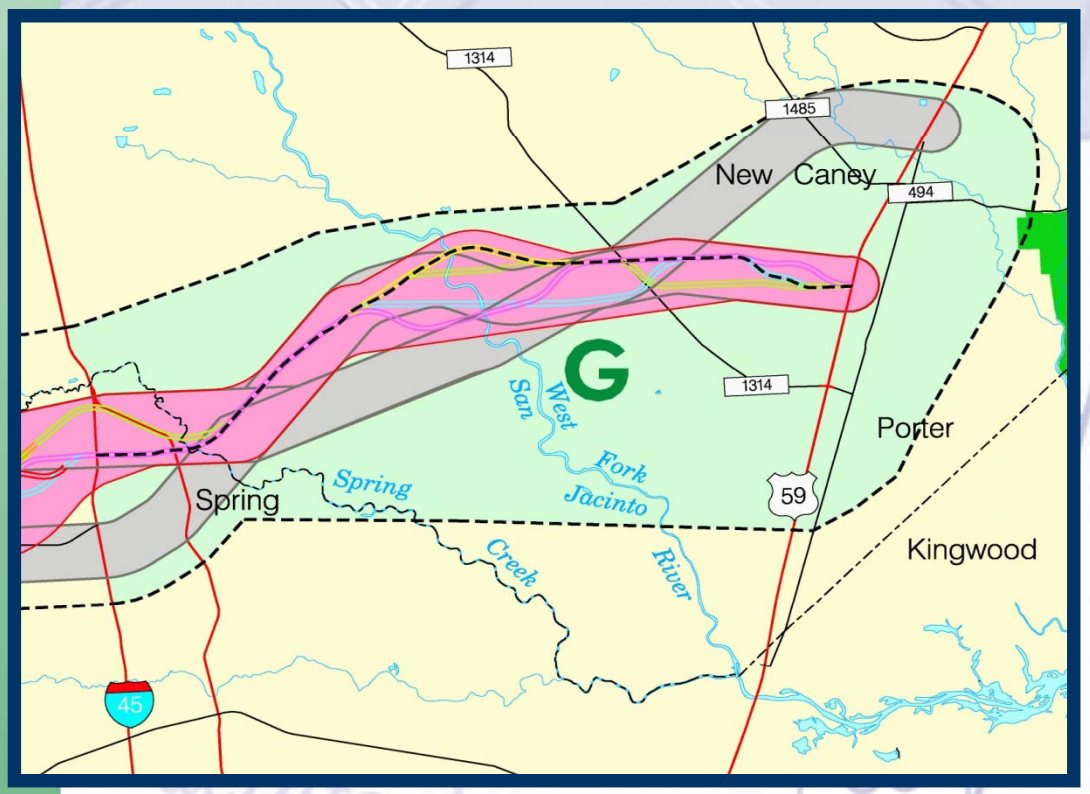
VOLUME I

From IH 45 to US 59
Harris County, Texas
Montgomery County, Texas

Final Environmental Impact Statement

Grand Parkway State Highway 99 Segment G



FHWA-TX-EIS-03-03-F

U.S. Department of Transportation
Federal Highway Administration

Texas Department of Transportation

U.S. Army Corps of Engineers
Cooperating Agency

January 2009

FHWA-TX-EIS-03-03-F

CSJ (control-section-job) Nos. 3510-06-903, 3510-06-001, 3510-07-001, and 3510-07-901

GRAND PARKWAY (STATE HIGHWAY 99) SEGMENT G FROM INTERSTATE HIGHWAY (IH) 45 TO UNITED STATE HIGHWAY (US) 59

FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS)

SUBMITTED PURSUANT TO 42 USC 4332(2)(c)

BY THE

U.S. DEPARTMENT OF TRANSPORTATION (USDOT)
FEDERAL HIGHWAY ADMINISTRATION (FHWA)
AND THE
TEXAS DEPARTMENT OF TRANSPORTATION (TxDOT)

COOPERATING AGENCY
U.S. ARMY CORPS OF ENGINEERS (USACE)

1-15-2009
Date of Approval

Federal Highway Administration

1-14-09
Date of Approval

Texas Department of Transportation
Environmental Affairs Division

Comments on this FEIS (due 30 days from the date the Notice of Availability[NOA] is published in the Federal Register) should be sent to the Grand Parkway Association, Attention: Mr. David Gornet, 4544 Post Oak Place, Suite 222, Houston, TX 77027 or to the Texas Department of Transportation, Attention: Director of Project Development, 7721 Washington Avenue (or P.O. Box 1386), Houston, TX 77251-1386.

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The following persons may be contacted for additional information concerning this document:

Ms. Dianna F. Noble, P.E.
Director of Environmental Affairs
Texas Department of Transportation
150 E. Riverside Drive, Bldg. 118
Austin, Texas 78704

Greg Punske, P.E.
District Engineer, District B (South)
Federal Highway Administration
Federal Office Building, Room 826
300 East 8th Street
Austin, Texas 78701

ABSTRACT

The proposed action will be located in the northwest quadrant of the planned 170-mile long, third loop of State Highway (SH) 99 (Grand Parkway) around the City of Houston, Texas. The proposed action is the construction of a new location highway facility, approximately 13.7 miles long, and built to accommodate a 70 mph design. The proposed action is a portion of the Grand Parkway and is known as "Segment G." Segment G of the Grand Parkway has a study area that is generally bounded by Interstate Highway (IH) 45 to the west, United States Highway (US) 59 to the east, Farm-to-Market Road (FM) 1960 to the south, and just beyond the proposed Grand Parkway segment to the north. The conceptual design for this study consists of a four-lane at-grade controlled access freeway within a 400-foot right-of-way (ROW) width. Transportation improvements are needed in the Segment G study area because there are inefficient connections between suburban communities and major radial roadways, the current and future transportation demand exceeds capacity, many roadways in the study area have a high accident rate, and there is an increasing strain on transportation infrastructure from population and economic growth. The purpose of the proposed transportation improvements in the Segment G study area is to efficiently link the suburban communities and major roadways, enhance mobility and safety, and respond to economic growth. The Preferred Alternative Corridor, Recommended Alternative Transportation Mode, and Recommended Alternative Alignment (Build Alternative) were proposed in the Draft Environmental Impact Statement (DEIS) after careful consideration and assessment of the potential environmental impacts and evaluation of agency and public comments received from a comprehensive agency/public outreach program. Following a Public Hearing and further consideration of agency and public comments, the Recommended Alternative Alignment was adjusted and then selected as the Preferred Alternative Alignment. The Preferred Alternative Alignment is comprised of a combination of alignments investigated during the study then further investigated after alteration as documented in this Final Environmental Impact Statement (FEIS). The Preferred Alternative Alignment that has emerged from the study was proposed based on its ability to best fulfill the need for and purpose of the project while minimizing impacts to the natural, physical, and social environments. The Preferred Alternative Alignment for Segment G would require the acquisition of new ROW (approximately 748 acres), the adjustment of utility lines, and the filling of aquatic resources, including jurisdictional wetlands. No commercial displacements and 110 residential displacements would occur, and no known archeological resources or non-archeological historic-age resources listed on or eligible for the National Register of Historic Places (NRHP) would be impacted. No endangered species would be impacted, and 280 noise receiver locations (all of which are residential) would be impacted by traffic noise.

Comments on this FEIS are due by
(March 16, 2009) and should be sent to:

The Grand Parkway Association
4544 Post Oak Place, Suite 222
Houston, TX 77027
Fax: 713-993-0106
E-mail: segmentgcomments@grandpky.com
Attn.: Mr. David W. Gornet

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SUMMARY

INTRODUCTION

The proposed State Highway (SH) 99 (Grand Parkway) is planned as a 170-mile circumferential facility (a roadway loop such as Beltway 8) around the Houston metropolitan area. The Grand Parkway would be a new location facility built to accommodate a 70 miles per hour (mph) design speed. The main lanes would be posted at 65 mph, and the frontage roads would be posted at 40 to 45 mph. The proposed project would be a four-lane controlled access toll road with intermittent frontage roads located within a 400-foot right-of-way (ROW). The 400-foot ROW can accommodate one of the following typical roadway sections: four-lane section without frontage roads, four-lane section with frontage roads, four-lane section with exit and entrance ramps, and four-lane section with toll facilities and exit and entrance ramps. The entire proposed facility traverses Harris, Montgomery, Liberty, Chambers, Galveston, Brazoria, and Fort Bend Counties, Texas, provides access to radial highways (such as United States Highway [US] 290 or Interstate Highway [IH] 45), and would serve as a third loop around the Houston metropolitan area (see Summary Exhibit 1). Segments E, F-1, F-2, and G are located approximately 25 to 30 miles northwest of Houston, which together would combine for a continuous facility connecting the region's radial highways: IH 10, US 290, SH 249, IH 45, and US 59. These proposed segments would traverse portions of western and northern Harris County and southern Montgomery County. The Segment G study area is generally bounded by IH 45 to the west, US 59 to the east, Farm-to-Market Road (FM) 1960 to the south, and just beyond the proposed Grand Parkway segment to the north.

This Final Environmental Impact Statement (FEIS) incorporates responses to comments received regarding the Segment G Draft Environmental Impact Statement (DEIS) that was released in February 2007. The Grand Parkway Association (GPA), in coordination with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA), has prepared this FEIS to include updated land use, updated indirect and cumulative effects, and the selection of the Preferred Alternative Alignment.

Description of the Proposed Action (Build Alternative)

Segment G begins at IH 45 and ends at US 59; the Preferred Alternative Alignment (Build Alternative) is approximately 13.74 miles long. The Preferred Alternative Alignment would be a new location, four-lane controlled access toll road with intermittent frontage roads in a 400-foot ROW. A controlled access facility has no at-grade intersections and only allows access to/from the facility at specific locations such as exit and entrance ramps. Traversing parts of Harris County and Montgomery County, the proposed new highway would provide access to IH 45 and US 59 (radial freeways). The roadway would be designed to accommodate a 70 mph design speed. The 400-foot ROW provides sufficient width to accommodate one of the following typical roadway sections: four-lane section without frontage roads, four-lane section

with frontage roads, four-lane section with entrance/exit ramps, and four-lane section with toll facilities and exit and entrance ramps. The preliminary construction cost estimate for the Segment G Preferred Alternative Alignment is $476.69 million.

Project History

In January 2000, a Notice of Intent (NOI) for Segments F-1, F-2, and G was published in the *Federal Register*. An NOI had been issued for Segment E in 1993. (An NOI is published in the *Federal Register* to notify the public that an agency is preparing an Environmental Impact Statement [EIS].) The formal scoping meetings required by these notices were held on February 1, 2, and 3, 2000. In addition to the formal scoping meetings, workshops were conducted to discuss issues and concerns with the public and governmental agencies. The project development process implemented for Segments E, F-1, F-2, and G consisted of studies to determine the need for and purpose of the project, alternatives analyses, affected environment, and indirect and cumulative effects. Throughout the study process, workshops were held to solicit comments from the public as well as resource agency officials. The preliminary environmental studies and public input were used to develop a full range of alternative corridors and select a Preferred Alternative Corridor to carry forward in a more detailed process.

Representatives of the Texas Parks and Wildlife Department (TPWD), the U.S. Fish and Wildlife Service (USFWS), and the U.S. Army Corps of Engineers (USACE) were particularly concerned with the identification and avoidance of wetlands; floodplains; rare, threatened, endangered, or otherwise protected species; and special habitat areas such as remnant prairie and bottomland hardwoods. Tools such as a Geographic Information System (GIS) were used to map and identify the resource agency concerns. Sensitive resources were avoided to the maximum extent practicable during the advance planning process.

Legislation

Segments E, F-1, F-2, and G of the Grand Parkway are included in recent federal transportation legislation, including the 1995 National Highway System designation, established by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), the North American Free Trade Agreement (NAFTA), the Transportation Equity Act for the 21st Century (TEA-21), and the 2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

At the local level, Segments E, F-1, F-2, and G are consistent with the city of Houston's 2006 Major Thoroughfare and Freeway Plan (MTFP) and the 2025 Regional Transportation Plan (RTP). Segments E, F-1, F-2, and G were included in the H-GAC's 2025 RTP. Segments E, F-1, and F-2 were also included in the conforming fiscal year (FY) 2006-2008 Transportation Improvement Program (TIP), while Segment G was included in the 2006-2008 TIP, Appendix D, as a project undergoing environmental review and scheduled for implementation beyond the three-year TIP time frame. The

2025 RTP and FY 2006-2008 TIP were adopted by H-GAC in April 2005 and found to conform to the State Implementation Plan (SIP) by the U.S. Department of Transportation (USDOT, which includes the FHWA and Federal Transit Administration [FTA]) on June 3, 2005 and October 31, 2005, respectively.

The Grand Parkway Segment G is included in the H-GAC's 2035 RTP and FY 2008-2011 TIP, as amended. On August 24, 2007, the H-GAC adopted the 2035 RTP and FY 2008-2011 TIP. USDOT (FHWA/FTA) found the 2035 RTP and 2008-2011 TIP to conform to the SIP on November 9, 2007.

Changes in modeled parameters between the 2025 RTP and the 2035 RTP (such as traffic volumes, population, employment, number of households, and vehicle miles traveled) have been evaluated to determine if any additional analysis is warranted before FHWA takes final environmental action. This evaluation confirmed that the changes in the modeled parameters were minor, and therefore no additional analysis is warranted. The analysis of 2025-2035 RTP modeled parameters can be found in the Administrative Record.

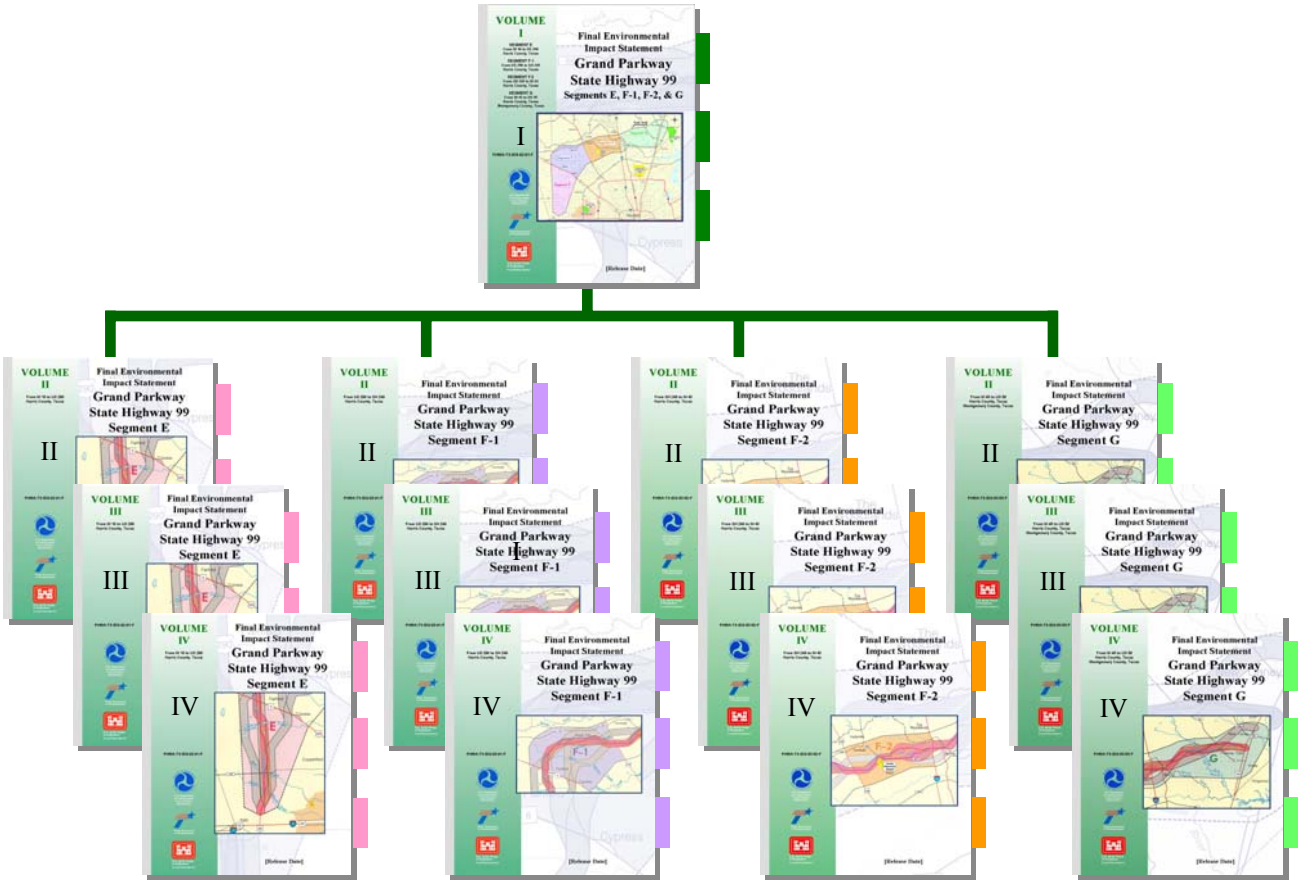
Document Organization and EIS Approach

The Grand Parkway Segments E, F-1, F-2, and G study area is divided into four segments to facilitate planning, design and construction because limited state and federal funding provides no assurance that all the Grand Parkway segments would be constructed. In response to public and resource agency comments concerning potential cumulative effects of all four segments and the need to assess all four segments as facilities with independent utility and logical termini, an EIS is being prepared for each segment. The FEIS for each segment is organized into a four-volume set:

- Volume I presents analyses and results common to Segments E, F-1, F-2, and G, including project description, the need for and purpose of the project, alternatives considered, affected environment, indirect and cumulative effects, and agency and public coordination.
- Volume II provides a detailed assessment of Segment G relative to its specific project area. It includes issues, permits, and federal actions particular to Segment G, such as the need for and purpose of the project; alternatives considered; affected environment; environmental consequences; avoidance, minimization, and mitigation measures; indirect and cumulative effects; and agency and public coordination.
- Volume III contains exhibits and appendices referenced in Volumes I and II.
- Volume IV includes materials related to the Segment G DEIS Public Hearing, comments submitted, and responses to the DEIS comments provided following the release of the Segment G DEIS in January 2007.

The volume covers and section tabs are color coded (Volume I [Green, common to Segments E, F-1, F-2, and G] and Volume II/III/IV, Segment E [Pink], Segment F-1 [Purple], Segment F-2 [Orange], and Segment G [Light Green]) to help the reader navigate through the document. Figure S-1 illustrates how the four FEISs are structured:

FIGURE S-1
FEIS STRUCTURE



Local Official and Public Involvement

Coordination with local elected officials in the study area identified several locally based needs for the project, including: improved safety on local roads through the division of through circumferential traffic to the new facility; freeway linkage between IH 10, US 290, SH 249, IH 45, and US 59 and the proposed Grand Parkway (SH 99); and the need for a transportation corridor to link together the rapidly growing areas in northwest Harris and southern Montgomery Counties. Information obtained at the Scoping Meetings and Open House Meetings indicated that citizens would use the new highway as a link to existing interstates for travel to locations in and around Houston and for travel to medical facilities, shopping areas, work, and recreation areas. For more information on public outreach, refer to Section 5 of this volume and Volume II, Section 6.

Project Independent Utility

While Segments E, F-1, F-2, and G support the overall purpose of the Grand Parkway, they also support the same purpose relevant to transportation needs specific to northwest Harris County and southern Montgomery County. As predicted by the H-GAC, residential and commercial development continues to expand from Houston's current outer

loop. Northwest Harris County and portions of southern Montgomery County will require improved and additional roadway facilities to accommodate the anticipated increase in traffic volume.

To this end, Segment G connects two existing major transportation corridors to ensure independent utility as well as independent significance as required by FHWA regulations (23 Code of Federal Regulations [CFR] 771.111[f]). Segment G has its logical termini at IH 45 and US 59, providing independent utility even if implemented separate from the other proposed segments.

S.1 PROJECT NEED AND PURPOSE

Segments E, F-1, F-2, and G are each a Segment of Independent Utility (SIU) that would collectively address regional transportation needs and independently address local transportation needs. Volume I of this FEIS presents the regional need for transportation improvements and the purpose of Segments E, F-1, F-2, and G, collectively. Volume II presents a discussion of the local need for transportation improvements and the purpose of Segment G. The following discussion presents the needs (or problems) found in the study area and the purposes (or goals) of the proposed project.

Transportation improvements are needed in the Segment G study area because there are inefficient connections between suburban communities and major radial roadways, the current and future transportation demand exceeds capacity, many roadways in the study area have a high accident rate, and there is an increasing strain on transportation infrastructure from population and economic growth. The local needs for Segment G are further detailed in the following:

- **System Linkage:** The current transportation system does not allow for efficient circumferential traffic movement, i.e., it does not provide efficient connections, or linkage, between major suburban communities and major roadways that radiate outward from Houston, such as IH 45 and US 59:
  - This region experiences a high number of east-west traffic movements. The origin/destination study shows that of the approximately 1,672,900 trips generated to/from the Segment G traffic study area [1], approximately 36 percent (607,900) are engaged in circumferential movement and could benefit from Segment G.
  - The transportation system does not provide efficient connections between suburban communities such as Spring, The Woodlands, Kingwood, Porter, and New Caney.
  - No roadways connect IH 45 and US 59 within the study area. To accomplish circumferential trips, travelers either use radial roadways such as IH 45, US 59, the Hardy Toll Road, or FM 1314 to reach circumferential roadways such as FM 1960 or SH 242, or they make trips that include Beltway 8, several miles south of FM 1960.

[1] The area used for analyzing traffic data has been expanded beyond the project study area in order to include all major roadways potentially affected by the proposed new transportation facility. This area is referred to as the traffic study area.

- **Expanded Capacity:** Transportation demand exceeds the current and future capacity of existing transportation infrastructure:
  - The collector roadways that provide partial circumferential movement in the traffic study area (such as Louetta Road, Riley Fuzzel Road, Treaschwig, FM 1314, Cypresswood Drive, or Rayford Road) will not be able to meet future traffic demand.
  - The circumferential roadways that lie within the traffic study area (FM 1960, SH 242, and Beltway 8) are expected to increase in traffic an average of 127 percent by 2025.
  - The major facilities in the Segment G traffic study area are expected to increase in traffic an average of 111 percent by 2025.
  - The Level of Mobility (LOM) of the major facilities in the area shows trends toward serious or severe conditions by 2025.
  - The number of Vehicle Hours Traveled (VHT) for the Segment G traffic study area is expected to increase by 48 percent from 2000 to 2025 (H-GAC, 2005a), which can be related to the average commuter spending more time getting to and from work.
- **Safety:** Many roadways in Segment G, such as FM 1960 and Cypresswood Drive have high accident rates. These roads are characterized by intersections, traffic signals, and/or stop signs, and multiple access points, all of which may contribute to stop-and-go conditions, increased crash rates, and congestion during peak travel times and emergency events:
  - The Houston region had a fatal and injury crash rate higher than both state and national averages. For example, 1,010 accidents occurred on roadways parallel to the proposed segment of the Grand Parkway in the period 1999 through 2001, six of which were fatalities, and 631 of which caused injuries or possible injuries (H-GAC, 2005c).
  - Since radial facilities are congested during an evacuation, there is a need to connect them with an efficient circumferential roadway. As an example, when as many as two million people fled the Houston metroplex before Hurricane Rita on September 22, 2005, evacuees followed roadways leading to Austin, San Antonio, and Dallas. Severe congestion ensued and contra-flow lanes were eventually opened. This evacuation prompted the creation of a task force to study evacuation from coastal areas in Texas (Little et al., 2006).
- **Economic Development:** The expected growth will continue to strain existing transportation infrastructure, creating a barrier to businesses, commuters, and economic development. For those areas outside the IH 610 Loop, H-GAC predicts an 83.4 percent growth in population and a 76.0 percent growth in employment from the year 2000 to 2025 (H-GAC, 2005a). Much of this growth would be concentrated in the study area. With this increasing population and corresponding increases in traffic and congestion, it could become progressively more difficult for businesses to function efficiently.

The purpose of the proposed transportation improvements in the Segment G study area is to efficiently link the suburban communities and major roadways, enhance mobility and safety, and respond to economic growth. The goal is to improve system linkage, address current and future transportation demand, improve safety, and address population and economic growth. The goals of Segment G are further detailed in the following:

- **System Linkage:** The proposed project would improve system linkage, or connectivity, within the existing transportation network. The proposed project would provide circumferential linkage between IH 45 and US 59, the two major radial facilities in the Segment G study area, to provide linkage for traffic engaged in circumferential traffic movement.
- **Expanded Capacity:** The proposed project would address transportation demand, improve the LOM, reduce traffic congestion, and provide travel options.
- **Safety:** The proposed project would improve regional and local safety for the traveling public by minimizing conditions that contribute to stop-and-go conditions, increased crash rates, and congestion during peak travel times and emergency events:
  - The proposed project would divert traffic from parallel roadways with high accident rates, such as FM 1960 and Cypresswood Drive thereby reducing accident rates.
  - The Grand Parkway would provide an additional hurricane and emergency evacuation route for the greater Houston area consistent with Minute Order No. 82325 signed October 25, 1984. The Grand Parkway could alleviate a portion of the congestion during mass evacuations, thus creating safer and more efficient evacuation conditions.
- **Economic Development:** The proposed project would accommodate demographic and economic growth by improving the movement of persons and goods thereby minimizing barriers between businesses, consumers, and transportation infrastructure.

S.2 ALTERNATIVES ANALYSIS

The following section discusses the alternatives considered throughout the project planning process. This process included consideration of a full range of alternatives; the Study Team considered the No-Build Alternative, various transportation modes, alternative corridors, and alternative alignments. This section also presents a traffic and transportation analysis of the No-Build and Build Alternatives. Careful consideration was given to all comments received from the public and local, state, and federal resource agencies.

S.2.1 Corridor Study

A multi-step process was utilized to determine the Preferred Alternative Corridor within the study area:

1. The initial step of this process was to develop sensitive resource (e.g., schools, churches, parks, cemeteries, aquatic resources including wetlands, and residential/commercial developments) GIS mapping for the entire study area.

2. Following the creation of GIS mapping, several 5,000-foot wide bands, or corridors, were developed that minimized inclusion of these identified environmental constraints (sensitive resources); initially, these included three corridors: A, B, and C.
3. Each corridor was extensively examined to develop a refined environmental constraints inventory.
4. Results of these analyses were presented to the public and state and federal resource agencies at the public workshops held on August 18, 24, and 26, 2000.
5. Following these presentations and after considering comments from the general public and resource agencies, a Preferred Alternative Corridor was selected that best served the need for and purpose of the project and that maximized the probability of being able to avoid the greatest number of sensitive resources during specific alignment development.

Corridors A, B, C, and two variations, partial Corridor CB and Corridor D, were developed from this process. The corridor study involved the analysis of environmental constraints using GIS analysis and resource mapping and through careful consideration of comments received from the public and resource agencies. A Preferred Alternative Corridor was proposed based on its ability to best fulfill the need for and purpose of the project while avoiding and minimizing adverse environmental impacts. The resource inventory analysis and public and agency coordination led to the selection of Corridor D as the Preferred Alternative Corridor depicted in Summary Exhibit 2. Corridor D was carried forward for the alignment-level study.

S.2.2 Transportation Mode Study

The No-Build and Build Alternatives were defined and evaluated with respect to meeting the project's transportation needs (see Volumes I and II, Section 1 for Project Need and Purpose). Alternative transportation modes that did not meet the need for and purpose of transportation improvements in the Segment G study area were eliminated from further consideration. The Build Alternative was selected because it is the only alternative that fulfills the need for and purpose of the project. The following summarizes the alternative transportation modes considered:

- **No-Build Alternative:** The No-Build Alternative includes all committed improvements in the 2025 RTP (H-GAC, 2005a) without the construction of Segments E, F-1, F-2, and G. These improvements include Transportation System Management (TSM), Travel Demand Management (TDM), and modal transportation improvements such as bus transit, high-occupancy vehicle (HOV) lanes, rail feasibility, and new planned roadway construction in the study area. The No-Build Alternative also includes short-term, minor restoration activities such as resurfacing, bridge repairs, and minor road widening. These improvements are already a part of the ongoing plan for the continued operation of the existing roadway system. Smart Street improvements as defined and discussed in the 2025 RTP are also included in the No-Build Alternative. Based on an analysis of these individual components both individually and collectively, the No-Build Alternative would improve traffic congestion, travel times, and safety, particularly after 2023 when the majority of Smart Streets are scheduled to be implemented. However, the No-Build Alternative would

not adequately address the need for and purpose of transportation improvements in the Segment G study area. Although the No-Build Alternative would not satisfy the need for and purpose of the project, it was retained as a basis for comparison with the alternatives carried forward for detailed study. The No-Build Alternative includes the following components:

- **Transportation System Management:** These measures typically include low cost transportation improvements in place of, or in addition to, large-scale changes. These improvements would include items such as park-and-ride lots, ridesharing, HOV lanes, traffic signal coordination, and intersection improvements. While the TSM improvements included in the 2025 RTP are expected to ease congestion and travel times for localized trips, these improvements do not adequately address system linkage, expanded capacity, safety, and economic development. The TSM improvements by themselves would not adequately meet the need for and purpose of the project.
- **Travel Demand Management:** These measures rely on commuters making voluntary behavioral changes to their travel habits that result in fewer vehicles during peak hours. TDM measures improve mobility and reduce congestion during the peak hours. Examples of TDM include carpooling/vanpooling, employee trip reduction programs, compressed work weeks, telecommuting, flex-time, and employer incentives to participate in these measures. All of these options rely on voluntary behavioral changes that would not be reliable enough to solve the capacity problem. The TDM component of the No-Build Alternative would not address system linkage, expanded capacity, safety, and economic development. Based on approved TDM measures in the 2025 RTP, TDM measures by themselves would not adequately meet the need for and purpose of the project.
- **Modal Alternatives:** This category of alternatives was eliminated from further consideration because of failure to meet the need for and purpose of the project. The modal alternatives considered in the analysis included:
  - **Bus Transit:** The Bus Transit improvement component of the No-Build Alternative would not address system linkage, expanded capacity, safety, and economic development. Commuter use of radial bus transit could be enhanced by the system linkage provided by the Grand Parkway.
  - **HOV Lanes:** The HOV lane concept does not adequately address system linkage, expanded capacity, safety, and economic development. The HOV lane concept would not be appropriate because a congested circumferential freeway corridor does not exist within the study area.
  - **Rail Transit:** The Rail Transit concept does not adequately address system linkage, expanded capacity, safety, and economic development. Potential rail projects along the radial highways that represent the termini of the Grand Parkway segments may benefit from improvements to circumferential travel. The proposed project could enhance use of park-and-ride lots associated with future rail transit.
- **Smart Street Alternatives:** Smart Streets are a concept developed and introduced into the 2025 RTP as an additional tool to increase mobility, improve transit access, and safety by providing operational improvements along strategic regional thoroughfares. Smart Street enhancements would improve mobility through a range of alternatives such as synchronization of traffic signals; construction of roundabouts, medians, or turn bays

(dedicated turn lanes); consolidation of duplicate driveways; and, as appropriate, partial grade separation of some traffic lanes at major intersections (H-GAC, 2007a). Some Smart Street enhancement alternatives may require the construction of an entirely new roadway or the acquisition of new ROW to accommodate additional lanes (capacity) or grade separations. Most Smart Street improvements are scheduled for the year 2023 and would take place along collector roadways such as FM 1960, Treaschwig, FM 1314, and SH 242.

- The Smart Street component would provide operational improvements along collector roadways, including several within the traffic study area. Although these enhancements would add capacity and improve mobility at specific locations, the enhancements would provide minimal system linkage because none of the roadways are continuous and many begin or end between radial facilities. Smart Street enhancements would not provide additional circumferential capacity to handle the expected increase in traffic. As indicated in H-GAC's 2025 RTP, Smart Street enhancements do not address system linkage and would not promote economic development for the next 15 to 20 years. The impact to business and commerce from Smart Streets is not fully known; the implementation of Smart Streets could displace businesses as existing ROW is expanded to accommodate new lanes, grade separations, or new construction.

- **Build Alternative:** The Build Alternative would meet all components of the need for and purpose of the project; it would provide system linkage, expand capacity, improve safety, and address economic development. The following section, Section S.2.3 (Traffic and Transportation Analysis) presents a comparison of the Build and No-Build traffic conditions. The Build Alternative consists of a controlled access toll road with intermittent frontage roads constructed on new location. The Build Alternative is being proposed in addition to, not in lieu of, the commitments identified in the No-Build Alternative, including continuation of the improvements to existing facilities, incorporating the execution of planned and/or committed roadway improvements, TSM, TDM, bus transit, HOV lanes, rail feasibility, and new roadway construction in the study area. The GPA would consider any and all future TSM, TDM, and modal transportation improvements, including future rail park-and-ride lots and/or stations.

S.2.3 Traffic and Transportation Analysis

The transportation facilities in the Segment G traffic study area are characterized by a network of roads that are becoming overwhelmed with existing traffic demand and would not adequately serve traffic because of projected residential and commercial growth in the Segment G project area. IH 45 and US 59 are radial highways connecting the city of Houston to its suburbs and beyond. To accomplish circumferential trips, travelers use radial roadways, such as IH 45 and US 59, to reach circumferential roadways, such as Beltway 8 and FM 1960. As a result, these facilities absorb most of the east-west travel demand and associated congestion. Presently, residential development is heavy in the area between these roadways, serviced by a network of roads developed primarily along property boundaries. In terms of transportation impact, the alternative alignments considered for the Segment G Build Alternative would have very similar results; therefore these alignments were treated and analyzed as one Build Alternative in the traffic and transportation analysis.

Segment G of the Grand Parkway, if constructed independently from the other segments, is expected to carry up to 53,700 vehicles per day in 2025, clearly showing the need for additional circumferential freeway capacity. Table S-1 shows the projected Average Daily Traffic (ADT) for the proposed Grand Parkway. A new circumferential roadway with capacity like that of the proposed Segment G would be used by travelers to access destinations within the outer suburbs and radial facilities such as IH 45 and US 59. The Grand Parkway provides greater benefit to arterials and collector roadways, which show a decrease in VHT because of improved travel time found on the proposed Grand Parkway.

TABLE S-1
PROJECTED AVERAGE DAILY TRAFFIC ON THE PROPOSED GRAND PARKWAY SEGMENT G

Year	Average Daily Traffic	
	Build (Segments E, F-1, F-2, & G)	Build (Segment G Only)
2015	43,400	25,800
2025	64,500	53,700

Source: H-GAC, 2005a

Studies have shown that roadways with frequent turns, stop-and-go conditions, distractions, and lack of access control tend to have more crashes than freeway facilities. In the Segment G traffic study area, most of the existing circumferential roadways are collector roadways, which characterize the conditions that cause frequent crashes. Segment G is expected to reduce the traffic on these high crash-rate facilities by as much as 24 percent in 2015. As travelers utilize the new facility instead of congested collector roadways and arterials, the crash rate in the Segment G traffic study area is anticipated to decrease.

S.2.4 Alternative Alignment Study

To avoid and minimize adverse effects to sensitive resources, four alternative alignments were developed for study in the DEIS: Alternative Alignment A, Alternative Alignment B, Alternative Alignment C, and Alternative Alignment D. These alternative alignments vary in length from 13.63 to 13.74 miles, and vary in land area from 713 to 748 acres. All alternative alignments would be a four-lane controlled access toll road with intermittent frontage roads within a 400-foot ROW.

Segments of the project area where two or more of the alternative alignments overlap because of the density of environmental constraints are called “reaches.” Within the Segment G project area, there are five alignment reaches (Reach 8, Reach 9, Reach 10, Reach 11, and Reach 12). Although the four alternative alignments can stand alone, different combinations of alternative alignments within each of the five alignment reaches were also analyzed for their potential independent and cumulative effects in order to select a Preferred Alternative Alignment. The Study Team performed an analysis of the existing and predicted physical, biological, and human environments that may be affected by the construction and operation of each alternative alignment within each reach. The alternative alignments are shown in Summary Exhibit 3.

S.2.4.1 Identification of Preferred Alternative Alignment

Identification of the Preferred Alternative Alignment is a process that has continually involved efforts to avoid and minimize environmental impacts while at the same time serving to fulfill the need for and purpose of the proposed project. A multi-step process was used to determine the Preferred Alternative Alignment for Segment G of the Grand Parkway after selection of the Preferred Alternative Corridor (Section S.2.1):

1. Development of alternative alignments.
2. Presentation of alternative alignments at the Public Hearing, and meetings with local officials and resource agencies.
3. Analysis of potential environmental impacts and comments received on the alternative alignments.
4. Selection of a Recommended Alternative Alignment using a screening process focused on four criteria:
   - Feedback from Public Workshops;
   - Number of Relocations;
   - Potential to Impact Floodplains; and
   - Potential to Impact Wetlands.
5. Presentation of the four original alternative alignments plus the Recommended Alternative Alignment in the DEIS and at the Public Hearing.
6. Comments received on the DEIS from the public, and federal, state, and local agencies were considered in the decision of whether or not to carry the Recommended Alternative Alignment forward for further analysis. Additionally, updated resource mapping, indirect and cumulative effects analysis, and agency coordination have taken place since the publication of the DEIS. All of this additional information was assessed in the selection of the Preferred Alternative Alignment presented in the FEIS.

S.2.4.2 Preferred Alternative Alignment

The Recommended Alternative Alignment presented in the DEIS was equivalent to Alternative Alignment D (which is a composite of Alternative Alignment A/C in Reach 8, the added Alternative Alignment D in Reach 9, Alternative Alignment A/B in Reach 10, Alternative Alignment A in Reach 11, and Alternative Alignment C in Reach 12). Updated resource mapping, indirect and cumulative effects analysis, and public and agency coordination have taken place since the publication of the DEIS in January 2007. Comments received on the DEIS, updated analyses, and coordination have led to the slight shifting of the Recommended Alternative Alignment in one area. Near the junction of Reach 8 and Reach 9, a new subdivision named Creekside Village has been planned for development at the end of Riley Fuzzel Road. The Grand Parkway alignment was shifted slightly to the south to avoid residential impacts in this subdivision.

The Preferred Alternative Alignment for the Grand Parkway Segment G is approximately 13.74 miles long (see Summary Exhibit 4). The Preferred Alternative Alignment begins at IH 45 approximately 2.9 miles north of FM 2920. It travels east for approximately 1.7 miles, crossing the Hardy Toll Road and Spring Creek. The Preferred Alternative Alignment turns to the northeast, paralleling Riley Fuzzel Road, and continuing in this direction for approximately 5.5 miles. After crossing the West Fork of the San Jacinto River, the Preferred Alternative Alignment turns to the southeast for approximately 1.5 miles. The alignment slightly turns to head easterly for approximately 3.1 miles, passing between the Cumberland and Winchester Place subdivisions and crossing FM 1314. After passing the Timberland Estates subdivision, the Preferred Alternative Alignment turns back toward the southeast for approximately 1.9 miles until its terminus at US 59. In this final stretch of the project area, the alignment parallels and then crosses the White Oak Creek floodplains and runs through the Valley Ranch community. All of the Preferred Alternative Alignment would be on new location, and its ROW would require approximately 748.4 acres. Estimated total construction cost for building the Preferred Alternative Alignment for Segment G is $476,687,000 (details provided in Section S.3.4). Environmental issues related to the construction of the Preferred Alternative Alignment are summarized in the following section.

S.3 ENVIRONMENTAL ISSUES

The Preferred Alternative Alignment was selected through a process that avoided and minimized environmental effects to the maximum extent practicable. Unavoidable environmental impacts resulting from the construction and operation of the proposed project have been measured and/or projected and are summarized in this section.

S.3.1 Land Use

The Preferred Alternative Alignment is consistent with state and local government plans and policies on land use and growth that is relevant within the project area. The Preferred Alternative Alignment would be approximately 13.74 miles in length and have an approximate ROW of 748.4 acres. The Preferred Alternative Alignment would result in the reduction of land available for development or greenspace, and would cause temporary visual and noise effects and temporary traffic delays in neighborhoods during project construction. The Preferred Alternative Alignment would likely cause community cohesion effects in the Northgate Crossing, Timberland Estates, and Valley Ranch subdivisions.

Indirect development would likely result from the Preferred Alternative Alignment in the Segment G project area. Nodes of indirect development are expected to occur at highway interchanges (i.e., IH 45 and US 59), along frontage roads, and at grade separations where entrance and exit ramps to the proposed Preferred Alternative Alignment are present. Preliminary design of the Preferred Alternative Alignment includes frontage roads in the following locations: 1) extending from IH 45 to entrance ramps; 2) from 0.7 miles east of the Hardy Toll Road extending north-eastward along Riley Fuzzel Road for approximately 2.7 miles; and 3) from US 59 west to Valley Ranch Thoroughfare (new roadway under construction). Grade separated intersections with entrance and exit ramps would be built at junctions with the following roads: IH 45 frontage roads, Hardy Toll Road, Riley Fuzzel Road near Spring Trails, Rayford Road, Birnam Woods Drive

(future), Townsen Road (future), FM 1314, Valley Ranch Thoroughfare (future), and US 59 frontage roads. Grade separations without entrance and exit ramps, such as at the Northgate Crossing Boulevard, would not likely experience indirect development until entrance and exit ramps are built some time in the future.

The actual extent and type of indirect development are influenced greatly by many variables including the size of and distance to nearby communities as well as the existing local services offered. This indirect development would likely include a variety of land uses such as convenience stores, gas stations, retail shopping centers, restaurants, office buildings, and residences, including apartments. Residential development may result because of community growth and improved access to nearby job markets. More detail regarding indirect and cumulative effects of the Preferred Alternative Alignment on land use patterns are addressed in Section 4 of this volume or Volume II, Section 5 (Indirect and Cumulative Effects).

Under the No-Build Alternative, suburban growth within the proposed project is expected to continue at a rate similar to historical trends. New subdivisions would lead to loss of forestland and other undeveloped land and disruption of the semi-rural nature of the proposed Segment G project area. Commercial development would likely occur along existing arterial roadways that run through the Segment G project area. Existing arterial roadways through the Segment G project area would likely become more heavily traveled without the proposed project and may become more congested over time. Potential short-term noise and visual effects and construction-related traffic delays would not occur under the No-Build Alternative. Induced development associated with exit and entrance ramps and short sections of frontage roads under the proposed project would not occur under the No-Build Alternative.

S.3.2 Geology, Soils, and Farmland Impacts

The Preferred Alternative Alignment would cross soils and geology similar in nature to the other alternative alignments. The proposed ROW includes 355 acres of prime and statewide important farmland soils. While these impacts, such as the removal of topsoil, compaction, and removal of vegetation, cause some temporary to permanent loss to these resources, they are considered minor as rated and scored by the Natural Resource Conservation Service (NRCS). Mitigation measures to be implemented during and after construction are considered prudent and positive in helping to restore a portion of these resources. Under the No-Build Alternative, no new ground disturbance would occur; therefore no impacts to existing geological or farmland soil resources would take place.

S.3.3 Social Impacts

An evaluation of the U.S. Environmental Protection Agency (EPA) environmental index maps and race and poverty data for the Segment G project area has shown that the population living within the Segment G project area is generally less racially diverse and of higher income than the majority of Harris County and is similar in ethnic diversity and income to that of Montgomery County. Following a methodology that is consistent and compliant with Executive Order (EO) 12898 on Environmental Justice (EJ), it was demonstrated that there is no potential for disproportionate or adverse effects to

minority or low-income populations within the Segment G project area. Additionally, Segment G is compliant with EO 13166 on persons with limited English proficiency (LEP). There were no individual Census tracts identified within the project area that have a considerable percentage of persons with LEP; however, notifications on the project have been published in *El Diá/La Subasta*, a newspaper that is circulated within the Spanish-speaking communities in the Houston metropolitan area, and announcements for the Public Hearing indicated translators were available upon request.

Many potential social impacts have been mitigated by the incorporation of grade separations to the design of the Preferred Alternative Alignment at all public road crossings. Travel times could be lengthened across the facility at the intersections; however, travel throughout the project area in general would improve because of the relief in congestion afforded by the new facility. Because of the congestion relief and quicker, safer travel afforded by the Grand Parkway, the Preferred Alternative Alignment would likely have an overall beneficial effect on public safety. Emergency responders (police, fire protection, and emergency medical services) would likely use the toll road during an emergency thereby improving response times through the project area. No fire stations, police stations, or health care facilities would be displaced by the Preferred Alternative Alignment.

Direct impacts to school bus routes would likely be improved travel times overall because of the new facility. Travel that can incorporate use of the new facility would improve. Local school districts choosing to use the toll facility could experience quicker school bus routes; however, they would have to absorb the increased cost because of the toll. If local school districts would not choose to use the new facility, routes may be slower at intersections with the Grand Parkway; however, routes would not be impacted by issues of access, and congestion overall in the project area would improve with the new facility. School bus routing may experience impacts because of increased traffic in the areas of increased development or changes in traffic patterns.

Community impacts expected as a result of the Preferred Alternative Alignment include potential increase in property values adjacent to the project, particularly at nodes of access to the facility; potential degradation of aesthetics and community character for individual single-family homes and the residential developments adjacent to the facility; and temporary construction impacts. Additionally, the Preferred Alternative Alignment would affect approximately 7.5 acres of the YMCA Camp Pine Tree (a private recreation area) within Reach 8 and access to the True-Holiness Church of God in Christ. The Preferred Alternative Alignment would cause the displacement of 110 residences. No businesses, schools, churches, cemeteries, parks, or Section 4(f) properties are located within the Preferred Alternative Alignment ROW.

Under the No-Build Alternative, community cohesion impacts from the proposed project would not occur. However, anticipated future development in the Segment G project area would continue to alter land use patterns in the area, changing the character from semi-rural to urbanized suburban. As arterial roadways in the Segment G project area take on additional traffic volume over time (without the proposed project), traffic congestion on these roadways would increase in the area. Increased future traffic congestion would likely affect school bus routing, and would likely increase emergency response times.

S.3.4 Economic Impacts

The economic effects from the Preferred Alternative Alignment were based on the total construction cost of $476.69 million for the proposed toll road project. Total cost includes estimates for the following: construction cost, ROW cost, utilities cost, escalation cost and inflation cost for the targeted letting year. The total cost estimate also includes construction of half the interchanges at the project termini; the estimate does not include the half of the interchange that is proposed (in a separate document) within the Grand Parkway Segment F-2 at IH 45 nor the half of the interchange that is proposed (in a separate document) within the Grand Parkway Segment H at US 59.

The total output impact, which includes direct, indirect, and induced impacts on all economic sectors because of increased production output associated with construction, of the proposed toll road project is estimated to be $1.072 billion. The total value added impact, which is a measurement of the value added to intermediate goods and services, is estimated to be $542.17 million. The total employment impact, which shows the number of new construction-related jobs that would be created, is estimated to be 7,620 employees. Finally, the total indirect business tax impact, which accounts for the amount of local and state sales tax that would be generated during construction, is estimated to be $28.25 million.

Under the No-Build Alternative, the Segment G project area is expected to become increasingly urbanized over time. Land in the Segment G project area would be converted over time from forestland and undeveloped land to residential subdivisions, offices, apartments, and commercial development. As development occurs over time, employment in the area is likely to grow. As the Segment G project area's economy diversifies and adds new jobs as a result of urbanization, total economic output and value-added impacts would increase. New commercial and residential development that would occur in the Segment G project area would likely increase the property tax base of the area. Newly built commercial businesses would boost sales taxes collected in the area.

S.3.5 Pedestrian and Bicyclist Impacts

The 2035 RTP includes a Regional Bikeway Plan update that contains a listing of current and proposed bicycle facilities for the Houston area. The Grand Parkway is not a corridor identified in the plan to receive a future bicycle facility. The Grand Parkway project as proposed would accommodate existing and future crossings for both pedestrians and bicyclists at intersections, bridges, and over/underpasses affecting or providing direct access to designated pedestrian and/or bicycle facilities. In the event that a bicycle or pedestrian facility is in place prior to the proposed project, the facility would be reconstructed to maintain continuity and function. As currently designed, it is not anticipated that bicycle traffic would be accommodated on the outside lanes of the toll-way main lanes or intermittent frontage roads. In the future, should the H-GAC RTP include a proposed bikeway corridor along the Grand Parkway, appropriate supplemental studies will be initiated. The flow of bicycle and pedestrian traffic may be affected by the Grand Parkway at grade separations with entrance and exit ramps.

Under the No-Build Alternative, future urbanization within the Segment G project area is expected to lead to greater traffic volumes on arterial roadways, which would affect the flow and safety of bicycle and pedestrian traffic.

S.3.6 Air Quality Impacts

Pollutants required to be evaluated include carbon monoxide (CO) and ozone (O_3). EPA's MOBILE6.2 mobile emission factor model and CALINE3 were used to estimate CO levels at the year of completion (2012) and the design year (2025). The Houston area is in attainment for all the criteria pollutants except for 8-hour O_3. Segment G will not contribute to additional violations nor prolong attaining the National Ambient Air Quality Standards (NAAQS) for O_3. Segment G conforms to the emissions budget established for the approved 1-hour standard for ozone, but an 8-hour emissions budget has not been approved for the Houston area. The modeling indicates that local concentrations of CO are not expected to exceed national standards at any time along Segment G, and that local CO concentrations are not expected to exceed national standards should the four contiguous segments (E, F-1, F-2, and G) be built.

The Grand Parkway Segment G was included in H-GAC's 2025 RTP, and was included in the FY 2006-2008 TIP, Appendix D, as project undergoing environmental review and scheduled for implementation beyond the three-year TIP time frame. The 2025 RTP and 2006-2008 TIP were adopted by H-GAC in April 2005 and found to conform to the SIP by USDOT (FHWA/FTA) on June 3, 2005 and October 31, 2005, respectively.

The Grand Parkway Segment G is included in H-GAC's 2035 RTP and FY 2008-2011 TIP, as amended. On August 24, 2007, H-GAC adopted the 2035 RTP and FY 2008-2011 TIP. USDOT (FHWA/FTA) found the 2035 RTP and 2008-2011 TIP to conform to the SIP on November 9, 2007.

Changes in modeled parameters between the 2025 RTP and the 2035 RTP (such as traffic volumes, population, employment, number of households, and vehicle miles traveled) have been evaluated to determine if any additional analysis is warranted before FHWA takes final environmental action. This evaluation confirmed that the changes in the modeled parameters were minor, and therefore no additional analysis is warranted. The analysis of 2025-2035 RTP modeled parameters can be found in the Administrative Record.

Analysis of Mobile Source Air Toxics (MSAT) indicates that a substantial decrease in MSAT emissions can be expected for both the Build and No-Build future cases (2015 and 2025) versus the base year (2000). Even accounting for anticipated increases in Vehicle Miles Traveled (VMT) and varying degrees of efficiency of vehicle operation, total MSAT emissions in Segment G are expected to decrease by approximately 81 percent by 2025 compared with 2000 levels, which is due in large part to the implementation of EPA's new motor vehicle emission control standards.

Emissions from diesel powered and other construction equipment would occur under the Build Alternative for Segment G. These construction emissions would be temporary in nature. In addition to tailpipe emissions, fugitive dust may be

generated during project construction. Specific dust suppression mitigation measures would be identified in a dust control plan prepared prior to project construction.

Under the No-Build Alternative, MSAT are expected to decline at nearly the same rate as the Build Alternative with no direct effect to air quality in the Houston area.

S.3.7 Traffic Noise

Future noise levels at representative receivers along the Segment G Preferred Alternative Alignment were predicted using build-out conditions assuming all four segments (E, F-1, F-2, and G) of the Grand Parkway would be constructed. This traffic condition represents the worst-case traffic noise conditions, as more vehicles would use Segment G if all four segments would be constructed. Since the DEIS, a detailed noise analysis (impact and abatement) was conducted for the Preferred Alternative Alignment. Results of the traffic noise analysis indicated that 79 representative receivers, representing a total of 280 residential receivers and no commercial receivers would be impacted by traffic noise.

Noise abatement measures were evaluated for each of the impacted representative receivers. Based on preliminary results, noise barriers would be both feasible and reasonable, and are proposed for incorporation into the project.

Under the No-Build Alternative, increases in population and employment growth are projected throughout the project area. It is expected that ambient noise levels would increase within areas of concentrated development associated with this projected growth.

S.3.8 Water Quality Impacts

Quality and quantity of storm water runoff would be altered by the Preferred Alternative Alignment; however, adherence to established Best Management Practices (BMPs) both during and after construction would minimize erosion and control the discharge of sediment and pollution laden runoff. The potential impacts on surface water quality would occur in two ways: 1) direct effects from construction and 2) effects from long-term operation of the roadway. The Preferred Alternative Alignment would cross the following surface waters: Spring Creek, Woodsons Gully, West Fork San Jacinto River, White Oak Creek, and ten tributaries to these streams. All perennial streams would be bridged, and the remaining tributaries would be culverted. Well records indicate that groundwater pollution prevention measures might be required for 16 public water supply wells. Additionally, one private water supply well is within the Preferred Alternative Alignment. Under the No-Build Alternative, no direct effect to surface water or groundwater resources would occur.

S.3.9 Permits

A Clean Water Act (CWA) Section 404 permit would be required by the USACE for the Preferred Alternative Alignment. Water quality certification from the Texas Commission on Environmental Quality (TCEQ) would also be necessary per

Section 401 of the CWA prior to filling wetlands. No navigable waters of the U.S. exist in the project area; therefore the need for a Section 9 permit from the U.S. Coast Guard (USCG) or a Section 10 permit from the USACE is not anticipated.

Since the Preferred Alternative Alignment would disturb more than one acre of land, TxDOT would be required to comply with the TCEQ Texas Pollutant Discharge Elimination System (TPDES) General Permit for Construction Storm Water Runoff, which requires development of a Storm Water Pollution Prevention Plan (SWPPP) in order to avoid adverse impacts potentially resulting from storm water runoff discharges. In addition, because the project would disturb more than five acres of land, TxDOT would issue an NOI prior to construction stating that the SWPPP has been developed and filed with TCEQ. TxDOT has its own storm water management guidelines and BMPs for construction activities that will be used in development of the SWPPP. Once construction has been completed, a Notice of Termination will be filed per permit requirements. Additionally, in accord with Clean Water Act Section 402, where storm water from the proposed construction project will discharge to a Municipal Separate Storm Sewer System (MS4), the MS4 permittee would be notified of the construction activity. Under the No-Build Alternative, no permits would be required.

S.3.10 Wetlands and Vegetative Community Impacts

S.3.10.1 Wetlands

The Preferred Alternative Alignment would potentially impact 64.4 acres of wetland, including 24.3 acres of non-forested wetland and 40.2 acres of forested wetland. Impact calculations do not account for bridging, which would likely reduce the wetland acreage impact particularly in the vicinity of West Fork San Jacinto River.

Additional investigation will be completed for the Preferred Alternative Alignment prior to completion of the Section 404 permit. This additional investigation consists of a formal wetland delineation, which began in the fall of 2007. The delineation is being conducted within the Preferred Alternative Alignment in accordance with the USACE 1987 Wetlands Delineation Manual. As of the completion of this FEIS, right-of-entry has not been obtained for approximately 60 percent of the total ROW along the Segment G Preferred Alternative Alignment. Results of this investigation are awaiting additional property owner access and will require verification by the USACE Galveston District.

S.3.10.2 Vegetative Communities

The Preferred Alternative Alignment encompasses 748.4 acres. Approximately 56 percent (or 417.28 acres) of the Preferred Alternative Alignment has designated vegetative land covers, as detailed in Table S-2. The ROW does not include any riparian forest; however, the forest acreage includes 129.76 acres of bottomland hardwoods. Preliminary design of the Preferred Alternative Alignment includes bridging substantial portions of the bottomland hardwood forest along with floodplains of Spring Creek and West Fork San Jacinto River. No officially designated natural areas were identified within the Segment G project area.

TABLE S-2
SUMMARY OF PREFERRED ALTERNATIVE ALIGNMENT VEGETATIVE COMMUNITY IMPACTS

Farmland (acres)	Rangeland (acres)	Forest (acres)	Non-Forested Wetland (acres)	Forested Wetland (acres)
0	0	352.84	24.30	40.16

Note: These impacts do not include impacts to residential, commercial, industrial, transportation, streams and canals, lakes or other areas that are not included in the five vegetation types shown above.
Source: Study Team, 2007

The No-Build Alternative would avoid impacts to larger wetlands (forested and non-forested), but could result in smaller wetland impacts associated with short-term, minor restoration activities (e.g., resurfacing, bridge repairs, road widening) to existing transportation facilities. The No-Build Alternative would also avoid impacts to other forested communities. The No-Build Alternative would likely avoid impacts to larger vegetative communities, but could result in smaller community impacts associated with improvements to existing transportation facilities.

