ENVIRONMENTAL ASSESSMENT

SH 36 / Spur 10

SH 36
FM 2218 TO FM 1495

SPUR 10
US 59 (S) TO SH 36

FORT BEND AND BRAZORIA COUNTIES

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

TEXAS DEPARTMENT OF TRANSPORTATION

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List of Acronyms

%	percent
ac	acre
ACHP	Advisory Council on Historic Preservation
ADT	average daily traffic
APE	area of potential effect
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
BG	block group
BHT	backhoe trenching
BMP	best management practice
C&G	curb and gutter
CAA	Clean Air Act
CBMB	Coastal Bottomland Mitigation Bank
CCWEP	Central Coast Wetlands Ecosystem Project
CDP	Census Designated Place
CEQ	Council on Environmental Quality
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CFR	Code of Federal Regulations
CMA	Congestion Management Analysis
CMAQ	Congestion mitigation and Air Quality Program
CMS	Congestion Management System
CMSA	Consolidated Metropolitan Statistical Area
CNRAs	Coastal Natural Resource Areas
CORRACTS	Corrective Action Activity Sites
CR	County Road
CT	census tract
CWA	Clean Water Act
CZMP	Coastal Zone Management Program
dB	decibel
dBA	A-weighted decibel
dbh	diameter at breast height
DHHS	Department of Health and Human Services
DPS	Department of Public Safety
EA	Environmental Assessment
EDR	Environmental Data Resources, Inc.
EFH	essential fish habitat
ENV	Environmental Affairs Division
EO	Executive Order
EPA	Environmental Protection Agency
EPIC	Environmental Permits, Issues, and Commitments
ERNS	Emergency Response Notification System
ESA	Environmental Site Assessment
ETC	estimated time of completion
FAC	facultative plants
FACW	facultative wetland plants
FBCAD	Fort Bend County Appraisal District
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FINDS	Facility Index System
FIRM	Flood Insurance Rate Map
FM	Farm-to-Market
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act

ft	feet
FY	fiscal year
GIS	Geographic Information System
GPS	Global Positioning System
H-GAC	Houston-Galveston Area Council
IH	Interstate Highway
in.	inch
ISD	Independent School District
Leq	equivalent sound level
LOS	Level of Service
LQG	large quantity generator
LUST	leaking underground storage tank
m	meter
mi	mile
MOU	Memorandum of Understanding
mph	miles per hour
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
MSATs	Mobile Source Air Toxics
NAC	Noise Abatement Criteria
NDD	Natural Diversity Database
NAAQS	National Air Quality Standards
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NFRAP	No Further Remedial Action Planned
NHPA	National Historic Preservation Act
NLEV	National Low Emission Vehicle
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPL	National Priority List
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NTCHS	National Technical Committee for Hydric Soils
NWP	Nationwide Permit
OBL	obligate plants
PA	Programmatic Agreement
PALM	Potential Archeological Liability Map
PS&E	Plan, Specifications and Estimates
PST	petroleum storage tank
RAATS	RCRA Administration Action Tracking System
RAZ	Regional Analysis Zone
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
RCW	Red-cockaded woodpecker
RECs	recognized environmental conditions
RFG	reformulated gasoline
ROW	Right-of-way
RRC	Railroad Commission of Texas
RTP	Regional Transportation Plan
RTHL	Recorded Texas Historic Landmarks
SAL	State Archeological Landmark
SCS	Soil Conservation Service
SH	State Highway
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SOC	species of concern

SQG	small quantity generator
SOV	single occupancy vehicle
SW3P	Storm Water Pollution Prevention Plan
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TCM	Traffic Control Measure
TDCJ	Texas Department of Criminal Justice
TDM	Travel Demand Management
THC	Texas Historical Commission
TIP	Transportation Improvement Program
TMA	Transportation Management Area
TNM	Traffic Noise Model
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
TRIS	Toxic Chemical Release Inventory
TSD	Treatment, Storage, and Disposal
TSCA	Toxic Substances Control Act
TSM	Transportation System Management
TSS	total suspended solids
TX IHW	Texas Industrial and Hazardous Waste
TxDOT	Texas Department of Transportation
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USCB	U.S. Census Bureau
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
UST	underground storage tank
VMT	vehicle miles traveled
vpd	vehicles per day
WMA	wildlife management area

I. INTRODUCTION

This Environmental Assessment (EA) discusses the social, economic, and environmental impacts of the proposed Texas Department of Transportation (TxDOT) improvements to State Highway 36 (SH 36) and Spur 10 (Hartledge Road). Proposed improvements to SH 36 extend approximately 51 miles (mi) from FM 2218 in Pleak, Fort Bend County, Texas south to FM 1495 in Freeport, Brazoria County, Texas. Proposed improvements to Spur 10 extend approximately 4 mi from US 59 in Rosenberg to SH 36 in Pleak, Fort Bend County, Texas (**Exhibits 1 and 2**). Total project length is approximately 55 mi.

The proposed roadway improvements would upgrade SH 36 and Spur 10, a designated hurricane evacuation route, to increase safety, access and mobility for the transportation of people and commercial goods in coastal areas in emergency situations. This project would also serve the local transportation needs of communities and towns within the project area, which include Rosenberg, Pleak, Needville, Guy, Damon, West Columbia, Brazoria, Jones Creek, and Freeport.

The proposed roadway would consist of a four-lane divided facility with a grassy center median in rural sections and a four-lane undivided facility with a continuous center left-turn lane in urban areas. Preliminary alternatives discussed in Section IV, Alternatives Analysis, include constructing Spur 10 in a new location or using the existing Hartledge Road alignment, widening the Spur 10 and SH 36 alignments equally to both sides along the existing alignment or widening to one side or the other, and a no-build alternative. Many of the preliminary alternatives, including the new location alternatives for Spur 10, were dismissed during the early planning stages in 1999 and 2000, due to public opposition and increased costs associated with new location alternatives. An environmental assessment (EA) was determined to be appropriate to analyze the remaining modified, or "best fit," build alternative and the no-build alternative. Approximately 795 acres (ac) of additional right-of-way (ROW) would be required to implement the preferred alternative and associated detention/floodplain mitigation areas for this project.

Construction is scheduled to begin in early 2009. Refer to **Appendix A** for a map and letting schedule for the proposed project on Spur 10 and SH 36. Estimated construction costs for the SH 36 improvements are $181,000,000 with an additional $34,200,000 for the Spur 10 area. Construction of the proposed project would be 80 percent (%) federally funded and 20% state funded. One section however would be 100% state funded. Local entities would be responsible for 100% funding of the utility relocations. The proposed project is listed in the 2025 Regional Transportation Plan (RTP) Update and the draft 2035 RTP. The project CSJs are also listed in the 2006-2008 Transportation Improvement Program (TIP) and Appendix D (D-92, D-93, and D-102) of the draft 2008-2011 TIP. The U.S. Department of Transportation (USDOT) found the fiscal year (FY) 2006-2008 and 2025 RTP to conform on October 31, 2005 and June 3, 2005 respectively. April 22, 2005 is the date of the Houston-Galveston Area Council's (H-GAC) adoption of the FY 2006-2008 with 2005 supplemental TIP and 2025 RTP.

Public involvement for the project, thus far, has included three rounds of public meetings and three limited public meetings. The first round of public meetings was held by TxDOT in September 1999 and consisted of two meetings, one at Needville High School and one at Brazoria Intermediate School. The results of these meetings indicated that the people living in the Spur 10 project area wanted additional alternatives for Spur 10. The previous proposed alternative consisted of widening the existing Spur 10/Hartledge Road facility. In September

2000, a Limited Public Meeting for the Spur 10 project area was held to present several alternatives for Spur 10/Hartledge Road. These alternatives included constructing Spur 10 on new location either to the north or the south of the existing Hartledge Road, or to widen the existing Spur 10/Hartledge Road. Refer to Section IV, Alternatives Analysis, for a more detailed description of these alternatives. Refer to **Appendix A** for a map of the Spur 10 project area and route alternatives.

The second round of public meetings was held in November 2000. Three meetings were held at Needville High School, First Baptist Church of Brazoria, and the Brazosport High School in Freeport. The purpose of these meetings was to present three proposed alternatives for the SH 36 alignment, including Spur 10. The second Limited Public Meeting was held in February 2001 for the town of Jones Creek. The purpose of this meeting was to present alternatives for the SH 36/Farm-to-Market Road (FM) 2004 interchange just north of the town of Jones Creek as well as present several roadway design options through the town of Jones Creek.

In April of 2001, a third round of public meetings was held to present the preferred alignment to the public. These meetings were held at the same locations as the second round of public meetings. This alignment consisted generally of a four-lane divided section with a grassy center median in rural areas and a four-lane undivided section with a continuous center left-turn lane in urban areas. In June 2001, a third Limited Public Meeting was held for the town of Jones Creek to present a refined alignment of SH 36 through Jones Creek based on comments received from the April 2001 public meetings.

II. NEED AND PURPOSE

Need: The following items are the focal points regarding the need for this project:

- Improved operational efficiency and safety
- Added capacity for projected population growth in the region; specifically north of the project corridor in Fort Bend County and south of the project corridor at the Port of Freeport in Brazoria County
- Improved mobility for hurricane evacuations
- Improved intermodal relationships with the Port of Freeport

Purpose: The purpose of the proposed project is to increase capacity and mobility and to improve the roadway design of the Spur 10 and SH 36 facilities. Additional travel lanes will accommodate for the projected increase in traffic volumes during hurricane evacuations and projected future corridor traffic demands. Improving the existing roadway design by adding dedicated turning lanes and improving intersections will better accommodate turning movements along the corridor, thus improving safety, efficiency, and mobility in the project area for local traffic and heavy truck traffic from the Port of Freeport.

A. Project Status

TxDOT is proposing roadway improvements to existing Hartledge/Gerken Road (Spur 10) and SH 36 to improve the operational efficiency and safety of the SH 36 facility, a designated hurricane evacuation route. Existing SH 36 is generally a north/south facility that connects many small communities from Rosenberg to Freeport within the project limits. The existing facility would be generally widened from two to four lanes and would include construction of overpasses at various locations.

The proposed project would eliminate the existing unsafe, undivided roadway by creating a divided roadway with a grassy center median or center left-turn lane that separates oncoming traffic. Additionally, the improvements would address other public safety and roadway deficiency problems that exist along the roadway. In Freeport, SH 36 leads to the Port of Freeport at FM 1495 where a non-signalized T-intersection is located. Heavy truck traffic related to the Port increases safety problems at this T-intersection. There are also numerous unsafe and less desirable intersections that would be improved by adding grade separations and improved roadway design at various locations within the project limits.

In addition to improving the operational efficiency and safety conditions of SH 36, the upgrading is warranted based on projected population growth both north and south of the project corridor, current and projected economic growth and development in the region, and the resulting projected increase in traffic volumes within the project limits.

B. System Linkage

SH 36 is a designated hurricane evacuation route and serves as a major route northward from Brazoria and Fort Bend counties. The Spur 10 portion of the project would connect directly with the existing Spur 10 north of US 59 to allow traffic to continue northward. The proposed roadway improvements are intended to improve the capacity and efficiency of the roadway

primarily for use as a hurricane evacuation route. This route is shown in the Hurricane Contingency Planning Guide, published by the Division of Emergency Management (Texas Department of Public Safety, 1999).

Within Brazoria County, there are four primary evacuation routes: SH 36, SH 35, SH 288, and FM 521. Within Fort Bend County, there are also four evacuation routes: SH 36, SH 6, US 90, and US 59. Refer to **Appendix A** for a map of hurricane evacuation routes across Fort Bend and Brazoria counties.

Fort Bend County is considered a "Reception" or "Host" county, meaning that it is inland and, in general, will supply shelter for citizens evacuating the coastal or "Evacuation" counties. Evacuation routes are established through the "Host" counties with local, county, and state police agencies coordinating the traffic control. The primary evacuation route in Fort Bend County is SH 36. The Brazoria County Office of Emergency Management and the Fort Bend County Office of Emergency Management organize evacuation procedures.

C. Mobility

Level of Service (LOS) is a qualitative measure describing operational conditions within a traffic stream and their perception by motorists or passengers. LOS definitions generally describe these conditions in terms of speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. The six service levels are graphically depicted below.

LOS A represents free flow.

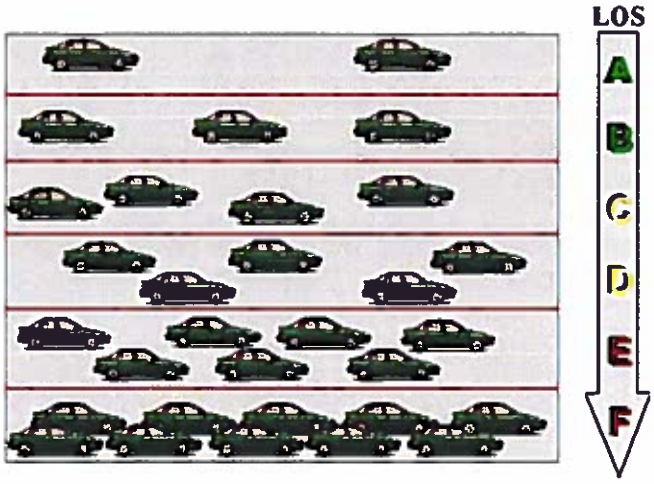
LOS B represents stable flow; presence of other users becomes noticeable

LOS C is in the range of stable flow; operation significantly affected by interaction with others.

LOS D represents high density but stable flow.

LOS E represents operating conditions at or near capacity

LOS F is forced or breakdown flow.



The existing SH 36 and Spur 10 facilities are two-lane, undivided roadways. The capacity of these roadways is not sufficient to meet the roadway and safety standards for a hurricane evacuation route. The current LOS for the existing SH 36 roadway during a hurricane evacuation is a level F. The current LOS for SH 36 under normal conditions is typically a level C or better. However, the H-GAC's *2006 Texas Metropolitan Mobility Plan* predicts that the SH 36 LOS will be a level F by 2025 and lists the SH 36 facility on the Prioritized List of Projects.

The SH 36 improvements would address the traffic volume increases projected for the year 2025. Existing average daily traffic (ADT) for the year 2005 and projected 2025 ADT for the project area are listed in **Table 1**.

Table 1: Spur 10 / SH 36 Traffic Volumes

Limits	2005 ADT (vpd)	2025 ADT (vpd)
SP 10: US 59 (S) to SH 36 (1.5 mi. S of Pleak)	1,191	2,923
SH 36: FM 2218 to Fort Bend/Brazoria county line	8,010	15,262
SH 36: Fort Bend/Brazoria county line to SH 35	4,871	9,525
SH 36: SH 35 to Union Pacific Railroad (UPRR)	10,283	16,453
SH 36: UPRR to Jones Creek	7,577	16,994
SH 36: Jones Creek to SH 288	8,118	14,938
SH 36: SH 288 to FM 1495	2,598	7,469

The Texas Transportation Institute (TTI) studied the hurricane evacuation routes in the TxDOT Houston District and published the *Recommended Practices for Hurricane Evacuation Traffic Operations for TxDOT* (2006). The designated evacuation corridors included SH 36 in Brazoria County to Breham, Texas. The report reads, in part:

> *The Houston-Galveston study area includes the counties of Brazoria, Galveston, and Harris; this represents over 3,500 square miles and 4.1 million residents according to 2003 population estimates and is the largest metropolitan area in Texas that is subject to hurricane threats. Prior to the remarkable 2005 hurricane season,* [Department of Public Safety] *DPS and emergency management officials from each of the three counties developed an updated evacuation plan which featured "channeled" evacuation corridors to expedite the movement of traffic away from the coastal region and the storm tidal surge zone. It is expected that these evacuation corridors will have limited access further inland, allowing evacuation traffic to proceed northward with very little interference from local traffic.*
>
> *Evacuating the Houston-Galveston area is unique in many respects. A major one is that evacuating the coastal region involves traveling through a major urban area. This complicates the movement of evacuees in that the roadways chosen as evacuation routes generally operate near capacity, and traffic demands often exceed capacity during peak commuter periods. In addition, some Houston area residents own property in the coastal region and may choose to drive to that area to secure and/or remove their belongings, returning to their Houston area homes using the evacuation routes.*

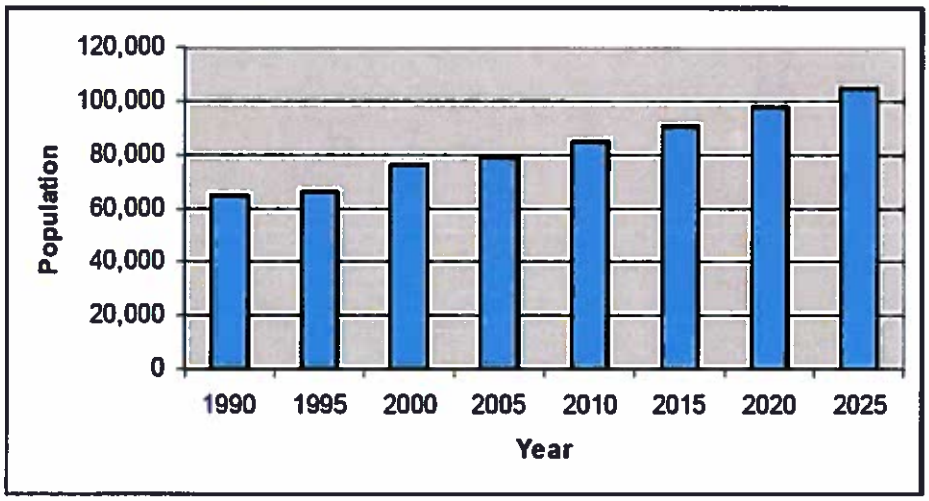
During the most recent hurricane evacuation event for Hurricane Rita in 2005, the LOS for the project area was estimated to be a level F. With mobility being a key component for a hurricane evacuation route, improvements to the existing SH 36 facility are needed to upgrade the LOS to a level C or better during hurricane evacuations.

D. Social Demands and Economic Development

Fort Bend County has experienced strong growth for a number of years. Fort Bend County was the fourth fastest growing county in Texas during the 1990s, increasing from a population of 225,421 in 1990 to 354,452 in 2000, a growth rate of 57.2%. Its proximity to Houston makes it a suburban county from which many residents commute to jobs in Houston and Harris County. In recent years, a number of commercial and industrial firms have established operations in Fort Bend County. Brazoria County has also experienced significant, but less dramatic growth during the 1990s. The County grew from a population of 191,707 in 1990 to 241,767 in 2000, a growth rate of 26.1%.

Fort Bend County is expected to grow dramatically at an average annual rate of 3.88% between 1990 and 2025. Brazoria County is expected to grow at an average annual rate of 1.42% over the same period. The SH 36 project area is expected grow at a relatively slow, but steady average annual rate of 0.52% (**Figure 1**).

Figure 1: Project Area Population Trends and Projections



Source: Year 1990 county population from USCB 1990; year 2000 population from USCB, *Census 2000*. Projections from H-GAC *2035 Regional Growth Forecast*.

The H-GAC prepared regional forecasts and county allocations for all 13 counties within the region into smaller areas called Regional Analysis Zones (RAZ). A RAZ is a grouping of adjacent census tracts. **Table 2** illustrates the population trends of Fort Bend and Brazoria counties as well as within the SH 36 project area based on the RAZ.

Table 2: Population Trends and Projections

Year	Brazoria County	Fort Bend County	SH 36 Project Area
		Population	
1990	191,707	225,421	64,361
1995	201,342	273,986	66,316
2000	241,767	354,452	76,464
2005	240,557	405,452	79,270
2010	257,416	463,697	84,582
2015	276,389	525,110	90,566
2020	297,885	591,294	97,383
2025	321,111	657,979	104,734
		Employment	
1990	70,790	50,214	32,954
2000	84,441	110,483	33,016
2005	91,759	129,301	34,638
2010	99,136	148,215	36,211
2015	105,123	163,499	37,444
2020	110,520	177,218	38,534
2025	115,789	190,553	39,568

Employment data not available for 1995.
Source: H-GAC Population Forecast 1990-2025

E. Modal Inter-relationships

SH 36 serves as a major transportation route for trucks importing and exporting commercial and industrial supplies to the Port of Freeport. The Port of Freeport is located at the intersection of SH 36 and FM 1495, the southern terminus of the project. Trucks transporting goods to and from this facility use SH 36 as a major north/south route. The Port is expected to grow both in facility size and import/export traffic in the future. In the U.S., the Port of Freeport is currently ranked 13th in foreign tonnage and 23rd in total tonnage (Port of Freeport, 2007). The Port is currently in the planning stages to add an additional 800,000-container capacity terminal to its facility and boasts 7,500 ac available for additional future development. The expansion of SH 36 would help to serve the Port and this area of the project by means of increased roadway capacity and safety considerations for the traveling public.

There are no airports or mass transit services located in or around the project area. Additionally, there are no serviceable rail facilities, other than those associated directly with the Port, which would interface with the proposed project.

F. Accidents/Safety Considerations

Statewide traffic accident rate data, compiled by TxDOT, indicate that Texas, overall, experienced a decrease in the number of accidents on state highways from 1995 to 1999; however, the most recent Motor Vehicle Traffic Accident Report compiled by the Texas DPS documents that Texas experienced an increase of the number of motor vehicle traffic fatalities. The largest increase of fatalities occurred on US Highways and State Highways with 33 more fatalities in 1998 than in 1997. The proposed SH 36 improvements address these safety considerations. Detailed accident data for SH 36 within the project area are provided for the years 1995 through 1999. The data indicate that in three out of the five years evaluated, SH 36 had a higher rate of accidents than the statewide average for Texas state highways. Roadway data was not available for Spur 10 (Hartledge/Gerken Road), therefore intersection data at SH 36/Hartledge Road is used for this analysis. There were no reported accidents at the US 59/Hartledge Road intersection. **Table 3** includes a list of accident rates per 100 million vehicle miles.

Table 3: Accident Rates Per 100 Million Vehicle Miles

LOCATION			ACCIDENT RATES				
General Area	From	To	1995	1996	1997	1998	1999
Spur 10							
Hartledge/Gerken Rd. and SH 36 Intersection			144.20	115.36	201.87	173.04	144.20
SH 36 (Rural)							
Rosenberg, Needville, and Guy	FM 2218 (MP 059)	Fort Bend/ Brazoria C/L (MP 173)	104.22	135.48	109.43	148.51	125.06
Damon and West Columbia	Fort Bend/Brazoria C/L (MP 001)	SH 35 (MP 132)	70.28	87.85	57.11	114.21	87.85
West Columbia and Brazoria	SH 35 (MP 139)	1.13 mi north of SH 332 (MP 219)	241.66	167.93	126.97	167.93	163.93
Brazoria and Jones Creek	1.13 mi north of SH 332 (MP 225)	Jones Creek Bridge (MP 330)	98.49	102.13	102.13	113.08	83.90
Freeport	Jones Creek Bridge (MP 338)	North of the Diversion Channel (MP 370)	95.19	59.49	95.19	142.79	47.60
Freeport	North of the Diversion Channel (MP 123)	FM 1495 (MP 131)	44.87	74.79	--	14.96	89.75
SH 36 Average			**109.19**	**104.61**	**98.17**	**116.91**	**99.70**
Statewide Rural Average			111.40	102.5	101.20	94.80	94.30

Traffic accident data were also reviewed in more detail, as available, for the years 1999-2001 to study the types of accidents occurring along the roadway. In this time period, the majority of accidents in the project area were vehicle-to-vehicle accidents. Fifty percent of vehicle-to-vehicle mainlane accidents were noted as having the center stripe or divider affecting the accident. Of the total number of accidents, 51% were intersection-related.

The proposed project would eliminate the existing unsafe, undivided roadway by creating a divided roadway with a grassy center median or center left-turn lane that separates oncoming traffic. There are also numerous unsafe and less desirable intersections that would be improved by adding grade separations and improved roadway design at various locations within the project limits.

G. Roadway Deficiencies

SH 36 and Spur 10 would be designed to current roadway standards for a hurricane evacuation route. Spur 10 and SH 36 roadway improvements warrant changes to the existing design for roadway deficiencies. Many of the cross-streets tie in with SH 36 at sharp angles. Therefore, the geometry of the intersections would be upgraded by straightening out the skew angle of the intersections.

For Spur 10, improved roadway hydraulics would increase the capacity of drainage features and allow for more positive flow of stormwater runoff in low-lying areas to help prevent flooding. The hydraulic design in some areas would be improved to increase the capacity of drainage features in low lying areas and bring the roadway to or above the 100-year flood level. Additionally, roadway designs would be upgraded to meet current standards. These designs include increasing the lane widths from 10 feet (ft) to 12 ft, adding shoulders, and flattening the existing unsafe, steep ditch side slopes. The bridges along SH 36 and Hartledge/Gerken Road are also deficient for highway standards of a designated hurricane evacuation route. These bridges do not have adequate railings, widths or structural capacities, and would have to be upgraded to current standards for the proposed roadway improvements.

III. PROJECT DESIGN

A. Project Location and Limits

The proposed SH 36 improvements begin with Spur 10 (Hartledge/Gerken Road), an extension of existing Spur 10 north of US 59, which extends from US 59 South along Hartledge/Gerken Road to the existing SH 36. An overpass at US 59 was constructed as part of another TxDOT project to link Spur 10 North and Spur 10 South. The environmental document for the Spur 10 overpass at US 59 was approved March 1, 2000. The improvements to SH 36 begin in Pleak, Fort Bend County, Texas at FM 2218 and extend south along SH 36 to FM 1495 in Freeport, Brazoria County, Texas.

B. Project Length

Roadway improvements would increase the existing roadways from two lanes to four lanes. The length of the project is approximately 55 mi, which includes improvements to 5 mi along Spur 10 and 50 mi along SH 36.

C. Type of Facility

Existing

The existing roadway is generally an undivided two-lane roadway with open ditches. The existing ROW width varies from 80 to 325 ft along the project route. Within the project limits, Spur 10 and SH 36 currently consist of an at-grade undivided two-lane roadway with shoulders and roadside ditches. SH 36 passes through several small towns where the typical sections of the roadway consist of four lanes. **Table 4** includes a list of the existing design for various roadway sections along the proposed project corridor.

Table 4: Existing Type of Facility

Section of SH 36 / Spur 10 Corridor	ROW (in ft)	Lanes	Shoulders	Median	Ditch/ Curb & Gutter	Sidewalk
SPUR 10						
Hartledge/Gerken Rd.	100	Two 10'	None	None	Ditch	No
SH 36						
FM 2218 to Old Needville-Fairchilds Rd.	100	Two 12'	Two 10'-outside	None	Ditch	No
Old Needville Fairchilds Rd. to FM 360	80	Two 12'	Two 10'-outside	None	Ditch	No
FM 360 to SH 35	100	Two 12'	Two 10'-outside	None	Ditch	No
SH 35 to FM 522	100-200	Four 12'	Two 12'-outside	14' flush	Ditch	No
From FM 522 to County Road (CR) 490	100-270	Two 12'	Two 10'-outside	None	Ditch	No
CR 490 to Elm St.	100	Two 11'	Two 9'-outside	None	Ditch	No
Elm St. to Centre St.	80	Two 12'	Two 9'-outside	14' flush	C&G	Yes
Centre St. to Live Oak St.	100-200	Two 12'	Two 10'-outside	None	Ditch	No
Live Oak St. to Peach Point Rd.	100	Four 11'	None	None	Ditch	No
Peach Point Rd. to CR 330	140-240	Two 12'	Two 10'-outside	None	Ditch	No
CR 330 to Old SH 36	180-240	Four 12'	Two 8'-outside	None	Ditch	No
From Old SH 36 to the Brazos River Diversion Channel Bridge	225	Two 12'	Two 8'-outside	None	Ditch	No
Brazos River Diversion Channel Bridge	325	Four 12'	Two 10'-outside	None	None	No
From the Brazos River Diversion Channel Bridge to FM 1495 (end of project)	325	Two 12'	Two 10'-outside	None	Ditch	No

Proposed

The proposed facility type for Spur 10 and SH 36 would be a rural four-lane divided roadway with a grassy center median and an undivided facility with a center left-turn lane in more urban areas. The majority of the project would be functionally classified as either a rural principal arterial facility, urban facility connecting links to rural arterials, or other urban principal arterial facilities.

The proposed roadway for rural areas would consist generally of an open ditch section with four 12-ft lanes, two 10-ft outside shoulders, two 8-ft inside shoulders and a 68 to 81-ft depressed grassy center median. For urban areas, the roadway would generally consist of four 12-ft lanes, a 14 to 16-ft flush median (center left-turn lane) with either ditches or a curb and gutter (C&G) design. **Table 5** lists the proposed design for various roadway sections throughout the length of the project. Refer to **Exhibit 3** for a view of the typical sections along SH 36 and Spur 10.

Table 5: Proposed Type of Facility

Section	Station Number	ROW (in ft)	Lanes	Shoulders	Median	Ditch/ C&G	Sidewalk
SPUR 10							
US 59 Frontage Rd. to Coon Creek	10+67 to 40+08	220	Four 12'	Two 10'-outside	14' flush	Ditch	No
Coon Creek to Horseshoe Rd.	40+08 to 251+07	220	Four 12'	Two 10'-outside Two 4' -inside	68' depressed	Ditch	No
Horseshoe Rd. to SH 36	251+07 to 261+58	229	Four 12'	Two 10'-outside	14' flush	Ditch	No
SH 36							
FM 2218 to Trinity Rd.	229+41 to 287+20	150	Four 12'	Two 10'-outside	16' flush	Ditch	No
Trinity Rd. to Kamas Ln. (Spur 10 / SH 36 intersection)	287+20 to 390+39	554	Four 12'	Two 10'-outside Two 8'-inside	76' depressed	Ditch	No
Kamas Ln. to north of Needville City Limits	390+39 to 564+00	220	Four 12'	Two 10'-outside Two 8' -inside	76' depressed	Ditch	No
North of Needville City Limits to FM 1236 (through Needville)	564+00 to 583+00	120	Four 12'	Two 2'- curb offsets	14' flush	C&G	Yes
FM 1236 to Needville / Fairchilds Rd.	583+00 to 640+00	95	Four 12'	Two 2'- curb offsets	14' flush	C&G	Yes
Needville / Fairchilds Rd. to Needville Southern City Limits	640+00 to 655+00	120	Four 12'	Two 10'-outside	16' flush	C&G	Yes
Needville Southern City Limits to south of FM 1994 (through Guy)	655+00 to 861+50	150	Four 12'	Two 10'-outside	16' flush	Ditch	No
South of FM 1994 to Fort Bend / Brazoria county line	861+50 to 992+44	260	Four 12'	Two 10'-outside Two 8'-inside	76' depressed	Ditch	No
Fort Bend / Brazoria county line to FM 1462	0+00 to 94+53	220	Four 12'	Two 10'-outside Two 8'-inside	65' depressed	Ditch	No
FM 1462 to CR 18 (through Damon)	94+53 to 180+87	150	Four 12'	Two 10'-outside	14' flush	Ditch	No
South of CR 18 to CR 467	180+87 to 658+12	220 (usual)	Four 12'	Two 10'-outside Two 8'-inside	71' depressed	Ditch	No
CR 467 to Dance St. (through West Columbia)	658+12 to 787+50	130-150+	Four 12'	Two 2' curb offsets	14' flush	C&G	Yes (North side only)
Dance St. to FM 522 (through West Columbia)	787+50 to 830+00	130-150+	Four 12'	Two 2' curb offsets	14' flush	C&G	No
South of FM 522 to North of CR 861	849+00 to 1029+00	220-310	Four 12'	Two 10'-outside Two 8'-inside	48' to 76' depressed	Ditch	No
South of CR 861 to CR 346	1044+00 to 1112+00	100	Four 11'	Two 4'-outside	12' Flush	Ditch	No

Section	Station Number	ROW (in ft)	Lanes	Shoulders	Median	Ditch/ C&G	Sidewalk
CR 346 to Gaines	1113+00 to 1158+00	100	Four 11'	Two 8'-outside	12' Flush	Ditch	No
South of Gaines to SH 332	1161+00 to 1165+00	100	Four 11'	Two 2'-outside	12' Flush	Ditch	No
Elm St. to Centre St.	1171+00 to 1199+00	80	Four 11'	Two 6'-outside	No	C&G	Yes
Centre St. to North of Mulberry St.	1213+00 to 1220+00	100	Four 11'	Two 6'-outside	No	C&G	No
North of Mulberry St. to North of CR 429	1220+00 to 1250+00	100-150	Four 11'	No	No	Ditch	No
CR 429 to North of Primrose St.	1272+00 to 1632+00	220-270	Four 12'	Two 10'-outside Two 8'-inside	76' depressed	Ditch	No
Live Oak to Atwood Lane	1645+00 to 1700+00	100	Four 12'	Two 2' curb offsets	12' flush	C&G	Yes
Atwood Lane to North of SH 288	1703+00 to 1920+00	150-316	Four 12'	Two 10'-outside	16' flush	Ditch	No
South of SH 288 to Velasco Blvd.	1983+00 to 1990+00	296-325	Four 12'	Two 10'-outside	12' flush	Ditch	No
Velasco Blvd. to North of Cherry	1992+00 to 2020+00	325	Four 12'	Two 10'-outside	4' flush	Ditch	No
North of Cherry to FM 1495	2024+00 to 2042+00	325	Four 12'	Two 10'-outside	12' flush	Ditch	No

The 55-mi roadway project would be divided into segments during construction, and these segments may be further divided into phases where overpasses would be constructed. Frontage roads may be constructed first at these overpasses to allow for uninterrupted traffic flow while the main lanes are under construction. Refer to **Table 1** for 2025 proposed traffic volumes.

