, postlarvae/juvenile and subadult white shrimp, and juvenile Spanish mackerel may be present within the project area. The available habitat is suboptimal for postlarvae/juvenile red drum since submerged vegetation is not present. Additionally, there are limited food sources for juvenile Spanish mackerel, making it unlikely that the species will be found in the project area. Due to the salinity range of the waterways, postlarvae/juvenile white shrimp are more likely to be present within the project area than subadult white shrimp. It is unlikely that postlarvae/juvenile or subadult pink shrimp will be present within the project area.

Environmental Consequences

Construction activities may temporarily increase sedimentation and turbidity of waters in the proposed project area. To minimize effects, Best Management Practices (BMPs) would be used to reduce potential turbidity and sedimentation. Construction activities may temporarily affect water quality, which could temporarily discourage habitat utilization by the brown shrimp, pink shrimp, and white shrimp. Following construction, recolonization of the habitats would occur; therefore only minimal effects to EFH are expected.

Amendments to the MSFCMA specifies that each Federal agency shall consult with NOAA Fisheries Service when an activity proposed to be permitted, funded, or undertaken by a federal agency may have adverse effects on designated EFH. The NOAA Fisheries Service Protected Resources Division was contacted for a list of federally protected species under their jurisdiction; no specific concerns were raised regarding effects to listed species or critical habitat (NOAA 2005). If adverse effects to EFH are discovered during design and finalization of water body effects, coordination will occur with NOAA Fisheries Service and a mitigation plan to offset adverse effects to EFH will be completed. According to the EFH findings between TxDOT, FHWA and NOAA Fisheries Service, the coordination for adverse effects to EFH may occur during the USACE permitting process as appropriate.