S.3.11 Wildlife

Assessing acreage impacts to vegetative communities that occur within the Preferred Alternative Alignment provides a method of quantifying and comparing terrestrial wildlife habitat impacts, including habitat fragmentation, potentially incurred by construction of Segment G. Acreage of impact to vegetative communities is provided in Table S-2. Other than direct conversion of land use from forest etc., other impacts to remaining wildlife habitat is summarized in this section.

Several potential impacts of nonpoint source pollution on terrestrial plant and animal life from construction and use of the roadway may occur with the proposed project. In addition, terrestrial wildlife impacts may occur because of increased spread of exotic and/or noxious species (such as non-native grass, shrub, and tree species planted in the ROW) into previously undisturbed portions of the Segment G project area. In addition, unintentional and/or illegal introductions of exotic terrestrial and aquatic plant and animal species may be facilitated by human access provided by the proposed Grand Parkway. However, the Segment G project area has already been subjected to extensive human access and alteration resulting from increasing development. Since forest habitat is a major component of the area surrounding the Preferred Alternative Alignment, forest fragmentation effects are a concern. The project will be implemented in full compliance with all provisions and regulations outlined in and pursuant to the Migratory Bird Treaty Act (MBTA) (16 USC 703-711).

The proposed project would impact aquatic habitat. The Preferred Alternative Alignment would cross several major streams in the project area, as well as perennial and intermittent tributaries to these streams. All of the major stream crossings (Spring Creek, Woodsons Gully, West Fork San Jacinto River, and White Oak Creek) would be bridged by the Preferred Alternative Alignment, while others would be bridged or culverted. BMPs will be followed before, during and

after construction activities; therefore no negative long-term impacts to aquatic species in the Segment G project area are expected because of project construction and usage. On small waterways, pipe and box culverts would be used to allow the passage of water, and relocations would incorporate natural channel design principles to provide a more natural habitat. Some individual mortality associated with construction when species are present at creek crossings.

The No-Build Alternative would avoid direct impacts to wildlife associated with the removal of terrestrial and aquatic habitats, but could result in impacts adjacent to existing transportation facilities where suitable habitat for wildlife exists. Although improvement activities associated with existing transportation facilities could also result in impacts to many wildlife species, the impacts would likely be considered less substantial than those of the Build Alternative since there would be a relatively small area of habitat removed and no new fragmentation of habitat.

S.3.12 Waterbody Modifications and Floodplains

S.3.12.1 Hydrology and Drainage

The Preferred Alternative Alignment would cross the four major streams flowing through the project area: Spring Creek, Woodsons Gully, West Fork San Jacinto River, and White Oak Creek. The alignment would also cross two tributaries to Spring Creek, a perennial tributary to Woodsons Gully, three tributaries to West Fork San Jacinto River (including Black Branch), and three tributaries to White Oak Creek. These crossings are almost all transverse, reducing the length of impact along the stream corridor. All of the major streams listed above would be bridged by the proposed facility, and the remaining streams would be bridged or culverted.

The proposed project would increase the amount of impervious area within the watersheds, resulting in increased surface runoff and impacted overland flow patterns. However, these impacts would be substantially reduced with the design of drainage (mitigation) facilities that consider sheet flow patterns. Final drainage and mitigation analyses would be conducted during final project design. The No-Build Alternative would avoid direct impacts to hydrology and drainage.

S.3.12.2 Floodways and Floodplains

The Preferred Alternative Alignment ROW includes 95.42 acres of regulatory floodway and 103.00 acres of 100-year floodplain. All of the floodway would be bridged with the possible exception of a portion of the floodway adjacent to Woodsons Gully. Further avoidance and minimization of floodplain encroachments would be considered during final design.

Rainfall runoff rates would be expected to increase slightly because of an increase in impervious pavement surface area with construction of the Preferred Alternative Alignment. However, natural and beneficial floodplain values would not be altered because of implementation of mitigation measures determined from final drainage and mitigation analyses conducted during final project design. Cross drainage and mitigation facilities associated with the proposed roadway and drainage improvements would be designed to handle a 100-year flood event. Review of this study by regulatory agencies would confirm that adequate measures have been taken to ensure that the project's floodplain encroachment would not

increase the risk of flooding to adjacent property. Project-related increases in base flood elevations would not be allowed to exceed one foot. The No-Build Alternative would avoid direct impacts to floodways and floodplains.

S.3.13 Wild and Scenic Rivers

The Preferred Alternative Alignment and the No-Build Alternative would not impact Wild and Scenic Rivers.

S.3.14 Coastal Barriers

The Preferred Alternative Alignment and the No-Build Alternative would not impact coastal barriers.

S.3.15 Coastal Zone Management

The Preferred Alternative Alignment is not within the Coastal Management Program (CMP) boundary. Neither the Build Alternative nor the No-Build Alternative would require coordination with the Coastal Coordination Council (CCC).

S.3.16 Essential Fish Habitat

The Preferred Alternative Alignment and the No-Build Alternative would not impact Essential Fish Habitat (EFH).

S.3.17 Threatened and Endangered Species

The Preferred Alternative Alignment is not known to include any unique or suitable habitats or any known populations or nest sites of listed species (based on the Texas Natural Diversity Database [TXNDD] file reviews [TPWD, 2007c], coordination with TPWD and USFWS, and limited field surveys). As ROW is acquired on lands that have not been surveyed because of lack of access (San Jacinto River Crossing), additional coordination (if required) will be initiated with the USFWS and TPWD in full compliance with the ESA. The Preferred Alternative Alignment may affect, but is not likely to adversely affect threatened and endangered species. The No-Build Alternative would have no direct effect on the Segment G project area relative to threatened and endangered species.

S.3.18 Cultural Resources

The No-Build Alternative could result in future cultural resource impacts associated with widening and passing lane construction activities along existing roads because of the population growth in the area. The extent of these impacts is not known at this time as detailed designs for these proposed projects are not known. Current levels of looting, vandalism, and non-scientific collecting would likely continue on known and discovered sites.

S.3.18.1 Archeological Resources

High Probability Areas (HPAs) were identified to assess the potential for prehistoric sites in the Preferred Alternative Alignment, and a total of 550 acres of HPAs were identified. The Map Units for these HPAs (Map Unit 2 and Map Unit 2a) do not recommend deep reconnaissance. As a result of archeological field surveys of accessible portions of the Preferred Alternative Alignment and coordination with the State Historic Preservation Officer (SHPO), one archeological historic property (36 CFR 800.16(l)) was identified within the surveyed portions of the Area of Potential Effect (APE). Site

41MQ197 will require additional investigations to determine if it would be potentially eligible for nomination to the National Register of Historic Places (NRHP). The total number of archeological sites within the Preferred Alternative Alignment will not be known until the completion of an archeological field survey for this segment. If archeological sites could be identified within the Preferred Alternative Alignment, additional investigations may be necessary to determine if they would be eligible for nomination to the NRHP.

S.3.18.2 Non-Archeological Historic Properties

In 2003, TxDOT Environmental Affairs Division completed coordination with the SHPO concerning the NRHP status of 22 non-archeological historic resources located within the APE of Segment G alignments. It has been determined that no non-archeological historic properties occur in or adjacent to the Preferred Alternative Alignment. In addition, the Preferred Alternative Alignment would not impact any Recorded Texas Historic Landmarks, State Archeological Landmarks (non-archeological), or Official State Historical Markers. Thus, the Preferred Alternative Alignment will not directly impact any non-archeological historic properties. No further consideration of impacts is required under Section 106 of the National Historic Preservation Act of 1966, as amended, or under Section 4(f) of the Department of Transportation Act.

S.3.19 Hazardous Materials Impacts

The proposed construction of the Segment G project area poses very little risk of hazardous material impacts to the environment. (Unanticipated hazardous materials and/or petroleum contamination encountered during construction would be handled according to applicable state and federal regulations and TxDOT guidelines.) The review of regulatory agency databases indicates the presence of one registered facility within the ROW of the Preferred Alternative Alignment, Site ID No. 21, owned by Averie Bass. This site is reported as an unauthorized landfill (LFUN) containing demolition materials and brush. The two-acre site is a reclaimed sand pit that was reportedly first used in 1979. According to a recent site reconnaissance, the facility is actively excavating aggregate and receiving brush and debris. The facilities that are located within the final design ROW of the Preferred Alternative Alignment would be acquired by the project owner. A Phase I Environmental Site Assessment would be conducted to assess the potential for hazardous material impacts to the existing environment. Based on the results of the assessment, sampling and analysis activities and possible remedial activity may be warranted.

Railroad Commission of Texas (RRC) records indicate that one observation well site and seven petroleum pipelines are located within the ROW of the Preferred Alternative Alignment. Elevated Naturally Occurring Radioactive Material (NORM) issues may be an environmental concern in oil fields, especially where water injection has been used as a secondary recovery technique, or water disposal has occurred. The concern would likely be limited to the current producing wells, of which there are none in the proposed project ROW. Arrangements with the responsible well operator for proper plugging according to applicable regulations would be addressed during the ROW acquisition and negotiation process. If not plugged prior to construction, the wells would be addressed per TxDOT standard specification Item 103 Disposal of Wells.

The Preferred Alternative Alignment crosses six active petroleum pipelines and one inactive pipeline. The relocation of existing pipelines does not appear necessary. However, the pipelines may be required to be reinstalled at a greater depth prior to roadway construction. The depths of the pipelines and their locations would be clearly marked prior to construction to prevent an accidental rupture.

Under the No-Build Alternative, further exploration and production of oil and gas could occur; however, suburban growth would eventually reduce the availability of land to lease for oil and gas production. Commercial development will likely increase the number of the most common of hazardous material sites, retail gasoline outlets (i.e., underground storage tank [UST] facilities).

S.3.20 Visual and Aesthetic Impacts

Because of the relatively large overall size of the project and the rural setting of the project area, the Preferred Alternative Alignment would have some effect on the existing aesthetic quality of the surrounding area. The visual impact would vary with location. Views both from and of the facility would be greatest at grade separations, which would be located at the following locations: IH 45, Hardy Toll Road, Northgate Crossing Boulevard, Riley Fuzzel Road near Spring Trails, Rayford Road, Birnam Woods Drive (future), Townsen Road (future), FM 1314, Valley Ranch Thoroughfare (future), and US 59. Preliminary design of the Preferred Alternative Alignment also includes long bridges over Spring Creek and the West Fork San Jacinto River and the bridging of Woodsons Gully, White Oak Creek, and a perennial tributary to Woodsons Gully. As the highway approaches existing development and communities, more residents have a view of the facility, but the highway would have less effect on the overall rural viewshed. Conversely, as the highway moves farther away from these developed areas, the result may be a greater change in the overall rural visual setting, but would be observed by fewer individuals. Outside grade separations, potential views of the highway would be limited because of the relatively flat nature of the project area. The toll facilities and all entrance and exit ramps would be lighted, which could be considered additional negative visual and aesthetic impacts, especially where residential areas are located near the main lane toll plazas and exit ramps with collection facilities.

The No-Build Alternative would not directly alter any visual resources; however, increased traffic congestion associated with the No-Build Alternative and the current development pressures in the region could lead to short-term and long-term impacts on the visual quality of the area road network and landowners adjacent to roads in the network.

S.3.21 Energy Impacts

The Preferred Alternative Alignment would require short-term energy consumption during construction activity. A worst-case estimate of operational energy consumption was calculated based on expected traffic conditions with the construction of Segments E, F-1, F-2, and G of the Grand Parkway. Based on this analysis, the future expected energy consumption is less than, though similar to, that of the No-Build Alternative. The short-term construction-related energy consumption could be offset by operational energy efficiencies gained with the use of an improved transportation facility over many decades.

S.3.22 Construction Impacts

The Preferred Alternative Alignment would have temporary construction impacts likely to include the temporary degradation of air, noise, and water quality; the temporary impedance to the maintenance and control of traffic; safety concerns because of changes in traffic patterns; the stockpiling and disposal of construction materials; and the use of borrow areas. Construction activities would affect residents in the immediate area and those traveling in the vicinity:

- **Air Quality:** Construction activities associated with the facility could have a short-term impact on local air quality during periods of site preparation. Particulate matter, also known as fugitive dust, has the greatest impact during construction activities. Any effects of fugitive dust would be temporary and would vary in scale depending on local weather conditions, the degree of construction activity, and the nature of the construction activity. During construction, the contractor would be required to adhere strictly to dust control measures to minimize this effect.
- **Noise:** Heavy equipment operations and certain construction activities, such as pile driving and the vibratory compaction of embankments, would result in temporary noise increases within the area.
- **Water Quality:** Effects to water quality resulting from erosion and sedimentation, as well as from pollutants such as chemicals, fuels, lubricants, bitumins, raw sewage, and other harmful waste, would be strictly controlled.
- **Maintenance and Control of Traffic:** Maintenance of the current flow of traffic on the existing roadway network would be planned and scheduled to minimize adverse impacts to the traveling public.
- **Health and Safety:** All reasonable safety considerations and safeguards necessary would be taken to protect the life and health of employees on the job, the safety of the public, and the protection of property in connection with roadway construction.
- **Pollution Control:** The stockpiling and disposal of the construction and excavation materials may be visually displeasing to some of the residents along the construction corridor, but would be a temporary condition and should pose no long-term impact.
- A conservative estimate of construction time for Segment G would be two to four years; however, a more exact length of construction time will be established during the final design phase. Up to date project status and construction schedule postings would be available on the Grand Parkway project website at http://www.grandpky.com/home.
- Borrow areas and any other project specific locations (PSLs) would be identified during the preparation of the Section 404 permit application prior to construction. If borrow pits would be identified within the 400-foot project ROW, TxDOT would have to obtain the necessary permits and clearances (such as the Section 404 permit and a SWPPP). If PSLs would be identified outside the project ROW, construction contractors would need to obtain the necessary permits and clearances (TxDOT, 2004b).

- The No-Build Alternative would not have the large-scale direct construction impacts that would occur with the Build Alternative. However, smaller construction projects associated with roadway maintenance would likely be greater with the No-Build Alternative because of the greater amounts of traffic using the existing facilities.

S.3.23 Relationship of Local Short-Term Uses versus Long-Term Productivity

Construction would cause short-term effects on the environment. The short-term uses of the environment associated with the Preferred Alternative Alignment are typical of those associated with highway construction. These short-term environmental concerns include air quality impacts, construction related noise, visual impacts, and water quality impacts. In comparison to these short-term impacts, the most evident long-term benefit of the proposed project is the improved local and regional system linkage and decreased congestion and delay. The benefits offered by the long-term productivity of this project should more than offset the short-term inconvenience and adverse effects on the natural, physical, and human environment.

S.3.24 Irreversible and Irretrievable Commitments of Resources

Construction would involve an irreversible and irretrievable commitment of resources, which include a range of natural, physical, human, and fiscal resources. The commitment of land to the ROW of the Preferred Alternative Alignment would be 748.4 acres, although further opportunities for reduction in ROW would be considered throughout final design. This land includes residential and business properties, farmland, and natural and forested landscapes. Land occupied by the proposed Grand Parkway would be considered an irreversible commitment during the period that the land is used for a highway facility. However, if a greater need would arise for use of the land, or if the highway facility would be no longer needed, the land can be converted to another use. At present, there is no reason to believe such a conversion would be necessary or desirable.

The natural resources required for construction include asphalt, sand, aggregate, cement, and iron ore for steel products. Once used for construction, these resources cannot be replaced as natural resources. These resources are not in short supply, and their use would not have an adverse effect upon the continued availability of these resources. Construction would also require an expenditure of fossil fuel. Although this is an irretrievable resource, the amount expended toward construction could be offset by the reduced fuel consumption of the vehicles using the facility and the benefits to improved mobility in the region. The commitment of these resources is based on the concept that residents in the immediate area, state, and region would benefit by the improved quality of the transportation system. These benefits would consist of improved accessibility and safety, savings in time, fuel savings, and greater availability of quality services that are anticipated to outweigh the commitment of these resources.

S.3.25 Mitigation

It is FHWA's policy that measures necessary to mitigate adverse impacts be incorporated into the proposed action. The Grand Parkway Segment G project has integrated and will continue to integrate mitigation sequencing. This ordered approach to mitigating impacts includes the following considerations for each potential impact:

- Avoiding the impact altogether by not taking a certain action or parts of an action;
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
- Compensating for the impact by replacing or providing substitute resources or environments.

The mitigation recommendations presented in the FEIS are appropriate for the Grand Parkway Segment G based on experience developing other transportation projects and on general recommendations made by various local, state, and federal agencies in response to preliminary discussions and correspondence concerning the proposed action.

A detailed review of all mitigation measures and commitments associated with the Preferred Alternative Alignment is provided in Volume II, Section 4.26, at the end of the Environmental Consequences section of the FEIS. Some key examples of mitigation measures that would be employed with the Preferred Alternative Alignment include: the consideration of further reduction in ROW width into final design; the incorporation of bridging; the use of construction BMPs to reduce erosion and pollution; the revegetation of native species; the construction of noise barriers; the preparation of and adherence to a SWPPP; and the preparation and adherence to a compensatory mitigation plan to address impacts to Waters of the U.S.

S.3.26 Indirect and Cumulative Effects

S.3.26.1 Indirect Effects

Potential indirect effects could include the following:

- Development and land use changes because of improved access;
- Runoff increases because of changes in land use and increased development on land surrounding the proposed facility;
- Increased sedimentation of wetlands and streams and decreased water quality because of future development of land adjacent to the new facility;
- Loss of wildlife habitat and decreased habitat value in areas of increased land development spurred by the proposed project;

- Impact to cultural resource sites from development projects on private property that do not require cultural resource investigation because public funds or permits are not required;
- Increased use of parks and recreational areas because of more convenient access provided by the new facility; and
- Stimulation of the local economy from the circulation of construction spending; improved access to employment opportunities, markets, goods, or services such as health and education; an increased work force related to construction; and development stemming from the new facility.

Potential indirect development would be similar for all alternative alignments of the Build Alternative. Where possible, the Study Team quantitatively determined the induced or indirect growth effect of the Build Alternative compared to the No-Build Alternative based on mapping developed by the Expert Panel. Unless otherwise noted, the anticipated growth and development under the No-Build Alternative would have similar indirect impacts to resources and issues as the Build Alternative.

S.3.26.2 Cumulative Effects (Segments E, F-1, F-2, and G)

The Study Team followed an 8-step approach to evaluate cumulative effects based on TxDOT's 2006 *Guidance on Preparing Indirect and Cumulative Impact Analyses*. Using this guidance, the Study Team established an Area of Influence (AOI) for Segments E, F-1, F-2, and G. The AOI is undergoing rapid population and employment growth that is anticipated to continue through the year 2025 and beyond under either the No-Build or Build Alternative. Local and regional government agencies continue to plan for this growth by adopting various land use and transportation plans such as the 2025 RTP. Segments E, F-1, F-2, and G, combined with other local/regional development efforts, would serve to accommodate growth and development, either present or planned. A number of regulatory mechanisms are in place to offset or minimize the adverse effects of social and economic growth, e.g., the Endangered Species Act, Section 404 permitting processes, and Clean Air Act (CAA) requirements. The objective of this Indirect and Cumulative Effects Analysis (CEA) is to evaluate land development and the corresponding environmental effects for two scenarios: the Build Alternative where Segments E, F-1, F-2, and G of the Grand Parkway are fully constructed and the No-Build Alternative where the Segments E, F-1, F-2, and G are not constructed.

Four major resources/issues were identified that warranted a detailed discussion and included: Land Use – including farmland from a land use classification; MSAT; Water Quality; and Wetlands and Vegetative Communities, including Wetlands, and the Katy Prairie.

Cumulative effects to land use, including wetlands were assessed for the No-Build and Build Alternatives and are summarized in Table S-3. The Katy Prairie cumulative effects difference between the No-Build and Build Alternatives was 2,829 acres. Cumulative effects to water quality under the No-Build and Build Alternatives would be similar as new residential subdivisions and associated infrastructure continue to develop within the AOI. New development would result in an increase in impervious cover and greater volumes of runoff during storm events. New

residential development would also result in new municipal discharges from sewage treatment and storm water runoff from new off system roadways.

TABLE S-3
POTENTIAL 2025 LAND USE BASED ON 2001 DRAFT NLCD DATA BY ALTERNATIVE

Description	2001 AOI		2025 No-Build AOI		2025 Build AOI		Difference Between Build and No-Build Scenarios
	Acres	% of the AOI	Acres	% of the AOI	Acres	% of the AOI	
Open Water	4,607	0.8%	2,750	0.5%	2,723	0.5%	-27
Developed	146,271	24.2%	429,752	71.1%	440,403	72.9%	10,651
Barren	5,740	1.0%	2,298	0.4%	2,258	0.4%	-40
Forested	150,025	24.8%	45,339	7.5%	40,979	6.8%	-4,360
Scrub/Shrub	33,528	5.5%	10,121	1.7%	8,548	1.4%	-1,573
Grasslands/Herbaceous	28,409	4.7%	9,113	1.5%	8,072	1.3%	-1,041
Herbaceous Planted/Cultivated	169,463	28.1%	61,646	10.2%	58,859	9.7%	-2,787
Wetlands	66,098	10.9%	43,121	7.1%	42,298	7.0%	-823
Total	**604,141**	**100%**	**604,141**	**100%**	**604,141**	**100%**	

Source: USGS/NOAA, 2001; Study Team, 2006; and Expert Panel, 2000

The cumulative effect from the MSAT analysis indicates a substantial decrease in MSAT emissions that can be expected for both the No-Build and Build Alternatives (2015 and 2025) versus the base year (2000). Emissions of total MSAT are expected to decrease by more than 81 percent in 2025 compared with 2000 levels because of newer technology vehicles, a change in vehicle fuels, both gasoline and diesel fuel, and a change in emission standards that both light-duty and heavy-duty on-highway motor vehicles must meet.

Of the six priority MSAT compounds, the cumulative effect from benzene and diesel particulate matter (DPM) contribute the most to the emissions total for Segments E, F-1, F-2, and G. In future years, a substantial decline in benzene is anticipated (more than a 72 percent reduction in benzene from 2000 to 2025, No-Build), and an even larger reduction in DPM emissions is expected (about a 93 percent decrease from 2000 to 2025, No-Build).

The Build Alternative may redirect the pattern of growth; development would progress along the proposed Grand Parkway instead of along radial roadways as in the No-Build Alternative. The difference in developed land in 2025 between any of the Build Alternatives and the No-Build Alternative is projected to be 2 percent (representing 11,373 acres). This relatively small difference, when compared to the 604,141-acre AOI, indicates that under either the No-Build or Build Alternative the conversion of undeveloped land would continue to occur. The expected annual growth rate of the No-Build (3.02 percent) and the Build (3.73 percent) imply that Segments E, F-1, F-2, and G would have a minor cumulative effect to the rapidly growing AOI.

S.4 AGENCY AND PUBLIC COORDINATION

The FHWA, TxDOT, and the GPA have engaged governmental agencies and the public in an extensive coordination effort to both inform others of progress in the planning process and solicit input from them. Details on meetings held with the public, with public officials and organizations, and with resource agencies are provided in the FEIS, Section 5 of this volume and Volume II, Section 6. The Grand Parkway project has been open to comments by any person, and all views on the scope of the proposed project, alternative actions, environmental impacts, and any other matter concerning the proposed Grand Parkway. The FHWA, TxDOT, and the GPA have considered all comments to date and will continue to consider all comments in its planning process into the future (see Volume IV, Section 2).

S.4.1 Public Involvement

The corridor and environmental impact studies have had an extensive public outreach program to inform the public about the proposed action. A Public Scoping Meeting was held in February 2000. Public Workshops were held in August 1999 and October 2000. Additionally, coordination occurred with several area community groups and homeowner associations during the study process. Through 2007, over 170 meetings have been held with homeowner associations, the media, and other community groups throughout the Segments E, F-1, F-2, and G study areas. The GPA also maintains a website (www.grandpky.com) to provide updates to the public on developments and issues concerning the Grand Parkway.

S.4.2 Local Official Involvement

Efforts have been made to keep local officials involved throughout the study process. Formal meetings with local officials were held in August 1999 and October 2000. Since 2000, continued coordination has been made to keep local officials and land use planning experts involved throughout the study process through verbal and written correspondence (see Table 4-19 of this volume or Volume II, Table 5-19 for the latest status of developments in the study area). In addition, as documented in Volume IV of the FEIS, local officials were sent individual notices of availability of the EIS documents and notices of the Public Hearing, and local officials submitted verbal and written comments on the DEIS.

S.4.3 Agency Coordination

As part of the project development process, federal, state, and local government agencies were consulted before and during the preparation of this document and all previous studies. Coordination included formal and informal meetings in the office and in the field held with FHWA, USACE, EPA, General Land Office (GLO), GPA, TCEQ, TPWD, TxDOT, and the EIS development team. Individual agency meetings have also been held with EPA and USACE throughout the study process to address specific issues related to their expertise. In addition, as documented in Volume IV of the FEIS, agencies are sent notices of availability of the EIS documents and notices of the Public Hearing, and agency representatives submitted verbal and written comments on the DEIS.

S.4.4 Expert Panel Meetings

To assist the Study Team in planning and development and further involve public and resource agencies, an Expert Panel was assembled early in the study process. In addition to the agency meetings, four Expert Panel meetings were held in 2000 and participants at one or more of the meetings included H-GAC, Houston Planning Commission, city of Houston, Cy-Fair Independent School District (ISD), Harris County Planning and Development, Harris County Engineering Department/Park Planning, Harris County Public Infrastructure Department, Woodlands Operating Company, American Metro Study, North Harris Montgomery Community College District, Harris County Precinct 3, Harris County Precinct 4, Harris County Flood Control District, TxDOT, and FHWA. Since 2000, members of the Study Team have continued to coordinate with members of the panel or the organizations they represent to regularly update information.

S.4.5 DEIS Public Hearing

The Segment G DEIS was released to the public on February 2, 2007, and a Public Hearing was held over two days on March 7, 2007 at Oak Ridge High School (27330 Oak Ridge School Road, Conroe 77385) and on March 8, 2007 at New Caney High School 9th Grade Campus (22784 US Highway 59 South, Porter 77365). The Public Hearing was held in order to present the findings of the DEIS using a variety of media and to receive oral and written comments on the document. The hearing consisted of an open house session, a formal presentation, and a public commenting session. On the first night, 98 people attended, including four elected officials; on the second night, 137 people attended including seven elected officials. Materials documenting the hearing are included in Volume IV, Section 1 of the FEIS.

The public comment period for the Grand Parkway Segment G DEIS was open from February 2 to April 27, 2007. Comments were submitted during the Public Hearing and throughout the comment period. In accord with the Council on Environmental Quality (CEQ) regulations (40 CFR 1503.4), substantive comments and responses to the comments are presented in Volume IV, Section 2 of the FEIS. Additionally, copies of all the comments in their entirety are included in Volume IV, Section 3.

Response to the Segment G DEIS included multiple comments on each of the following issues: the alternative of shifting the Grand Parkway to the north; the taking of houses, property values, and reimbursement for property acquisition; the use of mass transit; congestion on IH 45 and its feeder roads; ROW landscaping and reducing ROW width; support and critique of specific alternative alignments; school safety, noise impacts, visual impacts, and general impact to quality of life; and impacts from the Grand Parkway's being a toll road. See Volume IV for responses to these and other comments, including detail on how the FEIS incorporated some changes in response to some comments. Many commenters wrote or spoke to show general support for either the No-Build Alternative or the Build Alternative.

S.5 SUMMARY OF IMPACTS BY ALTERNATIVE ALIGNMENT AND REACH

Table S-4 provides a summary of impacts by the four alternative alignments analyzed in the DEIS, as well as by the Preferred Alternative Alignment. The alternative alignments are shown in Summary Exhibit 3. As described in Section S.2.4, the Recommended Alternative Alignment was shifted near the junction of Reaches 8 and 9 for the selection of the Preferred Alternative Alignment. Therefore, impacts associated with the Preferred Alternative Alignment are not equivalent to impacts associated with the Recommended Alternative Alignment, as presented in Table S-4.

TABLE S-4
SUMMARY OF IMPACTS BY ALTERNATIVE ALIGNMENT AND REACH FOR SEGMENT G

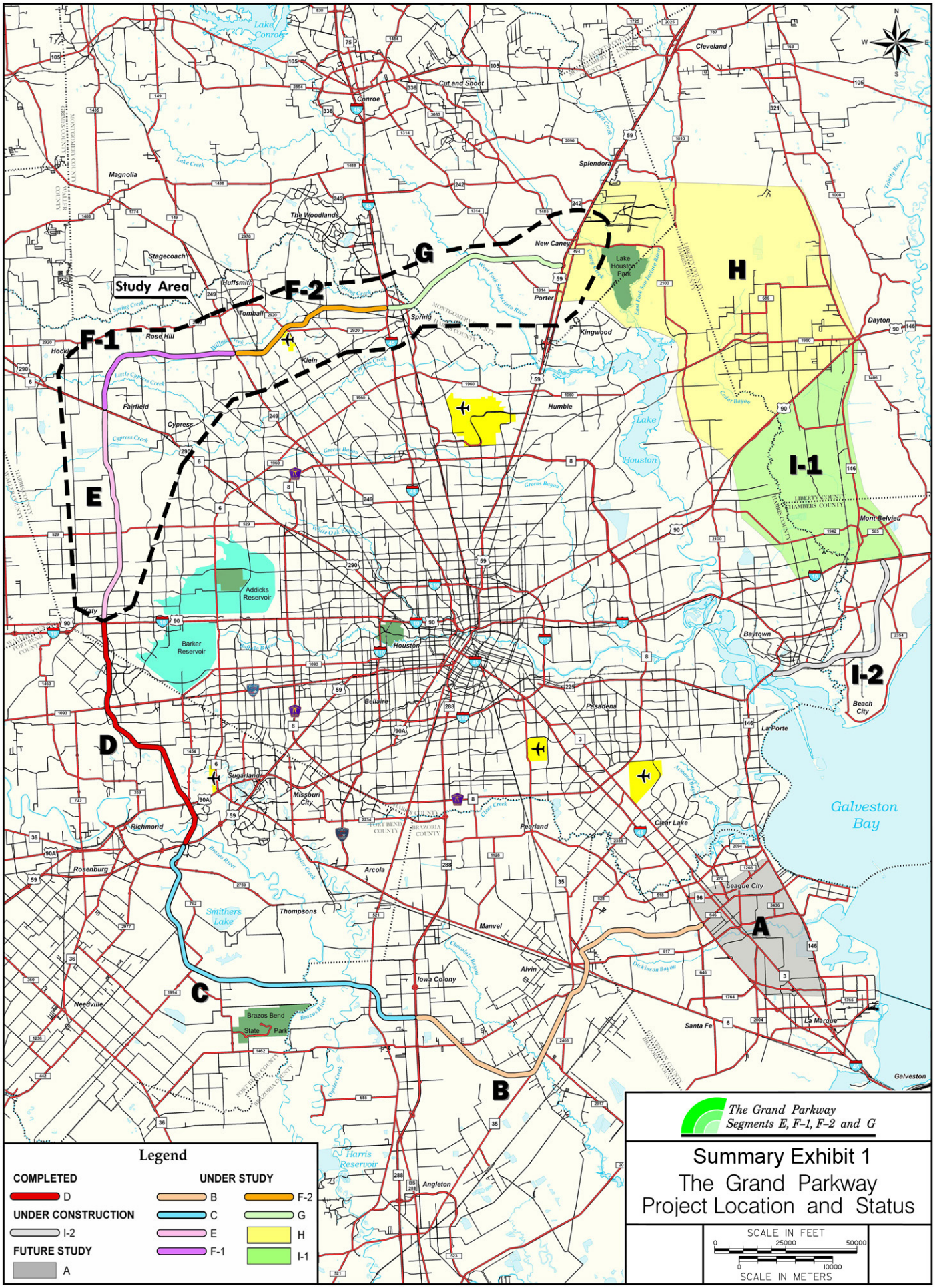
Alternative Alignment	Reach	Length (miles)	Land Use		Changes in Community Cohesion	Environmental Justice (EJ) Issues	Air Quality Impacts	Traffic Noise Impacts[1]	Residence Displacements	Commercial Displacements	School Properties [2]	Churches	Cemeteries	Parks	Natural Resources														Cultural Resources				Oil and Gas Wells	Potential Hazardous Material Sites	Water Wells	
															Special Resource Areas					Aquatic Resources				Flood Zones												
			Visual and Potential Access Impacts	Separation of Farmland from Homestead											Threatened & Endangered Species	Species of Concern	Remnant Prairie Topography (acres)	Bottomland Hardwoods (acres) [3]	Riparian Forest (acres)[3]	Adjacent Wetlands (acres)[4]	Isolated Wetlands (acres)[4]	Total Wetlands (acres)[4]	Stream Crossings [5]	100-Year Floodplain (acres)	Floodway (acres)[5]	Prime Farmlands (acres)	Statewide Important Farmland Soils	Recorded Archeology Sites	Historic Properties	Century Farm Sites	High Probability Area (acres) [6]			Public [7]	Private
A	8	4.92	Yes	No	Yes	No	No	137	18	-	-	-	-	-	-	-	-	23.9	-	13.9	2.3	16.2	5	31.8	35.2	59.9	22.0	-	-	-	211	1	1	10	1
	9	4.43	No	No	Yes	No	No	-	-	-	-	-	-	-	-	-	-	53.2	-	19.4	20.8	40.2	4	35.5	20.4	-	192.2	-	-	-	179	-	-	1	-
	10	0.39	Yes	No	Yes	No	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.3	-	-	-	3	-	-	2	-
	11	1.94	Yes	No	Yes	No	No	4	69	-	-	-	-	-	-	-	-	-	-	-	22.7	22.7	1	-	-	2.9	73.8	-	-	-	51	-	-	3	-
	12	2.02	Yes	No	Yes	No	No	-	22	-	-	-	-	-	-	-	-	32.3	-	2.7	2.2	4.9	4	27.8	8.8	1.3	16.3	-	-	-	94	-	-	-	-
Total		**13.70**	**-**	**-**	**-**	**-**	**-**	**141**	**109**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**109.4**	**0**	**36.0**	**48.0**	**84.0**	**14**	**95.1**	**64.4**	**64.1**	**315.6**	**0**	**0**	**0**	**538**	**1**	**1**	**16**	**1**
B	8	4.96	Yes	No	Yes	No	No	134	38	1	1	-	-	-	-	-	-	19.2	-	4.3	2.1	6.4	5	32.2	33.5	18.1	32.1	-	-	-	231	-	1	9	-
	9	4.27	No	No	Yes	No	No	-	-	-	-	-	-	-	-	-	-	43.6	-	23.2	7.2	30.4	3	13.7	49.4	4.6	139.4	-	-	-	170	-	-	1	-
	10	0.39	Yes	No	Yes	No	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.3	-	-	-	3	-	-	2	-
	11	2.09	Yes	No	Yes	No	No	67	64	-	-	-	-	-	-	-	-	-	-	-	5.0	5.0	-	-	-	-	11.1	-	-	-	45	-	-	-	-
	12	1.92	Yes	No	Yes	No	No	14	3	-	-	-	-	-	-	-	-	20.8	-	3.1	3.3	6.4	3	15.6	5.9	1.3	14.5	-	-	-	100	-	-	-	-
Total		**13.63**	**-**	**-**	**-**	**-**	**-**	**215**	**105**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**83.6**	**0**	**30.6**	**17.6**	**48.2**	**11**	**61.5**	**88.8**	**24.0**	**208.4**	**0**	**0**	**0**	**549**	**0**	**1**	**12**	**0**
C	8	4.92	Yes	No	Yes	No	No	137	18	-	-	-	-	-	-	-	-	23.9	-	13.9	2.3	16.2	5	31.8	35.2	59.9	22.0	-	-	-	211	1	1	10	1
	9	4.10	No	No	Yes	No	No	-	-	-	-	-	-	-	-	-	-	58.0	-	26.9	4.5	31.4	5	52.5	24.5	-	168.4	-	-	-	171	-	-	1	-
	10	0.39	Yes	No	Yes	No	No	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1.5	17.7	-	-	-	19	-	-	1	-
	11	2.19	Yes	No	Yes	No	No	-	169	-	-	-	-	-	-	-	-	-	-	-	10.3	10.3	1	-	-	16.2	46.4	-	-	-	56	-	-	3	-
	12	2.05	Yes	No	Yes	No	No	-	22	-	-	-	-	-	-	-	-	62.4	-	4.0	1.9	5.9	4	60.5	7.5	1.3	20.8	-	-	-	107	-	-	-	-
Total		**13.65**	**-**	**-**	**-**	**-**	**-**	**156**	**209**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**144.3**	**0**	**44.8**	**19.0**	**63.8**	**16**	**144.8**	**67.2**	**78.9**	**275.3**	**0**	**0**	**0**	**564**	**1**	**1**	**15**	**1**
D	8	4.92	Yes	No	Yes	No	No	137	18	-	-	-	-	-	-	-	-	23.9	-	13.9	2.3	16.2	5	31.8	35.2	59.9	22.0	-	-	-	211	1	1	10	1
	9	4.42	No	No	Yes	No	No	-	1	-	-	-	-	-	-	-	-	46.4	-	14.6	0.4	15.0	4	11.3	52.9	0.1	159.7	-	-	-	177	-	-	1	-
	10	0.39	Yes	No	Yes	No	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.3	-	-	-	3	-	-	2	-
	11	1.94	Yes	No	Yes	No	No	4	69	-	-	-	-	-	-	-	-	-	-	-	22.7	22.7	1	-	-	2.9	73.8	-	-	-	51	-	-	3	-
	12	2.05	Yes	No	Yes	No	No	-	22	-	-	-	-	-	-	-	-	62.4	-	4.0	1.9	5.9	4	60.5	7.5	1.3	20.8	-	-	-	107	-	-	-	-
Total		**13.72**	**-**	**-**	**-**	**-**	**-**	**141**	**110**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**132.7**	**0**	**32.5**	**27.3**	**59.8**	**14**	**103.6**	**95.6**	**64.2**	**287.6**	**0**	**0**	**0**	**549**	**1**	**1**	**16**	**1**
Recommended[8]	8	4.92	Yes	No	Yes	No	No	137	18	-	-	-	-	-	-	-	-	23.9	-	13.9	2.3	16.2	5	31.8	35.2	59.9	22.0	-	-	-	211	1	1	10	1
	9	4.42	No	No	Yes	No	No	-	1	-	-	-	-	-	-	-	-	46.4	-	14.6	0.4	15.0	4	11.3	52.9	0.1	159.7	-	-	-	177	-	-	1	-
	10	0.39	Yes	No	Yes	No	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.3	-	-	-	3	-	-	2	-
	11	1.94	Yes	No	Yes	No	No	4	69	-	-	-	-	-	-	-	-	-	-	-	22.7	22.7	1	-	-	2.9	73.8	-	-	-	51	-	-	3	-
	12	2.05	Yes	No	Yes	No	No	-	22	-	-	-	-	-	-	-	-	62.4	-	4.0	1.9	5.9	4	60.5	7.5	1.3	20.8	-	-	-	107	-	-	-	-
Total		**13.72**	**-**	**-**	**-**	**-**	**-**	**141**	**110**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**132.7**	**0**	**32.5**	**27.3**	**59.8**	**14**	**103.6**	**95.6**	**64.2**	**287.6**	**0**	**0**	**0**	**549**	**1**	**1**	**16**	**1**

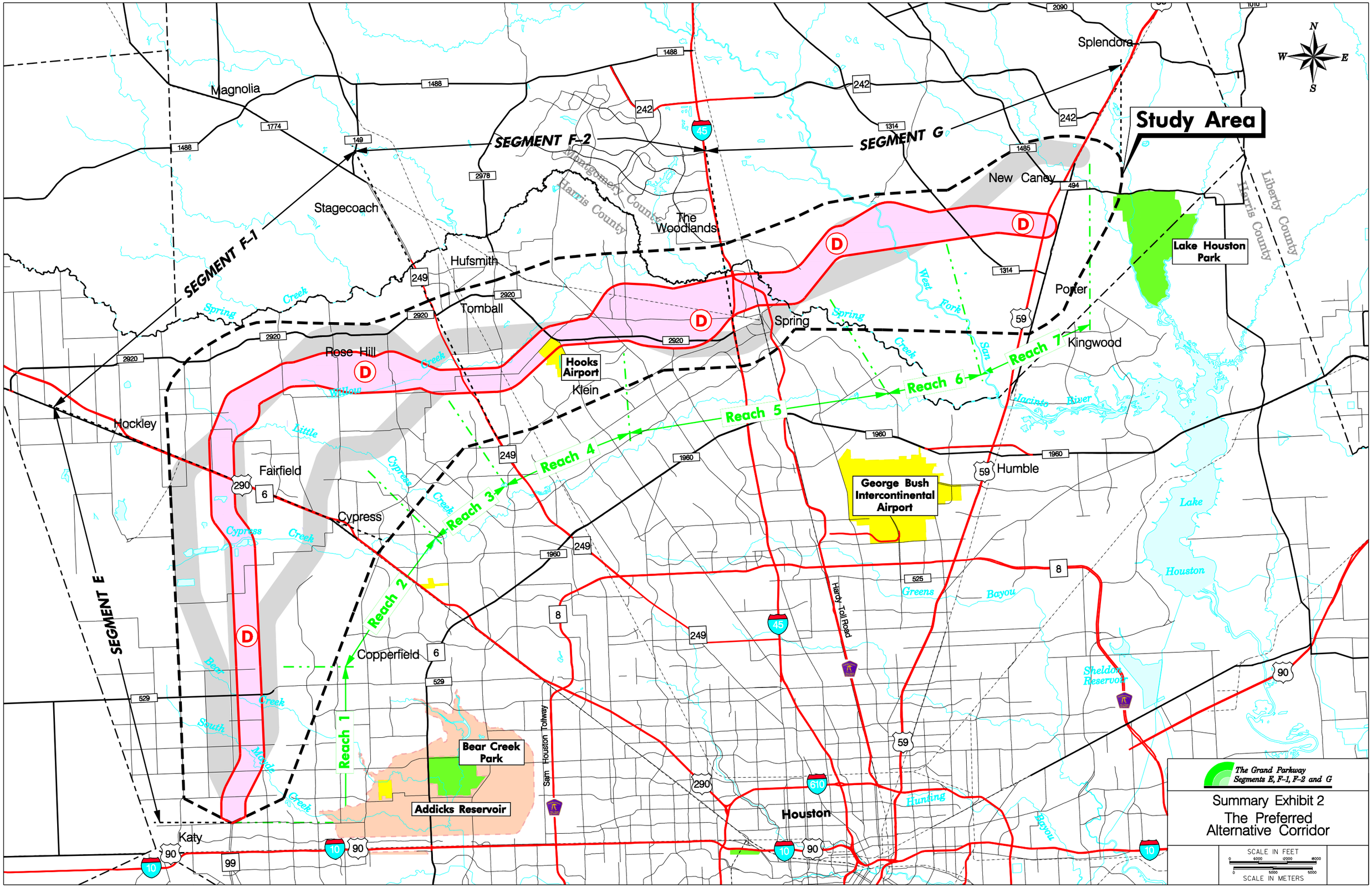
TABLE S-4 (CONT.)
SUMMARY OF IMPACTS BY ALTERNATIVE ALIGNMENT AND REACH FOR SEGMENT G

Alternative Alignment	Reach	Length (miles)	Land Use		Changes in Community Cohesion	Environmental Justice (EJ) Issues	Air Quality Impacts	Traffic Noise Impacts[1]	Residence Displacements	Commercial Displacements	School Properties[2]	Churches	Cemeteries	Parks	Natural Resources														Cultural Resources				Oil and Gas Wells	Potential Hazardous Material Sites	Water Wells	
															Special Resource Areas					Aquatic Resources				Flood Zones												
			Visual and Potential Access Impacts	Separation of Farmland from Homestead											Threatened & Endangered Species	Species of Concern	Remnant Prairie Topography (acres)	Bottomland Hardwoods (acres)[3]	Riparian Forest (acres)[3]	Adjacent Wetlands (acres)[4]	Isolated Wetlands (acres)[4]	Total Wetlands (acres)[4]	Stream Crossings[5]	100-Year Floodplain (acres)	Floodway (acres)[5]	Prime Farmlands (acres)	Statewide Important Farmland Soils	Recorded Archeology Sites	Historic Properties	Century Farm Sites	High Probability Area (acres)[6]			Public[7]	Private
Preferred	8	4.93	Yes	No	Yes	No	No	195	18	-	-	-	-	-	-	-	-	23.4	-	13.7	2.3	16.0	5	31.7	35.7	59.9	26.2	-	-	-	212	1	1	10	1
	9	4.43	No	No	Yes	No	No	26	1	-	-	-	-	-	-	-	-	44.0	-	19.4	0.5	19.9	4	10.7	52.2	0.1	158.6	-	-	-	177	-	-	1	-
	10	0.39	Yes	No	Yes	No	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.3	-	-	-	3	-	-	2	-
	11	1.94	Yes	No	Yes	No	No	43	69	-	-	-	-	-	-	-	-	-	-	-	22.7	22.7	1	-	-	2.9	73.8	-	-	-	51	-	-	3	-
	12	2.05	Yes	No	Yes	No	No	16	22	-	-	-	-	-	-	-	-	62.4	-	4.0	1.9	5.9	4	60.5	7.5	1.3	20.8	-	-	-	107	-	-	-	-
Total		**13.74**	**-**	**-**	**-**	**-**	**-**	**280**	**110**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**129.8**	**0**	**37.1**	**27.4**	**64.5**	**14**	**102.9**	**95.4**	**64.2**	**290.7**	**0**	**0**	**0**	**550**	**1**	**1**	**16**	**1**

Notes: Totals may not appear to equal sum of reaches because of rounding. [1] = Impacts account for traffic assuming construction of all four segments (E, F-1, F-2, and G) of the Grand Parkway (i.e., worst-case scenario with respect to noise impact). Preferred Alternative Alignment noise impacts are based on a revised analysis conducted for the FEIS; [2] = Impact in Alternative Alignment B is to undeveloped Spring ISD property; [3] = See definition of Bottomland Hardwoods and Riparian Forest in the Glossary; [4] = As with all land cover data, numbers for original alternative alignments reflect new land use calculations. Additionally, for the FEIS, a more detailed analysis of wetlands was conducted in the Preferred Alternative Alignment. See Volume II, Section 4.10 for further explanation; [5] = Includes stream crossings, lakes, and ponds; [6] = Total of Map Units 1, 2, 2a, 3, and 3a; [7] = Wellhead Capture Zones; [8] = Recommended Alternative Alignment is the same as that presented in the DEIS, however, impact calculations account for updated land use; "-" = No resource located within reach

Source: Study Team, 2007


Study Area
F-1
F-2
G
H
E
D
C
B
A
I-1
I-2
Legend
COMPLETED
D
UNDER CONSTRUCTION
I-2
FUTURE STUDY
A
UNDER STUDY
B
C
E
F-1
F-2
G
H
I-1
The Grand Parkway
Segments E, F-1, F-2 and G
Summary Exhibit 1
The Grand Parkway
Project Location and Status
SCALE IN FEET
0
25000
50000
0
10000
SCALE IN METERS
Galveston Bay
Houston
Conroe
Cut and Shoot
Cleveland
Splendora
Magnolia
The Woodlands
New Caney
Stagecoach
Huffsmith
Tomball
Spring
Porter
Kingwood
Rose Hill
Hockley
Klein
Humble
Fairfield
Cypress
Dayton
Mont Belvieu
Addicks Reservoir
Barker Reservoir
Baytown
Beach City
Bellaire
Pasadena
La Porte
Sugarland
Missouri City
Richmond
Pearland
Clear Lake
Rosenburg
Arcola
League City
Smithers Lake
Thompsons
Manvel
Alvin
Iowa Colony
Needville
Brazos Bend State Park
Santa Fe
La Marque
Galveston
Harris Reservoir
Angleton



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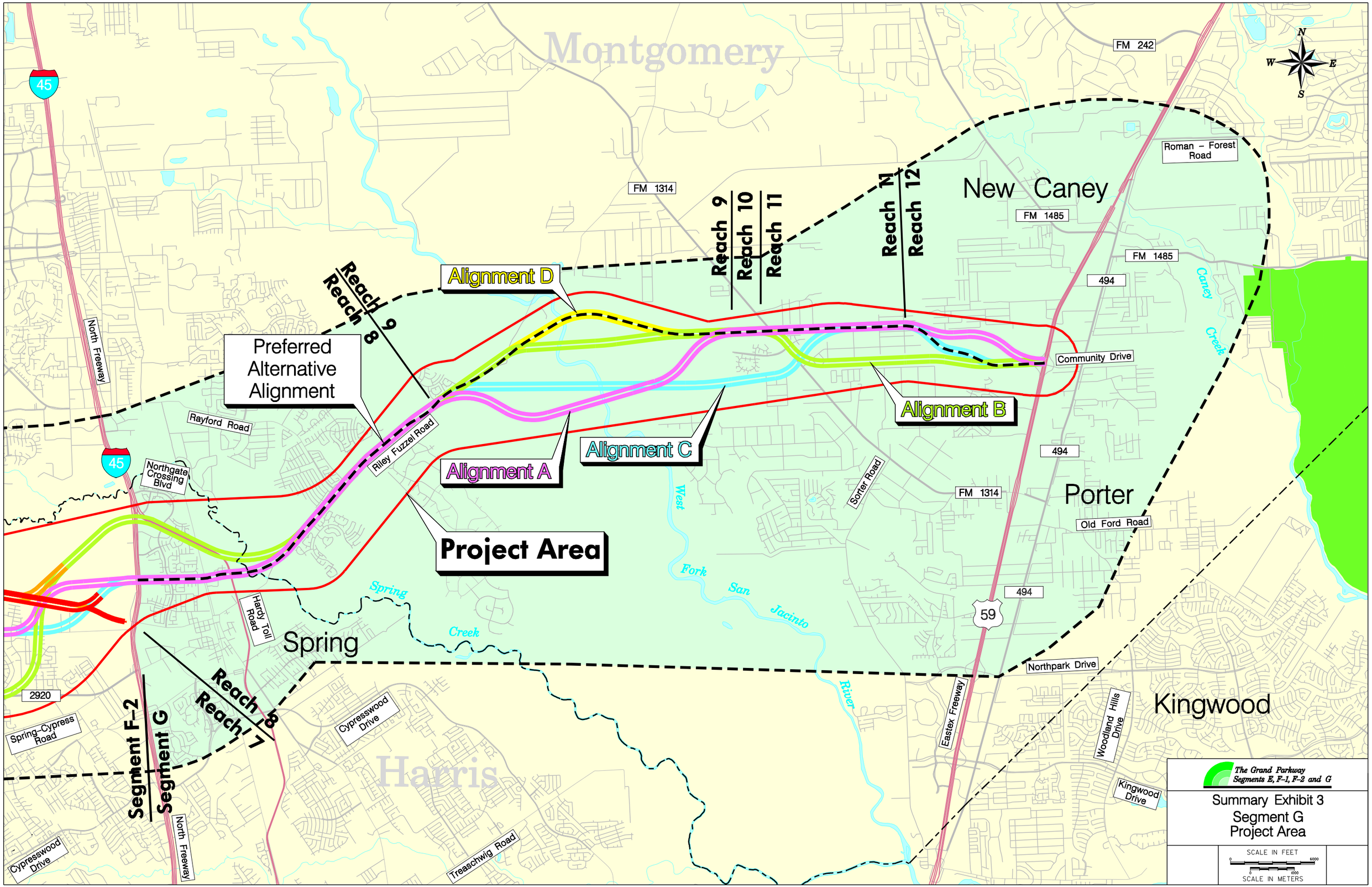

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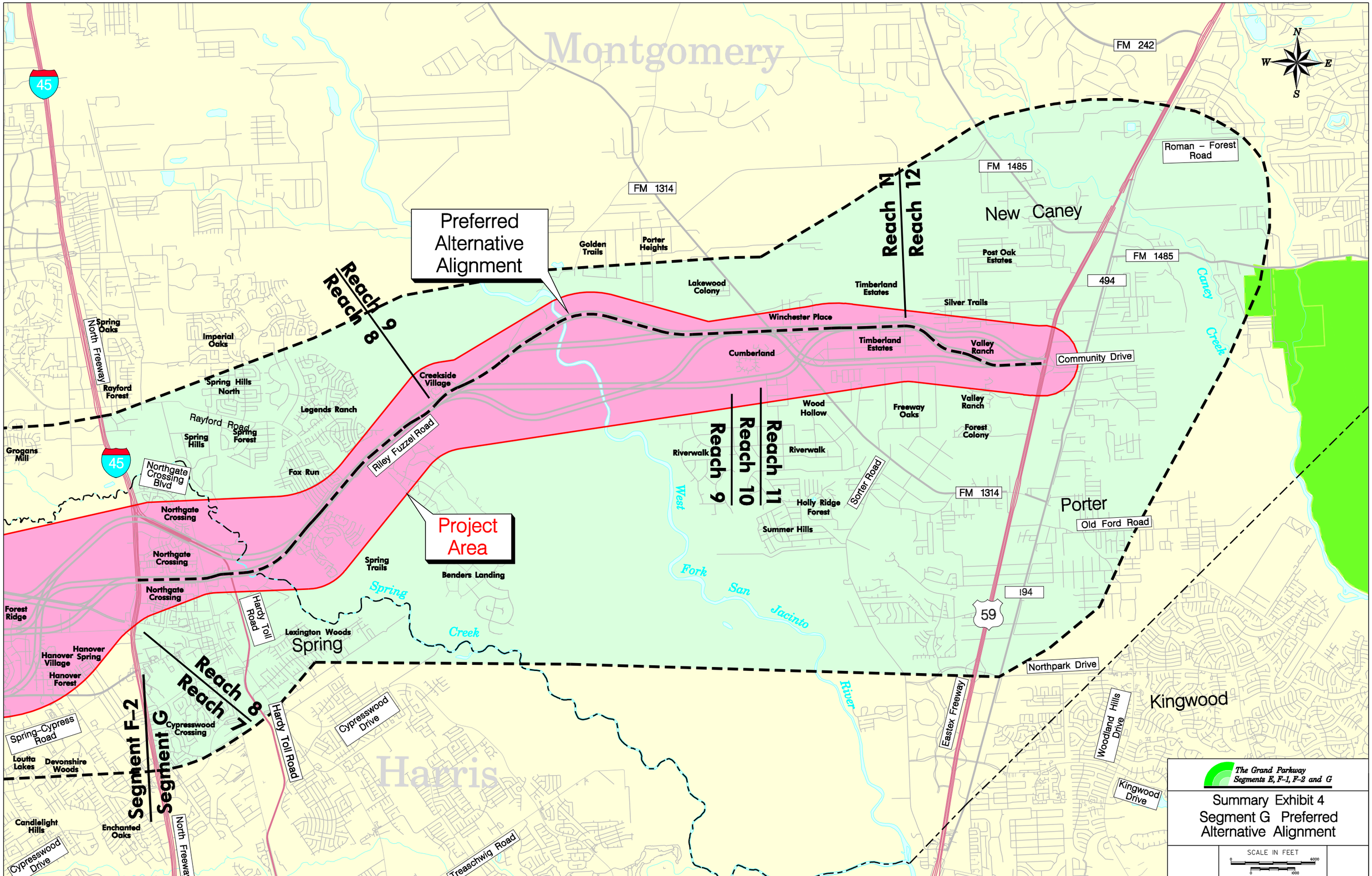


The Grand Parkway
Segments E, F-1, F-2 and G

Summary Exhibit 4
Segment G Preferred Alternative Alignment

SCALE IN FEET
0 6000
0 1000
SCALE IN METERS

M:\new_gpa\plot\eis\Seg_G\voll\sum_all_g_rec.dgn

LIST OF ACRONYMS

AADT ..... Annual Average Daily Traffic

ACM ..... Automatic Collection Machine

AVI .....Automatic Vehicle Identification

ADT ..... Average Daily Traffic

AOI ..... Area of Influence

APCA .....Air Pollution Control Act

APE ..... Area of Potential Effects

AST .....above ground storage tank

ASTM .....American Society for Testing and Materials

ATSDR..... Agency for Toxic Substances and Disease Registry

BFI ..... BFI Waste Systems, Inc.