The proposed project would generally follow the existing vertical and horizontal alignment except in areas where changes are required for design and safety standards or engineering/environmental constraints. Flush medians would allow for continuous left turning movements in urban areas. Turn lanes and crossovers would allow for turning movements throughout the divided rural roadway areas of SH 36. The intersections of SH 36 at Spur 10, SH 36 at FM 1301, and SH 36 at FM 2004 would be redesigned above-grade (grade separated), either in the current construction project or in future designs, while all other intersections would remain at grade. Additionally, the Brazos River Diversion Channel Bridge, currently a four-lane bridge, would not be altered during the construction of this project. Roadway segments through the town of Brazoria and from the town of Jones Creek to the end of the project at FM 1495 would be designed within the existing ROW.

IV. ALTERNATIVES ANALYSIS

Several alternative alignments were investigated for the SH 36 and Spur 10 (Hartledge / Gerken Road) roadway improvements. For Spur 10, the alternative alignments included widening existing Hartledge / Gerken Road and various new location alignments (Alternatives A, B, C, D, and E) within the Spur 10 project area (**Appendix A**). Additionally, three alternatives for the SH 36 alignment were investigated. These alternatives were evaluated along the existing alignment including an east, west, and center alignment to accommodate the roadway widening. The no-build alternative was also considered for SH 36 and Spur 10. Both design and environmental constraints were evaluated in determining the preferred alignment (**Exhibit 5**).

A. Spur 10

Spur 10 would connect to SH 36 at the northern end of the project and would extend northwest and tie into the existing Spur 10 north of US 59.

Widen Existing Hartledge Road (Preferred)
The proposed improvements to Spur 10 within the project limits of this alternative would consist of a four-lane divided rural roadway with a grassy median and open ditches along approximately 4 mi of the existing Hartledge Road alignment. The median openings would allow for left-turn movements; intersections would remain at grade. The total typical ROW width for this alternative is 220 ft. Approximately 57 ac of proposed ROW would need to be acquired from the north side of the road for this alignment. Refer to **Table 6** to view the various ROW alignments along Spur 10 and SH 36.

This alternative is the preferred alternative because it would not only accommodate the future traffic and safety needs of the area, but it would use the existing roadway rather than building a new roadway. By using the existing roadway, there would be a significant decrease in environmental impacts, ROW acquisition, and bisecting of properties. Refer to **Appendix A** for a list of the impact analyses of the Spur 10 alternatives.

Numerous design alternatives to the Spur 10 and SH 36 intersection were analyzed to determine the safest type of intersection and most effective intersection for traffic flow and turning movements. The preferred intersection would include an interchange allowing the SH 36 traffic to flow continuously on an overpass over Spur 10, whereas the Spur 10 traffic would have access onto SH 36 by signalized frontage roads. Other design options were considered for this intersection; however, they were not feasible once environmental and design impacts were quantified.

Alternative A
This alternative is a new location alternative northwest of the existing Hartledge Road and would include constructing Spur 10 on new location approximately 2,000 ft (0.38 mi) to the northwest of existing Hartledge Road from US 59 to the abandoned Southern Pacific Transportation Corporation Railroad (SPTC RR) easement. Alternative A would run parallel with the existing Hartledge Road until reaching the SPTC RR at which point it would connect to the existing SH 36 by one of three other alternatives C, D, or E.

This alternative was not preferred due to costs and environmental impacts that would result from constructing on new location which would require 220 ft of proposed ROW. Costs would

be greater for this new location alternative than the other alternatives evaluated in this area. Additionally, the environmental impacts and bisecting of farmlands were also greater for this alternative. A Limited Public Meeting held in September 2000 for the Spur 10 project area also showed that the general public was not in favor of constructing a new roadway.

Alternative B

Alternative B is a new location alternative southeast of existing Hartledge Road. This alternative was also not warranted for the same reasons as Alternative A. This alternative included constructing Spur 10 on new location approximately 2,600 ft (0.49 mi) to the southeast of the existing Hartledge Road from US 59 to the abandoned SPTC RR easement. Alternative B would also run parallel with the existing Hartledge Road until reaching the SPTC RR at which point it would connect to the existing SH 36 by one of three other alternatives C, D, or E.

Alternatives C, D, and E

Alternatives C, D, and E are new location alternatives south of the SPTC RR Easement. These alternatives were considered connecting alternatives south of the abandoned SPTC RR easement. These alternatives were also proposed on new location with 220 ft of ROW. These alternatives were quantified and compared independently from Alternative A, Alternative B, and existing Hartledge Road.

Alternative C, from the point at which Alternative A intersects the railroad easement, would travel south along the SPTC RR easement for approximately 2,000 ft (0.38 mi) and then turn southwest off of the easement and travel approximately 1.7 mi until it intersects with SH 36. Alternative C would be a continuation of Alternative B as it crosses over the railroad easement and then turns southwest to connect to SH 36. Alternative D, from the point at which Alternative A intersects the SPTC RR easement, would travel south along the easement for approximately 1.52 mi and then turn southwest and travel for approximately 1.33 mi until it intersects SH 36. Alternative D, from the point at which Alternative B intersects the SPTC RR, would travel approximately 3,000 ft (0.57 mi) along the easement and then turn southwest off of the easement for approximately 1.33 mi until it intersects with SH 36. Alternative E, from the point at which Alternative A intersects the SPTC RR, would travel approximately 2.18 mi along the easement and then turn southwest off of the easement and travels approximately 0.9 mi until it intersects SH 36. Alternative E, from the point at which Alternative B intersects the SPTC RR, would travel approximately 1.33 mi along the railroad easement before turning southwest off of the easement and traveling approximately 4,500 ft (0.85 mi) until it intersects SH 36.

These alternatives were not carried forward because of the increase in costs due to construction on new location and ROW acquisition, bisecting properties, farmlands, and residential communities, and a substantial increase in environmental impacts due to the number of additional stream crossings, forested areas and floodplain crossings.

All of the connecting alternatives would have required, at varying amounts, the use of the abandoned railroad easement which is currently owned by Reliant Energy-HL&P. Costs to purchase this property were not economically feasible for this proposed project.

B. SH 36 – Rural Areas

The preferred facility consists of a four-lane divided facility with open ditches and generally a 76-ft wide depressed center grassy median. **Table 5** shows a brief description of the proposed facilities throughout the length of the project.

Alternative 1 (Preferred)
This alternative is a combination of Alternatives 2, 3, and 4 described below. The alignment of this facility would vary throughout the project limits, based on the direction from SH 36 that proposed ROW is acquired. The variation in design, however, was based on current design and safety standards and impact analyses to the surrounding communities, travelling public and the environment. A concerted effort was made during the design phase to avoid numerous curves in the road, and at the same time, avoid numerous impacts to adjacent commercial and residential structures and various environmental constraints. Approximately 738 acres of ROW would be required for the preferred alternative. **Table 6** briefly summarizes the direction of the proposed ROW shifts along the project.

Alternative 2
This facility would center the alignment down the existing SH 36 facility thus dividing the additional ROW needs from both the west and east sides of the roadway. This alternative alone was not preferred due to environmental impacts, floodplain issues, displacements and design constraints.

Alternative 3
This facility would require additional ROW from the west side of the existing SH 36. This alternative alone was not warranted for the same reasons listed above in Alternative 2.

Alternative 4
This facility would require additional ROW needs from the east side of the existing SH 36. This alternative alone was not warranted for the same reasons listed above in Alternative 2.

Table 6: Proposed ROW Alignment Shifts

Section	Existing ROW Width (ft)	Proposed ROW Width (ft)	Proposed ROW Shift (direction)
Spur 10: Hartledge Rd. / Gerken Rd.	100	220	North
SH 36: FM 2218 to Foster School Rd.	100	Varies 150-220	West
SH 36: Foster School Rd. to N of School St.	100	220	East
SH 36: N of School St. to Old Needville / Fairchilds Rd.	100	120	West
SH 36: Old Needville / Fairchilds Rd. to Buffalo Creek	80	95	West
Buffalo Creek to FM 442	100	Varies 120-150	East
SH 36: FM 442 to Walcik Rd.	100	150	West
SH 36: Walcik Rd. to Vrilla Rd. / FM 1994	100	150	East
SH 36: Vrilla Rd. / FM 1994 south for approx. 0.4 mi; through Guy, TX	100	Varies 100-150	East
SH 36: Approx. 0.4 mi south of Vrilla Rd. to Richmond Rd. / FM 1462	100	220-260	East
SH 36: Richmond Rd. / FM 1462 through Damon, TX	100	150	West
SH 36: South of Damon to CR 467 / Hogg Ranch Rd.	100	220	West
SH 36: CR 467 / Hogg Ranch Rd. to FM 522	Varies 100-200	Varies 130-150	Centered
SH 36: FM 522 to CR 490 / Bernard St.	Varies 100-270	Varies 220-310	East
SH 36: CR 490 / Bernard St. through Brazoria, TX	Varies 80-100	Existing	None
SH 36: South of Brazoria to FM 2004 / FM 2611	150	Varies 220-270	West
SH 36: FM 2004 / FM 2611 to Live Oak Rd.	100-200	Varies 220-250	East
SH 36: Live Oak Rd. in Jones Creek to FM 1495	Varies 100-325	Existing	None

Note: North = Additional proposed ROW taken the north side of the existing road
East = Additional proposed ROW taken the east side of the existing road
West = Additional proposed ROW taken the west side of the existing road
Centered = Additional proposed ROW taken both the east and west sides of the road
Existing = No proposed ROW taken

C. SH 36 – Urban Areas

Alternatives within the urban areas along the project initially considered the east, west and center alignments and then further considered design alternatives to minimize impacts. **Exhibit 4**, shows the proposed preferred roadway alignment within the project limits and **Exhibit 3** shows the existing and proposed typical sections.

Needville
The preferred alternative through Needville would consist of a combination of east and west additional ROW based on the impact analyses. The preferred alternative for the town of Needville would consist of a curb and gutter section. This alternative was selected because it would impose the least amount of impacts to the town while accommodating the drainage needs resulting from the roadway improvements. An open-ditch section was not warranted because the location of the businesses and residences along the existing roadway were too close to accommodate the additional ROW needs for this type of design. However, they were not so close that a curb and gutter design could not expand the road.

Guy
The preferred alternative for the town of Guy would acquire additional ROW from the west side of the road. The town of Guy consists of less than 1 mi of frontage along SH 36. Within this town there is a gas station and a post office located on the east side of the road. Due to these constraints and their proximity to the existing roadway, taking additional ROW from the west side of the road resulted in the least amount of impact to this area.

Damon
The preferred alternative for the town of Damon would consist of an open ditch section with additional ROW acquisition from the west side of the existing roadway. Due to the proximity of the residences and businesses through this town, ROW acquisition to the west side created the least amount of impacts. The impact analyses show, in building displacements alone, the west ROW acquisition alignment displaced two residences and three commercial structures, while the center and east ROW alignments displaced three residences and seven commercial structures each.

West Columbia
The preferred alternative for the town of West Columbia would consist of a curb and gutter section with additional ROW needs for this alternative coming from the east side of the road where there would be the least amount of impacts to businesses and residences for the proposed alignment. The environmental impacts would also be the least on this side of the road because the woodlands and wetlands associated with Bell Creek are located on the west side of the road.

Brazoria
The preferred alternative for the town of Brazoria consists of adding two through lanes in each direction. The northern area of Brazoria would have an open ditch section, while the southern end of Brazoria would have a curb and gutter design. The proposed improvements are within the existing ROW through this area due to the location of several businesses and residences which are immediately adjacent to the road. Acquiring additional ROW is not proposed because widening the road beyond the existing ROW would impact every structure on both sides of the road. Further studies are planned as part of a separate TxDOT project to analyze a proposed new location bypass for the City of Brazoria.

Jones Creek

The preferred alternative for the town of Jones Creek is to widen within existing ROW and construct a curb and gutter facility. This alternative was selected because it would impose the least amount of impacts to the town while accommodating the drainage needs resulting from the roadway improvements. An open-ditch section was not warranted because the location of the businesses and residences along the existing roadway were too close to accommodate the additional ROW needs for this type of design. The impact analyses showed that the ROW required for an open ditch section would displace between 23 and 37 residences, three to seven businesses, and up to two churches. Additionally, the environmental impacts to wetlands, historical structures, parklands, and forested areas were not feasible for the acquisition of additional ROW in this area. Existing ROW was adequate to accommodate the undivided four-lane facility with a curb and gutter design.

D. No-Build Alternative

The no-build alternative would not improve the future safety and mobility needs of these areas of Fort Bend and Brazoria counties. SH 36 and future Spur 10 would serve as a hurricane evacuation route, evacuating citizens from the low-lying coastline in Freeport to US 59 in Fort Bend County. Due to current and future increases in population, a no-build alternative would not provide the safety standards for a roadway needed to evacuate the populations of these areas in the event of a major hurricane. In addition, the no-build alternative would not accommodate the mobility needs of the public resulting from increased growth of the Port of Freeport and towns along SH 36 within the project limits.

V. PROJECT SETTING

The project area, located in Fort Bend and Brazoria counties, lies within the Texas Gulf Coastal Plains. The land surface is nearly level with slopes that are generally south to southeast. Numerous creeks, bayous and tributaries of the Brazos and San Bernard Rivers drain the project area. The Brazos and San Bernard Rivers flow directly into the Gulf of Mexico while other creeks and tributaries drain into the bays adjacent to the Gulf of Mexico. Agriculture and petrochemical industries play a major role in the area and much of the landscape has been altered for farming, ranching or industrial uses.

A. Soils

Soils in the project area are predominantly clayey, somewhat poorly drained to poorly drained, and very slowly permeable. A few areas have coarser textured loam soils such as in the Asa-Norwood and the Katy-Waller soil associations. Soil series located along the project route include the following: Edna, Leton, Lake Charles, Bernard, Pledger, Asa, Norwood, Surfside, Ijam, Sumpf, Katy, Velasco and Waller. The mapped soil types within each of these soil series, which would be traversed by the project, are listed in **Table 7**. **Table 7** also details whether or not the soils are listed as hydric by the local Natural Resources Conservation Service (NRCS) and the National Technical Committee for Hydric Soils (NTCHS). Refer to **Appendix A** for a detailed description of the mapped soil types traversed by the SH 36 project.

Table 7: Mapped Soil Types Crossed by Proposed SH 36 and Associated Hydric Soil Status

Soil Series	Included Map Type	Hydric Status
	Spur 10: Hartledge / Gerken Rd.	
Lake Charles	Lake Charles clay, 0 to 1 percent slopes	Non-hydric
Edna	Edna fine sandy loam,0 to 1 percent slopes	Non-hydric
	Edna fine sandy loam, 1 to 5 percent slopes	Non-hydric
	Edna-Aris complex	Non-hydric
	Edna-Waller complex	Non-hydric
Bernard	Bernard clay loam, 0 to 1 percent slopes	Non-hydric
	Bernard-Edna complex	Non-hydric
	Bernard-Urban land complex	Non-hydric
	SH 36	
Lake Charles	Lake Charles clay, 0 to 1 percent slopes	Non-hydric
Edna	Edna fine sandy loam, 0 to 1 percent slopes	Non-hydric
	Edna fine sandy loam, 1 to 5 percent slopes	Non-hydric
	Edna-Aris complex	Non-hydric
	Edna-Waller complex	Non-hydric
Bernard	Bernard clay loam, 0 to 1 percent slopes	Non-hydric
	Bernard-Edna complex	Non-hydric
	Bernard-Urban land complex	Non-hydric
Velasco	Velasco clay	Hydric
Waller	Waller soils	Hydric
Katy	Katy fine sandy loam	Non-hydric
Sumpf	Sumpf clay	Hydric
Ijam	Ijam clay	Hydric
Surfside	Surfside clay	Hydric
Norwood	Norwood silt loam, 0 to 1 percent slopes	Non-hydric
	Norwood silt loam, 1 to 5 percent slopes	Non-hydric
Asa	Asa silty clay loam	Non-hydric
	Asa silt loam	Non-hydric
	Asa-Urban land complex	Non-hydric
Pledger	Pledger clay	Non-hydric
	Pledger-Urban land complex	Non-hydric
Leton	Leton-Aris complex	Hydric

B. Vegetation

The project area is located entirely within the Gulf Prairies and Marshes vegetational area. Within this vegetational area are four vegetation types, as described by the TPWD, which are traversed by the project. These vegetation types are marsh/barrier islands, bluestem grasslands, pecan-elm forests, and crops. Most of the vegetation along the proposed project corridor is consistent with these vegetation types. Beginning at the southern terminus of the project, coastal salt marsh areas exist adjacent to the roadway. Continuing north, the project area consists of a mixture of grasslands, shrublands, hardwood forests and woodlands. Grasslands occur in areas that have formerly been cultivated and only a few areas contain native grassland species. Shrublands typically occur where early successional species have colonized disturbed sites. Forests and woodlands occur as discontinuous stands which appear to be remnants of more extensive bottomland hardwood forests that once occupied much of the area, especially floodplain areas along creeks, streams and rivers. The project area is primarily rural and much of the land is cultivated for crops such as cotton, corn, milo and sorghum. The following sections briefly describe the grasslands, shrublands, forests and woodlands that would be potentially affected by the proposed project (McMahan et al.,1984).

Grasslands and Shrublands

The climax vegetation of the Gulf Prairies is largely grassland. The principal climax plants are tall grasses such as big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), eastern gamagrass (*Tripsacum dactyloides*), Gulf muhly (*Muhlenbergia capillaris*), several species of panic grass (*Panicum* spp.), paspalum (*Paspalum* spp.), and other tallgrass prairie grasses. The remaining plant community may include forbs such as Maximilian sunflower (*Helianthus maximiliani*), Gayfeather (*Liatris* spp.), Indian paintbrush (*Castilleja indivisa*), black-eyed Susan (*Rudbeckia hirta*), and prairie clover (*Lespedeza violacea*).

In heavily grazed areas, the climax vegetation may decrease while silver bluestem (*Bothriochloa longipaniculata)*, knotroot bristlegrass (*Setaria parviflora*) and longspike tridens (*Tridens strictus*) increase. Under continued heavy grazing, species such as broomsedge bluestem (*Andropogon virginicus)*, snow-on-the-prairie (*Euphorbia bicolor*), Buffalograss (*Buchloë dactyloides*), frog-fruit (Phyla spp.), smutgrass (*Sporobolus indicus*), annual weeds and grasses, and woody plants such as eastern baccharis (*Baccharis halimifolia*), Macartney rose (*Rosa bracteata*), rattlebush (*Sesbania drummondii*), Chinese tallow (*Sapium sebiferum*) and, in some areas, yaupon (*Ilex vomitoria*), mesquite (*Prosopsis glandulosa*) and huisache (*Acacia farnesiana*), invade the rangeland.

The coastal salt marsh areas typically support species of sedges (*Carex* spp.), flatsedges (*Cyperus* spp.), spikerushes (*Eleocharis* spp.), rushes (*Juncus* spp.), bulrushes (*Scirpus* spp.), several cordgrasses (*Spartina* spp.) and seashore saltgrass (*Distichlis* spicata).

Forests and Woodlands

Forests are defined here as vegetation areas dominated by trees where the canopy is essentially closed or continuous. Woodlands are areas where trees are dominant but substantial gaps occur between individual tree canopies.

Common species include sugar hackberry (*Celtis laevigata*), green ash (*Fraxinus pennsylvanica*), pecan (*Carya illinoensis*), sweetgum (*Liquidambar styraciflua*), water oak, (*Quercus nigra*), willow oak, (*Quercus phellos*), live oak, (*Quercus virginiana)*, American elm (*Ulmus americana*), deciduous holly (*Ilex decidua*), yaupon (*Ilex vomitoria*), black willow (*Salix nigra*), red mulberry (*Morus rubra*), wax myrtle (*Myrica cerifera*), cherry-laurel (*Prunus caroliniana*), sweetbay (*Persea borbonia*), red chokecherry (*Prunus virginiana*), short-leaf pine (*Pinus echinata*), rough-leaf dogwood (*Cornus drummondii*), and Chinese tallow (*Sapium sebiferum*).

Species composition in both the overstory and understory appears to be influenced by management practices such as selective clearing and livestock grazing in addition to soil type and other site characteristics. A few woodlands may reflect the original vegetation, but most woodlands appear to be altered as a result of selective clearing. Woodlands typically consist of live oak, pecan and water oak with a few elm and sugar hackberries.

VI. POTENTIAL SOCIAL, ECONOMIC, AND ENVIRONMENTAL EFFECTS OF THE PREFERRED ALTERNATIVE

A. ROW Acquisition / Displacements

Since approximately 795 ac of additional ROW would be required for the proposed SH 36 project, a number of residential and non-residential structures would need to be acquired. The displaced occupants of these structures would need to be relocated. TxDOT would be responsible for ROW acquisition. Acquisition and relocation assistance would be in accordance with the TxDOT Right-of-Way Acquisition and Relocation Assistance Program.

During the course of project development, a number of alternative alignments were studied. Estimated displacements resulting from these early planning alignments and the preferred alternative are shown in **Table 8**.

Table 8: Estimated Displacements for Early Planning Alignments and Preferred Alternative

Spur 10	Alignment A	Alignment B	Alignment C	Alignment D	Alignment E	Hartledge Road (Early Planning Alt.)	Preferred Alternative (Modified Best Fit)
Residential	1	0	2	2	1	23	13
Businesses	0	0	0	0	0	0	0
Churches	0	0	0	0	0	0	0
Schools	0	0	0	0	0	0	0
Barns							1
SH 36	**East Alignment**		**Center Alignment**		**West Alignment**		
Residential	120		146		176		48
Businesses	79		53		39		32
Churches	4		3		2		1
Schools	0		0		0		0

As the project design progressed, adjustments were made in the roadway alignment in an effort to minimize adverse impacts on the human and natural environments. The preferred alternative would displace an estimated 61 households, 32 businesses, one barn, and one church. The final total number of displacements will not be known until the ROW acquisition is completed after the next design phase. The households potentially displaced are single family homes. Approximately 20% of the displaced residences are rental homes, leaving the remaining approximately 80% as owner-occupied. It is estimated that 32% of the displaced households would be minority households and about 29% of the businesses would either be owned or would serve minority customers. More specifically, it is estimated that approximately 3% of the displaced households would be African American households and 25% would be Hispanic households. Similarly, about 2% of the displaced businesses would be owned or cater to African Americans and about 22% would be Hispanic owned or serving Hispanic customers. No significant changes in ethnic or minority employment opportunities are expected.

An estimated 39% of the householders are age 65 or older. This relatively high percentage suggests a potential community cohesion situation, since elderly persons tend to have greater attachments to their neighbors and local social institutions. During the relocation process, emphasis would be placed on finding appropriate housing in close proximity to the displacee's existing housing, if that is the displacee's preference. Given the amount of housing available in the area, no impact to community cohesion is anticipated. Persons with physical handicaps

represent an estimated 2.4% of the population. In contrast, the US Census Bureau indicated that 6.9% of the Texas population in 2000 had physical disabilities. Relocation of these persons is expected to be readily accomplished.

The church that would be relocated is the Greater St. Paul Missionary Baptist Church. This church is an African-American church, organized in 1867 (Wright, 2006). The church was rebuilt in 1966. As shown in **Exhibit 5** (page 61), the church is surrounded by undeveloped land. It is likely that the church structure could either be moved away from the SH 36 ROW on the existing church property or the church could be relocated to nearby undeveloped property. In this way, the church would remain in its present relative relationship to its parishioners. The church would continue serving its present function in the community. The alternative to acquiring the church property is displacing 10 households on the west side of SH 36.

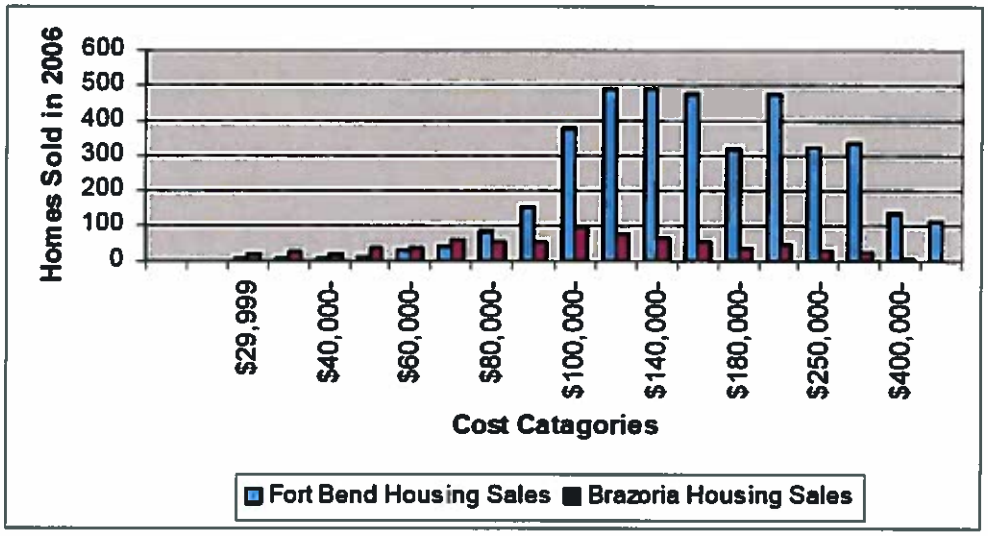
The absolute number of displacements will not be available until the precise ROW acquisition line is determined. However, the information presented is sufficient to adequately represent the magnitude of the potential impacts.

In March 2007, there were 735 houses listed for sale by the MLS in Brazoria County, a 6.2-month supply. The average price for the 135 houses sold in that month was $126,600 and the median price was $113,200. In that same month, 4,211 houses were listed for sale in Fort Bend County, a 4.2 month supply. The average price of the 936 houses sold in that month was $206,800 and the median price was $166,100.

The most detailed statistical data relating to trends in housing availability in the SH 36 corridor area is Census 2000. The census data can be utilized to demonstrate the order of magnitude concerning vacancy and availability of replacement housing. There were 439 vacant, for rent housing units and 229 vacant, for sale only housing in the project area, which is comprised of those census tracts which abut SH 36. Vacant-for-rent housing units in the census tracts adjacent to SH 36 were tabulated on the basis of rent asked. Housing units that were specified vacant-for-sale-only were tabulated on the basis of the asking price. Approximately 55% of the available rental housing units would rent for $350 per month or less and nearly 90% would rent for $600 per month or less. Nearly 57% of the vacant for sale only housing had an asking price of $50,000 or less and nearly 76% had an asking price of $100,000 or less.

During 2006, 3,853 homes were sold in Fort Bend County and 718 homes were sold in Brazoria County. Houses sold in Fort Bend County tend to be more expensive than those in Brazoria County. In 2006, the average price of the homes sold was $206,000; the median price was $170,600. In Brazoria County, the average price of homes sold in 2006 was $132,800 and the median price was $114,200. The price distribution of home sales is shown in **Figure 2.**

Figure 2: Price Distribution of MLS Homes Sold in Brazoria and Fort Bend Counties in 2006



Source: Real Estate Center at Texas A&M University. http://recenter.tamu.edu/data

It is anticipated that replacement housing would be readily available in the project area. It is expected that due to the length of the total project, the relocation process would extend over a period of several years, thus easing the relocation load that would be experienced at any given time. It is estimated that 65% of the displaced residents would be white, non-Hispanic residents, 22% would be Hispanic, and about 11% would be African-Americans.

Many of the businesses along SH 36 are located there because it is the main highway connecting the various cities and towns between Freeport and Richmond. Most of the businesses to be displaced are located outside of the built-up communities where undeveloped land would be available for relocation. It is expected that the majority of the displaced businesses would be successfully relocated to comparable locations.

The businesses that would likely need to be relocated range in type from gas stations to restaurants and drinking establishments to repair shops and small contractors' yards. These businesses employ from 5 to 15 employees each. Since the majority of the businesses are expected to be successfully relocated, the employees should not be adversely impacted.

In accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended and as contained in 49 Code of Federal Regulations (CFR), Part 24, Subparts C through F, TxDOT provides relocation resources to all displaced persons without discrimination. All property owners from whom property is needed are entitled to receive just compensation for their land and property. Just compensation is based upon the fair market value of the property. TxDOT also provides, through its Relocation Assistance Program, payment and services to aid in movement to a new location.

Relocation assistance is available to all individuals, families, businesses, farmers, and non-profit organizations displaced as a result of a State Highway project or other transportation project. This assistance applies to tenants as well as owners occupying the real property needed for the project. Replacement structures must be located in the same type of neighborhood and be equally accessible to public services and places of employment. The TxDOT Relocation Office would also provide assistance to displaced businesses and non-profit organizations to aid in

their satisfactory relocation with a minimum of delay and loss in earnings. The proposed project would proceed to construction only when all displaced families and businesses have been provided the opportunity to be relocated to adequate replacement sites. The available structures must also be open to persons regardless of race, color, religion, or nationality and be within the financial means of those individuals affected.

B. Regional Socioeconomic Data

Population data at the census tract block group (CT BG) level for the year 2000 from the US Department of Commerce, Census Bureau, has been used in this socioeconomic analysis. A block group (BG) is a statistical subdivision of a census tract (CT). BGs are the smallest geographical area for which the US Census Bureau (USCB) tabulates sample data from a decennial census. Year 2000 data is the most current census data available at the CT BG level of detail.

Employment and Income Data

The proposed project is located in the eastern portion of Fort Bend County and crosses the entire Brazoria County area, extending from US 59 southwest of Richmond to FM 1495 in Freeport. The Fort Bend County economy is primarily based on agri-business, petrochemicals, sulfur, sugar refining, and government service. Many residents commute from the SH 36 project area to work in Houston. Employers with 1,000 or more employees in Fort Bend County include Fort Bend ISD, Baker Petrolite, Lamar CISD, Schlumberger Technology Corporation, Fluor Corporation, Fort Bend County, Texas Instruments, Richmond State School, Texas Department of Criminal Justice, United Parcel Service, and Unocal (Greater Fort Bend Economic Council, 2006).

The Brazoria County economy is primarily based on the petroleum and chemical industry, fishing, tourism, and agri-business. The production of oil and gas is an important industry in Brazoria and Fort Bend Counties. The Damon Mound oil field, West Columbia oil field, and Needville oil and gas field lie within the project area (*Dallas Morning News*, 2003).

The bulk of Brazoria County's economic activity occurs in Brazosport, a community of nine cities including three SH 36 project area cities: Brazoria, Freeport, and Jones Creek. Brazosport is home to a major chemical facility complex, deepwater seaport, and commercial fishing industry. Major employers in the Brazosport area include Dow North America – Texas Operations, US Contractors, Texas Department of Criminal Justice, Brazosport ISD, Phillips 66, BASF, Amoco Chemical Company, and Monsanto Company.

Project area household income has been evaluated from two perspectives, overall distribution, and later, under Environmental Justice, those households below the poverty level. Houston-Galveston-Brazoria Consolidated Metropolitan Statistical Area (CMSA) household income was distributed into five income groups, based on the 16 income categories reported in *Census 2000*. Each income group includes as close to one-fifth of the households as is possible using the grouped data. The income groups are defined as follows:

- Low-income households: under $20,650
- Lower middle income households: $20,650 - $34,999
- Middle income households: $35,000 - $59,999
- Upper middle income households: $60,000 - $99,999

- Upper income households: $100,000 and over

The area traversed by SH 36 and the proposed extension of Spur 10 lies within 27 CT BGs. Eight of these CT BGs are located in Fort Bend County and 19 are located in Brazoria County. **Table 9** contains 1999 household income in the CT BGs along SH 36 in Brazoria and Fort Bend counties. Median household income ranges from $37,368 to $56,442 for the CT BGs in Fort Bend County and from $22,425 to $56,000 for the CT BGs in Brazoria County. Overall, the CT BGs in the Fort Bend County portion of the project area exhibit higher household incomes than are found in the CMSA, which had a median household income of $44,761. Those in the Brazoria County portion of the project area tend to be lower than those in the metropolitan area. Overall, the project area income is reasonably well distributed and is generally comparable to the metropolitan area distribution.