BMPs .....Best Management Practices

BTD .....Brazos Transit District

Btu.....British thermal unit

CAA.....Clean Air Act

CAAA .....Clean Air Act Amendments

Caltrans.....California Department of Transportation

CAPA .....critical aquifer protection area

C-CAP.....Coastal Change Analysis Program

CEA.....Indirect and Cumulative Effects Analysis

CEQ .....Council on Environmental Quality

CERCLA .....Comprehensive Environmental Response, Compensation, and Liability Act

CERCLIS .....Comprehensive Environmental Response, Compensation, and Liability Information System

CESQG..... conditionally exempt small quantity generator

CFR ..... Code of Federal Regulations

CLOMR..... Conditional Letter of Map Revision

cm ..... centimeter

CMA..... Congestion Mitigation Analysis

CMAQ.....Congestion Management Air Quality Program

CMP..... Coastal Management Program

CMS.....Congestion Management System

CMSA ..... Consolidated Metropolitan Statistical Area

CO ..... carbon monoxide

CORRACT..... Corrective Action Database for Resource Conservation and Recovery Information System

CSJ.....control-section-job

CWA .....Clean Water Act

CZMA .....Coastal Zone Management Act

dB .....decibel

dBA..... A-weighted decibel level

dbh..... diameter at breast height

DEIS ..... Draft Environmental Impact Statement

DEOG .....diesel exhaust organic gases

DFIRM .....Digital Flood Insurance Rate Maps

DGPS ..... Digital Global Positioning Satellite

DOL ..... U.S. Department of Labor

DPM.....diesel particulate matter

EFH ..... Essential Fish Habitat

EIS ..... Environmental Impact Statement

EJ ..... Environmental Justice

EO .....Executive Order

EPA .....U.S. Environmental Protection Agency

ERNS .....Emergency Response Notification System

ESA ..... Endangered Species Act

ESL .....Effect Screening Level

ETJ.....Extra-Territorial Jurisdiction

FBCTRA.....Fort Bend County Toll Road Authority

FEIS .....Final Environmental Impact Statement

FEMA ..... Federal Emergency Management Agency

FHBM .....Flood Hazard Boundary Map

FHWA.....Federal Highway Administration

FIRM ..... Flood Insurance Rate Maps

FM ..... Farm-to-Market Road

FPPA..... Farmland Protection Policy Act

ft ..... feet / foot

FTA .....Federal Transit Administration

FY..... fiscal year

GIS ..... Geographic Information System

GLO..... General Land Office

g/mi ..... grams of pollutant per vehicle mile traveled

GPA..... Grand Parkway Association

GPS.....Global Positioning System

GWDB .....Ground Water Database

HAP ..... hazardous air pollutant

HAS .....Houston Airport System

HCFCD..... Harris County Flood Control District

HCTRA..... Harris County Toll Road Authority

HDDV..... Heavy-Duty Diesel Vehicle

H-GAC .....Houston-Galveston Area Council

HGCSD .....Harris-Galveston Coastal Subsidence District

HHS .....Department of Health and Human Services

HOA ..... Homeowner Association

Houston-PALM .....Houston District Potential Archaeological Liability Map

HOV .....high-occupancy vehicle

HPA ..... High Probability Area

IH ..... Interstate Highway

IRIS.....Integrated Risk Information System

ISD.....Independent School District

ISTEA .....Intermodal Surface Transportation Efficiency Act

IUCN/SCC ..... International Union for the Conservation of Nature and Natural Resources/ Species Survival Commission

KPC ..... Katy Prairie Conservancy

KCWMB .....Katy-Cypress Wetlands Mitigation Bank

LEP .....limited English proficiency

Leq..... equivalent sound level

LFUN ..... landfill unauthorized and unpermitted

LOM ..... Level of Mobility

LOS..... Level of Service

LQG .....large quantity generator

LUST.....Leaking Underground Storage Tank

MBTA.....Migratory Bird Treat Act

METRO.....Metropolitan Transit Authority

mg/l .....milligrams per liter

mi ..... mile(s)

MIS.....Major Investment Study

MOA.....Memorandum of Agreement

MOU..... Memorandum of Understanding

mph.....miles per hour

MPO.....metropolitan planning organization

MSAT.....Mobile Source Air Toxics

MSL..... mean sea level

MTFP ..... Major Thoroughfare and Freeway Plan

MUD.....Municipal Utility District

MVEB.....Motor Vehicle Emissions Budget

NAAQS ..... National Ambient Air Quality Standards

NAC .....Noise Abatement Criteria

NAFTA ..... North American Free Trade Agreement

NATA ..... National Air Toxics Assessment

NCHRP ..... National Cooperative Highway Research Program

NEPA .....National Environmental Policy Act

NFIP.....National Flood Insurance Program

NFRAP..... No Further Remedial Action Planned

NHA ..... North Houston Association

NHTSA.....National Highway Traffic Safety Administration

NIOSH.....National Institute for Occupational Safety and Health

NLCD .....National Land Cover Database

NLEV..... national low emission vehicle

NMFS.....National Marine Fisheries Service

NMHC .....non-methane hydrocarbon

NO_2 ..... nitrogen dioxide

NOAA..... National Oceanic and Atmospheric Administration

NOI .....Notice of Intent

NORM.....Naturally Occurring Radioactive Material

NO_x .....nitrogen oxides

NPL.....National Priority List

NPS ..... National Park Service

NRCS .....Natural Resource Conservation Service

NRDC .....Natural Resources Defense Council

NRHP .....National Register of Historic Places

NWI.....National Wetland Inventory

O_3..... ozone

OSHA .....Occupational Safety and Health Administration

Pb ..... lead

PEM..... Palustrine Emergent

PFO .....Palustrine Forested

PL .....Public Law

PM ..... particulate matter

PMSA .....Primary Metropolitan Statistical Area

POW .....Palustrine Open Water

ppm.....parts per million

PSL..... project specific locations

PSS .....Palustrine Scrub-Shrub

RAZ ..... Regional Analysis Zone

RCRA ..... Resource Conservation and Recovery Act

RCRA-G ..... Resource Conservation and Recovery Act – Generators and Violators

RCRA-TSD . Resource Conservation and Recovery Act – Treatment Storage and Disposal

RCRIS .....Resource Conservation and Recovery Information System

RCRIS-G ..... Resource Conservation and Recovery Information System - Generators

RFG ..... reformulated gasoline

RFP ..... Request for Proposal

RIA ..... Regulatory Impact Analysis

ROD ..... Record of Decision

ROW ..... right-of-way

RRC ..... Railroad Commission of Texas

RTP ..... Regional Transportation Plan

SAFETEA-LU .... The 2005 Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users

SAL ..... State Archaeological Landmark

SFHA ..... special flood hazard areas

SH ..... State Highway

SHPO ..... State Historic Preservation Officer

SIP ..... State Implementation Plan

SIU ..... Segment of Independent Utility

SJR ..... Senate Joint Resolution

SO_2 ..... sulfur dioxide

SOV ..... single-occupancy vehicle

SQG ..... small quantity generator

STIP ..... State Transportation Improvement Program

SWPA ..... Source Water Protection Area

SWPPP ..... Storm Water Pollution Prevention Plan

TAZ ..... Traffic Analysis Zones

TCEQ ..... Texas Commission on Environmental Quality (formerly Texas Natural Resource Conservation Commission)

TCMP ..... Texas Coastal Management Program

TDLR ..... Texas Department of Licensing and Regulation

TDM ..... Travel Demand Management

TDS ..... Total Dissolved Solids

TEA-21 ..... Transportation Equity Act for the 21st Century

THC ..... Texas Historical Commission

TIP ..... Transportation Improvement Program

TMA ..... Transportation Management Area

TMDL ..... Total Maximum Daily Load

TNM ..... Traffic Noise Model

TNRCC ..... Texas Natural Resource Conservation Commission (now known as Texas Commission on Environmental Quality)

TORI ..... Texas Outdoor Recreation Inventory

TOS ..... Texas Ornithological Society

TPC ..... Transportation Policy Council

TPDES ..... Texas Pollutant Discharge Elimination System

TPWD ..... Texas Parks and Wildlife Department

TRB ..... Transportation Research Board

TSARP ..... Tropical Storm Allison Recovery Project

TSD ..... Treatment, Storage, or Disposal

TSM ..... Transportation System Management

TSWQS ..... Texas Surface Water Quality Standards

TTC ..... Trans-Texas Corridor

TTI ..... Texas Transportation Institute

TWDB ..... Texas Water Development Board

TXAST ..... Texas Above Ground Storage Tank

TxDOT ..... Texas Department of Transportation

TxLED ..... Texas Low Emission Diesel

TXLF ..... Texas Landfill Database

TXLUST ..... Texas Leaking Underground Storage Tank

TXNDD..... Texas Natural Diversity Database

TXSPILL..... Texas Spills Incident Information System

TXSSF ..... Texas State Superfund List

TXUST ..... Texas Underground Storage Tank Database

TXVCP ..... Texas Voluntary Cleanup Program

ULI ..... Urban Land Institute

UNESCO..... United Nations Educational, Scientific, and Cultural Organization

UPRR..... Union Pacific Railroad

US ..... United States Highway

U.S. ..... United States

USACE..... U.S. Army Corps of Engineers

USCG..... U.S. Coast Guard

USDA ..... U.S. Department of Agriculture

USDOT .... United States Department of Transportation

USFWS ..... U.S. Fish and Wildlife Service

USGS..... U.S. Geological Survey

UST..... underground storage tank

UTP..... Uniform Transportation Program

v/c ..... volume to capacity

VFD..... Volunteer Fire Department

VHT..... Vehicle Hours Traveled

VMT ..... Vehicle Miles Traveled

VOC ..... volatile organic compound

WHA..... West Houston Association

GLOSSARY

Alternative: A general term that refers to possible approaches to meeting the need for and purpose of the project, including corridor, transportation mode, and alignment. It typically refers to the No-Build and the Build Alternatives.

Alternative Alignment: An alignment that refers to a proposed routing of the Build Alternative.

Ambient Air Quality: The state of quality of the air in the surrounding environment.

Aquatic Resources: For the purpose of this study, aquatic resources are defined as both adjacent and isolated wetlands.

Aquifer: A water-bearing geologic unit of permeable rock, sand, or gravel that yields considerable quantities of water to springs and wells.

Area of Influence (AOI): The geographic boundary within which possible indirect development and potential indirect impacts could occur.

At-Grade: Describes a roadway that will be relatively close to the existing ground elevation and not elevated on a bridge structure.

At-Grade Intersection: A point where two roadways meet and traffic is controlled by a traffic signal or stop sign.

Attainment: The status of the various pollutants described in the National Ambient Air Quality Standards (NAAQS). A condition where a pollutant meets NAAQS.

Average Daily Traffic: The average traffic volume in a 24-hour period on a particular roadway.

Benthic: A characteristic that describes the lowest level or sediments of a body of water or pertaining to bottom-dwelling organisms.

Biodiversity: The variety and abundance of species, their genetic composition, and the communities, ecosystems, and landscapes in which they occur.

Biotic: An attribute that pertains to life and living organisms.

Bottomland Forest: For the purpose of this study, bottomland forest is defined as deciduous, wetland forested areas dominated by mesic hardwood tree species that occur primarily within the 100-year floodplain. Bottomland forest is commonly found wherever streams or rivers (at least occasionally) cause flooding beyond their channel confines.

Build Alternative: The Build Alternative consists of a controlled access highway constructed on a new location within the project area. This is the preferred alternative transportation mode because it is the only alternative mode of travel found to fulfill the need for and purpose of the project.

Carbon Monoxide (CO): A colorless, odorless, poisonous gas that is formed as a product of the incomplete combustion of carbon and is emitted directly by automobiles and trucks.

Circumferential Roadway: A facility that is oriented in a circular manner such as a beltway.

Collector Roadways: These roadways provide service to any county seat, large towns, or other major traffic generators not served by the arterial system. They provide links to the higher classified routes and serve as important intra-county travel corridors. Examples of collector roadways are Fry Road, Grant Road, Farm-to-Market Road (FM) 2920, and Cypresswood Drive.

Community Cohesion: The connections between and within communities, which are essential for serving the needs of the residents.

Complex Encroachments: Continuous linear impacts that are mixtures of both longitudinal and transverse impacts.

Control-Section-Job (CSJ) Numbers: CSJ numbers are numbers assigned to all on-system public highways in Texas. The CSJ is a unique, nine-digit identification for a project.

Corridor: A corridor is a broad geographical band with no predefined size or scale that follows a general directional flow connecting major sources of trips. It involves a nominally linear transportation service area that may contain a number of streets, highways, and transit route alignments. For the Grand Parkway study, a corridor was defined as approximately 5,000 feet in width.

Cultural Resources: The patterned physical remains of human activity distributed over the landscape through time.

Cumulative Effect/Impact: An impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions.

Direct Impact: Direct effects are caused by the action and occur at the same time and place (40 CFR 1508.8).

Environmental Constraints/Sensitive Resources: Ecological, socio-economic, or cultural areas that may restrict or confine the placement of a project. Examples include areas of sensitive habitat, wetlands, cemeteries, or parks.

Environmental Justice: In accord with Executive Order 12898, the avoidance of actions that cause disproportionately high and adverse impacts on minority and low income populations with respect to human health and the environment.

Flood Hazard Zone: The area flooded during a 100-year storm.

Floodplain: The portion of a river or stream valley, adjacent to the channel, which is covered with water when the river or stream overflows its banks at flood stage. It is also defined as lowland and relatively flat areas adjoining inland and coastal waters, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year (the 100-year floodplain).

Floodway: The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

Grade Separated Intersection: A point where two highways or a highway and railroad meet, and the through traffic/train from each facility is separated by an overpass/underpass.

Grand Parkway Association (GPA): A nonprofit transportation organization acting on behalf of the Texas Department of Transportation (TxDOT) in the promotion and development of public transportation facilities and systems within the State of Texas to assist TxDOT in obtaining land and funding to meet the primary, legal, engineering and right-of-way (ROW) requirements of the Grand Parkway.

Groundwater: Subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated.

Habitat Evaluation Procedure: A method created by the U.S. Fish and Wildlife Service (USFWS) to evaluate the quantity and quality of habitat for selected wildlife species.

Higher Class Roads: Facilities that are mostly free-flowing with controlled or limited access and higher speeds. Examples are Interstate Highways/Freeways and Principal Arterials.

Historic Archeological Site: Any subsurface cultural manifestation dated post-European contact.

Houston-Galveston Area Council (H-GAC): The Houston-Galveston Area Council is the region-wide voluntary association of 133 local governments and local elected officials in the 13-county Gulf Coast Planning Region of Texas. The Gulf Coast Planning Region consists of Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Harris, Liberty, Matagorda, Montgomery, Walker, Waller, and Wharton Counties. Its service area is 12,500 square miles and contains almost 5.4 million people. Organized in 1966, H-GAC provides a forum for the discussion of area-wide concerns, promoting regional cooperation through comprehensive planning and services to local governments.

Impact/Effect: In environment analyses, the words "impact" or "effect" are used to express the extent or severity of an environmental problem, e.g., the number of persons displaced by a new transportation facility. As indicated in the Council on Environmental Quality (CEQ) Section 1508.8, impacts and effects are considered to be synonymous. Impacts or effects may be ecological, aesthetic, historic, cultural, economic, social, or health related, and they may be direct, indirect, or cumulative.

Indirect Effect/Impact: An impact that is caused by an action and is later in time or farther in distance but is still reasonably foreseeable.

Interstate Highways (IH)/Freeways: These are divided highways with two or more lanes designated for the exclusive use of traffic in each direction. These roadways are intended to provide uninterrupted flow. There are no signalized or stop-controlled at-grade intersections. Direct access from adjacent properties is not permitted. Access is limited to ramp locations and opposing directions are separated by a raised barrier, a

median, or a raised traffic island. Examples of Interstate Highways are IH 10, IH 45, and IH 610. The term "freeway" in this document is consistent with terminology in the Transportation Research Board's (TRB) Highway Capacity Manual (2000). Any divided arterial with complete access control and unimpeded traffic flow is designated a freeway, *whether it is tolled or not*.

Level of Mobility (LOM): A concept introduced by the Houston-Galveston Area Council (H-GAC) that is based on a ratio of traffic volume to roadway capacity, which takes into account traffic demand, speed, roadway type, and number of lanes. A Level of Mobility of 0 – 0.85 represents a tolerable condition, 0.86 – 1.00 represents a moderate condition, 1.01 – 1.24 a serious condition, and 1.25 and higher represents a severe condition.

Level of Service (LOS): Operating conditions within a stream of traffic describing safety, traffic interruptions, speed, freedom to maneuver, comfort, and convenience. Six levels of service are defined, designated A through F, with A representing the best conditions and F the worst.

Logical Termini: The Federal Highway Association (FHWA) memorandum *Guidance on the Development of Logical Project Termini* (FHWA, 1993) defines termini as: (1) rational end points for a transportation improvement, and (2) rational end points for a review of environmental impacts.

Low-Income Population: A population whose household income is below the Department of Health and Human Services (HHS) poverty guidelines.

Lower Class Roads: Facilities with multiple at-grade intersections, minimal access management, and lower speeds. Examples are minor arterials and collector roadways.

Major Facilities: Roadways that carry a large number of vehicles, possibly serving more regional traffic.

Metropolitan Planning Organization (MPO): The MPO is a federally designated, regional agency that works with state and local governments, the private sector, and the region's citizens to plan coordinated transportation systems designed to move goods and people affordably, efficiently, and safely.

Major products produced by the MPO include a long-range Regional Transportation Plan (RTP), a shorter-term Transportation Improvement Program (TIP), a Congestion Management System (CMS), and a Unified Planning Work Program (UPWP).

Minor Arterials: These roadways interconnect and supplement the principal arterial system with a greater emphasis on land access and a lower level of traffic mobility. They provide intra-community service and connect rural collector roadways to the urban highway system. An example of a minor arterial is State Highway (SH) 242.

Mobile Source Air Toxics (MSAT): A category of substances in the air that are known or suspected of causing cancer or other health problems in humans, and for which an NAAQS (National Ambient Air Quality Standard) does not exist (i.e., excluding ozone, carbon monoxide, particulate matter, sulfur dioxide, nitrogen oxide).

Modal Transportation Improvements: Modal transportation improvements include bus transit, high-occupancy vehicle (HOV) lanes, rail, bicycle, and pedestrian.

National Register: The National Register of Historic Places (NRHP), as maintained by the United States Department of the Interior, pursuant to 16 USC § 470a.

NEPA Document: Any document or report prepared by or on behalf of a federal agency pursuant to the National Environmental Policy Act (NEPA) for a project, including, but not necessarily limited to, any Environmental Assessment (EA), Finding of No Significant Impact (FONSI), Draft Environmental Impact Statement (DEIS), Final EIS (FEIS), or Record of Decision (ROD), but not including any pre-decisional, deliberative, or privileged materials.

Nitrogen Oxide (NOx): Colorless, sweet-tasting gas emitted directly by automobiles and trucks.

No-Build Alternative: (Does not include the construction of the proposed Grand Parkway.) This represents a continuation of the existing transportation facilities, which incorporates the execution of planned and/or committed roadway improvements, Transportation System Management (TSM), Transportation Demand Management (TDM) and modal transportation improvements, new planned roadway construction, and Smart Streets.

Non-Attainment: An area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for criteria pollutants.

Notice of Intent (NOI): An NOI is published in the Federal Register to notify the public that an agency is preparing an EIS.

Ozone: Unstable blue gas with a pungent odor formed principally in indirect reactions involving volatile organic compounds, nitrogen oxides and sunlight.

Palustrine Emergent Wetland: Wetlands that are characterized by erect, herbaceous vegetation present for most of the growing season (i.e., marshes, wet meadows, fens, sloughs, or potholes).

Palustrine Forested Wetland: Wetlands that are characterized by woody vegetation greater than 20 feet (6 meters) in height (i.e. swamps of bottomlands).

Palustrine Scrub-Shrub Wetland: Wetlands that are characterized by woody vegetation less than 20 feet (6 meters) in height (i.e., shrub swamps, or wet thickets).

Physiographic Province: A region that is generally consistent in geologic structure and climate and which has had a unified geomorphic history.

Preferred Alternative Alignment: The alignment alternative that the proponent (FHWA/TxDOT/GPA) believes would fulfill its statutory mission and responsibilities and is consistent with the need for and purpose of the project, while giving consideration to economic, environmental, technical, and other factors, including public and agency comments received in response to the DEIS. This alignment may or may not be the same as the Recommended Alternative Alignment identified in the DEIS.

Preferred Alternative Corridor: The corridor alternative that the proponent (FHWA/TxDOT/GPA) believes would fulfill its statutory mission and responsibilities and is consistent with the need for and purpose of the project, while giving consideration to economic, environmental, technical, and other factors.

Prehistoric Archeological Site: Any cultural manifestation predating European contact.

Principal Arterials: These roadways provide an integrated network of roads that connect principal metropolitan areas and serve virtually all urban areas with a population greater than 25,000. They serve long distance travel demands such as statewide and interstate travel. Principal arterials can be grouped into two separate categories:

(1) Freeway Principal Arterial: These principal arterials have complete access control. Much like an interstate facility, they are designed to have an unimpeded traffic flow. Examples include United States Highway (US) 290, US 59, the Hardy Toll Road, Beltway 8, and SH 249. The proposed Grand Parkway is an example of a freeway principal arterial.

(2) Non-Freeway Principal Arterial: These principal arterials do not exhibit access control. At-grade intersections and impeded traffic flow is common. SH 6 and FM 1960 can be classified as non-freeway principal arterials.

Project: The whole of an action that has a potential for resulting in a physical change in the environment, directly or ultimately, and that is any of the following:

(1) An activity directly undertaken by any public agency, including but not limited to public works construction and related activities, clearing or grading of land, improvements to existing public structures, enactment and amendment of zoning ordinances, and the adoption and amendment of local General Plans or elements thereof pursuant to Government Code Sections 65100-65700.

(2) An activity undertaken by a person, which is supported in whole or in part through public agency contracts, grants, subsidies, loans, or other forms of assistance from one or more public agencies.

(3) An activity involving the issuance to a person of a lease, permit, license, certificate, or other entitlement for use by one or more public agencies.

Project Area: The area bound by the selected Preferred Alternative Corridor within which alternative alignments have been located.

Radial Roadway: These are roadway facilities that radiate outward from the core of the metropolitan area like spokes on a wheel. The radial facilities typically become less dense in outer suburbs. Examples of radial roadways include IH 10, US 290, SH 249, IH 45, and US 59.

Reach: The segments of corridors or alignments where two or three of the corridors or alignments overlap due to the density of environmental constraints in those areas. A reach is used to examine hybrid combinations of the corridors or alignments.

Recommended Alternative Alignment: The alignment alternative that is the recommended routing of the Build Alternative at the time of the publication of the DEIS. The selection of this alignment is based on public and agency outreach results and an analysis and comparison of the potential effects on the physical, biological, and human environment of each alternative alignment. The purpose of identifying a Recommended Alternative Alignment in the DEIS is to inform the public which direction the Study Team is leaning.

Regulatory Floodway: The portion of the 100-year floodplain within which the majority of the flood waters are carried and where flooding hazards are the highest.

Riparian: A trait pertaining to anything connected with or immediately adjacent to the banks of a stream.

Section 106: Section 106 of the National Historic Preservation Act of 1966, 16 USC § 470f pertains to the protection and preservation of historic resources.

Section 4(f): Section 4(f) of the Department of Transportation Act of 1966, 49 USC § 303(c) pertains to the protection of a Section 4(f) resource.

Section 4(f) Document: Any finding, evaluation, report, or other document prepared by or on behalf of FHWA or TXDOT pursuant to Section 4(f) with respect to a project, including, but not necessarily limited to, any finding of no constructive use and any approval of the use of a Section 4(f) resource, but not including any predecisional, deliberative, or privileged materials.

Section 4(f) Resource: Any park, recreation area, wildlife or waterfowl refuge or historic site that is protected under Section 4(f).

Segment of Independent Utility (SIU): Segments of Independent Utility (SIUs) must meet the requirements of 23 CFR 771.111(f), as follows, "In order to ensure meaningful evaluation of alternatives and to avoid commitments to transportation improvements before they are fully evaluated, the action evaluated in each EIS...shall: (1) Connect logical termini and be of sufficient length to address environmental matters on a broad scope; (2) Have independent utility or independent significance, i.e., be usable and be a reasonable expenditure even if no additional transportation improvements in the area are made; and (3) Not restrict consideration of alternatives for other reasonably foreseeable transportation improvements."

Smart Streets/Express Streets: Smart Streets are defined in the 2025 and 2035 Regional Transportation Plans (RTP) as improvements that include traffic signal synchronization, deployment of roundabouts, medians, turn bays, consolidation of duplicate driveways, and as appropriate partial grade separation of some traffic lanes at major intersections as an additional tool to increase mobility, improve transit access, and safety by providing operational improvements along strategic regional thoroughfares. Smart Street improvements are scheduled for the year 2023 and would take place along collector roadways. Examples of future Smart Streets include Fry Road, Cypress Rosehill Road, FM 1960, and FM 2920.

Special Interest Organizations: Those groups that have the potential to be specially benefited or harmed by the proposed project.

Study Area: The large area within which corridor selection took place for the development of alternatives to address the need for and purpose of the project.

Study Team: The consultant team consisting of Michael Baker Jr., Inc. (Prime), PBS&J, Brown and Gay Engineers, Inc., and Community Awareness Services, Inc.

System Linkage: The connection of major facilities within a highway system.

Traffic Analysis Zone (TAZ): A traffic analysis zone is the unit of geography most commonly used in conventional transportation planning models. The size of a zone varies, but for typical metropolitan planning software, a zone of under 3,000 people is common. The spatial extent of zones typically varies in models, ranging from very large areas in the exurbs to as small as city blocks or buildings in central business districts.

Traffic Study Area: An area used in analyses of traffic conditions that includes all major roadways potentially affected by the proposed new transportation facility.

Transportation Demand Management (TDM) Alternatives: Behavioral changes to commuters' travel habits that result in fewer vehicles during peak hours. Examples would be carpooling/vanpooling, employee trip reduction programs, compressed work weeks, telecommuting, flex-time, and employer incentives.

Transportation System Management (TSM) Alternatives: Management to make the existing transportation system as efficient as possible. Examples would be park-and-ride lots, ridesharing, HOV facilities, traffic signal coordination, and intersection improvements.

Travel Demand: The number of users desiring to travel the highway system based on the available roadway network.

TxDOT Houston District Potential Archeological Liability Map (Houston-PALM): A geoarcheological model designed as a decision-support tool for use by TxDOT in the compliance process. It allows a priori assessment of geoarcheological potential and the potential impact on archeological resources by transportation activities without requiring a field visit.

Upland Habitat: Land that has sufficient dry conditions for hydrophytic vegetation, hydric soils, and /or wetland hydrology to be lacking. Any area that is not a wetland, deepwater aquatic habitat, or other special aquatic site is considered upland habitat.

Vehicle Hours Traveled (VHT): The time (in hours) that users spend on the roadway system during a specific time period.

Viewshed: All land seen from one static point.

Watershed: A specific geographic area drained by a major stream or river.

Wetland (Adjacent): Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated conditions. Adjacent wetlands also lie within the 100-year floodplain and/or have a hydrologic connection to navigable waters.

Wetland (Isolated): Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated conditions. Isolated wetlands do not lie within the 100-year floodplain nor do they have a hydrologic connection to navigable waters.

NOTE: For further reference, please consult the TxDOT website at: http://onlinemanuals.txdot.gov/txdotmanuals/glo/index.htm.

VOLUME I

SEGMENT E
From IH 10 to US 290
Harris County, Texas

SEGMENT F-1
From US 290 to SH 249
Harris County, Texas

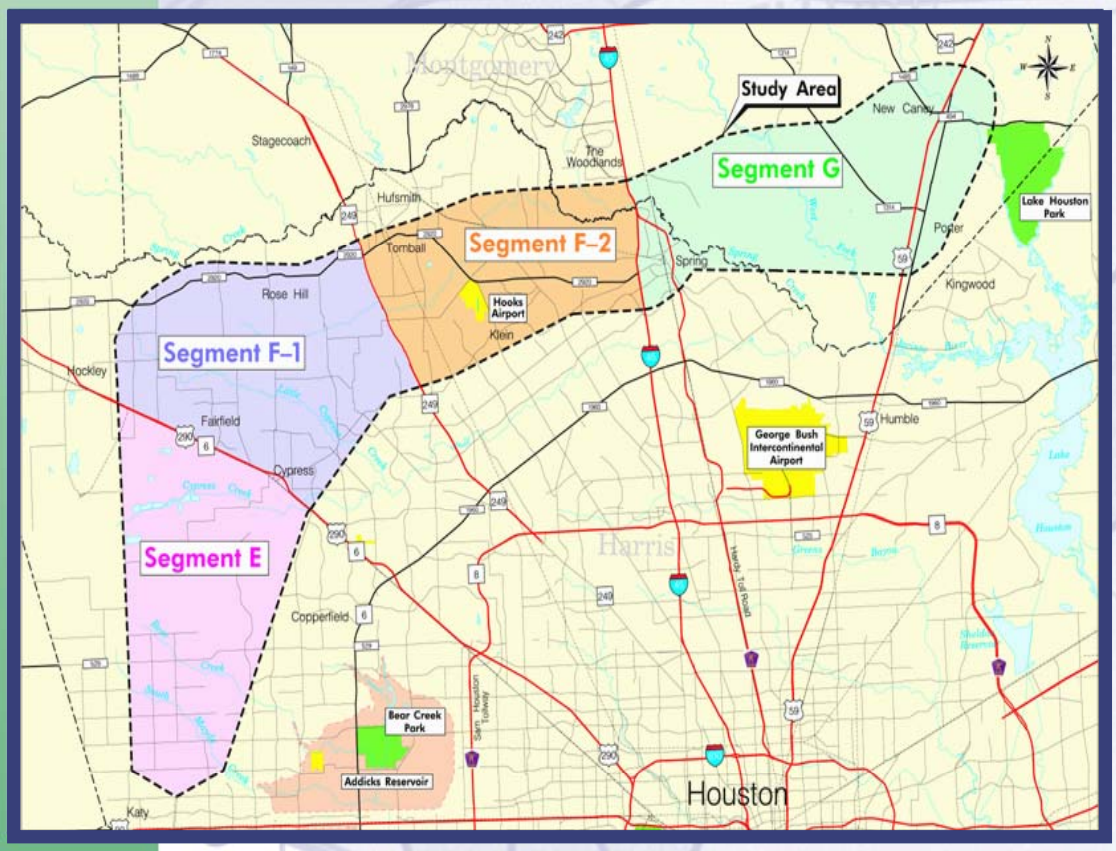
SEGMENT F-2
From SH 249 to IH 45
Harris County, Texas

SEGMENT G
From IH 45 to US 59
Harris County, Texas
Montgomery County, Texas

Final Environmental Impact Statement

Grand Parkway State Highway 99

Segments E, F-1, F-2, & G



FHWA-TX-EIS-03-03-F

U.S. Department of Transportation
Federal Highway Administration

Texas Department of Transportation

U.S. Army Corps of Engineers
Cooperating Agency

January 2009

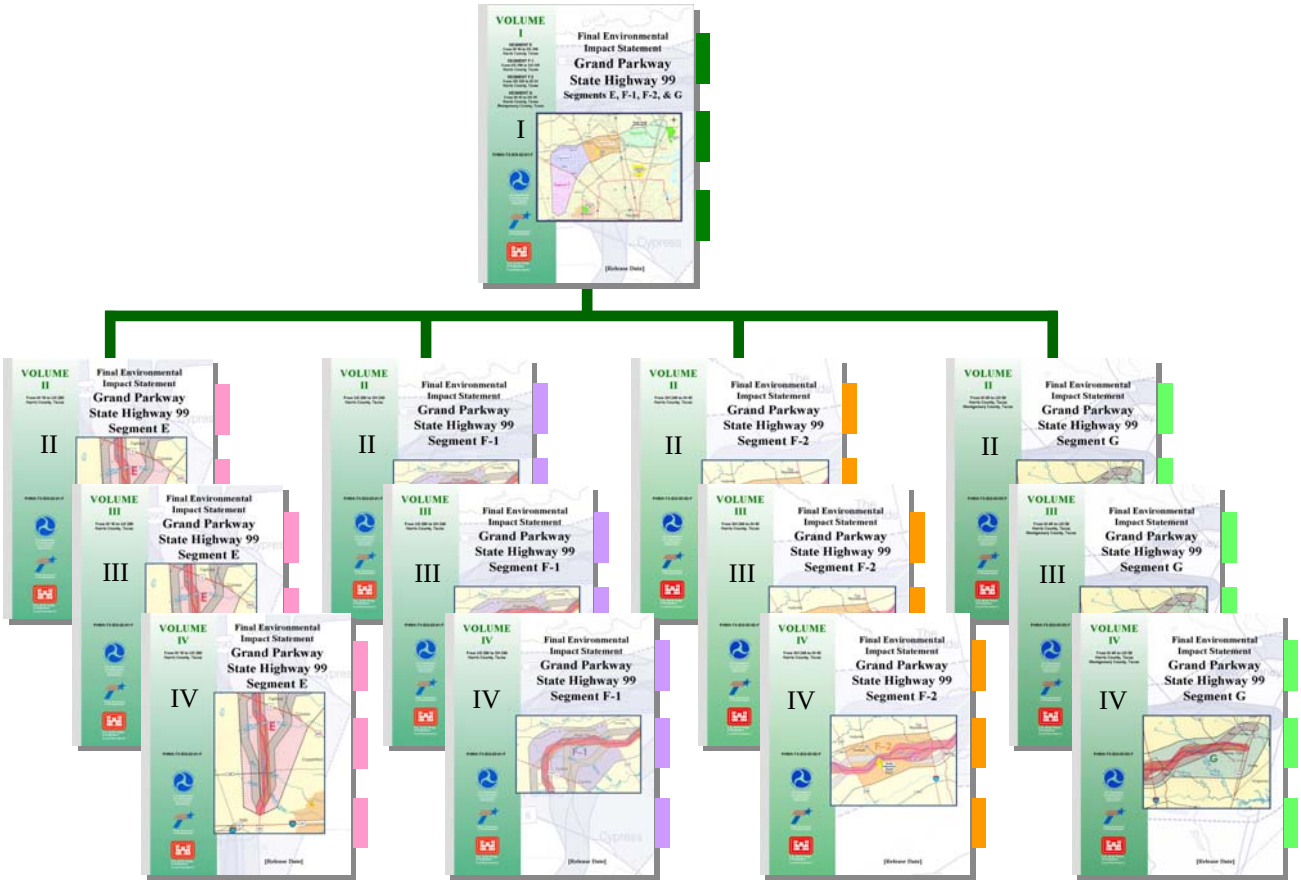
Document Organization

The Grand Parkway Segments E, F-1, F-2, and G study area is divided into four Segments of Independent Utility (SIUs) to facilitate planning, design, and construction because limited state and federal funding provides no assurance that all the Grand Parkway segments would be constructed. Each SIU would connect at least two existing major transportation corridors to ensure independent utility as well as independent significance as required by the U.S. Department of Transportation (USDOT), Federal Highway Administration (FHWA) regulations (23 Code of Federal Regulations [CFR] 771.111[f]).

The Final Environmental Impact Statement (FEIS) is organized in a four-volume set in response to public and resource agency comments concerning potential cumulative effects of all four segments and the need to assess all four segments as facilities with independent utility and logical termini, as follows:

- Volume I presents analyses and results common to Segments E, F-1, F-2, and G, including project description, the need for and purpose of the project, alternatives considered, affected environment, indirect and cumulative effects, and agency and public coordination.
- Volume II provides a detailed assessment of Segment G relative to its specific project area. It includes issues, permits, and federal actions particular to Segment G, such as the need for and purpose of the project; alternatives considered; affected environment; environmental consequences; avoidance, minimization, and mitigation measures; indirect and cumulative effects; and agency and public coordination.
- Volume III contains exhibits and appendices referenced in Volumes I and II.
- Volume IV includes materials related to the Segment G Draft Environmental Impact Statement (DEIS) Public Hearing, comments submitted, and responses to the DEIS comments provided following the release of the Segment G DEIS in January 2007.

The volume covers and section tabs are color coded (Volume I [Green, common to Segments E, F-1, F-2, and G] and Volume II/III/IV, Segment E [Pink], Segment F-1 [Purple], Segment F-2 [Orange], and Segment G [Light Green]) to help the reader navigate through the document. The following illustrates how the four FEISs are structured:



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INTRODUCTION

PROJECT DESCRIPTION

The proposed State Highway (SH) 99 (Grand Parkway) is planned as a 170-mile circumferential facility (a roadway loop such as Beltway 8) around the Houston metropolitan area. The Grand Parkway would be a new location facility built to accommodate a 70 miles per hour (mph) design speed. The main lanes would be posted at 65 mph, and the frontage roads would be posted at 40 to 45 mph. The proposed project would be a four-lane controlled access toll road with intermittent frontage roads located within a 400-foot right-of-way (ROW). The 400-foot ROW can accommodate one of the following typical roadway sections: four-lane section without frontage roads, four-lane section with frontage roads, four-lane section with exit and entrance ramps, and four-lane section with toll facilities and exit and entrance ramps. The entire proposed facility traverses Harris, Montgomery, Liberty, Chambers, Galveston, Brazoria, and Fort Bend Counties, provides access to radial highways (such as United States Highway [US] 290 or Interstate Highway [IH] 45), and would serve as a third loop around the Houston metropolitan area (see Exhibit G–1).

PROJECT HISTORY

The Grand Parkway was first proposed in 1961 by Harris County and the city of Houston Planning Commission following traffic studies that identified regional transportation deficiencies. The Grand Parkway corridor was placed on city maps in 1968, but funds were not available to advance the project. With the development of the Houston metropolitan area, the Katy area, and other residential and corporate facilities in West Houston, the need for additional transportation facilities increased. County officials and landowners mapped a proposed corridor for the Grand Parkway and submitted the plan to the Texas Transportation Commission.

In 1984, the Texas Legislature authorized the creation and organization of a nonprofit transportation corporation to act on behalf of the Texas Department of Transportation (TxDOT) in the development of public transportation facilities and systems within the state. The Grand Parkway Association (GPA), the first of these corporations created, was charged with assisting the Texas Transportation Commission in obtaining land and funding to meet the planning, legal, engineering, and ROW requirements of the Grand Parkway. Since its inception, the GPA has worked directly with landowners, local and state governmental agencies, elected officials, and the public to complete the Grand Parkway.

In August 1993, TxDOT and Federal Highway Administration (FHWA) filed a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) for Segment E. (An NOI is published in the *Federal Register* to notify the public that an agency is preparing an EIS.) In January 2000, an NOI was published for Segments F-1, F-2, and G. Formal public scoping meetings were held in September 1993 and February 2000 for Segment E and Segments F-1, F-2, and G, respectively (see Section 5 [Agency and Public Coordination] of this volume for a detailed discussion of agency and public involvement; Volume II, Section 6 includes agency and public involvement specific to Segment G).

The April 2003 Texas Transportation Commission Minute Order 109226 states, "The completion of the Grand Parkway is essential and urgent, as construction of the projects would alleviate congestion and improve traffic flow in the Houston metropolitan area and the surrounding region..." and "The commission has determined that constructing and operating the Grand Parkway as a toll facility is the most efficient and expeditious means of ensuring its development, and encourages the development of partnerships and the employment of innovative methods for its financing and construction." The Houston-Galveston Area Council's (H-GAC) 2035 Regional Transportation Plan (RTP) identifies the addition of tolled facilities, including the Grand Parkway, as necessary to address current congestion and future growth in the Houston region (H-GAC, 2007a). H-GAC has been designated by the state of Texas as the metropolitan planning organization (MPO) charged with coordinating transportation planning for the eight-county area around Houston, including Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties (see also Glossary and Section 3.1.3 of this volume).

CURRENT STATUS

The current status of each segment of the Grand Parkway is shown in Table 1. Locations of these segments are illustrated in Exhibit G–2.

TABLE 1
GRAND PARKWAY PROPOSED SEGMENTS

Segment	Proposed Location	Approx. Length (mi)	Counties	Status
A	SH 146 west to IH 45	6.4	Galveston	Corridor Feasibility Study initiated (fall 2008)
B	IH 45 west to SH 288	20.5	Galveston, Brazoria	Release of Final EIS (FEIS) in fall 2009
C	SH 288 west to US 59	26.0	Brazoria, Fort Bend	Release of FEIS in summer 2009
D	US 59 north to IH 10	19.0	Fort Bend, Harris	Complete
E	**IH 10 north to US 290**	**14.0**	**Harris**	**Record of Decision (ROD) issued in June 2008**
F-1	**US 290 east to SH 249**	**12.0**	**Harris**	**ROD issued in November 2008**
F-2	**SH 249 east to IH 45**	**12.0**	**Harris**	**Release of FEIS in August 2008**
G	**IH 45 east to US 59**	**13.7**	**Harris, Montgomery**	**Release of FEIS in January 2009**
H	US 59 south to US 90	23.0	Montgomery, Harris	Release of Draft EIS (DEIS) in summer 2009
I-1	US 90 south to IH 10	12.5	Harris, Liberty, Chambers	Release of DEIS in summer 2009
I-2	IH 10 south to SH 146	12.5	Chambers, Harris	Complete

Note: Bold/Shaded text indicates segments included in this study.
Source: GPA, 2009

The portion of the Grand Parkway that is the subject of this study is represented by the shaded text in Table 1. Segment E is proposed to extend approximately 14.0 miles north from IH 10 and west to US 290. Approximately one mile of Segment E, from IH 10 to Franz Road, was already constructed with Segment D. Segment F-1 would extend northeast approximately 12.0 miles from US 290 to SH 249. Segment F-2 would extend east approximately 12.0 miles from SH 249 to IH 45. Finally, Segment G would continue east approximately 13.7 miles from IH 45 to US 59.

PROJECT INDEPENDENT UTILITY AND LOGICAL TERMINI

The Grand Parkway is divided into 11 segments to facilitate planning, design, and construction since limited state and federal funding provides no assurance that all of the Grand Parkway segments will be constructed (Table 1). Because of commercial and residential growth and the expansion of SH 249 as a major transportation corridor, Segment F was further divided into two segments, F-1 and F-2.

While Segments E, F-1, F-2, and G support the overall purpose of the Grand Parkway, they also support the same purpose relevant to transportation needs specific to northwest Harris County and southern Montgomery County. As expected by H-GAC, residential and commercial development continues to expand from Houston's current outer loop. Northwest Harris County and portions of southern Montgomery County will require improved and additional roadway facilities to accommodate the anticipated increase in traffic volume.

To this end, each segment connects at least two existing major transportation corridors to ensure independent utility as well as independent significance as required by FHWA regulations (23 Code of Federal Regulations [CFR] 771.111[f]). Segments E, F-1, F-2, and G each have logical termini at radial highways, providing independent utility even if implemented separately. Segments E, F-1, F-2, and G are each Segments of Independent Utility (SIUs) that collectively would address regional transportation needs and, if implemented separately, independently would address local transportation needs.

LEGISLATION

Segments E, F-1, F-2, and G of the Grand Parkway are included in recent federal transportation legislation, including the 1995 National Highway System designation, established by the Intermodal Surface Transportation Efficiency Act (ISTEA), the North American Free Trade Agreement (NAFTA), the Transportation Equity Act for the 21st Century (TEA-21), and the 2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

At the state level, Segments E, F-1, F-2, and G are included in the Statewide Transportation Improvement Program (STIP) for funding between 2006 and 2008. The STIP allocates funds for all transportation and air quality projects necessary for addressing existing and projected statewide transportation needs. Inclusion in the STIP designates Segments E, F-1, and F-2 as consistent with state-level transportation planning. Segment G is included in the 2006-2008 STIP fiscal year (FY) 2006 Revisions in Appendix D, as a project that is undergoing environmental review scheduled for implementation beyond the three-year STIP time frame.

At the local level, Segments E, F-1, F-2, and G are consistent with the city of Houston's Major Thoroughfare and Freeway Plan (MTFP), the 2025 RTP, and the Transportation Improvement Program (TIP), as detailed in the following paragraphs.

Segments E, F-1, F-2, and G are included in the city of Houston's 2006 MTFP (Houston Planning Commission, 2006). The MTFP covers the city of Houston and unincorporated portions of Harris, Montgomery, Waller, Liberty, and Fort Bend Counties. Updated annually, the MTFP guides roadway and transit planning and development within the city of Houston and is supported by neighboring county and local governments in the Consolidated Metropolitan Statistical Area (CMSA).

Segments E, F-1, F-2, and G were contained in H-GAC's 2025 RTP as four-lane, controlled access toll facilities that are necessary to address congestion and future growth in the region (H-GAC, 2005a). Since H-GAC has been designated by the state of Texas as the MPO charged with coordinating transportation planning for the eight-county area around Houston, H-GAC's Transportation Policy Council (TPC) approves the RTP and TIP.

The RTP is a long-range plan designed to:

- Identify the need for transportation improvement projects, including mass transit and other non-road projects;
- Satisfy future transportation demand; and
- Bring the Houston metropolitan area into conformance with regulatory emission limits and air quality standards.

In addition to traditional funding sources, the 2025 RTP identified other funding sources such as motor fuel taxes and toll roads that will play a strategic role in expanding the roadway system. The TPC provides regional coordination with various stakeholders, including cities and counties in the eight-county area, TxDOT, transportation agencies (such as transit, toll, and port authorities), and citizens of the region. The 2025 RTP conformed to emission limits set by the Texas Commission on Environmental Quality (TCEQ, formerly Texas Natural Resource Conservation Commission [TNRCC]) and approved by the U.S. Environmental Protection Agency (EPA).

Segments E, F-1, and F-2 were also included in the FY 2006-2008 TIP, which identified the highway and transit improvements recommended for advancement during that three-year period (H-GAC, 2005b). Segment G was included in the 2006-2008 TIP, Appendix D, as project undergoing environmental review and scheduled for implementation beyond the three-year TIP time frame. The 2025 RTP and FY 2006-2008 TIP were adopted by H-GAC in April 2005 and found to conform to the State Implementation Plan (SIP) by the U.S. Department of Transportation (USDOT, which includes FHWA and Federal Transit Administration [FTA]) on June 3, 2005 and October 31, 2005, respectively.

The Grand Parkway Segments E, F-1, F-2, and G are included in the H-GAC's 2035 RTP and FY 2008-2011 TIP, as amended. On August 24, 2007, the H-GAC adopted the 2035 RTP and FY 2008-2011 TIP. USDOT (FHWA/FTA) found the 2035 RTP and 2008-2011 TIP to conform to the SIP on November 9, 2007.

Changes in modeled parameters between the 2025 RTP and the 2035 RTP (such as traffic volumes, population, employment, number of households, and vehicle miles traveled) have been evaluated to determine if any additional analysis is warranted before FHWA takes final environmental action. This evaluation confirmed that the changes in the modeled parameters were minor, and therefore no additional analysis is warranted. The analysis of 2025-2035 RTP modeled parameters can be found in the Administrative Record.

PROJECT DEVELOPMENT PROCESS AND DOCUMENT ORGANIZATION

The project development process implemented for Segments E, F-1, F-2, and G consisted of studies to determine the need for and purpose of the project, analyze various alternatives, determine the affected environment, and study indirect and cumulative effects. For each level of study in the project development process, Table 2 shows the alternatives considered, the focus of study, the terms used by the Study Team (see also Glossary), and the result of the DEIS, Revised DEIS (RDEIS) and FEIS. Throughout the study process (Table 3), workshops were held to solicit comments from the public and resource agency officials. Section 5 of this volume and Volume II, Section 6 (Agency and Public Coordination) provide greater detail on coordination and outreach efforts for the corridor and alignment studies. The environmental studies and public input were used to develop a full range of alternative corridors and select a Preferred Alternative Corridor to carry forward in a more detailed process. The project development process is depicted graphically in Exhibit G–3.

The Grand Parkway Segments E, F-1, F-2, and G study area has been divided into four SIUs to facilitate planning, design, and construction because limited state and federal funding provides no assurance that all the Grand Parkway segments would be constructed. In response to public and resource agency comments concerning potential cumulative effects of all four segments and the need to assess all four segments as facilities with independent utility and logical termini, the FEIS is organized in a four-volume set:

- Volume I presents analyses and results common to Segments E, F-1, F-2, and G, including project description, the need for and purpose of the project, alternatives considered, affected environment, indirect and cumulative effects, and agency and public coordination.
- Volume II provides a detailed assessment of Segment G relative to its project area. It includes issues, permits, and federal actions particular to Segment G, such as the need for and purpose of the project; alternatives considered; affected environment; environmental consequences; avoidance, minimization, and mitigation measures; indirect and cumulative effects; and agency and public coordination.
- Volume III contains exhibits and appendices referenced in Volumes I and II.
- Volume IV contains materials related to the Segment G DEIS Public Hearing, comments submitted, and responses to the DEIS comments provided following the release of the Segment G DEIS in January 2007.

The volume covers and section tabs are color-coded (Volume I [Green, common to Segments E, F-1, F-2, and G], Volume II/III/IV, Segment E [Pink], Segment F-1 [Purple], Segment F-2 [Orange], and Segment G [Light Green]) to help the reader navigate through the document.

TABLE 2
ALTERNATIVES CONSIDERED AT EACH LEVEL OF STUDY

Alternative Considered			Focus of Study	Results of DEIS	Results of FEIS
Level of Study	**Examples**				
Volume I					
Corridor	Segment E	A, B, C, CB, and D	Study Area	Preferred Alternative Corridor	Preferred Alternative Corridor
	Segment F-1	A, B, C, CB, and D			
	Segment F-2	A, B, C, and D			
	Segment G	A, B, C, and D			
Transportation Mode	No-Build and Build Alternatives		Traffic Study Area	Recommended Alternative Transportation Mode	Preferred Alternative Transportation Mode
Volume II					
Alignment	Segment E	A, B, C, and NB	Preferred Alternative Corridor (Project Area)	Recommended Alternative Alignment	Preferred Alternative Alignment
	Segment F-1	A, B, C, and NB		Recommended Alternative Alignment	Preferred Alternative Alignment
	Segment F-2	A, B, C, D, E, F, and NB		Recommended Alternative Alignment	Preferred Alternative Alignment
	Segment G	A, B, C, D, and NB		Recommended Alternative Alignment	Preferred Alternative Alignment

Notes: NB = No-Build Alternative. Although the No-Build Alternative would not satisfy the need for and purpose of the project, it was retained as a basis for comparison per 40 CFR 1502.14(d).

Source: Study Team, 2007

TABLE 3
STEPS IN THE DEVELOPMENT PROCESS OF THE GRAND PARKWAY

Step	Scope	Purpose	Public Meeting/ Workshop*
Project Initiation and Early Scoping	Presentation of the project to the public, local officials, and state and federal resource agencies.	To include public and cooperating agencies early in the project development process and solicit public/agency comments.	Yes
Socioeconomic Study	Evaluation of past, present, and future forecasts of social and economic conditions of the study area and the region.	To determine project need and guide project design to meet the need.	No
Corridor Study	Develop broad environmental inventory mapping of the study area and develop preliminary corridors roughly 5,000 feet in width.	To develop preliminary corridors, determine environmental constraints on a broad scale, solicit public comments, and select the Preferred Alternative Corridor for detailed alignment specific analysis.	Yes
Indirect Development Analysis	Evaluate the difference in land use and corresponding environmental effects from: 1) Segments E, F-1, F-2, and G are not built; and 2) Segments E, F-1, F-2, and G are built.	To assess potential long term or geographically distant impacts from highway-induced development associated with the No-Build and Build Alternatives.	No
Traffic Study	Model future travel demand within the study area, based on future land use scenarios.	To continue to establish the need for and purpose of the project as well as guide preliminary alternative design to best serve the study area.	No
Affected Environment	Study natural, physical, and social resources that could be impacted by the proposed facility.	To identify the alignment that minimizes impacts to the natural, physical, and social environment that best fulfills the need for and purpose of the project.	No
Alignment Study	Study natural, physical, and social resources specific to preliminary alignments.	To identify project impacts, to refine preliminary alignments, and to develop an appropriate mitigation plan.	Yes
Mitigation Planning	Coordinate to develop a plan to resolve unavoidable impacts of the project on resource specific variables identified in the affected environment study.	To continue to develop a project that minimizes impacts.	No
Environmental Documentation	Produce a DEIS and FEIS that disclose the benefits and impacts of the proposed action.	To provide the public and agencies an opportunity to comment on the findings of the environmental studies and ultimately to reach a ROD.	Yes

Note: * The dates of meetings and workshops are discussed in Section 5 of this volume and Volume II, Section 6.
Source: Study Team, 2007

Environmental Resource Mapping

In order to efficiently collect, organize, analyze, and display large amounts of environmental data in the 300 square-mile study area, a Geographic Information System (GIS) was established for the study. Coverages (features or layers) include the roadway network; traffic and demographic information; census information; past, present, and forecasted land use; vegetative cover types; jurisdictional (adjacent) and isolated wetlands; floodplains; sensitive resource areas and protected species; political boundaries; streams and waterbodies; parks and recreation areas; historic properties and known or potential archeological sites; locations of potentially hazardous materials; and locations of study alternatives.

Continual coordination with local officials, business owners, and landowners has contributed to the identification of planned or platted housing developments, as well as properties purchased for expansion of schools. The residential acreage mapped and presented in the inventory includes any residential development planned for construction and completion within a three to five year period.

Representatives of the Texas Parks and Wildlife Department (TPWD), the U.S. Fish and Wildlife Service (USFWS), and the U.S. Army Corps of Engineers (USACE) were particularly concerned with the identification and avoidance of wetlands; floodplains; rare, threatened, endangered, or otherwise protected species; and special habitat areas such as remnant prairie and bottomland hardwoods. Tools such as GIS were used to identify, map, and analyze the resource agencies' concerns.

This information was used to produce maps identifying environmental constraints to be considered for the proposed project. The objective of the GIS constraints mapping effort was to identify, avoid, and minimize impacts to sensitive resources while developing 5,000-foot wide alternative corridors within the study area. A corridor of this width was chosen to allow project planners to develop reasonable and distinct alternative alignments within the corridor, while providing maximum flexibility to avoid adverse impacts. The majority of the information compiled during the corridor study was available in state and local databases and other existing sources. Table 4 presents the environmental data categories and the source of these data for the corridor-level analysis. The data were overlaid on 1995 aerial photography (updated for 1999 housing and development). For the purpose of corridor-level analysis, the study area was divided into seven corridor reaches to facilitate the determination of the Preferred Alternative Corridor. A corridor reach is defined as a segment of the study area where two or three of the corridors overlap because of the density of environmental constraints in those areas. Reaches were used to examine "hybrid" combinations of the corridors. The seven corridor reaches allowed the Study Team to analyze and compare the potential impacts associated with various corridors or combinations of corridors.

TABLE 4
GIS DATA COVERAGES

Coverage	Source(s)
Cemeteries	U.S. Geological Survey (USGS) 7.5 minute series quadrangle maps, Harris (2000) and Montgomery (2000) County Key Maps
Churches	USGS 7.5 minute series quadrangle maps, Harris (2000) and Montgomery (2000) County Key Maps
Golf Courses	North and West Houston Association Development Maps, Aerial Photography
Recorded Archeological Sites	Texas Archeological Research Lab
Farmland Soils	Natural Resource Conservation Service (NRCS) Soil Surveys
Floodplain and Floodways	Federal Emergency Management Agency (FEMA)
Residential Development	Aerial photography, North and West Houston Association Maps, Harris (2000) and Montgomery (2000) County Key Maps, County Engineers, Developers
Hazardous Material Sites	Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), National Priority List (NPL), Resource Conservation and Recovery Act – Treatment Storage and Disposal (RCRA-TSD), RCRA Corrective Action Database (CORRACT), Resource Conservation and Recovery Act – Generators and Violators (RCRA-G), Emergency Response Notification System (ERNS), Texas State Superfund List (TXSSF), Texas Landfill Database (TXLF), Texas Leaking Underground Storage Tank Database (TXLUST), Texas Underground Storage Tank Database (TXUST), Texas Above Ground Storage Tank Database (TXAST), Texas Spills Incident Information System (TXSPILL)
Historic-Age Resources	USGS 7.5 min series quadrangle maps older than 50 years; TxDOT mapping
Area of Influence (AOI)	Expert Panel, Study Team
Wetlands	USFWS National Wetland Inventory Mapping, Aerial Photography
Oil and Gas Wells	Texas Railroad Commission and Banks Information Systems
State Historic Markers	Texas Historical Commission
Parks	Precincts 3 and 4 Recreation Maps
Prior Converted Wetlands	NRCS
High Probability Areas for Archeological Resources	TxDOT Environmental Affairs Division
Rare, Threatened, and Endangered Species	USFWS, TPWD
Schools	Aerial photography; contact with school districts

TABLE 4 (CONT.)
GIS DATA COVERAGES

Coverage	Source(s)
Streams	TxDOT, Study Team, USGS 7.5 min series quadrangle maps
Project Area	Study Team
Remnant Prairie Topography	USFWS, TPWD, Study Team
Forested Floodplains	USFWS, TPWD, Study Team
Water Wells	TCEQ

Source: Study Team, 2007

Once a Preferred Alternative Corridor was selected, 400-foot wide alternative alignments were identified within the selected corridor. At this level of study, the Preferred Alternative Corridor was defined as the project area. For the purposes of the alternative alignment-level of analysis, the project area (Preferred Alternative Corridor) was divided into 12 alignment reaches to facilitate the determination of a Recommended Alternative Alignment. These alignment reaches were segments of the project area where two, three, or more alternative alignments overlap because of the density of environmental constraints. The 12 alignment reaches allowed the Study Team to analyze and compare the potential impacts associated with various alternative alignments or combinations of alternative alignments (for further explanation, see Volume II, Section 2.3.1 [Alternative Alignments Development]).

Public Involvement

FHWA, TxDOT, and the GPA have engaged governmental agencies and the public in an extensive coordination effort to both inform others of progress in the planning process and solicit input from them. Through 2007, over 170 meetings have been held with homeowner associations, the media, and other community groups throughout the Segments E, F-1, F-2, and G study areas. The GPA maintains a website (www.grandpky.com) to provide updates to the public on developments and issues concerning the Grand Parkway. The Grand Parkway project has been open to comments by any person and all views on the scope of the proposed project, alternative actions, environmental impacts, and any other matter concerning the proposed Grand Parkway. FHWA, TxDOT, and the GPA have considered all comments to date and will continue to consider all comments in its planning process into the future.

Initial public workshops were held in August 1999 to introduce the public to Segments E, F-1, F-2, and G, to solicit public comments regarding the proposed project, and to provide an explanation of the studies needed to further the project. The Preferred Alternative Corridor was identified after engineering and environmental studies, coordination with state and federal resource agencies, and public scoping meetings in February 2000. Subsequent public meetings in October 2000 were held to present preliminary alternative alignments within the Preferred Alternative Corridor. These meetings are detailed in Sections 5.2.1 and 5.2.3 of this volume.

For each of the Grand Parkway Segments E, F-1, F-2, and G, a Public Hearing was held after publication of the DEIS. The Public Hearings consisted of an exhibit viewing session, a formal presentation, and a public commenting session. Availability of the DEISs and announcements for Public Hearings were published in the *Federal Register*, *Texas Register*, and area newspapers. Comments were submitted during both the Public Hearing and the following comment period. In accord with the Council on Environmental Quality (CEQ) regulations (40 CFR 1503.4), substantive comments, and responses to the comments are presented in the FEIS (see Volume IV). Public involvement is further addressed in Section 5 of this volume and Volume II, Section 6 (Agency and Public Coordination).

SECTION 1: PROJECT NEED AND PURPOSE

This volume (Volume I) addresses Grand Parkway Segments E, F-1, F-2, and G collectively. The study area for Segments E, F-1, F-2, and G encompasses portions of western and northern Harris and southern Montgomery Counties, approximately 25 to 30 miles northwest of Houston, Texas (see Volume III, Exhibit G–1 for a depiction of the study area).

This section presents the needs (or problems) found in the study area and the purposes (or goals) of the proposed project. Section 1.1 presents a summary of the regional need for transportation improvements and the purpose of Segments E, F-1, F-2, and G, collectively. Section 1.2 presents a detailed transportation needs analysis of the study area. For a discussion of the local need for transportation improvements and the purpose of Segment G, independent of other segments, see Volume II.

1.1 NEED FOR AND PURPOSE OF THE PROPOSED PROJECT

Transportation improvements are needed because there are inefficient connections between suburban communities and major radial roadways, the current and future transportation demand exceeds capacity, many roadways in the study area have a high accident rate, and there is an increasing strain on transportation infrastructure from population and economic growth. The regional needs for Segments E, F-1, F-2, and G are further detailed in the following:

- System Linkage: The current transportation system does not allow for efficient circumferential traffic movement, i.e., it does not provide efficient connections, or linkage, between major suburban communities and major roadways that radiate outward from Houston.
- Expanded Capacity: Transportation demand exceeds the current and future capacity of existing transportation infrastructure:
  - The Average Daily Traffic (ADT) is expected to increase an average of 83 percent on roadways from 2000 to 2025. Some collector facilities are expected to have over a 300 percent increase in ADT (Table 1-1).
  - The Level of Mobility (LOM) is expected to worsen between 2000 and 2025.
  - The total number of Vehicle Hours Traveled (VHT) is expected to increase 77 percent from 2000 to 2025, which can be related to the average commuter spending more time getting to and from work (Table 2-3 in Section 2 of this volume).
- Safety: Many roadways are characterized by conditions that result in higher accident rates. These roadways have a high number of intersections, traffic signals, and driveways, all of which may contribute to stop-and-go conditions, increased crash rates, and congestion during peak travel times and emergency events:
  - The Houston region had a fatal and injury crash rate higher than both state and national averages. On fourteen representative roadways in the study area, 5,072 accidents were documented during years 1999 through 2001 (see Table 1-3), 37 of which resulted in fatalities, and 3,112 of which caused injuries or possible injuries (H-GAC, 2005c).

- Since radial facilities are congested during an evacuation, there is a need to connect them with an efficient circumferential roadway. As an example, when as many as two million people fled the Houston metroplex before Hurricane Rita on September 22, 2005, evacuees followed roadways leading to Austin, San Antonio, and Dallas. Severe congestion ensued and contra-flow lanes were eventually opened. This evacuation prompted the creation of a task force to study evacuation from coastal areas in Texas (Little et al., 2006).

- Economic Development: The expected growth will continue to strain existing transportation infrastructure, creating a barrier to businesses, commuters, and economic development. For those areas outside the IH 610 Loop, H-GAC predicts an 83.4 percent growth in population and a 76.0 percent growth in employment from the year 2000 to 2025 (H-GAC, 2005a). With this increasing population and corresponding increases in traffic and congestion in the region, it could become progressively more difficult for businesses to function efficiently.

The purpose of the proposed transportation improvements is to efficiently link the suburban communities and major roadways, enhance mobility and safety, and respond to economic growth. The goal is to improve system linkage, address current and future transportation demand, improve safety, and accommodate population and economic growth. The overall goals of Segments E, F-1, F-2, and G are further detailed in the following:

- System Linkage: The proposed project would improve system linkage, or connectivity, within the existing transportation network. The proposed project would provide circumferential linkage between western and northern Harris County and southern Montgomery County, including linkage between IH 10, US 290, SH 249, IH 45, and US 59. An origin/destination traffic analysis found that approximately 23 percent of the total daily trips generated within the traffic study area could benefit from additional circumferential capacity (Section 1.2.1).

- Expanded Capacity: The proposed project would address transportation demand, improve the LOM, reduce traffic congestion, and provide travel options.

- Safety: The proposed project would improve regional and local safety for the traveling public by minimizing conditions that contribute to stop-and-go conditions, increased crash rates, and congestion during peak travel times and emergency events:
  - The proposed project would divert traffic from roadways with high accident rates thereby reducing traffic by as much as 33 percent by 2015 (Table 2-6 in Section 2 of this volume) and consequently, reducing accident rates.
  - The Grand Parkway would provide an additional hurricane and emergency evacuation route for the greater Houston area consistent with Minute Order No. 82325 signed October 25, 1984. The Grand Parkway could alleviate a portion of the congestion during mass evacuations thus creating safer and more efficient evacuation conditions.

- Economic Development: The proposed project would accommodate demographic and economic growth by improving the movement of persons and goods thereby minimizing barriers between businesses, consumers, and transportation infrastructure.

This section was prepared in accordance with FHWA's Technical Advisory T 6640.8A, *Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (FHWA, 1987), FHWA's memorandum entitled, *Purpose and Need in Environmental Documents* (FHWA, 1990a), FHWA's and FTA's joint memorandum entitled, *Integration of Planning and NEPA [National Environmental Policy Act] Processes* (FHWA and FTA, 2005), and TxDOT's memorandum entitled, *Guidance on Purpose and Need* (TxDOT, 2001). FHWA (1990a) indicates that the need for and purpose of the project may, and probably should, evolve during the project development process as information is gathered and more is learned about the study area. Studies conducted for the proposed Grand Parkway included substantial interaction with project stakeholders, including the general public, local businesses and landowners, local officials and community leaders, regulatory agencies, FHWA, and TxDOT.

1.2 DETAILED TRANSPORTATION NEEDS ANALYSIS

A transportation needs analysis, or "traffic analysis," was performed to assess the need for: 1) additional transportation improvements for circumferential travel, and 2) improved system linkage between suburban communities and major roadway facilities. The area used for this traffic analysis is referred to as the "traffic study area" and is larger than the study area shown in Exhibit G–2 because it includes all major roadways potentially affected by the proposed new transportation facility. The traffic study area is generally bounded by IH 10 to the south, US 59 to the east, and extends just beyond the proposed Grand Parkway to the north and west.

The 2025 RTP was reviewed to document transportation forecasts and travel deficiencies. Several different years were analyzed to better understand the land use changes and consequential travel demand changes over time. Analyzing interim years allows planners to assess proposed transportation improvements that are planned for construction throughout the 20-year planning horizon. To fully understand the transportation issues, the traffic analysis presented in the following sections included data from years 2000 (base year), 2010 (No-Build only), 2015, and 2025. The state has identified the need for Segments E, F-1, F-2, and G by including them in TxDOT's Unified Transportation Program (UTP), a 10-year statewide plan for transportation project development (last updated October 27, 2005). The No-Build Alternative discussed herein is defined as a condition in which all planned and programmed improvements included in the 2025 RTP are in place except Grand Parkway Segments E, F-1, F-2, and G.

1.2.1 System Linkage

The interstate highway system was developed to connect the nation's major urban areas and tie together the lower 48 states. The interstate and regional highway systems are predominantly oriented in either an east-west or a north-south direction. Circumferential transportation infrastructure would link the interstate and state highway system. Information obtained from the public meetings (see Section 5 of this volume) indicated that citizens would use the proposed project as a link to the existing interstates or state highways for travel to areas outside Houston.

Population and employment are primary demographic and economic indicators for travel demand. For the city of Houston (the area inside the IH 610 Loop), H-GAC predicts a population increase of 12 percent from 2000 to 2025. For those areas outside the IH 610 Loop, H-GAC predicts an 83.4 percent growth in population and a 76.0 percent growth in employment from the year 2000 to 2025. Much of this growth would be concentrated in the traffic study area. It is expected that development will progress in a manner consistent with suburban growth trends nationally: jobs follow population growth to the extent that suburban areas become self-contained with their own residential, retail, and employment centers. U.S. Census Bureau data, H-GAC, and the Harris County Toll Road Authority (HCTRA) projections all indicate this trend is underway and is expected to continue within the Houston-Galveston region.

An origin/destination analysis was conducted using the H-GAC model to predict the daily number of travelers in the years 2015 and 2025 that would be traveling circumferentially around Houston. Results of the origin/destination analysis show the degree and impact of suburban development and its independence from the metropolitan core. A summary of the findings of the origin/destination analysis for 2015 and 2025 includes that:

- In the year 2015, there are a total of approximately 4,675,500 total daily trips beginning or ending in the traffic study area; in 2025, there are approximately 6,155,100 total trips or an increase in total daily trips of 3.1 percent annually.
- Approximately 24 percent of total daily trips beginning or ending in the traffic study area are radial trips to or from the core of Houston for years 2015 and 2025.
- In 2015 and 2025, approximately 23 percent of trips with an origin or destination in the traffic study area could benefit from additional circumferential capacity in the region.

1.2.2 Expanded Capacity

The H-GAC regional travel demand model of the Houston metropolitan area was used to determine the base year traffic (2000) and future (2025) traffic projections. Base year and future traffic were compared to determine the change in traffic volumes over time. H-GAC's model determines traffic volumes on roadway facilities based upon current and projected population and employment data as well as the transportation network available to travelers.

The traffic analysis was conducted for the following facility types defined by FHWA:

- Interstate Highways/Freeways: These roadways are divided highways with two or more lanes designated for the exclusive use of traffic in each direction and are intended to provide uninterrupted flow. There are no signalized or stop-controlled at-grade intersections. Direct access from adjacent properties is not permitted. Access is limited to ramp locations and opposing directions are separated by a raised barrier, a median, or a raised traffic island. Examples of Interstate Highways are IH 10, IH 45, and IH 610.
- Principal Arterials: These roadways provide an integrated network of roads that connect principal metropolitan areas and serve virtually all urban areas with a population greater than 25,000. They serve long distance travel demands such as statewide and interstate travel. Principal arterials can be grouped into two separate categories:

- Freeway Principal Arterial: These principal arterials have complete access control. Much like an interstate facility, they are designed to have an unimpeded traffic flow. Examples include US 290, US 59, the Hardy Toll Road, Beltway 8, and SH 249. The proposed Grand Parkway is an example of a freeway[1] principal arterial.
- Non-Freeway Principal Arterial: These principal arterials do not exhibit access control. At-grade intersections and impeded traffic flow are common. SH 6 and Farm-to-Market Road (FM) 1960 can be classified as non-freeway principal arterials.

♦ Minor Arterials: These roadways interconnect and supplement the principal arterial system with a greater emphasis on land access and a lower level of traffic mobility. They provide intra-community service and connect rural collector roadways to the urban highway system. An example of a minor arterial is SH 242.

♦ Collector Roadways: These roadways provide service to any county seat, large towns, or other major traffic generators not served by the arterial system. They provide links to the higher classified routes and serve as important intra-county travel corridors. Examples of collector roadways are Fry Road, Grant Road, FM 2920, and Cypresswood Drive.

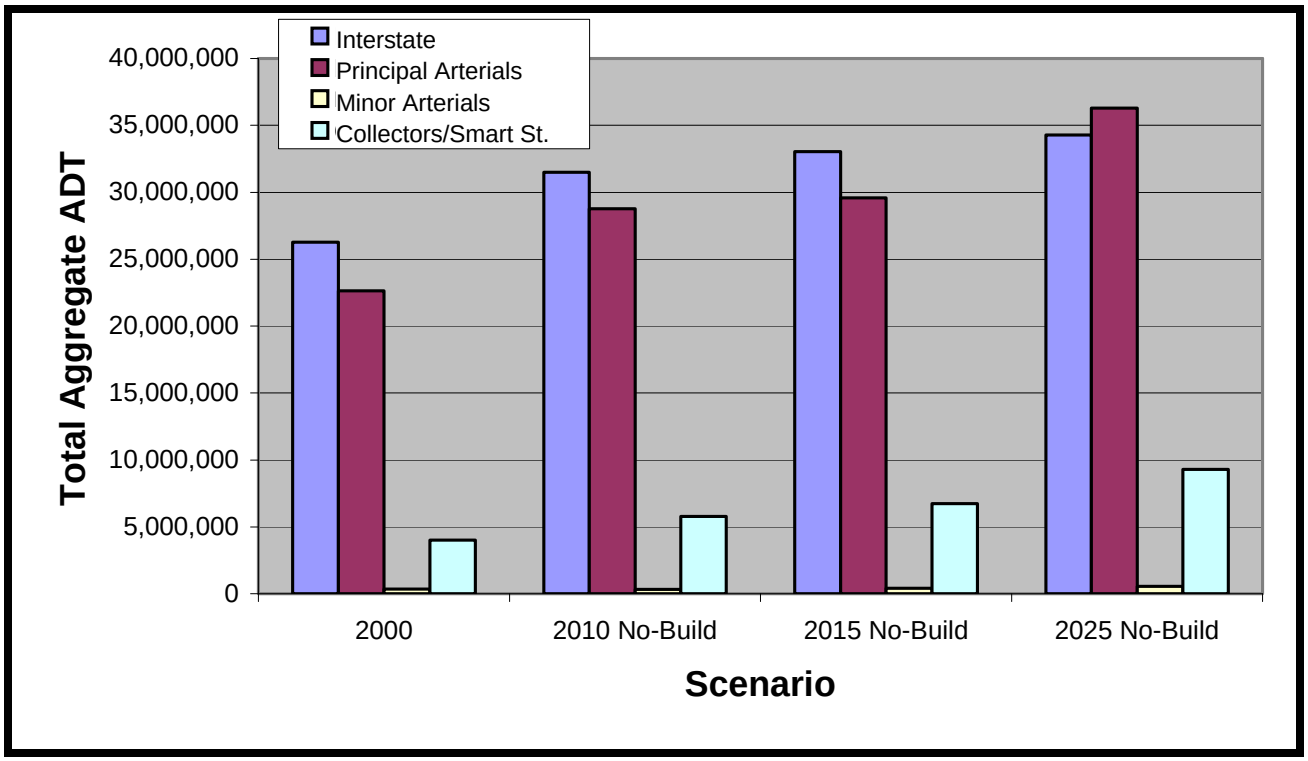
♦ Smart Streets/Express Streets: Smart Street enhancement is a concept developed and introduced into the 2025 RTP as an additional tool to increase mobility and improve transit access and safety by providing operational improvements along strategic regional thoroughfares. Smart Street enhancements would improve mobility through a range of alternatives, such as synchronization of traffic signals; construction of roundabouts, medians, or turn bays (dedicated turn lanes); consolidation of duplicate driveways; and, as appropriate, partial grade separation of some traffic lanes at major intersections (H-GAC, 2007a). Smart Street improvements are scheduled for the year 2023 and would take place along collector roadways. Examples of future Smart Streets include Fry Road, Cypress Rosehill Road, FM 1960, and FM 2920. Expected future benefits of Smart Streets include:

- Reduced cut-through traffic in neighborhoods;
- Opportunities for economic development along select arterials;
- Improvements to transportation and land use access through the use of back access roads to major traffic generators;
- Increased travel options due to improved arterials and connectivity;
- Enhanced regional evacuation routes; and
- Improvements to transit and reliability of transit trip times resulting from the proposed Smart Street alignment with the Metropolitan Transit Authority's (METRO) Signature Express bus line plans.

[1] The term, "freeway" in this document is consistent with terminology in the TRB's Highway Capacity Manual (2000). Any divided arterial with complete access control and unimpeded traffic flow is designated a freeway, whether it is tolled or not.

Figure 1-1 depicts the total aggregate ADT (of all links within the transportation travel demand model) for roadway segments in graphical format. Table 1-1 presents examples of base year and future No-Build traffic data for each segment of the selected roadways. A No-Build Alternative represents a condition in which all planned and programmed improvements are in place except the Grand Parkway Segments E, F-1, F-2, and G. Exhibits G–4 through G–11 depict ADT and LOM for the base year and No-Build Alternative in 2010, 2015, and 2025.

FIGURE 1-1
BASE YEAR AND FUTURE NO-BUILD ADT



Source: H-GAC, 2005a

Most of the roadways are expected to have major increases in ADT from the year 2000 to 2025 (Table 1-1 and Exhibits G–4, G–6, G–8, and G–10). As shown in Table 1-1, the ADT of many facilities increased nearly 50 percent; however, some of the Smart Streets see increases in ADT of 200 percent or more. This growth in traffic is consistent with the projected future population and employment growth.

In addition to traffic volumes, LOM calculations were used to assess roadway operating conditions. The LOM is a concept developed by H-GAC and introduced in the 2025 RTP to illustrate the degree of congestion on roadways within the region. The LOM is comparable to the Transportation Research Board (TRB) Highway Capacity Manual's "Level of Service" (LOS) methodology (TRB, 2000), but LOS is a more specific measure because it provides a greater number of categorizations of traffic flow.

TABLE 1-1
TRAFFIC STUDY AREA BASE YEAR AND FUTURE NO-BUILD ADT BY ROADWAY SEGMENT

Facility	From	To	2000 (Base Year) ADT	2010 No-Build		2015 No-Build		2025 No-Build	
				ADT	% Change (from 2000)	ADT	% Change (from 2000)	ADT	% Change (from 2000)
Interstates									
IH 10	Katy-Fort Bend	SH 99	56,000	64,700	16%	66,300	18%	80,300	43%
	SH 99	SH 6	107,100	97,600	-9%	112,200	5%	119,400	11%
	SH 6	Beltway 8	211,100	194,800	-8%	212,200	1%	227,800	8%
	Beltway 8	IH 610	216,900	224,800	4%	241,300	11%	258,800	19%
IH 610	IH 10 [2]	US 290 [2]	356,300	392,700	10%	127,700	-64%	167,500	-53%
	US 290	SH 249	203,300	218,400	7%	248,200	22%	269,900	33%
	SH 249	IH 45	178,900	204,400	14%	219,000	22%	239,500	34%
	IH 45	US 59	196,500	167,700	-15%	182,900	-7%	199,600	2%
IH 45	North of SH 99	SH 99	146,700	194,900	33%	233,200	59%	244,600	67%
	SH 99	FM 1960	127,300	144,400	13%	170,300	34%	177,400	39%
	FM 1960	Beltway 8	180,400	200,300	11%	219,400	22%	224,600	25%
	Beltway 8	IH 610	213,300	218,400	2%	231,400	8%	256,400	20%
Principal Arterials									
US 290	Katy Hockley Rd	SH 99	36,600	54,200	48%	62,700	71%	73,400	101%
	SH 99	FM 1960	72,400	87,400	21%	88,800	23%	120,700	67%
	FM 1960	Beltway 8	130,200	132,100	1%	135,900	4%	164,200	26%
	Beltway 8	IH 610	203,700	209,400	3%	236,400	16%	266,400	31%
SH 249	FM 2920	SH 99	21,100	17,000	-19%	41,000	94%	53,500	154%
	SH 99	Spring-Cypress Rd	35,700	52,500	47%	60,000	68%	74,000	107%
	Spring-Cypress Rd	FM 1960	60,820	83,800	38%	73,500	21%	103,100	70%
	FM 1960	IH 45	38,600	42,400	10%	39,900	3%	59,400	54%

TABLE 1-1 (CONT.)
TRAFFIC STUDY AREA BASE YEAR AND FUTURE NO-BUILD ADT BY ROADWAY SEGMENT

Facility	From	To	2000 (Base Year) ADT	2010 No-Build		2015 No-Build		2025 No-Build	
				ADT	% Change (from 2000)	ADT	% Change (from 2000)	ADT	% Change (from 2000)
US 59	North of SH 99	SH 99	54,900	50,300	-8%	58,800	7%	66,100	20%
	SH 99	FM 1960	115,700	135,600	17%	145,400	26%	157,100	36%
	FM 1960	Beltway 8	141,100	159,600	13%	177,100	26%	202,400	43%
	Beltway 8	IH 610	185,000	175,300	-5%	189,400	2%	215,000	16%
SH 6	IH 10	US 290	55,100	62,100	13%	72,100	31%	85,900	56%
FM 1960	US 290	SH 249	42,500	51,900	22%	58,500	38%	72,400	70%
	SH 249	IH 45	54,600	60,300	10%	61,300	12%	70,500	29%
	IH 45	US 59	47,800	63,600	33%	69,900	46%	70,700	48%
Beltway 8	IH 10	US 290	93,000	106,800	15%	109,600	18%	131,300	41%
	US 290	SH 249	73,300	86,600	18%	84,600	15%	99,100	35%
	SH 249	IH 45	62,500	92,800	48%	86,900	39%	110,200	76%
	IH 45	US 59	39,400	77,700	97%	91,700	133%	125,600	219%
Hardy Toll Rd	IH 45	SH 99	26,500	35,200	33%	32,400	22%	41,000	55%
	SH 99	FM 1960	31,800	40,700	28%	38,100	20%	48,000	51%
	FM 1960	Beltway 8	37,200	40,400	9%	33,600	-10%	50,400	35%
	Beltway 8	IH 610	45,700	41,000	-10%	33,300	-27%	58,600	28%
Minor Arterials									
SH 242	FM 1488	IH 45	26,900	18,700	-30%	25,500	-5%	28,500	6%
	IH 45	FM 1314	13,300	15,700	18%	17,100	29%	29,300	120%
Collector Roadways/Smart Streets									
FM 529/Freeman Rd	Katy Hockley Rd	SH 99	4,400	2,100	-52%	3,000	-32%	8,100	84%
	SH 99	Barker Cypress Rd	14,000	22,500	61%	26,100	86%	32,700	134%
Louetta Rd	Kuykendahl Rd	IH 45	14,200	18,300	29%	22,500	58%	33,600	137%

TABLE 1-1 (CONT.)
TRAFFIC STUDY AREA BASE YEAR AND FUTURE NO-BUILD ADT BY ROADWAY SEGMENT

Facility	From	To	2000 (Base Year) ADT	2010 No-Build		2015 No-Build		2025 No-Build	
				ADT	% Change (from 2000)	ADT	% Change (from 2000)	ADT	% Change (from 2000)
Spring Cypress Rd	Kuykendahl Rd	IH 45	9,000	21,100	134%	24,600	173%	21,200	136%
Barker Cypress Rd	IH 10	FM 529/Freeman Rd	10,900	19,100	75%	21,400	96%	29,200	168%
	FM 529/Freeman Rd	US 290	8,800	19,300	119%	23,600	168%	22,000	150%
Katy Hockley Rd	IH 10	FM 529/Freeman Rd	8,400	16,800	100%	19,200	129%	21,200	152%
Fry Rd	IH 10	FM 529/Freeman Rd	11,000	11,800	7%	20,300	85%	45,400	313%
Telge Rd	Louetta Rd	Spring-Cypress Rd	20,000	19,100	-5%	21,400	7%	27,500	38%
Grant Rd	Spring-Cypress Rd	Louetta Rd	3,900	1,000	-74%	2,300	-41%	5,500	41%
	Louetta Rd	SH 249	8,900	12,900	45%	16,500	85%	19,200	116%
Mueschke Rd	US 290	SH 99	1,500	9,100	507%	8,900	493%	9,600	540%
	SH 99	FM 2920	2,900	9,800	238%	9,900	241%	12,000	314%
Cypresswood Dr	Kuykendahl Rd	IH 45	21,200	26,300	24%	24,900	17%	30,300	43%
FM 2920	US 290	SH 249	8,000	11,200	40%	13,000	63%	22,500	181%
	SH 249	SH 99	19,800	19,400	-2%	25,100	27%	32,400	64%
	SH 99	Kuykendahl Rd	16,100	11,500	-29%	19,700	22%	16,600	3%
	Kuykendahl Rd	Spring-Cypress Rd	20,300	19,000	-6%	21,600	6%	27,600	36%
Kuykendahl Rd	FM 2920	Spring-Cypress Rd	17,200	22,300	30%	26,200	52%	40,200	134%
	Spring-Cypress Rd	Spears/IH 45	20,500	20,500	0%	22,000	7%	33,900	65%
Eldridge Parkway	IH 10	FM 529/Freeman Rd	21,200	25,500	20%	29,000	37%	50,600	139%
	FM 529/Freeman Rd	US 290	15,900	23,700	49%	27,400	72%	36,800	131%
	US 290	FM 1960	29,300	30,300	3%	34,600	18%	47,700	63%
	FM 1960	Spring-Cypress Rd	9,400	6,600	-30%	8,800	-6%	15,500	65%

TABLE 1-1 (CONT.)
TRAFFIC STUDY AREA BASE YEAR AND FUTURE NO-BUILD ADT BY ROADWAY SEGMENT

Facility	From	To	2000 (Base Year) ADT	2010 No-Build		2015 No-Build		2025 No-Build	
				ADT	% Change (from 2000)	ADT	% Change (from 2000)	ADT	% Change (from 2000)
Spring Stuebner Rd	FM 2920	IH 45	10,100	10,000	-1%	12,100	20%	13,600	35%
Boudreaux Rd	Telge Rd	SH 249	4,900	6,200	27%	9,200	88%	7,900	61%
FM 1488	US 290	SH 249	4,500	7,600	69%	8,400	87%	13,300	196%
	SH 249	Kuykendahl Rd	14,800	16,500	11%	18,300	24%	19,500	32%
	Kuykendahl Rd	IH 45	13,100	25,900	98%	28,400	117%	36,000	175%

Source: H-GAC, 2005a

LOS is a qualitative measure of the operating conditions of a traffic stream on a transportation facility. There are six LOSs (LOS A-F) defined for each type of facility. LOS A represents the free-flow or best operating conditions with no congestion and LOS F denotes the forced-flow or worst operating conditions with heavy congestion. LOS D is considered an acceptable LOS, especially for urban areas such as the Houston area.

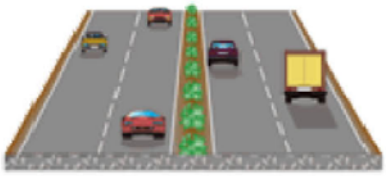
The Highway Capacity Manual provides LOS criteria based on maximum density, minimum speed, the ratio of flow rate known as volume to capacity (v/c), and maximum service flow rate. H-GAC provides LOM criteria based only on roadway v/c. The LOM incorporates local adjustments to account for facilities that have higher volumes than they were designed to carry. The LOM concept takes into account traffic demand, speed, roadway type, and number of lanes. An LOM of 0 – 0.85 represents a tolerable condition, 0.86 – 1.00 represents a moderate condition, 1.01 – 1.24 represents a serious condition, and 1.25 and higher represents a severe condition.

Figure 1-2 demonstrates how LOS uses six categories while LOM uses four categories to classify traffic flow conditions. This comparison shows that a tolerable LOM represents acceptable conditions; a moderate LOM is the point at which the volume of vehicles is approaching or has reached the capacity of the facility and the traffic flow is breaking down, and serious and severe LOMs relate to situations in which facility capacity has been reached or exceeded, causing considerable delays and lengthy traffic jams.

Taking Grand Parkway out of the equation, planned and programmed transportation improvements alone will not be sufficient to accommodate the projected increase in congestion. Even with the improvements, congestion is expected to worsen through the year 2015. For example, in 2000, 17 percent of all roadway miles operate with serious and severe LOM conditions. In 2015, this amount increases to 29 percent. However, in 2025, this percentage drops to 9 percent of roadways operating at serious and severe conditions. Thus, the year 2025 level of congestion is expected to be better than the base year 2000 even with an increase in traffic volumes. Table 1-2, Figure 1-3, and Exhibits G–5, G–7, G–9, and G–11 show the LOM for the base year and No-Build Alternative in 2010, 2015, and 2025.

The improvement in LOM in the year 2025, as stated above, is attributable to the implementation of the Smart Streets concept. Smart Streets, per the 2025 RTP, are scheduled to be open to traffic in the year 2023. Smart Streets allow for increased capacity and improved traffic or operational flow along arterial corridors without adding additional lanes. The effect of Smart Streets on the LOM in the year 2025 is explained in detail in Figure 1-4.

FIGURE 1-2
EXPANDED CAPACITY – LOM/LOS*

Level Of Mobility (LOM)	Volume to Capacity (V/C)		Technical Descriptions	Flow Conditions	Level Of Service (LOS)
	LOM	LOS			
Tolerable	0-0.85	0-0.27	Highest quality of service. Traffic flows freely with little or no restrictions on speed or maneuverability. No delays		A
		0.28-0.44	Traffic is stable and flows freely. The ability to maneuver in traffic is only slightly restricted. No delays		B
		0.45-0.64	Few restrictions on speed. Freedom to maneuver is restricted. Drivers must be more careful making lane changes. Minimal delays		C
		0.65-0.85	Speeds decline slightly and density increases. Freedom to maneuver is noticeably limited. Minimal delays		D
Moderate	0.86-1.00	0.86-1.00	Vehicles are closely spaced, with little room to maneuver. Driver comfort is poor. Significant delays		E
Serious	1.01-1.24	>1.00	Few restrictions on speed. Freedom to maneuver is restricted. Drivers must be more careful making lane changes. Considerable delays		F
Severe	>1.25	N/A			

Note: *For further information in regards to LOM, LOS, and v/c, please refer to Section 1.2.2 (Expanded Capacity).

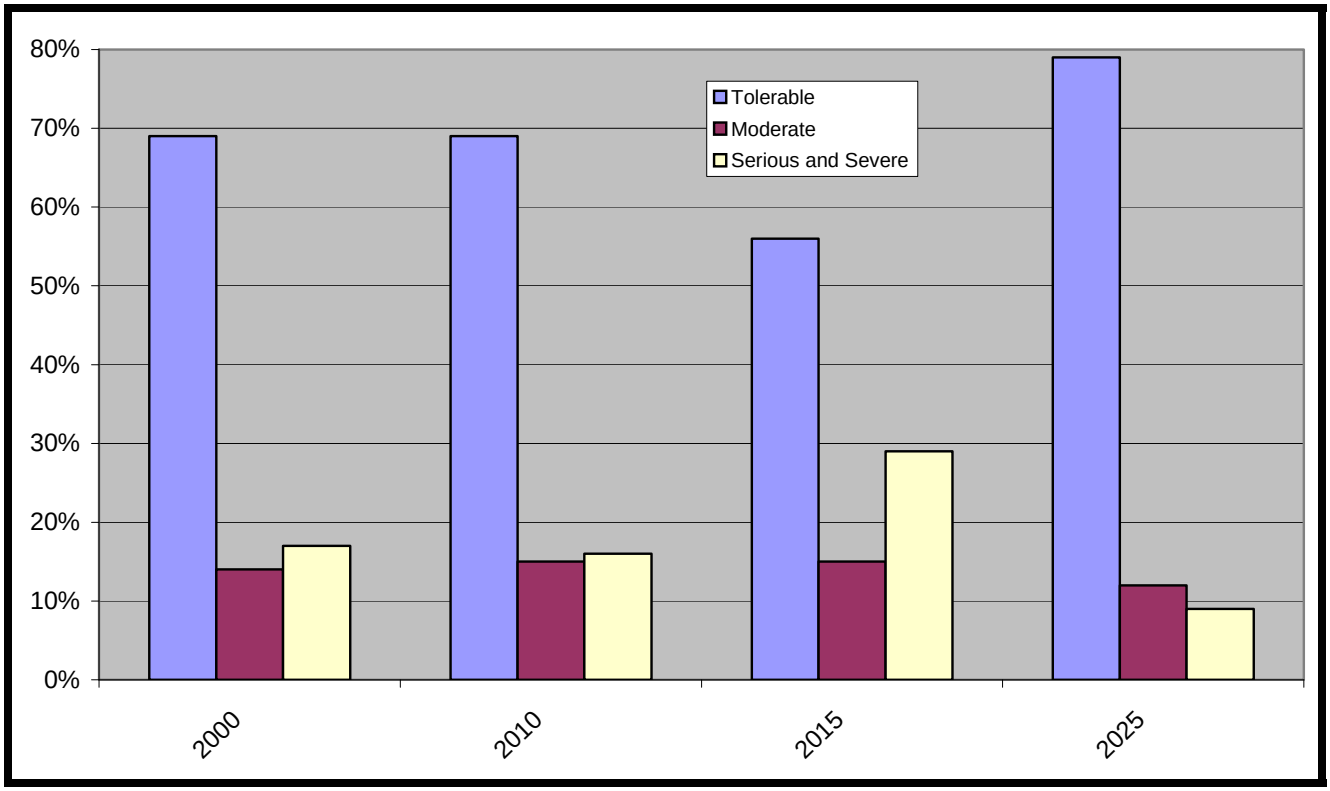
Source: California Department of Transportation (Caltrans), 2003 and Study Team, 2007

TABLE 1-2
TRAFFIC STUDY AREA BASE YEAR AND FUTURE NO-BUILD LOM BY FACILITY TYPE

Condition	2000 (Base Year)	2010 No-Build	2015 No-Build	2025 No-Build[1]
Interstates				
Tolerable	70%	83%	72%	77%
Moderate	10%	14%	22%	14%
Serious	15%	3%	6%	9%
Severe	6%	0%	0%	0%
Principal Arterials				
Tolerable	81%	81%	82%	85%
Moderate	10%	8%	5%	7%
Serious	6%	8%	10%	6%
Severe	4%	3%	3%	2%
Minor Arterials				
Tolerable	34%	45%	39%	34%
Moderate	33%	12%	6%	23%
Serious	14%	27%	35%	23%
Severe	19%	16%	20%	20%
Collector Roadways/Smart Streets				
Tolerable	65%	59%	36%	77%
Moderate	15%	21%	21%	15%
Serious	13%	15%	31%	7%
Severe	7%	5%	12%	1%
Total Roadway Miles[2]				
Tolerable	69%	69%	56%	79%
Moderate	14%	15%	15%	12%
Serious	11%	12%	21%	7%
Severe	6%	4%	8%	2%

Notes: [1] By 2025, unless funding sources are identified for major projects in the 2025 RTP (such as Smart Streets), more roadways, particularly collector roadways/Smart Streets, would operate at less than tolerable conditions (i.e., with a Moderate, Serious, or Severe LOM).
[2] Total roadway miles based on weighted average.
Source: H-GAC, 2005a and Study Team, 2005

FIGURE 1-3
TRAFFIC STUDY AREA BASE YEAR AND FUTURE NO-BUILD LOM



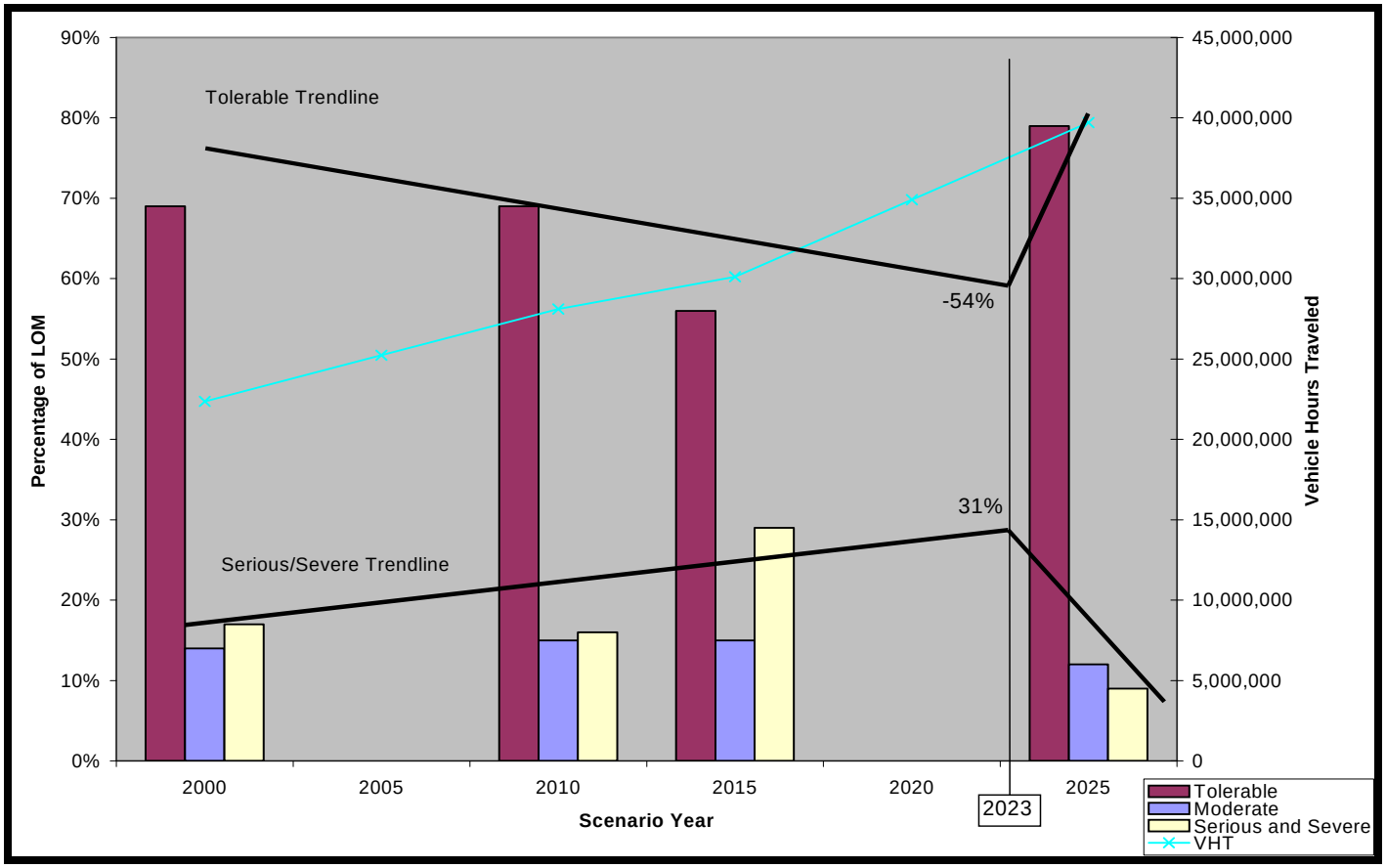
Note: By 2025, unless funding sources are identified for major projects in the 2025 RTP (such as Smart Streets), more roadways, particularly collector roadways/Smart Streets, would operate at less than tolerable conditions (i.e., with a Moderate, Serious, or Severe LOM).

Source: Study Team, 2005 and H-GAC, 2005a

While the proposed Grand Parkway is shown as funded in the TIP (projects authorized to be implemented within the next three years), Smart Streets are included in the 2025 RTP as long-range projects and many do not have identified funding sponsors (listed as “To Be Determined” in the 2025 RTP, and also listed as "Unsponsored [TBD]" in the 2035 RTP) (H-GAC, 2005a and 2007a). As a short-term project, the Grand Parkway is expected to deliver traffic congestion relief much sooner than the Smart-Streets concept. Long-range projects are generally conceptual in nature and are based on forecasted transportation needs. Prior to implementation, long-range projects require additional planning and public involvement as they are reviewed and revised during the regular RTP update that occurs every three years. As the RTP is updated, regional transportation needs are re-evaluated and long-range projects may be removed from further consideration or may move forward in the planning process to be included as short range projects (projects to be implemented in four to ten years) where project sponsors are identified. Since Grand Parkway Segments E, F-1, F-2, and G are included in the 2008-2011 TIP (projects authorized to be implemented within the next three years), a trend-line analysis was prepared to illustrate the travel conditions that could be expected in the year 2023, just prior to the implementation of the conceptual Smart Streets.

As shown in Figure 1-4, the trend-line analysis interpolated the data from the base year model, the 2010 model, and the 2015 model to obtain 2023 operating conditions. Under this scenario, the percentage of roadway miles operating at serious and severe conditions in 2023 increases to 31 percent when compared to 17 percent in 2000, while the percentage of roadway miles operating at a tolerable condition is reduced to 54 percent. The proposed Grand Parkway could provide congestion relief as the proposed Smart Streets evolve through the H-GAC planning process over the next 15 to 20 years.

FIGURE 1-4
BASE YEAR AND FUTURE NO-BUILD PROJECTED LOM



Source: Study Team, 2005 and H-GAC, 2005a

1.2.3 Safety

For the three-year period of 1999-2001, the Houston region had a fatal and injury crash rate 2.48 times that of the U.S. and 1.36 times that of the state of Texas (H-GAC, 2006). Table 1-3 shows examples of frequent accident locations within the project area.

An accident analysis was conducted to determine how travel safety would be affected by new circumferential freeway capacity. Nationally, freeways have lower accident rates per number of vehicles than lower classified roads because of the design of the freeways, fewer access points, fewer driver distractions, and less stop-and-go conditions. Therefore, diverting traffic from collector roadways to a limited access facility, such as the proposed project, would reduce the accident fatality rate.

Studies have also shown a correlation between accident rates and frequency of access points (Cirillo, 1968 and McGuirk, 1973). The proposed project would eliminate at-grade intersections and limit access points to specific, controlled locations.

The Texas Transportation Institute's (TTI) Center for Transportation Safety compared fatal crashes by roadway functional class for the years 2000 and 2001 (National Highway Traffic Safety Administration [NHTSA], 2001 and NHTSA, 2002). The study concluded that fatal crashes were the lowest on freeways and expressways. The highest number of fatal crashes was recorded on local roads and principal arterials. The distribution of fatal crashes in Texas for the year 2001 by roadway function class was as follows: 25 percent on local roads; 21 percent on principal arterials other than interstates, freeways, and expressways; 18 percent for collector roadways; 13 percent on minor arterials; 9 percent on urban interstate principal arterials; 7 percent on rural interstate principal arterials; and 7 percent for freeway principal arterials, such as the proposed project.

Local roads, collector facilities, and non-freeway principal arterials have much higher accident rates because of more frequent turns, stop-and-go conditions, roadway distractions, and lack of access control. Many of these roadways are parallel to the proposed project.

Crash locations on circumferential facilities that would be directly competing with the proposed Grand Parkway are shown in Table 1-3. These facilities are currently saturated with traffic signals and characterize the stop-and-go conditions associated with high crash rates. It is anticipated that if a new circumferential controlled access facility were constructed, accident rates would decrease because traffic would be diverted from non-freeway principal arterials, collector roadways, and local roads to a less congested, safer facility.

The Grand Parkway would also provide an additional hurricane and emergency evacuation route for the greater Houston area (Exhibit G–12) consistent with Minute Order No. 82325 signed October 25, 1984. The circumferential route connects to numerous radial facilities that are often congested during an evacuation. As an example, when as many as 2 million people fled the Houston metroplex before Hurricane Rita on September 22, 2005, evacuees followed roadways leading to Austin, San Antonio, and Dallas. Severe congestion ensued and contra-flow lanes were eventually opened. This evacuation prompted the creation of a task force to study evacuation from coastal areas in Texas (Little et al., 2006).

The Grand Parkway could alleviate a portion of the congestion during mass evacuations thus creating safer and more efficient evacuation conditions.

1.2.4 Economic Development

H-GAC predicts substantial population and economic growth for western and northern Harris County and southern Montgomery County through the year 2025. Increased population combined with increased traffic and congestion could make it more difficult for businesses to function efficiently. The rate and distribution of population and employment growth influence travel demand, creating the need for transportation improvements and alternative solutions. H-GAC predicts that because of increased traffic, existing plans for transportation and traffic management improvements will not relieve future congestion. Segments E, F-1, F-2, and G of the proposed project would provide necessary additional roadway capacity to help alleviate this problem.

The Grand Parkway Segments E, F-1, F-2, and G would increase transportation efficiency for many commuters. The proposed project would provide an alternative circumferential route that would avoid local traffic conflicts and connect local communities thus addressing and accommodating existing and future growth.

TABLE 1-3
LOCATIONS IN THE TRAFFIC STUDY AREA WITH HIGH ACCIDENT RATES

Roadway			Accident Type					
Facility	From	To	Fatalities	Incapacitating Injury	Non-Incapacitating Injury (Probable Injury Crashes)	Possible Injury	Non-Injuries (Serious Property Damage)	Total
SH 6	IH 10	FM 1960	8	33	174	570	509	1,294
FM 1960	US 290	SH 249	1	32	109	330	266	738
	IH 45	US 59	6	57	151	396	361	971
FM 529/Freeman Rd	Katy Hockley Rd	SH 6	4	19	48	128	126	325
Katy Hockley Rd	IH 10	US 290	0	2	4	6	7	19
Fry Rd	IH 10	FM 529/Freeman Rd	0	4	16	30	38	88
Barker Cypress Rd	IH 10	US 290	2	3	22	46	53	126
FM 2920	US 290	SH 249	8	27	57	84	103	279
	SH 249	IH 45	7	26	81	216	234	564
Spring-Cypress Rd	US 290	SH 249	0	3	5	10	15	33
	SH 249	FM 2920	1	2	14	57	36	110
Louetta Rd	SH 249	Cypresswood Dr	0	5	36	98	97	236
Telge Rd	US 290	FM 2920	0	0	7	16	18	41
Grant Rd	Spring-Cypress Rd	SH 249	0	1	9	32	31	73
Cypresswood Dr	SH 249	IH 45	0	2	5	30	27	64
	IH 45	FM 1960	0	2	7	18	12	39
Mueschke Rd	US 290	FM 2920	0	0	3	1	1	5
Spring Stuebner Rd	Kuykendahl Rd	IH 45	0	4	9	28	26	67

Note: Represents years 1999 through 2001, the most recent dataset available.

Source: H-GAC, 2005c

SECTION 2: ALTERNATIVES ANALYSIS

This section presents the analysis of a range of transportation alternatives and the selection of a Preferred Alternative Corridor that satisfies the need for and purpose of the project within the study area. The corridor study involved creation and analysis of environmental constraints mapping using GIS as described in the Introduction (Environmental Resource Mapping) of this volume. Additionally, careful consideration was given to all comments received from the public and local, state, and federal resource agencies. A 5,000-foot wide Preferred Alternative Corridor was selected based on its ability to best fulfill the need for and purpose of the project while minimizing environmental impacts. A corridor of this width was chosen to allow project planners to develop reasonable and distinct alternative alignments within the Preferred Alternative Corridor, while providing maximum flexibility to avoid adverse impacts.

A range of transportation alternatives were considered, including the alternative of building the Grand Parkway as a toll road (Build Alternative) and not building Segments E, F-1, F-2, and G of the Grand Parkway (No-Build Alternative). The No-Build Alternative is defined as the implementation of all committed improvements found in the 2025 RTP (H-GAC, 2005a) without the construction of Segments E, F-1, F-2, and G. These committed improvements include Transportation System Management (TSM), Travel Demand Management (TDM), and modal transportation improvements such as bus transit, high-occupancy vehicle (HOV) lanes, rail feasibility, and new planned roadway construction. Smart Street improvements, as defined and discussed in the 2025 RTP, are also included in the No-Build Alternative.

Transportation alternatives determined not to meet the need for and purpose of the project (documented in this section) were eliminated from further consideration, while other reasonable alternatives were identified and carried forward for detailed study in Volume II. The Build Alternative was selected as the Preferred Alternative Transportation Mode because it is the only alternative that fulfills the need for and purpose of the project. Identification of the Preferred Alternative Corridor, Preferred Alternative Transportation Mode, and Preferred Alternative Alignment in the FEIS is consistent with FHWA and CEQ guidelines and regulations (Technical Advisory; T 6640.8A; 40 CFR 1502; and FHWA, 1987). Specific Build Alternative Alignments are addressed in Volume II of the FEISs prepared for individual segments. Exhibit G–3 shows an example of this multi-step study process, which allows the examination of a full range of alternatives at the corridor (Volume I), transportation mode (Volume I), and alignment levels (Volume II) with increasing detail as the study has progressed. This process has enabled alternatives to be evaluated in several stages so that only the most practicable, those alternatives that met the need for and purpose of the project, and that had the potential to minimize adverse environmental impacts were advanced to the next phase of study.

This study process also satisfies various regulatory and coordination requirements for projects integrating the NEPA and the Section 404 permit processes. The multi-step project approach allowed a thorough consideration of all alternatives developed with respect to potential impacts to “Waters of the U.S.,” including wetlands, as required under Section 404 of the Clean Water Act (CWA). The required Section 404 (b)(1) alternatives analysis has been conducted during the

corridor and alignment studies as the project has progressed. This approach first emphasized avoidance, and then minimization to ensure that the identified Preferred Alternative Corridor, Preferred Alternative Transportation Mode, and ultimately, the Preferred Alternative Alignment minimize adverse impacts to the greatest extent possible.

The GIS approach was used to assist in the development of several alternative corridors, approximately 5,000 feet in width within the study area. Once a Preferred Alternative Corridor and transportation mode were selected, alternative alignments 400 feet in width were identified within the Preferred Alternative Corridor. Several alternative corridors/alignments were evaluated to determine if they address the need for and purpose of the project, and avoid and minimize impacts to sensitive resources. As part of the study, federal, state, and local resource agencies, the GPA, TxDOT, FHWA, and the Study Team held meetings to identify key issues to be considered during the corridor and alignment development process (see Section 5 of this volume for general Segments E, F-1, F-2, and G agency and public coordination; Volume II, Section 6 outlines agency and public coordination specific to Segment G). Early identification of environmental concerns is essential to maximizing the ability to avoid and minimize impacts during the alternative development phase (corridor and alignment level). This GIS approach does not substitute for the public involvements, scoping, alternative development and analysis, and other aspects of the NEPA process. However, it does complement them and provides an effective tool for managing and analyzing large amounts of environmental data in a cost and time efficient manner.

The GIS based approach utilized for this study and in the consideration of potential alternatives at both the corridor and alignment levels is a useful and reasonable tool for streamlining the FHWA NEPA process and assisting in the avoidance and minimization of impacts to environmental resources. Appendix A contains a FHWA Memorandum on GIS study from the office of NEPA facilitation, which discusses the use and practicable application of GIS in NEPA studies.

In summary, a broad range of alternatives at the corridor level, transportation mode level, and alignment level were identified and evaluated for the Segments E, F-1, F-2, and G. The alternatives were analyzed to determine if they were able to meet the various components of the need for and purpose of the project for the proposed action (see Section 1 of this volume for general Segments E, F-1, F-2, and G Project Need and Purpose; Volume II, Section 1 outlines Project Need and Purpose specific to Segment G). Those alternatives at the corridor (Volume I), transportation mode (Volume I), and alignment level (Volume II) found to meet the need for and purpose of the project for the proposed action were carried forward to the next level of analysis.

2.1 CORRIDOR STUDY

The corridor study process implemented for Segments E, F-1, F-2, and G was a complex effort. *Working Paper #1: Socioeconomic and Corridor Study* was produced in April 2000 (Michael Baker Jr., Inc, 2000a) documenting the project initiation and early scoping outreach period, socioeconomic aspects of the need for and purpose of the project, environmental resource mapping, corridor alternatives and comparison, formal scoping and corridor outreach period, and corridor recommendation and is available on the Grand Parkway website, www.grandpky.com.

A multi-step process was utilized to determine the location of potential corridors:

1. The initial step of this process was to develop sensitive resource mapping (e.g., schools, churches, parks, cemeteries, wetlands, and residential commercial developments).
2. Following the creation of a GIS, approximately 5,000-foot wide bands, or linear "corridors," were developed that minimized inclusion of identified environmental constraints (sensitive resources).
3. Each corridor was extensively examined to develop a refined environmental constraints inventory.
4. Results of these analyses were presented to the public and state and federal resource agencies at the public workshops held on August 18, 24, and 26, 2000.
5. Following these presentations and analysis of comments derived from them, a Preferred Alternative Corridor was identified that best served the need for and purpose of the project and that maximized the probability of being able to avoid the greatest number of sensitive resources during specific alignment development.

During Step 2 of the process, engineering control locations were identified throughout the project length in order to develop the corridors. These control locations included areas such as probable interchange locations (e.g., IH 10), areas free of sensitive resources, and acceptable river and floodplain crossing locations. Connections between these control locations were then arranged in a number of configurations that met engineering design criteria. This process resulted in the development of the three corridors: A, B, and C (Exhibit G–13). These corridors are described in the following paragraphs along with the analysis that led to the selection of a Preferred Alternative Corridor.

There are places where two or three corridors overlap because of the density of environmental constraints. The segments of corridors between these overlap areas were defined as "reaches." The corridor reaches were used as a tool for examining "hybrid" combinations of the three original corridors. There are seven corridor reaches that overlap with Segments E, F-1, F-2, and G of the Grand Parkway: Reach 1 is completely within Segment E, Reach 2 is partially within Segments E and F-1, Reach 3 is completely within Segment F-1, Reach 4 is partially within Segments F-1 and F-2, Reach 5 is partially within Segments F-2 and G, and Reaches 6 and 7 are completely within Segment G. In addition to Corridors A, B, and C, two corridor variations were added in response to comments received during the public outreach program and new land use information: partial Corridor CB (in Reach 2) and Corridor D (a full length corridor), as detailed in Section 2.1.6 (see also Exhibits G–13 and G–14).

2.1.1 Corridor A

Corridor A (Exhibit G–13) begins one mile north of IH 10 and continues north for about five miles, then shifts slightly west and parallels Katy Hockley Road, and proceeds northward to US 290 and Becker Road. There, Corridor A turns northeast for about 7.5 miles crossing Cypress Rosehill Road before turning east, then parallels FM 2920 for 1.5 miles. Corridor A turns southeast crossing Willow Creek, then turns east crossing SH 249, and parallels Boudreaux Road to

Stuebner-Airline Road. After crossing Stuebner-Airline Road, Corridor A turns east again crossing Kuykendahl and Gosling Roads before turning northeast (for a distance of 5.5 miles) crossing IH 45, Spring Creek, and the Harris/Montgomery County line. In Montgomery County, Corridor A continues northeast for nearly eight miles, crosses the San Jacinto River, and then trends east for about three miles to its terminus at US 59.

2.1.2 Corridor B

Corridor B (Exhibit G–13) begins north of IH 10 and travels about 12 miles due north to intersect with US 290 at Fairfield. Corridor B continues northward crossing Little Cypress Creek and joins Corridor A heading toward Mueschke Road. There, Corridor B turns due east for 5.5 miles, then northeast across SH 249. Corridor B then turns east for 6.5 miles crossing Hufsmith Kohrville Road, Willow Creek, and Stuebner-Airline Road before rejoining Corridor A. Corridors A and B continue eastward crossing Kuykendahl Road, Gosling Road, IH 45, the Hardy Toll Road, and Spring Creek. Corridor B turns northeast after crossing Spring Creek for 4.5 miles, then eastward crossing the San Jacinto River, and continues on crossing FM 1314. Corridor B proceeds northeast crossing FM 1485 and then turns eastward to an intersection with US 59 North.