Table 9: Household Income for Census Tracts Within the Project Area for 1999

Area / Census Tract Block Group	Households	Mean Household Income in 1999	Median Household Income in 1999	Household Income <$20,000		Household Income ($20,000 - $34,999)		Household Income ($35,000 - $59,999)		Household Income ($60,000 - $99,999)		Household Income >$100,000	
				Number	%	Number	%	Number	%	Number	%	Number	%
Houston - Galveston - Brazoria CMSA	1,640,843	61,115	44,761	328,889	20%	310,658	19%	401,798	24%	351,155	21%	248,343	15%
Brazoria County	82,020	58,273	48,632	14,690	18%	14,172	17%	20,956	26%	21,058	26%	11,144	14%
Fort Bend County	111,164	78,765	63,831	11,894	11%	14,591	13%	25,203	23%	31,167	28%	28,309	25%
Project Area													
CT 6620, BG 2	350	32,884	26,552	124	35.4%	85	24.3%	88	25.1%	46	13.1%	7	2.0%
CT 6620, BG 3	345	49,297	42,938	58	16.8%	77	22.3%	91	26.4%	85	24.6%	34	9.9%
CT 6620, BG 4	246	56,126	56,000	31	12.6%	32	13.0%	66	26.8%	102	41.5%	15	6.1%
CT 6620, BG 5	408	38,560	33,056	124	30.4%	87	21.3%	118	28.9%	67	16.4%	12	2.9%
CT 6626, BG 1	242	44,368	35,278	50	20.7%	70	28.9%	72	29.8%	38	15.7%	12	5.0%
CT 6626, BG 2	358	57,409	47,321	92	25.7%	54	15.1%	67	18.7%	93	26.0%	52	14.5%
CT 6626, BG 3	345	46,352	38,583	96	27.8%	49	14.2%	79	22.9%	107	31.0%	14	4.1%
CT 6626, BG 4	353	46,256	35,924	85	24.1%	83	23.5%	72	20.4%	89	25.2%	24	6.8%
CT 6629, BG 1	461	39,884	33,942	170	36.9%	66	14.3%	111	24.1%	84	18.2%	30	6.5%
CT 6629, BG 2	541	46,991	45,542	99	18.3%	118	21.8%	167	30.9%	129	23.8%	28	5.2%
CT 6629, BG 3	453	52,412	51,797	104	23.0%	68	15.0%	111	24.5%	131	28.9%	39	8.6%
CT 6629, BG 4	232	42,900	36,667	56	24.1%	52	22.4%	75	32.3%	39	16.8%	10	4.3%
CT 6630, BG 1	367	61,352	51,964	55	15.0%	62	16.9%	101	27.5%	116	31.6%	33	9.0%
CT 6630, BG 2	369	45,903	37,417	96	26.0%	74	20.1%	76	20.6%	91	24.7%	32	8.7%
CT 6630, BG 3	453	52,412	51,797	104	23.0%	68	15.0%	111	24.5%	131	28.9%	39	8.6%
CT 6644, BG 6	561	41,216	22,425	232	41.4%	104	18.5%	133	23.7%	66	11.8%	26	4.6%
CT 6645, BG 1	352	49,164	37,167	69	19.6%	94	26.7%	92	26.1%	63	17.9%	34	9.7%
CT 6645, BG 2	242	59,274	44,500	45	18.6%	35	14.5%	70	28.9%	59	24.4%	33	13.6%
CT 6645, BG 3	481	45,487	40,298	105	21.8%	94	19.5%	155	32.2%	98	20.4%	29	6.0%
CT 6754, BG 2	821	57,410	50,677	147	17.9%	132	16.1%	189	23.0%	265	32.3%	88	10.7%
CT 6755, BG 1	633	54,295	43,036	125	19.7%	113	17.9%	185	29.2%	132	20.9%	78	12.3%
CT 6756, BG 1	895	59,474	52,824	96	10.7%	155	17.3%	274	30.6%	268	29.9%	102	11.4%
CT 6756, BG 2	618	71,429	56,442	58	9.4%	130	21.0%	132	21.4%	174	28.2%	124	20.1%
CT 6757, BG 1	606	51,165	48,333	120	19.8%	90	14.9%	202	33.3%	144	23.8%	50	8.3%
CT 6757, BG 2	640	45,245	37,368	175	27.3%	127	19.8%	139	21.7%	150	23.4%	49	7.7%
CT 6757, BG 3	375	57,290	48,594	57	15.2%	56	14.9%	117	31.2%	95	25.3%	50	13.3%
CT 6757, BG 4	385	55,072	49,258	83	21.6%	41	10.6%	127	33.0%	91	23.6%	43	11.2%
Project Area Total	11679	51,100	N/A	2552	21.9%	2148	18.4%	3109	26.6%	2822	24.2%	1048	9.0%

Source: USCB *Census 2000*. American FactFinder, http://factfinder.census.gov/ Tables P52, P53, and P54.

Land Values and Tax Base

Expanding the SH 36 highway to four lanes would have a positive effect on the value of adjacent properties. Improved accessibility, traffic flow, visibility, and safety are all likely benefits to land values. As new development occurs in the region (as shown in **Table 2**), the local tax base would be enhanced, tending to offset the relatively small tax base loss associated with ROW acquisition.

During actual construction, the proposed project would temporarily increase employment and income in the local economy as construction-related expenditures are magnified. The project is not expected to affect long-term employment or income levels.

Community Cohesion

Community cohesion is a term that refers to an aggregate quality of a residential area. Cohesion is a social attribute that indicates a sense of community, common responsibility, and social interaction within a limited geographic area. It is the degree to which residents have a sense of belonging to their neighborhood or community or a strong attachment to neighbors, groups, and institutions as a continual association over time.

Community cohesion would remain intact since Spur 10 and SH 36 are existing facilities, and widening the roadway would have a minimal divisive effect on area communities. Current development patterns along this corridor have existed for many years and appear to be well established and unlikely to change appreciably, except for the area near Rosenberg. Suburban development is beginning to occur in the area south of US 59. This area is in a state of transition from agricultural to suburban land use. While conversion of Hartledge Road from a narrow two-lane thoroughfare to a four-lane divided highway may result in short-term impacts to the rural community, in the long-term, the Hartledge Road area will likely experience effects from more extensive urban development planned just north of the project area, in Rosenberg and along US 59.

Relocation of residents and businesses could be a community cohesion impact if it meant removing significant numbers of residents from their neighborhoods or communities or depriving the residents of certain neighborhoods or communities of the retail establishments serving their needs. This is not expected to occur as a result of the proposed SH 36 / Spur 10 improvements. An estimated 39% of the householders are age 65 or older. This relatively high percentage suggests a potential community cohesion situation, since elderly persons tend to have greater attachments to their neighbors and local social institutions. During the relocation process, emphasis would be placed on finding appropriate housing in close proximity to the displacee's existing housing, if that is the displacee's preference. Given the amount of housing available in the area, no impact to community cohesion is anticipated. Persons with physical handicaps represent an estimated 2.4% of the population. In contrast, the US Census Bureau indicated that 6.9% of the Texas population in 2000 had physical disabilities. Relocation of these persons is expected to be readily accomplished.

Environmental Justice

This evaluation addresses the requirements of Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*. EO 13166, *Improving Access to Services for Limited English Proficiency* (LEP) and Title VI, Civil Rights Act of 1964, and the Civil Rights Restoration Act of 1987. In response to EO 12898, signed by President

Clinton on February 11, 1994, the USDOT developed an environmental justice strategy that follows within the framework of the National Environmental Policy Act (NEPA) and Title VI of the Civil Rights Restoration Act of 1987. The USDOT Order on Environmental Justice defines minority as a person who is:

- Black or African-American (a person having origins in any of the black racial groups of Africa);
- Hispanic (a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race);
- Asian American (a person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the pacific Islands); or
- American Indian or Alaska Native (a person having origins in any of the original peoples of North America and who maintains cultural identification through tribal affiliation or community recognition) (USDOT 1997).

Ethnicity, race, income, and poverty data from *Census 2000* were used to identify CT BGs that met thresholds established for minority and low-income populations. The minority and low-income thresholds used to identify areas of environmental justice concern were based on CT BG data from the *Census 2000*.

The income and racial/ethnic characteristics of the Houston-Galveston-Brazoria CMSA serve as the general population or as the base condition for this analysis. Minority populations are identified as those in which the percentage of minority persons reaches or exceeds 50%. The primary minority groups encountered in the project area are non-Hispanic African Americans and Hispanics or Latinos. CT BGs in which the percentage of the population that is non-Hispanic African American or Hispanic reaches or exceeds 50% are considered to be environmental justice areas. A disproportionate impact results from an environmental hazard when the risk or rate of exposure for a minority or low-income population appreciably exceeds or is likely to appreciably exceed the magnitude of the risk or rate of exposure for the general population and, where available, to another appropriate comparison group.

As shown in **Table 10**, the project area is predominantly inhabited by non-Hispanic white persons. Population data from the *Census 2000* at the CT BG level from the US Department of Commerce, USCB, was in this analysis.

Overall, the minority population in the project area accounts for 31% of the population, and ranges from 6% in BG 4 of CT 6629 to 79% in BG 3 of CT 6630. Approximately 21% of the project area population is Hispanic. The Federal government considers race and Hispanic origin to be two separate and distinct concepts. As a result, *Census 2000* uses the Office of Management and Budget (OMB) definition of Hispanic or Latino to be "a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race."

The one CT BG within the project area for which the percentage of African Americans approaches 50% is BG 3 in CT 6630. The population in this CT BG is comprised entirely of inmates in the Texas Department of Criminal Justice (TDCJ) Clemens Unit. Only one of the project area CT BGs contains a Hispanic population that exceeds 50%, BG 1 in CT 6755 in the Needville area.

Table 10: Racial and Ethnic Percentages of Census Tracts Along SH 36 in Year 2000

Area / Census Tract Block Group	Total Population	Population of One Race / Not Hispanic or Latino				Other / Two or More Races	Hispanic or Latino*	Total Minority Population
		White	Black or African American Alone	American Indian and Alaska Native Alone	Asian and Pacific Islander			
Houston - Galveston - Brazoria CMSA	4,669,571	2,236,569	776,907	12,635	223,608	70,346	1,349,506	2,433,002
	100%	*48%*	*17%*	*0%*	*5%*	*2%*	*29%*	*52%*
Brazoria County	241,767	157,936	19,973	904	4,751	3,169	55,034	83,831
	100%	65%	8%	0%	2%	1%	23%	35%
Fort Bend County	354,452	279,666	69,992	892	38,804	6,207	74,786	74786
	100%	*79%*	*20%*	*0%*	*11%*	*2%*	*21%*	*21%*
CT 6620, BG 2	855	380	177	0	17	0	281	475
	100%	*44%*	*21%*	*0%*	*2%*	*0%*	*33%*	*56%*
CT 6620, BG 3	1025	906	43	0	0	0	76	119
	100%	*88%*	*4%*	*0%*	*0%*	*0%*	*7%*	*12%*
CT 6620, BG 4	667	579	13	0	0	9	66	88
	100%	*87%*	*2%*	*0%*	*0%*	*1%*	*10%*	*13%*
CT 6620, BG 5	1041	797	0	2	3	12	227	244
	100%	*77%*	*0%*	*0%*	*0%*	*1%*	*22%*	*23%*
CT 6626, BG 1	780	529	36	9	0	0	206	251
	100%	*68%*	*5%*	*1%*	*0%*	*0%*	*26%*	*32%*
CT 6626, BG 2	827	639	75	0	42	12	59	188
	100%	*77%*	*9%*	*0%*	*5%*	*1%*	*7%*	*23%*
CT 6626, BG 3	902	775	43	0	0	22	62	127
	100%	*86%*	*5%*	*0%*	*0%*	*2%*	*7%*	*14%*
CT 6626, BG 4	962	746	130	0	11	29	46	216
	100%	*78%*	*14%*	*0%*	*1%*	*3%*	*5%*	*22%*
CT 6629, BG 1	1182	787	261	10	10	35	79	395
	100%	*67%*	*22%*	*1%*	*1%*	*3%*	*7%*	*33%*
CT 6629, BG 2	1,490	1,257	39	0	13	25	156	233
	100%	*84%*	*3%*	*0%*	*1%*	*2%*	*10%*	*16%*
CT 6629, BG 3	1,399	960	130	0	0	7	302	439
	100%	*69%*	*9%*	*0%*	*0%*	*1%*	*22%*	*31%*
CT 6629, BG 4	595	561	8	0	0	5	21	34
	100%	*94%*	*1%*	*0%*	*0%*	*1%*	*4%*	*6%*
CT 6630, BG 1	1,017	848	9	11	4	23	122	169
	100%	*83%*	*1%*	*1%*	*0%*	*2%*	*12%*	*17%*
CT 6630, BG 2	971	773	23	18	0	47	110	198
	100%	*80%*	*2%*	*2%*	*0%*	*5%*	*11%*	*20%*
CT 6630, BG 3**	1,124	235	528	0	9	0	352	889
	100%	*21%*	*47%*	*0%*	*1%*	*0%*	*31%*	*79%*
CT 6644, BG 6	1,267	718	252	0	0	0	297	549
	100%	*57%*	*20%*	*0%*	*0%*	*0%*	*23%*	*43%*
CT 6645, BG 1	1,006	749	84	5	0	25	143	257
	100%	*74%*	*8%*	*0%*	*0%*	*2%*	*14%*	*26%*
CT 6645, BG 2	615	543	0	5	7	32	28	72
	100%	*88%*	*0%*	*1%*	*1%*	*5%*	*5%*	*12%*
CT 6645, BG 3	1,333	1,009	8	7	9	4	296	324
	100%	*76%*	*1%*	*1%*	*1%*	*0%*	*22%*	*24%*

CSJs: 0187-05-050, 0188-02-029, 0188-03-019, 0188-04-035, 0188-04-025, 0188-05-027, 0188-06-046, 0111-08-100, 0187-05-048, 0188-04-044, and 0188-02-036

Area / Census Tract Block Group	Total Population	Population of One Race / Not Hispanic or Latino				Other / Two or More Races	Hispanic or Latino*	Total Minority Population
		White	Black or African American Alone	American Indian and Alaska Native Alone	Asian and Pacific Islander			
CT 6754, BG 2	2,622	1,602	36	0	0	14	970	1,020
	100%	*61%*	*1%*	*0%*	*0%*	*1%*	*37%*	*39%*
CT 6755, BG 1	2,062	922	34	0	15	32	1,059	1,140
	100%	*45%*	*2%*	*0%*	*1%*	*2%*	*51%*	*55%*
CT 6756, BG 1	2,773	2,077	114	5	13	46	518	696
	100%	*75%*	*4%*	*0%*	*0%*	*2%*	*19%*	*25%*
CT 6756, BG 2	1,745	1,443	12	0	23	45	222	302
	100%	*83%*	*1%*	*0%*	*1%*	*3%*	*13%*	*17%*
CT 6757, BG 1	1,842	1,104	43	8	32	45	610	738
	100%	*60%*	*2%*	*0%*	*2%*	*2%*	*33%*	*40%*
CT 6757, BG 2	1,872	935	344	0	0	34	559	937
	100%	*50%*	*18%*	*0%*	*0%*	*2%*	*30%*	*50%*
CT 6757, BG 3	985	857	0	0	14	0	114	128
	100%	*87%*	*0%*	*0%*	*1%*	*0%*	*12%*	*13%*
CT 6757, BG 4	1,072	836	87	0	0	8	141	236
	100%	*78%*	*8%*	*0%*	*0%*	*1%*	*13%*	*22%*
Total Project Area	34,031	23,567	2,529	80	222	511	7,122	10,464
	100%	*69%*	*7%*	*0%*	*1%*	*2%*	*21%*	*31%*

*Of any race. ** CT 6630, BG 3 consists only of the TDCJ Clemson Unit
Source: USCB *Census 2000*. American FactFinder, http://factfinder.census.gov/ Table P7.

Low-income is defined as a household income at or below the US Department of Health and Human Services (DHHS) poverty guidelines (2007). These data constitute a statistical version that measures the number of households with income below the threshold for that size household. The DHHS 2007 poverty guideline for a family of four is $20,650. The DHHS poverty guidelines are an administrative version of the poverty measure and are used in determining financial eligibility for certain federal programs. Only the decennial census provides poverty data for small areas such as CTs and CT BGs. Annual updates from the USCB and the DHHS are available only down to the county level. As a result, CT BG data from *Census 2000* was used in this analysis to define conditions in the project area.

Federal Highway Administration (FHWA) Order 6640.23 defines a low-income population as any readily identifiable group of low-income persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or native Americans) who would be similarly affected by a proposed FHWA program, policy, or activity.

A comparison of median household income and poverty status is shown in **Table 11**. The project area is somewhat less affluent than the CMSA, primarily due to the small proportion of households in the high income (over $100,000) category. Median household incomes for the CT BGs comprising the project area ranged from $22,425 to $56,442 in 1999. In that year, 1,265 of the 11,679 households in the project area, or 10.8% were below the poverty level. The two CT BGs with the lowest median household income had meaningfully greater proportions of below poverty level households.

Table 11: Low-Income Population

County / Project Area Census Tract Block Group	Total Households	Median Household Income in 1999	Income in 1999 Below Poverty Level	Households Below Poverty Level (%)
Houston - Galveston - Brazoria CMSA	1,640,843	$44,761	200,686	12.2%
Brazoria County	82,020	$48,632	7,971	9.7%
Ft. Bend County	111,164	$63,831	7,094	6.4%
Project Area				
CT 6620, BG 2	350	$26,552	66	18.9%
CT 6620, BG 3	345	$42,938	52	15.1%
CT 6620, BG 4	246	$56,000	7	2.8%
CT 6620, BG 5	408	$33,056	65	15.9%
CT 6626, BG 1	242	$35,278	35	14.5%
CT 6626, BG 2	358	$47,321	28	7.8%
CT 6626, BG 3	345	$38,583	34	9.9%
CT 6626, BG 4	353	$35,924	29	8.2%
CT 6629, BG 1	461	$33,942	87	18.9%
CT 6629, BG 2	541	$45,542	51	9.4%
CT 6629, BG 3	453	$51,797	64	14.1%
CT 6629, BG 4	232	$36,667	10	4.3%
CT 6630, BG 1	367	$51,964	28	7.6%
CT 6630, BG 2	369	$37,417	66	17.9%
CT 6630, BG 3**	0	0	0	0.0%
CT 6644, BG 6	561	$22,425	128	22.8%
CT 6645, BG 1	352	$37,167	24	6.8%
CT 6645, BG 2	242	$44,500	18	7.4%
CT 6645, BG 3	481	$40,298	60	12.5%
CT 6754, BG 2	821	$50,677	76	9.3%
CT 6755, BG 1	633	$43,036	45	7.1%
CT 6756, BG 1	895	$52,824	42	4.7%
CT 6756, BG 2	618	$56,442	46	7.4%
CT 6757, BG 1	606	$48,333	61	10.1%
CT 6757, BG 2	640	$37,368	81	12.7%
CT 6757, BG 3	375	$48,594	18	4.8%
CT 6757, BG 4	385	$49,258	44	11.4%
Project Area Total	11,679		1265	10.8%

** CT 6630, BG 3 consists only of the TDCJ Clemson Unit
Source: USCB *Census 2000*, American FactFinder, http://factfinder.census.gov/, Table P90.

During the public involvement phase of the project, public input was solicited at three public meetings and two limited public meetings and the results did not indicate that there would be disproportionately high adverse impacts to minority populations. The public notices for the public meetings were published in both English and Spanish in order to communicate the proposed project to a broader range of people within the project area. The proposed improvements would enable the highway to more efficiently serve as a hurricane evacuation route from the coast inland. As such, it would serve all persons who would need to evacuate the coastal area during times of an impending storm. The community and agency involvement process described in this report has included all residents and population groups in the project area.

Limited English Proficiency

EO 13166, *Improving Access to Services for Persons with Limited English Proficiency (LEP)*, signed by President Clinton on August 11, 2000, requires federal agencies to examine the services they provide and identify any need for services to those with LEP. The EO requires federal agencies to work to ensure that recipients of federal financial assistance provide meaningful access to their LEP applicants and beneficiaries. Failure to ensure that LEP persons can effectively participate or benefit from federally assisted programs and activities may violate the prohibition under Title VI of the Civil Rights Act of 21964, 42 U.S.C. 2000d and Title VI regulations against national origin discrimination

The USDOT defines LEP persons as individuals with a primary or home language other than English who must, due to limited fluency in English, communicate in that primary or home language if the individuals are to have an equal opportunity to participate effectively in or benefit from any aid, service or benefit provided by the transportation provider or other USDOT recipient. *Census 2000* CT BG level data was used to determine the LEP population, using the same approach as that used to define environmental justice areas.

As shown in **Table 12**, the incidence of LEP, or linguistic isolation, in the project area is low. Only 3.8% of the population 5 years of age and older speaks English less than very well (i.e. Not Well or Not at All). Nearly 98% of these are Spanish speaking individuals.

Table 12: Limited English Proficiency Population - 1999

Census Tract Block Group	Population 5 Years and Older	Total Number Who Speak English Not Well or Not at All			
		Spanish	Asian	Total	
				Number	Percent
CT 6620, BG 2	805	85	0	85	10.6%
CT 6620, BG 3	981	6	0	6	0.6%
CT 6620, BG 4	624	11	0	11	1.8%
CT 6620, BG 5	985	22	0	22	2.2%
CT 6626, BG 1	727	86	0	86	11.8%
CT 6626, BG 2	767	0	0	0	0.0%
CT 6626, BG 3	840	20	0	20	2.4%
CT 6626, BG 4	909	0	0	0	0.0%
CT 6629, BG 1	1,064	8	0	8	0.8%
CT 6629, BG 2	1,378	48	0	48	3.5%
CT 6629, BG 3	1,278	71	0	71	5.6%
CT 6629, BG 4	554	0	0	0	0.0%
CT 6630, BG 1	952	29	0	29	3.0%
CT 6630, BG 2	890	5	0	5	0.6%
CT 6630, BG 3**	1,124	23	9	32	2.8%
CT 6644, BG 6	1,149	50	0	50	4.4%
CT 6645, BG 1	936	9	0	9	1.0%
CT 6645, BG 2	587	1	1	2	0.3%
CT 6435, BG 3	1,214	48	2	50	4.1%
CT 6754, BG 2	2,463	100	0	100	4.1%
CT 6755, BG 1	1,913	155	0	155	8.1%
CT 6756, BG 1	2,612	29	0	29	1.1%
CT 5756, BG 2	1,627	10	0	10	0.6%
CT 6757, BG 1	1,701	82	11	93	5.5%
CT 6757, BG 2	1,752	53	0	53	3.0%
CT 6757, BG 3	931	0	4	4	0.4%
CT 6757, BG 4	1,001	0	0	0	0.0%
Project Area	31,764	951	27	978	3.1%

**CT 6630, BG 3 consists only of the TDCJ Clemson Unit
Source: USCB *Census 2000*. American FactFinder, http://factfinder.census.gov/ Table P19

Community participation is an important aspect of any major project. TxDOT has ensured that opportunities for community input in the NEPA process have been and will continue to be provided. Reasonable attempts to solicit public comments were made at the public meetings. The meetings were announced in multiple advertisements in local newspapers in English in the *Brazosport Facts*, *The Brazoria County News*, *The Herald Coaster*, in English and Spanish in the *Houston Chronicle*, and in Spanish in the *La Nueva Voz*. Meeting notices were mailed to elected officials, government agencies, local organizations, civic groups, the media, businesses, and interested citizens.

The mailed notices and newspaper announcements provided opportunities for citizens to request language interpreters and TxDOT had at least one bilingual English-Spanish employee at the public meetings. In addition, TxDOT maintains a mailing list of public meeting attendees and other interested parties to be contacted prior to future public meetings and/or announcements. TxDOT has attempted to address all issues of concern expressed at the

meetings in the development of this document. A notice announcing the availability of this EA will be published in local newspapers to allow the public (including minority and low-income individuals and populations) the opportunity to comment on the proposed project, and a public hearing will be conducted.

Land Use

Widening SH 36 from FM 2218 in Pleak, Fort Bend County to FM 1495 in Freeport, Brazoria County would have a minimal effect on land use, since this proposed project would widen an existing roadway. The project area is primarily rural but does include a few small cities and towns. The project area land use was determined through the use of H-GAC 1999 RAZ land use estimates for Fort Bend and Brazoria counties. Only 2.4% of the project area is residential and 0.9% is commercial. The bulk of the project area (88.0%) is open land or agricultural. Future land use is anticipated to change only slightly, with the exception of the Rosenberg and Freeport areas, which are north and south of the project area, respectively. In these latter two areas, population growth will be evident in the form of residential, commercial, and industrial development.

Widening SH 36 from FM 2218 in Pleak, Fort Bend County, to FM 1495 in Freeport, Brazoria County, would increase the accessibility of the area. This increased accessibility would have the tendency to encourage increased land development in the surrounding area, increasing the likelihood that population and employment projections discussed earlier in this document would be achieved. Generally, land development is anticipated at the south end of the proposed project as a result of Port of Freeport expansion and in the vicinity of Rosenberg, north of the proposed project. The proposed project is currently some distance from the primary growth areas of Fort Bend and Brazoria counties. Future land development patterns in any one segment of the metropolitan area would be dependent upon the relative desirability and accessibility compared to other segments.

Many scattered residences, churches, schools, and small retail establishments are found throughout the route, with most having access directly onto the roadway. Additionally, there is one roadside park, one parcel of land deeded to the U.S. Department of Agriculture (USDA) Wetlands Reserve Program, the Texas Department of Corrections-Clemens Unit, prison facilities, the Damon Mound oil fields, and the Peach Point Wildlife Management Area (WMA) located along the route. The prison facilities, the Damon Mound oil fields, and the Peach Point WMA are all extensive land use features located adjacent to SH 36.

The majority of the project area is rural and is currently used for farming and ranching activities. The Spur 10 area located at the northern end of the project area is in the process of transitioning into suburban land development. At the present time, this development is not in the form of large facilities, but rather individual residences.

C. Farmlands

The project area lies within a region that contains prime farmlands. Approximately 441 ac of prime farmland soils within the existing and proposed ROW would be impacted by the proposed project. The soil types in the project area are designated in Capability Classes that the NRCS considers potentially subject to the Farmland Protection Policy Act (FPPA). The FPPA of 1981, (P.L. 97-98 and amendments, 7 USC. 4201(b)), authorizes the USDA NRCS to develop criteria for identifying the effects of Federal programs on the conversion of farmland to non-agricultural uses.

A Farmland Conversion Impact Rating Form (Form AD-1006) Site Assessment Criteria was completed for this project and totaled less than 60 points for the proposed project; therefore, no coordination with the NRCS is required. Form AD-1006 is on file at the Houston District of TxDOT.

D. Beneficial Landscape Practices

In accordance with the Executive Memorandum of August 10, 1995, all agencies shall comply with the NEPA as it relates to vegetation management and landscape practices for all federally assisted projects. The Executive Memorandum 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 run-off reduction practices; and (5) create demonstration projects employing these practices. Landscaping included with this project would be in compliance with the Executive Memorandum and the guidelines for environmentally and economically beneficial landscape practices.

E. Invasive Species

In accordance with EO 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping, landscaping would be limited to seeding and replanting the ROW with native species of plants where possible. A mix of native grasses and native forbs would be used to revegetate the ROW, as available.

F. Area Wildlife

The project area falls into the Gulf Coast Region as detailed by the Texas Parks and Wildlife Department (TPWD). This area is a nearly level, slowly drained plain, bissected by streams and rivers flowing into the Gulf of Mexico. This region includes barrier islands along the coast, salt grass marshes surrounding bays and estuaries, remnant tallgrass prairies, oak parklands and oak mottes scattered along the coast, and tall woodlands in the river bottomlands (McMahan, et al. 1984).

The prairie habitats along the project route support a variety of bird species including mourning doves (*Zenaida macroura*) and bobwhite quail (*Colinus virginianus*). White-tailed deer (*Odocoileus virginianus*) use the fringe areas of the prairies adjacent to wooded areas. The wooded areas provide habitat for wildlife such as the fox squirrel (*Sciurus niger*), gray squirrel (*Sciurus carolinensis*), swamp rabbit (*Sysdxlvilagus aquaticus*), many species of songbirds, and fur-bearing animals including bobcat (*Lynx rufus*), raccoon (*Procyon lotor*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), and Virginia opossum (*Didelphis virginiana*). Other fur-bearing animals, such as beaver (*Castor canadensis*), nutria (*Myocastor coypus*), mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), and river otter (*Lutra canadensis*) inhabit wooded or riparian habitats adjacent to streams or creeks.

Some of the wetland areas support wildlife including numerous migratory ducks and geese, the American coot (*Fulica americana*), common snipe (*Gallinago gallinago*), rails (*Rallus sp.*), and the American alligator (*Alligator mississippiensis*). This portion of the project is also used as a fallout area for neotropical migratory songbirds. Sea turtles may be found along the tidal areas

of this region occasionally entering coastal shallow waters of bays and lagoons. Many species of gulls, terns, and shorebirds also inhabit the tidal areas. The SH 36 project, with the southern terminus ending near the coastline, has been designated as a Great Texas Coastal Birding Trail (GTCBT).

To avoid effects to migratory birds and their habitat with the preferred alternative, construction should be avoided during the peak-nesting season. Construction would be accomplished in compliance with the guidance concerning migratory birds that is in effect at the time construction begins. Measures would be taken to avoid impacts to migratory birds, their nests, their eggs, and their young during construction.

Nesting swallows were observed by an ornithologist April 30, 2001 at the southern crossing of Varner Creek. Cliff swallows (*Petrochelidon pyrrhonota*) and their nests were present in large numbers. They were also observed at additional bridge sites along the proposed route. Barn swallows (*Hirundo rustica*) also nest along the SH 36 roadway. Further onsite investigation is needed to determine the exact locations and numbers of the nesting swallows. Confirmed nesting sites are the Seabourne, Cottonwood, and Varner Creek bridges. The swallow nesting colonies are active in the spring and summer months. Construction will be scheduled to avoid possible disturbance of their nests during the nesting season.

It is difficult to evaluate impacts, especially short-term and long-term indirect impacts, to wildlife from roadway improvement projects. The amount or extent of secondary development and the rate of development that may result from the proposed improvements to Spur 10 and SH 36 is uncertain. Projections may be made based upon previous county data or data from adjacent counties. Some species adapt to and tolerate urban type conditions more readily than others. Increased traffic, noise, and residential and commercial construction that drastically alter land use eliminate species presence, depending upon the rate of the improvements and the individual vulnerabilities of each species. Oftentimes, it may be a combination of factors that actually eliminate the presence of certain species, both from direct and indirect impacts. Some species may be able to adapt to the changing conditions and remain for some time.

Through the alternatives analysis process, the proposed project was selected to have the least amount of environmental impacts. When avoidance would not be practicable or feasible, the proposed project would mitigate for possible impacts to wildlife through minimizing habitat loss and fragmentation as well as wetland restoration, enhancement, or construction. The proposed project would have no significant adverse effects to area wildlife.

G. Vegetation Impacts

Forests and woodlands in the area are very valuable resources from wildlife habitat, natural heritage, and aesthetic standpoints. Approximately 700 ac of vegetation would be impacted by the proposed project. Up to 50 - 60 ac of varying-density woody vegetation, including 21 ac of hardwood forests and 6 ac of woodland forest, may be impacted by the proposed project. Of the 700 ac of vegetation within the proposed ROW, approximately 440 ac of pasture and cropland would be acquired by the proposed project. The remaining 200 ac of vegetated areas within the proposed ROW consist of disturbed or maintained grassy areas. Efforts were made to minimize the total acreage of these vegetation types that would be impacted.

It is estimated that this project may impact approximately 50 - 60 ac of wooded vegetation areas of varying densities. Of this, approximately 21 ac are estimated to be hardwood forests, and 6 ac are estimated to be woodland forest. Impacted areas would be linear and vary in width from

0 to 150 ft and would typically be several hundred feet long. Individual areas impacted are typically less than 5 ac in size. To the maximum extent possible, consistent with highway safety and other engineering requirements, woody vegetation, including understory, trees and shrubs, would be left in the highway median and along the outer portions of the ROW. Thus, the total acreage listed above for impacts to woody vegetation may not represent figures for total removal. Woody vegetation would be removed where necessary and fragmentation of forest stands may still occur, but substantial amounts of woody vegetation would be preserved within medians and other portions of the ROW.

The southern portion of the project (FM 1495 to Jones Creek) reflects mainly a coastal prairie. This area is dominated by grasslands and is primarily open. Representative species include saltgrass (*Distichlis spicata*), cordgrass (*Spartina sp.*), Eastern baccharis (*Baccharis halimifolia*), rattlebox (*Sesbania drummondii*), and saltcedar (*Tamarix gallica*). Scattered tree species are found mainly along fencelines and are dominated by sugarberry. Sugarberry ranges in diameters at breast height (dbh) from 4 to 10 in. and in height from 10 to 15 ft. Canopy cover within this area is approximately 5%. The total estimated area of impacted woody vegetation in this section is approximately 0.4 ac. **Table 13** indicates a species list, general chronological order of dominance of the top five species, and ranges of dbh, the and overall estimated height for the trees found in this section.

Table 13: Tree Species List for the Proposed Widening of SH 36: FM 1495 to Jones Creek

Common Name	Scientific Name	Dominant Species (D)	Range in Diameter at Breast Height (dbh)(in.)	Range in Height (ft)
Palm	*Sabal* sp.	D4	8-15	8-15
Chinese tallow	*Sapium sebiferum*	D2	4-5	8-10
Cedar elm	*Ulmus crassifolia*	D3	4-10	10-20
Sugarberry	*Celtis laevigata*	D1	4-10	10-15
Live oak	*Quercus virginiana*	D5	--	--
Texas oak	*Quercus texana*		--	--
Pecan	*Carya illinoensis*		--	--

Further to the north along SH 36 (Jones Creek to FM 1301), the prairie area transitions into bottomland hardwood forests composed primarily of live oak, pecan, cedar elm, sugarberry, and water oak. Pecan dominates and ranges in dbh from 4 in. to over 42 in. and in height from 15 to 50 ft. There are a few scattered grassland pastures as well as major agricultural crop fields found near the prison area. The three major urban development areas, Jones Creek, Brazoria, and West Columbia, in this section are dominated by large live oak and pecan trees, with live oaks ranging in diameter from 4 in. to 74 in. and in height from 10 ft to over 50 ft. Efforts would be made to preserve as many of the large trees as possible. Canopy cover within this area is approximately 30%. The total estimated area of impacted woody vegetation in this section is approximately 21 ac. **Table 14** indicates a species list, general chronological order of dominance of the top five species, and ranges of the dbh and overall estimated height for the trees found in this section.