2.1.3 Corridor C

Corridor C (Exhibit G–13) begins north of IH 10 and travels about five miles north, turns northeast crossing Cypress Creek, then proceeds north crossing US 290 near Mueschke Road. From there, Corridor C continues north to Little Cypress Creek, then northeast for a distance of eight miles intersecting and joining with Corridor A. Both corridors continue eastward crossing SH 249, Hufsmith Kohrville Road, FM 2920, and Kuykendahl Road. Corridor C turns southeast at Gosling Road generally following FM 2920 eastward for about four miles toward IH 45. Corridor C then turns northeast, crossing the Hardy Toll Road and Spring Creek. There, Corridor C rejoins Corridor A, continues northeast crossing the San Jacinto River, and then turns east crossing FM 1314 and proceeds on toward US 59.

2.1.4 Corridor Resource Inventory

The resource inventory for the three full-length corridors is included in Table 2-1. These data represent the sum total of all resources within each 5,000-foot wide corridor and were used as a guide to determine which corridor would provide the best opportunity to develop alternatives that avoid or minimize adverse environmental effects within that corridor. The actual construction impacts of the highway within a 400-foot wide ROW would be substantially less than the inventory data presented for the 5,000-foot wide corridor. Environmental constraints within the corridors, as they existed at the time of this study, are presented graphically in Exhibit G–15a-e. This exhibit has five parts to cover the entire study area of Segments E, F-1, F-2, and G.

TABLE 2-1
CORRIDOR RESOURCES INVENTORY FOR SEGMENTS E, F-1, F-2, AND G

Reach[1]	Corridor[2]	Meets Need and Purpose	Length (mi)	Residential Area (acres)	School Properties	Churches	Cemeteries	Golf Courses	Parks	Natural Resources								Cultural Resources			Oil and Gas Wells	Potential Hazardous Material Sites	Water Wells	
										Special Resource Areas	Wetlands (acres)	Prior Converted Wetlands (acres)	Remnant Prairie (TPWD 2/2/2000)	Remnant Prairie Topography (c.1995) (acres)	Forested Floodplain (acres)	100 year Floodplain (acres)	Prime Farmland (acres)	Recorded Archeology Sites	Historic-Age Resources	High Probability Area (HPA) (acres)			Public	Private
No-Build		No	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
1	A	Yes	6.3	264	-	-	-	-	-	1	400	64	-	-	-	2,197	3,728	-	10	-	23	-	-	1
	B	Yes	6.3	721	-	-	-	-	-	1	171	128	-	-	-	1,815	3,733	-	14	-	35	-	4	3
	C	Yes	6.5	720	-	-	-	-	-	2	244	57	-	-	-	894	3,850	-	15	-	14	-	1	1
	D	Yes	6.4	753	-	-	-	-	-	2	191	122	-	-	-	1,348	3,763	-	12	-	21	-	3	3
2	A	Yes	13.1	34	-	-	-	-	-	2	960	507	-	112	116	1,709	7,809	-	18	91	2	1	-	7
	B	Yes	11.9	30	-	-	-	-	-	1	620	1,232	-	112	210	1,501	7,140	1	22	105	3	-	-	12
	C	Yes	9.7	1,809	-	1	2	2	1	2	373	1,254	-	12	198	1,469	5,858	2	27	59	38	-	-	5
	D	Yes	12.3	161	-	-	-	-	-	1	728	1,389	-	112	193	1,617	7,682	1	21	106	7	-	1	6
	CB	Yes	11.2	1,692	-	-	3	1	1	-	488	1,355	-	272	196	1,341	6,727	2	30	75	38	-	2	5
3	A	Yes	7.6	537	-	1	1	-	1	1	349	-	-	121	-	287	4,525	-	53	-	143	3	5	6
	B	Yes	6	241	-	-	-	-	-	-	215	-	-	338	-	932	3,556	-	14	-	68	-	2	1
	C	Yes	4.7	583	1	-	-	-	1	2	356	-	-	332	221	601	2,813	-	25	29	34	1	-	-
	D	Yes	6.4	349	1	-	-	-	-	-	256	-	-	339	-	1196	4,226	-	15	-	86	-	2	2
4	A	Yes	8	1,396	2	-	-	-	2	-	476	-	-	138	33	353	4,820	-	39	153	65	10	11	7
	B	Yes	8.1	168	1	-	1	1	2	-	437	-	-	138	93	654	4,671	-	36	214	152	14	12	10
	C	Yes	7.9	1,344	2	-	-	-	2	-	474	-	-	138	33	277	4,721	-	39	153	61	10	11	7
	D	Yes	80	1,396	2	-	-	-	2	-	475	-	-	138	33	341	4,769	-	38	153	64	10	11	7
5	A	Yes	8.2	1,190	1	1	1	-	2	-	358	-	-	37	234	964	4,008	-	111	1,707	70	7	7	6
	B	Yes	8.2	1,261	1	1	1	-	2	-	340	-	-	37	234	963	4,008	-	113	1,608	69	7	7	6
	C	Yes	8.8	1,224	3	8	1	-	2	-	377	-	-	110	142	444	4,284	-	80	636	30	18	29	15
	D	Yes	8.1	2,343	3	3	1	-	3	-	589	-	-	133	234	756	6,799	-	143	1,600	79	19	25	16
6	A	Yes	5.3	163	-	-	-	-	-	1	369	-	-	-	1,225	1,160	106	1	-	350	-	-	-	-
	B	Yes	5.9	181	-	-	-	-	-	1	602	-	-	-	1,503	1,383	176	-	7	960	2	-	-	1
	C	Yes	5.3	163	-	-	-	-	-	1	375	-	-	-	1,242	1,177	109	1	-	350	-	-	-	-
	D	Yes	5.9	182	-	-	-	-	-	1	671	-	-	-	1,512	787	265	-	7	831	2	-	-	1
7	A	Yes	4.1	570	2	-	-	-	-	-	329	-	-	-	-	399	799	-	2	366	1	-	-	3
	B	Yes	6.4	548	1	-	-	-	-	-	378	-	-	-	278	749	1,438	-	-	296	3	-	4	2
	C	Yes	4.1	570	2	-	-	-	-	-	329	-	-	-	-	399	799	-	2	366	1	-	-	3
	D	Yes	4.1	731	2	-	-	-	-	-	346	-	-	-	-	249	875	-	3	366	1	-	-	4

Notes: [1] There are seven corridor reaches that overlap with Segments E, F-1, F-2, and G of the Grand Parkway: Reach 1 is completely within Segment E, Reach 2 is partially within Segments E and F-1, Reach 3 is completely within Segment F-1, Reach 4 is partially within Segments F-1 and F-2, Reach 5 is partially within Segments F-2 and G, and Reaches 6 and 7 are completely within Segment G.

[2] Corridors are approximately 5,000 feet wide.

Source: Study Team, 2002

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2.1.5 Agency and Public Coordination

Extensive coordination with the public, local officials, state and federal resource agencies, and landowners has been conducted to date. Throughout the Segments E, F-1, F-2, and G study areas, over 170 meetings were held with homeowner associations, the media, and other community groups during the corridor study (for details, see Section 5.4.2 of this volume). Six formal public workshops were held between August 1999 and February 2000. At these workshops, the corridors were presented to the public as well as federal, state, and local agencies through the use of multi-media presentations. The public was asked for their response and feedback during the workshops.

Reports of the proceedings of the public workshops and all meeting minutes are on file at the GPA. Agency coordination and public involvement are detailed in Section 5 of this volume and Volume II, Section 6 (Agency and Public Coordination) of the FEIS.

Coordination with various agencies indicated that a number of issues needed to be addressed before identification of a Preferred Alternative Corridor, which included:

- Identification of remnant prairie elements (mima mounds) as potential habitat for the federally listed endangered Texas prairie dawn (Hymenoxys texana) and Texas windmill-grass (Chloris texensis);
- Distinction between regulated forested wetlands and forested floodplains;
- Identification of potential wetland mitigation sites;
- Location determination of state plant species of special concern; and
- Identification of extensive additional residential development as previously defined (three to five year period).

These issues were addressed through photo-interpretation, coordination with resource agency representatives, and/or meetings with proposed land developers and city and county officials. The corridor resource inventory was then revised, recalculated, and reviewed with the TPWD, USACE, and USFWS (Table 2-1).

2.1.6 Corridor Revisions

In response to comments received during the public outreach program, a partial corridor, Corridor CB, was developed to avoid remnant prairie topography that is potential habitat for the federally protected Texas prairie dawn. Corridor CB was also developed to avoid areas that are targeted for development over the next three to five years. A new full-length corridor, Corridor D, was developed. Corridor D consists of portions of Corridors A, B, and C as well as five areas where shifts were made to avoid or minimize potential impacts.

2.1.6.1 Partial Corridor CB

In Segments E and F-1, between Little Cypress Creek and Willow Creek, Corridor C crosses substantial land area identified for development in a three to five year period, as well as areas identified as remnant prairie topography that is

potential habitat for the protected species, Texas prairie dawn. At the suggestion of TPWD, USFWS, and the USACE, Corridor CB was developed for Segments E and F-1 only. Corridor CB turns north from Corridor C and connects back to Corridor B (Exhibit G–13). The resource inventory for Corridor CB is provided in the Reach 2 portion of Table 2-1.

2.1.6.2 Corridor D

The Study Team, using an interdisciplinary approach, developed Corridor D to avoid and/or minimize adverse environmental effects. Corridor D generally follows existing corridors A, B, or C (Exhibit G–14). However, deviations from A, B, or C were made in order to:

- Reduce potential floodplain area impacts;
- Reduce potential residential area impacts;
- Avoid potential remnant prairie impacts; and
- Expand the project area within Reach 5.

Five adjustments were made as follows:

- In Reaches 1 and 2, Corridor B was shifted slightly east in order to reduce floodplain encroachment.
- In Reach 2, just north of the US 290 crossing, Corridor B was widened to avoid an area of remnant prairie.
- In Reach 3, Corridor B was widened to the north near the crossing of Telge Road in order to avoid a residential area and remnant prairie.
- In Reach 5, because of numerous environmental constraints in Corridor A/B, it was widened to roughly 10,000 feet (about 5,000 feet south) for further study.
- In Reach 6, Corridor B was shifted slightly south to minimize possible impacts at the San Jacinto River crossing.

The resource inventory for Corridor D is provided in Table 2-1.

2.1.7 Preferred Alternative Corridor Recommendation

Results of the resource inventory analysis and public and agency coordination led to the selection of Corridor D as the Preferred Alternative Corridor (Exhibit G–14). Therefore, Corridor D was carried forward for the alignment study for Segments E, F-1, F-2, and G.

Based on public comments and coordination during the environmental process for Segments F-2 and G (see Table 2-2), the Study Team analyzed an additional corridor, the FM 1488–SH 242 (Northern Alignment) corridor, for Segments F-2 and G. The Northern Alignment is located in Harris and Montgomery Counties between SH 249 and US 59 and is approximately 30 miles in length. This corridor was evaluated to determine if a potentially reasonable and feasible alignment could be developed as an alternative to Segments F-2 and G.

TABLE 2-2
SUMMARY OF COMMENTS RECEIVED FROM RESOURCE AGENCIES ON PRELIMINARY CORRIDORS

Reach	Corridor Preference (USACE)	Corridor Preference (USFWS)	Corridor Preference (TPWD)	Corridor Preference Study Team	Basis for Preference Study Team
1	C	B or C	C	B	Preferred by public; minimizes potential wetland impacts; consistent with local transportation plans; effect on current and future residential areas has been considered in development plans; avoids snow goose (*Chen caerulescens*) roosting sites.
2	C or B	B	C/B	B	Preferred by public; minimizes potential impact to existing residential areas; further inspection of this reach suggests a greater ability to minimize impacts to wetlands during alignment development in Corridor B.
3	C or B	None stated*	B	B	Preferred by public; avoids school property and existing residential areas in Corridor C; minimizes potential impacts to residential areas
4	A/C	None stated*	B, then A/C	A	Minimizes potential floodplain impact; avoids oil fields; avoids conservation easement in Corridor B; residential effect on Gleannloch Farms residential development has been planned for; public was undecided in this reach.
5	C	C	None stated*	ABC	None at this time. Received a great deal of information at the public workshops about specific land developments that have recently occurred. Need more information to make a corridor decision; public was undecided in this reach. Advantages of Corridor A/B include avoiding historic Spring area, minimizes potential impact to existing and planned residential areas; provides opportunity to follow Hardy Toll Road in this reach; effect on residential areas in Northgate Development have been incorporated into plans; careful engineering can avoid most floodplain areas. Advantages of C include minimizing potential floodplain impact.
6	B	No-Build*	B may be better	B	Preferred by the public; minimizes potential wetland impacts; provides better bridge crossing location of the San Jacinto River; because Corridor B is more northern, it may involve fewer bottomland hardwoods; provides opportunity to follow a ridge and minimize effects on floodplains and bottomland; alignments within corridor can avoid roosting sites.
7	A/C	No-Build*	A/C	A/C	Preferred by the public; shorter by 2.3 miles; can avoid Lake Houston Park during future development of the Grand Parkway.

Note: * Refer to March 16, 2000 USFWS letter, Appendix B.

Source: Study Team, 2002

Based on the analysis presented in the environmental, engineering, and financial feasibility study, the evaluation concluded that:

- Based on the traffic analysis conducted for this effort, the alternative alignments and options developed for the feasibility study are serving a different traffic study area than Segments F-2 and G.
- As the Northern Alignment would serve a separate and distinct traffic study area from Segments F-2 and G, this alternative would not meet the identified need for transportation improvements in the study area for Segments F-2 or G.
- As the Grand Parkway is designated as a toll facility, the potential toll collection from the Northern Alignment can only partially fund the project and would not be a viable alternative. Segments F-2 and G are expected to generate higher revenue that would fund the implementation of these projects.
- The Northern Alignment would displace substantially more residences and businesses than the Recommended Alternative Alignments for Segments F-2 and G.
- The Northern Alignment would impact publicly owned parkland and would require a Section 4(f) evaluation to determine that there is no feasible and prudent alternative to the use of this property.

Based on the these findings, the Northern Alignment, as an alternative corridor for either Segments F-2 or G, was not carried forward for more detailed study (Michael Baker Jr. Inc., 2006).

2.2 TRANSPORTATION MODE STUDY

The No-Build and Build Alternatives were defined and evaluated with respect to meeting the need for and achieving the purpose of transportation improvements. The results of these evaluations and the reasons for elimination of transportation alternatives are presented in the following sections. Elimination of transportation alternatives from detailed study is consistent with 23 CFR 771.125.

2.2.1 No-Build Alternative

The No-Build Alternative includes all committed improvements found in the 2025 RTP (H-GAC, 2005a) without the construction of Segments E, F-1, F-2, and G. These committed improvements include TSM, TDM, and modal transportation improvements such as bus transit, HOV lanes, rail feasibility, and new planned roadway construction. The No-Build Alternative also includes short-term, minor restoration activities such as resurfacing, bridge repairs, and minor road widening. These improvements are already a part of the ongoing plan for the continued operation of the existing roadway system. Smart Street improvements, as defined and discussed in the 2025 RTP, are also included in the No-Build Alternative. The TSM, TDM, modal transportation improvements, and Smart Street components of the No-Build Alternative are detailed in the following sections.

2.2.1.1 Transportation System Management (TSM)

The purpose of TSM is to make the existing transportation system as efficient as possible through the implementation of such measures as:

- Park-and-Ride Lots – encourage ridesharing and HOV lane usage;
- Ridesharing – reduces vehicles on the existing roadway network by combining trips of common origin and destination. Ridesharing is most effective in areas of high density residential development and employment;
- HOV Facilities – as a TSM improvement would involve restriction of lanes on existing roadways for non-HOV use during peak traffic periods;
- Traffic Signal Coordination – results in increased traffic capacity of existing roadways by optimizing traffic signal phasing of individual intersections and coordination of successive signalized intersections along a thoroughfare; and
- Intersection Improvements – consist of additional turn lanes, added through lanes through restriping, and traffic signal optimization.

Although TSM measures are generally considered appropriate in urban areas where the existing facilities operate beyond their designed capacity limits (FHWA, 1987), based on currently approved TSM measures in the 2025 RTP, TSM measures by themselves would not be adequate to handle the rapid growth projected for northwestern Harris County over the next 18 years. For example, SH 6/FM 1960 does not serve regional traffic very effectively. It was not constructed as a complete circumferential controlled access highway. It is a partial circumferential principal arterial and currently serves local traffic desiring to make shorter trips. Its design (non-controlled access) is not conducive to the longer trips that the Grand Parkway Segments E, F-1, F-2, and G serve. Adjacent property can be or currently is developed with residential and commercial businesses. This type of adjacent development tends to impede the roadway's ability to serve longer trips. Traffic interruptions occur causing motorist delays because of the existence of driveways and traffic signals. Segments E, F-1, F-2, and G would be constructed as a controlled access toll facility with no traffic signals or driveways.

As with SH 6/FM 1960, other circumferential roadways located within or in proximity to the study area are limited. No other roadway crosses all four segments. FM 2920 is located in portions of Segments F-1 and F-2 and is considered a major arterial.

The transportation model supplied by H-GAC includes all major TSM improvements currently in the 2025 RTP (Appendix C). Smaller TSM projects, such as traffic management systems, were included in the Congestion Mitigation Analysis (CMA) conducted for Segments E, F-1, F-2, and G (Appendix D). Some forms of TSM improvements also require additional ROW. On roadways where development is directly adjacent to the facility, the cost of ROW for the most effective TSM improvements, such as additional turning lanes, may outweigh the benefits of such improvements. Furthermore, as stated previously, many TSM improvements are most effective in areas of high-density residential development and employment. While Houston ranks as the sixth most populated metropolitan area in the country next to

New York City, Los Angeles, and Chicago, Houston ranks 14th in terms of population density (with 3,000 people per square mile vs. 7,400 people per square mile in Los Angeles, CA). This pattern of development makes it difficult for many of the TSM strategies to be effective. Therefore, it is unlikely that TSM measures, additional to those already planned, would be adequate to handle the rapid growth projected for northwestern Harris County over the next 20 years.

A CMA was conducted for the parallel facilities that would be affected by the Grand Parkway (Appendix D). The CMA included all TSM and TDM improvements too small to be programmed into H-GAC's travel demand model. The study revealed that TSM and TDM improvements are not expected to substantially improve the LOM.

While the TSM improvements included in the 2025 RTP are expected to ease congestion and travel times for localized trips, these improvements do not adequately address system linkage, expanded capacity, safety, and economic development. The TSM improvements by themselves would not adequately meet the need for and purpose of the project.

2.2.1.2 Travel Demand Management (TDM)

TDM relies on commuters making voluntary behavioral changes to their travel habits that result in fewer vehicles during peak hours. TDM measures improve mobility and reduce congestion during the peak hours. Several examples of TDM measures include:

- Carpooling/Vanpooling – Combining multiple commuters into a single vehicle, resulting in fewer peak hour trips;
- Employee Trip Reduction Programs – Programs that require major employers to reduce the average vehicular occupancy of their work force, resulting in fewer peak hour trips;
- Compressed Work Weeks – Working full time in fewer days, resulting in some reduction in peak hour trips;
- Telecommuting – Working from home, resulting in few or no peak hour trips;
- Flex-Time – Working non-typical schedules resulting in a shift in commute trips from the peak hours to non-peak hours; and
- Employer Incentives – Incentives that encourage employees to carpool or vanpool.

The first two TDM measures previously described require modification to the behavioral patterns of individual commuters. The remaining TDM measures result from employers allowing employees to vary their typical work schedules. All of these options rely on voluntary behavioral changes that would not be reliable enough to solve the transportation increase in traffic volume predicted through 2025.

A CMA was conducted for the parallel facilities that would be affected by the Grand Parkway (Appendix D). The CMA included all TSM and TDM improvements too small to be programmed into H-GAC's travel demand model. The study revealed that TSM and TDM improvements are not expected to substantially improve the LOM.

The TDM component of the No-Build Alternative would not address system linkage, expanded capacity, safety, and economic development. Based on currently approved TDM measures in the 2025 RTP, TDM measures by themselves would not adequately meet the need for and purpose of the project.

2.2.1.3 Modal Transportation Improvements

Modal transportation improvements include bus transit, HOV lanes, and rail feasibility. The 2025 RTP recommends a major expansion of the public transit system in the region. The plan incorporates the 2025 METRO Solutions Plan and recommends some service expansions beyond the METRO service area based on increasing population densities.

Bus Transit

Four public transit agencies serve the Houston-Galveston Transportation Management Area (TMA): METRO, Brazos Transit District (BTD), Island Transit, and Connect Transportation. The study area counties are serviced by METRO and BTD. METRO's service area covers most of Harris County and small portions of Fort Bend and Montgomery Counties, and BTD provides park-and-ride service between southern Montgomery County and three main destinations in Houston (Greenway Plaza, Downtown, and the Medical Center). Although BTD utilizes IH 45, it does not provide circumferential service in the study area. System linkage to IH 45 may facilitate easier access to their services.

METRO is the largest public transit agency in the region. Its service area includes most of the study area; however, there are currently no fixed routes (north of FM 1960) within the study area. METRO expands service as demand increases. With projections for increased population, employment, and associated traffic congestion, the study area may be a candidate for future expansion of service. However, commuter use of radial bus transit in the greater Houston area could be facilitated by improved circumferential system linkage provided by the Grand Parkway.

The bus transit improvement component of the No-Build Alternative would not address system linkage, expanded capacity, safety, and economic development. Bus transit improvements by themselves would not adequately meet the need for and purpose of the project.

High-Occupancy Vehicle (HOV) Lane

The HOV lane concept is used in conjunction with an existing roadway, which is experiencing considerable traffic congestion. HOV lanes are most effective when potential ridesharers have common geographic trip origins and destinations within similar time frames. METRO operates HOV lanes in Houston on several radial freeway corridors: US 59 North and South, IH 45 North and South, US 290, and IH 10 West.

The HOV lane concept would not be appropriate because a congested circumferential freeway corridor does not exist within the study area. The HOV lane concept does not adequately address system linkage, expanded capacity, safety, and economic development. The HOV concept would not adequately meet the need for and purpose of the project.

Rail Transit

The rail transit concept is most effective where commuters have common geographic trip origins and destinations. A rail system offering circumferential travel between radial freeways would not have sufficient ridership to make such a plan financially feasible, and such a facility is not currently planned (H-GAC, 2005a).

Since its inception, METRO has been studying the need for and feasibility of rail services within its service area, which includes most of the study area. The 2025 METRO Solutions Plan, which is incorporated into the 2025 RTP, recommends a major expansion of the public transit system in the region, including rail. METRO is studying several major corridors for implementation of a comprehensive rail system. The vision of this proposed system includes both radial and circumferential corridors. However, the success of a rail system implemented in Houston would be based upon its ability to attract ridership from the residential areas to the major employment centers. METRO is currently operating a light rail system connecting Reliant Park to the Texas Medical Center and downtown Houston and is focusing its rail efforts along the existing radial highway corridors. Grand Parkway Segments E, F-1, F-2, and G would serve a different commuter and would provide a direct (circumferential) route between IH 10, US 290, SH 249, IH 45, and US 59 (all of which are radial routes) for residents of Harris and Montgomery Counties. The 2025 METRO Solutions Plan analyzed and tested commuter and rail services for potential ridership along the SH 249 and IH 45 North corridors. The feasibility of a METRO light rail extension along the IH 45 North corridor will be studied in more detail during future RTP updates. A portion of METRO's study area crosses the Grand Parkway near IH 45 and the Hardy Toll Road. If the preferred alternative were to cross the Grand Parkway, the Grand Parkway could be designed to accommodate increased ridership in the corridor. A Major Investment Study (MIS) has also been completed for the US 290 corridor. The locally preferred alternative transportation mode includes increased capacity, but also has proposed an advanced high capacity transit (light rail transit/bus rapid transit). The Grand Parkway could be designed to accommodate increased ridership in the US 290 corridor by supporting park-and-ride facilities and providing access. In addition, METRO continues to evaluate the viability of rail transit in the IH 10 corridor. The 2025 METRO Solutions Plan notes that despite the addition of service lines, "increasing transit capacity alone is not sufficient enough to alter travel behavior to the point where motorists will, with little hesitation, decrease SOV [single-occupancy vehicle] mileage" (H-GAC, 2005a).

The rail transit concept does not adequately address system linkage, expanded capacity, safety, and economic development. However, potential rail transit projects listed in the 2025 RTP along the radial freeways that represent the project termini of the Grand Parkway may benefit from improvements to circumferential roadway travel. The Grand Parkway could facilitate commuter use of park-and-ride lots associated with future rail transit. The rail transit concept would not adequately meet the need for and purpose of the project.

2.2.1.4 Smart Street Alternatives

Smart Streets are a concept developed and introduced into the 2025 RTP as an additional tool to increase mobility, transit access, and safety by providing operational improvements along strategic regional thoroughfares. Smart Street

enhancements would improve mobility through a range of alternatives such as synchronization of traffic signals; construction of roundabouts, medians, or turn bays (dedicated turn lanes); consolidation of duplicate driveways; and, as appropriate, partial grade separation of some traffic lanes at major intersections (H-GAC, 2007a). Some Smart Street enhancement alternatives may require the construction of an entirely new roadway or the acquisition of new ROW to accommodate additional lanes (capacity) or grade separations. Most Smart Street improvements are scheduled for the year 2023 and would take place along collector roadways. Examples of Smart Streets include:

- Segment E – Fry Road, future Louetta Road, and SH 6;
- Segment F-1 – Cypress Rosehill Road, FM 2920, and FM 1960;
- Segment F-2 – Louetta Road, Stuebner-Airline Road, FM 1960, Kuykendahl Road, and FM 2920; and
- Segment G – FM 1960, Kingwood Drive, Treaschwig, FM 1314, and SH 242.

The Smart Street component of the No-Build Alternative would provide operational improvements along collector roadways, including several within the traffic study area. Although these enhancements would add capacity and improve mobility at specific locations, the enhancements would provide minimal system linkage because none of the roadways are continuous and many begin or end between radial facilities. Smart Street enhancements would not provide additional circumferential capacity to handle the expected increase in traffic. As indicated in H-GAC's 2025 RTP, Smart Street enhancements do not address system linkage and would not promote economic development for the next 15 to 20 years. The impact to business and commerce from Smart Streets is not fully known; the implementation of Smart Streets could displace businesses as existing ROW is expanded to accommodate new lanes, grade separations, or new construction.

2.2.1.5 No-Build Alternative Summary

The No-Build Alternative includes all committed improvements found in the 2025 RTP (H-GAC, 2005a) without Segments E, F-1, F-2, and G and includes TSM, TDM, and modal transportation improvements such as bus transit, HOV lanes, rail, and Smart Streets. Based on an analysis of these components individually and collectively, the No-Build Alternative would improve traffic congestion, travel times, and safety, particularly after 2023 when the majority of Smart Streets are scheduled to be implemented. However, the No-Build Alternative would not adequately address the current regional and/or local circumferential system linkage, expanded capacity, safety, and economic development. Although the No-Build Alternative would not satisfy the need for and purpose of the project, it was retained as a basis for comparison with the alternatives carried forward for detailed study as required by CEQ regulations (40 CFR 1502.14[d]).

2.2.2 Build Alternative

As conceived by TxDOT and the GPA, and as included in various regional planning documents, including the H-GAC 2025 RTP, the Build Alternative consists of a controlled access toll road constructed on a new location. The Build Alternative is being proposed in addition to, not in lieu of, the commitments identified in the No-Build Alternative, including

continuation of the improvements to existing facilities, incorporating the execution of planned and/or committed roadway improvements, TSM, TDM, bus transit, HOV lanes, rail feasibility, and new roadway construction in the study area. The GPA would consider any and all future TSM, TDM, and modal transportation improvements, including future rail park-and-ride lots and/or stations. Committed improvements are those projects included in the 2025 RTP (H-GAC, 2005a). This alternative transportation mode would relieve local and regional congestion, improve mobility and system linkage, and improve safety on congested roadways within the region. The Build Alternative meets the need for and purpose of the project.

A free or non-toll Build Alternative (controlled access, four-lane freeway on new location) was considered, but eliminated from further study. The non-toll Build Alternative would not be consistent with the 2025 RTP that identifies the addition of tolled facilities, including the Grand Parkway, as necessary to address current congestion and future growth in the H-GAC planning region. The 2025 RTP states, "If the 2025 RTP did not include new roads financed by user tolls, congestion would grow by 26%." The implementation of a non-tolled Build Alternative would divert funds allocated for other projects identified in the 2025 RTP and TIP as necessary to meet regional and local transportation improvement objectives. The 2025 RTP recognizes that as the region's travel demand increases, federal and state revenues for building and maintaining freeways will need to be supplemented through the creation of toll facilities to expand the area transportation system. The 2025 RTP is consistent with 2001 Texas legislation Senate Joint Resolution (SJR) 16 that, upon voter approval, amended the Texas State Constitution to create the Texas Mobility Fund and authorized grants and loans of money and issuance of obligations for financing the construction, reconstruction, acquisition, operation, and expansion of state highways, turnpikes, toll roads, toll bridges, and other mobility projects. Given the new financing strategies available under this amendment and the growth of regional toll authorities like the HCTRA and the Fort Bend County Toll Road Authority (FBCTRA), H-GAC has included tolling as an integral part of its financial planning strategy and the Grand Parkway as a component of the 2025 RTP.

2.2.3 Alternative Transportation Modes Eliminated from Detailed Study

The alternatives study process enabled alternatives to be evaluated in several stages so that only the most practicable, those that met the need for and purpose of the project and those that had the potential to minimize adverse environmental impacts, were advanced to the next phase of study. The following alternatives were eliminated from detailed study:

- TSM Alternatives (Park-and-Ride Lots, Ridesharing, HOV facilities, traffic signal coordination, and intersection improvements): While TSM measures are generally considered appropriate in urban areas where the existing facilities operate beyond their designed capacity limits (FHWA, 1987), TSM measures by themselves, based on currently approved TSM measures in the 2025 RTP, would not be adequate to handle the rapid projected growth. Without providing added capacity to handle the expected increase in traffic, the TSM Alternatives would lead to the same congestion posed by the No-Build Alternative.

- TDM Alternatives (Carpooling, Employee Trip Reduction Programs, Compressed Work Weeks, Telecommuting, Flex-Time, and Employer Incentives): All TDM measures rely on behavioral or voluntary changes that would not be reliable enough to solve the large capacity problem expected for the project area. TDM measures would not address the regional and interstate and intrastate commerce needs of the project and would not address the need for improved system linkage.
- Bus Transit: Bus Transit Alternatives proposed in the 2025 RTP were included in the transportation modeling for the No-Build Alternative. The results of the analysis of the No-Build Alternative (see Section 1 [Project Need and Purpose] of this volume) concluded that a Bus Transit Alternative would not meet the need for and purpose of this project.
- HOV Lanes: HOV strategies are most effective on freeway type facilities that experience recurring congestion. No such facility currently exists in the Grand Parkway corridor. However, HOV strategies could be incorporated into the Grand Parkway as congestion warrants in future years.
- Rail Transit: Rail Transit Alternatives are most effective when oriented in a radial fashion to serve commuters during peak hours traveling into and out of the central business core of a city. A Rail Transit Alternative positioned in a circumferential orientation, as in the study corridor, is not expected to have enough ridership to satisfy the need for and purpose of the project.
- Smart Street Alternatives: The Smart Street component of the No-Build Alternative would provide minimal system linkage and expanded circumferential capacity. In addition, Smart Street enhancements would not promote economic development for the next 15 to 20 years, and their impact to business and commerce is not fully known. The implementation of Smart Streets could displace businesses as existing ROW is expanded to accommodate new lanes, grade separations, or new construction. Therefore, this alternative does not meet the need for and purpose of the project.

2.2.4 Alternative Transportation Modes Advanced for Further Study

2.2.4.1 No-Build Alternative

The No-Build Alternative does not include construction of the Grand Parkway Segments E, F-1, F-2, and G. This alternative transportation mode consists of a continuation of the existing transportation facilities and incorporates the execution of planned and/or committed roadway improvements, TSM, TDM, modal transportation improvements, and new roadway construction in the project area. Committed improvements are those projects included in the 2025 RTP (H-GAC, 2005a) excluding new construction of the Grand Parkway. The No-Build Alternative includes short-term, minor restoration activities such as resurfacing, bridge repairs, and minor road widening. These improvements are already a part of the ongoing plan for the continued operation of the existing roadway system.

The project area has and will continue to experience growth. The No-Build Alternative would result in high traffic volumes being confined to the existing roadway network leading to increased stop-and-go conditions (i.e., increased congestion). The lack of adequate improvements to system linkage and roadway capacity would result in the No-Build Alternative failing to satisfy the need for and purpose of the project.

As shown in Section 1 (Project Need and Purpose) of this volume, the No-Build Alternative would not reduce existing and future traffic volumes on roadways within the project area. Although the No-Build Alternative would not include the costs to construct the Grand Parkway, the No-Build Alternative would result in higher maintenance costs to existing roadways because of increased traffic volumes on those facilities. The No-Build Alternative would also require additional short-term restoration and safety improvements to enhance the operation of existing roadways. These traffic disruptions on existing facilities for maintenance purposes would be more frequent with the No-Build Alternative and would contribute to higher levels of congestion.

Although the No-Build Alternative would not satisfy the need for and purpose of the project, it was retained as a basis for comparison with the alternative transportation modes carried forward for detailed study as required by CEQ regulations (40 CFR 1502.14[d]).

2.2.4.2 Build Alternative

The Build Alternative would be an approximately 52 miles long, four-lane controlled access toll road with intermittent frontage roads in a 400-foot ROW. Traversing parts of Harris and Montgomery Counties, the proposed new highway would provide access to IH 10, US 290, SH 249, IH 45, and US 59 (radial freeways). Typical sections of the Grand Parkway facility are shown in Exhibit G–42a-b. As described in Volume II, Section 2.3 (Alternative Alignment Study), alternative alignments were developed through public outreach and agency coordination and continuous avoidance and minimization of impacts to sensitive resources. The Build Alternative would also include a continuation of the existing transportation facilities, and incorporate the execution of planned and/or committed roadway improvements. These improvements include TSM, TDM, modal transportation improvements, Smart Streets, and new roadway construction in the project area. Committed improvements are those projects included in the 2025 RTP (H-GAC, 2005a).

The Build Alternative would provide system linkage, expanded capacity to ease circumferential travel around Houston, improved roadway safety, and a relief from barriers to economic development. Thus, the Build Alternative fulfills the need for and purpose of the project and was advanced for further evaluation.

2.2.5 Traffic and Transportation Analysis

In terms of transportation impact, the corridors considered for the Build Alternative have very similar results (i.e., the alternative alignments analyzed in Volume II of each segment's EIS). Therefore, these corridors were treated and analyzed as one Build Alternative in the following section. To accurately show the effects of the proposed Build Alternative, the same traffic study area from Section 1.2 (Detailed Transportation Needs Analysis) of this volume is used in this section.

2.2.5.1 System Linkage

As shown in Section 1 (Project Need and Purpose) of this volume for the year 2015, a total of approximately 4,675,500 daily trips have origins and/or destinations within the overall traffic study area; while in 2025, there are expected to be

approximately 6,155,100 daily trips with origins or destinations within the traffic study area. Of these totals, the model analyses indicated that approximately 23 percent of these total trips would likely benefit from additional circumferential freeway capacity.

An analysis was conducted to determine the total VHT in the traffic study area once the Grand Parkway is constructed. Consistent with personal travel behavior, the model developed by H-GAC distributes traffic to roadways based on the quickest route to their destination. When a facility with high capacity and high speeds becomes congested, trips are distributed to other facilities to save time over the congested roadways. Table 2-3 shows the results of the VHT analysis for the No-Build and Build Alternatives for 2000 (base year), 2010 (No-Build only), 2015, and 2025.

TABLE 2-3
TRAFFIC STUDY AREA VHT*

Facility	2000 (Base Year)	2010 No-Build	2015			2025		
			No-Build	Build	% Change	No-Build	Build	% Change
Interstate Highways / Freeways	171,700	202,500	215,700	210,900	-2%	246,800	238,200	-3%
Principal Arterials	209,700	266,200	279,800	262,600	-6%	388,400	378,600	-3%
Proposed Grand Parkway	N/A	N/A	N/A	25,400	N/A	N/A	33,800	N/A
Collector Roads	77,800	106,000	127,600	113,900	-11%	178,600	167,100	-6%
Total	459,200	574,700	623,100	612,800	-2%	813,900	817,700	0%

Note: * VHT (Vehicle Hours Traveled) is the total of all hours driven by each car in the traffic study area in one day.
Source: H-GAC, 2005a and Study Team, 2005

As shown in Table 2-3, the VHT statistics vary greatly depending on the type of roadway being considered. A new circumferential roadway with capacity like that of the proposed Grand Parkway would be used by travelers to access destinations within the outer suburbs and radial facilities such as IH 10 and IH 45. The Grand Parkway provides a greater benefit to arterials and collector roadways, which show the greatest decrease in VHT because of the improvement in travel time found on the proposed Grand Parkway.

2.2.5.2 Expanded Capacity

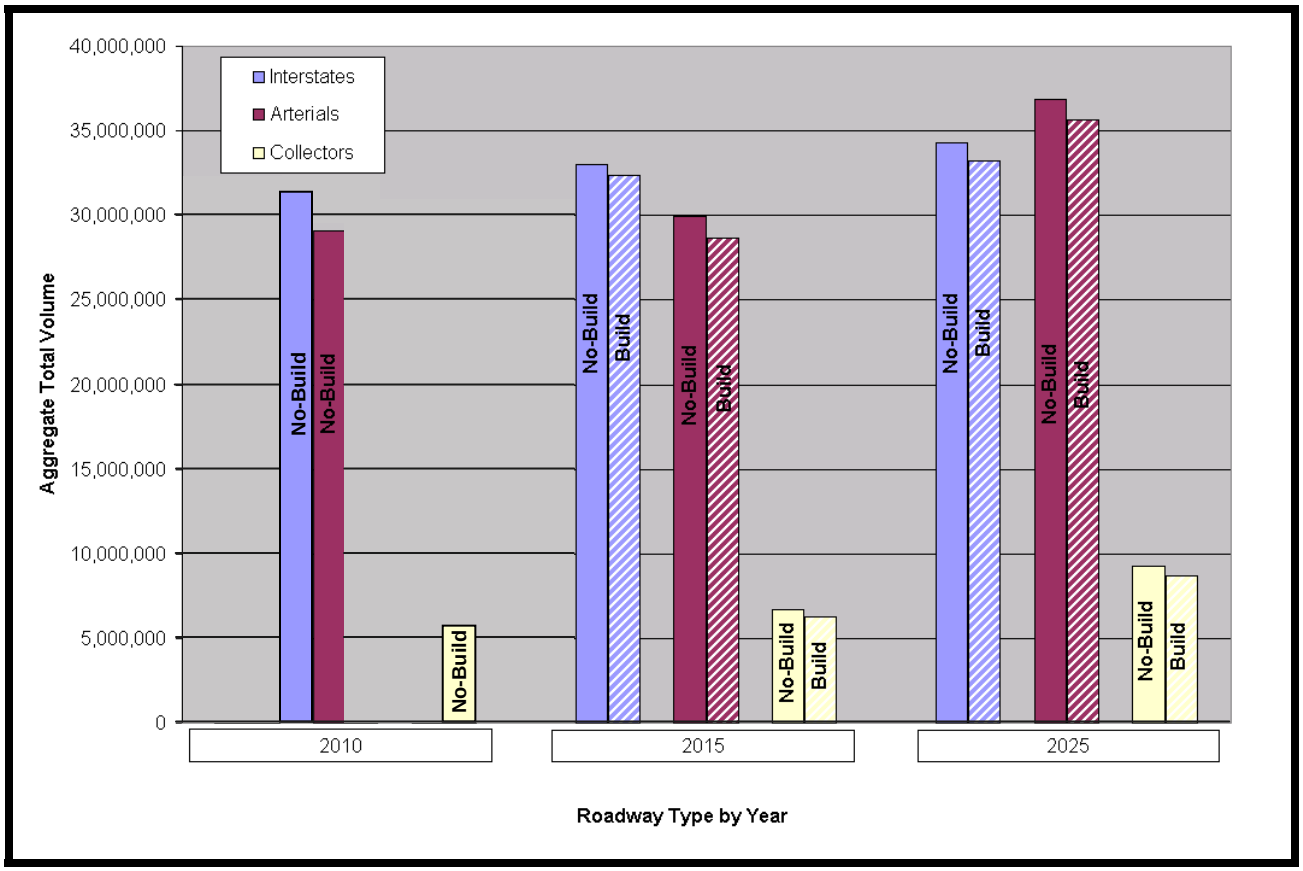
The H-GAC regional travel demand model for the Houston metropolitan area was used to determine the base year traffic and future traffic projections for the No-Build Alternative as well as future traffic projections for the Build Alternative. Future traffic projections were compared for the No-Build and Build Alternatives to determine the transportation impacts of constructing Segments E, F-1, F-2, and G of the proposed Grand Parkway. H-GAC's model determined traffic volumes on roadway facilities based upon current and projected population and employment data as well as the transportation network available to travelers. The model was refined through the use of an Expert Panel that predicted additional

residential and commercial development under the No-Build and Build Alternatives (see Section 4, Volume I [Indirect and Cumulative Effects]). The expected additional development was converted to population and households and submitted to H-GAC for consideration in their travel demand model runs. The analysis of the area roadways was limited to certain facility types, as described in Section 1.2 (Detailed Transportation Needs Analysis) of this volume.

Table 2-4 presents No-Build and Build Alternative traffic volumes for Segments E, F-1, F-2, and G of the Grand Parkway and other selected roadways for 2000 (base year), 2010 (No-Build only), 2015, and 2025. The No-Build Alternative represents a condition in which all planned improvements in the 2025 RTP are in place excluding the Grand Parkway Segments E, F-1, F-2, and G. The Build Alternative represents a condition in which all planned improvements in the 2025 RTP are in place, including the proposed Grand Parkway.

Figure 2-1 shows a chart of No-Build and Build traffic volumes by facility type for the analysis years. The aggregate total volume represents a sum of the ADT for each segment of roadway, as listed in Table 2-4 and shown in Exhibits G–4, G–6, G–8, and G–10.

FIGURE 2-1
FUTURE NO-BUILD AND BUILD ADT



Source: H-GAC, 2005a and Study Team, 2005

TABLE 2-4
TRAFFIC STUDY AREA BASE YEAR AND FUTURE NO-BUILD AND BUILD ADT BY ROADWAY SEGMENT

Facility	From	To	2000 (Base Year) ADT	2010 No-Build ADT	2015			2025		
					No-Build ADT	Build ADT	% Change from No-Build	No-Build ADT	Build ADT	% Change from No-Build
Interstates										
IH 10	Katy-Fort Bend	SH 99	56,000	64,700	66,300	65,700	-1%	80,300	81,200	1%
	SH 99	SH 6	107,100	97,600	112,200	106,100	-5%	119,400	113,000	-5%
	SH 6	Beltway 8	211,100	194,800	212,200	207,500	-2%	227,800	221,600	-3%
	Beltway 8	IH 610	216,900	224,800	241,300	242,600	1%	258,800	256,100	-1%
IH 610	IH 10	US 290	356,300	392,700	127,700	128,600	1%	167,500	158,100	-6%
	US 290	SH 249	203,300	218,400	248,200	247,800	0%	269,900	264,200	-2%
	SH 249	IH 45	178,900	204,400	219,000	218,500	0%	239,500	233,500	-3%
	IH 45	US 59	196,500	167,700	182,900	182,700	0%	199,600	196,100	-2%
IH 45	North of SH 99	SH 99	146,700	194,900	233,200	210,300	-10%	244,600	241,500	-1%
	SH 99	FM 1960	127,300	144,400	170,300	163,600	-4%	177,400	166,200	-6%
	FM 1960	Beltway 8	180,400	200,300	219,400	211,900	-3%	224,600	209,800	-7%
	Beltway 8	IH 610	213,300	218,400	231,400	231,000	0%	256,400	251,300	-2%
Principal Arterials										
US 290	Katy Hockley Rd	SH 99	36,600	54,200	62,700	67,100	7%	73,400	80,800	10%
	SH 99	FM 1960	72,400	87,400	88,800	82,100	-8%	120,700	105,700	-12%
	FM 1960	Beltway 8	130,200	132,100	135,900	129,100	-5%	164,200	148,200	-10%
	Beltway 8	IH 610	203,700	209,400	236,400	235,900	0%	266,400	255,400	-4%
SH 249	FM 2920	SH 99	21,100	17,000	41,000	41,600	1%	53,500	50,700	-5%
	SH 99	Spring-Cypress Rd	35,700	52,500	60,000	62,800	5%	74,000	75,400	2%
	Spring-Cypress Rd	FM 1960	60,820	83,800	73,500	68,900	-6%	103,100	91,900	-11%
	FM 1960	IH 45	38,600	42,400	39,900	40,000	0%	59,400	62,100	5%
US 59	North of SH 99	SH 99	54,900	50,300	58,800	61,600	5%	66,100	74,100	12%
	SH 99	FM 1960	115,700	135,600	145,400	125,200	-14%	157,100	144,600	-8%
	FM 1960	Beltway 8	141,100	159,600	177,100	171,100	-3%	202,400	187,800	-7%
	Beltway 8	IH 610	185,000	175,300	189,400	190,800	1%	215,000	208,400	-3%
SH 6	IH 10	US 290	55,100	62,100	72,100	69,800	-3%	85,900	85,000	-1%
FM 1960	US 290	SH 249	42,500	51,900	58,500	58,000	-1%	72,400	71,700	-1%
	SH 249	IH 45	54,600	60,300	61,300	61,100	0%	70,500	72,800	3%
	IH 45	US 59	47,800	63,600	69,900	57,500	-18%	70,700	75,100	6%
Beltway 8	IH 10	US 290	93,000	106,800	109,600	97,800	-11%	131,300	127,100	-3%
	US 290	SH 249	73,300	86,600	84,600	71,700	-15%	99,100	93,100	-6%
	SH 249	IH 45	62,500	92,800	86,900	67,500	-22%	110,200	103,400	-6%
	IH 45	US 59	39,400	77,700	91,700	77,700	-15%	125,600	113,800	-9%

TABLE 2-4 (CONT.)
TRAFFIC STUDY AREA BASE YEAR AND FUTURE NO-BUILD AND BUILD ADT BY ROADWAY SEGMENT

Facility		From	To	2000 (Base Year) ADT	2010 No-Build ADT	2015			2025		
						No-Build ADT	Build ADT	% Change from No-Build	No-Build ADT	Build ADT	% Change from No-Build
Hardy Toll Road		IH 45	SH 99	26,500	35,200	32,400	24,100	-26%	41,000	46,000	12%
		SH 99	FM 1960	31,800	40,700	38,100	41,800	10%	48,000	67,300	40%
		FM 1960	Beltway 8	37,200	40,400	33,600	33,600	0%	50,400	56,800	13%
		Beltway 8	IH 610	45,700	41,000	33,300	33,600	1%	58,600	64,400	10%
Grand Parkway											
Proposed Grand Parkway	E	IH 10	US 290	N/A	N/A	N/A	33,400	N/A	N/A	38,400	N/A
	F-1	US 290	SH 249	N/A	N/A	N/A	26,400	N/A	N/A	31,000	N/A
	F-2	SH 249	IH 45	N/A	N/A	N/A	45,100	N/A	N/A	59,500	N/A
	G	IH 45	US 59	N/A	N/A	N/A	43,400	N/A	N/A	64,500	N/A
Minor Arterials											
SH 242		FM 1488	IH 45	26,900	18,700	25,500	24,000	-6%	28,500	28,800	1%
		IH 45	FM 1314	13,300	15,700	17,100	15,200	-11%	29,300	25,800	-12%
Collector Roadways/Smart Streets											
FM 529/Freeman Rd		Katy Hockley Rd	SH 99	4,400	2,100	3,000	2,600	-13%	8,100	4,500	-44%
		SH 99	Barker Cypress Rd	14,000	22,500	26,100	25,600	-2%	32,700	27,600	-16%
Louetta		Kuykendahl Rd	IH 45	14,200	18,300	22,500	20,500	-9%	33,600	33,200	-1%
Spring-Cypress Rd		Kuykendahl Rd	IH 45	9,000	21,100	24,600	21,500	-13%	21,200	20,200	-5%
Barker Cypress Rd		IH 10	FM 529/Freeman Rd	10,900	19,100	21,400	20,200	-6%	29,200	28,200	-3%
		FM 529/Freeman Rd	US 290	8,800	19,300	23,600	19,500	-17%	22,000	22,900	4%
Katy Hockley Rd		IH 10	FM 529/Freeman Rd	8,400	16,800	19,200	17,100	-11%	21,200	20,400	-4%
Fry Road		IH 10	FM 529/Freeman Rd	11,000	11,800	20,300	19,400	-4%	45,400	42,900	-6%
Telge Road		Louetta	Spring-Cypress Rd	20,000	19,100	21,400	21,000	-2%	27,500	28,400	3%
Grant Road		Spring-Cypress Rd	Louetta Rd	3,900	1,000	2,300	2,200	-4%	5,500	5,400	-2%
		Louetta Rd	SH 249	8,900	12,900	16,500	15,900	-4%	19,200	19,800	3%
Mueschke Rd		US 290	SH 99	1,500	9,100	8,900	6,200	-30%	9,600	6,300	-34%
		SH 99	FM 2920	2,900	9,800	9,900	11,600	17%	12,000	16,000	33%
Cypresswood Dr		Kuykendahl Rd	IH 45	21,200	26,300	24,900	25,300	2%	30,300	30,500	1%
FM 2920		US 290	SH 249	8,000	11,200	13,000	12,100	-7%	22,500	22,000	-2%
		SH 249	SH 99	19,800	19,400	25,100	22,900	-9%	32,400	26,800	-17%
		SH 99	Kuykendahl Rd	16,100	11,500	19,700	14,000	-29%	16,600	9,600	-42%
		Kuykendahl Rd	Spring-Cypress Rd	20,300	19,000	21,600	17,100	-21%	27,600	21,700	-21%
Kuykendahl Rd		FM 2920	Spring-Cypress Rd	17,200	22,300	26,200	24,700	-6%	40,200	31,600	-21%
		Spring-Cypress Rd	Spears/IH 45	20,500	20,500	22,000	22,100	0%	33,900	30,300	-11%

TABLE 2-4 (CONT.)
TRAFFIC STUDY AREA BASE YEAR AND FUTURE NO-BUILD AND BUILD ADT BY ROADWAY SEGMENT

Facility	From	To	2000 (Base Year) ADT	2010 No-Build ADT	2015			2025		
					No-Build ADT	Build ADT	% Change from No-Build	No-Build ADT	Build ADT	% Change from No-Build
Eldridge Parkway	IH 10	FM 529/Freeman Rd	21,200	25,500	29,000	28,500	-2%	50,600	52,300	3%
	FM 529/Freeman Rd	US 290	15,900	23,700	27,400	27,100	-1%	36,800	36,200	-2%
	US 290	FM 1960	29,300	30,300	34,600	34,500	0%	47,700	48,800	2%
	FM 1960	Spring-Cypress Rd	9,400	6,600	8,800	8,700	-1%	15,500	17,500	13%
Spring Stuebner Rd	FM 2920	IH 45	10,100	10,000	12,100	8,100	-33%	13,600	10,000	-26%
Boudreaux Rd	Telge Rd	SH 249	4,900	6,200	9,200	9,000	-2%	7,900	9,500	20%
FM 1488	US 290	SH 249	4,500	7,600	8,400	7,700	-8%	13,300	11,100	-17%
	SH 249	Kuykendahl Rd	14,800	16,500	18,300	21,200	16%	19,500	25,000	28%
	Kuykendahl Rd	IH 45	13,100	25,900	28,400	25,100	-12%	36,000	30,600	-15%

Source: H-GAC, 2005a

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Interstate Highways showed an increase in projected traffic volumes from the base year to 2025 (see Table 2-4 and Figure 2-1). However, if the proposed Grand Parkway were constructed, these traffic volumes are expected to decrease by as much as 10 percent in 2015 and 7 percent in 2025.

The total projected change in ADT for Interstate Highways because of the proposed Grand Parkway was also calculated. The results show that there is an overall decrease in daily interstate travel of 2 percent in 2015 and 3 percent in 2025 as the proposed Grand Parkway diverts traffic away from congested facilities to roadways that have available capacity. With the addition of the proposed Grand Parkway, interstate facilities see a decrease in traffic in 2015 and 2025 compared to the No-Build Alternative for the same years.

Arterials (principal and minor as defined in Section 1.2 [Detailed Transportation Needs Analysis] of this volume) are projected to decrease by as much as 26 percent in 2015 and 12 percent in 2025 should the proposed Grand Parkway be built. In 2015, the total ADT on arterials would decrease by 5 percent from the No-Build Alternative to the Build Alternative, while the proposed Grand Parkway is expected to carry as many as 45,100 vehicles. By 2025, an overall ADT decrease of 2 percent is seen on arterials between the No-Build and Build Alternatives, and the proposed Grand Parkway is projected to carry up to 59,500 vehicles per day. In all future year scenarios, the proposed Grand Parkway would alleviate congestion on principal arterials compared to the No-Build Alternative for the same years.

Collector roadways are the lowest functional class of facilities investigated in this study, and a majority of these carries an east-west movement throughout suburban Houston. These roads show the greatest benefit from the proposed Grand Parkway because they are parallel to the proposed facility. In 2015, the additional capacity provided by the Grand Parkway will draw up to 33 percent of traffic away from parallel circumferential facilities, especially lower classified roadways. In the year 2025, new circumferential capacity will attract up to 44 percent of traffic on parallel roadways (see also Figure 2-1). In 2015, the total ADT on collector roadways shows a decrease of 7 percent between the No-Build and Build Alternatives. The difference between the No-Build and Build Alternatives shows a decrease of 6 percent in 2025. The proposed Grand Parkway diverts traffic from congested collector roadways to the new circumferential capacity. In addition, congestion on radial facilities will also improve in many places. This improvement is due to travelers not having to use these radial facilities to access “out-of-the-way” circumferential roadways when the Grand Parkway is constructed.

The construction of the proposed Grand Parkway would increase the percentage of roadways operating under “tolerable” conditions while decreasing the percentage of roadway miles operating at “serious” and “severe” conditions for the years 2015 and 2025 (see Table 2-5).

In 2015, the percentage of collector roadway miles operating at tolerable conditions increases from 36 percent to 52 percent (16 percent improvement), and the percentage of collector facilities functioning at serious and severe conditions decreases from 43 percent to 32 percent (11 percent improvement). Notably, the lower classified facilities receive the most overall benefit from the proposed Grand Parkway.

The Grand Parkway would improve the total roadway miles operating at tolerable conditions by 13 percent in 2015 under the Build Alternative, while decreasing total roadway miles functioning at serious and severe conditions by 10 percent in 2015. However, in 2025 the percentage of total roadway miles operating at a tolerable condition would increase by only 3 percent, while the percentage of total roadway miles operating at a serious or severe condition would remain the same for both the No-Build and Build Alternatives. The lack of improvement between 2015 and 2025 could be attributed to the implementation of Smart Streets in the 2023-2025 time frame, which could offset the additional capacity provided by the Grand Parkway. The Build Alternative LOM is shown in Exhibits G–16 and G–17.

TABLE 2-5
TRAFFIC STUDY AREA BASE YEAR AND FUTURE NO-BUILD AND BUILD LOM BY FACILITY TYPE

LOM	2000 (Base Year)		2010 (No-Build Only)		2015		2025[1]	
Interstates								
Tolerable	70%	N/A	83%	N/A	72%	74%	77%	80%
Moderate	10%	N/A	14%	N/A	22%	20%	14%	11%
Serious	14%	N/A	3%	N/A	6%	6%	9%	9%
Severe	6%	N/A	0%	N/A	0%	0%	0%	0%
Principal Arterials								
Tolerable	80%	N/A	81%	N/A	82%	84%	85%	84%
Moderate	10%	N/A	8%	N/A	5%	6%	7%	7%
Serious	6%	N/A	8%	N/A	10%	7%	6%	7%
Severe	4%	N/A	3%	N/A	3%	3%	2%	2%
Proposed Grand Parkway								
Tolerable	N/A	N/A	N/A	N/A	N/A	100%	N/A	100%
Moderate	N/A	N/A	N/A	N/A	N/A	0%	N/A	0%
Serious	N/A	N/A	N/A	N/A	N/A	0%	N/A	0%
Severe	N/A	N/A	N/A	N/A	N/A	0%	N/A	0%
Minor Arterials								
Tolerable	34%	N/A	45%	N/A	39%	44%	34%	34%
Moderate	33%	N/A	12%	N/A	6%	18%	23%	31%
Serious	14%	N/A	27%	N/A	35%	18%	23%	19%
Severe	19%	N/A	16%	N/A	20%	20%	20%	16%

TABLE 2-5 (CONT.)
TRAFFIC STUDY AREA BASE YEAR AND FUTURE NO-BUILD AND BUILD LOM BY FACILITY TYPE

LOM	2000 (Base Year)		2010 (No-Build Only)		2015		2025[1]	
Collector Roadways/Smart Streets								
Tolerable	65%	N/A	59%	N/A	36%	52%	77%	77%
Moderate	15%	N/A	21%	N/A	21%	16%	15%	13%
Serious	13%	N/A	15%	N/A	31%	24%	7%	8%
Severe	7%	N/A	5%	N/A	12%	8%	1%	2%
Total Roadway Miles[2]								
Tolerable	69%	N/A	69%	N/A	56%	69%	78%	81%
Moderate	14%	N/A	15%	N/A	15%	12%	13%	10%
Serious	11%	N/A	12%	N/A	21%	14%	7%	7%
Severe	6%	N/A	4%	N/A	8%	5%	2%	2%

Notes: Unshaded cells = No-Build; Shaded cells = Build

[1] By 2025, unless funding sources are identified for major projects in the 2025 RTP (such as Smart Streets), more roadways, particularly collector roadways/Smart Streets, would operate at less than tolerable conditions (i.e., with a Moderate, Serious, or Severe LOM). See Volume I, Section 1.2.2, particularly the trend-line analysis presented in Figure 1-4, for further explanation.

[2] Total roadway miles based on a weighted average.

Source: H-GAC, 2005a and Study Team, 2005

2.2.5.3 Safety

An accident analysis was conducted to determine how travel safety would be affected by new circumferential freeway capacity. Nationally, freeways have lower accident rates per number of vehicles than lower classified roads because of the design of the freeway, fewer access points, fewer driver distractions, and less stop-and-go conditions. Consequently, it can be determined that moving traffic from lower classified facilities, such as collector roadways, to higher classified roadways, such as freeways, including toll roads, would reduce the accident rate in the area. See the complete discussion of safety issues in Section 1.2.3 (Safety) of this volume. Table 2-6 shows examples of frequent accident locations and the amount of traffic diverted by the proposed Grand Parkway.

TABLE 2-6
LOCATIONS IN THE TRAFFIC STUDY AREA WITH HIGH ACCIDENT RATES

Roadway			Number of Crashes[1]	% Change in ADT as a Result of Building the Grand Parkway	
Facility	From	To		2015	2025
SH 6 [2]	IH 10	FM 1960	1,294	-3%	-1%
FM 1960	US 290	SH 249	738	-1%	-1%
	IH 45	US 59	971	-18%	+6%
FM 529/Freeman Rd [2]	Katy Hockley Rd	SH 6	325	-3%	-21%
Katy Hockley Rd [2]	IH 10	US 290	19	-11%	-4%
Fry Rd	IH 10	FM 529/Freeman Rd	88	-4%	-6%
Barker Cypress Rd	IH 10	US 290	126	-12%	<1%
FM 2920	US 290	SH 249	279	-7%	-2%
	SH 249 [2]	IH 45 [2]	564	-19%	-24%
Spring-Cypress Rd [2]	US 290	SH 249	33	-13%	-5%
	SH 249	FM 2920	110		
Louetta Rd [2]	SH 249	Cypresswood Dr	236	-9%	-1%
Telge Rd [2]	US 290	FM 2920	41	-2%	+3%
Grant Rd	Spring-Cypress Rd	SH 249	73	-4%	+2%
Cypresswood Dr [2]	SH 249	IH 45	64	+2%	+1%
	IH 45	FM 1960	39		
Mueschke Rd	US 290	FM 2920	5	-5%	+3%
Boudreaux Rd/ Spring Stuebner Rd [2]	Kuykendahl Rd	IH 45	67	-33%	-26%

Notes: [1] Represents years 1999 through 2001, the most recent dataset available.
[2] ADT figures represent a portion of the high crash segment rather than the entire high crash segment because of the different source data.
Source: H-GAC, 2005c

As shown in Table 2-6, traffic on most of these roadways with high accident rates would be reduced in 2015 by as much as 33 percent. These vehicles would not be eliminated from the overall transportation system, but funneled to other facilities with lower national average crash rates (e.g., the proposed Grand Parkway). Therefore, it is likely the crash rate in the traffic study area would decrease with the construction of the Grand Parkway.

2.2.5.4 Individual Segment Analysis

In this section, the individual traffic study areas were investigated based on two alternatives. The 2025 No-Build Alternative represents a condition in which all planned improvements in the 2025 RTP are in place excluding the Grand Parkway. The 2025 Build Alternative represents a condition in which all planned improvements are in place, including the specific segment.

Travel demand models were obtained from H-GAC for the SIUs analyses. These models include all of the projects programmed in the 2025 RTP as well as the independent Grand Parkway segment being analyzed. For example, the model for the Segment G analysis includes only the segment from IH 45 to US 59. The anticipated volumes for each SIU are shown in Table 2-7.

TABLE 2-7
2025 SIU TRAFFIC

Segment	2025 SIU ADT Volume
E	19,900
F-1	9,900
F-2	32,300
G	53,700

Source: H-GAC, 2005a

Segment E

This traffic study area is bounded by IH 10 to the south, US 290 to the north, IH 610 to the east, and just east of the Harris/Waller County line to the west. These roadways are the only facilities in the area with an FHWA rating of at least minor arterial. IH 10 and US 290 are two radial freeways leading traffic to and from Houston. SH 6 and Beltway 8 are circumferential roadways, but only serve the eastern part of the Segment E traffic study area. Other circumferential roadways in this area consist of small, county roads with less capacity and lower speeds. Development is expected to occur in the eastern portion of the traffic study area, closer to Houston and in the southern portion near existing SH 99. The origin/destination study shows that of the approximately 975,600 trips generated to/from the Segment E traffic study area, approximately 15 percent (144,200) are engaged in circumferential movement and could benefit from Segment E.

Segment F-1

This traffic study area is bounded by US 290 to the west, SH 249 to the east, IH 610 to the south, and just beyond the proposed Grand Parkway to the north. The development in this region is expected to be primarily residential, and is expected to occur mostly along the existing transportation network, adding traffic to the already congested roadways. US 290 and SH 249 serve as radial roadways, allowing travelers to move to and from the Houston metropolitan area, while farther in the southeastern part of the traffic study area, FM 1960 and Beltway 8 serve as the only highly classified circumferential roadways. The origin/destination analysis shows that of the approximately 846,000 trips generated to/from the Segment F-1 traffic study area, approximately 13 percent (113,800) are engaged in circumferential movement and could benefit from Segment F-1.

Segment F-2

The Segment F-2 traffic study area is bounded by SH 249 to the west, IH 45 to the east, IH 610 to the south, and just beyond the proposed Grand Parkway to the north. Commercial and industrial growth is expected as residential development is projected for future years. SH 249 and IH 45 serve as the primary radial roadways allowing travelers to get into or out of Houston. Circumferential roadways consist of primarily collector facilities in the center of the region that are expected to be saturated in the design year 2025. The origin/destination study shows that of the approximately 1,452,200 trips generated to/from the Segment F-2 traffic study area, approximately 20 percent (289,300) are engaged in circumferential movement and could benefit from Segment F-2.

Segment G

This traffic study area is bounded by IH 45 to the west, US 59 to the east, IH 610 to the south, and just beyond the proposed Grand Parkway segment to the north. The most intensive development in this sub-area is found along the existing transportation network and is primarily residential. IH 45 and US 59 are radial freeways that allow travelers access to Houston. FM 1960 and Beltway 8 are the only circumferential roadways in the area and are located to the far south forcing roadway users to travel out of their way to access them. The origin/destination study shows that of the approximately 1,672,900 trips generated to/from Segment G traffic study area, approximately 36 percent (607,900) are engaged in circumferential movement and could benefit from Segment G.

2.2.5.5 Traffic Analysis Summary

As population and employment continue to expand to the outer regions of the Houston metropolitan area, travel patterns show a change in orientation. An analysis of travel origins and destinations shows that a large number of trips are occurring circumferentially in the region as jobs follow housing. Even those trips destined for the core of the Houston metropolitan area need to move laterally across the region to access radial facilities that become less dense in the outer suburbs.

The roadway network would fail to meet the needs of future travelers even with the improvements described in the 2025 RTP. Construction of the proposed Grand Parkway would provide a beneficial impact on travel conditions in the context of traffic volume, traffic operations (LOM), system linkage, safety, and travel time. All of these attributes have a direct impact on quality of life for those living in, working in, traveling through, and visiting the Houston metropolitan area.

The following includes a summary of the transportation impacts of the proposed Grand Parkway:

- The volumes on a majority of roadways in the traffic study area are expected to decrease substantially following the construction of the proposed Grand Parkway. This trend is especially true on collector roadways on which traffic volumes are expected to decrease by as much as 44 percent (Table 2-4).

- The outlined decrease in traffic volume would allow the existing facilities to operate more efficiently. With the Grand Parkway, the number of total roadway miles operating at tolerable conditions in the traffic study area is expected to increase by 13 percent in 2015 and 3 percent in 2025 (Table 2-5).
- The origin/destination study showed that approximately 23 percent of trips with an origin or destination in the traffic study area could benefit from additional circumferential capacity in the region. These travelers would take advantage of the proposed facility, as evidenced by the projected traffic volumes shown for the Grand Parkway.
- Under the Build Alternative, the amount of time spent traveling on lower classified facilities (such as collector roadways) in the traffic study area would decrease by a total of 11 percent in 2015 and 6 percent in 2025, with some specific classes of roadway experiencing much greater reductions. This trend directly affects quality of life as travelers have increased time for other interests (Table 2-3).
- Nationally, lower classified facilities, such as collector roadways, have higher accident rates than facilities such as principal arterials and interstates due to more frequent turns, stop-and-go conditions, roadway distractions, and lack of access control. Many of these roadways also run circumferentially around the Houston metropolitan area, parallel to the proposed Grand Parkway. As seen in Table 2-6, if a new circumferential freeway were constructed, traffic would be diverted to the less congested and safer new facility, resulting in reduced accident rates for these areas and the region.
- In addition to these positive impacts, construction of the Grand Parkway would also provide better access to park-and-ride facilities to encourage car-pooling and HOV lane usage on radial facilities, as well as improve access to planned radial rail systems and transit routes reducing traffic on radial roadways.
- If individual segments of the Grand Parkway were constructed independently, many of the outlined patterns are realized, but to a lesser degree. There is a cumulative benefit to providing contiguous segments of the proposed Grand Parkway.

2.2.6 Preferred Alternative Transportation Mode

The environmental study process was a complex, interdisciplinary effort that involved public outreach, environmental resource mapping, socioeconomic studies, and detailed analysis. Exhibit G–3 shows the multi-step study process, which allows the examination of a full range of alternatives at both the corridor (see Section 2.1 in this volume [Corridor Study]) and the alignment (Volume II of this FEIS) levels, with increasing detail as the study has progressed. This process has enabled alternatives to be evaluated in several stages so that only the most practicable, those that met the need for and purpose of the project and those that had the potential to minimize adverse environmental impacts, were advanced to the next phase of study.

Based on the conclusions summarized in Section 2.2.3 (Alternative Transportation Modes Eliminated from Detailed Study) and the traffic analysis summarized in Section 2.2.5 (Traffic and Transportation Analysis), the Build Alternative was selected as the Preferred Alternative Transportation Mode. The Build Alternative is the only alternative transportation mode that would satisfy the need for and purpose of the project. Although the No-Build Alternative would not satisfy the need for and purpose of the project, it was retained as a basis for comparison with the Build Alternative throughout the analysis of environmental impacts (detailed in Volume II, Section 4 [Environmental Consequences]) as required by CEQ regulations (40 CFR 1502.14[d]). Evaluation of different Build Alternative alignments is presented for an individual segment in Volume II, Section 2 [Alternatives Analysis] of the FEIS.

SECTION 3: AFFECTED ENVIRONMENT

This section presents baseline information for the existing affected environments common to all four segments under study. Detailed information regarding the existing affected environment particular to each segment is presented in Volume II, Section 3 (Affected Environment) of this FEIS. By definition, the project area includes the area bounded by the selected Preferred Alternative Corridor, within which alternative alignments have been located. For each of the 20 technical and scientific disciplines in this section, baseline information is presented for the project area for both the No-Build and Build Alternatives where the Grand Parkway has been proposed.

Information is presented in technical and scientific disciplines with respect to the existing physical, biological, and human environments that may be affected by the Grand Parkway within Segments E, F-1, F-2, and G. These technical and scientific disciplines include: Land Use and Transportation Planning; Geology, Soils and Farmland; Social Characteristics; Economics; Pedestrians and Bicyclists; Air Quality; Existing Noise Environment; Water Quality; Permits; Wetlands and Vegetative Communities; Wildlife; Floodplains; Wild and Scenic Rivers; Coastal Barriers; Coastal Zone Management; Essential Fish Habitat (EFH); Threatened and Endangered Species; Cultural Resources; Hazardous Materials; and Visual and Aesthetic Qualities.

3.1 LAND USE AND TRANSPORTATION PLANNING

3.1.1 Historical Development Patterns

Over the last 30 years, the Houston region has become a central city surrounded by “edge cities” large enough to support retail and labor markets of their own. The lower cost of land increasingly farther away from central Houston in Harris County and in surrounding counties has attracted residential development. As bedroom communities grew through the 1980s, the decentralization or sprawling development pattern of Houston continued as jobs and retail sales began to follow homeowners to the suburbs.

Much of the area in the Houston vicinity has been developed in a “leap frog” pattern. New subdivisions are built in outlying areas, where the cost of land is less prohibitive, while more expensive land closer to the city is still undeveloped. Consequently, land in the region is developed if it is relatively close to existing subdivisions, is near transportation arteries, and is large enough to make the private construction of stand-alone infrastructure economically efficient (Wilbur Smith Associates, 1999). For more detail on historic land use patterns, see Section 4.2.1.1 (The Land Use Forecast Process: Assumptions and Methods) of this volume.

This type of growth (i.e., master-planned communities developed by private entities) is occurring in the project area. Planned communities are large enough to lower per unit costs for private development of capital infrastructure while at the same time offering open space and community facilities. Often, once these communities are established and operating, they are annexed by surrounding cities in efforts to improve that city’s tax base (Wilbur Smith Associates, 1999).

The project area falls within the Houston-Galveston-Brazoria CMSA, consisting of three Primary Metropolitan Statistical Areas (PMSAs): Houston, Galveston-Texas City, and Brazoria. The project area lies completely within Harris and Montgomery Counties, with approximately 76 percent of the project area occurring within Harris County, and approximately 24 percent occurring within Montgomery County. Most of the project area falls within the city of Houston's Extra-Territorial Jurisdiction (ETJ), while relatively small portions fall within the city of Tomball's ETJ and within unincorporated areas of Montgomery County. None of the project area is within the city limits of the city of Houston.

Within the portions of the project area that are in the city of Houston's ETJ, review and approval of new subdivisions is a joint responsibility of the city of Houston and either Harris or Montgomery County depending on the location of the property. The subdivision review process is consolidated into one process with both the city of Houston and each county participating in the review and approval and each providing specific subdivision platting guidelines (Chapter 242, Texas Statutes, Local Government Code). The city of Houston's subdivision ordinance applies within the city's ETJ. Within the portions of the project area that are in unincorporated areas of Montgomery County, approval of new subdivisions is the responsibility of Montgomery County. Montgomery County has adopted a subdivision ordinance that applies within unincorporated areas of the county. In the portion of the project area that has been annexed into the city of Tomball's ETJ, subdivision review is a joint responsibility shared by the city of Tomball and Harris County. The city of Tomball has adopted a subdivision ordinance that will be applicable within this area. There are no government agencies that have adopted zoning ordinances affecting land development within any part of the project area. All subdivision plats, no matter where they are located, are recorded at the applicable County Clerk's office.

In the Houston area, Municipal Utility Districts (MUDs) are frequently formed as a way to build and finance new master-planned subdivision communities. A MUD is a political subdivision of the state of Texas authorized by the TCEQ to provide water, sewage treatment, drainage, and other services within the MUD boundaries. In addition, MUDs typically build and maintain roads within their boundaries, and they have the authority to issue bonds (or other forms of debt) and to levy taxes in order to pay for public services or improvements within their boundaries. However, MUDs do not have the authority to regulate land development within their boundaries. Therefore, new subdivisions located in MUDs in the project area will be subject to county and/or city subdivision requirements that are no different from other subdivisions in the area.

3.1.2 Agricultural Land Use

The 2002 Census of Agriculture reports that 304,868 acres of land within Harris County are under farm ownership. The total market value of agricultural products sold in 2002 was $52,878,000, which was a 17.1 percent increase over that of 1997. In 2002, crop sales accounted for 66.2 percent of the market value of all agricultural products sold in the county, while livestock and poultry (and their products) sales accounted for 33.8 percent. Beef cattle, horses, nursery plants, and hay are the major agricultural revenue sources within the county (U.S. Department of Agriculture [USDA], 2002).

For Montgomery County, the 2002 Census of Agriculture reports that 197,892 acres of land were under farm ownership. The total market value of agricultural products sold in 2002 was $20,069,000, which was a 21.1 percent increase over that of 1997. In 2002, crop sales accounted for 57.5 percent of the market value while livestock and poultry (and their products) sales accounted for 42.5 percent. Beef cattle, horses, nursery plants, and hay are the major agricultural revenue sources within the county (USDA, 2002).

Within the project area (for Segments E, F-1, F-2, and G) there are 14,492 acres of agricultural land (including both farmland and rangeland), which represents approximately 36 percent of the project area. Farmland covers 6,964 acres, or 18 percent of the project area, while rangeland covers 7,528 acres, or 19 percent of the project area.

3.1.3 Transportation Planning

H-GAC is the MPO for transportation planning in the eight-county Houston-Galveston area, which includes Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties. H-GAC's Transportation Policy Council approves the RTP and TIP. The RTP is a mechanism to help local and state governments and transportation agencies identify transportation investments that will improve mobility, increase safety, and complement community development plans. The 2025 RTP identifies $7.7 billion in priority transportation investments for ports, airports, roadways, and transit systems (H-GAC, 2005a). The Grand Parkway is included in the 2025 RTP.

3.2 GEOLOGY, SOILS, AND FARMLAND

3.2.1 Geology

3.2.1.1 Physiography

The project area is located within the Gulf Coastal Plain physiographic province of Texas. The province ranges in character from a nearly smooth, featureless depositional plain bordered by shallow bays, barrier islands, and beaches along the Gulf of Mexico, to low, rolling hills extending inland to the Balcones Fault Zone. Small stream and larger stream valleys that drain the region interrupt the generally flat relief of the Gulf Coastal Plain. These streams flow through shallow, incised valleys that provide the most notable relief in topography. The West Fork of the San Jacinto River and smaller headwater-eroding streams cut the coastal plain. At some locations, this topographical pattern is interrupted by the presence of such features as salt domes and fault scarps. Some scattered salt domes have surface expression in the form of broad mounds having as much as 100 feet of relief. Faults are common in the region, but generally have little or no surface expression. The natural ground surface slopes coastward and ranges in elevation from about 100 feet above mean sea level (MSL) near the eastern extent of the project to about 215 feet above MSL near the northwestern corner.

3.2.1.2 Stratigraphy and Structure

The project area is located on the northern flank of the Gulf Coast Geosyncline, a major center of sediment deposition since the middle to late Jurassic Period. The sedimentary rock and unconsolidated sediment beneath the project area are more than 30,000 feet thick and differentiated into named stratigraphic units (i.e., formations) that dip and thicken toward the Gulf of Mexico from their landward margins. The younger formations crop out progressively coastward of the older formations and they dip coastward at angles slightly greater than the slope of the land surface. The result is a vertically stacked sequence of offlapped wedges whose outcrops occur as concentric bands that generally parallel the Texas coast.

As mentioned previously, faulting is common in the Gulf Coast Province. The project area crosses one documented fault located along the northern extent of Segment E and along the eastern extent of Segment F-1 (Exhibit G–18). The unnamed fault trends northeast and roughly parallels the contact between the Lissie and Willis Formations. The southern extent of this fault is located approximately three miles from the Hockley Salt Dome, but most likely originated from a major facies change occurring along the boundary of the two unconsolidated formations. The Hockley Salt Dome is the most prominent subsurface feature within the vicinity of the project. Smaller radial faults occur around the dome; however, current documents do not indicate that any of these faults extend eastward to the project area.

3.2.1.3 Subsidence

Land-surface subsidence is another natural geologic process that is a function of the depositional environment of the Texas Coastal Basin. The natural rate of subsidence has been greatly accelerated because of increased utilization of groundwater resources. Excessive groundwater withdrawal is the primary cause of land-surface subsidence. As groundwater is removed, the artesian pressure and piezometric surface decline allowing the water-saturated clay beds in the aquifer to become compressible. As the clay beds are compacted and dehydrated, they undergo a volume reduction that results in subsidence of the overlying land surface. Land subsidence already experienced is irreversible.

According to studies performed by the Harris-Galveston Coastal Subsidence District (HGCSD), the land-surface in the project area has subsided approximately one to two feet between 1906 and 1995 (Exhibit G–19). If groundwater reductions outlined in the HGCSD Regulatory Plan are successfully implemented, predicted ground subsidence, adjacent to the Preferred Alternative Corridor, in the year 2030 would range from slightly less than 18 inches to as much as 24 inches below 1995 elevations. If the HGCSD Plan is not successfully implemented and groundwater withdrawals continue to increase, the predicted subsidence in the year 2030 is expected to range from 18 inches to as much as 48 inches below 1995 elevations. Subsidence specific to individual Grand Parkway segments is addressed in Volume II of the FEIS for each segment.

3.2.2 Soils

The USDA Soil Surveys of Harris and Montgomery Counties indicate the project area includes the following soil associations: Katy-Aris, Clodine-Addicks-Gessner, Wockley-Gessner, Segno-Hockley, and Aldine-Ozan in Harris County and the Albany-Tuckerman, Tuscumbia, Sorter, and the Splendora-Boy-Segno in Montgomery County. These soils are formed from the parent material on the outcrops of the Lissie, Willis, Beaumont, and Deweyville Formation, and Quaternary alluvium deposits. The depositional origin of these lithologic units includes fluvial, deltaic, and floodplain settings. Specific soil descriptions and whether they are considered hydric are issues addressed in Volume II for each segment.

In Harris County, the Katy-Aris, Clodine-Addicks-Gessner, and Wockley-Gessner soil associations are nearly level soils on prairies. They have a loamy surface layer and loamy or clayey underlying layers. They are somewhat poorly drained and are moderately permeable to very slowly permeable. Many of the soils mapped as the Clodine-Addicks-Gessner association are covered by buildings and other urban structures, while most of the Katy-Aris and Wockley-Gessner associations are used for cultivated crops, native pasture, and improved pasture.

The Segno-Hockley and Aldine-Ozan associations are nearly level to gently sloping, loamy soils on forested uplands. They have a loamy surface layer and loamy or clayey underlying layers. They are moderately well drained to poorly drained and are moderately permeable to very slowly permeable. These associations include the most heavily timbered areas in Harris County. The soils are used mainly for timber production, woodland grazing, and improved pasture.

In Montgomery County, the Splendora-Boy-Segno association consists of broad, nearly level and gently sloping, fine sandy loams and some ridges of fine sand. The soils of this association range from well drained to somewhat poorly drained. This association is used mostly for pine timber, but the better drained soils are well suited to pasture and crops. The Sorter association occurs on flat to slightly depressed areas that have no well-defined drainage patterns. The water table is near the surface during much of the winter and spring, which maintains moisture in the soils. This association is generally used for pine and hardwood timber; however, some development has occurred on isolated sandy ridges.

The Albany-Tuckerman and Tuscumbia associations occur on low stream terraces and adjacent floodplains. The Albany-Tuckerman occupies broad stream terraces, poorly drained flats, and gently sloping, somewhat poorly drained, sandy ridges. This association is used mainly for pine timber. The Tuscumbia association is composed of mostly clayey soils that develop in alluvium, and as a result are subject to overflow. This association is used principally for hardwood timber. Large acreages have been cleared for pasture, but these soils are subject to overflow and are thus not suitable for cultivation.

A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Hydric soils found in the project area are presented in Table 3-1.

TABLE 3-1
HYDRIC SOILS WITHIN THE PROJECT AREA

Soil Name	Grand Parkway Segment			
	E	F-1	F-2	G
Addicks Loam	X			
Aris Fine Sandy Loam	X			
Aris-Gessner Complex	X			
Clodine Loam	X			
Gessner Complex		X	X	
Gessner Loam	X	X	X	X
Ozan	X			
Sorter Silt Loam				X
Tuckerman Loam				X
Tuscumbia Clay (frequently flooded)				X
Waller Loam				X
Waller Soils (Ponded)				X

Note: X = Presence of this type of soil in the segment.
Source: Natural Resources Conservation Service (NRCS), 2000a

3.2.3 Farmland

In accordance with the Farmland Protection Policy Act (FPPA) of 1984, farmland impact evaluations were performed for the project area. Through coordination with the USDA, NRCS, a Farmland Conversion Impact Rating (Form CPA-106) for each county impacted by the project was completed.

Form CPA-106 is a tool that is used by the NRCS to evaluate the impact to soils that the NRCS has designated as prime, unique, statewide, or locally important. Prime farmland soils, as defined by the USDA, are soils that are best suited to producing food, feed, forage, and oilseed crops. Unique farmland is further defined as that whose value is derived from its particular advantages for growing specialty crops. Statewide and locally important farmlands are defined by the appropriate state or local agency as important for the production of food, feed, fiber, and forage or oilseed crops. In accordance with the FPPA, the NRCS criteria for determining these types of soils are based on soil type and slope, regardless of whether or not the land in question is currently being used for agricultural purposes.

Farmland impacts associated with the construction of each segment and Form CPA-106 reviewed by the NRCS are discussed in greater detail in Volume II of the FEIS for each segment.

3.3 SOCIAL CHARACTERISTICS

3.3.1 Population

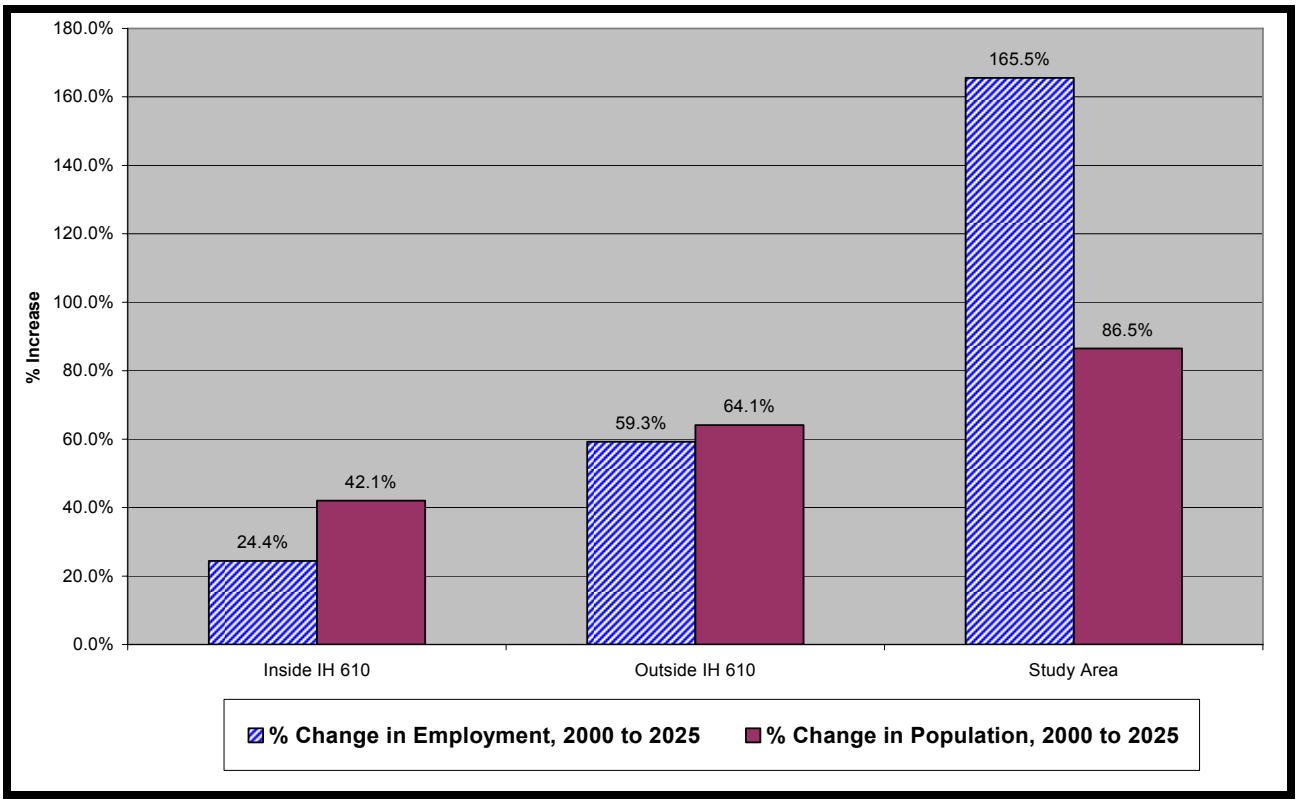
Demographic and economic projections predict substantial growth for the Houston CMSA with growth concentrating in the general study area (the large area shown in Exhibit G–2 that surrounds the Preferred Alternative Corridor). Population and employment are primary demographic and economic indicators for travel demand, defined as the number, purpose, and type of trips. H-GAC projections indicate substantial suburban population and employment growth through the year 2025. The following includes a presentation of population trends. The population trends are presented using the latest available demographic data. Specific descriptions of segment populations and economic factors are addressed in Volume II of this document.

3.3.1.1 Rate of Growth

H-GAC has developed the 2025 Regional Growth Forecast, which provides population and employment projections to the year 2025 within the Houston CMSA, and within Regional Analysis Zones (RAZs) located within the eight-county region (H-GAC, 2003). In the H-GAC report, two sets of projections are provided: Moderate Growth and Aggressive Growth. H-GAC recommends the Aggressive Growth forecast in their report; therefore it was used in this section. From 2000 to 2025, the H-GAC report predicts the population within the Houston CMSA would increase 64.1 percent from approximately 4,670,000 to 7,662,000 and employment would increase 56.2 percent from approximately 2,863,000 to 4,472,000 during the same period.

Projected rates of population and employment growth are higher for the study area than for the Houston CMSA. Within the Segments E, F-1, F-2, and G study area RAZs, population and employment are expected to increase by 86.5 and 165.5 percent, respectively. Population would increase from 410,901 to 766,322 between 2000 and 2025, and employment would increase from 83,973 to 222,953 during the same period. From 2000 to 2025, Harris County would capture approximately 66 percent of all new population growth and approximately 78 percent of all new employment growth in the Houston CMSA. During the same time period, Montgomery County would capture approximately 11.5 percent of all population growth and approximately 6.7 percent of all employment growth in the Houston CMSA. Figure 3-1 graphically presents H-GAC projections for population and employment increase within the IH 610 Loop, outside the IH 610 Loop, and specifically within the study area from 2000 to 2025. The greatest rates of population and employment growth would be concentrated within the Segments E, F-1, F-2, and G study area. The H-GAC projections indicate increasing growth in employment and population from inside the IH 610 Loop to outside the IH 610 Loop, and higher than average growth within the study area.

FIGURE 3-1
EXPECTED POPULATION AND EMPLOYMENT INCREASE FROM 2000 TO 2025 WITHIN THE STUDY AREA



Source: H-GAC, 2003

3.3.1.2 Distribution of Growth

It is expected that growth would progress in a manner consistent with suburban growth trends nationally: jobs follow population growth to the extent that suburban areas become self-contained with their own residential, retail, and employment centers. H-GAC projections indicate this trend is underway and is expected to continue. Exhibits G–20 through G–22 present historical population and employment distribution for 1980, 1990, and 2000, respectively (U.S. Census Bureau, 1980, 1990, and 2000). Exhibit G–23 presents projected population and employment by RAZ for 2025 (H-GAC, 2003). Noteworthy is the population and employment growth toward northern and western Harris County and southern Montgomery County. Section 4 of this volume (Indirect and Cumulative Effects) elaborates on the development of socioeconomic projections.

3.3.1.3 Development Trends

Development patterns and trends vary by segment. To quantify development trends, development was analyzed using historic aerial photography for the years 1970, 1980, 1995, and 2000 (Exhibit G–24a-d). Table 3-2 presents a summary of development changes as determined from the historic aerial photography.

TABLE 3-2
STUDY AREA DEVELOPMENT CHANGES

Year	Residential Development (acres)	Other Development (acres)	Undeveloped (acres)
1970	2,412 (1.2%)	4,016 (2.1%)	186,555 (96.7%)
1980	10,330 (5.4%)	4,863 (2.5%)	177,790 (92.1%)
1995	30,842 (16.0%)	5,425 (2.8%)	156,716 (81.2%)
2000	50,526 (26.2%)	6,889 (3.6%)	135,568 (70.2%)

Note: Utilities and roads are included as part of the developed acreage totals. These data are for the large study area depicted in Exhibit G–2.
Source: NRCS, 2000b

3.3.1.4 Housing Trends

As reflected in the city of Houston *Growth Indicators* newsletters from March 2001 to October 2004 (see Appendix E), subdivision activity within the city of Houston's city limits and ETJ has shown a clear trend of increasing growth farther away from Houston. The *Growth Indicators* newsletters provide building permit trends inside and outside Loop 610 and subdivision platting trends within the city of Houston's city limits versus the city's ETJ. The history of building permits and plat approvals shown in these newsletters demonstrates the trend of growth in the study area. The dynamics of this growth are influenced by many factors, including housing costs, demographics, schools, and the economy. In August 2004, the average single-family residential housing construction costs inside and outside the IH 610 Loop were $274,600 and $87,800, respectively. Within the IH 610 Loop, the predominant housing types are townhouses and condominiums, although a large number of single-family residential housing units have been built inside the IH 610 Loop in recent years (see Appendix E). Outside the IH 610 Loop, the predominant housing type is single-family residential housing. Based on 2000 Census tract data, the average housing cost within the study area was approximately $106,300, with single-family homes being the predominant housing type (U.S. Census Bureau, 2000). The West Houston Association (WHA) recorded 34 percent of all the Houston CMSA new home sales in 2000, compared with 28 percent in 1999, resulting in an overall increase of 225 percent since 1990. For instance, 11,862 home starts and 11,351 home sales were recorded in 2000 (WHA, 2003). These figures indicated a continuing demand for homes in the West Houston area. In addition, the North Houston Association (NHA) reported 401,120 total housing units in 2000 with 63 percent owner occupied and 30 percent renter occupied. Approximately 7 percent of the NHA housing units were reported as vacant (NHA, 2004).

The 2003 West Houston Area Population and Housing Profile Report, prepared by the WHA, describes population, employment, housing, and development trends generally within the West Houston area (which includes approximately 60 percent of the study area, including all of Segments E and F-1, about half of Segment F-2, and none of Segment G). This report found that West Houston's quality of life and diverse economy have attracted a population that is younger, more educated, more affluent, and more likely to hold white-collar employment than the population living within the Houston CMSA. For instance, in 2000, the average age was 31.5 for residents within the West Houston area and 32 for the

Houston CMSA. In addition, approximately 62 percent of the population in the West Houston area earned incomes greater than $50,000 per year while approximately 41 percent earned greater than $75,000 per year (WHA, 2003).

Within the city of Houston's ETJ and in areas outside the IH 610 Loop[1], the number of households has increased dramatically in recent years. According to information from the last produced *Growth Indicators*, new residential unit permits increased by 31.9 percent outside the IH 610 Loop, compared with a 10.3 percent increase of permits inside the IH 610 Loop. During November 2003, the city of Houston reported $30.5 million in single-family homes that had received building permits and were under construction. The year-to-date value of new residential construction inside the IH 610 Loop increased 4.7 percent from $296.5 million in November 2002 to $310.6 million in November 2003. The year-to-date value of all residential development (single-family and multi-family) with building permits outside the IH 610 Loop was $882 million (city of Houston, 2003).

Demographic, housing, and market data suggest development within the study area and inside the IH 610 Loop targets separate and distinct markets. Inside the IH 610 Loop, the market consists predominantly of middle to upper class young, single or recently married professionals, divorcees, and "empty nesters," for whom the smaller living areas and higher per square foot housing costs are not prohibitive. Middle class families show a tendency to locate where space, lower per square foot housing costs, and good schools are attractive. Furthermore, the H-GAC's forecasts predict a trend of strong suburban growth around Houston's redeveloping urban center, which is a continuation of a pattern that emerged in the late 1990s. Substantial population and job growth are forecasted for the core-urbanized areas. However, 67 percent of the growth in households and 59 percent of job growth, from 2000 to 2025, are projected to occur outside of Beltway 8 (H-GAC, 2003).

Between 1995 and 2003, 298,392 new housing units were permitted in the Houston PMSA (Table 3-3). About 69 percent of all Houston PMSA housing units were in single-family structures in Harris County.

TABLE 3-3
NEW PRIVATELY-OWNED HOUSING UNITS IN THE STUDY AREA REGION, 1995-2003

Units per Structure	Units									1995 – 2003 Change	
	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total	% of Total
Houston PMSA											
1 Unit	13,486	16,482	17,936	21,743	22,248	23,917	25,610	29,215	33,996	204,633	68.58
2 Units	70	38	74	100	112	106	18	146	100	764	0.26
3 and 4 Units	942	131	160	1,006	700	96	426	863	71	4,395	1.47
5 Units or More	4,328	4,225	10,933	19,607	9,225	6,765	6,556	10,997	15,964	88,600	29.69
Total Units	**18,826**	**20,876**	**29,103**	**42,456**	**32,285**	**30,884**	**32,610**	**41,221**	**50,131**	**298,392**	**100.00**

Source: U.S. Department of Housing and Urban Development, 2004

[1] This area includes the study area. Hereafter, this area is simply referred to as "outside the IH 610 Loop."

3.4 ECONOMICS

3.4.1 Leading Economic Sectors

The various industrial sectors for 1998 and 2002 within Harris and Montgomery Counties are presented in Table 3-4 and Table 3-5, respectively. In Harris County, Services added the greatest number of jobs during this five-year period with 53,924 new jobs. The industry sector with the second greatest addition of new jobs for this time period was Construction (16,337). The Retail Trade sector provided the third largest addition of new jobs (10,088). During these same years, the industry sectors with the fastest job growth were Agricultural Services, Forestry, and Fishing; Unclassified Establishments; and Mining at 285.7 percent, 96.8 percent, and 19.3 percent, respectively. Losses of jobs between these years occurred in the Manufacturing industry (loss of 8,064 jobs) and Wholesale Trade industry (loss of 1,305 jobs) (Table 3-4).

The industry sector that had the greatest increase in the number of places of business (new establishments) in Harris County from 1998 to 2002 was Services, with 1,436 new places of business. The industry sector with the second greatest increase in the number of business establishments between these years was Finance, Insurance, and Real Estate (447). The industry sector with the third largest increase in the number of new places of business was Retail Trade (338). With regard to the percentage increase in the number of business establishments, the leading industry sectors were Unclassified Establishments; Agricultural, Forestry, and Fishing; and Finance, Insurance, and Real Estate with 35.2 percent, 25.6 percent, and 4.8 percent increases, respectively. Losses in the number of business establishments between these years occurred in the Mining industry (loss of 107 business establishments), in the Manufacturing industry (loss of 271 business establishments), in the Wholesale Trade industry (loss of 176 business establishments) and in the Construction industry (loss of 105 business establishments) (Table 3-4).

TABLE 3-4
TOP 10 INDUSTRIES BY NUMBER OF EMPLOYEES - 1998 AND 2002, HARRIS COUNTY

Industry	Number of Employees				Number of Business Establishments			
	Year		1998–2002 Change		Year		1998–2002 Change	
	1998	2002	No.	%	1998	2002	No.	%
Agricultural Services, Forestry, and Fishing	147	567	420	285.7%	39	49	10	25.6%
Mining	24,066	28,705	4,639	19.3%	1,025	918	-107	-10.4%
Construction	116,775	133,112	16,337	14.0%	5,614	5,509	-105	-1.9%
Manufacturing	163,834	155,770	-8,064	-4.9%	4,491	4,220	-271	-6.0%
Transportation and Public Utilities	98,881	103,727	4,846	4.9%	2,518	2,573	55	2.2%
Wholesale Trade	106,115	104,810	-1,305	-1.2%	7,514	7,338	-176	-2.3%
Retail Trade	166,325	176,413	10,088	6.1%	11,566	11,904	338	2.9%
Finance, Insurance, and Real Estate	108,806	116,898	8,092	7.4%	9,386	9,833	447	4.8%
Services	806,289	860,213	53,924	6.7%	40,388	41,824	1,436	3.6%
Unclassified Establishments	1,041	2,049	1,008	96.8%	767	1,037	270	35.2%

Source: U.S. Census Bureau, 1998a and 2002a County Business Patterns for Harris County, Texas

For Montgomery County, Services added the greatest number of jobs during this five-year period, with 4,965 new jobs. The industry sector with the second greatest addition of new jobs for this time period was the Retail Trade sector, with 2,020 new jobs. The industry sector with the third largest addition of new jobs was Finance, Insurance, and Real Estate, with 839 new jobs. During these same years, the industry sectors with the fastest job growth were Unclassified Establishments; Finance, Insurance, and Real Estate; and Transportation and Public Utilities at 77.8, 27.0, and 25.1 percent, respectively. Losses of jobs, between these years, occurred in the Agricultural Services, Forestry, and Fishing industry (loss of 28 jobs) and the Mining industry (loss of 308 jobs) (Table 3-5).

The industry sector that had the greatest increase in the number of business establishments in Montgomery County from 1998 to 2002 was Services, with 336 new places of business. The industry sector with the second greatest increase in the number of business establishments between these years was Finance, Insurance, and Real Estate, with 102 new places of business. The industry sector with the third largest increase in the number of new places of business was Retail Trade, with 92 new places of business. With respect to the percentage increase in the number of business establishments, the leading industry sectors were Unclassified Establishments; Finance, Insurance, and Real Estate; and Services with 24.6, 19.4, and 14.3 percent growth, respectively. Losses in the number of business establishments, between these years, occurred in the Agricultural, Forestry, and Fishing industry (loss of two business establishments) and the Mining industry (loss of 16 business establishments) (Table 3-5).

TABLE 3-5
TOP 10 INDUSTRIES BY NUMBER OF EMPLOYEES - 1998 AND 2002, MONTGOMERY COUNTY

Industry	Number of Employees				Number of Business Establishments			
	Year		1998 –2002 Change		Year		1998 –2002 Change	
	1998	2002	No.	%	1998	2002	No.	%
Agricultural Services, Forestry, and Fishing	125	97	-28	-22.4%	23	21	-2	-8.7%
Mining	1,180	872	-308	-26.1%	73	57	-16	-21.9%
Construction	5,516	5,961	445	8.1%	652	696	44	6.7%
Manufacturing	7,386	7,768	382	5.2%	305	324	19	6.2%
Transportation and Public Utilities	1,731	2,166	435	25.1%	138	150	12	8.7%
Wholesale Trade	3,064	3,329	265	8.6%	371	392	21	5.7%
Retail Trade	12,919	14,939	2,020	15.6%	865	957	92	10.6%
Finance, Insurance, and Real Estate	3,108	3,947	839	27.0%	527	629	102	19.4%
Services	38,860	43,825	4,965	12.8%	2,357	2,693	336	14.3%
Unclassified Establishments	90	160	70	77.8%	61	76	15	24.6%

Source: U.S. Census Bureau, 1998b and 2002b County Business Patterns for Montgomery County, Texas

3.5 PEDESTRIANS AND BICYCLISTS

Based on the FHWA Technical Advisory (T 6640.8A), TxDOT is committed to identifying all existing and proposed pedestrian and bicycle facilities, the potential impacts of the alternatives, and the proposed measures, if any, to avoid or reduce adverse impacts to the facility(ies) and its users. For each segment, existing and proposed facilities for pedestrians and bicyclists have been identified in Volume II, based on the H-GAC Regional Bike Plan. The H-GAC Regional Bike Plan for the 13-County Gulf Coast Planning Region (which includes Harris and Montgomery Counties) is part of the 2035 RTP (H-GAC, 2007a) and identifies existing and proposed pedestrian and bicycle facilities. Potential impacts, avoidance, and mitigation measures are detailed in Volume II for each segment.

3.6 AIR QUALITY

Air pollution may contribute to adverse human health effects and ecosystem degradation. Motor vehicles, industries, construction equipment, and some commercial operations are among the sources of air pollution in the Houston area. The main air pollutants emitted from motor vehicles are volatile organic compounds (VOCs), nitrogen oxides (NO_X), carbon monoxide (CO), carbon dioxide (CO_2), particulate matter (PM) and a class of compounds called Mobile Source Air Toxics (MSAT).

3.6.1 Criteria Pollutants

The NEPA of 1969 and the Clean Air Act of 1970 (CAA), as amended, resulted in federal requirements for USDOT to consider the impact proposed highways, such as the Grand Parkway, may have on the local air quality. Under the CAA, the EPA sets national ambient air quality standards (NAAQS) for six criteria air pollutants to protect public health and the environment, with an adequate margin of safety. NAAQS exist for: CO, ozone (O_3), nitrogen dioxide (NO_2), SO_2, PM for both 10 and 2.5 microns and less (PM_{10} and $PM_{2.5}$), and lead (Pb). The air standards shown in Table 3-6 represent levels of these pollutants and exposure periods that the EPA has determined pose no substantial threat to human health or welfare. The Clean Air Act Amendments (CAAA) of 1990 establishes specific milestones toward attaining the NAAQS, depending on the severity of the air pollution problem in the region. The EPA classified the Houston-Galveston area, which includes Harris County, as a moderate O_3 non-attainment area (EPA, 2006a). Currently, the Houston area exceeds the national O_3 standard for about 40 days per year. The Houston area is in attainment for all other NAAQS.

TABLE 3-6
NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

Pollutant	Primary Standard (Public Health)			Secondary Standard (Public Welfare)		
	Level	Averaging Time	Form	Level	Averaging Time	Form
Ozone (O_3)	0.08 ppm	8 hours	3-year average of annual 4th highest daily maximum	Same as Primary Standard		
Particulate Matter 10 microns or smaller (PM_{10})	150 μg/m3	24 hours	3-year average of annual 99th percentiles	Same as Primary Standard		

TABLE 3-6 (CONT.)
NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

Pollutant	Primary Standard (Public Health)			Secondary Standard (Public Welfare)		
	Level	Averaging Time	Form	Level	Averaging Time	Form
Particulate Matter 2.5 microns or smaller ($PM_{2.5}$)	35 μg/m3	24 hours	3-year average of annual averages	Same as Primary Standard		
	15 μg/m3	Annual	3-year average of 98th percentile	Same as Primary Standard		
Carbon Monoxide (CO)	35 ppm	1 hour	More than once per year	No Secondary Standard		
	9 ppm	8 hours				
Sulfur Dioxide (SO_2)	0.14 ppm	24 hours	24 hour standard	0.50 ppm	3-hour	More than once per year
	0.03 ppm	Annual	Annual arithmetic mean			
Nitrogen Dioxide (NO_2)	0.053 ppm	Annual	Not to be exceeded	Same as primary standard		
Lead (Pb)	1.5 μg/m3	Quarterly	Not to be exceeded	Same as primary standard		

Notes: All standards with averaging times of 24 hours or less are not to be exceeded more than once per year.
ppm = parts per million; μg/m3 = micro grams per cubic meter
Source: EPA, 2006b (40 CFR 50)

VOCs in motor vehicle emissions are created by incomplete combustion. Some of these VOCs contribute to O_3 and smog formation, while others, such as benzene and formaldehyde, are toxic or carcinogenic. Trucks and older cars emit much more VOCs than newer cars.

NO_X are created inside the combustion chambers of motor vehicles when, under high heat and pressure, nitrogen molecules in the air are split into reactive nitrogen atoms, which then combine with oxygen. NO_X also react with oxygen and VOCs in the atmosphere to form O_3 and smog. Motor vehicles produce the least emissions of NO_X per mile between 20 and 30 miles per hour. NO_X emissions per mile increase as vehicles go either slower or faster, so simply increasing or decreasing average traffic speed can increase NO_X emission.

PM consists of tiny particles that are emitted by vehicle engines (especially the diesel engines of trucks), brake pads, tires, and other moving parts of motor vehicles. These particles contribute to smog and haze and are dangerous to human health, especially to people with respiratory conditions. The EPA provides health criteria for particles smaller than ten microns (about one-seventh the width of a human hair) and for particles smaller than 2.5 microns.

CO is a very reactive gas that can cause asphyxiation. Because of its high reactivity, it does not persist in the air long after it is emitted; therefore CO is a local problem where it occurs. In order to evaluate local air quality changes, a localized analysis of CO has been performed (Volume II, Section 4.6, Air Quality) in accordance with TxDOT's *Air Quality Guidelines* (2006a) and FHWA's Technical Advisory T 6640.8A.

VOCs from motor vehicles, industry, and other sources can combine with NOx in a series of photochemical reactions under certain conditions to form O_3. These reactions take place over a period of several hours and can result in high

concentrations of O_3 that are often far downwind from the precursor sources. Determining the cause of O_3 through modeling requires long-term meteorological data and detailed area-wide emission rates for all potential sources (industry, business, and transportation).

The EPA has determined that Harris County and the seven other counties (including Montgomery County) that comprise the Houston-Galveston Area are in attainment for all of the NAAQS pollutants except the 8-hour O_3 air quality standards. EPA regulations require that a non-attainment area demonstrate that its RTP and TIP conform to the intent of the SIP by showing that the emissions under the plan are less than the emission budget set in the SIP. Under the regulations, added capacity projects, such as the Grand Parkway, may advance to construction only if they are part of the RTP and TIP that have been determined to conform to the SIP by the MPO and USDOT.

Segments E, F-1, F-2, and G were included in the area's financially constrained 2025 RTP. Segments E, F-1, and F-2 were also included in the FY 2006-2008 TIP, while Segment G was included in the 2006-2008 TIP, Appendix D, as project undergoing environmental review and scheduled for implementation beyond the three-year TIP time frame. The 2025 RTP and FY 2006-2008 TIP were adopted by H-GAC in April 2005 and found to conform to the SIP by USDOT (FHWA and FTA) on June 3, 2005 and October 31, 2005, respectively.

The Grand Parkway Segments E, F-1, F-2, and G are included in H-GAC's 2035 RTP and FY 2008-2011 TIP, as amended. On August 24, 2007, H-GAC adopted the 2035 RTP and FY 2008-2011 TIP. USDOT (FHWA/FTA) found the 2035 RTP and 2008-2011 TIP to conform to the SIP on November 9, 2007.

Changes in modeled parameters between the 2025 RTP and the 2035 RTP (such as traffic volumes, population, employment, number of households, and vehicle miles traveled) have been evaluated to determine if any additional analysis is warranted before FHWA takes final environmental action. This evaluation confirmed that the changes in the modeled parameters were minor, and therefore no additional analysis is warranted. The analysis of 2025-2035 RTP modeled parameters can be found in the Administrative Record.

3.6.2 Mobile Source Air Toxics (MSAT)

In addition to the criteria air pollutants for which there are NAAQS, the EPA also regulates toxic air pollutants. Most toxic air pollutants originate from man-made sources, including on-road mobile sources (e.g., cars, light trucks, motorcycles, and 18-wheelers), non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners and gas stations), and stationary sources (e.g., electric utilities, petrochemical refining, and factories).

MSAT are a subset of the 188 toxic air pollutants defined by the CAA. MSAT are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted into the air when the fuel evaporates or passes through the engine unburned, for example benzene. 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 (EPA, 2000a). In a 2001 rulemaking, EPA identified six priority MSAT: acetaldehyde, acrolein, benzene, 1,3-butadiene, diesel exhaust (including diesel PM and organic gases), and formaldehyde (EPA, 2001a, 66 FR 17230).

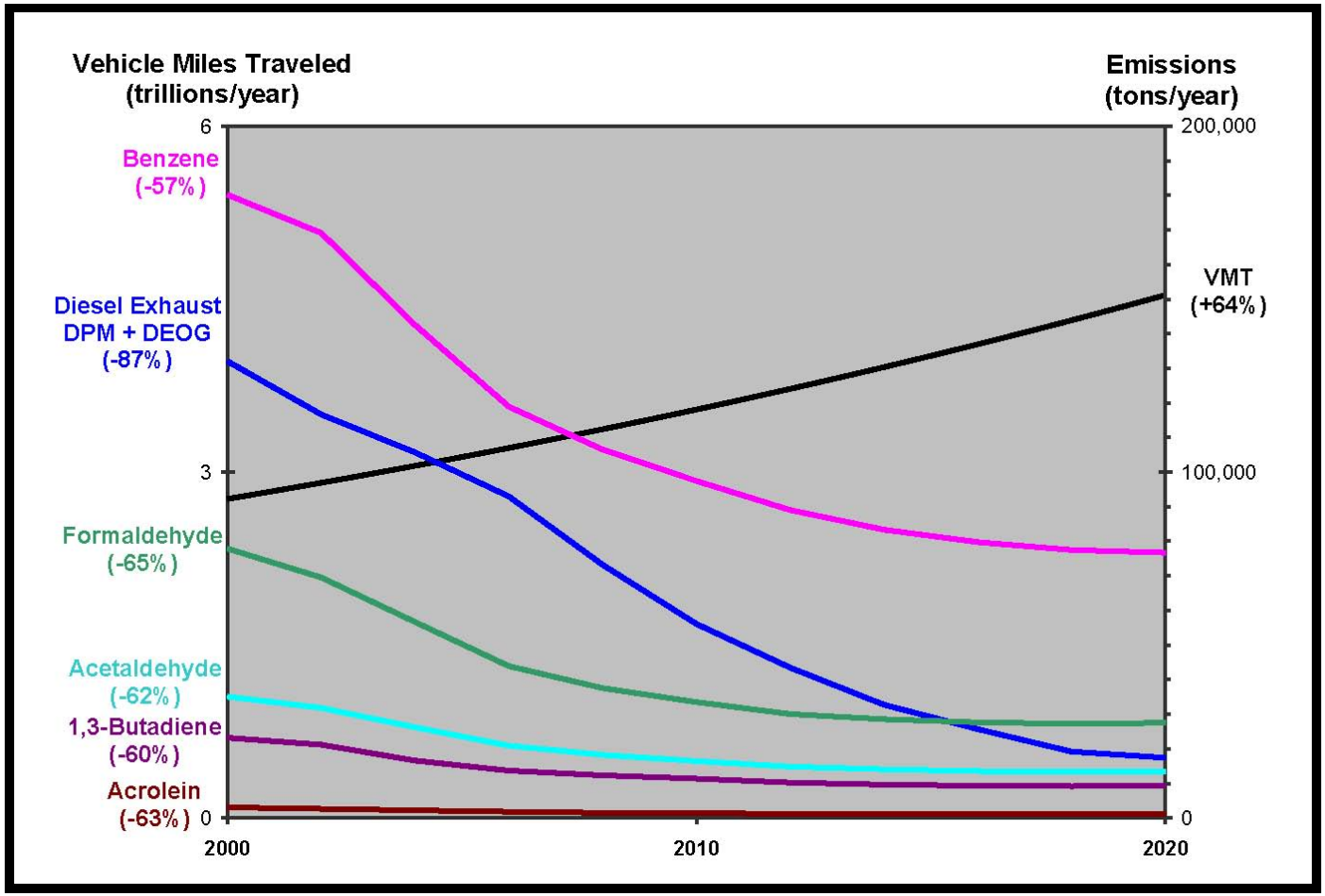
The EPA is the lead federal agency for administering the CAA and has some responsibilities on the health effects of MSAT. In 2001, the EPA issued a final rule on controlling emissions of hazardous air pollutants from mobile sources (66 CFR 17229, March 29, 2001). This rule was issued under the authority in Section 202 of the CAA. In its rule, the EPA examines the impacts of current and newly promulgated mobile source control programs, including its reformulated gasoline program, national low-emission vehicle standards, Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and heavy-duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, despite a 64 percent increase in Vehicle Hours Traveled (VMT), the mobile source control programs will reduce on-highway emissions of benzene, formaldehyde, acetaldehyde, 1,3-butadiene, and acrolein by 57 percent to 65 percent, and will reduce on-highway diesel PM emissions by 87 percent, as shown in Figure 3-2.