Table 14: Tree Species List for the Proposed Widening of SH 36: Jones Creek to FM 1301

Common Name	Scientific Name	Dominant Species (D)	Range of dbh (in.)	Range in Height (ft)
Sugarberry	*Celtis laevigata*	D2	4-40	15-45
Live oak	*Quercus virginiana*	D5	4-74	10-50
Cedar elm	*Ulmus crassifolia*		10-27	25-40
Chinese tallow	*Sapium sebiferum*	D3	4-30	15-35
Pecan	*Carya illinoensis*	D1	4-42	15-50
Black willow	*Salix nigra*		4-20	10-35
American elm	*Ulmus americana*		6-36	25-40
Eastern redcedar	*Juniperus virginiana*		4-30	12-35
Water oak	*Quercus nigra*	D4	8-38	23-50
Slash pine	*Pinus elliottii*		12-18	20-42
Sweetgum	*Liquidambar styraciflua*		9-22	23-35
Bald cypress	*Taxodium distichum*		5-24	15-30
Loblolly pine	*Pinus taeda*		10-33	10-50
Green ash	*Fraxinus pennsylvanica*		4-31	20-40
Red mulberry	*Morus rubra*		4-27	10-15
Camphor tree	*Cinnamomum camphora*		10-36	20-25
Cherry-laurel	*Prunus caroliniana*		24-30	15
Eastern cottonwood	*Populus deltoides*		24-28	33-40
American sycamore	*Platanus occidentalis*		10-30	25-40
Honey locust	*Gleditsia triacanthos*		4-30	12-40
Palm	*Sabal* sp.		--	5-13
Southern magnolia	*Magnolia grandiflora*		4-12	15-30
Yellow poplar	*Liriodendron tulipifera*		10	22
Eastern redbud	*Cercis canadensis*		4	20
Mimosa	*Albizia julibrissin*		4-15	13-20
Chinaberry	*Melia azedarach*		12	10
Southern catalpa	*Catalpa bignoniodes*		--	--
Persimmon	*Diospyros virginiana*		10-12	30-40
Poison sumac	*Toxicodendron vernix*		4	18
Hawthorn	*Crataegus* sp.		4	13
Crapemyrtle	*Lagerstroemia indica*		4-5	20-23
Southern crabapple	*Malus angustifolia*		--	--
Tree ligustrum	*Ligustrum* sp.		4-10	12-22
Black walnut	*Juglans nigra*		7	30
Eastern arborvitae	*Platycladus orientalis*		8	10

In the northern portion of the project (FM 1301 to FM 2218 section), mainly open grassland and ranch land can be found as well as row crop production. There are occasional woodlands dominated by Chinese tallow and sugarberry. Sugarberry ranges in diameter from 4 in. to 40 in. and in height from 15 ft to 40 ft. Chinese tallow ranges in diameter from 4 in. to 30 in. and in height from 10 to 35 ft. This area also contains grasslands with scattered mesquite trees and yaupon (*Ilex vomitoria*) thickets. Riparian areas along Varner Creek and others contain species like green ash, black willow, and sugarberry. Two major urban areas, Needville and Pleak, are found within this section. Work within these urban areas may impact approximately 1 ac of area also dominated by sugarberry and Chinese tallow. Canopy cover within this section is approximately 10%. The total estimated area of impacted woody vegetation in this section is approximately 23 ac. **Table 15** indicates a species list, general chronological order of dominance of the top five species, and ranges of the dbh and overall estimated height for the trees found in this section.

Table 15: Tree Species List for the Proposed Widening of SH 36: FM 1301 to FM 2218

Common Name	Scientific Name	Dominant Species (D)	Range in dbh (in.)	Range in Height (ft)
Southern catalpa	*Catalpa bignoniodes*		4-27	10-35
Sugarberry	*Celtis laevigata*	D2	4-40	15-40
Live oak	*Quercus virginiana*	D3	4-42	10-50
Slash pine	*Pinus elliottii*		8-38	15-50
Pecan	*Carya illinoensis*		4-22	15-35
Loblolly pine	*Pinus taeda*		6-36	25-40
Honey mesquite	*Prosopis glandulosa*		4-30	10-20
Chinese tallow	*Sapium sebiferum*	D1	4-30	10-35
Red mulberry	*Morus rubra*		4-10	10-15
Sweetgum	*Liquidambar styraciflua*		6	20
Water oak	*Quercus nigra*	D4	10-33	10-40
Texas oak	*Quercus texana*		27	30
Southern magnolia	*Magnolia grandiflora*		4-13	5-25
Shortleaf pine	*Pinus echinata*		26	40
Eastern redcedar	*Juniperus virginiana*		4-16	10-25
Eastern cottonwood	*Populus deltoides*		12-33	35-40
Cedar elm	*Ulmus crassifolia*	D5	4-30	10-35
Osage orange	*Maclura pomifera*		6-34	20-35
American elm	*Ulmus americana*		4-35	15-40
Tree ligustrum	*Ligustrum* sp.		4	25
Black willow	*Salix nigra*		8-23	10-40
Camphor tree	*Cinnamomum camphora*		4	20
Honey locust	*Gleditsia triacanthos*		4-22	12-40
Green ash	*Fraxinus pennsylvanica*		6-30	10-35
Bradford pear	*Pyrus calleryana*		8	12-15
Bald cypress	*Taxodium distichum*		8-14	10-20
Arizona ash	*Fraxinus velutina*		--	--
American sycamore	*Platanus occidentalis*		8-24	25-40
Mimosa	*Albizia julibrissin*		6-8	10-15
Eastern arborvitae	*Platycladus orientalis*		7	10-15
Huisache	*Acacia farnesiana*		8-12	10-20
Chinaberry	*Melia azedarach*		4-12	10-20
Hercules club	*Zanthoxylum clava-herculis*		4-12	10-20
Redbay	*Persea borbonia*		--	--

The area along the proposed Spur 10 (SH 36 to US 59 section) is mainly open grassland and ranch land with some row crop production. Sugarberry, cedar elm, Chinese tallow, and water oaks can primarily be found along fencelines. There are also occasional rows of Loblolly pine that appear to serve as shelterbelts adjacent to cultivated fields. Several thickets of huisache can be found on small tracts usually less than an acre in area where routine maintenance and grazing has been halted. Sugarberry dominates in this section and ranges in dbh from 4 in. to 20 in. and in height from 10 to 20 ft. Canopy cover within this area is approximately 15%. The total estimated area of impacted woody vegetation in this section is approximately 5 ac. **Table 16** indicates a species list, general chronological order of dominance of the top five species, and ranges of the dbh, and overall estimated height for the trees found in this section.

The density of trees within the project area ranges from open areas with a density as low as 1 tree per acre to a density of 83 trees per acre for wooded areas dominated by Live oak and Pecan. The densities of the wooded areas dominated by Chinese tallow and Sugarberry

typically range higher, up to at least 115 trees per acre. Hardwood forest stands would be avoided and forest stands would be preserved, where possible, within the proposed ROW.

Table 16: Tree Species List for the Proposed Widening of Spur 10: SH 36 to US 59

Common Name	Scientific Name	Dominant Species (D)	Range in Diameter at Breast Height (in.)	Range in Height (ft)
Loblolly pine	*Pinus taeda*	D2	20-24	30-40
Chinese tallow	*Sapium sebiferum*	D4	4-8	10-20
Green ash	*Fraxinus pennsylvanica*		15-16	30
Water oak	*Quercus nigra*		12-30	20-30
Live oak	*Quercus virginiana*	D3	6-30	10-30
Red mulberry	*Morus rubra*		6-14	10-20
Sugarberry	*Celtis laevigata*	D1	4-20	10-20
Pecan	*Carya illinoensis*	D5	12-14	20-25
Cedar elm	*Ulmus crassifolia*		--	--
Chinaberry	*Melia azedarach*		6-12	--
Eastern cottonwood	*Populus deltoides*		16	35
Huisache	*Acacia farnesiana*		4	10-15
Southern crabapple	*Malus angustifolia*		--	--
Arizona ash	*Fraxinus velutina*		--	--
American sycamore	*Platanus occidentalis*		--	--
Bald cypress	*Taxodium distichum*		10	20
Eastern redcedar	*Juniperus virginiana*		10	20
Lacebark elm	*Ulmus parvifolia*		6-10	15-20

Mitigation

Forests and woodlands in the area are valuable resources from wildlife habitat, natural heritage, and aesthetic standpoints. In accordance with Provision (4) (A) (ii) of the TxDOT-TPWD MOU, habitats given consideration for non-regulatory mitigation include:

1. Habitat for federal candidate species (impacted by the project) if mitigation would assist in the prevention of listing the species;
2. Rare vegetation series (S1, S2, S3) that also locally provides habitat for a state-listed species;
3. All vegetation communities listed as S1 or S2, regardless of whether or not the series in question provides habitat for state-listed species;
4. Bottomland hardwoods, native prairies, riparian sites; and
5. Any other habitat feature considered locally important that the Houston District TxDOT chooses to consider.

The existing vegetation within the project area meets the criteria for non-regulatory mitigation. Efforts have been made to minimize the total acreage of these vegetation types that would be impacted by the proposed project.

There is one rare vegetation series as defined by the TPWD in "Plant Communities of Texas (Series Level)," located and identified on the west side of the SH 36 roadway south of Damon, Texas. This area is referred to as a Gammagrass-Switchgrass Series (*Tripsacum dactyloides-Panicum virgatum)* (G2S1). The proposed widening of SH 36 would impact this rare vegetation area. In accordance with the TPWD and TxDOT MOU, mitigation would be proposed for this rare grass series. TxDOT would coordinate with TPWD to determine appropriate mitigation.

The Gammagrass-Switchgrass Series G2S1 consists of tallgrass grassland found primarily in low areas or poorly drained uplands over clayey soils in the Blackland, Fayette and Upper Coastal Prairies. Indiangrass (*Sorghastrum mitans)*, little bluestem *(Schizachyrium scoparium)*, tall dropseed *(Sporobolus asper)*, ilath aster *(Aster ericoides)*, Maximilian sunflower *(Helianthus maximiliani)* and other grasses and forbs may be important. This type occurs as isolated remnants, often surrounded by cropland.

In addition, TxDOT would avoid and preserve hardwood forest stands where possible within the proposed ROW. The TxDOT Houston District would coordinate with the TxDOT ENV and the TPWD for compensatory mitigation for any vegetation community impacts in accordance with Provision (4) (A) (ii) of the TxDOT-TPWD MOU.

H. Threatened and Endangered Species

Tables 17 and **18** list species that have a geographic range including Fort Bend and Brazoria counties that are considered by USFWS and TPWD to be endangered, threatened or rare species or species of concern (SOC). It should be noted that inclusion on the following table does not imply that a species is known to occur in the project area, but only acknowledges the potential for occurrence.

The US Fish and Wildlife Service (USFWS) was contacted by TxDOT, in correspondence dated October 11, 1999, for concurrence that the proposed project would have no adverse effects on any Federally listed threatened or endangered species. In correspondence from the USFWS dated October 20, 1999, addressed to TxDOT, the USFWS concurred that the proposed project would have no adverse effect on any federally listed threatened or endangered species **(Appendix B)**.

Subsequently, the USFWS was contacted a second time during the EA preparation phase in a letter dated July 26, 2000, and at which time they responded, in a letter dated August 25, 2000, that several pairs of Bald eagles (*Haliaeetus leucocephalus*) are known to nest in the general vicinity of the proposed project area in Brazoria County. A follow-up phone conversation with USFWS on August 29, 2001 concluded that USFWS does not foresee any problems between the SH 36 roadway improvements and any of the known eagle nests. The proposed roadway project lies outside the one-mile Secondary Management Zone restricted zone as designated by the USFWS.

A third call with the Clear Lake office of USFWS on October 10, 2006 concluded that the 1 mi Secondary Management Zone restricted zone as designated by the USFWS prior to 2001 had not changed, however the USFWS has not tracked eagles in this area since 2004. A project biologist also contacted the TPWD October 13, 2006, per the recommendation of the local USFWS office. The TPWD stated that there are no known Bald eagle nests within 1 mi of the proposed project area at this time. TPWD biologist also noted that the highest probability areas one would likely encounter Bald eagles near SH 36 would be from West Columbia to Jones Creek due to the close proximity to the Brazos River.

Habitat may occur within the project area for 12 of the species listed on **Tables 17** and **18**; however, no listed species were observed within the proposed project area during field investigations conducted during 2000 through 2005, and no impacts are anticipated to these species. Based on the background research and field work performed for the project, a

determination of "no effect" on threatened or endangered species has been reached for the proposed project.

Table 17: State and Federal Threatened and Endangered Species of Fort Bend County

Common Name	Scientific Name	State Status	Federal Status	Habitat Description	Habitat Present
AMPHIBIANS					
Houston Toad	*Bufo houstonensis*	E	E†	Sandy soil, breeds in ephemeral pools	No
BIRDS					
American Peregrine Falcon	*Falco peregrinus anatum*	T	DM†	Potential migrant	No
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	T	DM†	Potential migrant	No
Attwater's Greater Prairie-chicken	*Tympanuchus cupido attwateri*	E	E†	Thick 1-3' tall grass from 0'-200' above sea level along coast	Yes
Bald Eagle (Nesting)	*Haliaeetus leucocephalus*	T	DM*[1]	Near water areas, in tall trees	Yes
Interior Least Tern	*Sterna antillarum athalassos*	E	*	Nests along sand and gravel bars within streams and rivers, only listed when 50 miles inland	No
White-faced Ibis	*Plegadis chihi*	T	*	Freshwater marshes, but some brackish or salt marshes	Yes
White-tailed Hawk	*Buteo albicaudatus*	T	*	Coastal Prairies	Yes
Whooping Crane	*Grus americana*	E	E†	Winters in Aransas NWR	No
Wood Stork	*Mycteria americana*	T	*	Prairie ponds and flooded pastures	Yes
MAMMALS					
Louisiana Black Bear	*Ursus americanus luteolus*	T	T†	Bottomland hardwoods; large, undisturbed forested areas	No
Red Wolf	*Canis rufus*	E	E†	Extirpated, brushy, forested areas, coastal prairies	Yes
REPTILES					
Alligator Snapping Turtle	*Macrochelys temminckii*	T	*	Water bodies with mud bottom and abundant vegetation	No
Texas Horned Lizard	*Phrynosoma cornutum*	T	*	Open, semi-arid regions, with bunch grass	No
Timber / Canebrake Rattlesnake	*Crotalus horridus*	T	*	Swamps / floodplains of hardwood / upland pine	Yes
VASCULAR PLANTS					
Texas Prairie Dawn	*Hymenoxys texana*	E	E	Poorly drained areas in open grasslands; pimple mounds	No

* 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 (2006).

† 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 (2006).

[1] Protected by the Bald Eagle Protection Act of 1940.

E = endangered T = threatened H = historical occurrence I = introduced population C = candidate species SOC = species of concern DM = delisted taxon, recovered, being monitored first five years AD = proposed delisting SAT = similarity of appearance to a threatened taxon.

Table 18: State and Federal Threatened and Endangered Species of Brazoria County

Common Name	Scientific Name	State Status	Federal Status	Habitat Description	Habitat Present
BIRDS					
American Peregrine Falcon	*Falco peregrinus anatum*	E	DM†	Potential migrant, nest in west Texas	No
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	T	DM†	Potential migrant	No
Bald Eagle (Nesting)	*Haliaeetus leucocephalus*	T	DM*'	Near water areas, in tall trees	Yes
Brown Pelican (Nesting)	*Pelecanus occidentalis*	E	E, DM	Island near coastal areas	No
Eskimo Curlew	*Numenius borealis*	E	E†	Grasslands, pastures, plowed fields, marshes, mudflats	Yes
Piping Plover (Wintering)	*Charadrius melodus*	T	T	Beach and bayside mud or salt flats	No
Reddish Egret	*Egretta rufescens*	T	*	Brackish marshes and tidal flats	No
Sooty Tern	*Sterna fuscata*	T	*	Maritime bird	No
Swallow-tailed Kite	*Elanoides forficatus*	T	*	Lowland forest swamps	Yes
White-faced Ibis	*Plegadis chihi*	T	*	Freshwater marshes, but some brackish or salt marshes	Yes
White-tailed Hawk	*Buteo albicaudatus*	T	*	Coastal Prairies	Yes
Whooping Crane	*Grus americana*	E	E†, EXPN	Winters in Aransas NWR	No
Wood Stork	*Mycteria americana*	T	*	Prairie ponds and flooded pastures	Yes
MAMMALS					
Jaguarundi	*Herpailurus yaguarondi*	E	E†	Thick brushland near water	Yes
Louisiana Black Bear	*Ursus americanus*	T	T†	Bottomland hardwoods; large, undisturbed forested areas	No
Ocelot	*Leopardus pardalis*	E	E†	Dense chaparral; mesquite-thorn scrub and live oak mottes	Yes
Red Wolf	*Canis rufus*	E	E†	Extirpated, brushy, forested areas, coastal prairies	Yes
West Indian Manatee	*Trichechus manatus*	E	*	Gulf and bay system	No
REPTILES					
Alligator Snapping Turtle	*Macrochelys temminckii*	T	*	Water bodies with mud bottom and abundant vegetation	No
Atlantic Hawksbill Sea Turtle	*Eretmochelys imbricata*	E	E	Gulf and bay system	No
Green Sea Turtle	*Chelonia mydas*	T	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	*Phrynosoma cornutum*	T	*	Open, semi-arid regions, with bunch grass	No
Timber / Canebrake Rattlesnake	*Crotalus horridus*	T	*	Swamps / floodplains of hardwood / upland pine	Yes

* 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 (2006).

† 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 (2006).

' Protected by the Bald Eagle Protection Act of 1940.

E = endangered T = threatened H = historical occurrence I = introduced population C = candidate species SOC = species of concern DM = delisted taxon, recovered, being monitored first five years AD = proposed delisting SAT = similarity of appearance to a threatened taxon, EXPN = Experimental Population, Non-Essential

The following paragraphs present distributional data concerning each federally listed or state-listed species, along with a brief evaluation of the potential for the species to occur within the project area. The following sub-sections discuss the federally listed species and their habitats by major phylogenetic group.

Birds

There are 15 species of birds with varying federal and state status that may occur in the project area.

The **American peregrine falcon** is a potential migrant through most of state, winters along coast and nests in west Texas. Peregrine falcons may potentially occur throughout Texas, including the project area, during fall and spring migrations. There are no essential components of peregrine falcon habitat within the project area; therefore, no impacts are anticipated for this species.

The **Arctic peregrine falcon** lives mostly along mountain ranges, river valleys, and coastlines. Peregrines from Alaska, Canada, and Greenland migrate in the fall to Central and South America, returning north in the spring. Arctic peregrine falcons may potentially occur throughout Texas, including the project area, during fall and spring migrations. In Texas, Arctic peregrine falcons are most likely to occur on the barrier islands of the Gulf of Mexico coast, where they hunt during seasonal migrations (Oberholser, 1974). There are no essential components of Arctic peregrine falcon habitat within the project area; therefore, no impacts are anticipated for this species.

The **Attwater's greater prairie-chicken** is found only in the coastal prairies of Texas. Prime habitat consists of tallgrass prairie dominated by bunchgrasses such as little bluestem, indiangrass, switchgrass and big bluestem; along with flowering plants such as Ruellia, yellow falsegarlic, and ragweed. The birds prefer open prairies without woody cover and avoid areas with more than 25% cover of shrubs. Breeding activity occurs on or near leks, which are common areas usually located on bare ground or shortgrass areas, which allow the males to be seen by the females. There are only a few tallgrass coastal prairie areas located along SH 36. Most of the grassland areas are now used for farming and ranching activities. Due to the rarity of this bird, the few occurrences of potential habitat in the project area, and no known sightings with the project corridor, no impact to this species is anticipated from the proposed project.

The **Bald eagle** ranges throughout the United States, Canada, and Northern Mexico. The Bald eagle is protected by the Bald Eagle Protection Act of 1940. These eagles are present all year throughout Texas as spring and fall migrants, breeders, or winter residents. The Bald eagle population in Texas is divided into two populations: breeding birds and nonbreeding or wintering birds. Breeding populations occur primarily in the eastern half of the state and along coastal counties from Rockport to Houston. Preferred nesting habitat in Texas is undisturbed coastal regions, or along river systems or lake shores with large, tall trees for nesting and roosting. Nests are usually located within 1 to 2 mi of large bodies of water, such as lakes, reservoirs or rivers, and are often located in the ecotone or edge between forest and water. Suitable habitat for this species was identified along the project; however, known nesting sites were not located within the one-mile Secondary Management Zone restricted zone as designated by the USFWS.

The **brown pelican** is a large, dark water bird that primarily inhabits seacoasts and islands of the Pacific and Atlantic. Today, Brown Pelicans are found along the Texas coast from Chambers County on the upper coast to Cameron County on the lower coast. These pelicans

nest on small isolated coastal islands where they are safe from predators such as raccoons and coyotes. Nesting habitat ranges from mud banks and spoil islands to offshore islands covered with mangroves and other woody vegetation. Most of the breeding birds nest on Pelican Island in Corpus Christi Bay and Sundown Island near Port O'Connor. Smaller groups occasionally nest on Bird Island in Matagorda Bay, a series of older spoil islands in West Matagorda Bay, Dressing Point Island in East Matagorda Bay, and islands in Aransas Bay. Neither nesting nor breeding habitat was identified along the project. Although there are coastal canals adjacent to the roadway near FM 1495, these areas are not isolated from predators, which the pelican prefers.

The **Eskimo curlew** has extensive migration routes, thus using a variety of habitats. They were once abundant on the Texas prairies during their spring migration from South America to breeding areas in the Arctic. Early observers describe the Eskimo Curlew as frequenting mainly the plains and prairies, both in the interior and coast region. Like many shorebirds, it was found near lakes, ponds, sloughs, and streams, but also ranged into dry prairies located away from water. Because of the diversity of habitats used by this bird, suitable habitat could be found adjacent to the SH 36 project area. To avoid effects to migratory birds and their habitat, construction should be avoided during the peak-nesting season, and would be accomplished in compliance with the guidance concerning migratory birds that is in effect at the time construction begins. Measures would be taken to avoid impacts to migratory birds, their nests, their eggs, and their young during construction. Therefore, no impacts to this species are anticipated by the proposed project.

The **interior least tern** nests along sand and gravel bars and mad-made structures. Due to the lack of preferred habitat within the project corridor, this species would not occur within the project area and no impacts are anticipated for this species.

Critical habitat has been designated for the **piping plover** along the Texas Gulf Coast. The Piping Plover winters primarily along Gulf Coast beaches from Florida to Mexico, and along the Atlantic Coast from North Carolina to Florida. Wintering Piping Plovers in Texas seem to prefer sparsely vegetated tidal mudflats, sandflats, or algal flats. Tidal flats formed at the base of jetties and tidal passes are important feeding areas, especially north of the Coastal Bend. Piping Plovers also feed on beaches, especially when high tides cover the flats. These suitable habitats were not identified along the SH 36 project. There is no Critical Habitat for the piping plover adjacent to the SH 36 project ROW.

The **reddish egret** typically inhabits salt bays and marshes. In most places, this species is a permanent resident, but some birds along the Gulf Coast of Texas and Louisiana appear to migrate south during the winter. The potential for the reddish egret within the project area is unlikely due to the lack of salt bays and marshes. No impacts are anticipated for this species.

The **sooty tern** is predominately 'on the wing'; does not dive, but snatches small fish and squid with bill as it flies or hovers over water. It breeds April through July. The tern nests on islands off the Texas and Louisiana coasts. Due to the lack of preferred habitat within the project corridor, this species would not occur within the project area and no impacts are anticipated for this species.

The **swallow-tailed kite** is a casual to rare migrant in all parts of the state except the Panhandle and western half of the Edwards Plateau. Habitat consists of lowland forest regions, especially swampy areas, ranging into open woodlands; marshes, along rivers, lakes, and ponds; and bottomlands with adjacent prairie habitat. Woodland and adjacent prairie habitat,

the preferred habitat for the swallow-tailed kite does occur within the project area, however it is unlikely that the species would occur within the project area. No impacts are anticipated for this species.

The **white-faced ibis** forages bays, marshes, lakes, and ponds. While the entirety of Brazoria and Fort Bend counties are within the known range of the white-faced ibis, the proposed project would not directly impact lacustrine habitat. Therefore, no adverse impacts are anticipated for this species. The white-faced ibis would likely benefit from the proposed project because habitat would be set aside as wetland mitigation areas and located far from roadways.

The **white-tailed hawk**, a state-listed threatened species, is found on the coastal plain of southern Texas. The northern limits of this hawk's range extend to include Waller County. The white-tailed hawk hunts on coastal prairies and pastures. The proposed project would have a negligible impact on pasture habitat and would not adversely affect any white-tailed hawks that might be present in the vicinity of the project. No adverse impacts are anticipated for this species. The white-tailed hawk would benefit temporarily from the proposed project as they are known to hunt in construction zones.

Whooping Cranes currently exist in three wild populations. The only self-sustaining wild population is the one that winters in and around the Aransas National Wildlife Refuge on the Texas coast and nests primarily within Wood Buffalo National Park, Northwest Territories, Canada. The Whooping Crane's principal wintering habitat consists of about 22,500 acs of marshes and salt flats on Aransas National Wildlife Refuge and adjacent publicly and privately owned islands. The SH 36 / Spur 10 project area would not impact any suitable nesting or breeding areas of the whooping crane; therefore, no impacts are anticipated for this species.

The **wood stork**, is an uncommon to common post-breeding visitor to the central and upper coastal prairies and a regular visitor of lakes and reservoirs in central and east Texas. The wood stork forages in shallow standing water, including salt-water, and usually roosts communally in tall snags; however, the wood stork has not been known to nest in Texas since 1960. Therefore, no adverse impacts are anticipated for this species. The species would likely benefit from the proposed project because habitat would be set aside as wetland mitigation areas and located far from roadways.

Mammals

There are 5 species with varying federal and state status which may occur in the project area.

The **Louisiana black bear** is one of sixteen recognized subspecies of the American Black Bear. Its habitat is primarily bottomland hardwoods and floodplain forests, but also upland hardwoods, mixed pine / hardwoods, coastal flatwoods, and marshes. The historic range of the Louisiana black bear is East Texas (all counties east of or touching a line from Linden, Cass County, SW to Bryan, Brazos County, thence SSW to Rockport, Aransas County), Louisiana, and Mississippi. While bottomland hardwoods and floodplain forests habitat may exist adjacent to some areas of the project corridor, large undisturbed forested tracts preferred by this species are not present. The potential for an impact to the species is unlikely; therefore, no impacts are anticipated for this species.

Habitat for the **Jaguarundi** consists of tracts of at least 100 ac of isolated dense brush, or 75 ac of brush interconnected with other habitat tracts by brush corridors are considered important habitat. Even vegetated tracts as small as five acres, when adjacent to larger areas of habitat, may be used by Jaguarundis. Riparian habitats along rivers or creeks are sometimes used.

Roads, narrow water bodies, and rights-of-way are not considered breaks in habitat. Typical habitat areas for the Jaguarandi are present in some areas along SH 36. While habitat may exist adjacent to some areas of the project corridor, the potential for an impact to the species is unlikely; therefore, no impacts are anticipated for this species.

Optimal habitat for the **Ocelot** has at least 95% canopy cover of shrubs, whereas marginal habitat has 75 to 95% canopy cover. Tracts of at least 100 ac of isolated dense brush, or 75 ac of brush interconnected with other habitat tracts by brush corridors, are considered very important. Ocelots may even use tracts as small as five acres, when adjacent to larger areas of habitat. Roads, narrow water bodies, and rights-of-way are not considered breaks in habitat. Brushy fencelines, water courses, and other brush strips connecting areas of habitat are very important in providing escape and protective cover. Typical habitat areas for the Ocelot are present in some areas along SH 36. While habitat may exist adjacent to some areas of the project corridor, the potential for an impact to the species is unlikely; therefore, no impacts are anticipated for this species.

The **red wolf** prefers brushy, forested areas and coastal prairies. The red wolf has been extirpated in Texas. Coastal prairie habitat does exist adjacent to the project area, however the preferred brushy habitat for the red wolf does not uniquely exist within the project corridor, and the potential for an occurrence of this species is unlikely, therefore no impacts are anticipated for this species.

The **West Indian manatee** is a large, grayish, nearly hairless, aquatic mammal without hind limbs and paddlelike front limbs. The tail is broadened into a horizontal, rounded paddle. They are found in rivers, estuaries, and coastal areas of the tropical and subtropical New World from the southeastern United States coast along Central America and the West Indies to the northern coastline of South America. They occur chiefly in large rivers and brackish water bays. They are able to live in salt waters of the sea, however, and travel from one island to another or from place to place along the coast. The SH 36 project would not impact any rivers, estuaries or other suitable habitat of the Manatee; therefore, this species would not be impacted.

Reptiles and Amphibians

There is one amphibian and eight reptile species with varying federal and state status which may occur in the project area.

Houston toad prefers large areas of predominantly sandy soils greater than 40 inches (in.) deep. Typical vegetation type is pine or oak woodland or savannah, with native bunchgrasses and forbs present in open areas. For breeding, Houston Toads require still or slow-flowing bodies of water that persist for at least 30 days. These water sources may include ephemeral rain pools, flooded fields, blocked drainages of upper creek reaches, wet areas associated with seeps or springs, or more permanent ponds containing shallow water. Its current range is from Harris County to Bastrop County in southeastern Texas. Suitable breeding habitat for this toad is located along SH 36 in the various drainages and flooded fields. However, nesting habitats, deep sandy soils, is not typical of the project area adjacent to SH 36.

The normal range of the **leatherback sea turtle** is the open seas of the warmer waters of the Atlantic, moving into coastal waters only during the reproductive season. During nesting, it is seen on Texas beaches from the mouth of the Sabine River to just north of Corpus Christi. There are no beaches located within the project area; therefore, suitable habitat for this turtle does not exist within the project area.

The **Atlantic Hawksbill Sea Turtle** is a small to medium sized ocean-dwelling turtle that prefers shallow coastal waters with rocky bottoms or coral reefs. Its normal range is the warmer waters of the Atlantic Ocean, but is occasionally seen nesting on Texas beaches. There was not suitable habitat identified along the SH 36 project area for this turtle.

The **green sea turtle** is an ocean-dwelling turtle that prefers shallow coastal waters with abundant marine plants. Its normal range is the warmer waters of the Atlantic. It is sometimes seen nesting on Texas beaches. Suitable habitat for this turtle was not identified along the SH 36 project area.

Kemps' Ridely sea turtle prefers shallow coastal waters, coming ashore to nest on sandy beaches. This turtle's normal range is the open seas of the warmer waters of the Atlantic and the Gulf of Mexico. It is seen on the beaches of South Texas during nesting. There are no beaches located within the project area; therefore, suitable habitat for this turtle does not exist within the project area.

The **Loggerhead sea turtle** is an ocean-dwelling turtle, but it may also frequent large coastal bays. It comes ashore to nest on sandy beaches. These turtles are found worldwide in tropical and temperate waters where temperatures exceed 10°C. This turtle is sometimes seen nesting on Texas beaches. There are no beaches or coastal bays located within the project area, therefore, the project area is not considered suitable habitat for this turtle.

The **alligator snapping turtle** is an inhabitant of deep rivers, lakes, and large streams with muddy bottoms. Potential habitat for the alligator snapping turtle includes larger drainages and associated marshes and sloughs. Like the common snapping turtle, the alligator snapping turtle lives in a primarily aquatic environment, such as slow moving streams, lakes, or swamps. Typically only nesting females will venture onto land. They are capable of staying submerged for as long as 50 minutes at a time. The turtle's preferred habitat is not uniquely found within the project area; therefore, no impacts are anticipated for this species.

The **Texas horned lizard** is a burrowing animal found in sparsely vegetated arid and semi-arid regions. The piney woods ecoregion of Texas, which includes the project area, does not have an arid or semi-arid climate but rather receives moderate rainfall throughout the year. The Texas horned lizard was historically found throughout the state in areas with open terrain, scattered vegetation, and sandy or loamy soils. In recent decades, it has nearly vanished from the eastern half of the state, east of a line from Fort Worth to Austin to Corpus Christi. Although its occurrence in the project area is remotely possible, no impacts are anticipated for this species.

The **timber/canebrake rattlesnake** inhabits heavily vegetated riparian waterways in the eastern part of the Texas, typically occurring within the floodplains of major creeks and rivers (Tennant, 1998). It is considered widely distributed, but generally uncommon (Dixon, 1987). The diet of this snake consists mainly of rodents, birds, and rabbits. While habitat for this rattlesnake may exist adjacent to the project corridor, the potential for an impact to the species is unlikely; therefore, no impacts are anticipated for this species.

Plants

There is one plant species with a Federal status of endangered that may occur within the project vicinity.

Texas prairie dawn occurs in sparsely vegetated areas, "slick spots," at the base of mima mounds, "pimple mounds," or other nearly barren areas on slightly saline soils in coastal prairie grasslands. The entire right of way was surveyed during the wetland delineation and no suitable habitat was found in the project area for Texas prairie dawn. A separate survey of the project corridor conducted by a qualified biologist for the endangered species determined that the Texas prairie dawn and its suitable habitat are not present within the project area.

I. Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act, as amended on October 11, 1996, directs that all Federal agencies, whose actions will impact essential fish habitat, must consult with the National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries) regarding potential adverse effects. This project would impact coastal waters and wetlands within the existing ROW near the southern end of the project. A letter was sent to the NOAA Fisheries (formerly the National Marine Fisheries Service), to determine if there would be any adverse affects to essential fish habitat. On February 10, 2003, NOAA Fisheries responded that the proposed project would not adversely impact essential fish habitat (**Appendix B**).

J. Section 4(f) Evaluation

If ROW is required from publicly-owned parks, recreation areas, historic or archeological sites, wildlife or waterfowl refuges of national, state, or local significance, special studies are performed and a separate document, a Section 4(f) Evaluation, is prepared.

Land from a publicly-owned park or recreation area may not be used for a highway project unless a determination is made that there is no feasible and prudent alternative to use the land and the proposed action includes all possible planning to minimize harm to the property resulting from such proposed use.

When a Section 4(f) property has been acquired or developed with funds provided by the Land and Water Conservation Fund (LWCF) Act of 1965 and this land is required for highway ROW, a Section 6(f) evaluation process must be followed. Special coordination and approval of the National Park Service (NPS) and the Department of the Interior (DOI) is necessary.

The proposed project would not require land from a Section 6(f) property. However, the proposed project would require the permanent alteration of land and a construction easement from one Section 4(f) property. Two areas of concern in the initial planning phases were the Brazoria Elementary School and the Peach Point WMA. The alternatives analysis and planning phase of the proposed SH 36 project avoided impacts to the Brazoria Elementary School playground. At the Peach Point Wildlife Management Area, no additional ROW would be required for the footprint of the highway; however, a floodplain detention pond is proposed within the Peach Creek floodplain. The proposed detention pond would be constructed by TxDOT within a construction easement and would remain the property of the TPWD. In addition, a Section 4(f) property, a historic-aged farmstead in Guy, is eligible for inclusion in the National Register.

Section 4(f) Properties

a) Brazoria Elementary School

Brazoria Elementary School, built in 1930, is located in the 100 block of West Smith Street in the City of Brazoria, Brazoria County, Texas. The school's playground is located

adjacent to SH 36. This recreational area contains a variety of playground and recreational equipment.

The Brazoria Elementary School structure is located approximately 200 ft west of the existing western ROW limits of SH 36 while the playground is immediately adjacent to the ROW limits. During the alternatives analysis, it was determined that it would not be feasible to widen the roadway at this location due to the location of the businesses on the east side of the roadway and the adjacent playground of the school on the west side of the roadway. Widening the roadway to the east, west, or evenly down the center of SH 36 in this area would impact the properties on both sides of the roadway, including the Brazoria Elementary School playground. The proposed highway improvements would be constructed within the existing ROW through the City of Brazoria. As a result, school property would not be acquired for the proposed project.

b) Peach Point Wildlife Management Area (WMA)

The Peach Point WMA is located on the west side of SH 36, south of the town of Jones Creek. This 10,311-acre facility is owned and operated by the TPWD. Peach Point WMA is part of the Central Coast Wetlands Ecosystem Project (CCWEP), and is representative of the Gulf Coast Prairies and Marshes Ecoregion that encompasses approximately 15,000 square mi of Texas. The CCWEP's mission is to provide for sound biological conservation of all wildlife resources within the central coast of Texas for the common benefit of the public.

Peach Point WMA provides for recreational activities including hunting, hiking and bird watching. During the alternatives analysis of this project, it was not deemed feasible to acquire additional ROW at this location due to the constraints located immediately adjacent to the roadway. To the west side of SH 36 is the WMA, while the east side of the road contains the Stringfellow historical marker and picnic area and a mobile home park. SH 36 is the northern boundary of the 10,311-ac Peach Point WMA. The nearest recreational facility, a nature trail, to SH 36 within the WMA is greater than 850 ft away from the roadway. The proposed highway improvements will be constructed within the existing ROW limits in this area of the SH 36 project. Refer to **Exhibit 4** (sheets 50-51a), **Exhibit 5** (sheets 82-84), and **Appendix D** for a map of the Peach Point WMA.

Although the proposed highway would not encroach onto the Peach Point WMA, a 25-ac floodplain detention pond would be constructed by TxDOT within a construction easement located adjacent to Jones Creek on WMA property. TxDOT coordinated with the TPWD to develop a design that would improve wildlife opportunities while also meeting the floodplain mitigation needs. A Section 4(f) Programmatic Net Benefit evaluation was prepared as a separate document to address the impacts to the Peach Point WMA as a result of constructing a floodplain detention pond (**Appendix D**). In a letter from the Peach Point WMA dated March 22, 2005, the TPWD approved the proposed floodplain mitigation basin. In a letter received July 22, 2007, the TPWD agreed that the proposed floodplain mitigation basin would be a net benefit to the Section 4(f) resource (**Appendix B**).

c) Historical Resource - (Site 41)

One historic property, Site 41 (41, 41a, 41c), was determined to be eligible for listing on the National Register. Site 41 is located at 18438 SH 36 in Guy. The historic farmstead consists of two parcels; a residential parcel and an agricultural parcel. Both parcels are immediately adjacent to SH 36.

Site 41 is a wood-framed residence, apparently occupied. The one-and-one-half story building has wood siding and a composition-shingled gabled roof. The windows are double-hung, wood-framed. A porch, supported by wood posts, extends across most of the house. The house appears to sit on a pier-and-beam foundation. The construction date is 1935 (FBCAD), and the structure is in fair condition. Early in the planning process, the ROW in this area was proposed on the southwest side of SH 36 which would have constituted an adverse effect on the historic resource and required a Section 4(f) evaluation. However, during the Section 4(f) coordination process, TxDOT was able to redesign the roadway and eliminate the need for additional ROW from this historic resource, therefore eliminating the need for a Section 4(f) document for this property.

K. Historic and Archeological Properties

The Brazoria and Fort Bend County Historic Chairpersons were contacted for information concerning and potential historical or archeological sites located within the project area. Copies of the correspondence letters, dated September 12, 2000 and May 22, 2007, are included in **Appendix B**. In a telephone conversation on June 5, 2007, a representative of the Fort Bend County Historic Commission stated that his field assessment of the project area is that it has remained unchanged; and therefore, he had no comments to add (Croccer, 2007). A response from the Brazoria County chairperson has not been received at the time this document was prepared.

Archeological Sites

According to the Houston-Potential Archeological Liability Map (PALM) geographic information system (GIS) database (**Appendix A**) compiled by the TxDOT Austin Environmental Affairs Division (ENV), this project is located in the areas identified as Map Units 1,2,3, and 4. For those areas identified as Map Unit 1, a surface survey is recommended and a deep reconnaissance is recommended if deep impacts are anticipated. Areas identified as Map Unit 2, a surface survey is recommended, and no deep reconnaissance is recommended. For those areas identified as Map Unit 3, no surface survey is recommended, and a deep reconnaissance is recommended if deep impacts are anticipated. For areas mapped as Map Unit 4, there is no survey recommended.

An archeological survey was conducted by a consultant under Texas Antiquities Permit (TAP) Number 2595 to determine the presence or absence of cultural materials within the proposed ROW of the SH 36 and Spur 10 roadways. The survey assessed any potentially impacted archeological sites and provided recommendations for future survey work.

Table 19: Summary of Archeological Findings Along SH 36 and Spur 10

Segment	Description	Number of Shovel Tests	Results	Recommendations
1	Spur 10; SH 36 from FM 2218 south through Needville	123	No cultural artifacts found	Further survey needed in areas where right-of-entry was not granted*
2	South of Needville to north of Damon	95	No cultural artifacts found	Further survey needed in areas where right-of-entry was not granted**
3	South of Damon to north of West Columbia	105	No cultural artifacts found	Further survey needed in areas where right-of-entry was not granted***
4	South of West Columbia to north of Brazoria	65	No cultural artifacts found	No additional survey required
5	South of Brazoria to west of Jones Creek	114	Temporary Site #1 contained early 20th century materials; 4 sites identified for BHT-no cultural artifacts found	No additional survey required

Notes: * Lack of right-of-entry prevented the field crew from accessing part of Coon Creek or any part of Cottonwood Creek and Big Creek.
** Lack of right-of-entry prevented surveys on properties containing pimple mounds.
*** Lack of right-of-entry prevented the field crew from testing one bank of Varner Creek and the land adjacent to it.
BHT: Backhoe trenching

Initially, a review of previous archeological investigations within the SH 36 and Spur 10 project areas were conducted to determine if there were any known archeological sites along the proposed project area. The results of this investigation revealed that only six projects, with corresponding archeological work, appeared to have crossed or contacted portions of the ROW for SH 36 or Spur 10. Only one of these projects, a pipeline crossing, actually impacted the proposed ROW area of Spur 10. This pipeline crossed Hartledge Road near the Coon Creek bridges. There is no formalized report or record for the survey, but they do not appear to have found any cultural remains.

Between June and July, 2001, a field survey was conducted within the proposed ROW of SH 36 and Spur 10. The survey crew excavated 500 shovel tests. Additionally, on January 15, 2002, the survey crew excavated 4 backhoe trenches in predetermined locations; refer to **Table 19** above for a brief description of the shovel test and backhoe trenching findings. A more detailed description of the findings can be obtained from the "Archeological Survey of State Highway 36 and Spur 10, Fort Bend and Brazoria County, Texas" report on file at the TxDOT-Houston District office and The Texas Historical Commission (THC) in Austin, Texas.

No significant cultural materials or deposits were encountered during the course of the investigation. It is recommended that the SH 36 and Spur 10 roadway projects can proceed in areas where archeological surveys were performed. It is also recommended that additional surveys be performed in the above-mentioned areas along SH 36 and Spur 10 once TxDOT has purchased the properties. The THC has reviewed the archeological investigation. They concur with the recommendation of no further consultation in the areas that have been surveyed. However, they also acknowledge that nearly 50% of the project area has not been surveyed due to lack of right-of-entry onto the properties and no construction may proceed in these areas until archeological work has been completed and coordinated. A TxDOT archeologist evaluated the Area of Potential Affect (APE) for the proposed undertaking to affect archeological historic properties or State Archeological Landmarks in the APE. Section 106 review and consultation

will proceed in accordance with the Programmatic Agreement (PA) among TxDOT, the THC, FHWA, and the Advisory Council on Historic Preservation, as well as the Memorandum of Understanding (MOU) between the THC and TxDOT. In the event of that unanticipated archeological deposits are encountered during construction, work in the immediate area of discovery will cease, TxDOT archeological staff will be contacted to post-review discovery procedures under the provisions of the PA and MOU.

Historic Structures

A review of the National Register of Historic Places (NRHP), the list of State Archeological Landmarks (SAL), and the list of Recorded Texas Historic Landmarks (RTHL) indicated that no historically significant resources have been previously documented within the APE. It has been determined through consultation with the State Historic Preservation Officer (SHPO) that the APE for the proposed project is 500 ft from the proposed right-of-way. Pre-qualified historians conducted several site visits between 2000 and 2006 and found 172 historic-age (pre-1960) resources in the APE.

In accordance with the PA for Cultural Resources between the FHWA, the Texas State SHPO, the Advisory Council on Historic Preservation, and the TxDOT and the MOU between TxDOT and the THC, TxDOT individually coordinated this project with the THC on July 2, 2004, August 2004, and August 1, 2006. TxDOT determined that of the 172, twenty-three are eligible for the NRHP, all of which are listed in **Table 20**. The THC ultimately concurred with all these determinations of eligibility on August 18, 2006 (**Appendix B**).

Between the 2004 and 2006 coordination letters, TxDOT learned new information regarding several resources. In 2006, TxDOT reversed the 2004 eligibility determinations for Sites 7, 79, 83, 84, 98, 104, and 115 based on new information. Site 7, a historic-age farmstead, was initially determined eligible in 2004; however, new research and a site visit with THC personnel in the Spring of 2006 revealed that the property is not eligible. As a result, in the August 2006 letter, TxDOT determined Site 7 not eligible and the THC concurred.

Sites 79, 83, 84, 98, 104, and 115 are six Official State Historical Markers that are located within the project APE. These thematic markers are neither 50 years old, nor do they possess significance based on their own value. Consultation with the SHPO on August 18, 2006 determined the markers **not eligible** for the NRHP under Criteria Consideration F: Commemorative Properties. All but one of the markers, Site 104, will not need to be relocated. Prior to construction, the marker's relocation will be coordinated with the Brazoria County Historical Commission and the THC's Marker Programs when the new location is selected.

Also, in accordance with the above referenced PA, TxDOT determined that the proposed project will have no effect and/or no adverse effect to the NRHP eligible properties in the APE. The proposed project will not pose a direct effect to the NRHP eligible properties as the project does not require right-of-way from any historic property. Additionally, there will be no indirect or cumulative effects to the eligible resources as the existing relationship between the roadway and the resources will remain unchanged. The THC concurred with these determinations on July 2004, August 2004, and August 18, 2006 (**Appendix B**). These determinations are listed in **Table 20**.

Table 20: NRHP-Eligible Properties and Effects Determinations

Site #	Community	Address	Description	Date*	Effect Determination
2	Clemens Prison Unit: Saddle Shop	Brazoria County	Prison Saddle Shop	1939	No Effect
3	Clemens Prison Unit: Saddle House	Brazoria County	Prison Saddle House	1939	No Effect
4	Clemens Prison Unit: Field Office	Brazoria County	Prison Field Office	1953	No Effect
5	Clemens Prison Unit: Dry Storage Shed	Brazoria County	Prison Dry Storage	1939	No Effect
14	Clemens Prison Unit: Guard Tower	Brazoria County	Prison Guard Tower	c. 1940	No Effect
20	Needville	13702 SH 36	Needville Gin Co.	1930s-1950s	No Effect
22	Needville	9315 Main Street	residence	1920 (F)	No Effect
41	Guy	18438 SH 36	residence	c. 1935 (F)	No Adverse Effect
59	Brazoria	200 block, Brooks Street	Henry Smith monument	1930s-1950	No Effect
60	Brazoria	100 block West Smith Street	Brazoria Public School	1930 (B)	No Effect
66	Brazoria	306 Virginia St	First Presbyterian Church	1930 (B)	No Effect
70	Brazoria	514 Virginia	residence	1915 (B)	No Effect
76	Brazoria	300 Block Tennis	Brazoria Cemetery	1922	No Effect
85	Gulf Prairie	Peach Point Road and SH 36	Centennial Marker	1936	No Effect
86	Gulf Prairie	7831 SH 36	residence	1950 (B)	No Effect
93	Jones Creek	6019 SH 36	residence	1940 (B)	No Effect
95	Jones Creek	6503 S.F. Austin Road	residence	1950 (B)	No Effect
105	Brazoria	114 East New York	Saint John's Episcopal Church	1920	No Effect
114	Brazoria	SH 36 at Red Oak	Brazoria Lodge	1930s-1950s	No Effect
127	Needville	3118 violent	residence	1925 (F)	No Effect
130	rural	106011 Rybak	residence	1920 (F)	No Effect
131	rural	9731 SH 36	residence	1920 (F)	No Effect
132	rural	6143 Kamas Lane	residence	1948 (F)	No Effect

** F. Fort Bend Central Appraisal District records, B. Brazoria Central Appraisal District records."*

In particular, Site 41, located at 18438 SH 36 in Guy, was determined NRHP-eligible in July 2004 as a historic farmstead, of which the proposed project was determined to have an adverse effect due to proposed ROW acquisition from the eligible resource. Yet, between the 2004 and 2006, the project was redesigned at Site 41 so that no additional ROW will be acquired from this NRHP eligible farmstead. As a result, in the August 2006 letter, TxDOT determined that the proposed project will pose no adverse effect to Site 41. The SHPO concurred with this determination on August 18, 2006.

L. Stream Crossings

A field survey was conducted on July 9-10 2002, to identify stream crossings in the project corridor along Spur 10 and SH 36. In an effort to remain consistent in identifying streams throughout the entire corridor, identification criteria included; the presence of an established channel on both sides of the roadway; identification of a stream on USGS topographic maps, and a culvert or bridge present during the field investigation. Twenty-six stream crossings were identified during this survey. The stream crossings were identified as either natural or maintained. Crossings considered maintained consisted of straight flowing streams, consistently sloped uniform banks, and vegetation control occurring along the channel. Information pertaining to each crossing is contained in **Appendix A**.

Crossings along Hartledge Road consisted of three maintained and natural channels that flowed under old timber style bridges paved with asphalt. The SH 36 corridor contained culverts at 18 crossings and bridges at four other crossings. A crossing was identified on Trinity Road due to its close proximity to Detention Pond #5. This location had a bridge spanning a stream crossing on the eastern edge of the project area with concrete stream banks below the bridge in the ROW.

Eight additional locations were observed that contained culverts along SH 36, however, they were not considered stream crossings. These crossings either did not have an established stream channel, could not be identified on USGS topographic maps, were mapped wetland areas bisected by the existing road, or were designated as outfall structures.

The only stream channel modifications will occur at Varner Creek. A maximum of 0.39 ac of waters of the U.S. is estimated to be impacted at this location.

The vegetation in the existing ROW consisted primarily of herbaceous vegetation and woody vegetation along the fence lines and on adjacent properties. The design process for these areas has not yet progressed to a point to specify impacts, if any, to each individual stream crossing. As the design phase progresses, efforts will be made to keep any impacts to the streams to a minimum. The current approach will be to keep the same number of bents that currently exist at stream crossings and to span bridges over the crossings to minimize impacts.

M. Floodplains

The Flood Insurance Rate Maps (FIRM) for Fort Bend and Brazoria counties were referenced to determine the location of the 100-year floodplains within the project area. The FIRM maps indicate that much of the project lies within the 100-year floodplains of several creeks and bayous and the Brazos River. The designated floodplains crossed by the roadway are areas of the Brazos River, Jones Creek, Varner Creek, Fairchilds Creek, Seabourne Creek, Buffalo Creek, Hall's Bayou, Big Creek, Coon Creek, Deer Creek, Cottonwood Creek, Bell Creek and Mound Creek. The floodplain areas associated with the proposed project can be seen in **Exhibit 5**.

Low areas along the proposed roadway would be elevated to levels above the 100-year floodplain. The proposed project would not increase the base flood elevation to a level that would violate applicable floodplain regulations and ordinances. The hydraulic design practices for this project would be in accordance with current TxDOT design standards and procedures. The highway facility would permit the conveyance of the 100-year flood, inundation of the roadway being acceptable, without causing significant damage to the highway, stream or other

property. Brazoria and Fort Bend Counties are participants in the National Flood Insurance Program. The Village of Pleak and the Cities of Needville, Brazoria, Jones Creek and Freeport are also participants in the National Flood Insurance Program. The Cities of Damon, Guy and West Columbia are not participants.

Nine detention ponds and/or floodplain mitigation basins would be constructed as part of the highway improvement (**Exhibit 4**). Detention ponds would be constructed to compensate for increased runoff caused by the additional pavement. The floodplain mitigation basins would compensate for the fill added within the 100-year floodplain that is necessary to raise the roadway above the 100-year flood level.

The detention ponds and floodplain mitigation basins would occupy a total of approximately 56 ac. TxDOT design engineers are currently coordinating the approximate location and dimensions of Floodplain Basin #5. The total acreage and location of each detention pond and floodplain mitigation basin will be determined during the next design phase of the project. The proposed location of each site, its proposed size, and the associated sheet number in **Exhibit 4** it can be found is shown on the following table:

Table 21: Detention Ponds and Floodplain Mitigation Basins

Pond / Basin	Volume (ac ft)	Area (ac)	Exhibit 4 Sheet
1. Floodplain Basin #1 @ approx. Station 25+00	3.88	1.67	1
2. Floodplain Basin #2 @ approx. Station 180+00	5.6	2.3	4 and 4a
3. Floodplain Basin #3 @ approx. Station 236+00	3.33	1.64	7
4. Floodplain Basin #4 @ approx. Station 290+00	76.00	10.38	8 and 9
5. Detention Pond #1 @ approx. Station 305+00	14.27	2.72	6 and 9
6. Detention Pond #2 @ approx. Station 625+00	10.50	4.42	15
7. Detention Pond # 3 @ approx. Station 455+00	13.05	3.35	28 and 29
8. Floodplain Basin #5 @ approx. Station 880+00	24.22*	4.19*	36
9. Floodplain Basin #6 @ approx. Station 1755+00	151.00	25	51 and 51a

*Volume and area of Basin #5 are estimated based on the original design configuration. The final design will be determined in the next design phase of the project.

N. Wetlands

This section provides a brief overview of the potential impacts to wetlands and other jurisdictional waters of the U.S. occurring within the proposed SH 36 project area.

Methodology

On-site surveys and photo interpretation were used to identify and assess wetland impacts along the project corridor. The *1987 Corps of Engineers Wetland Delineation Manual* (Technical Report Y-87-1 or *1987 Manual*) states that wetlands must possess three essential characteristics. Under normal circumstances, these characteristics include the presence of:

- hydrophytic vegetation,
- wetland hydrology, and
- hydric soils.

A wetland delineation was completed in accordance with the *1987 Manual* within the project limits. The wetland delineation specifically consisted of staking and mapping identified wetland areas within the existing and proposed SH 36 ROW where right-of-entry was granted. Indicators of hydrophytic vegetation, wetland hydrology and hydric soils were documented in the

wetland areas. For the purposes of this study, data forms were completed at every plant community change as well as at logical intervals within and along the roadside drainages/ditches located within the SH 36 ROW. Additional data forms were completed in areas containing soils with naturally occurring low chroma and values.

Specific delineation activities involved the following:

- Utilization of the "Onsite Determination Method" as described in the *1987 Manual*. All dominant plant species in tree, shrub, sapling, herbaceous, and woody vine strata were categorized according to indicator status as per the *1988 National List of Vascular Plant Species* at representative locations throughout the proposed project limits.

- At the same locations, soil samples were obtained from roughly the upper 12-16 in. of the soil surface (to the extent possible) and compared with mapping units from the published Natural Resource Conservation Service (formerly the Soil Conservation Service) *Soil Survey of Brazoria County, Texas* and *Soil Survey of Fort Bend County, Texas*. Shovel testing, using a "sharpshooter" shovel, was conducted at numerous locations throughout the ROW to verify the accuracy of the NRCS mapping units. Exact soil sampling depths for each sample hole were noted on the accompanying data form for each location.

Soils occurring throughout the project ROW were characterized according to the following parameters: matrix color (hue, value, and chroma), soil texture (sand, silt, and clay), evidence of gleying, mottle color, mottle size, mottle abundance, presence of concretions, and degree of soil saturation, if any, to determine the presence or absence of hydric indicators. The presence or absence of hydrologic indicators (i.e., depressions, swales, etc.) was noted within the project ROW, with special attention given to any areas which exhibited indicators of both hydrophytic vegetation and hydric soils.

Once the identified wetland areas were delineated and staked, sites were surveyed using differentially corrected Global Positioning System (GPS) methodology followed by the generation of an exhibit of the delineated wetlands including the location of all observation points. Refer to **Exhibit 4** for illustrations of the delineated wetland areas located throughout the ROW limits of this project. The delineations were conducted according to U.S. Army Corps of Engineers (USACE) guidelines, and have been verified by the USACE (**Appendix B**).

Descriptions of Waters of the U.S. and Wetlands Potentially Impacted

Approximately 213 ac of waters of the U.S., including wetlands, were identified along the project corridor within the existing and proposed project ROW limits. Of these waters/wetlands, approximately 205 ac are jurisdictional and 8 ac are non-jurisdictional. **Table 22** gives a detailed description of the waters/wetlands identified along the project. For the purposes of wetland delineation and permitting, the proposed project corridor was divided into four sections. Section 1 consists of Spur 10 (Hartledge Road). Section 2 is FM 2218 to SH 35, Section 3 is SH 35 to FM 2004, and Section 4 is FM 2004 to the end of the project. Proposed construction activities would involve the discharge of dredged or fill material into approximately 0.097 ac (Section 1), 1.80 ac (Section 2), 1.59 ac (Section 3), and 5.06 ac (Section 4) of wetlands and 2.97 ac (Section 4) of waters. Therefore, three USACE Section 404 Individual Permits are anticipated for Sections 2, 3, and 4, and a Nationwide Permit (NWP) 14 – *Linear Transportation Projects* and a NWP 25 – *Structural Discharges* are anticipated for Section 1. The NWPs for Section 1 have been approved by the USACE, and Individual Permits for Sections 2, 3, and 4

are pending approval from the USACE. Specific permit requirements for this project will be based on the final design.

The following abbreviations are used for description purposes of jurisdictional waters/wetlands: OP = open water, D = depressional meadows and scrub/shrub wetlands, FW = forested wetland, and EW = emergent wetland. Most isolated wetlands identified along the corridor represented low quality depressional meadow and scrub/shrub wetlands. The delineated wetlands and waters of the U.S. can be seen in **Exhibit 4**.

Table 22: Waters of the U.S., Including Wetlands

Area	Associated Observation Points	Acres	Jurisdictional	Location & Type	Schematic Sheet #
1	176 & 177	0.07	Y	Coon Creek/OP	1
2	351-356	0.05	Y	Coon Creek/D	-
3	291-293	0.09	Y	Coon Creek/OP	1
4	178, 261-264	0.40	N	Upland Drainage Ditch	2
5	266	0.03	N	Isolated Wetland/D	2
6	180	0.03	N	Isolated Wetland/D	2
7	162	0.28	N	Isolated Wetland/D	3
8	No OP	0.11	Y	Cottonwood Creek/OP	4
9	181, 283-289 & 295-297	0.25	Y	Cottonwood Creek/EW	4
10	160 & 161	0.03	Y	Big Creek/EW	4
11	290	0.11	Y	Seabourne Creek/OP	7
12	260	0.15	Y	Big Creek/OP	9
13	No OP	0.07	Y	Foss Creek/OP	10
14	No OP	0.22	Y	Fairchilds Creek/OP	10
15	No OP	0.12	Y	Fairchilds Creek/OP	11
16	No OP	0.12	Y	Fairchilds Creek/OP	12
17	250	0.15	Y	Fairchilds Creek/OP	13
18	No OP	0.15	Y	Fairchilds Creek/OP	13
19	151 & 152	0.12	N	Isolated Wetland/D	15
20	No OP	0.13	Y	Buffalo Creek/OP	15
21	150	0.05	N	Upland drainage ditch	15
22	No OP	0.05	Y	Deer Creek/OP	16
23	No OP	0.04	Y	Mound Creek/OP	17
24	148 & 149	0.03	N	Upland drainage ditch	18
25	No OP	0.08	Y	Mound Creek/OP	19
26	No OP	0.05	N	Upland drainage ditch	19
27	No OP	0.13	N	Upland drainage ditch	20
28	254 & 256	0.74	N	Isolated Wetland/D	21
29	117, 118 & 257	0.28	N	Isolated Wetland/D	21
30	116	0.05	N	Isolated Wetland/D	21
31	114, 115, 270 & 271	0.76	Y	Outfall Channel ditch/OP	22
31a	No OP	0.13	Y	Adjacent Wetland/EW	22
32	No OP	0.06	N	Upland drainage ditch	23
33	No OP	0.09	N	Outfall Channel to Cow Creek	24
34	106	0.24	N	Isolated Wetland/D	-
35	89, 104 & 108	1.95	Y	Wetland/D	25
36	88	0.03	Y	Wetland/D	25
37	87	0.06	Y	Tributary of Varner Creek/EW	26
38	84 & 85	0.03	N	Upland drainage ditch	Omitted
39	251-253	0.14	N	Isolated Wetland/D	27
40	No OP	0.16	Y	Varner Creek/OP	28

Area	Associated Observation Points	Acres	Jurisdictional	Location & Type	Schematic Sheet #
41	95	0.39	Y	Varner Creek/OP	28
42	83 & 94	0.06	Y	Wetland/D	29
43	31 & 82	0.21	Y	Varner Creek/OP	29
44	81	0.06	N	Upland drainage ditch	30
45	No OP	0.22	N	Isolated Wetland/D	31
46	72 & 206	0.55	N	Isolated Wetland/D	31
47	71, 71A & 71B	1.21	N	Isolated Wetland/D	31
48	70	0.18	N	Isolated Wetland/D	31
49	275-279	0.04	N	Upland drainage ditch	31
50	69	0.41	N	Isolated Wetland/D	31
51	66-68	0.16	N	Isolated Wetland/D	31
52	No OP	0.14	N	Isolated Wetland/D	31
53	No OP	0.05	N	Isolated Wetland/D	31
54	64 & 65	0.10	N	Isolated Wetland/D	32
55	207 & 208	0.01	N	Isolated Wetland/EW	32
56	No OP	0.004	N	Upland drainage ditch	32
57	No OP	0.01	N	Upland drainage ditch	33
58	No OP	0.19	Y	Bell Creek/OP	34
59	62	0.003	N	Outfall channel to Bell Creek	34
60	No OP	0.04	N	Outfall channel to Bell Creek	35
61	57-61, 503, 504, 201 & 202	1.71	Y	Wetlands/EW	36
62	53, 54, 55	0.01	N	Upland drainage ditch	-
63	50	0.73	Y	Wetlands/FW	37
64	No OP	0.03	Y	Brazos River outfall channel/OP	37
65	No OP	0.01	N	Upland drainage ditch	39
66	173, 174	0.02	N	Isolated Wetland/D	39
67	173, 174	0.02	N	Isolated Wetland/D	39
68	189, 190, 191, 192	0.08	N	Upland drainage ditch	40
69	43, 501	0.02	N	Upland drainage ditch	40
70	43, 501	0.06	N	Isolated Wetland/D	40
71	42, 500	0.02	N	Isolated Wetland/D	41
72	39, 40	0.05	N	Isolated Wetland/D	-
73	363	0.02	N	Upland drainage ditch	43
74	167	0.14	N	Upland drainage ditch	44
75	103-112 & 115	0.32	Y	Wetlands/EW	45
76	100-102	0.15	N	Isolated Wetland/D	47
77	22-24, 411 & 412	0.81	Y	Jones Creek/EW	51
77a	No OP	0.31	Y	Jones Creek/OP	51
78	18 & 19	0.12	Y	Tributary of Jones Creek/EW	51
79	130-136, 408, 409, AA, 12, 13, 16, X, U, 414, 415, 417 & 418	13.19	Y	Wetland/EW	52-54
80	11, 90, 406 & 407	0.41	Y	Intracoastal ditch/EW	55
80a	No OP	0.37	Y	Intracoastal ditch/OP	55
81	01 & 02	0.37	N	Isolated Wetland/D	55
82	M1 & M2	1.10	N	Isolated Wetland/EW	55
83 Brazos River	No OP	3.68	Y	Brazos River/OP	55

Area	Associated Observation Points	Acres	Jurisdictional	Location & Type	Schematic Sheet #
84	E2-E4	10.11	Y	Wetland/D	84
85	1-10, H, E, 404 & 405	45.32	Y	Coastal canals/ OP and EW	85
	Total Acres	90.947			
	Jurisdictional	83.040			
	Non-Jurisdictional	8.007			

The open waters of the Brazos River (Area 83) delineated along this project corridor would not be impacted because there would be no roadway improvements to the Brazos River Bridge. Additionally, Areas 80, 81, 82 and 84, which are located on either side of the Brazos River, would also not be impacted because there would be no construction in these areas. Due to a design modification which resulted in a minimization of proposed ROW in several areas after the initial wetland delineation and USACE coordination, Areas 67 and 69 are no longer within the proposed ROW for the project area. All of the remaining open water crossings currently contain culverts or bridge structures, which would be replaced during the roadway improvements. Impacts at these areas would be minimized to the extent possible during the design and construction phases.

All of the waters/wetlands located at creek and stream crossings could not be avoided. These crossing structures (i.e., culverts, pilings, rip-rap etc.) would need to be replaced due to the widening of the roadway and the upgrading of structures to current TxDOT design standards. Impacts to these areas, however, would be reduced to the extent possible during the construction phase of the project.

The majority of the depressional, isolated wetlands were considered low to medium quality wetlands along the project. The quality of the wetlands was assessed based on vegetation and hydrology. These areas contained, generally, 50% or less OBL plants (Obligate wetland plants- > 99% occurrence in wetlands) or FACW (Facultative wetland plants- >67-99% occurrence in wetlands) and/or species of plants that are generally considered weedy and opportunistic species; the majority of the vegetation consisted of FAC species (Facultative plants- 33-67% occurrence in wetlands). In addition, these depressional wetlands were generally located in pastures that are currently grazed by cattle or disturbed by farming activities. All efforts to minimize impacts to these isolated wetlands were made during the alternatives analysis process; however, in many instances, they could not be avoided due to roadway design and safety standards. The following is a brief description of the jurisdictional wetland impact areas.

Area 63 is the only forested wetland site to be impacted by the project. Area 63 (delineated by desktop method) is a remnant oxbow area of a slough, just north of the town of Brazoria, which previously crossed the area where SH 36 is today. This area is depressional and holds water for long periods. It was determined through the alternatives analysis that it would not be feasible to avoid this area because at least two structures would be impacted on the opposite side of the road- a house and a business.

Nineteen of the 85 sites delineated are considered upland drainage features. These drainage features comprise nearly 1.27 ac of the total waters/wetlands identified along the project. These areas could not be avoided through the alternatives analysis; any alignment of the proposed roadway would cross these features.

Wetlands delineated in the Damon Oil Field area (Areas 44-54), mottled with old sludge pits and drainage features, account for 3.12 ac of the total waters/wetlands. The impacts through this area could not be avoided due to the close location of oil well pumps on the opposite side of the road. Additionally, the opposite side of the road in this location consisted of a comparable amount of wetlands as determined through desktop and windshield reviews.