In an ongoing review of MSAT, the EPA finalized additional rules under the authority of CAA Section 202(l) to further reduce MSAT emissions to even a greater extent than is reflected in Figure 3-2. The EPA issued a set of final rules on Control of Hazardous Air Pollutants from Mobile Sources (72 FR 8427, February 26, 2007) under 40 CFR 59, 80, 85, and 86. The rule changes were effective on April 27, 2007. Because of this review, the EPA adopted the following new requirements to substantially lower emissions of benzene and other MSAT by: 1) lowering the benzene content in gasoline; 2) reducing evaporative emissions that permeate through portable fuel containers; and 3) reducing non-methane hydrocarbon (NMHC) exhaust emissions from passenger vehicles operated at cold temperatures (under 75 degrees Fahrenheit) (EPA, 2007a).

Beginning in 2011, petroleum refiners must meet an annual average gasoline benzene content standard of 0.62 percent by volume for both reformulated and conventional gasolines, nationwide, which would be a 38 percent reduction from 2007. The EPA standards to reduce NMHC exhaust emissions from new gasoline-fueled passenger vehicles will become effective in phases. Standards for light-duty vehicles and trucks (≤ 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 grams of hydrocarbons per gallon per day (EPA, 2007a).

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 substantially reduce annual national MSAT emissions. 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 MSAT (including 61,000 tons of benzene), more than one million tons of VOCs, and more than 19,000 tons of $PM_{2.5}$ (EPA, 2007a).

FIGURE 3-2
VEHICLE MILES TRAVELED (VMT) VS.
MOBILE SOURCE AIR TOXICS EMISSIONS, 2000-2020



Notes: For on-road mobile sources, emissions factors were generated using MOBILE6.2, which does not include the emission reductions associated with EPA's 2007 final rule, "Control of Hazardous Air Pollutants from Mobile Sources," as published in the *Federal Register* (EPA, 2007a). 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.

Source: FHWA, 2006

3.6.2.1 Existing Environment /TCEQ Monitor Data

TCEQ and other local entities operate air quality monitors in the Houston area. In the Houston area, there are 57 active monitors. This network of monitors measures the air quality and determines the levels of the various pollutants in the air. Consequently, the following paragraphs discuss the monitors nearest to the project (Table 3-7), as well as ambient monitors that have detected levels of MSAT.

The closest air quality monitors are between approximately 0.8 miles and approximately six miles of the Grand Parkway segments (Table 3-7). The closest air quality monitor is about 0.8 miles from Segment F-1. The closest $PM_{2.5}$ monitor used for compliance with the $PM_{2.5}$ NAAQS is about 27.4 miles from Segment G. The official monitor data are found on EPA's national air quality monitor web site (www.epa.gov/air/data). As can be seen in Table 3-7, not all monitors sample for the same pollutants, and not all monitors have one year of complete data to compile an annual average for any given pollutant.

The Mayor of Houston has recently organized a task force to help reduce air quality health risks in Houston. The main focus of this task force is to "…review and summarize the available evidence on the health risks associated with air pollution in the Houston region, recommend areas of research needed to allow regional leaders to make the best decisions on strategies for reducing pollution, within established legal timetables, and to provide guidance to the City on strategies for reducing health risks."

TABLE 3-7
LOCAL MONITOR DATA

Air Monitor	Activation Date	Average Ozone 2006	Annual Average $PM_{2.5}$ 2006	Average Benzene 2006 **	Average 1,3 Butadiene 2006 **	Distance from GP/Segment
CAMS 26	April 1997	0.0445 ppm (Standard is a 3 year average which must be 0.080 ppm or below)	N/A	9.48 ug/m^3	0.17 ug/m^3	0.8 miles from F-1
CAMS 555	April 2004	N/A	N/A	N/A	N/A	6.0 miles from G
CAMS 309	February 2001	N/A	11.59 ug/m^3 *	N/A	N/A	5.6 miles from G
CAMS 557	February 2004	N/A	N/A	N/A	N/A	5.7 miles from F-2
CAMS 554	January 2004	N/A	N/A	N/A	N/A	6.1 miles from E
CAMS 148	August 1998	N/A	10.25 ug/m^3 (Standard is a 3-year annual average below 15 ug/m^3)	10.41 ug/m^3	0.69 ug/m^3	Closest $PM_{2.5}$ compliance monitor to any GP segment (27.4 miles from Segment G)

Notes: EPA disclaimer regarding these data: "Readers are cautioned not to infer a qualitative ranking order of geographic areas based on AirData reports. Air pollution levels measured in the vicinity of a particular monitoring site may not be representative of the prevailing air quality of a county or urban area. Pollutants emitted from a particular source may have little impact on the immediate geographic area, and the amount of pollutants emitted does not indicate whether the source is complying with applicable regulations."

* Not a regulatory monitor for $PM_{2.5}$, these monitors do not use the same collection and analysis methods for measuring $PM_{2.5}$ data and are therefore not used for compliance monitoring.

** Currently, no NAAQS have been established for any of the priority MSAT. The EPA is in the process of assessing the risks of exposure to these pollutants. For more information see the MSAT Technical Report (Appendix F) or http://www.epa.gov/iris for potential human health effects that may result from exposure to various MSAT.

Source: EPA, 2007b

3.6.2.2 Existing Environment/Proximity to Roadways and the Potential to Impact Health

Recent studies have been reported to show that proximity to roadways is related to negative health outcomes, particularly respiratory problems (South Coast Air Quality Management District, 2000; Sierra Club, 2004; Environmental Law Institute, 2005). On February 26, 2007, the EPA issued a final rule on the "Control of Hazardous Air Pollutants from Mobile Sources." In the preamble to this final rule, the EPA summarized recent studies by stating, "Significant scientific uncertainties remain in our understanding of the relationship between adverse health effects and near-road exposure, including the exposures of greatest concern, the importance of chronic versus acute exposures, the role of fuel type (e.g., diesel or gasoline) and composition (e.g., % aromatic), relevant traffic patterns, the role of co-stressors including noise and socioeconomic status, and the role of differential susceptibility within the 'exposed' populations" (EPA, 2007a).

The lack of professional consensus on concentration levels needed to impact health is evident. What can be determined fairly consistently amid the research is the tendency for pollutant levels to drop off substantially as the distance from the roadway increases. Pollutant concentration starts to decline most rapidly at approximately 328 feet (100 meters) from the roadway. By 1,640 feet (500 meters), most studies reviewed have found difficulty distinguishing between the background levels of a given pollutant and detectable levels that may have been found directly adjacent to the roadway. Finally, wind direction and speed, vehicle traffic levels, and roadway design can further increase or decrease the distance at which detectable levels of any given pollutant can be distinguished as directly associated with a roadway, as opposed to simply a background concentration of the pollutant.

Sensitive receptors were mapped and entered to the project GIS. Exhibit G–25a-e depicts sensitive receptors that were considered; these receptors include all public and private schools, hospitals, senior citizen care facilities, and licensed daycare facilities.

3.6.2.3 Existing MSAT Levels

A basic quantitative analysis of the total mass of MSAT emissions from the traffic study area of Segments E, F-1, F-2, and G was completed. The traffic study area used for this analysis includes all major roadways potentially affected by the proposed new transportation facility, in this case the Grand Parkway. The traffic study area is generally bounded by IH 10 to the south, US 59 to the east, and extends just beyond the proposed Grand Parkway to the north and west. These areas appear graphically in Exhibit G–26.

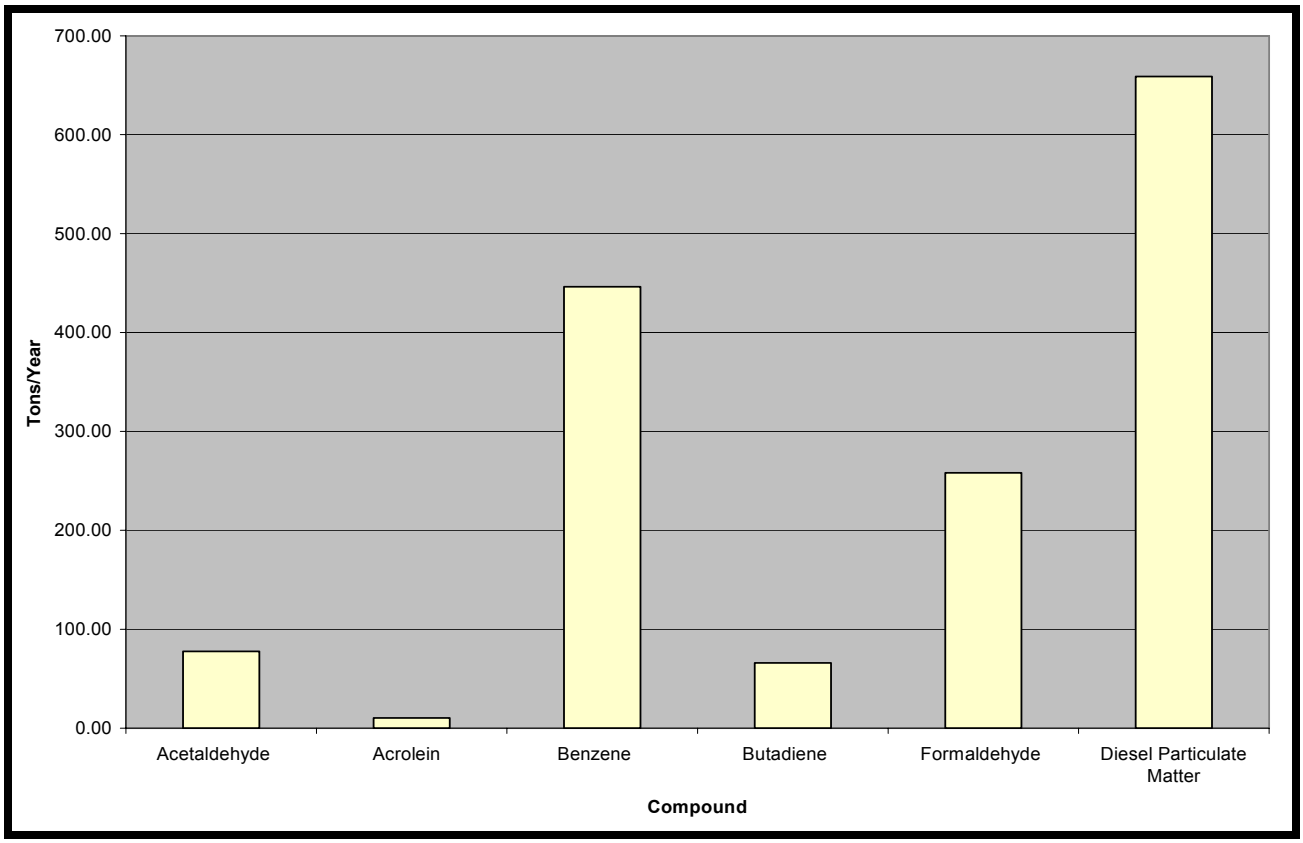
A discussion of how total MSAT levels were estimated and some of the limitations and cautions regarding these estimations is contained in Volume II, Section 4.6 and Volume III, Appendix F. A summary of these emissions for the base year is shown in Table 3-8 and total MSAT emissions are illustrated in Figure 3-3.

TABLE 3-8
TOTAL MSAT EMISSIONS TONS/YEAR FOR THE COMPLETE TRAFFIC STUDY AREA (SEGMENTS E, F-1, F-2, AND G)

Compound	2000 Base Year
Acetaldehyde	77
Acrolein	10
Benzene	446
Butadiene	66
Formaldehyde	258
Diesel Particulate Matter	659
Total MSAT	**1,516**

Source: Study Team, 2007

FIGURE 3-3
TOTAL MSAT EMISSIONS TONS/YEAR BY COMPOUND FOR THE COMPLETE TRAFFIC STUDY AREA (SEGMENTS E, F-1, F-2, AND G)



Note: Results were calculated using the EPA MOBILE6.2 model (see Appendix F, Part 4 for detailed methodology), which does not include the emission reductions associated with EPA's 2007 Final Rule, "Control of Hazardous Air Pollutants from Mobile Sources," as published in the Federal Register (EPA, 2007a).

Source: Study Team, 2007

3.6.2.4 MSAT Summary

MSAT modeled for the Grand Parkway, Segments E, F-1, F-2, and G, were found to be substantially lower in the future years (2015 and 2025) than the base year (2000). MSAT will continue to improve over time because of dramatic improvements in vehicle technology and fuels and traffic flow improvements realized over time.

3.7 EXISTING NOISE ENVIRONMENT

To assess the existing or ambient noise conditions within the project area, a noise measurement program was conducted for each of the alternative alignments within the project segments. This monitoring program was conducted in accordance with FHWA publication FHWA-PD-96-046, "Measurement of Highway-Related Noise," May 1996. A summary of these ambient noise-monitoring sites and their associated monitored noise levels are discussed in greater detail in Volume II of the FEIS for each segment.

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." Examples of common noises and their typical sound levels are presented in Table 3-9. 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." Traffic sound levels are never constant because of the changing number, type, and speed of vehicles. For that reason, a single value is used to represent the average or equivalent sound level and is expressed as "Leq."

TABLE 3-9
COMMON NOISES AND TYPICAL SOUND LEVELS

Common Outdoor Noise Levels	Noise Level (dBA)	Common Indoor Noise Levels
Pneumatic Hammer	100	Subway Train
Gas Lawn Mower at 3 ft		
	90	Food Blender at 3 ft
Downtown (Large City)	80	Garbage Disposal at 3 ft
Lawn Mower at 100 ft	70	Vacuum Cleaner at 10 ft
		Normal Speech at 3 ft
Air Conditioning Unit	60	Clothes Dryer at 3 ft
Babbling Brook		Large Business Office
Quiet Urban (Daytime)	50	Dishwasher (Next Room)
Quiet Urban (Nighttime)	40	Library

Source: TxDOT, 2005

The FHWA has established 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 would occur. These land use activity area criteria are presented in Table 3-10. A noise impact occurs when either the absolute or relative criterion is met:

- Absolute Criterion: The predicted noise level at a receiver that approaches, equals, or exceeds the NAC is considered an absolute criterion noise impact. "Approach" is defined as one dBA below the NAC. For example, a noise impact would occur at a Category B (see Table 3-10) residence if the noise level were predicted to be 66 dBA or above.
- Relative Criterion: The predicted noise level that substantially exceeds the existing noise level at a receiver even though the predicted noise level does not approach, equal, or exceed the NAC is considered a relative criterion noise impact. "Substantially exceeds" is defined as more than 10 dBA. For example, a noise impact would occur at a Category B residence if the existing level were 54 dBA and the predicted level were 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.

TABLE 3-10
FHWA NOISE ABATEMENT CRITERIA (NAC)

Activity Category	dBA Leq	Description of Land Use Activity Areas
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area were 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 were physically shielded from the roadway or if there were little or no human activity in exterior areas adjacent to the roadway.
Source: FHWA, 2001 (23 CFR 772)

Future noise levels and impacts associated with the construction of each segment are discussed in Volume II of the FEIS.

3.8 WATER QUALITY

3.8.1 Surface Water

The TCEQ Permanent Rules Chapter 307, Texas Surface Water Quality Standards (TSWQS) Subsections 307.1 – 307.10, dated August 17, 2000, presents surface water quality standards that apply to all surface waters in the state. The

major surface waters of the state are classified in the TSWQS as "segments" for the purposes of water quality management and designation of site-specific standards. Waterbodies that do not support their water quality standards, and for which existing controls are not adequate, are placed on the 303(d) List of Impaired Waterbodies (as required under Clean Water Act [CWA] Section 303[d]). The 2006 303(d) List (TCEQ, 2007), the most recent data available, indicates water quality concerns for six segments that traverse the project area (Table 3-11). Table 3-12 presents the specific water quality concerns for the portion of these TSWQS segments that overlaps the project area.

TABLE 3-11
TEXAS SURFACE WATER QUALITY STANDARDS SEGMENTS WITHIN THE PROJECT AREA

TSWQS Segment	Description of Surface Water Segment	Grand Parkway Segment
1004	West Fork of the San Jacinto River from the confluence of Spring Creek in Harris/Montgomery Counties to Conroe Dam in Montgomery County	G
1008	Spring Creek from the confluence with the West Fork of the San Jacinto River in Harris/Montgomery Counties to the most upstream crossing of FM 1736 in Waller County	G
1008H	Willow Creek from 0.3 miles north of Juergen Road to the confluence with Spring Creek	F-1, F-2
1009	Cypress Creek from the confluence with Spring Creek in Harris County to confluence of Snake Creek and Mound Creek in Waller County	E
1009E	Little Cypress Creek from the confluence with Cypress Creek upstream to Highway 290A	F-1
1014A	Bear Creek perennial stream from the confluence with South Mayde Creek upstream to the confluence with an unnamed tributary 1.24 km north of Logenbaugh Road	E

Source: TCEQ, 2007

Cypress Creek is an effluent dominated stream and has been ranked as the third worst segment in the state regarding water quality and the need for corrective action (Kolbe, 1994). The designated water uses for each of these TSWQS segments are contact recreation, aquatic life, general uses, and public water supply.

TABLE 3-12
SUMMARY OF WATER QUALITY CONCERNS

TSWQS Segment	Assessment Unit[1]	ALU[2] Designation	Water Quality Concerns
1004	1004_02	High	Water quality concern based on screening levels for nitrate. Non-supporting of water uses because of *E. coli* bacteria from non-point sources including urban runoff/storm sewers.
1008	1008_04	High	Non-supporting of water uses because of *E. coli* bacteria from non-point sources including urban runoff/storm sewers and on-site treatment systems and from sanitary sewer overflow point sources.
1008H	All of segment has concern	High	Water quality concern based on screening levels for nitrate and total phosphorus. Non-supporting of water uses because of *E. coli* bacteria from non-point sources including urban runoff/storm sewers and from unknown point sources.

TABLE 3-12 (CONT.)
SUMMARY OF WATER QUALITY CONCERNS

TSWQS Segment	Assessment Unit[1]	ALU[2] Designation	Water Quality Concerns
1009	1009_01	High	Water quality concern based on screening levels for depressed dissolved oxygen. Non-supporting of water uses because of *E. coli* bacteria from non-point sources including urban runoff/storm sewers and on-site treatment systems and from sanitary sewer overflow point sources.
1009E	All of segment has concern	High	Water quality concern based on screening levels for ammonia, nitrate, and total phosphorus. Non-supporting of water uses because of *E. coli* bacteria from non-point sources including on-site treatment systems and from sanitary sewer overflow point sources.
1014A	1014A_01	Limited	Water quality concern based on screening levels for nitrate and total phosphorus. Non-supporting of water uses because of *E. coli* bacteria from non-point sources including urban runoff/storm sewers and from sanitary sewer overflow and municipal point sources.

Notes:
[1] The specific portion of the segment that overlaps the project area and for which specific water quality concerns are presented.
[2] ALU=Aquatic Life Use
Source: TCEQ, 2007

Environmental effects of highway construction and operation are variable. During the short term, the main effects to the water quality are due to actual construction. During this time, the exposed earth may erode, and the eroded sediments may contribute to turbidity and sediment load of area waterbodies. Since this project would disturb more than one acre of land, TxDOT would be required to comply with the TCEQ through a Texas Pollutant Discharge Elimination System (TPDES) Construction General Permit TXR150000. Permitting would be accomplished by developing a Storm Water Pollution Prevention Plan (SWPPP) in order to avoid adverse impacts potentially resulting from storm water runoff discharges. In addition, because the project would disturb more than five acres of land, TxDOT would issue an NOI prior to construction stating that the SWPPP has been developed and filed with TCEQ. Erosion and sedimentation would be controlled by job specifications, on-site inspections during construction, and by seeding and sodding near completion of the project. TxDOT contract specifications require the contractor to minimize negative effects to the environment at all times during construction.

After construction and during the operation of the highway, the direct effect to surface water quality would be storm water runoff from the road and ROW. Where storm water from the proposed project would discharge to a Municipal Separate Storm Sewer System (MS4), the MS4 permittee would be notified of the construction activity. Pollutants that may be present in the runoff include oils and greases and spilled materials due to accidents. Establishing and constructing Best Management Practices (BMPs) can reduce these potential adverse effects to water quality. BMPs may include grassy

swales and grass lined drainage features adjacent to the roadway and storm water management facilities incorporated into detention/retention ponds to help the elimination of pollutants before runoff reaches the stream system.

Indirect effects, in the form of potential induced development, would also increase the potential for contaminant loading of area waterbodies. It is expected that storm water generated by future development would be regulated for proper treatment prior to release to the waterways. Water quality in the area would continue to be monitored by the TCEQ and other resource and regulatory agencies. Further description of streams and potential impacts is presented in Volume II of this document.

3.8.2 Groundwater

Data on groundwater resources are available from USGS and the TCEQ. Recognized aquifers in the project area that contain fresh water (i.e., water having not more than 1,000 mg/l Total Dissolved Solids [TDS]) include the Chicot, Evangeline, Jasper, and Catahoula Aquifers (Baker, 1979). Quaternary alluvial deposits along the streams in the project area (South Mayde Creek, Bear Creek, Cypress Creek, Little Cypress Creek, Willow Creek, Spring Creek, West Fork of the San Jacinto River, and Caney Creek) may also be a source of fresh groundwater; however, no published or open-file information on hydraulic characteristics or use of this water-bearing unit was identified.

The Chicot, Evangeline, Jasper, and Catahoula Aquifers are sub-aquifers within the Gulf Coast Aquifer. The Gulf Coast Aquifer forms an irregularly shaped belt along the Gulf of Mexico from Florida to Mexico. The Houston metropolitan area is the largest municipal user of the aquifer. The Gulf Coast Aquifer and all its sub-aquifers are depicted in Exhibit G–27.

The Chicot Aquifer is the shallowest major aquifer of the Gulf Coast Aquifer system and consists of all strata between ground surface and the top of the Evangeline Aquifer. Wesselman (1972) subdivided the Chicot Aquifer into upper and lower units in southeastern Fort Bend County, a neighboring county to the project area, based on the occurrence of an intervening clay stratum at a depth of about 200 feet. Sand strata constitute about 40 percent to 75 percent of the aquifer, with the rest consisting of less permeable clays, sandy clays, and muds (Wesselman, 1972). The boundaries of the Chicot Aquifer are not distinct, but the upper Chicot is generally correlated to the Beaumont Formation, and the lower Chicot is generally correlated to the Montgomery, Bentley, and Willis Formations. Groundwater in the upper Chicot may exist under confined (i.e., artesian) or unconfined (i.e., water table) conditions, while groundwater in the lower part is under confined or leaky confined conditions. The elevation of the base of the Chicot Aquifer is estimated to range approximately from MSL to 400 feet below MSL for the project area (Baker, 1979).

The Evangeline Aquifer underlies the Chicot Aquifer and consists of layers of sand and clay in the Fleming Formation and Goliad Sand that are present throughout the Houston metropolitan area except where the unit is pierced by salt domes. The Evangeline is estimated to be about 700 feet thick beneath the project area. Sand strata constitute about 33 to 40 percent of the aquifer. The basis for separating the Evangeline Aquifer from the Chicot Aquifer is primarily a difference in

hydraulic conductivity (Meyer and Carr, 1979). The Evangeline Aquifer is the most important source of fresh groundwater in the Houston metropolitan area. The elevation of the base of the Evangeline Aquifer is estimated to range from about 600 feet below MSL to about 1,000 feet below MSL (Baker, 1979).

The Jasper Aquifer underlies the Evangeline Aquifer and consists of layers of sand in clay from the Fleming Foundation and the Oakville Sandstone in some locations and the Catahoula Confining System in others. The Jasper is estimated to be about 1,000 feet thick beneath the project area. The Jasper Aquifer is separated from the Evangeline by the Burkeville Confining System or aquiclude, a layer that ranges up to approximately 300 feet thick and is relatively high in silt and clay content. An aquiclude is a relatively impermeable formation that may contain water, but is relatively impermeable or incapable of transmitting substantial quantities in relation to the adjacent aquifers. The elevation of the base of the Jasper Aquifer is estimated to range from about 1,600 feet below MSL to about 2,200 feet below MSL (Baker, 1979).

The Catahoula Aquifer is the deepest and contains groundwater near the outcrop (i.e., surface extent) in relatively restricted sand layers. This aquifer contains moderate quantities of fresh water and slightly saline water (1,000 to 3,000 mg/l TDS). The Catahoula Sandstone is approximately 300 to 500 feet thick and ranges from about 1,500 feet below MSL in Montgomery County to more than 5,000 feet below MSL in the southeastern portion of the project area (Popkin, 1971).

Recharge to the Chicot, Evangeline, and Jasper Aquifers occurs predominantly by infiltration of precipitation through permeable portions of the aquifers that crop out at the land surface and by leakage from overlying aquifers. Recharge to the Chicot Aquifer occurs mainly on the outcrops of the Montgomery, Bentley, and Willis Formations, in Waller, Austin, and Colorado Counties (Gabrysch, 1977). There is likely recharge to the Chicot Aquifer in Montgomery County by infiltration of precipitation in the area. Recharge to the upper Chicot likely occurs by leakage from saturated alluvium deposits along the many streams in the area. The Goliad Formation, which comprises most of the Evangeline Aquifer, is overlaid by the Willis Formation in the project area and in Austin and Waller Counties to the north; therefore recharge to the Evangeline is presumed to occur mainly by leakage from the overlying Chicot Aquifer (Wesselman, 1972). In a similar manner, recharge to the Jasper is presumed to occur mainly by leakage through the Burkeville Confining System from the Evangeline Aquifer. The Catahoula Aquifer and the lower part of the Jasper Aquifer crop out in the northern portion of Montgomery County. Recharge to these aquifers is achieved by the down dip movement of water from the outcrop area (Popkin, 1971).

3.8.2.1 Water Well Review

Public well records from TCEQ and private water well records and drillers' reports from the Texas Water Development Board (TWDB) were reviewed for the project area. Both agencies maintain a listing of water wells existing in the area. However, the databases only include wells that have been reported to the TCEQ and TWDB and may not include all water wells in the project area.

The results of the water well review indicate that there are a total of 215 water wells within the project area. Of this total, 58 are public water supply wells. The remaining 157 wells are private, which are not presently afforded protection by any regulations. Private wells are utilized for domestic, livestock, industrial, or irrigation purposes.

All public water supply systems are eligible to participate in the Source Water Protection Program. The Source Water Protection Program is a voluntary pollution prevention program created by the 1996 Safe Drinking Water Act Amendments. It is an expansion of the existing Wellhead Protection Program and was implemented to protect public groundwater sources from possible surface and subsurface source contamination.

Under the program, a wellhead protection area is established around each public supply well. This area is a protective buffer zone of a diameter specific to each well (based upon the hydrogeology of the area) within which certain development is excluded to prevent possible contamination of the groundwater. TCEQ has established these "capture zones" for most public supply wells inside and adjacent to the project area. For wells that do not have designated capture zones, a default zone of a quarter mile radius surrounding the well was utilized for project resource mapping. The four-segment project area (Segments E, F-1, F-2, and G) overlaps 157 public water supply well capture zones (TCEQ, 2006; TWDB, 2006c).

Appropriate precautions, such as established BMPs, should be taken to divert surface runoff from entering the aquifers in the wellhead protection area. All public supply wells and capture zones in the project area must be investigated to ensure that they are protected from any possible adverse impacts of the project. Specific wellhead impacts are discussed in Volume II for an individual Grand Parkway segment.

3.9 PERMITS

3.9.1 Waters of the U.S., Including Wetlands

Section 404 of the CWA authorizes the USACE to regulate discharges of dredged or fill material into Waters of the U.S., including wetlands. As part of the USACE approval process, the state environmental agency (TCEQ) must certify, pursuant to Section 401 of the CWA, that the discharge of dredged or fill material to be licensed or permitted by the USACE will comply with the applicable state effluent limitations and water quality standards. The project area is mostly upland; however, several wetlands and intermittent and perennial streams (Waters of the U.S.) have been identified within the project area and may be jurisdictional under Section 404 of the CWA. Placement of dredged or fill material within Waters of the U.S., including wetlands, requires a permit from the USACE under Section 404 and water quality certification from the TCEQ under Section 401. The results of the Section 404 field evaluations and potential impacts are discussed in Volume II, Sections 3.10.1 and 4.10.1 (Wetlands).

Section 402 of the CWA prohibits the discharge of any pollutant to Waters of the U.S. from a point source unless the discharge is authorized by TPDES permit. Construction activity is considered a point source discharge. Permit authorization may be given under an Individual Permit or an existing General Permit. Currently, coverage under a TPDES permit is required in Texas for construction activity that disturbs more than five acres of soil.

The TPDES permit requires completion of a SWPPP. The SWPPP requirements are designed to allow maximum flexibility when selecting BMPs at the construction site. As part of the SWPPP, inspections are required of both stabilized and unstabilized areas in the construction site for evidence of, or the potential for, pollutants entering the drainage system via storm water runoff. Summary reports of these inspections must be written and retained as part of the SWPPP. Once construction has been completed, a Notice of Termination must be filed per permit requirements. Additional coordination with Harris County local government regarding storm water runoff pollution prevention may also be required prior to project construction.

3.9.2 Navigable Waters of the U.S.

As defined in 33 CFR 329.4, "Navigable waters of the United States are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity."

The General Bridge Act of 1946 and Sections 9 and 10 of the Rivers and Harbors Act of 1899 prohibit the unauthorized obstruction, including bridge construction, or alteration of any navigable Water of the U.S. unless the work has been authorized by permit from the U.S. Coast Guard (USCG) and the USACE, respectively. Because of the size and use of Spring Creek and the West Fork of the San Jacinto River, navigable status was requested from the USACE for the Segment G project area. Per correspondence with the USACE (May 21, 2003, Appendix B) no navigable waterways occur within the Segment G project area.

No navigable waterways occur within the entire project area (Segments E, F-1, F-2, and G). Therefore, the need for a Section 9 permit from the USCG or a Section 10 permit from the USACE is not anticipated.

3.10 WETLANDS AND VEGETATIVE COMMUNITIES

3.10.1 Wetlands

Wetlands within the project area can be generally divided into two categories: non-forested and forested, which typically correspond to the Cowardin Classification System's Palustrine Emergent, Palustrine Scrub-Shrub, and Palustrine Forested wetland categories (Cowardin, Carter, Golet, and LaRoe, 1979). Table 3-13 summarizes the approximate acres of forested and non-forested wetlands within the project area.

TABLE 3-13
WETLANDS WITHIN THE PROJECT AREA

Segment	Non-Forested Wetlands (acres)	Forested Wetlands (acres)	Total Wetlands (acres)
E	441	10	**451**
F-1	322	29	**351**
F-2	255	46	**301**
G	375	601	**976**

Source: Study Team, 2007

Typical project area non-forested wetlands include emergent marshes, wet meadows, scrub-shrub wetlands, and remnant prairie potholes. Based on the field investigations, the portion of the project area crossed by Segments E and F-1 contains wetland areas that are typically non-forested. Non-forested wetlands observed within Segment E and portions of Segment F-1 include remnant prairie-pothole wetlands that are known to have occurred historically throughout the Katy Prairie. Many of these wetlands occur within pasture and agricultural areas. Many of the non-forested wetlands found within Segments F-2 and G in the project area may have historically been forested wetlands prior to conversion to pasture or agricultural lands.

Typical forested wetlands occur in isolated depressional areas, bottomland hardwood areas, and floodplains throughout the project area. Forested wetlands found in Segments E and F-1 appear to be early successional forested wetlands or herbaceous wetlands being converted to forested wetlands. The majority of the forested wetlands within Segments F-2 and G are considered mid to late successional forested wetland communities. Typical forested wetlands within Segment G can be found within the floodplains, oxbows, sloughs, and remnant channels of Spring Creek and the West Fork of the San Jacinto River. Based on preliminary field investigations, forested wetlands occur more frequently in Segments F-2 and G than other portions of the project area.

The wetland vegetation present in depressions and forested areas in the project area is typical of Palustrine Emergent, scrub-shrub and forested wetland areas within southeast Texas. Wetland grass-like vegetation species present in the various swales, sloughs, and depressions include rushes (*Juncus* spp.), sedges (*Carex* spp.), spikerushes (*Eleocharis* sp.), flatsedges (*Cyperus* spp.), bushy bluestem (*Andropogon glomeratus*), longtom (*Paspalum lividum*), and maidencane (*Panicum hemitomon*). Forbs present include smartweed (*Polygonum* spp.), seedbox (*Ludwigia* spp.), and hairy hyrdolea (*Hydrolea ovata*). Tree species in forested wetlands include sugarberry (*Celtis laevigata*), water oak (*Quercus nigra*), willow oak (*Quercus phellos*), sweetgum (*Liquidambar styraciflua*), green ash (*Fraxinus pennsylvanica*), bald cypress (*Taxodium distichum*), and Chinese tallow-tree (*Sapium sebiferum*). Typical shrubs consist of Drummond's rattlebush (*Sesbania drummondii*), dwarf palmetto (*Sabal minor*), eastern baccharis (*Baccharis halimifolia*), and southern bayberry (*Myrica cerifera*). Cherokee sedge (*Carex cherokeensis)* and narrowleaf woodoats (*Chasmanthium sessiliflorum*)

typically dominate the herbaceous layer in forested wetland areas. Additional descriptions of the non-forested and forested wetland communities in the project area are presented in Section 3.10.2 (Vegetative Communities).

3.10.1.1 Wetland Functions and Values

Wetlands provide a variety of functions and values to the natural ecosystem and to humans, which include wildlife and aquatic habitat, removal of sediments and toxicants, removal or transformation of nutrients, flood control, erosion control/stabilization, groundwater recharge and discharge, production export, threatened and endangered species habitat, recreation, educational/scientific research, aesthetics, and potential unique heritage or scientific values (Mitsch and Gosselink, 1986; USACE, 1999). Wetlands within the project area provide many of these functions and values at varying levels and degrees. The following paragraphs provide a general overview of these functions and values relative to typical wetland habitats observed within the various segments of the project area. The USACE New England District's Descriptive Approach will be used to provide a more detailed evaluation of wetland functions and values within the project area in Volume II of the FEIS (USACE, 1999).

An important function of wetlands within the project area, especially along major floodplains and areas adjacent to floodplains, is flood control. Wetlands often attenuate flows and retain large amounts of water during flood-level runoff periods (Mitsch and Gosselink, 1986). Wetlands can act as a sponge or sink, absorbing and storing water, then releasing it slowly. Wetlands in river floodplains can reduce flow rates up to 80 percent as floodwaters overflow banks, reducing peak flows of potential floods (Tacha, 1994). Wetlands throughout the project area provide varying degrees of flood control. For example, wetlands associated with the Spring Creek and West Fork Trinity River floodplains within Segment G provide great potential for floodwater storage and retention. Similarly, the natural depressions and artificial basins used for rice farming on the Katy Prairie may attenuate flows by as much as 80 percent (Harris County Flood Control District [HCFCD], 2000).

Sediments carried into wetlands during flood events eventually settle there because of decreased flow velocities, thereby reducing the sediment and nutrient load in local streams and waterways. Many forms of toxic chemicals adhere to sediments in runoff, especially runoff from agricultural areas (Tacha, 1994). As the sediments precipitate, wetland vegetation acts as a filter by absorbing nutrients and contaminants into their tissues and by trapping the nutrients, contaminants, and sediments in the soil through their root systems. Wetlands serve as nutrient sinks, absorbing up to 99 percent of nitrogen and 95 percent of phosphorus from runoff waters. The net result is a reduction of sediments and contaminants in surface water and groundwater, with a net increase in water quality (Mitsch and Gosselink, 1986). Wetlands throughout the project area function as nutrient sinks, especially in the prairie potholes, emergent marshes, and riparian drainages crossed by Segments E, F-1, and F-2 that remove nutrients and chemicals associated with adjacent agricultural operations.

In addition to their functions related to surface water, wetlands act as a catch basin for groundwater recharge where subsurface geology permits gravity flow of surface water to groundwater zones, which is typical in many riverine systems. Runoff and precipitation collected in wetlands percolates through the soil to the water table, recharging underground aquifers. During recharge, as the water percolates through the soil, sediments, and nutrients are filtered out by the soils and root zone of the vegetation, improving water quality (Tacha, 1994).

In addition to the surface and groundwater functions, wetlands provide secure habitat with an abundance of food and shelter for a variety of wildlife species, both terrestrial and aquatic. Volumes I and II, Section 3.11 (Wildlife) include an overview of wildlife species likely to occupy wetlands within the project area. Wetlands associated with the Katy Prairie (Segments E and portions of F-1) provide important habitat for waterfowl within the Texas Gulf Coast marshes and associated rice prairie lands, an area of international significance to migrating and wintering mid-continental waterfowl (Texas Mid-Coast Initiative Team, 1990). This area forms part of the wintering grounds for waterfowl in the Central Flyway (Buller, 1964). Wetlands between Spring Creek and the West Fork of the Trinity River within Segment G provide suitable habitat and support a wide variety of native wildlife in a relatively unfragmented area that has experienced little impact from development.

The project area crosses eight major streams, numerous minor streams, and several stock ponds. The major streams are South Mayde Creek, Bear Creek, Cypress Creek, Little Cypress Creek, Willow Creek, Spring Creek, West Fork of the San Jacinto River, and Caney Creek. These waterbodies are considered special habitat features in the Memorandum of Understanding (MOU) between TxDOT and TPWD. Refer to Volume II, Section 4.12.1 (Hydrology and Drainage) for a detailed account of the permanent and temporary stream impacts associated with the proposed project as well as the steps taken to avoid or minimize impacts.

Human recreational and commercial uses are important functions/values of wetlands. Wetland areas provide multiple recreational uses, such as hiking, wildlife viewing, hunting, and fishing. Wetlands throughout the project area afford varying degrees of human recreational and commercial value. As discussed previously, wetlands associated with the Katy Prairie and Segments E and F-1 provide valuable waterfowl habitat and thus afford excellent opportunities for bird watching and sport hunting. Forested wetlands within Segments F-2 and G support silviculture activities, as well as offer opportunities for hiking, nature viewing, and hunting near a major metropolitan area.

3.10.2 Vegetative Communities

Harris and Montgomery Counties are located within the Gulf Prairies and Marshes, Pineywoods, and a portion of the Blackland Prairies ecological regions as defined by Hatch, Kancheepuram, and Brown (1990). Within these counties, the project area for Segments E, F-1, F-2, and G includes the Gulf Prairies and Marshes and the Pineywoods. The Gulf Prairies and Marshes are characterized by nearly level topography with precipitation averaging 48 inches per year. The

elevation extends from sea level along the coast up to 250 feet above MSL. The Pineywoods are characterized by nearly level to gently undulating and locally hilly topography with precipitation also averaging 48 inches per year. Elevations within the Pineywoods range from 200 to 700 feet above MSL (Hatch et al., 1990).

South of US 290, Segment E crosses through the Gulf Coast Prairies and Marshes. Between IH 45 and US 59, Segment G crosses through the Pineywoods. Between US 290 and US 59, Segments F-1 and F-2 cross through an ecotone, or edge area, between these two ecological regions (Gould, 1975).

The vegetative communities that are present within the project area can be divided into five general categories: farmland, rangeland, forest, non-forested wetlands, and forested wetlands. Table 3-14 presents the amount of each of these land covers in the project area by segment. Segment-specific details on vegetative communities can be found in Volume II, Section 3.10.2 (Vegetative Communities).

TABLE 3-14
WETLANDS VEGETATIVE COMMUNITIES WITHIN THE PROJECT AREA

Segment	Farmland (acres)	Rangeland (acres)	Forest (acres)	Non-Forested Wetland (acres)	Forested Wetland (acres)
E	2,491	4,716	158	441	10
F-1	2,811	2,634	1,232	322	29
F-2	1,647	178	2,825	255	46
G	15	0	4,883	375	601

Source: Study Team, 2007

3.10.2.1 Farmland

McMahan, Frye, and Brown (1984) define farmland as any "cultivated cover crop or row crop providing food and/or fiber for either man or domestic animals." This definition corresponds to the authors' vegetation type 44 (Crops). Farmland in the project area is normally used to grow corn, rice, peanuts, and soybeans. In the abandoned fields, various invading species such as eastern baccharis, narrow-leaf sumpweed (*Iva angustifolia*), Canada goldenrod (*Solidago canadensis*), western ragweed (*Ambrosia psilostachya*), Chinese tallow-tree, and Brazilian vervain are common.

3.10.2.2 Rangeland

Vegetative communities are considered rangeland generally "where the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs and where natural herbivory was an important influence in its pre-civilization state" (Anderson et al., 1976). Rangeland accounts for a large portion of the project area (see Table 3-14). The vast majority of the project area rangeland is located within Segments E and F-1, while Segments F-2 and G contain very little rangeland. Much of the remaining rangeland communities in the project area have been heavily disturbed or altered by

human influence. Conversion of native prairie to improved pasture for livestock grazing and suppression of a natural fire regime has allowed non-native grasses and forbs to dominate these communities. Some native species still exist as minor components of improved pastures and in remnant prairie areas.

3.10.2.3 Forest

The majority of forest in the portion of the project area crossed by Segments E and F-1 are scattered bands or isolated mottes of mid to late successional forested communities. These communities typically occur along fencerows, abandoned farm areas, and riparian corridors. Based on field observations, typical overstory trees are approximately 20 to 50 feet tall with an average diameter at breast height (dbh) ranging between six and 15 inches. Canopy coverage ranges between 60 and 80 percent.

The portion of the project area crossed by Segments F-2 and G contains much more extensive forest communities than Segments E and F-1. The majority of the forest in this portion of the project area is considered mid to late successional forested communities. Based on field observations, typical overstory trees are approximately 20 to 50 feet tall with average dbh ranging between six and 20 inches. In areas where the forested vegetation has not been cleared, canopy coverage ranges between 60 and 80 percent. This forested community type corresponds with McMahan et al.'s (1984) vegetation type 42 (Pine-Hardwood Forest).

Typical overstory vegetation species within the project area non-wetland forest communities include loblolly pine, post oak, cedar elm, winged elm (*Ulmus alata*), live oak, sugarberry, pecan (*Carya illinoiensis*), water oak, willow oak, green ash, and Chinese tallow-tree. Understory and shrub species include yaupon, wax myrtle (*Myrica cerifiera*), dwarf palmetto, Chinese privet, flowering dogwood (*Cornus florida*), and Chinese tallow-tree saplings. Common vine species include greenbriar (*Smilax rotundifolia* and *S. laurifolia*), southern dewberry, trumpet creeper (*Campsis canadensis*), peppervine (*Ampelopsis arborea*), Japanese honeysuckle (*Lonicera japonica*), poison ivy (*Toxicodendron radicans*), and Alabama supplejack (*Berchemia scandens*). The herbaceous layer includes narrowleaf woodoats, Cherokee sedge, and broomsedge (*Andropogon virginicus*). Forested wetlands are typically located within and/or contiguous with non-wetland forest. Please refer to Volumes I and II, Section 3.10.2.5 (Forested Wetlands) for additional discussion regarding forested wetlands within the Grand Parkway project area. In addition, two subcategories of forest have been defined in order to better quantify and evaluate potential project impacts: riparian forest and bottomland hardwood forest.

Riparian Forest

Riparian forest refers to linear bands of trees, shrubs, and other vegetation along stream channels. This forest provides ecological buffers that serve several purposes, including reduction of pollution impacts by trapping, filtering, and converting sediments, nutrients, and other chemicals; maintaining channel integrity; and supplying food, cover, and thermal protection to fish and other wildlife. These communities also provide forested riparian corridors valuable for wildlife habitat and movement across the landscape. In addition, they slow flood waters and help control nonpoint source

pollution from agriculture, grazing, and urban development (Chesapeake Bay Program, 2001; Virginia Department of Forestry, 2001).

While riparian forests vary in character and size based on ecological setting, the term "riparian forest" is used in Volume II of the FEIS to describe narrow forest corridors along streams within a matrix of an otherwise non-forested area (e.g., narrow forested band along South Mayde Creek in Segment E). These communities are typically limited to the Segments E and F-1 project areas.

Bottomland Hardwood Forest

For purposes of this FEIS, the term "bottomland hardwood forest" refers to forested areas dominated by mesic hardwood tree species that occur primarily within the 100-year floodplain. These areas may contain scattered pine and often coincide with forested wetlands. Bottomland hardwood forest is primarily found in Segments F-2 (especially along Spring Creek) and G (especially within the floodplain between Spring Creek and the West Fork of the San Jacinto River) project areas. However, these communities can be found to a limited extent in Segments E and F-1 project area floodplains.

Bottomland hardwood forest occurs primarily within floodplains and flats and in areas along river channels. Species commonly found in this habitat type are mesic and include water oak, willow oak, black gum (*Nyssa sylvatica*), American elm (*Ulmus americana*), overcup oak (*Quercus lyrata*), green ash, deciduous holly (*Ilex decidua*), American holly (*Ilex opaca*), hawthorns (*Crataegus* spp.), American hornbeam (*Carpinus caroliniana*), and occasionally dwarf palmetto. Presence of pines is minimal, though some pine plantations have been established. Periodic inundation prevents the establishment of more xeric upland species and perpetuates the functions of this vegetation type (Clark and Benforado, 1981).

Bottomland hardwood forest is considered among the most important habitats for wildlife in the region. This forest contains swamps, ponds, and meandering channels that not only provide various habitats needed by a variety of fish and wildlife species and migrating birds, but also contain resources necessary for their survival. This forest is also rich in plant and animal species diversity. Bottomland hardwood forest helps control soil erosion, maintain water quality, recharge groundwater, and prevent flood damage. However, the bottomland hardwood forest is often primary locations for economic development. Hardwood trees, fertile soils, water resources, and unique landscape attract many kinds of development activities, such as agriculture, forestry, tourism, industry, and water development. Consequently, bottomland hardwood forest has been disappearing rapidly since the turn of this century in Texas as well as throughout the nation (TPWD, 1998).

Riparian and bottomland hardwood forests were delineated within the Grand Parkway project area using National Wetlands Inventory (NWI) maps, Federal Emergency Management Agency (FEMA) floodplain maps, available field data, and interpretation of several years' (1982, 1988, 1995, 1999, and 2004) worth of color infra-red and black-and-white aerial photography. Historical aerial photography was used in order to better delineate areas originally containing bottomland

hardwood forest since extensive silvicultural activity has occurred in the project area within the last few years. These "cut-over" bottomland hardwood areas have been included in impact analysis based on the assumption that they could return to their original condition if left undisturbed.

These two forest sub-categories were delineated for impact analysis purposes only within and in the vicinity of the proposed alternative alignments for each Grand Parkway segment. They were not delineated throughout the entire project area. While many areas within riparian and bottomland hardwood forests include jurisdictional (Section 404) forested wetlands, these forest subcategories may include non-wetland forest areas as well. Potential impacts to bottomland and riparian forests are addressed within Volume II for each segment.

3.10.2.4 Non-Forested Wetlands

Non-forested wetlands, or Palustrine Emergent and Palustrine Scrub-Shrub (Cowardin et al., 1979), are scattered throughout the project area. This community type corresponds with McMahan et al.'s (1984) vegetation type 43 (Marsh/Barrier Island). Many of the non-forested wetlands observed are considered early successional communities experiencing secondary succession. Various non-forested wetlands observed within Segment E and portions of Segment F-1 are remnant prairie-pothole wetlands that are known to have occurred historically throughout the Katy Prairie. Many of these wetlands occur within agricultural areas and have been converted for producing crops.

Many of the non-forested wetlands found in the project area within Segments F-2 and G were most likely forested wetlands prior to conversion to pastureland or agricultural lands. Although these areas may have been forested wetlands in the past, the length of time these wetlands have been converted indicates that the observed community represents the new normal circumstance or expected community type. Because of ongoing agricultural practices and increasing urban development within the project area, the probability for these areas to revert to climax forested wetland communities is remote.

Although non-forested wetlands within the project area vary in plant composition, the following list represents the typical vegetation observed in this habitat type during initial field investigations. Typical vegetation includes swamp smartweed (*Polygonum hydropiperoides*), green flatsedge, jointed flatsedge (*Cyperus articulatus*), soft rush (*Juncus effusus*), grassleaf rush, sand spikerush (*Eleocharis montevidensis*), smooth water primrose (*Ludwigia peploides*), curly dock, sawtooth frog-fruit (*Phyla incisa),* hairy hydrolea (*Hydrolea ovata*), arrowhead (*Sagittaria* sp.), Cherokee sedge, maidencane (*Panicum hemitomon*), bushy bluestem (*Andropogon glomeratus*), longtom (*Paspalum lividum*), morning glory (*Ipomoea coccinea*), Drummond's rattlebush, eastern baccharis, wax myrtle, southern bayberry, and Chinese tallow-tree saplings.

3.10.2.5 Forested Wetlands

Forested wetlands, or Palustrine Forested (Cowardin et al., 1979), occur in isolated depressions, bottomland hardwood areas, and floodplains throughout the project area. However, the greatest concentration occurs within Segment G

associated with floodplains, oxbows, sloughs, and remnant channels of Spring Creek and the West Fork of the San Jacinto River. Forested wetland community types within the project area closely correspond with McMahan et al.'s (1984) vegetation types 31, 36, and 39 (Willow Oak-Water Oak-Blackgum Forest, Water Oak-Elm-Hackberry Forest, and Bald Cypress-Water Tupelo Swamp, respectively).

The majority of the forested wetlands within Segments F-2 and G are considered mid to late successional forested wetland communities. Based on preliminary field surveys, the overstory trees observed are typically between 20 and 60 feet tall, with average dbh ranging from four to 12 inches. Typical canopy coverage ranges between 50 and 80 percent. Vegetation within these areas typically includes willow oak, water oak, sweetgum, American elm (*Ulmus americana*), bald cypress (*Taxodium distichum*), black gum, cottonwood (*Populus deltoides*), sugarberry, Chinese tallow-tree, green ash, dwarf palmetto, Cherokee sedge, maidencane, Virginia wildrye (*Elymus virginicus*), and narrowleaf woodoats.

In addition to the mid to late successional forested wetland communities, several forested wetlands located throughout the project area, especially within Segments E and F-1, appear to be early successional forested wetlands or herbaceous wetlands being converted to forested wetlands. Based on preliminary field surveys, these wetlands are dominated by sugarberry, Chinese tallow-tree, green ash, and black willow (*Salix nigra*) trees that range in height from 20 to 60 feet. The average dbh ranges from four to 12 inches and the canopy coverage typically ranges from 50 percent to 80 percent.

3.10.3 Natural Areas

Natural areas are ecologically sensitive areas, including portions of certain important habitats such as bottomland hardwood forest, wetlands, and native tall grass prairie. The project area includes two recognized ecologically sensitive areas: a flat open expanse of pastureland, cropland, and remnant native prairie south of Little Cypress Creek known as the Katy Prairie; and a largely unfragmented expanse of mixed upland and bottomland hardwood forest east of IH 45 historically associated with an ecologically distinct region known as the Big Thicket.

Katy Prairie

The Katy Prairie is a low, somewhat featureless, generally poorly drained plain located west of the city of Houston in Harris, Waller, and Fort Bend Counties. The Katy Prairie, sometimes locally referred to as the Katy-Hockley Prairie, originally encompassed approximately 200,000 acres loosely bounded by the Brazos River bottom on the west, the southwest, pine-hardwood forest on the north and northeast, and the city of Houston on the east and southeast (Vallette, 1994). Approximately one-quarter of that area has been developed by the westward expansion of the city of Houston (Vallette, 1994). Within the Segment E project area, the Katy Prairie begins at IH 10 and extends northward to approximately Little Cypress Creek, north of US 290 (Segments E and F-1).

Historically, the Katy Prairie consisted of tall grass prairie habitat dissected with riparian corridors and tree "islands" and dotted with emergent wetland prairie "potholes" (Smeins, 1994). The Katy Prairie has since been converted for agriculture (primarily rice), ranching, and commercial/residential development. Agricultural and ranching areas still

contain extensive wetland habitats, both natural and human-induced (e.g., rice fields). The North American Waterfowl Management Plan identifies wetlands within the Katy Prairie as having international significance (Texas Mid-Coast Initiative Team, 1990).

The Katy Prairie lies within a major migratory bird flyway, with between 350 and 400 species of birds over-wintering in the area, including approximately 18 species of ducks and four species of geese, important game birds within the region (Smeins, 1994). Waterfowl surveys conducted on the Katy Prairie by the USFWS in 1992 recorded 184,000 snow geese (*Chen caerulescens*), approximately 23 percent of the wintering snow goose population on the Texas coast (Lobpries, 1994). Sport hunting is a sizeable industry in and around the Katy Prairie because of the large numbers of wintering waterfowl and the prairie's convenient location west of the Houston metropolitan area (Gore, 1994).

Big Thicket

East of IH 45 in the Segment G study area includes the southern extreme of an ecologically distinct region known as the Big Thicket. The Big Thicket contains a wide variety of habitats, such as jungle-like swamps, thickly forested uplands and bottomlands, and open park-like savannahs (Gunter, 1993). Its geological boundaries are best described as, "Its northern border was the last shore line of the Pliocene Age, its entire area Pliocene. Its southern boundary…was the shore line of the Gulf of Mexico during the transgression of the Gulf at the end of the [most recent] interglacial period…Its western boundary is the bluff line of the ancestral Brazos River" (Parks et al., 1938). Parks estimated that the historical Big Thicket was over 3,000,000 acres in total land area (Parks et al., 1938). By virtue of geographical location, this region is a "biological crossroads" of plant species from tropical and semitropical areas of North America, as well as relic species once widespread but now found only in tolerant areas like the Big Thicket (Ajilvsgi, 1979). The Big Thicket's continuity has been greatly reduced and fragmented by farming, logging, petroleum exploration and production, and other land uses (Ajilvsgi, 1979).

The Big Thicket was estimated at 1,000,000 acres in 1936 by Parks, who was commissioned by the East Texas Big Thicket Association for a survey to justify protection of this resource from the pressures of population and timber production (Parks et al., 1938). During the 1930s and 1940s, the conservation movement fell into neglect but began anew in the 1960s and 1970s with a drive to establish governmental protection of a large area. The intent of the original preservation movement was to preserve a great portion of the original 1,000,000 acres, but opposition to the preservation of such an area and limited funding were obstacles to this goal (NPS, 2006b). The Big Thicket National Preserve was created in 1974, originally consisting of 84,550 acres scattered through five counties (Abernethy, 2001). The Big Thicket National Preserve is now over 97,000 acres (NPS, 2006a) and spans across seven counties. Plans are in place to acquire more land for the preserve as soon as funding becomes available in 2006-2007 (NPS, 2006b).

Currently, fragmented remnants of undisturbed forest exist in remote locations and narrow corridors typically associated with Big Thicket National Preserve, adjacent conservation easements, and areas that are otherwise protected, difficult to access, or difficult to develop. These remnant areas are thought to total 300,000 to 500,000 acres (NPS, 2006b). Efforts

to preserve or recognize the unique habitat found within the Big Thicket include the National Park Services' Big Thicket National Preserve, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) Man and Biosphere Program in 1981, and the American Bird Conservancy's designation of the Big Thicket National Preserve as a Globally Important Bird Area in 2001. The preserve is largely buffered by surrounding land owned and managed by timber companies, but between 2000 and 2004, more than two million acres of timber company land were sold or put up for sale (NPCA, 2005). Much of the land adjacent to the preserve is still in timber holdings or under conservation easements (NPS, 2006b).

3.10.4 Beneficial Landscape Practices and Invasive Species

In accordance with the Executive Memorandum on Environmentally Beneficial Landscaping (issued April 26, 1994), all agencies shall comply with 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 runoff reduction practices, and 5) create demonstration projects employing these practices. Landscaping included with this project would be in compliance with the Executive Memorandum on Environmentally Beneficial Landscaping and the guidelines for environmentally and economically beneficial landscape practices.

In particular, landscaping would be limited to seeding and replanting the ROW with native species of grasses, shrubs, and/or trees where applicable and feasible in order to comply with the Executive Memorandum on Environmentally Beneficial Landscaping and Executive Order 13112 on Invasive Species (issued February 3, 1999). No invasive or noxious species would be used to revegetate the ROW. Soil disturbance would be minimized to ensure that invasive species do not establish in the ROW.

3.11 WILDLIFE

With respect to the 10 vegetation regions of the state described by Hatch et al. (1990), Harris and Montgomery Counties are located within the Gulf Prairies and Marshes, Pineywoods, and a portion of the Blackland Prairies ecological regions. Within these counties, the project area occurs only within the Gulf Prairies and Marshes and the Pineywoods. The wildlife habitats within the project area correspond to these vegetative types. Vegetative communities are described in Volumes I and II, Section 3.10.2 (Vegetative Communities). No endemic wildlife species occur within the project area, and vertebrate fauna in the project area is typical of that found over most of the Austroriparian Biotic Province to the east.