Impacts to Area 35, 1.95 ac of high quality prairie wetlands, could also not be avoided. This area of the project is low on the landscape and wetlands are located on both sides of the road. This alternative was selected to keep the ROW continuous on the west side of the road. Area 36, a wetland ditch, is located within the existing ROW and could also not be avoided by future improvements to SH 36. Area 37 is a tributary of Varner Creek with emergent wetlands. This wetland extends from the existing roadway west to the proposed ROW line. It would be impacted to some degree with any of the proposed ROW alternatives and there would be impacts to a home if the ROW was taken on the opposite side of the road to minimize these impacts. Since the impacts to this wetland are minimal, this alternative was the most feasible.

Area 61 is a roadside drainage ditch, which drains adjacent wetlands in this area of the project. The existing roadway within this area of the project has been built up due to the high level of the 100-year floodplain. The Brazos River runs generally parallel to the roadway within this area and is less than a half of a mile away from SH 36. Much of the area between the river and SH 36 in this area consists of wetlands. Due to design constraints of the roadway, curvature and elevation, it was most feasible to widen to the east of SH 36 in this area; therefore, these wetland impacts could not be avoided. This wetland drainage ditch, however, is considered to be low quality due to the amount of weedy plant species in the ditch and the routine maintenance activities that occur on a regular basis.

Wetlands in Area 75, drainages within the TDCJ Clemens Unit, are very low quality wetlands that could not be avoided due to roadway design and engineering constraints in this area. These wetlands are located on the opposite side of the road from the prison facilities in the cultivated fields. It was not feasible to impact the prison facility in order to minimize these wetland impacts.

Area 78 is a small tributary of Jones Creek that runs through the Stringfellow Park and picnic area. The roadway improvements within this area of the project are within the existing ROW; therefore, the impacts could not be further minimized at this location.

Area 79 includes the roadside ditches of SH 36 south of Jones Creek to just north of the Brazos River. These ditches were previously dug in wetland areas, as determined through data points of adjacent properties and review of available desktop resources. The proposed roadway through this area would be within existing ROW; therefore, impacts could not be further reduced. These ditches contain water most of the year and some species of high quality (OBL and FACW) wetland vegetation. However, due to the prevalence of weedy species and the routine maintenance activities, these wetland ditches are considered to be low quality.

Area 85 consists of coastal canals adjacent to SH 36 containing OBL and FACW plant species and open water areas. Wildlife, including waterfowl and fishes, were observed inhabiting this area. Of the 45.32 ac delineated within the existing ROW, approximately 5.10 ac are expected to be impacted. The alternatives considered for widening SH 36 in this area included options to widen evenly down the center of the existing roadway or to widen entirely to one side or the other of the existing roadway. The preferred alignment was to widen evenly down the center of the existing alignment. This alternative was the most environmentally sensitive alternative

because it utilizes the existing alignment as well as existing ditches. To widen entirely to one side or the other in this area would create more impacts to the adjacent canals.

Approximately 0.1 ac of a 1,020.3-acre tract of land deeded to the USDA Wetlands Reserve Program is included within the proposed ROW. A proposed detention basin in the area was redesigned to avoid impacts to the property. Coordination with the NRCS has been initiated to avoid and minimize impacts to the reserve area, and to comply with Title 440-V-CPM, Amendment 2, October 2000, regarding easement modifications.

Coordination has been initiated with the Galveston District of the USACE. Three Pre-Application meetings have been held at the Galveston District offices, one on February 14, 2001 and one on October 10, 2001, to discuss wetland delineation and reporting procedures for this project. The third pre-application meeting was on April 10, 2002 to further discuss wetland mitigation and permitting options for the project. Three Individual Permits and one NWP 14- *Linear Transportation Crossings* and one NWP 25- *Structural Discharges* will be prepared for the project.

Wetland Functions and Benefits

Generally wetland areas serve the following functions and benefits: ground water recharge, ground water discharge, flood storage and velocity reduction, shoreline anchoring, sediment trapping, nutrient retention, food chain support, fishery habitat, wildlife habitat, general diversity, active recreation, passive recreation and heritage. In general, the wetland sites throughout the project corridor do not serve the purposes of ground water discharge, shoreline anchoring, active recreation, passive recreation, and heritage. Although all wetland sites along the project would serve for ground water recharge, flood storage and velocity reduction, sediment trapping, nutrient retention, food chain support, wildlife habitats and general diversity, these functions and benefits would vary in importance for each site.

Avoidance / Minimization of Impacts to Wetlands

Consistent with the National Policy, as expressed in EO 11990, this "Wetlands Finding" is provided in summary form. There are no practicable alternatives to the proposed project. Avoidance of these wetland impacts is not feasible due to the fact that the proposed improvements involve an existing facility. The preferred alternative, which utilizes the existing corridor, was found to be the most feasible alignment in terms of minimizing overall impacts. In Fort Bend and Brazoria counties, many areas qualify as wetlands due to the prevalence of hydric soils. In many areas, changes in the horizontal alignment of the proposed facility would only impact other wetland areas. In some areas, changes in the horizontal alignment would also displace businesses that support the small, local communities for which the proposed improvements are meant to serve, thus possibly causing socio-economic impacts. The following measures to minimize impacts to wetland areas were used along the entire project limits. The proposed ROW width for the facility was kept to a minimum yet complies with current TxDOT design standards.

To the extent possible, wetland areas would be avoided along the SH 36 project. Where avoidance is not practicable, wetland impacts would be minimized. Minimization efforts to wetland impacts can be seen throughout the project where roadway alignments and ROW limits have been reduced or adjusted, within design and safety standards, to reduce impacts to wetland areas. These minimization measures are observed near the southern end of the project where numerous ac of coastal wetlands exist adjacent to SH 36. All roadway work in this area

would be constructed within the existing ROW limits to avoid impacts to the coastal wetlands. For those wetland areas where avoidance and minimization was not possible for the proposed roadway construction, mitigation for prairie wetland impacts is proposed at the TxDOT Coastal Bottomland Mitigation Bank (CBMB).

Wetlands Mitigation

On-site mitigation would not be feasible due to the fact that the type and quality of wetland areas impacted could not be appropriately created and maintained within a roadway corridor. On-site mitigation would also limit future improvements to the facility. TxDOT proposes to mitigate for potentially impacted prairie wetlands at the TxDOT CBMB established at Nannie M. Stringfellow WMA. The Stringfellow WMA is a 3,800-ac tract approximately 4 mi north of the San Bernard National Wildlife Refuge. TxDOT established the CBMB on the Stringfellow Tract to provide mitigation for transportation projects in the Brazos River, San Jacinto-Brazos, and Brazos-Colorado Coastal Basins. The SH 36 project lies within the Brazos River and the Brazos-Colorado Coastal Basins.

Mitigating for wetland impacts at a single location would be the most cost effective and most beneficial for wetland habitat replacement. Mitigation would be of like-kind and would consist of forested and emergent palustrine wetland habitats at the CBMB through the use of credits.

O. Water Quality

The project is within the San Bernard and Lower Brazos watersheds. The project corridor crosses Coon Creek, Cottonwood Creek, Big Creek, Seaborne Creek, Fairchilds Creek, Buffalo Creek, Deer Creek, Mound Creek, Cow Creek, Varner Creek and tributaries, Bell Creek and tributaries, the Brazos River and Jones Creek and tributaries. Existing rainfall drainage patterns would be maintained and would be unaltered by the proposed project, as would the project area's public water supply treatment facilities and distribution systems. Since the proposed SH 36 project does not involve the need for subsurface water, no effect on the water table is anticipated. In view of the generally level terrain along the project, construction would not appear to entail a serious problem for erosion. Water quality resulting from rainfall, sheet flow, and run-off would not be adversely affected by the proposed project. Erosion and sedimentation would be controlled by job specifications, which would be addressed during the Texas Commission on Environmental Quality (TCEQ) 401 Water Quality Certification process and on-site inspections during construction. The TCEQ Tier II 401 Water Quality Certification Questionnaire, alternatives analysis and mitigation plan would also be completed. The Tier II questionnaire would detail the Best Management Practices (BMPs) for erosion control, sediment control and the control of total suspended solids for this project. TxDOT contract specifications require the contractor to minimize negative effects to the environment at all times during construction operations.

Three detention basins and six floodplain mitigation basins are proposed for the preferred alternative. According to the EPA, detention ponds are storm water control structures providing both retention and treatment of contaminated storm water runoff. The detention ponds serve to control both storm water quality and quantity by collecting runoff from each rain event, which is then detained and treated in the pond until it is displaced by runoff from a future rain event. Detention pond benefits include "decreased potential for downstream flooding and stream bank erosion and improved water quality due to the removal of suspended solids, metals, and dissolved nutrients." (EPA 1999)

Storm water runoff from this proposed construction would flow into Big Creek, segment number 1202J of the Lower Brazos river basin. This feature is listed in the TCEQ Water Quality Inventory. This segment is designated as threatened or impaired for bacteria in the 2004 Clean Water Act Segment 303(d) list. The project is less than 5 mi upstream from the impaired segment. Therefore, coordination with the TCEQ regarding total maximum daily loads is required.

Since this project would disturb more than 5 ac, TxDOT would be required to comply with the TCEQ's Texas Pollutant Discharge Elimination System (TPDES) General Permit and a Notice of Intent (NOI) must be filed with the TCEQ.

P. Hazardous Waste Sites

A Phase I Environmental Site Assessment (ESA) was conducted by a consultant on behalf of TxDOT and submitted in August 2001 in accordance with the current American Standard Testing Methods (ASTM) E-1527-00 guidance standards as documented in *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* for the SH 36 (Site) project. The Phase I ESA included a drive-by and walk through site inspection (site reconnaissance), a drive-by observation of adjacent properties and the site vicinity, a review of Federal and state regulatory agency environmental databases, a review of historical aerial photographs, a cursory review of Railroad Commission of Texas (RRC) Oil and Gas Well Location maps, interviews with off-site parties, and a review of USGS topographic maps. The information obtained from these surveys was used to determine if there were any sites that would pose an environmental concern to the proposed project or if there are any existing environmental conditions that may be a concern with regard to the design, construction, and operation of the proposed project. The Phase I ESA was conducted and completed as a separate report and can be obtained from the TxDOT Houston District Office.

The Phase I ESA revealed no recognized environmental conditions (RECs), as defined in ASTM E-1527-00, that were definitively determined through field verification to be located on the site. However, the Oil and Gas Well maps indicate that multiple oil and gas wells appear to be located on the site. Additionally, multiple subsurface pipelines were also observed to cross the site. In each case, no apparent environmental impacts to the site were observed based on observations of the land surface. There were no subsurface investigations included in the Phase I ESA.

The Phase I ESA did reveal multiple sites with RECs located immediately adjacent to the site. It is possible that some of the off-site RECs could be at least partly located on the site, or may represent environmental conditions with the potential to impact the site. Without a survey of the actual site boundaries, in conjunction with additional site assessment activities to adjacent properties which is beyond the scope of the Phase I ESA, it was not possible to determine if some of the RECs adjacent to the site have impacted the site. RECs identified during the Phase I ESA include underground petroleum storage tank sites (UST), above-ground petroleum storage tanks (AST), leaking underground storage tank sites (LUST), pipelines, power substation sites (possible sources of PCB contamination), and oil and gas production and exploration sites. The potential exists that these adjacent REC sites have had releases of regulated substances that may have impacted the site.

A review of regulatory records was included as part of the Phase I ESA. Information pertaining to regulated facilities within the ASTM-specified search radii of the site is contained in the Phase I ESA Corridor Study Report (database report) obtained from Environmental Data Resources,

Inc. (EDR). This report includes information obtained from the US EPA electronic databases, State of Texas electronic databases, and other readily obtainable information sources. The following is a brief summary of the regulated facilities identified during the Phase I ESA.

- National Priority List (NPL) or Proposed NPL – No sites were identified by EDR within a 1-mi search radius of the site.

- US EPA Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Sites – Although the EDR database report indicates 1 CERCLIS site located within a 1-mi radius of the site, site reconnaissance determined that the CERCLIS site is located more than 1 mi from the site.

- CERCLIS No Further Remedial Action Planned (NFRAP) Sites – The database report compiled by EDR indicates that 3 CERCLIS NFRAP sites are located within a 1-mi radius of the site; however, after site reconnaissance activities, it was determined that all of the reported CERCLIS NFRAP sites are located more than 1 mi from the site.

- Resource Conservation and Recovery Act (RCRA) Corrective Action Activity Sites (CORRACTS) Sites – The EDR database report indicates that 1 CORRACTS site is located within a 1-mi radius of the site; however, based upon direct field observations, this CORRACTS site was determined to be located more than 1 mi from the site.

- US EPA Resource Conservation and Recovery Information System (RCRIS) – Treatment, Storage, and Disposal (TSD) / Generator Database Sites:

  - RCRIS TSD – The EDR database report indicates 1 RCRIS TSD site is located within a 1-mi radius of the site. However, based upon direct field observations, this RCRIS TSD site was determined to be located more than 1 mi from the site.
  - RCRIS Large Quantity Generator (LQG) – Two RCRIS LQG sites are listed in the EDR database report within the Site. However, after field verification, these 2 RCRIS LQG sites were determined to be located more than 1 mi from the site.
  - RCRIS Small Quantity Generator (SQG) – The EDR database report lists 21 RCRIS SQG sites within the search area associated with the proposed SH 36 project. Of these 21 reported RCRIS SQG sites, only 4 are located adjacent to the Site. The remaining 17 RCRIS SQG sites are located beyond the ASTM standard search radius from the site.

- US EPA Emergency Response Notification System (ERNS) Sites – Although 1 ERNS site is listed in the EDR database report, the reported address is located more than 1 mi from the site.

- TCEQ LUST Database Sites – The EDR database report listed 48 LUST sites:

  - Twenty-eight LUST sites are within a 1-mi radius of the site. Of these 28 LUST sites, only 9 are located within the ASTM standard minimum search distance of ½-mile. Of these 9 LUST sites, 8 are located adjacent to the Site. Three of these LUST sites adjacent to the site have been granted final concurrence and regulatory closure by the TCEQ, but cannot be eliminated as potential sources of environmental impacts. The EDR database report further indicates that groundwater monitoring activities are being conducted at the remaining 5 LUST sites adjacent to the site, which represents potentially significant risk for environmental impacts to the site.

- The remaining 20 LUST sites identified in the EDR database report are not located in the immediate vicinity of the Site, and based upon their distance from the site, do not appear to represent a significant environmental risk to the site.
- One LUST site not listed in the EDR database report was also identified. This LUST site is listed as the Needville ISD Bus Garage, and is reportedly located at 16319 South Highway 36 in Needville, Fort Bend County. According to TCEQ records, a 1,000-gallon UST was removed from the ground in 1988, which did leak; however, only soil was impacted. TCEQ issued final concurrence and the site has been granted regulatory closure, but cannot be eliminated as a potential source for environmental impact.

- TCEQ Underground Storage Tank (UST) Database Sites – The EDR database report identified 88 UST sites within a 1-mi radius of the site:

  - Only 35 of these UST sites are located within the ASTM standard minimum search radius. Of these 35 UST sites, 8 are also the LUST sites located adjacent to the Site. Fourteen of the UST sites have had all USTs removed from the ground. Twenty-nine UST sites have had no leaks reported to the State.
  - The remaining 53 UST sites identified in the EDR database report are not located in the immediate vicinity of the Site and do not appear to represent a significant environmental risk to the proposed SH 36 project.
  - Three additional UST sites were identified in the TCEQ Petroleum Storage Tank (PST) database records:
    - Case Power & Equipment in Needville, Fort Bend County, had two 500-gallon USTs abandoned-in-place in 1985.
    - Boyd's in Damon, Brazoria County, had two 1,000-gallon USTs that were removed from the ground in 1995.
    - Kirk's Handy Way in Brazoria, Brazoria County, has three 6,000-gallon USTs containing gasoline and currently in use.

- Facility Index System (FINDS) Database Sites – The EDR database report identified 27 FINDS sites within a 1-mi radius of the site. Of these 27 reported FINDS sites, only five are located within a 1/8-mile radius of the site. None of these five FINDS sites appears to represent a significant environmental risk to the subject property based solely upon their listing in the FINDS database.

- RCRA Administration Action Tracking System (RAATS) Database Sites – The EDR database report identified 1 RAATS site within a 1-mi search radius of the site. However, based upon field observation, this reported RAATS site was determined to be located more than 1 mi from the site.

- Toxic Chemical Release Inventory System (TRIS) Database Sites – Although 1 TRIS site is listed in the EDR database report, based on field observation, this TRIS site is located more than 1 mi from the site.

- Toxic Substances Control Act (TSCA) Chemical Substance Inventory List Database Sites – Although the EDR database report identified one TSCA site within a 1-mi radius of the site, based upon field observation, this TSCA site is not located within a 1-mi radius of the site.

- Aboveground Storage Tank (AST) Database Sites:

- The EDR database report identified 6 AST sites within a 1-mi radius of the site. Of these 6 AST sites, only 1 is located within the immediate vicinity of the site. The remaining AST sites are located more than 1/8-mile from the site.
- None of the AST sites identified in the EDR database report appear to represent a significant environmental risk to the proposed SH 36 project based upon their distance from the site.
- Two additional AST sites not listed in the EDR database report were also identified. One AST site is listed as Civil Highway & Paving – West Columbia, and is reportedly located at 500 North Highway 36 in West Columbia, Brazoria County. According to TCEQ records, one 8,000-gallon and two 2,000-gallon ASTs were formerly in use at the site. The ASTs were reportedly of steel construction and were utilized to store gasoline. The ASTs were reported out-of-use in 1999. The other site not listed in the EDR database report is the Kincer Oil Company Bulk Plant located on Highway 36 North in Brazoria, Brazoria County. The only information gathered from the TCEQ PST database was that 4 ASTs are located at this site. Interviews with former owner Bill Kincer indicated that there were four 20,000-gallon ASTs at this site. One AST contains diesel fuel while the remaining 3 contain gasoline. Both of these AST sites cannot be eliminated as potential sites of environmental concern without further investigation.

- Industrial and Hazardous Waste (TX IHW) Database Sites – Ten TX IHW sites were identified by EDR within a 1-mi radius of the site. However, only three are located within the immediate vicinity of the site. None of the TX IHW sites represent a significant environmental concern to the subject property based solely upon their listing in the TX IHW database.

- ASTM Supplemental State or Local Databases – A search of the following ASTM supplemental State or local databases indicated no sites within a 1-mi search radius of the site.

  - TCEQ Spills Database
  - Texas Superfund Liens
  - TCEQ Voluntary Cleanup Program Database
  - Multi Media Enforcement Cases
  - Commercial Hazardous and Solid Waste Management Facilities
  - Current Emission Inventory Data

The Phase I ESA concluded that although no RECs definitively occurred on the site, several adjacent properties have RECs that may be at least partially located on the site. It is recommended that a Phase II ESA Workplan be developed during the ROW acquisition process to evaluate the site for potential environmental impacts. TxDOT is currently evaluating these recommendations and coordinating these efforts. A detailed summary of the hazardous materials sites, including their addresses, identified during the Phase I ESA is located in **Appendix A**, under Summary of Phase I ESA Results. The locations of these sites are noted on **Exhibit 5**. Any unanticipated hazardous materials and/or petroleum contamination encountered during construction would be handled according to applicable state and federal regulations and TxDOT standard specifications.

The proposed project includes the demolition and/or relocation of building structures. The buildings may contain asbestos containing materials. Asbestos inspections, specification, 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.

Q. Air Quality Assessment

The proposed project area falls within the TCEQ Region 12, which is a moderate non-attainment region for ozone. The transportation conformity rule applies because the proposed improvements are located in two counties designated as non-attainment by the EPA. The traffic numbers used for the air quality assessment were based on the estimated time of completion (ETC) and ETC plus 20 years. ETC year traffic (2013) is estimated to range from 1,804 vpd to 11,352 vpd. ETC plus 20 years traffic (2033) is estimated to range from 3,289 vpd to 16,126 vpd. These traffic projections do not exceed 140,000 vpd; therefore, a traffic air quality analysis (TAQA) is not required because previous analyses of similar projects did not result in a violation of National Ambient Air Quality Standards (NAAQS).

The no-build alternative would not reduce congestion. Conversely, continued land development in the surrounding area would result in increased congestion, resulting in increased air pollution in the vicinity of the roadway.

All projects in the H-GAC's TIP that are proposed for federal or state funds were 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 proposed action is consistent with the area's financially constrained 2025 RTP and draft 2035 RTP, and the 2006-2008 TIP and draft 2008-2011 TIP as proposed by the H-GAC. The 2025 RTP was found to conform to the State Implementation Plan (SIP) on June 3, 2005; the 2006-2008 TIP was found to conform on October 31, 2005.

Congestion Management System

It is stated in 23 CFR 450.320(b) that no single occupancy vehicle (SOV) capacity may be built in the Transportation Management Area (TMA) designated as nonattainment for ozone or carbon monoxide unless the project complies with a congestion management system (CMS). The 2025 RTP for the Houston-Galveston Transportation Management Area, which includes Brazoria and Fort Bend counties, includes a CMS. The CMS was originally adopted in October 1997 and later amended in December 1997 and May 1998. It is an ongoing process that is designed to systematically evaluate, select, and implement cost-effective strategies to manage proposed and existing transportation facilities.

The CMS identifies appropriate traffic control measures (TCMs) for implementation in various congested areas, today and in the future. The CMS refers to several methods of roadway management, including Transportation System Management (TSM) and Travel Demand Management (TDM) strategies which seek to improve traffic flow and safety through better operation and management of transportation facilities. Additionally, these strategies provide low cost solutions that can be constructed in less time and provide air quality benefits to the region. TSM attempts to identify improvements that would enhance the capacity of the existing transportation system. Better management and operation of existing facilities improves traffic flow, air quality, movement of vehicles and goods, and enhances system accessibility and safety. TSM strategies include intersection and signal improvements, freeway bottleneck removals, special events management, and data collection to monitor system performance. TDM addresses alternative forms of transportation to commuters that seek to reduce congestion

and air pollution and to increase efficiency of the transportation system. TDM programs may include carpools, vanpools, transit, telecommuting, compressed work weeks, park-and-ride facilities, bike and pedestrian transportation, and Transportation Management Associations. No specific TCMs have been identified in the draft 2035 RTP for the proposed project or for intersecting roadways within the project corridor; however, intersection improvements will be included in the proposed project as a congestion reduction strategy.

The SH 36/Spur 10 project was developed from the H-GAC operational CMS, which meets all requirements of CFR 500.109. The proposed improvements to the facility would conform to the Houston-Galveston area CMS. Congestion Management Analyses (CMAs) are performed by the local MPO. Brazoria and Fort Bend counties are members of the H-GAC. The H-GAC has performed CMAs for the SH 36 facility (CSJs 0188-02-029, 0188-03-019, 0188-04-035, 0188-04-025, 0188-04-044, 0188-05-027, 0188-06-046, 0111-08-100, and 0188-02-036), and provided letters of waiver (LOWs) for the Spur 10 facility (CSJs 0187-50-050 and 0187-05-048). Copies of the CMAs and LOWs are included in **Appendix B**.

Mobile Source Air Toxics

The purpose of this project is to upgrade SH 36 and Spur 10 by constructing a four-lane divided facility with a grassy center median in rural sections and a four-lane undivided facility with a continuous center left-turn lane in urban areas. The facility is a designated hurricane evacuation route, to increase safety, access, and mobility for the transportation of people and commercial goods in coastal areas in emergency situations.

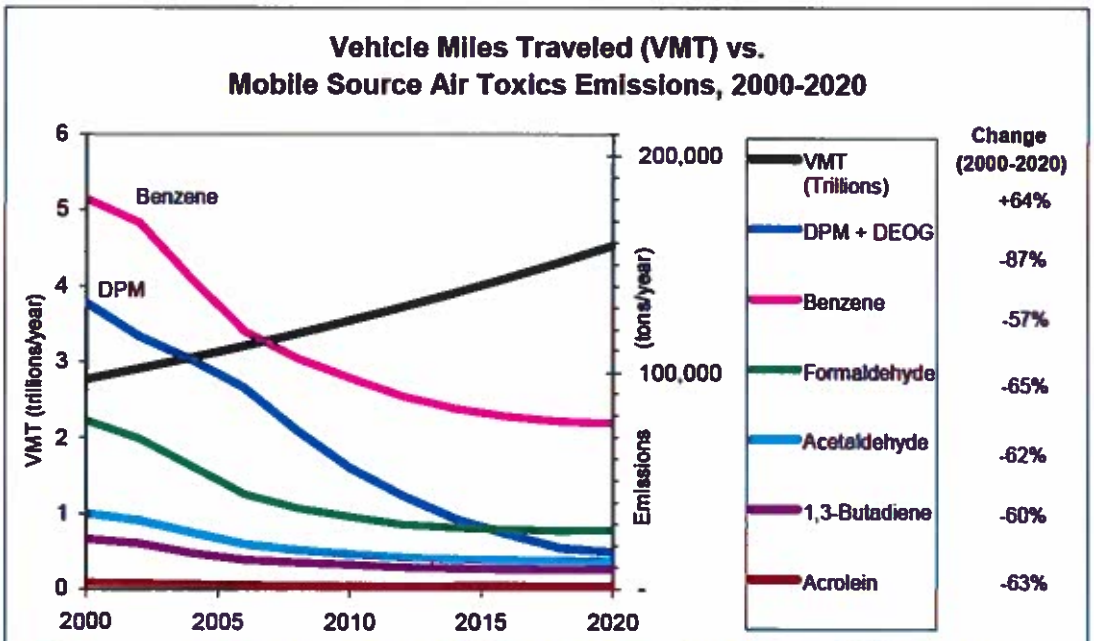
In addition to the criteria air pollutants for which there are NAAQS, the EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, off-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries).

Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the Clean Air Act (CAA). The MSATs are compounds emitted from highway vehicles and off-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

For each alternative in this EA, the amount of MSATs emitted would be proportional to the vehicle miles traveled (VMT) assuming that other variables such as fleet mix are the same for each alternative. The VMTs estimated the build alternative are slightly higher than that for the no-build alternative, because the additional capacity increases the efficiency of the roadway and attracts rerouted trips from elsewhere in the transportation network. This increase in VMT would lead to higher MSATs emissions for the action alternative along the highway corridor, along with a corresponding decrease in MSATs emissions along the parallel routes. The emissions increase is offset somewhat by lower MSATs emission rates due to increased speeds; according to the EPA's MOBILE6.2 emissions model, emissions of all of the priority MSATs, except for diesel particulate matter, decrease as speed increases. The extent to which these speed-related emissions decreases will offset VMT-related emissions increases cannot be reliably projected due to the inherent deficiencies of technical models. Because the estimated VMT under each of the alternatives are nearly the same, it is expected there would be no appreciable difference in overall MSATs emissions among the various alternatives.

The EPA is the lead federal agency for administering the CAA and has certain responsibilities regarding the health effects of MSATs. EPA issued a Final Rule on *Controlling Emissions of Hazardous Air Pollutants from Mobile Sources* (66 FR 17229, March 29, 2001). This rule was issued under the authority in Section 202 of the Clean Air Act. In its rule, EPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline (RFG) program, its national low emission vehicle (NLEV) standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, FHWA projects that even with a 64 percent increase in VMT, these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 to 65%, and will reduce on-highway diesel PM emissions by 87%, as shown in **Figure 3**.

Figure 3: VMT vs. MSATs Emissions, 2000-2020



Notes: For on-road mobile sources. Emissions factors were generated using MOBILE6.2. MTBE proportion of market for oxygenates is held constant, at 50%. Gasoline RVP and oxygenate content are held constant. VMT: *Highway Statistics 2000*, Table VM-2 for 2000, analysis assumes annual growth rate of 2.5%. "DPM + DEOG" is based on MOBILE6.2-generated factors for elemental carbon, organic carbon and SO4 from diesel-powered vehicles, with the particle size cutoff set at 10.0 microns. 1 short ton = 907,200,000 mg.

In an ongoing review of MSATs, the EPA finalized additional rules under authority of CAA Section 202(l) to further reduce MSATs emissions that are not reflected in the above graph. The EPA issued Final Rules on Control of Hazardous Air Pollutants from Mobile Sources (72 FR 8427, February 26, 2007) under Title 40 Code of Federal Regulations Parts 59, 80, 85, and 86. The rule changes were effective April 27, 2007. As a result of this review, the EPA adopted the following new requirements to significantly lower emissions of benzene and the other MSATs by: (1) lowering the benzene content in gasoline; (2) reducing non-methane hydrocarbon (NMHC) exhaust emissions from passenger vehicles operated at cold temperatures (under 75°F); and (3) reducing evaporative emissions that permeate through portable fuel containers.

Beginning in 2011, petroleum refiners must meet an annual average gasoline benzene content standard of 0.62% by volume, for both reformulated and conventional gasolines, nationwide. The national benzene content of gasoline in 2007 is about 1.0% by volume. The EPA standards to reduce NMHC exhaust emissions from new gasoline-fueled vehicles will become effective in phases. Standards for light-duty vehicles and trucks (less than or equal to 6000 pounds [lbs]) become effective during the period of 2010 to 2013, and standards for heavy light-duty trucks (6,000 to 8,000 lbs) and medium-duty passenger vehicles (up to 10,000 lbs) become effective during the period of 2012 to 2015. Evaporative requirements for portable gas containers become effective with containers manufactured in 2009. Evaporative emissions must be limited to 0.3 gram of hydrocarbons per gallon per day.

The EPA has also adopted more stringent evaporative emission standards (equivalent to current California standards) for new passenger vehicles. The new standards become effective in 2009 for light vehicles and in 2010 for heavy vehicles. In addition to the reductions from the 2001 rule, the new rules will significantly reduce annual national MSATs emissions. For example, the EPA estimates that emissions in the year 2030, when compared to emissions in the base year prior to the rule, will show a reduction of 330,000 tons of MSATs (including 61,000 tons of benzene), reductions of more than 1,000,000 tons of volatile organic compounds, and reductions of more than 19,000 tons of PM2.5.

Project Specific MSATs Information

Numerous technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSATs emissions and effects of this project (refer to "Unavailable Information for Project Specific MSATs Impact Analysis" at the end of this section for more information). However, it is possible to qualitatively assess the levels of future MSATs emissions under the project. Although a qualitative assessment cannot identify and measure health impacts from MSATs, it can give a basis for identifying and comparing the potential differences among MSATs 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:

www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm

Because the estimated VMT under each of the Alternatives is nearly the same it is expected there would be no appreciable difference in overall MSATs emissions among the various alternatives. Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of the EPA's national control programs that are projected to reduce MSATs emissions by 57 to 87% between 2000 and 2020. 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 MSATs emissions in the project area are likely to be lower in the future in nearly all cases.

The additional travel lanes contemplated as part of the project alternatives will have the effect of moving some traffic closer to nearby homes, schools and businesses; therefore, there may be localized areas where ambient concentrations of MSATs could be higher under the build alternative than under the no-build alternative. The localized increases in MSATs concentrations would likely be most pronounced along the expanded roadway sections that would be built at Pleak, Needville, Guy, Damon, West Columbia, Brazoria, and Jones Creek. However, as discussed previously, the magnitude and the duration of these potential increases compared to

the no-build alternative cannot be accurately quantified due to the inherent deficiencies of current models. In sum, when a highway is widened and, as a result, moves closer to receptors, the localized level of MSATs 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 MSATs emissions). Also, MSATs will be lower in other locations when traffic shifts away from them. However, on a regional basis, the EPA's vehicle and fuel regulations coupled with fleet turnover will cause region-wide MSATs levels to be significantly lower than today in almost all cases.

Sensitive Receptor Assessment

There may be localized areas where ambient concentrations of MSATs are slightly higher in any build scenario than in the no-build scenario. Dispersion studies have shown that the "roadway" air toxics start to drop off at about 100 meters (m). By 500 m, most studies have found it very difficult to distinguish the roadway from background toxic concentrations in any given area. An assessment of some potential sensitive receptors within both 100 and 500 m should be conducted. Sensitive receptors include those facilities most likely to contain large concentrations of the more sensitive population (hospitals, schools, licensed day cares, and elder care facilities). Thirteen sensitive receptors have been identified within 500 m of the SH 36 project ROW (**Table 23** and **Exhibit 6**).

Table 23: Sensitive Receptors By Distance

Sensitive Receptor ID	Facility Name	Address	Located within 100 m (328 ft) from the Roadway	Located within 500 m (1,640 ft) from the Roadway
SR 1	Good Beginnings Child Care	9234 Line St. Needville, TX 77461		X
SR 2	Needville Elementary	3600 Margaret St. Needville, TX 77461		X
SR 3	Needville High School	16319 Hwy 36 Needville, TX 77461	X	
SR 4	Charlie Brown Intermediate	305 W. Bernard St. West Columbia, TX 77486		X
SR 5	Ms Missy's Day Care Center	1320 W. Brazos Ave West Columbia, TX 77486		X
SR 6	Brazoria CO J J A E P Alternative School	521 S. 16th St. West Columbia, TX 77486		X
SR 7	Columbia High School	521 S. 16th St. West Columbia, TX 77486		X
SR 8	The Learning Barn	202 Gaines St. Brazoria, TX 77422		X
SR 9	Barrow Elementary	112 Gaines Brazoria, TX 77422	X	
SR 10	Lollipop Daycare Center	322 E. Alabama St. Brazoria, TX 77422		X
SR 11	Ms Memes Childcare and Preschool	421 E. Florida St. Brazoria, TX 77422		X
SR 12	S F Austin Elementary	7351 Stephen F Austin Rd. Freeport, TX 77541	X	
SR 13	Jane Long Elementary	1200 W. Eleventh St. Freeport, TX 77541		X

Unavailable Information for Project Specific MSATs Impact Analysis

This document includes a basic analysis of the likely MSATs emission impacts of this project. However, available technical tools do not enable the prediction of project-specific health impacts of the emission changes associated with the alternatives in this project. Due to these limitations, the following discussion is included in accordance with CEQ regulations (40 CFR 1502.22[b]) regarding incomplete or unavailable information:

Information that is Unavailable or Incomplete

Evaluating the environmental and health impacts from MSATs on a proposed highway project would involve several key elements, including emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the MSATs health impacts of this project.

1. Emissions: The EPA tools to estimate MSATs emissions from motor vehicles are not sensitive to key variables determining emissions of MSATs in the context of highway projects. While MOBILE6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE6.2 is a trip-based model-emission factors are projected based on a typical trip of 7.5 miles, and on average speeds for this typical trip. This means that MOBILE6.2 does not have the ability to predict emission factors for a specific vehicle operating condition at a specific location at a specific time. Because of this limitation, MOBILE6.2 can only approximate the operating speeds and levels of congestion likely to be present on the largest-scale projects, and cannot adequately capture emissions effects of smaller projects. For particulate matter, the model results are not sensitive to average trip speed, although the other MSATs emission rates do change with changes in trip speed. Also, the emissions rates used in MOBILE6.2 for both particulate matter and MSATs are based on a limited number of tests of mostly older-technology vehicles. Lastly, in its discussions of PM under the conformity rule, EPA has identified problems with MOBILE6.2 as an obstacle to quantitative analysis.

These deficiencies compromise the capability of MOBILE6.2 to estimate MSATs emissions. MOBILE6.2 is an adequate tool for projecting emissions trends, and performing relative analyses between alternatives for very large projects, but it is not sensitive enough to capture the effects of travel changes tied to smaller projects or to predict emissions near specific roadside locations. However, MOBILE6.2 is currently the only available tool for use by FHWA / TxDOT and may function adequately for larger scale projects for comparison of alternatives.

2. Dispersion. The tools to predict how MSATs disperse are also limited. The EPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated more than a decade ago for the purpose of predicting episodic concentrations of carbon monoxide to determine compliance with the NAAQS. The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at some time at some location within a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific highway project locations across an urban area to assess potential health risk. The NCHRP is conducting research on best practices in applying models and other technical methods in the analysis of MSATs. This work also will focus on identifying appropriate methods of documenting and communicating MSATs impacts in the NEPA process and to the general public. Along with these general limitations

of dispersion models, the FHWA is also faced with a lack of monitoring data in most areas for use in establishing project-specific MSATs background concentrations.

3. Exposure Levels and Health Effects. Finally, even if emission levels and concentrations of MSATs could be accurately predicted, shortcomings in current techniques for exposure assessment and risk analysis preclude us from reaching meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is difficult to accurately calculate annual concentrations of MSATs near roadways, and to determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are magnified for 70-year cancer assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. There are also considerable uncertainties associated with the existing estimates of toxicity of the various MSATs, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. Because of these shortcomings, any calculated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against other project impacts that are better suited for quantitative analysis.

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATs
Research into the health impacts of MSATs is ongoing. For different emission types there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to toxics has been a focus of a number of EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or State level.

The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at http://www.epa.gov/iris. The following toxicity information for the six prioritized MSATs was taken from the IRIS database *Weight of Evidence Characterization* summaries. This information is taken verbatim from EPA's IRIS database and represents the Agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

- **Benzene** is characterized as a known human carcinogen.
- **Acrolein:** The potential carcinogenicity of acrolein cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.
- **Formaldehyde** is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- **1, 3-butadiene** is characterized as carcinogenic to humans by inhalation.

- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- **Diesel exhaust** is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases. Diesel exhaust also represents chronic respiratory effects, possibly the primary non-cancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

There have been other studies that address MSATs health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by the EPA, the FHWA, and industry, has undertaken a major series of studies to research near-roadway MSATs hot spots, the health implications of the entire mix of mobile source pollutants, and other topics. The final summary of the series is not expected for several years.

Some recent studies have reported that proximity to roadways is related to adverse health outcomes, particularly respiratory problems. Much of this research is not specific to MSATs, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they do not provide information that would be useful to alleviate the uncertainties listed above and enable us to perform a more comprehensive evaluation of the health impacts specific to this project.

Relevance of Unavailable or Incomplete Information
While available tools do allow us to reasonably predict relative emissions changes between alternatives for larger projects, the amount of MSATs emissions from each of the project alternatives and MSATs concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. As noted above, the current emissions model is not capable of serving as a meaningful emissions analysis tool for smaller projects. Therefore, the relevance of the unavailable or incomplete information is that it is not possible to make a determination of whether any of the alternatives would have significant adverse impacts on the human environment.

In this document, a qualitative assessment has been provided relative to the various alternatives of MSATs emissions and has acknowledged that the build alternative may result in increased exposure to MSATs 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.

R. Traffic Noise Analysis

This analysis was accomplished in accordance with TxDOT's (FHWA approved) *1996 Guidelines for Analysis and Abatement of Highway Traffic Noise*.

Representative sound pressure levels (decibels) for a variety of common outdoor and indoor areas/activities are depicted in **Table 24**. 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 "dBA."

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 24: Common Sound / Noise Levels

Outdoor	dBA	Indoor
Pneumatic hammer	100	Subway Train
Gas lawn mower at 1 m		
	90	Food blender at 1 m
Downtown (large city)	80	Garbage disposal at 1 m
Lawn mower at 30 m	70	Vacuum cleaner at 3 m
		Normal speech at 1 m
Air conditioning unit	60	Clothes dryer at 1 m
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 (**Table 25**).

Table 25: FHWA Noise Abatement Criteria

Activity Category	dBA Leq	Description of Land Use Activity Areas
A	57 (exterior)	Lands on which serenity and quiet are of extra-ordinary 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)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	72 (exterior)	Developed lands, properties or activities not included in categories A or B above.
D	--	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

NOTE: primary consideration is given to exterior areas (Category A, B or C) where frequent human activity occurs. However, interior areas (Category E) 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.

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 dBA below the NAC. For example: a noise impact will occur at a Category B residence if the noise level is predicted to be 66 dBA 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 will occur at a Category B residence if the existing level is 54 dBA and the predicted level is 65 dBA (11 dBA increase).

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.

The FHWA traffic noise modeling software 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. The traffic numbers used in the noise model are listed in **Table 1**.

Existing and predicted traffic noise levels were modeled at 130 representative receiver locations (**Table 26** 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. All of the receivers in the following table that do not have a description are residences.

Table 26: Traffic Noise Levels (dBA Leq)

Receiver	NAC Category	NAC Level	Existing 2005	Predicted 2025	Change (+/-)	Noise Impact
A-1	B	67	41	51	+10	Yes
A-2	B	67	41	52	+11	Yes
A-4	B	67	51	55	+4	No
A-6	B	67	44	50	+6	No
A-7, Future Development Area	B	67	41	55	+14	Yes
A-9	B	67	46	52	+6	No
A-12	B	67	43	50	+7	No
A-15	B	67	41	52	+11	Yes
A-17	B	67	41	53	+12	Yes
A-18	B	67	43	50	+7	No
A-21	B	67	40	52	+12	Yes
A-23	B	67	43	50	+7	No
A-26	B	67	48	53	+5	No
A-28	B	67	41	48	+7	No
A-29	B	67	40	52	+12	Yes
A-32	B	67	43	50	+7	No
A-35	B	67	50	58	+8	No
B-3	B	67	62	63	+1	No
B-8	B	67	60	62	+2	No
B-10, Business	C	72	57	60	+3	No
B-13	B	67	61	62	+1	No
B-17	B	67	61	61	0	No
B-22	B	67	60	64	+4	No
B-29	B	67	53	54	+1	No
B-33	B	67	60	62	+2	No
B-34	B	67	59	59	0	No
B-38	B	67	61	61	0	No
B-40	B	67	59	61	+2	No
B-41	B	67	62	59	-3	No
B-45	B	67	62	62	0	No
B-46	B	67	55	60	+5	No
C-6, Church (Interior)	E	(52)	(40)	(42)	+2	No
C-16	B,C	67, 72	63	64	+1	No
C-21	B	67	64	66	+2	Yes
C-29	B	67	61	63	+2	No
C-32	B	67	63	61	-2	No
C-35, Church (Interior)	E	(52)	(47)	(46)	-1	No
C-36	B	67	61	62	+1	No
C-38	B	67	62	64	+2	No
C-43	B	67	57	61	+3	No
C-45	B	67	61	63	+2	No
C-51	B	67	60	62	+2	No
C-52	B	67	59	62	+3	No
C-56	B	67	61	64	+3	No
C-59	B	67	54	61	+7	No
C-62	B	67	59	63	+4	No
C-72	B	67	62	63	+1	No
C-83	B	67	57	62	+5	No
C-84	B	67	53	61	+8	No
C-89	B	67	58	61	+3	No
C-94	B	67	60	61	+1	No

Receiver	NAC Category	NAC Level	Existing 2005	Predicted 2025	Change (+/-)	Noise Impact
C-97	B	67	61	62	+1	No
D-2	B	67	61	65	+4	No
D-8	B	67	60	64	+4	No
D-11	B	67	60	62	+2	No
D-17	B	67	58	60	+2	No
D-18	B	67	61	62	+1	No
D-23	C,B	72,67	61	61	0	No
D-24	B	67	58	58	0	No
D-27	B	67	60	60	0	No
D-29	B	67	54	58	+4	No
D-31	B	67	54	58	+4	No
D-35	B	67	63	60	-3	No
D-36	B	67	54	56	+2	No
D-41	B	67	53	58	+5	No
E-8	B	67	56	58	+2	No
E-13	B	67	60	59	-1	No
E-16	B	67	57	58	+1	No
E-18	B	67	57	61	+4	No
E-21	B	67	57	55	-2	No
F-1	B	67	55	53	-2	No
F-7	B	67	63	62	-1	No
F-15	B	67	62	61	-1	No
F-30	B	67	60	59	-1	No
F-38	B	67	60	58	-2	No
F-49, Church (Interior)	E	(52)	(43)	(43)	0	No
F-51, Church (Interior)	E	(52)	(40)	(41)	+1	No
F-61	B	67	62	62	0	No
F-69	B	67	61	61	0	No
F-80	B	67	61	64	+3	No
F-92	B	67	56	60	+4	No
F-97	B	67	59	62	+3	No
F-99	B	67	59	61	+2	No
F-104, Church (Interior)	E	(52)	(44)	(46)	+2	No
F-116	B	67	60	62	+2	No
F-124	B	67	59	61	+2	No
F-125	B	67	59	61	+2	No
F-134	B	67	63	66	+3	Yes
F-138	B	67	61	64	+3	No
G-2	B	67	54	54	0	No
G-5	B	67	62	60	-2	No
G-6	B	67	55	59	+4	No
G-8	B	67	60	59	-1	No
G-13	B	67	63	62	-1	No
G-20	B	67	62	62	0	No
G-28	B	67	61	61	0	No
G-37	B	67	63	62	-1	No
G-44	B	67	61	58	-3	No
G-47	B	67	62	62	0	No
G-60	B	67	59	61	+2	No
G-64 & G-75, Businesses	C	72	65	68	+3	No
G-92	B	67	59	61	+2	No
G-95, Church (Interior)	E	(52)	(44)	(46)	+2	No
G-115	B,C	67,72	57	63	+6	No
G-120	B	67	57	63	+6	No
G-136	B	67	62	67	+5	Yes
G-146, Church (Interior)	E	(52)	(44)	(48)	+4	No

Receiver	NAC Category	NAC Level	Existing 2005	Predicted 2025	Change (+/-)	Noise Impact
G-149	B	67	60	61	+1	No
G-154	B	67	57	64	+7	No
G-159	B	67	52	54	+2	No
H-2	B	67	62	59	-3	No
H-11	B	67	62	59	-3	No
H-17	B	67	61	62	+1	No
H-26	B	67	61	62	+1	No
H-29	B	67	59	61	+2	No
H-32	B	67	61	61	0	No
H-34, Church (Interior)	E	(52)	(38)	(39)	+1	No
H-38	B	67	58	60	+2	No
H-43	B	67	60	61	+1	No
H-51, Church (Interior)	E	(52)	(47)	(50)	+3	No
H-52	B	67	62	65	+3	No
H-53 & H-54	B	67	59	61	+2	No
H-55 & H-57	B	67	60	62	+2	No
H-56	B	67	58	60	+2	No
H-58, Church (Interior)	E	(52)	(45)	(47)	+2	No
H-66	B	67	59	61	+2	No
H-72 & H-79	B	67	60	63	+3	No
H-76	B	67	60	63	+3	No
H-93	B	67	65	69	+4	Yes
H-106	B	67	57	59	+2	No

Note: All receivers are classified as residential unless otherwise noted. There were no receivers in Sections 21-24 because these sections were undeveloped.

Eighteen out of 130 representative receivers have lower predicted noise levels than existing noise levels due to changes in the proposed highway alignment. As indicated in **Table 26**, eleven receivers experienced predicted noise levels exceeding existing levels by a minimum of 2 dBA and a maximum of 14 dBA. Four of these representative receivers, C-21, F-134, G-136, and H-93, approached, equaled or exceeded the NAC. The following noise abatement measures were considered: traffic management, alteration of horizontal and/or vertical alignments, and acquisition of undeveloped property to act as a buffer zone and the construction of noise barriers.

Before any abatement measure can be incorporated into the project, it must be both feasible and reasonable. In order to be feasible, the measure should reduce noise levels by at least 5 dBA at impacted receivers; and to be reasonable it should not exceed $25,000 for each benefited receiver.

Traffic management: control devices could be used to reduce the speed of the traffic; however, the minor benefit of one dBA per 5 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 ROW 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. However, for this project, a noise barrier would severely restrict access to adjacent activity areas. Numerous gaps in the noise barrier would satisfy access requirements but would render the barrier ineffective (unfeasible). Also, noise barriers could have a detrimental impact on nearby businesses by restricting views and access by potential customers. Finally, a noise barrier would not be cost effective for an individual receiver. Noise barriers were considered for each of the impacted receiver locations with the following results:

Receiver A-7 represents a soon to be developed residential area on the north side of Hartledge Road (Spur 10) located near the northern end of the proposed SH 36 project. A noise barrier that would achieve the minimum feasible reduction of at least 5 dBA would exceed the reasonable, cost-effectiveness criterion of $25,000.

Receivers A-1, A-2, A-15, A-17, A-21, A-29, C-21, F-134, G-136, and H-93 are separate, individual residences. A noise barrier that would achieve the minimum feasible reduction of at least 5 dBA at each of these locations would exceed the reasonable, cost-effectiveness criterion of $25,000.

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

Numerous land use activity areas along SH 36 are currently Category D, undeveloped land. No new development is currently planned, designed or programmed in these areas. There is no NAC for undeveloped land; however, to avoid noise impacts that may result from future development of properties adjacent to the 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 contours. **Table 27** lists the predicted contours for the project area.

Table 27: 2025 Noise Impact Contours

Undeveloped Area	Land Use	Impact Corridor	Distance from ROW
Foster School Road to Padon Road	NAC Category B	66 dBA	81 ft
CR 4 to FM 1301	NAC Category B	66 dBA	50 ft
CR 310 to FM 2004	NAC Category B	66 dBA	56 ft
Steven F. Austin Road to Brazos River Road	NAC Category B	66 dBA	76 ft

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 would 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.

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.

S. Construction Impacts

Construction of the proposed project would be carried out in phases. Construction would begin at Spur 10 (Hartledge / Gerken Road) and continue south to FM 1495.

Due to operations normally associated with road construction, there is a possibility that noise levels would be above normal in the areas adjacent to the ROW. Construction is normally limited to daylight hours when occasional loud noises are more tolerable. Due to the relatively short-term exposure periods imposed on any one receptor, extended disruption of normal activities is not considered likely. Every reasonable effort will be made to minimize construction noise.

Construction may temporarily degrade air quality through dust and exhaust gases associated with construction equipment. Measures to control dust would be considered and incorporated into the final design and construction specifications. TxDOT would insure that businesses have ingress and egress to all business establishments during the construction phase of the project.

T. Indirect and Cumulative Impacts

The following sections describe both the indirect and cumulative impacts derived from the analysis. Resources such as decennial census data, H-GAC 2025 population and employment forecasts and analysis developed during environmental documentation allowed for the establishment of quantitative assumptions which were utilized to develop the findings discussed in the following sections. A GIS-based analysis was used to quantify the data gathered. Given the unpredictable nature of indirect and cumulative impacts, it must be stated that the analysis primarily relied upon qualitative assumptions. Various qualitative assumptions used during the analysis included anticipated demographic trends and associated travel demands along with recognized development trends.

Indirect Impacts

The CEQ defines indirect impacts as those "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect impacts 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 another action or 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 has developed procedures for estimating indirect effects of transportation projects (2002). This guidance utilizes an eight-step approach to assess the indirect impacts of transportation projects on resources within the project area. The eight steps are listed in **Table 28**.

Table 28: Eight-Step Approach to Estimate Indirect Impacts

Step No.	Step
1	Scoping.
2	Identify the Study Area's Direction and Goals.
3	Inventory the Study Area's Notable Features.
4	Identify Impact-Causing Activities of Proposed Action and Alternatives.
5	Identify Potentially Significant Indirect Effects for Analysis.
6	Analyze Indirect Effects.
7	Evaluate Analysis Results.
8	Assess Consequences and Develop Mitigation.

Source: National Cooperative Highway Research Program, 2002.

The eight-step process outlined above will serve as the basic approach for this indirect impacts analysis.

Step 1: Scoping

Existing SH 36 is generally a north/south facility that connects many small communities from Rosenberg to Freeport within the project limits. The existing facility would be generally widened from two to four lanes and would include construction of overpasses at various locations. SH 36 is a designated hurricane evacuation route, serving as a major route northward from Brazoria and Fort Bend counties. The Spur 10 portion of the project would connect directly with the existing Spur 10 north of US 59 to allow traffic to continue northward. The proposed roadway improvements are intended to improve the capacity and efficiency of the roadway primarily for use as a hurricane evacuation route. This route is shown in the Hurricane Contingency Planning Guide, published by the Division of Emergency Management, Texas DPS, 1999.

The geographical boundaries of the indirect impacts study area for the indirect impact analysis include the San Bernard and Lower Brazos watersheds, south of US 59. The indirect impacts study area includes the area in which the proposed improvements to Spur 10 and SH 36 could influence local traffic patterns or land development. Areas outside the indirect impacts study area are better served by other roadways. The indirect impacts study area encompasses 605,806 ac.

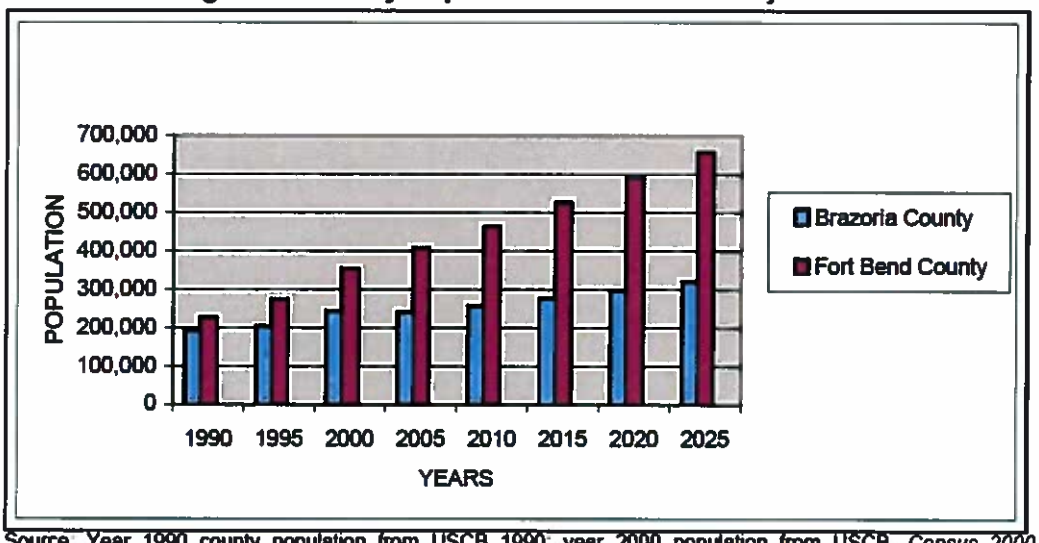
Step 2: Identify the Study Area's Direction and Goals

Indirect effects are commonly related to changes in land use. When a transportation project is constructed, an indirect impact may occur when land in the study area develops. For example, if a bypass or a relief route is constructed around a town, development may occur in the bypass area in the form of restaurants, gas stations, and other commercial establishments. Land development, in turn, results in the transformation of primarily agricultural uses within the study area to residential and commercial land uses. Increased development can alter the landscape, increase impervious cover, modify species composition of any remaining habitats, and introduce fertilizers and anthropogenic chemicals into the biotic system.

The SH 36 study area growth is expected to continue, albeit at a slower pace than the counties it traverses. Over the next 30 years, the population of Brazoria County is expected to increase by 202,000 persons, growing from an estimated total population of 267,000 in 2005 to 469,000 in 2035 (H-GAC, 2006). While this is not a significant increase in total population when

compared to adjacent counties, much of the growth is expected to utilize SH 36 as a major thoroughfare in the region. The population of Fort Bend County is expected to increase by 508,000 persons, growing from an estimated total population of 437,000 in 2005 to 935,000 in 2035, though much of that growth is projected to occur in other areas of the county (H-GAC, 2006). Refer to **Figure 4**. Because the roadway is used as a major thoroughfare and designated as a hurricane evacuation route, the historic trends and projected growth in Brazoria and Fort Bend counties have caused a need for a higher-capacity infrastructure.

Figure 4: County Population Trends and Projections



Source: Year 1990 county population from USCB 1990; year 2000 population from USCB, *Census 2000*. Projections from H-GAC, *Small Area Allocation Forecast 1990-2025, updated September 2000*.

The proposed project lies within the limits of the cities of Pleak, Needville, Guy, West Columbia, Brazoria, Jones Creek, and Freeport. The proposed project is currently some distance from the primary growth areas of Fort Bend and Brazoria counties. Generally, land development is anticipated at the south end of the proposed project as a result of Port of Freeport expansion and in the vicinity of Rosenberg, primarily north of the proposed project. Widening SH 36 from FM 2218 in Pleak, Fort Bend County, to FM 1495 in Freeport, Brazoria County, would increase the accessibility of the area. Future land development patterns in any one segment of the metropolitan area would be dependent upon the relative desirability and accessibility compared to other segments.

A positive indirect impact to the local economy can reasonably be expected to occur because of the circulation of money related to construction spending; an increase in work force related to the construction; and improved access to employment opportunities, markets, goods, and services.

The H-GAC was contacted in February 2007 to discuss land use trends and potential development in the study area. The H-GAC analyst stated that development is occurring north of the SH 36 / Spur 10 corridor in Fort Bend County. All H-GAC models used for the 2025 RTP are based on the TIP. That is, the growth models that the H-GAC has created for the study area are based on the assumption that all projects identified in the TIP, including SH 36, will be built. The 2025 RTP shows the greatest rates of development projected to the northwest of the project corridor.

An interview was conducted with the City Manager of the City of Freeport in February 2007. The City Manager does not anticipate land development along the SH 36 corridor within the Freeport area, with or without the proposed improvement, because it is outside the area protected by the levee. The levee is a barrier built along the coast on Freeport, intended to be a protective barrier against storm surge. The City Manager anticipates that all development will occur within the areas protected by the levee along the coast.

The City Manager of Brazoria noted that while Brazoria does not have a master plan, several businesses are planned for the north side of town and an assisted living facility is planned on the south side of town. She stated that this development would be independent of any work occurring along SH 36 and was unfamiliar with any effect the proposed project might have on development in Brazoria.

The majority of the development within the indirect impacts study area is occurring outside the project corridor, to the north of the project corridor, as shown by the Fort Bend County 2005 Economic Forecast presentation. Currently planned land development projects in the SH 36 / Spur 10 project area are expected to continue as planned; however, the rate would be indirectly influenced by the proposed project. Future development of the plans would be based upon developer expectations of transportation improvements to the corridor and would be accelerated by improved transportation infrastructure. It is generally known that development tends to follow established infrastructure patterns, and in turn, infrastructure (e.g. transportation improvements) follows development. Other independent variables, such as the state of the economy, also impact the rate and location of development. Some indirect land use changes could occur as a result of the proposed project in the vicinities of Spur 10 and SH 36. Properties that are adjacent to land that would be acquired for additional roadway ROW may redevelop and/or change use as access changes to SH 36 and Spur 10 leading to and from the US 59 facility, a major corridor to the Houston metropolitan area. Therefore, the proposed project would have some unquantifiable indirect impacts to land use in those areas.

Step 3: Inventory of Study Area's Notable Features

The baseline of conditions for environmental resources that exist before project construction is included in Section VI of this document. The environmental resources include land, water, vegetation, air, wildlife, cultural, and socioeconomic. Notable features within the study area have been defined as prime farmlands, surface water, and vegetation. These notable features were delineated within the study area based on regulatory guidance and local interest. Vegetation and wildlife habitat were generally characterized through interpretation of high resolution aerial photography for the year 2006. USFWS NWI maps, dated 2003, were utilized for information regarding potential waters of the U.S., including wetlands. NRCS 2005 prime farmlands data was also utilized. Information on the various resources studied was digitized, and spatial data was developed through the use of GIS software.

The proposed project is located in the Gulf Prairies and Marshes Ecoregion which is known for its rich soils and prime farmlands. The NRCS has defined prime farmland soils as soils best suited to food, feed, forage, fiber, or oilseed crops. There are 379,870 ac of prime farmlands within the indirect impacts study area. Most of the prime farmlands within the study area are currently managed as cultivated croplands, pastures, and hayfields.

The Columbia Bottomlands, also known as Austin's Woods, span over 1 million ac along the Gulf Coast, within the Gulf Coast Prairies and Marshes Ecoregion. The Bottomlands cross the floodplains of three river systems: Colorado, San Bernard, and Brazos. It is estimated that only

177,000 ac of an original 700,000 ac of Columbia Bottomlands hardwoods remain in Texas and Louisiana today (The Nature Conservancy, 2003). The remaining habitat is highly fragmented. Although no areas are specifically targeted for conservation within the proposed project ROW, areas adjacent to the study area fall within the larger Columbia Bottomlands designated habitat area.

The indirect impacts study area contains several water bodies within the San Bernard and Lower Brazos watershed, including: Coon Creek, Cottonwood Creek, Big Creek, Seaborne Creek, Fairchilds Creek, Buffalo Creek, Deer Creek, Mound Creek, Cow Creek, Varner Creek and tributaries, Bell Creek and tributaries, the Brazos River, Jones Creek and tributaries, and the San Bernard River. In addition, based on 2003 USFWS NWI data, approximately 54,825 ac of wetlands are located within the 605,086-ac indirect impacts study area.

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

The proposed project would require the removal of 441 ac of prime farmlands, and the removal of approximately 60 ac of woody vegetation. Approximately 83 ac of waters of the U.S., including wetlands, are located within the proposed ROW. In addition, the proposed project would add approximately 160 ac of impervious cover over the watershed.

Step 5: Identify Potentially Significant Indirect Effects for Analysis

The objective of this step is to evaluate the potential impact-causing actions of the proposed project on the notable features and compare the actions to land use planning goals within the indirect impacts study area.

Prime Farmlands

Under the no-build alternative, no indirect impacts are anticipated to result from SH 36 / Spur 10. For the build alternative, soil and geological resources within the indirect impacts study area that could be indirectly impacted by project activities include prime farmland soils. Prime farmlands could be indirectly impacted by the proposed project if the roadway improvements encouraged or influenced an increase in the development of lands within the study area, thereby converting prime farmland to suburban uses.

Changes in existing land use would occur under both the build and no-build alternatives. Approximately 80% of the land immediately adjacent to SH 36 / Spur 10 is agricultural/ undeveloped. Residences and commercial establishments comprise the remaining 20%. New development in the study area includes a master planned community in Rosenberg and expansion of the Port of Freeport.

Staff personnel from the H-GAC, the City of Freeport, and the City of Brazoria were asked a series of questions regarding land use and development patterns within the area surrounding the indirect impacts study area. When asked if the proposed project would induce development within the study area, all agreed that development would occur with or without the proposed improvements. Therefore, the proposed SH 36 / Spur 10 improvements are not anticipated to induce land development within the study area, since current trends and future land use plans are expected to continue with or without the project.

Based on 2005 NRCS data, prime farmlands compose approximately 379,870 ac of the 605,086 ac within the indirect impacts study area. The proposed project would directly impact 441 ac of prime farmlands. The analysis of land use trends based on interviews with officials of the H-GAC, City of Brazoria, and City of Freeport, and research of available information online from the Fort Bend County economic development studies support the findings that changes in land

use within the study area are being driven by planned development, indirect impacts to prime farmlands resulting from the proposed project would be insignificant. For this reason, indirect impacts to prime farmlands will not be evaluated further.

Vegetation

Under the no-build alternative, no indirect impacts to Columbia Bottomlands are anticipated to result from the proposed SH 36 / Spur 10 improvements. Under the build alternative, loss of any habitat vegetation would be an example of a potential indirect impact from proposed roadway improvements. Specifically, bottomland hardwood vegetation could be indirectly impacted by the proposed project if the roadway improvements encouraged or influenced an increase in development in any fragmented bottomland hardwood areas occurring in the indirect impacts study area. However, increased accessibility associated with the proposed improvements is not, by itself, viewed as sufficient to induce significant habitat loss. Therefore, indirect impacts to biological resources from the SH 36 / Spur 10 build alternative would be insignificant. For this reason, indirect impacts to remnant vegetation will not be evaluated further.

Surface Water

Under the no-build alternative, no indirect impacts to water resources are anticipated to result from the proposed SH 36 / Spur 10 improvements. For the build alternative, loss of jurisdictional stream channel due to an increase in development associated with the project could be an example of a potential indirect impact, if the increased development was caused by the proposed improvements. Specifically, water quality or quantity could be indirectly impacted by the project if the roadway improvements encouraged or influenced an increase in development which led to the channelization of streams, the concrete lining of stream channels, and the increase of impervious cover. In addition, increased runoff due to an increase in impervious ground cover leads to an increase in stream velocities, thereby increasing bank and streambed erosion downstream. The increased erosion can lead to a decrease in water quality as total dissolved solids increase in the water column. Also, with increased development and runoff, contaminants such as pesticides, fertilizer, and oils are more likely to impact water quality.

The increase in impervious cover is dependent on changes in local land use, namely, conversion of undeveloped land to developed uses. Significant indirect effects to jurisdictional waters of the U.S. from the proposed improvements would not occur. For this reason, these potential effects will not be evaluated further.

Other potential indirect impacts to water resources from the build alternative could include the degradation of water quality should roadway contaminants or increased sediments in runoff impact water resources downstream of the study area. These indirect impacts could occur during the construction of the proposed improvements or due to accidental spills relating to vehicle collisions during the use of the facilities. Indirect water quality impacts in the form of roadway contaminants or chemical spills due to the proposed improvements would only occur downstream of the study area. The project corridor crosses Coon Creek, Cottonwood Creek, Big Creek, Seaborne Creek, Fairchilds Creek, Buffalo Creek, Deer Creek, Mound Creek, Cow Creek, Varner Creek and tributaries, Bell Creek and tributaries, the Brazos River, and Jones Creek and tributaries. The listed creeks and tributaries all flow into either the Lower Brazos or San Bernard watersheds, which then flow into the Gulf of Mexico.

A significant soils disturbance during the construction at the creek and tributary crossings could increase sediment loads within the creek and surface recharge features and impair water quality. Similarly, a chemical spill during the construction or use of the roadway at the creek

crossing could decrease water quality causing non-attainment of the designated water uses for the stream segment. Indirect impacts to surface and ground waters would result in a reduction in drinking water quality for downstream water users. However, the potential of the proposed project to indirectly affect the water quality down stream during construction activities would be negated by the development and implementation of a Surface Water Pollution Prevention Plan (SW3P) and BMPs such as the use of silt fence, rock berms, and/or detention/retention ponds. The construction of permanent BMPs would serve to remove pollutants and sediments. Regulations requiring these BMPs apply to all areas of the study area. Because of these required measures, significant indirect impacts to water quality from the proposed improvements are not anticipated.

Step 5: Summary

Based on the analysis presented above, no issues will be carried forward for further analysis in Steps 6 through 8. Assuming appropriate implementation of applicable land use planning regulations and control strategies, related effects to air and water and other natural systems, including ecosystems, would be avoided and minimized. The proposed project would not contribute to significant adverse indirect impacts to the indirect impacts study area.

Cumulative Impacts

The CEQ defines cumulative impacts (i.e., effects) as "the impact on the environment which results from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions" (40 CFR Section 1508.7). As this regulation suggests, the purpose of cumulative effects 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 impacts of the proposed build alternative in light of the overall health and abundance of selected resources. In essence, a cumulative effects evaluation 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 *Guidance on Preparing Indirect and Cumulative Impact Analyses* (December 2006), which reflects the requirements of controlling case law. To conduct the cumulative impact analysis, it was essential to build on information derived on the direct and indirect impacts analyses. Unlike direct impacts, quantifying indirect and cumulative impacts may be difficult, since a large part of the analysis requires an eye to the future and what may happen in the study area. This eight-step approach was utilized to assess the potential cumulative impacts of the past, present, and reasonably foreseeable actions on the resources in the proposed study area. The eight-step methodology from TxDOT's *Guidance* is depicted in **Table 29**. Each of the eight steps is identified in the evaluation that follows **Table 29**, 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 the CEQ, *Considering Cumulative Effects under the National Environmental Policy Act* (1997).

Table 29: TxDOT Eight-Step Approach to the Cumulative Impact Analysis

Step No.	Step
1	Identify the resources to consider in the analysis.
2	Define the study area for each affected resource.
3	Describe the current health and historical context for each resource.
4	Identify direct and indirect impacts that may contribute to a cumulative impact.
5	Identify other reasonably foreseeable actions that may affect resources.
6	Assess potential cumulative impacts to each resource.
7	Report the results.
8	Assess and discuss mitigation issues for all adverse impacts.

Source: *Guidance on Preparing Indirect and Cumulative Impact Analyses*. TxDOT, December 2006.

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 the CEQ, *Considering Cumulative Effects under the National Environmental Policy Act* (1997).

Identify Resources and Define Resource Study Areas (RSAs) (Steps 1-2)

Step 1: The initial step of the cumulative effects analysis uses information from the evaluation of direct and indirect impacts in the selection of environmental resources that should be evaluated for cumulative effects. TxDOT's *Guidance* states: "If a project will not cause direct or indirect impacts on a resource, it will not contribute to a cumulative impact on the resource. The cumulative impact 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 the project impacts are relatively small (less than significant)." Similarly, the CEQ guidance recommends narrowing the focus of the cumulative effects 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 effects of the proposed action or eventual decisions. Thus, the cumulative effects analysis should focus only on the resources that are substantially affected by the proposed project by direct and/or indirect impacts. Whether a resource is 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 that are at risk even if the proposed project impacts would not be major.

Applying the foregoing criteria, the resources or environmental issues related to the proposed project with the potential for cumulative effects are listed in **Table 30**. As recommended by the CEQ guidance, specific indicators of each resource's condition have been identified and are shown in **Table 30**. The use of indicators of a resource's health, abundance, and/or integrity are helpful tools 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 effects.

Table 30: Resource Indicators and Study Areas for the Cumulative Effects Analysis

Resource Category	Indicators of Resource Condition and Potential Impacts	Health of Resource	Resource Study Area (RSA)
Biological Resources	Wildlife Habitat: the amount and quality of upland wooded areas suitable for sustaining a diversity of wildlife species.	Declining health	Lower Brazos and San Bernard watersheds, south of US 59
Water Resources	Waters of the U.S., including Wetlands: the amount/quality of areas affected.	At-risk	Lower Brazos and San Bernard watersheds, south of US 59
	Water Quality: expected change in water quality to adjacent water bodies.	At-risk	
Air Quality	8-Hour Ozone Standard: ability of the region to meet this air quality standard.	Non-attainment area for ozone for the Houston-Galveston-Brazoria metropolitan area	8-county (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller) non-attainment area for the Houston-Galveston metropolitan area

Step 2: Cumulative impacts are considered within spatial and temporal boundaries. Each resource has its own RSA to best assess the impacts to that individual impact. The second step of this analysis seeks to evaluate the direct and indirect effects of the proposed project as far away from the study area as the effects are expected to be felt on each of the resources studied.

Because the resources/issues vary widely, the appropriate geographical context for evaluating cumulative effects depends upon a myriad of factors. The setting of spatial limits for resource indicators was established using TxDOT and CEQ criteria, and considered factors such as each resource's physical characteristics, biological relationships, and affected institutional jurisdictions. The Rasps defined for the examination of each indicator of resource condition and potential impacts are also shown in **Table 30**.

The temporal boundary set for each resource differs slightly, as noted in Step 3; however, the future date of the temporal boundary was set at 2025, based on the H-GAC's 2025 RTP. The H-GAC 2025 RTP was created by community leaders to address regional mobility, air quality, and safety, under the current growth projections for the eight-county area over the next two decades. Therefore, this timeframe was considered to be the most appropriate for this area.

The geographical boundaries of the RSA (also known as zone of potential impact), evaluated for the biological and water resources, include the San Bernard and Lower Brazos watersheds, south of US 59. The RSA includes the area in which the proposed improvements to Spur 10 and SH 36 could influence local traffic patterns or land development. Areas outside the RSA are better served by other roadways. The cumulative impact RSA encompasses 605,806 ac. The proposed study area drains directly into the Brazos River and into tributaries that drain into

the Brazos River and the San Bernard River. 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 study area, 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. In addition, a watershed approach was also taken for characterizing impacts to developable land (i.e., land that is outside designated floodplain areas that has not yet been developed). Conversion of this resource would affect the hydrology and ecology that currently characterizes the Lower Brazos and San Bernard watersheds.

The RSA for evaluating air quality was designated as the Houston-Galveston 8-hour ozone nonattainment area. This large area represents the management unit for mobile source pollutants as regulated by Federal, state, and local government agencies. Unlike the other resources evaluated, air quality impacts from mobile sources are evaluated and managed on a regional basis primarily through the H-GAC, in coordination with the EPA.

Describe Resources, Identify Impacts, Assess Cumulative Effects, Report Results, and Assess Mitigation (Steps 3-8)
The remainder of the cumulative effects analysis consolidates the remaining six steps from the TxDOT *Guidance* so that the analytical steps may be grouped within the discussion about each resource (December 2006).

Step 3: The examination of the current health and historical context of each resource is necessary to establish a baseline for determining the effects of the proposed action and other reasonably foreseeable actions on the resource. For the three resource categories of special interest identified earlier, each resource's abundance and quality at the present time, defined as the publishing date of this EA, 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 given resource in the future.

The discussion below describes the historical and current condition of each resource within the context of its RSA. A summary of existing conditions is included in **Table 31**, where it serves as a point of reference for summaries of impacts from the proposed project and from other projects within each resource's RSA. Demographic and land use information was obtained from local government planning offices and websites. Vegetation and wildlife habitat were generally characterized through interpretation of high resolution aerial photography for the year 2006. USFWS NWI maps were utilized for information regarding potential waters of the U.S., including wetlands. Information on the various resources studied was digitized, and spatial data was developed through the use of GIS software.

Step 4: The analysis of cumulative impacts must look at the direct and indirect impacts of the proposed action within the RSAs. Identification of the direct and indirect impacts of the proposed action will also assist in determining the project's contribution to the cumulative impact on the resource. The direct and indirect effects expected from the proposed project were discussed in detail earlier in this document. The results of the study of direct effects are summarized in **Table 31** in the next subsection; where they may be viewed along side the

expected impacts from reasonably foreseeable future projects (**Step 5**) for the resources that were selected for cumulative effects analysis.

Step 5: CEQ regulations indicate that cumulative effects analyses must add an assessment of impacts of other past, present, and/or reasonably foreseeable future actions affecting the resources studied (40 CFR Section 1508.7). This portion of the cumulative effects analysis sought out other transportation projects and planned large-scale public or private developments in the Lower Brazos and San Bernard watersheds. The identification of other past, present, and reasonably foreseeable future actions for the watershed RSA was based on a review of proposed and ongoing development projects that are associated with the cities of Rosenberg, Freeport, and Brazoria and surrounding areas, including Fort Bend and Brazoria counties, H-GAC plans, local municipality plans, and county economic development studies. Transportation projects were determined from the H-GAC's 2025 RTP, TxDOT databases, and engineering documents. Past, current, short term, and long term projects, within the project study area, listed on the H-GAC's 2025 RTP that were reviewed for this analysis include: FM 2218, FM 360, School Street, FM 1994, SH 35, SH 332, FM 2004, SH 288, and SH 2495. In addition, a 1,700-ac master planned community southwest of Rosenberg, and development at the Port of Freeport are planned for the future. The proposed Brazoria Bypass, a new location roadway circumventing the City of Brazoria, is also currently in the early planning stages. The estimated proposed ROW for this facility may include 146 ac. At the time of this document, potential land use impacts are unknown because the preferred alignment for the proposed bypass facility has not been determined.

In addition to site-specific development plans, the anticipated impacts from the eventual development of the watershed RSA as reflected in comprehensive land use plans or zoning ordinances were considered in reviewing future impacts to biological and water resources. Qualitative inferences as to potential impacts on the resources studied were drawn from the description of each project or plan. Individual projects were not identified for the ozone nonattainment area because air quality is regulated and managed on a regional level, with expected development projects with substantial air emissions included in air pollution budgets, dispersion modeling, and air quality implementation plans. Similarly, individual development projects were not inventoried for the entire RSA because the nature of the land use plans already integrates the future land development actions that necessarily accompany the estimated increases in population growth.

The results of reviewing past, present, and reasonably foreseeable future actions for potential impacts are summarized in **Table 31**. These results are shown with a summary of existing conditions (**Step 3**) and a summary of the combined direct and indirect impacts for the proposed project (**Step 4**). Note that the expected direct and indirect impacts from the proposed project and the expected impacts from past, present, and foreseeable future projects shown in **Table 31** reflect potential impacts; that is, the analysis to this point does not consider the mitigation that would be required as part of the regulatory programs that are reviewed in the last step (**Step 8**) of the cumulative effects analysis.

Table 31: Summary of Existing Resource Conditions and Potential Impacts

Resource Category	Indicator of Resource Condition (Step 1)	Resource Study Area (Step 2)	Summary of Existing Resource Condition and Potential Impacts		
			Existing Condition (Step 3)	Proposed Project Direct /Indirect Impacts[1] (Step 4)	Impacts from Other Past, Present, Foreseeable Projects[2] (Step 5)
Biological Resources	Vegetation	Lower Brazos and San Bernard watersheds, south of US 59	Commercial/residential development with isolated pockets of undeveloped land; existing ROW frequently mowed and woody species planted for landscape purposes	Loss of vegetated areas: Herbaceous: 640 ac Woody vegetation: 60 ac Total = 700 ac	Herbaceous: 2,650 ac Wooded vegetation: 200 ac Total = 2,850 ac
Water Resources	Waters of the U.S., including Wetlands	Lower Brazos and San Bernard watersheds, south of US 59	Proposed ROW includes Coon Creek, Cottonwood Creek, Big Creek, Seaborne Creek, Fairchilds Creek, Buffalo Creek, Deer Creek, Mound Creek, Cow Creek, Varner Creek and tributaries, Bell Creek and tributaries, the Brazos River, and Jones Creek and tributaries	83.04 ac	146.72 ac
	Water Quality	Lower Brazos and San Bernard watersheds, south of US 59	Big Creek is threatened or impaired in meeting standards for public water supply, high aquatic life, and contact recreation	Increase impervious surface by 160 ac	Increase impervious surface area by 1,180 ac
Air Quality	Effects on 8-hour Ozone Standard	8-County Non-Attainment Area for Houston-Galveston-Brazoria Region	Air Quality Control Region is currently non-attainment for ozone	Decrease in congestion on existing roadway would likely benefit air quality	Increase in urbanization would likely have a negative effect on air quality

NOTES:
1. Acreages and other data are approximate estimates and are based on information presented earlier in this document.
2. Acreages and other data are approximate. Past, present, and reasonably foreseeable future transportation systems that factor into the cumulative impacts of the proposed improvements include FM 2218, FM 360, School Street, FM 1994, SH 35, SH 332, FM 2004, SH 288, Brazoria Bypass, and SH 2495. Additional development in the RSA includes a master planned community southwest of Rosenberg and development at the Port of Freeport. Expected future conditions (2025) do not take into consideration potential mitigation or other measures stipulated/required by regulatory authorities.

Steps 6, 7, and 8: The information contained in **Table 31** represents the starting point for assessing (**Step 6**) and reporting (**Step 7**) cumulative impacts in this subsection. Cumulative impacts were evaluated using the following factors: the historical context of each resource, current condition and trend, future land use and zoning plans, and the pertinent regulations and standards associated with each resource. These factors capture the influences that have shaped and are shaping the amount and quality of each resource, and which would continue to shape the resources into the future. Several key assumptions that are implicit in the approach to predicting the future condition of resources include:

- 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 net effects on each resource that remain after full compliance with the regulatory requirements at all levels. To this point in this analysis, the approach has been to identify and report the potential unmitigated impacts to each of the resources, but net cumulative effects must consider the long-term impacts in light of mitigation that would likely be applied. The discussion of cumulative effects for each resource studied first outlines key regulatory measures government leaders and agencies have implemented to manage and sustain the resource for long-term use, then evaluates expected net cumulative effects for each of the resources analyzed. This discussion of key mitigation measures affecting the expected potential cumulative impacts is an integral part (**Step 8**) of the cumulative effects analysis. More detailed discussions of specific regulatory measures to control adverse impacts to various resources is contained in earlier discussions of direct impacts to specific resources in this document.

Biological Resources

Background and Condition

The study area is located entirely within the Gulf Prairies and Marshes natural region of Texas. Within this region are four vegetation types, as described by the TPWD, all of which are traversed by the project. These vegetation types are marsh/barrier islands, bluestem grasslands, pecan-elm forests, and crops. Beginning at the southern terminus of the project, coastal salt marsh areas exist adjacent to the roadway. Continuing north, the study area consists of a mixture of grasslands, shrublands, hardwood forests, and woodlands. Grasslands occur in areas that have formerly been cultivated and only a few areas contain native grassland species. Shrublands typically occur where early successional species have colonized disturbed sites. Forests and woodlands occur as discontinuous stands which appear to be remnants of more extensive bottomland hardwood forests that once occupied much of the area, especially floodplain areas along creeks, streams, and rivers. This Gulf Coast region is known as the Columbia Bottomlands. The study area is primarily rural, and much of the land is cultivated for crops such as cotton, corn, milo, and sorghum.

Mitigation: Regulatory Controls

The Texas Transportation Code (§201.607) directs TxDOT to adopt an MOA with appropriate environmental resource agencies, including TPWD. The responsibilities of the 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 state's fish and wildlife resources. The MOA between TxDOT and TPWD (Texas Administrative Code [TAC]) 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 MOA 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.

The TPWD designates animals which are "threatened with statewide extinction" as endangered within the State of Texas. Those species which are "likely to become endangered in the future" are listed as threatened. Listed species are protected under the TAC (§65.171) from being killed, removed, transported, owned, sold, released, or exported without an appropriate permit. Violators are penalized under TPWD Code (§68.021) with a Class C Parks and Wildlife Code misdemeanor. Some species listed by the State are protected by Federal regulations as well; these are listed by the USFWS.

Municipal governments have the authority to avoid, minimize, and/or 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. The zoning and land use regulations of the local municipalities are designed to minimize the adverse effects of growth and urbanization.

Cumulative Impacts

As summarized in **Table 31**, the proposed project's direct impacts to upland habitat would cause the loss of 60 ac of wooded and 640 ac of herbaceous habitat. Reviews of other past, present, and reasonably foreseeable future transportation projects and master planned development communities in the RSA indicate an expected loss of approximately 200 ac of wooded habitat and 2,650 ac of herbaceous habitat.

Based on the availability of park and floodplain vegetated habitat in the 605,086-ac RSA, and assuming appropriate implementation of regulated avoidance, minimization, and mitigation strategies for vegetation and habitat impacts, the proposed project would not contribute to significant cumulative impacts to the area's vegetation and habitat.

Water Resources

Waters of the U.S.

Background and Condition

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. From the mid-1800s until about 1970, approximately one-half of Texas' historic wetlands acreage was converted from natural systems in response to society's demand for urban development and sustenance. In the Lower Brazos and San Bernard watersheds, the conversion of prairies and some forested areas to agricultural and urban uses has already resulted in the impoundment, excavation, and filling of some of the area's natural streams and wetlands. Based on information in FEMA maps, water bodies within the RSA include the Brazos and San Bernard

watersheds, including: Coon Creek, Cottonwood Creek, Big Creek, Seaborne Creek, Fairchilds Creek, Buffalo Creek, Deer Creek, Mound Creek, Cow Creek, Varner Creek and tributaries, Bell Creek and tributaries, the Brazos River, and Jones Creek and tributaries.

Mitigation: Regulatory Controls

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.

Cumulative Impacts

The proposed project ROW includes 83.04 ac of waters of the U.S., including wetlands. A review of available information indicates the past, present, and reasonably foreseeable future transportation projects in the RSA would have an impact of greater than approximately 146.72 ac to waters of the U.S, including wetlands. For the past, present, and reasonably foreseeable future private developments in the study area, information as to specific potential impacts with regard to waters of the U.S. was not available, and was therefore estimated. The proposed project's impact to waters of the U.S. would be avoided or minimized by compliance with the USACE Section 404 Nationwide Permit and Individual Permit programs, and the Federal No Net Loss policy. The cumulative impact of past, present, and 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

Background and Condition

Water quality is important as an indicator of potential construction and operations that may contribute to pollutant loading of surface waters (i.e., increased runoff from impervious surfaces), with further impacts on aquatic and upland wildlife that depend on these waters, as well as human use and enjoyment of aquatic resources. Storm water and other runoff from the Lower Brazos and San Bernard watersheds flow into the Brazos and San Bernard River basins, respectively. This suite of water uses increases the importance of maintaining water quality within the watershed, particularly within the floodplain.

Big Creek is listed on the TCEQ's 2004 Section 303(d) list for threatened or impaired waters. The water body is impaired due to bacteria concentrations. As noted above, agricultural activities and urbanization in the watershed area have likely contributed to degradation of water quality from prehistoric pine-hardwood forest conditions by contributing pollutants such as sediment from disturbed areas, herbicides/pesticides from lawns and agricultural activities, and petro-chemicals from parking lots and streets. Commercial, residential, and municipal discharges, along with storm water runoff from construction sites, developed sites, 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 watershed in light of the uses for water in the Lower Brazos and San Bernard watersheds may heighten the need to mitigate adverse effects on water quality.

Mitigation: Regulatory Controls

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 1 ac of land 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 H-GAC was designated as the area-wide water quality management planning agency for the urbanizing portion of the region. The H-GAC's water quality management plan includes regulatory and non-regulatory programs, activities, and BMPs to control pollution to achieve water quality goals.

Cumulative Impacts

As noted in **Table 31**, the amount of land dedicated to transportation corridor land use created by the proposed project would increase by approximately 160 ac. Approximately 1,180 ac of past, present, and reasonably foreseeable future projects are expected to be impervious surfaces. As noted above, control of construction sites 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. These areas provide natural filtering of sediment and other debris that would otherwise reach the Brazos River, and San Bernard River basins.

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 an 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 the EPA/TCEQ regulation of large-scale construction activities under the TPDES permit program. The 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 significant cumulative impacts to the area's water quality.

Air Quality

Background and Condition

The amount of pollution emitted into the local atmosphere has been the net effect of population growth. The Houston-Galveston-Brazoria metropolitan 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 daily vehicle miles traveled on the area's transportation systems. Traffic congestion has become one of the greatest challenges facing the Houston 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 dispersion 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 EPA designated eight counties in the Houston-Galveston-Brazoria region as nonattainment for the 8-hour ozone standard in accordance with the NAAQS. The eight-county region (including Fort Bend and Brazoria 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 Houston-Galveston-Brazoria region remains in non-attainment 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 region is attributable in part to the effective integration of highway and alternative modes of transportation, cleaner fuels, improved emission control technologies, and the H-GAC's regional clean air initiatives.

Mitigation: Regulatory Controls

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 they 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 an 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 an 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 non-attainment areas. These regulatory controls, as well as other local transportation and development initiatives implemented throughout the Houston-Galveston region 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.

Cumulative Impacts

The cumulative impact on air quality from the proposed project and other past, present, and reasonably foreseeable future transportation projects are addressed at the regional level by analyzing the air quality impacts of transportation projects in the 2025 RTP, the draft 2035 RTP, and the 2006-2008 and draft 2008-2011 TIPs. The H-GAC's 2025 RTP includes nearly $77.3 billion in transportation projects. Of this amount, nearly $22.2 billion is for added capacity projects. Brazoria County transportation improvement projects listed in the 2025 RTP total nearly $3.2 billion for transportation projects, including nearly $2.2 billion in added capacity projects. Transportation projects in Fort Bend County total nearly $4.7 billion. This includes $2.7 billion in added capacity projects. These projects are distributed throughout the two counties. The proposed project and the other reasonably foreseeable transportation projects were included in the RTP and TIP, which 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 study area are anticipated to have a cumulatively beneficial impact on air quality.

The Houston-Galveston-Brazoria 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.

U. Mitigation and Monitoring Commitments

Archeological Resources: Nearly 50% of the project area has not been surveyed due to lack of right-of-entry onto the properties and no construction may proceed in these areas until archeological work has been completed and coordinated. Section 106 review and consultation

will proceed in accordance with the PA among TxDOT, the THC, FHWA, and the Advisory Council on Historic Preservation (ACHP), as well as the MOU between the THC and TxDOT.

In the unlikely event that evidence of archeological deposits is encountered during construction, work in the immediate area will cease and TxDOT archeological staff will be contacted to initiate accidental discovery procedures under the provisions of the PA among TxDOT, the THC, the FHWA, and the ACHP, and the MOU between TxDOT and the THC.

Wildlife: ROW clearing will be avoided during the peak nesting season to avoid adverse effects to migratory birds and their habitat.

Correspondence from the USFWS dated October 20, 1999 concurred that the proposed project would have no adverse effects on any federally listed threatened or endangered species. Follow-up communications on August 29, 2001 concluded that while several pair of Bald eagles are known to nest in the general vicinity of the proposed project, the proposed project lies outside the one-mile Secondary Management Zone designated by the USFWS. Subsequent communication with USFWS indicates that the agency has not tracked eagles in the area since 2004.

The highest probability areas for encountering Bald eagles in the vicinity of SH 36 would be in the area between West Columbia and Jones Creek due to the close proximity to the Brazos River. Prior to construction in this area, TxDOT will conduct a survey to ensure that eagle nests are not within 1 mi of the project. TxDOT will coordinate its actions with USFWS should a nest be found within the 1 mi limit.

Vegetation: The existing vegetation within the project area meets the criteria for non-regulatory mitigation. Efforts have been made to minimize the total acreage of these vegetation types that would be impacted by the proposed project. There is one rare vegetation series as defined by the TPWD in "Plant Communities of Texas (Series Level)," located and identified on the west side of the SH 36 roadway south of Damon, Texas. This area is referred to as a Gammagrass-Switchgrass Series (G2S1). The proposed widening of SH 36 would impact this rare vegetation area. In accordance with the TPWD and TxDOT MOU, The impacts to this plant community, referred to as a Gammagrass-Switchgrass series, will be mitigated.

In addition, TxDOT will avoid and preserve hardwood forest stands where possible within the proposed ROW. The TxDOT Houston District will coordinate with the TxDOT ENV and the TPWD for compensatory mitigation for any vegetation community impacts in accordance with Provision (4) (A) (ii) of the TxDOT-TPWD MOU.

Parkland: No parkland would be acquired for the proposed project. However, a floodplain detention pond would be constructed by TxDOT within a construction easement adjacent to Jones Creek on the Peach Point WMA property. TxDOT has coordinated its efforts with TPWD to develop a design that would improve wildlife opportunities while also meeting the floodplain mitigation needs.

Water Quality: The proposed project would disturb more than five ac. TxDOT will comply with the TCEQ's TPDES General Permit. A NOI will be filed with the TCEQ.

Hazardous Materials: A Phase I ESA addressing the project area concluded that no REC occurred within the project area, adjacent properties have RECs that may be at least partially located within the project. It is recommended that a Phase II ESA Workplan be developed to

evaluate the project for potential environmental impacts. If any hazardous materials are discovered during the construction phase, activities will cease immediately and the contractor will follow TxDOT standard guidelines.

The proposed project would include the demolition and/or relocation of building structures. During the ROW acquisition process, prior to construction and any demolition and/or relocation of structures from the ROW, asbestos inspections, notifications, and abatement would be completed. Additionally, asbestos inspections, specification, notification, license, accreditation, abatement, and disposal, as applicable, would be performed in compliance with federal and state regulations.

Construction Impacts: TxDOT will ensure that the public has ingress and egress to all business establishments and other properties during the construction phase of the project.

The mitigation and monitoring commitments discussed above will be incorporated into the Environmental Permits, Issues, and Commitments (EPIC) sheets in the SH 36 Plan, Specifications, and Estimates (PS&E) plans.

V. Permits

U.S. Coast Guard Bridge Permit

Two navigable waterways are crossed by the project route; the Brazos River Diversion Channel and Jones Creek. The current bridge over the Brazos River Diversion Channel is of a suitable size to accommodate the improvements along SH 36. Therefore, no work would be conducted on this bridge during the construction activities associated with SH 36 and thus no USCG permit would be necessary. Jones Creek is also considered a navigable waterway by the USCG. The bridge over Jones Creek is exempt from the USCG permitting process because the waterway is neither used for commercial nor recreational vessels. The FHWA made a determination, under the Surface Transportation Assistance Act of 1978, that a USCG bridge permit is not required for the proposed bridge construction over Jones Creek. The USCG concurred with this determination. The FHWA and TxDOT will request an exemption for the navigational lighting requirement noted by the USCG in their March 18, 2002 letter (**Appendix B**).

TCEQ Section 401 Water Quality Certification

The proposed project would require a Section 401 Water Quality Certification, including an Alternatives Analysis, since it would impact more than 8 ac of wetlands and would involve impacts to waters of the U.S. To minimize impacts to water quality during construction, the proposed project will utilize both temporary and permanent erosion and sedimentation control practices from TxDOT's manual *Standard Specifications for Construction of Highways and Bridges*. The TCEQ Tier II 401 Water Quality Certification Questionnaire, Alternatives Analysis and Mitigation Plan are included in **Appendix A**: Supporting Documentation.

The CWA makes it unlawful to discharge storm water from construction sites into waters of the United States unless authorized by the TCEQ's TPDES General Permit. If more than five ac of ROW are disturbed at one time during construction, a NOI must be filed with the TCEQ. Construction activities would disturb more than five ac; therefore, TxDOT would be required to file an NOI.

A SW3P would be required for this project. Measures would be taken to prevent or correct erosion that may develop during construction. Vegetative controls (temporary vegetation,

vegetative filter strips) will be implemented during construction to provide an inhibitor to erosion by slowing sheet flow runoff and acting as a filtration device. Other soil stabilization measures such as the use of soil retention blankets, rock filter dams, and silt fences would be used where necessary to slow runoff. Some of these best management practices will be incorporated during construction and will remain after the construction is completed. All temporary erosion controls would be in compliance with TxDOT Standard Specifications and would be in place, according to the construction plans, prior to commencement of construction related activities and inspected on a regular basis to ensure maximum effectiveness.

United States Army Corps of Engineers (USACE)

As required by the USACE, per Section 404 of the CWA, the discharge of dredged or fill material into waters of the U.S., including wetlands, generally requires notification or the issuance of a permit from the USACE (33 CFR 320-330). Waters of the U.S., including wetlands, were observed within the proposed project limits. Three USACE Section 404 Individual Permits are anticipated for Sections 2, 3, and 4, and a NWP 14 – *Linear Transportation Projects* and a NWP 25 – *Structural Discharges* are anticipated for Section 1. The NWPs for Section 1 have been approved by the USACE, and Individual Permits for Sections 2, 3, and 4 are pending approval from the USACE. Specific permit requirements for this project will be based on the final design of the project and the USACE's concurrence.

Coastal Zone Management Program

The southern end of the SH 36 improvement project located in Brazoria County lies within the Texas Coastal Zone Management Program (CZMP) boundary. The boundary in the project area travels along FM 521 to the junction of SH 36 south of Brazoria; then northward along SH 36 to the junction of SH 332 in Brazoria. The CZMP identifies Coastal Natural Resource Areas (CNRAs), identifies uses or activities that may adversely affect those areas, and sets uniform policies to address those effects. CNRAs are the coastal resources designated in the Coastal Coordination Act as the focus of the CZMP (Texas Natural Resources Code §33.203). Any potential impacts to CNRAs would be addressed through coordination with the USACE under wetland permitting activities required by Section 404 of the CWA.

The CNRA's in the project vicinity include:

- **Coastal wetlands** having a predominance of hydric soils that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstance support, the growth and regeneration of hydrophytic vegetation, as defined in the Texas Water Code, Chapter 11, Subchapter J, and that lie within the Coastal Facility Designation Line and within 1 mi from the mean high tide line of tidal river and stream segments to the inland extent of tidal influence.

- **Special hazard areas** designated by the administrator of the Federal Insurance Administration under the National Flood Insurance Act as having special flood, mudslide (i.e., mudflow) and/or flood-related erosion hazards, and shown on a Flood Hazard Boundary Map or Flood Insurance Rate Map as Zone A, AO, A1-30, AE, A99, AH, VO, V1-30, VE, V, M, or E.

FEMA's FIRM for Brazoria County were referenced to determine the 100-year floodplains located within the CZMP. The designated flood hazard boundaries in the project area consist of land adjacent to the defined drainage channels for Jones Creek and the Brazos River. SH 36 is being upgraded to hurricane evacuation route standards; therefore,

coordination with FEMA and the local flood control district would occur to ensure that all roadway designs and hydraulic studies comply with flood control regulations.

- **Coastal historic areas** listed in the NRHP on public land and state archaeological landmarks that are identified by the THC as being coastal in character.

An examination of the THC's Texas Historic Sites Atlas indicated two NRHP properties and a number of Official Texas Historical Markers in the CMP within the general area (one mile or less) of the proposed project route. The Duranzo Plantation, a National Register listing is located south of Jones Creek. The Brazoria Bridge, also a National Register listing is located 0.9 mi east of SH 36 on SH 332. The Ellerslie Plantation is located 1 mi southeast of the intersection of SH 36 and FM 2611. It was removed from the National Register in 1979. There are also 13 Official Texas Historical Markers in the general vicinity of SH 36.

There are 4 archeological sites that the proposed project route encroaches on within the CZMP. The first one is 1,250 ft long, located along SH 36 just south of Brazoria, approximately 530 ft south of the intersection of SH 36 and FM 521. The next two are located along SH 36 within the boundaries of the TDCJ Clemens Unit. The first one is 1,275 ft long and is approximately 4,200 ft north of the intersection of SH 36 and FM 2611. The second one is 1,275 ft long and is approximately 1,795 ft north of the intersection of SH 36 and FM 2611. The final one is located along SH 36, south of the town of Jones Creek on the eastern border of the Peach Point WMA. It is 6,250 ft long and is approximately 1,250 ft north of the intersection of SH 36 and CR 336.

- **Coastal preserves** on lands owned by the State that are designated and used as parks, recreation areas, scientific areas, WMAs, wildlife refuges, or historic sites that are designated by the TPWD as being coastal in character and/or waters under tidal influence.

The Peach Point WMA located just south of the town of Jones Creek, is a wildlife management area managed by the TPWD. Located only a few miles from the coast off of SH 36, this WMA is considered coastal in nature.

TxDOT has reviewed this proposed action for consistency with the Texas CZMP goals and policies in accordance with the regulations of the Coastal Coordination Council, and has determined that the proposed action is consistent with the applicable CZMP goals and policies.

VII. SUMMARY

The proposed project involves widening the existing roadway to a four-lane divided, rural, open ditch facility with a grassy median on SH 36 from Rosenberg, Fort Bend County, Texas to Freeport, Brazoria County, Texas. An urban, four-lane facility with a continuous left-turn lane and curb and gutter drainage system would be constructed in portions of Needville, Brazoria, West Columbia, and Jones Creek.

For the preferred alignment, approximately 795 ac of proposed ROW would be required for the roadway expansion and necessary detention and floodplain mitigation areas. The preferred alternative would displace an estimated 61 residences, 32 businesses, one barn, and one church. The preferred alternative would impact an estimated total of 50-60 ac of mature woody vegetation of various densities, including 27 ac of forests, approximately 8.5 ac of jurisdictional wetlands, and less than 3 ac of waters of the U.S. The proposed project would require fill in waters of the U.S., including wetlands, requiring three Section 404 Individual Permits, one NWP 14, and one NWP 25. The project would not require a USCG permit. Coordination with the USFWS does not indicate that there would be impacts to any federally listed threatened or endangered species or their habitats including the bald eagle, which has known habitat near the project area. Mitigation is proposed to compensate for unavoidable adverse impacts to wetland habitats and a rare grass series. The proposed project construction would impact 25 ac of the Peach Point WMA; howe er, a Section 4(f) document has been prepared and concurrence for a joint-use solution has been received from the TPWD and is considered to be an enhancement to the WMA.

The proposed project is listed in the 2025 RTP Update and the draft 2035 RTP. The project CSJs are also listed in the 2006-2008 TIP and Appendix D (D-92, D-93, and D-102) of the draft 2008-2011 TIP. Estimated construction costs for the project total $215,200,000 and would be 80% federally funded and 20% state funded. The preferred alternative would have minimal impacts on noise, air, and water quality. This alternative represents an optimum gain in roadway efficiency, LOS, and safety, and minimizes construction costs and environmental impacts. Evaluations performed thus far in project planning indicate that project effects on the environment are not significant; therefore, a Finding of No Significant Impact is anticipated.