The project area can be divided into several major wildlife habitat types, which closely coincide with the major vegetative communities present. The major habitat divisions are defined as farmland, forested uplands and bottomlands, upland pasture/grassland, non-forested wetlands, and forested wetlands. The distribution of habitat types in the project area and the activity patterns of many wildlife species result in some overlapping of faunal communities. Forest-dwelling species

may occasionally occur in open areas around forest stands, and species particular to non-forested habitats may occasionally be found in forested areas. Ecotones between major habitats are often preferred by wildlife species because of the diversity of food and cover usually provided by the overlap of vegetative communities.

Amphibians

Amphibians are exothermic and require moisture for reproduction. Therefore, most amphibian species are associated with aquatic habitat. Amphibians likely to occur within the project area include the Gulf Coast toad (*Bufo valliceps valliceps*), northern cricket frog (*Acris crepitans crepitans*), upland chorus frog (*Pseudacris triseriata feriarum*), bull frog (*Rana catesbeiana*), bronze frog (*Rana clamitans clamitans*), green treefrog (*Hyla cinerea*), southern leopard frog (*Rana utricularia*), northern spring peeper (*Pseudacris crucifer*), Cope's gray treefrog (*Hyla chrysoscelis*), and gray treefrog (*Hyla versicolor*).

Reptiles

Reptiles that may occur within the project area include many species of turtles, lizards, and snakes. Some of the more common turtle species are most likely to be associated with aquatic habitat and include the red-eared slider (*Trachemys scripta elegans*), common snapping turtle (*Chelydra serpentina serpentina*), Mississippi mud turtle (*Kinosternon subrubrum hippocrepis*), and Midland smooth softshell (*Trionyx muticus muticus*). Two terrestrial species of turtles that may occur in the project area include the three-toed box turtle (*Terrapene carolina triunguis*) and the ornate box turtle (*Terrapene ornata ornata*). Common lizard species that may occur throughout the project area include the green anole (*Anolis carolinensis*), ground skink (*Scincella lateralis*), five-lined skink (*Eumeces fasciatus*), and northern fence lizard (*Sceloporus undulates hyacinthinus*). Snake species that may occur in the project area include the Texas rat snake (*Elahe obsolete lindheimeri*), eastern hognose snake (*Heterodon platirhinos*), gulf coast ribbon snake (*Thamnophis proximus orarius*), and rough earth snake (*Virginia striatula*). Other snake species such as the diamondback water snake (*Nerodia rhombifer*), broad-banded water snake (*Nerodia fasciata confluens*), and western mud snake (*Farancia abacura reinwardtii*) may occur around aquatic habitat within the project area. Several venomous species of snakes may also occur within the project area. These venomous snake species include the southern copperhead (*Agkistrodon contortrix contortrix*), western cottonmouth (*Agkistrodon piscivorus leucostoma*), Texas coral snake (*Micrurus fulvius tener*), and western pigmy rattlesnake (*Sistrurus miliarius streckeri*).

Avian Species

Numerous avian species are found within the project area. Some avian species that may occur are year-round residents while others are only seasonal migrants. Year-round residents that may occur include such species as the great blue heron (*Ardea herodias*), white-faced ibis (*Plegadis chihi*), great egret (*Ardea alba*), killdeer (*Charadrius vociferous*), black vulture (*Coragyps atratus*), turkey vulture (*Cathartes aura*), red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo jamaicensis*), northern bobwhite quail (*Colinus virginianus*), mourning dove (*Zenaida macroura*), blue jay (*Cyanocitta cristata*), American crow (*Corvus brachyrhynchos*), Carolina chickadee (*Poecile carolinensis*), tufted titmouse (*Baeolophus bicolor*), northern mockingbird (*Mimus polyglottos*), European starling (*Sturnus vulgaris*), northern cardinal

(*Cardinalis cardinalis*), eastern screech owl (*Otus asio*), house sparrow (*Passer domesticus*), red-winged blackbird (*Agelaius phoeniceus*), eastern meadowlark, and savannah sparrow (*Passerculus sandwichensis*). Migrant/winter resident avian species expected to occur in the project area include the American robin (*Turdus migratorius*), ruby-crowned kinglet (*Regulus calendula*), cedar waxwing (*Bombycilla cedrorum*), yellow-rumped warbler (*Dendroica coronata*), American goldfinch (*Carduelis tristis*), and white-eyed vireo (*Vireo griseus*).

Other migrant and winter resident species that may occur in the project area include many species of waterfowl. Some of the more common migrant/winter resident species that may occur within the project area are associated with a portion of the Gulf Prairies and Marshes historically known as the Katy Prairie. The Katy Prairie was historically composed of a mosaic of trees and prairie potholes within a tall grass prairie. Currently, the Katy Prairie is dominated by ranching and agriculture with substantial amounts of surface water that together provide an internationally substantial migration and wintering habitat for mid-continental waterfowl (Texas Mid-Coast Initiative Team, 1990). Some of the common waterfowl associated with the project area in the Katy Prairie include the green-winged teal (*Anas crecca*), northern pintail (*Anas acuta*), common gadwall (*Anas strepera*), American widgeon (*Anas americana*), lesser scaup (*Aythya affini*), northern shoveler (*Anas clypeata*), snow goose (*Chen caerulescens*), and greater white-fronted goose (*Anser albifrons*).

Mammal Species

Mammal species that may occur throughout the project area include the Virginia opossum (*Didelphis virginiana*), common raccoon (*Procyon* lotor), eastern fox squirrel (*Sciurus niger*), eastern gray squirrel (*Sciurus carolinensis*), eastern red bat (*Lasiurus borealis*), and house mouse (*Mus musculus*). Common mammals that are likely to occupy less developed areas within the project area include the eastern cottontail (*S. floridanus*), striped skunk (*Mephitis mephitis*), nine-banded armadillo (*Dasypus novemcinctus*), swamp rabbit (*Sylvilagus aquaticus*), marsh rice rat (*Oryzamys palustris*), hispid cotton rat (*Sigmodon hispidus*), northern pygmy mouse (*Baiomys taylori*), coyote (*Canis latrans*), common gray fox (*Urocyon cinereoargenteus*), feral pig (*Sus scrofa*), and white-tailed deer (*Odocoileus virginianus*). Other common mammals associated with aquatic habitat within the project area include the nutria (*Myocastor coypus*) and American beaver (*Castor canadensis*).

3.12 FLOODPLAINS

3.12.1 Hydrology and Drainage

The project area is located within the San Jacinto River Basin in Harris and Montgomery Counties, Texas. This basin is bordered by the Trinity River Basin on the east and the Brazos River Basin on the west. The San Jacinto Basin has a drainage area of over 3,400 square miles. Data from the Southern Regional Climate Center show that the average annual precipitation for the Houston area (1971 to 2000) is 47.84 inches (SRCC, 2006). The project area is located within the coastal plain, where the grades of the streams are low, resulting in slow water velocities. The overland slopes in the project area are approximately four feet/mile (0.08 percent). The project area encompasses undeveloped acreage such as farmland and wooded areas, as well as large-lot subdivisions, small “ranchettes” and some typical subdivisions.

The project area crosses eight major streams, numerous minor streams, and several stock ponds. The major streams are South Mayde Creek, Bear Creek, Cypress Creek, Little Cypress Creek, Willow Creek, Spring Creek, West Fork of the San Jacinto River, and Caney Creek. Each of the major streams mentioned above has at least one USGS stream gauging station located within the project area or just outside of the boundary. Potential impacts to hydrological resources are reviewed in Volume II, Section 4.12.1 (Hydrology and Drainage).

3.12.2 Floodways and Floodplains

The topography of the region varies from nearly flat terrain immediately along the Gulf Coast to a gently undulating plain that extends inland approximately 50 to 100 miles. Floodplains associated with the watercourses in most of the region are typically characterized as wide, flat, and wooded. In addition, the floodplains have been subject to residential development and extensive urbanization in the Houston area.

During the corridor study, year 2000 Flood Insurance Rate Maps (FIRMs) were obtained for communities within the study area. Since the corridor study, the Tropical Storm Allison Recovery Project (TSARP) produced Digital FIRMs (DFIRMs) for Harris County. These maps have undergone the necessary regulatory review process, were finalized in December 2006, and have become effective as of June 18, 2007 (TSARP, 2007). The floodways and floodplains from the Harris County Preliminary 2006 DFIRMs were transferred onto the project mapping in the GIS. A comparative analysis of the preliminary 2006 flood boundaries represented herein and the June 18, 2007 effective flood boundaries indicate no substantive differences within the Grand Parkway Segments E, F-1, F-2, and G study areas.

The DFIRMs delineate the base floodplain and regulatory floodways for the major rivers and streams. The regulatory floodway indicates the corridor of effective flow area within the floodplain where, if the base flood is encroached equally on both banks in terms of flow conveyance, the base flood elevation is increased no more than one foot. Regulatory floodways are associated with all of the major streams within the project area. Total floodway and floodplain acreages are presented in Table 3-15. Table 3-15 includes 2006 data from Harris County and 2000 data from Montgomery County. Only Segment G includes data from Montgomery County.

TABLE 3-15
TOTAL FLOODWAYS AND FLOODPLAINS IN THE PROJECT AREA

Segment	Floodways (acres)	Floodplains (acres)	Total (acres)
E	839.0	2,308.7	**3,147.7**
F-1	1,062.3	1,245.4	**2,307.6**
F-2	129.5	619.3	**748.8**
G	1,604.1	1,468.7	**3,072.8**

Source: TSARP, 2006; FEMA Digital Q3 Data, 2000

3.13 WILD AND SCENIC RIVERS

The proposed action is not situated in the vicinity of any river either on the National Wild and Scenic River System list (National Park Service [NPS], 2007) or on the Nationwide Rivers Inventory list (NPS, 2004).

3.14 COASTAL BARRIERS

Coastal barriers are undeveloped areas on barrier islands and peninsulas or otherwise protected areas, as mapped by the USFWS Texas Coastal Management Program (TCMP) (National Oceanic and Atmospheric Administration [NOAA], 1996). Coastal barriers can provide natural resources such as sediment utilized in coastal processes and food and habitat for numerous faunal species. The landward boundaries of coastal barriers are distinct at the shoreline of bays and estuaries. The project area is outside any coastal barrier systems.

3.15 COASTAL ZONE MANAGEMENT

The state of Texas has a Coastal Management Program (CMP), designed to meet the requirements of the Federal Coastal Zone Management Act (CZMA). The CMP was approved by the NOAA on December 23, 1996, as published in the *Federal Register* (Volume 62, Number 7) on January 10, 1997. The CMP boundary delineates the coastal zone in accordance with the requirements of the CZMA, federal program development and approval regulations, and the Texas Coastal Coordination Act. The southern portion of Harris County is included in the CMP boundary. At its closest point, the project area boundary is approximately 14 miles west of the CMP boundary. None of the segments of the proposed project, and therefore none of the alternatives discussed in Volume II of the FEIS are within the CMP boundary. The location of the project relative to the delineated coastal zone is depicted in Exhibit G–28.

3.16 ESSENTIAL FISH HABITAT (EFH)

The Magnuson-Stevens Fishery Conservation and Management Act, as amended on October 11, 1996, directs that all federal agencies, whose actions will impact EFH, must consult with the National Marine Fisheries Service (NMFS) regarding potential adverse effects. As a result, any project receiving federal funding must address potential impacts to EFH. The proposed project is outside the limits of tidally influenced, coastal waters and would not impact EFH; therefore coordination with the NMFS is not required.

3.17 THREATENED AND ENDANGERED SPECIES

Table 3-16 lists state and federal threatened or endangered wildlife and plant species identified in Harris and Montgomery Counties. It should be noted that inclusion on the list does not indicate that a species is known to occur in the project area, but only acknowledges the potential for occurrence. The following paragraphs present distributional data concerning each state or federally listed species, along with a brief evaluation of the potential for the species to occur within the project area. More specific detail regarding potential occurrence of species by habitat type and potential impacts to the species appears in Volume II of the FEIS.

TABLE 3-16
STATE AND FEDERAL THREATENED OR ENDANGERED SPECIES OF HARRIS AND MONTGOMERY COUNTIES, TEXAS

Common Name	Scientific Name	State Status	Federal Status	Habitat Description	County
Amphibians					
Houston toad	*Bufo houstonensis*	E	E*	Sandy soil, breeds in ephemeral pools	Harris
Birds					
American Peregrine falcon	*Falco peregrinus anatum*	E	DM*	Potential migrant	Harris, Montgomery
Arctic Peregrine falcon	*Falco peregrinus tundrius*	T	DM*	Potential migrant	Harris, Montgomery
Bald eagle	*Haliaeetus leucocephalus*	T	DM*	Near rivers and large lakes, in tall trees	Harris, Montgomery
Brown pelican	*Pelecanus occidentalis*	E	E*	Island near coastal areas	Harris
Piping plover	*Charadrius melodus*	T	T*	Potential migrant	Montgomery
Red-cockaded woodpecker	*Picoides borealis*	E	E**	Nest in 60+ year pine, forages in 30+ pine	Harris, Montgomery
White-faced ibis	*Plegadis chihi*	T	--	Freshwater marshes, sloughs and irrigated rice fields, but some brackish or salt marshes	Harris, Montgomery
White-tailed hawk	*Buteo albicaudatus*	T	--	Coastal prairies and inland prairies and mesquite-oak savannahs	Harris
Whooping crane	*Grus americana*	E	E*	Potential migrant; winters in coastal marshes of Aransas, Calhoun, and Refugio counties	Harris
Wood stork	*Mycteria americana*	T	--	Prairie ponds and flooded pastures, ditches or other shallow standing water	Harris, Montgomery
Fishes					
Creek chubsucker	*Erimyzon oblongus*	T	--	Tributaries of the Red, Sabine, Neches, Trinity, and San Jacinto rivers; variety of small rivers and creeks, prefers headwaters	Harris, Montgomery
Paddlefish	*Polyodon spathula*	T	--	Large, free-flowing rivers	Montgomery
Mammals					
Louisiana black bear	*Ursus americanus luteolus*	T	T*	Possible as transient; bottomland hardwoods; large, inaccessible forested areas	Harris, Montgomery
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	T	--	Cavity trees in bottomland hardwoods, concrete culverts, abandoned buildings	Harris, Montgomery
Red wolf	*Canis rufus*	E	E*	Extirpated; formerly known throughout eastern half of Texas in brushy, forested areas and coastal prairies	Harris, Montgomery
Reptiles					
Alligator snapping turtle	*Macroclemys temminckii*	T	--	Deep water of rivers, lakes, oxbows and canals; usually in water with mud bottom and abundant aquatic vegetation	Harris, Montgomery

TABLE 3-16 (CONT.)
STATE AND FEDERAL THREATENED OR ENDANGERED SPECIES OF HARRIS AND MONTGOMERY COUNTIES, TEXAS

Common Name	Scientific Name	State Status	Federal Status	Habitat Description	County
Green sea turtle	*Chelonia mydas*	T	T*	Gulf and bay system	Harris
Leatherback sea turtle	*Dermochelys coriacea*	E	E*	Gulf and bay system	Harris
Loggerhead sea turtle	*Caretta caretta*	T	T*	Gulf and bay system	Harris
Louisiana pine snake	*Pituophis melanoleucus ruthveni*	T	C*	Mixed deciduous-longleaf pine woodlands	Montgomery
Smooth green snake	*Liochlorophis vernalis*	T	--	Gulf Coastal Plain, mesic coastal shortgrass prairie vegetation; prefers dense vegetation	Harris
Texas horned lizard	*Phrynosoma cornutum*	T	--	Open, semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; sandy to rocky soils	Harris, Montgomery
Timber/Canebrake rattlesnake	*Crotalus horridus*	T	--	Swamps, floodplains, upland pine and deciduous woodlands, riparian zones, and abandoned farmland; prefers dense groundcover	Harris, Montgomery
Vascular Plants					
Texas prairie dawn	*Hymenoxys texana*	E	E	Poorly drained depressions or base of mima mounds in open grasslands, or mostly undeveloped areas on slightly saline soils	Harris

Notes: * These species are listed by the USFWS; however, they are not listed to occur within these counties by the Clear Lake office of the USFWS (2007a).
** This species is only federally listed for Montgomery County by the Clear Lake office of the USFWS (2007a).
-- These species occur on the State listing of threatened or endangered species; however, they are not federally listed at this time by the USFWS (2007a).
E = Endangered; T = Threatened; C = Candidate Species; DM = Delisted taxon, recovered, being monitored first five years; AD = proposed delisting
Source: USFWS, 2007a; TPWD, 2007a, 2007b

3.17.1 State and Federally Listed Threatened and Endangered Species

3.17.1.1 Amphibian Species

The Houston Toad

The state and federally endangered Houston toad is endemic to southeast central Texas and is currently known to exist in Austin, Burleson, Colorado, Freestone, Lavaca, Leon, Milam, and Robertson Counties (Price and Yantis, 1993). The Houston toad inhabits areas with deep, friable, sandy soils, which contain varying degrees of overstory vegetation. All known populations occur within two separate bands of geologic formations, which contain the deepest surface sands of the region, including the Sparta Sand, Weches Formation, Queen City Sand, Recklaw Formation, and Carrizo Sand (Bureau of Economic Geology, 1981). Vegetative cover within Houston toad habitat usually contains some degree of forested vegetation, with post oak (*Quercus stellata*) woodlands comprising the predominant vegetation type.

Breeding habitat consists of either ephemeral pools or permanent waterbodies. Historically, breeding activity occurred primarily in ephemeral ponds and low-lying depressions; however, because of landscape modifications that have occurred to date, the majority of breeding sites at present are stock ponds and similar impoundments (USFWS and the International Union for the Conservation of Nature and Natural Resources/Species Survival Commission [IUCN/SSC] Captive Breeding Specialist Group, 1994). During wetter years, breeding sites may occur under a variety of situations as long as ample water is present. The breeding season typically lasts from late January to June, with a peak occurring in February and March. Houston toads were first discovered in the Houston area (Harris, Fort Bend, and Liberty Counties) in the late 1940s, disappearing during the 1960s because of an extended period of drought and rapid urbanization of the city. The geologic formations in which the known populations occur are not found in the project area. Therefore, the Houston toad is not likely to occur in the project area.

3.17.1.2 Bird Species

Piping Plover

The piping plover is a federal and state listed threatened species. This species is a wintering migrant to the Gulf Coast and prefers beaches, mud flats, sand flats, algal flats, and washover passes in dunes. This species may occur within the project area along banks and edges of larger lakes and reservoirs during their winter migration (Bryan et al, 2000).

Peregrine Falcon

Two subspecies of the peregrine falcon occur in Texas, American and Arctic. Both species of the peregrine falcon were de-listed by the USFWS in 1999 (USFWS, 1999). However, the American peregrine falcon still retains the state status of endangered and the arctic peregrine falcon retains the state status of threatened as implemented by TPWD. The American peregrine falcon is a known resident in the Chisos and Guadalupe Mountains (Texas Ornithological Society [TOS], 1984). The Arctic peregrine falcon winters along the entire Gulf Coast and occurs statewide during migration. Either of these may occur in the project area, particularly during spring and fall migrations (Oberholser, 1974; TOS, 1984).

Bald Eagle

The bald eagle is a state listed, threatened species and was federally delisted in August 2007. The bald eagle is an uncommon to rare migrant and winter resident throughout Texas (TOS, 1995). It is generally found in coastal areas and around large bodies of water such as reservoirs, lakes, and rivers. Nesting in Texas is largely restricted to the eastern third of the state and to the coastal region. In Texas, wintering and migrating bald eagles frequently stop over along the shores and large rivers, which provide the eagle with the bulk of its dietary requirements. The bald eagle may occur within the project area. According to the TPWD, one known bald eagle nest exists north of the Segment F-1 and F-2 project areas (see TPWD letter dated March 20, 2001 in Appendix B).

Brown Pelican

The federal and state endangered brown pelican is primarily a coastal species that rarely ventures very far out to sea or inland. In Texas, it occurs primarily along the lower and middle coast, but occasional sightings are reported on the upper coast and inland to central, north-central, and eastern Texas, usually on large fresh water lakes (TOS, 1984). Such occurrences are relatively uncommon. The brown pelican is not likely to occur within the project area.

Red-Cockaded Woodpecker

The federal and state endangered red-cockaded woodpecker inhabits mature pine forests of the southeastern U.S. and nests almost exclusively in old living pines infected with red heart disease (*Fomes pini*) (USFWS, 1985). A high correlation exists between the occurrence of the red-cockaded woodpecker and the distribution of the longleaf pine (*Pinus palustris*), for which the bird has a particular affinity, and also slash pine (*P. elliotti*), loblolly pine (*P. taeda*), shortleaf pine (*P. echinata*), pitch pine (*P. rigida*), and pond pine (*P. serotina*) (Thompson and Baker, 1971). The historical range of the red-cockaded woodpecker extends from Texas, primarily east of the Trinity River, east to the Atlantic and as far north as Maryland (Hooper et al., 1986). Habitat loss is the major contributing factor responsible for the red-cockaded woodpecker's endangered status (USFWS, 1985). The red-cockaded woodpecker may occur within the eastern portion of the project area.

White-Faced Ibis

The white-faced ibis, an inhabitant of marshes, is a common resident along the coast. This species is state listed as threatened. Habitat preferred by the bird includes fresh water marshes, sloughs, and irrigated rice fields, and also the occasional brackish and saltwater habitat. The white-faced ibis may occur within the project area (Oberholser, 1974).

White-Tailed Hawk

The white-tailed hawk is state listed as threatened and is considered an uncommon local resident along the Texas coastal plain (TOS, 1995). The white-tailed hawk may occur within the project area in savannah-like, grassland habitats.

Whooping Crane

The whooping crane is listed as a federal and state endangered species. Each year, the entire breeding population of whooping cranes migrates 2,600 miles from Canada's Northwest Territories and winters in the prairies, salt marshes, and bays along the Texas coast. Rest areas along the migration route include the central and eastern panhandle of Texas (Campbell, 1995). Since Harris and Montgomery Counties lie within the whooping crane migration corridor, the whooping crane may occur within the project area as a migrant species.

Wood Stork

The wood stork is state listed as a threatened species. This bird 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. This species may occur in the project area (Oberholser, 1974).

3.17.1.3 Fish Species

Creek Chubsucker

The creek chubsucker, a state listed threatened species, occurs in eastern Texas streams from the Red River southward to the San Jacinto Drainage (Hubbs, Edwards, and Garrett, 1991). This fish inhabits sand and gravel bottom pools of clear headwaters, creeks, small rivers, and (occasionally) lakes, often near vegetation. The creek chubsucker spawns in river mouths or pools, lake outlets, riffles, and upstream creeks (Lee et al., 1980). Since part of the project area crosses the West Fork of the San Jacinto River Basin, the creek chubsucker may occur within the project area in appropriate aquatic habitat.

Paddlefish

The paddlefish, a state listed threatened species, live in slow moving water of large rivers or reservoirs, usually in water deeper than four feet. The native range of paddlefish includes the Mississippi River basin from New York to Montana and south to the Gulf of Mexico. Historically in Texas, paddlefish lived in the Red River's tributaries (TPWD, 2006). The project area does not traverse any large rivers or reservoirs; therefore the paddlefish is not likely to occur within the project area.

3.17.1.4 Mammal Species

Louisiana Black Bear

The Louisiana black bear, a state and federal listed threatened species, are periodically reported from various counties of east Texas, probably occurring as transients from populations native to Louisiana. Louisiana black bear habitat includes bottomland hardwoods and large tracts of undisturbed forest (TPWD, 2005). No large tracts of undisturbed forest exist within the project area.

Rafinesque's Big-Eared Bat

The state listed threatened Rafinesque's big-eared bat occurs throughout the southeastern U.S., with East Texas being at the western limit of its range (Barbour and Davis, 1969). Specimens have been recorded in extreme East Texas, including records in Montgomery and Liberty Counties (Schmidly, 1991). Rafinesque's big-eared bat roosts most frequently in buildings, wells, and hollow trees in bottomland hardwoods (Davis and Schmidly, 1994). This bat has been recorded in counties within and adjacent to the project area and may occur within the project area.

Red Wolf

The red wolf, a federally and state listed endangered species, formally ranged throughout the eastern half of Texas, but their numbers and range quickly declined under pressure of intensive land use in the region. Red wolves inhabited brushy and forested areas, as well as the coastal prairies. The red wolf was apparently extinct in the wild by 1980. It is doubtful red wolves can be re-introduced in Texas because of human population growth in their former habitat (Davis and Schmidly, 1997). This species is not likely to occur within the project area.

3.17.1.5 Reptile Species

Alligator Snapping Turtle

The alligator snapping turtle is an inhabitant of deep rivers, lakes, and large streams with muddy bottoms (Garrett and Barker, 1987). Other habitats include oxbows, bayous, and even tidally influenced waters (Ernst, Lovich, and Barbour, 1994). This turtle is state listed as threatened and may occur within the project area.

Sea Turtles

Three sea turtles are included on the TPWD list of threatened and endangered species. These sea turtles include the green sea turtle (state and federally listed as threatened), leatherback sea turtle (state and federally listed as endangered), and loggerhead sea turtle (state and federally listed as threatened). These sea turtles are known to occur in the Gulf of Mexico and may utilize the beaches along the coast as nesting grounds. The project area is inland; thus these sea turtles are not likely to occur within the project area.

Louisiana Pine Snake

The Louisiana pine snake is an inhabitant of sandy areas of longleaf pine and hardwood communities of east Texas and west central Louisiana (Conant and Collins, 1991). Many other subspecies of this snake occur throughout the U.S. but are not considered as rare as the Louisiana pine snake. This subspecies is federally listed as a candidate for listing under the Endangered Species Act (ESA) and state listed as threatened. Although unlikely, this snake may occur in the project area within suitable habitat.

Smooth Green Snake

In Texas, the smooth green snake is a state listed threatened species found in the Gulf Coastal Plain. This terrestrial snake is found in mesic shortgrass prairies (Tennant, 1998). This snake has been recorded in Harris County (Dixon, 2000) and may occur within the project area; however, its presence within the project area would be rare.

Texas Horned Lizard

The Texas horned lizard, a state listed threatened species, was historically found throughout the state in areas with flat, open terrain, scattered vegetation, and sandy or loamy soils. Over the past 20 years, it has almost vanished from the eastern half of the state, but still maintains relatively stable numbers in West Texas. While this species has been

recorded from both Harris and Montgomery Counties (Dixon, 1987), it has virtually disappeared east of a line from Fort Worth to Austin to Corpus Christi (Price, 1990). The Texas horned lizard is not likely to occur within the project area.

Timber/Canebrake Rattlesnake

The timber/canebrake rattlesnake occurs throughout most of the southeastern U.S. (Conant and Collins, 1991). In Texas, its range includes the eastern third of the state where it is considered widely distributed, but generally uncommon (Dixon, 1987). Tennant (1985) describes the habitat of the timber rattlesnake to be dense thickets and brushy areas along extensive floodplains of major creeks and rivers. Occasionally, this snake has been encountered in old-pasture regrowth areas in unused farmland. This state-listed, threatened species may occur in the project area.

3.17.1.6 Vascular Plant Species

Texas Prairie Dawn

The Texas prairie dawn, a federal and state listed endangered plant, is an annual sunflower (Asteraceae) that ranges in height from 1.5 to seven inches. The bracts conceal the minute ray flowers; the yellow disk flowers are 0.1 to 0.2 inches long. Texas prairie dawn habitat consists of small, sparsely vegetated areas of fine-sandy saline soil. These sparsely vegetated areas commonly occur on the lower sloping portion of pimple (mima) mounds or on the level to slightly concave area around the mound's base. Prairie remnants are often characterized by this unusual microrelief topography (Smeins, 1994). The Texas prairie dawn blooms and fruits from mid-March to mid-April and senescence are usually complete by May (Poole and Riskind, 1987). There is a high potential for the Texas prairie dawn to occur within portions of the project area, especially within the Katy Prairie (Segments E and F-1).

3.17.2 Rare Species

In addition to state and federally listed threatened and endangered species, the following rare species, with no regulatory status, may occur in Harris and Montgomery Counties, but not necessarily in the project area. Some of these listings may be based on past history and include migratory species. Bird species of concern include the black rail (*Laterallus jamaicensis*), Henslow's sparrow (*Ammodramus henslowii*), mountain plover (*Charadrius montanus*), snowy plover (*Charadrius alexandinus*), and southeastern snowy plover (*Charadrius alexandinus tenuirostris*). Insect species of concern include two species of mayfly (*Plauditus gloveri* and *Tricorythodes curvatus*), the Gulf Coast clubtail (*Gomphus modestus*), and the Texas emerald dragonfly (*Somatochlora margarita*). Mammal species of concern include the plains spotted skunk (*Spilogale putorius interrupta*) and the southeastern myotis bat (*Myotis austroriparius*). Mollusks include creeper (*Strophitus undulants*), fawnsfoot (*Truncilla donaciformis*), little spectaclecase (*Villosa lienosa*), Louisiana pigtoe (*Pleurobema riddellii*), pistolgrip (*Tritogonia verrucosa*), rock-pocketbook (*Arcidens confragosus*), sandbank pocketbook (*Lampsilis satura*), Texas pigtoe (*Fusconaia askewi*), and the Wabash pigtoe (*Fusconaia flava*). No reptilian species of concern are listed as potentially occurring in Harris and Montgomery Counties. Fish species include only the American eel (*Anguilla rostrata*). Plants of concern include the coastal gay-feather (*Liatris bracteata*), Houston daisy (*Rayjacksonia aurea*), Texas meadow-rue (*Thalictrum texanum*), Texas windmill-grass (*Chloris texensis*), threeflower broomweed

(*Thurovia triflora*), giant sharpstem umbrella sedge (*Cyperus cephalanthus*), and Correll's false dragon-head (*Physostegia correllii*). All of these species may potentially occur in the project area.

3.18 CULTURAL RESOURCES

This section presents the prehistoric and historic context for archeological and non-archeological historic resource analysis in the project area. Specific resources are addressed for each of the project segments in Volume II of this document.

Section 106 of the National Historic Preservation Act requires that the effects of this project on properties included in, or eligible for, the National Register of Historic Places (NRHP) be taken into consideration. In accordance with the First Amended Programmatic Agreement between FHWA, the Texas Historical Commission (THC), the Advisory Council on Historic Preservation, and TxDOT and in accordance with the Memorandum of Agreement (MOA) between TxDOT and the THC, TxDOT consulted with the State Historic Preservation Officer (SHPO) regarding the project's potential to affect significant sites. The results of the Section 106 coordination have been utilized in the selection of the Recommended Alternative Alignment that avoids or minimizes to the greatest extent possible any adverse effects from the project on identified prehistoric and historic archeological resources as well as on non-archeological historic resources.

HPAs for prehistoric cultural resource sites were predicted for this project using a TxDOT GIS model called the Houston District Potential Archeological Liability Map (Houston-PALM) (Exhibit G–29). The primary criteria used in developing the Houston-PALM (Abbott, 2001) included landform types, soil types, and evidence of historic and recent land use. These mapping criteria were integrated with broad environmental determinations (upland, coastal, riverine, and water) from the Geologic Atlas of Texas (Bureau of Economic Geology, 1982) and field reconnaissance of the Houston area. While the Houston-PALM has been shown to illustrate the potential for prehistoric sites in the area, it is not a completely reliable method for predicting historic archeological sites. Historical cultural resource sites were predicted based on the review of historical maps of Harris and Montgomery Counties, TxDOT's historic bridges database, local historical literature, and agricultural publications.

Official determinations of NRHP eligibility of all cultural resources identified within the Area of Potential Effects (APE) are on-going at the time of this publication. In Volume II, NRHP assessments of historic properties for a specific segment of the Grand Parkway are presented. These assessments have been determined through archival research, field survey, the public involvement process, and coordination with the SHPO.

3.18.1 Natural Setting

The project area is located in Harris and Montgomery Counties, within the THC Southeast Texas Archeological Study Region of the Eastern Planning Region (Kenmotsu and Perttula, 1993). The project area is located in the inland area of the Western Texas Gulf Coastal Plain, within the San Jacinto River Basin.

In general, the Southeast Texas Archeological Region is characterized by a repetition of prairie and marshes interspersed with patches of swamp, barrier beach, and forest (Kenmotsu and Perttula, 1993). Harris County is dominated by Upland Prairie and Woods, while Montgomery County is dominated by Woods and Blackland Prairie. The San Jacinto River was likely the most reliable source of surface water within the area before modern times, as smaller streams were more seasonal. In the Blackland Prairie to the north, slowly permeable clays abound and intermittent stream flow is typical. To meet continually increasing water demand, modern water control/water supply reservoirs were constructed in the area, including Lake Conroe, Lake Houston, and Addicks/Barker Reservoir.

Geologically, the Western Texas Gulf Coastal Plain is comprised of belt-like strips roughly paralleling the modern Gulf of Mexico shoreline. The more resistant strata break the terrain with low, landward-facing escarpments. These escarpments commonly deflect stream courses eastward, but have not historically inhibited travel throughout the area. Surface and near surface geologic formations within the project area include lignite, glauconite, clay, and iron ore. As such, raw materials useful for producing a variety of stone tools are rare in the area. For instance, an exposure of Manning fused glass is present in nearby Walker County; however, this source is marred by fault planes, voids, and inclusions and was of little use to prehistoric flintknappers (Story et al., 1990).

3.18.2 Cultural Chronology

The following overview provides a framework for early Native American occupation through the present, divided into three eras: prehistoric, protohistoric, and historic. The broad prehistoric era refers to pre-contact between Native American inhabitants and Europeans, and is divided into the chronological divisions proposed by Story et al. (1990) for the inland archeological manifestations of the Gulf Coastal Plain. The protohistoric era refers to the time of initial contact between Native American inhabitants and Europeans. European settlement marks the beginning of the historic era, which continues up through the present.

3.18.2.1 Prehistoric Era

Paleoindian (9500 to 7000 B.C.)

During the Paleoindian era, streams and shorelines in Southeastern Texas underwent considerable change in response to deglaciation. Prairies were likely the predominant landcover, with changes in overall area corresponding with changes in sea level (Story et al., 1990). Species of extinct mammals believed to have been present in the area at least until 8000 B.C. include mammoths, mastodons, camels, horses, long-nose peccary, sloths, giant beaver, and giant armadillos.

As in most areas in North America during the Paleoindian era, groups obtained lithic raw material from non-local sources and produced finely crafted stone projectile points, such as Clovis, Folsom, Dalton, San Patrice, and Scottsbluff points. Widespread distributions of point styles suggest that early cultures in the area utilized a highly mobile hunter-gatherer subsistence strategy, exploiting a wide variety of resources, including some seasonally or geographically localized concentrations of plants and animals on the lower coastal plain (Story et al., 1990).

Archaic Cultures (7000 B.C. to A.D. 100)

Shifts in technology and patterns of raw material exploitation mark this time period, with a focus on intensive regional and local toolstone exploitation strategies. Generally, widespread point styles of the Paleoindian era are replaced by more area-specific styles. The shift of seasonal movements over a smaller area created a scenario where high quality raw material for stone tools was less abundant. Therefore, groups focused on exploiting local abundant, lesser quality raw material, favoring expedient tools over highly curated, formal tools. Although the reason for the limitation of seasonal movement is not entirely clear, it may stem from an increased density in population, and thus a reduction of the size in area exploited by each group. Other technologies associated with this period include stone-lined hearths, baking pits, milling implements, pecked and polished ornaments and implements, and burials.

Early Archaic points for this area include side notched and early expanded stem, Keithville, Calf Creek, Tortugas, Wells, and Morrill points (Story et al., 1990). Subsequent point styles associated with the Archaic period in this area include Pontchartrain, Kent, Palmillas, Ellis, and Gary points (Story et al., 1990). Local variations of regional point styles have been identified for southeast Texas.

Early Ceramic (A.D. 100 to A.D. 900)

Pottery manufacture and certain burial practices characterize this period in the region. These developments suggest changes in settlement and economic systems. Since it is not easily transported, the presence of pottery suggests more prolonged stays at specific locales. Story et al. (1990) suggest A.D. 100 as the beginning of the Clear Lake Period, of the Mossy Grove Tradition, which is characterized by the appearance of sandy paste pottery in the area.

The Early Ceramic period marks the first appearance of mound burials, indicative of some form of ranked status. Burial placement and associations suggest role and status differentiation characteristic of fairly simply organized, egalitarian societies. Personal ornaments and Gary and Kent points are most often associated with burials of this period (Story et al., 1990).

Late Ceramic (ca. A.D. 900 to A.D.1528)

Within the project area, bow and arrow technology, small flaked-stone drills, and grog and bone tempered pottery are indicative of this time period. The use of the bow and arrow provided a greater range, required less effort, and afforded less body exposure than the dart and spear-thrower technology. The frequency of certain types of pottery in the project area suggests direct or indirect interaction with groups to the north. Caddoan pottery from the north is better represented in the project area than decorated coastal made wares, possibly suggesting groups utilizing the area interacted more with groups to the north than with those to the south (Story et al., 1990).

3.18.2.2 Protohistoric Era

The protohistoric era begins with the entry of the first Europeans into Texas and ends with sustained Euro-American settlement in the area. As indigenous groups on the coast began trading with Europeans, Old World diseases such as

small pox and influenza were spread through traditional trade networks in the area. In the fall of 1528, a ship under the command of Alvar Nuñez Cabeza de Vaca was caught in a Gulf storm and ran aground at Galveston Island (Wintz, 2000). De Vaca and three of his men survived and lived eight years among the Native Americans, first as prisoners and slaves, then as medicine men and traders (Wintz, 2000). After eight years on the coast, they made their way across almost 800 miles of desert and mountains to a Spanish outpost in northwestern Mexico.

Spanish and French expeditions followed throughout the next 200 years as each tried to establish a stronghold in the New World. Exploration facilitated European interaction with indigenous groups in the area. In 1719, Jesuit officer, Simars Belisle, landed in Galveston Bay, was stranded alone, and was eventually rescued from an Akokisa group by a group of Hasinai who took him to safety in New Orleans. In 1745-1746, an expedition headed by Spaniard Joaquin Orbio Bazterra traveled to the Trinity River and camped near two Akokisa villages in present-day Montgomery County (Story et al., 1990). Bazterra reported that the French moved freely among the natives. In 1747, Bazterra continued to explore the coastal area between the Guadalupe and Trinity Rivers and noted the presence of non-Spanish white men near the mouth of the Trinity (Story et al., 1990). Although some effort was put forth to establish a mission and presidio called "El Orcoquisac" near the mouth of the Trinity, internal dissension and damage from a hurricane made it necessary to abandon all plans for the complex.

In November 1803, Spain ceded the Louisiana Territory to France, who subsequently sold it to the U.S. In order to protect its holdings to the south, Spain established military posts and colonies throughout the region, while the English and the French settled in previously established areas. A few years later, Spain lost control of the area to Mexican-Texan revolutionists, and in 1812, the Mexican American Guitierrez-Magee expedition took control of the Trinity River area. Evidence suggests Jean Lefitte settled Galveston Island in 1817. By 1820, the stage was set for Mexico's declaration of independence from Spain and the rush of Anglo-American settlers (Story et al., 1990) with the first of Stephen F. Austin's colonists being dropped off at the mouth of the Brazos River in 1822.

3.18.2.3 Historic Era

<u>1800s</u>

Texas declared its independence from Mexico on March 2, 1836. On April 21, true independence was established when the Texan army under General Sam Houston defeated Santa Anna's Mexican army at the Battle of San Jacinto. Houston was established August 1836, when the Allen brothers bought 6,642 acres of land near the head of tidewater on Buffalo Bayou, named the area after Sam Houston, then persuaded the first Congress of the Republic of Texas to select the area as its capital. The capital was moved to Austin in October of 1839 (Hurley, 2000). On February 19, 1846, Texas became the 28th state of the Union. By 1848, the war with Mexico was ended with the treaty of Guadalupe Hidalgo (Hurley, 2000). Navigation and rail systems were developed in the Houston area in the middle of the nineteenth century and served as conduits of commerce, carrying exports such as cotton and lumber throughout the nation. Arteries of commerce facilitated Houston's growth and connection to other cities in the U.S.

Texas seceded from the U.S. in March 1861. Governor Sam Houston resigned after refusing to take the Confederate oath of allegiance, and by July 1861, the U.S. Navy blockaded the Texas Coast. Of Harris County's population, 12 percent joined the Confederate Army. Following Robert E. Lee's surrender on April 9, 1865, three black schools were established in the Harris County by the Freedman's bureau. On June 19, 1865, Major General Gordon Granger arrived in Galveston and proclaimed the emancipation of Texas slaves, creating the celebration day of "Juneteenth."

Reconstruction of the area ensued via assistance to re-establish commerce and Texas was readmitted to the Union. By 1870, Harris County had 64 manufacturing establishments, employing 583 laborers, and the City Bank of Houston opened. In addition, Congress declared Houston a port of entry, authorized a customs house, and proposed the construction of a channel from Houston to the Gulf of Mexico (Hurley, 2000).

The decade of 1870-1880 brought developments that contributed to the area's subsequent urbanization. The Cotton Exchange was organized and Houston's first northbound out-of-state railroad outlet for freight was established when the Houston and Texas Central Railroad reached Denton at the Missouri-Kansas-Texas line. The production of lumber from the pine forests of East Texas and from the hardwoods north and west of Houston ranked high among the port's exports. Produce from the Rio Grande was carried via rail service from the San Antonio Valley, through Houston and on to the Midwest markets. Steamer cargo, including lumber, lime, cement, railroad iron, and salt, pushed increasing tonnages across the docks of the Port of Houston. Advances in agricultural technology made it possible to cultivate row crops in areas that previously were used exclusively for grazing.

Railroad transportation, commercial enterprises, and industry expanded throughout the area. In town, 10 railroads served the city and the port. The first passenger train made the Houston-New Orleans run on August 30, 1880 and the first "through" freight arrived from San Francisco on January 15, 1882, which included a carload of salmon. Mineral resources were exploited in comparatively large amounts and iron and steel production increased during the last quarter of the century. Seed rice brought from Japan is credited with establishing the origin of the Gulf Coast rice industry (Dethloff, 1999).

1900s

Advantages of a protected, inland port near Houston became apparent when a tidal surge swept over and destroyed Galveston Island in September 1900. The oil-producing legacy of the area began in 1901, with the discovery of oil at Spindletop near Beaumont, Texas. World War I brought the development and widespread usage of the internal combustion engine to vast open markets for gasoline that could be refined from the oil that had been produced in the region. The construction of a coordinated highway system in the region began in 1925. Cotton receipts reached almost two million bales at the Port of Houston by 1926 (Hurley, 2000). From this time until the onset of the Great Depression, however, petroleum was the only industry that surpassed lumber in Texas' industrial capacity and revenue (Maxwell and Baker, 1983; Maxwell, 1981).

Preparing for World War II, the expansion of the state highway system, and the utilization of public transportation continued to increase demand for petroleum products throughout the region. In 1946, 6 percent of the land area in the 19 counties surrounding Houston accounted for 20 percent of the state's total crude oil production and 40 percent of its refinery capacity. This area had over 100 oil fields with almost 7,000 producing wells, with an average daily production of 64 barrels per well, compared to a state average of 21 barrels (Hurley, 2000). Rapid economic growth in subsequent decades was marked by the construction of the NASA Manned Spacecraft Center in 1961, the Mission Control Center in 1965, and the relocation of Shell Oil Co. corporate headquarters to Houston in 1971.

In 1983, *Alicia*, the most expensive hurricane in U.S. history to that date, hit the Galveston and Houston areas. In the years to follow, oil prices collapsed, building permits fell, the *Challenger* space shuttle exploded, and banks failed. By the 1990s, things began to turn around. The area's unemployment rate dropped below the national average and rice remained a substantial agricultural commodity in Harris County. The agricultural economy of Montgomery County stabilized with truck farming, cattle and horse ranching, and the raising of greenhouse products. In addition, lumbering became active again in the area, as many forests experienced second growth. By 1990, as much as three-fourths of Montgomery County was covered in timber.

3.19 HAZARDOUS MATERIALS

An inventory of known and potential hazardous substances and hazardous waste generators was conducted for the project area in accordance with TxDOT's *Guidelines for Identifying and Dealing with Hazardous Waste on Highway Projects* (1992), guidelines set forth in FHWA's Technical Advisory T 6640.8A, and FHWA's *Interim Guidance: Hazardous Waste Sites Affecting Highway Project Development* (1988).

A comprehensive search of federal, state, and local agencies' databases was conducted for the project area. These databases contain information on hazardous waste generators, handlers, disposal sites, and incidents. The TelAll Corporation of Austin, Texas, was retained to perform this database search. The scope of the regulatory information search included the following databases:

- Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) – CERCLIS is the official repository for site and non-site specific Superfund data in support of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and contains information on hazardous waste site assessments and remediation from 1983 to the present.
- National Priority List (NPL) – The NPL is a priority subset of the CERCLIS list that lists priority sites that the EPA has determined to pose a threat to human health and/or the environment and where remedial action is required.
- No Further Remedial Action Planned (NFRAP) – The NFRAP database lists of a CERCLIS site that has been designated as "no further remedial action planned."

- Resource Conservation and Recovery Information System (RCRIS) – Treatment, Storage, or Disposal (TSD) Database - RCRIS, under the Resource Conservation and Recovery Act (RCRA) that identifies registered hazardous waste generators, transporters, treatment, storage, and disposal facilities, provides information to state environmental agencies/EPA concerning facility activities. The RCRIS-TSD database is a subset of the RCRIS list, which tracks facilities that generate, transport, treat, store, and/or dispose of hazardous waste.
- RCRIS Corrective Action (CORRACT) Database – The CORRACT database lists sites that are currently or in the past have had corrective action.
- RCRIS Generators (RCRIS-G) Database – The RCRIS-G database, under the RCRA, tracks facilities that generate or transport hazardous waste. A conditionally exempt small quantity generator (CESQG) is a facility that produces less than 100 kilograms per month of hazardous waste, a small quantity generator (SQG) produces at least 100 kilograms per month but less than 1,000 kilograms per month of hazardous waste, and a large quantity generator (LQG) produces more than 1,000 kilograms per month of hazardous waste.
- Emergency Response Notification System (ERNS) – The ERNS database supports the release notification requirements of Section 103 of the CERCLA, as amended; Section 311 of the CWA; and Sections 300.51 and 300.65 of the National Oil and Hazardous Substances Contingency Plan. Additionally, ERNS serves as a mechanism to document and verify incident location information as initially reported and is utilized as a direct source of easily accessible data needed for analyzing oil and hazardous substance spills.
- Texas Voluntary Cleanup Program (TXVCP) – The TXVCP was established in 1995 to provide administrative, technical, and legal incentives to encourage the cleanup of contaminated sites in Texas.
- Texas State Superfund (TXSSF) List – The TXSSF database is a list of sites that the state of Texas has identified for investigation or remediation.
- Texas Landfill (TXLF) Database – This database is a listing of solid waste facilities registered and tracked by the TCEQ Solid Waste Division. The TCEQ requires municipalities and counties to report active and inactive landfills. The facilities tracked include solid waste disposal sites as well as transfer and processing stations.
- Unauthorized and Unpermitted Landfills (LFUN) Database – The LFUN database is compiled by Southwest Texas University under contract with TCEQ and includes sites that have no permit and are considered abandoned.
- Leaking Underground Storage Tank (LUST) Database – This database is maintained by the TCEQ listing facilities with known underground storage tank releases.
- Registered Storage Tank (Above Ground Storage Tank [AST] Database and Underground Storage Tank [UST] Database) – The Texas AST and UST databases are maintained by the TCEQ to track permitted petroleum storage tank sites.
- Texas Innocent Owner/Operator Program (TXIOP) – The TXIOP database is maintained by the TCEQ and tracts properties impacted by adjacent properties. These properties enrolled in the TXIOP do so after the property has changed hands if an undetected source of off-site contamination were discovered.

- Brownfields Database (BRNFD) – The BRNFD database consists of properties that have a historical use that may have resulted in the presence of hazardous substances or pollutants. This database is maintained by the TCEQ.
- Dry Cleaner Database (DRYC) – The DRYC database is maintained by the TCEQ and tracts dry cleaning drop stations and dry cleaning facilities.
- Indian Reservation Underground Storage Tanks (IRUST) – The IRUST database is maintained by the EPA and tracts permitted underground storage tanks on Indian Land.
- Texas Spills Incident Information System (TXSPILL) – This list is maintained by the TCEQ to document cases where emergency response is needed for cleanup of toxic substances.

Hazardous material site impacts associated with the construction of a specific segment are discussed in Volume II of the FEIS.

3.19.1 Oil/Gas Well and Pipeline Review

Oil and gas well and pipeline data for the project were acquired from the Texas Railroad Commission and Banks Information Systems. Detailed locations and potential impacts are discussed in Volume II, Section 3.19.2 (Oil/Gas Wells), Section 3.19.3 (Petroleum Pipelines), Section 4.19.2 (Oil/Gas Wells and Pipeline Sites) and Section 4.19.3 (Petroleum Pipelines) for each segment.

3.19.2 Utilities

Since portions of the project area are located in urban areas, impacts to utilities (i.e., water, sewer, electric, natural gas, etc.) may be associated with the construction of any of the alternatives. This issue is addressed with construction impacts in Volume II, Section 4.22.

3.20 VISUAL AND AESTHETIC QUALITIES

The visual experience and aesthetic quality of an area depends upon the pattern of land (or topography), the pattern of waterbodies, vegetation patterns, and the patterns of human development (FHWA, 1990b). More specifically, factors used to assess a person's visual experience and the aesthetic quality of an area may include:

- Uniqueness of the landscape in relation to the region as a whole;
- Whether the scenic area is a foreground, middle ground, or background view;
- Focus of the view;
- Scale of the elements in the scene;
- Number of potential viewers;
- Duration of the view; and
- Amount of disturbance to the landscape.

The Grand Parkway project area consisting of Segments E, F-1, F-2, and G includes the Gulf Prairies and Marshes and the Pineywoods ecological regions. South of US 290, Segment E crosses through the Gulf Coast Prairies and Marshes. Between IH 45 and US 59, Segment G crosses through the Pineywoods. Between US 290 and IH 45, Segments F-1 and F-2 cross through an ecotone between these two ecological regions (Gould, 1975).

The Gulf Prairies and Marshes are characterized by nearly level topography. The Pineywoods are characterized by nearly level to gently undulating and locally hilly topography. Elevations within the Gulf Prairies and Marshes range from sea level to 250 feet above MSL and the Pineywoods range from 200 to 700 feet above MSL (Hatch et al., 1990).

Segment E begins at the southern end of the project area, proceeding north from IH 10. The altitude in this area ranges from 135 to 195 feet above MSL. Segment E extends through a portion of the Gulf Prairies and Marshes, which is historically and locally known as the Katy Prairie. This region of the project area has been disturbed and/or altered from its original native condition. The landscape currently consists of farming, ranching, and increased urbanization. Most of Segment E is productive farmland for growing row crops and rice. Very little native prairie remains because of urbanization, agricultural activities, and suppression of wildfire (Eubanks, 1994; Smeins, 1994). This portion of the project area also contains scattered, non-forested prairie pothole wetlands. Segment E is predominately rural in nature with scattered large acre residential home/ranch sites. The southern and northern ends of Segment E are experiencing rapid residential growth with a number of large planned communities either currently under construction or in the planning stages. A number of small two-lane roads currently traverse this segment.

Segments F-1 and F-2 (between US 290 and IH 45) cross an ecotone (i.e., intergrade between ecological regions) between the Gulf Prairie to the south and the Pineywoods to the northeast. Altitude in this region of the project area ranges between 153 and 215 feet above MSL for Segment F-1 and between 153 and 215 feet above MSL for Segment F-2. Native vegetation within this portion of the project area originally consisted of tall grass prairie and post oak savannah, intermixed with pine-hardwood forests. Segments F-1 and F-2 have historically been dominated by scattered, large-acreage, residential home sites in a rural setting. Segments F-1 and F-2 have realized very rapid growth in both residential and commercial developments, including a number of very large planned communities. The increased suburbanization of Segments F-1 and F-2 has changed the aesthetic and visual character from a rural residential nature to a suburban environment. Farming and ranching is very quickly being converted to residential/commercial sites. A number of roadways ranging in size between small rural two-lane roads to six-lane highways currently traverse these segments.

Segment G (between IH 45 and US 59) crosses through mainly forested and urbanized areas in northern Harris County and southeastern Montgomery County. The altitude in this area ranges from 100 to 128 feet above MSL. The majority of the project area for this segment is located in Montgomery County and skirts the southern edge of an ecologically distinct region historically known as the Big Thicket (Parks et al., 1938; Gunter, 1993). Segment G contains mixed pine-

hardwood forested uplands similar to those found in Segments F-1 and F-2, with relatively unfragmented bottomland hardwood forest in the floodplains between Spring Creek and the West Fork of the San Jacinto River. Portions of this bottomland hardwood forest are considered forested wetlands. The western and eastern portions of this Segment are experiencing similar residential/commercial growth that was previously discussed with respect to Segments F-1 and F-2. The middle portion of the project area in and around the San Jacinto River and its floodplain is relatively undisturbed with scattered sand and gravel operations.

SECTION 4: INDIRECT AND CUMULATIVE EFFECTS

This section describes the Indirect and Cumulative Effects Analysis (CEA) conducted for the proposed Grand Parkway project, Segments E, F-1, F-2, and G. This analysis follows the requirements and processes outlined in 23 CFR 771, the FHWA Technical Advisory T 6640.8A (1987), CEQ's handbook, *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ, 1997), *Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process* (FHWA, 2003), CEQ's memorandum *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis* (CEQ, 2005), and TxDOT's *Guidance on Preparing Indirect and Cumulative Impact Analyses* (TxDOT, 2006b). NOTE: This section is an exact duplication of Volume II, Section 5 (Indirect and Cumulative Effects). The FEIS includes this repetition in order to reduce the reader's need to open another volume of the document (see the Summary, Figure S-1 for a chart of the FEIS document organization).

4.1 AREA OF INFLUENCE (AOI)

For this analysis, the Study Team defined the geographic boundary within which possible indirect development and potential cumulative effects could occur as the AOI (Exhibit G–30). The AOI is an irregularly shaped study area for land use in the northwest Houston metropolitan area, over 600,000 acres (approximately 945 square miles) in size encompassing the communities of Katy, Copperfield, Tomball, The Woodlands, Spring, and Kingwood. The Study Team developed the AOI using traffic data from H-GAC. Fifteen, 30, and 45-minute trips outward from the proposed Grand Parkway corridor were calculated along each radial roadway and the end points of each time interval were connected to produce travel contours (Exhibit G–30). The travel contours were then overlaid with the regional Traffic Analysis Zones (TAZ) used by the H-GAC in their travel forecast program. By comparing the geographic extent of each travel contour with typical commutes for the Houston area, the Study Team (along with the Expert Panel - see Table 4-1) determined that only part of the typical commute trip would use the Grand Parkway with the remainder of the trip using other roadways. For example, for a typical 45-minute commute, 15 minutes could be spent traveling to the Grand Parkway, 15 minutes traveling on the Grand Parkway, and the remaining 15 minutes traveling on other roadways to the final destination. Using this assumption, the 15-minute contour was selected and then adjusted to coincide with the nearest H-GAC zone to form the outer boundary of the AOI. The inner boundary of the AOI (also shown in Exhibit G–30) was set by existing dense development that roughly parallels SH 6 and FM 1960. These efforts are described in detail in *Working Paper #2: Secondary Development Analysis* (Michael Baker Jr., Inc., 2000b), available on the Grand Parkway website, www.grandpky.com.

Please note that the study area (Exhibit G–14) is approximately 300 square miles, while the AOI (Exhibit G–30) is approximately 945 square miles. The study area is the area within which alternative corridor locations were developed and direct effects were assessed. The AOI is the geographic boundary within which possible indirect and cumulative development and potential cumulative effects could occur.

4.2 LAND USE FORECASTING

The Study Team recognized the need to conduct a detailed land use forecasting model involving knowledgeable members of the community with first hand experience in planning or development in the government, education, and private sectors. Drawing from a large group of transportation and planning professionals, an Expert Panel was assembled to assist the Study Team with this effort (Table 4-1). The Expert Panel and the Study Team collaborated to develop reasonable and potential scenarios of future land use maps and associated demographics for Segments E, F-1, F-2, and G for the No-Build and Build Alternatives. These efforts are described in detail in *Working Paper #2: Secondary Development Analysis* (Michael Baker Jr., Inc., 2000b). Although the Expert Panel initially convened in 2000 to address the land use issues, members of the Study Team have continued to coordinate with members of the panel or the organizations they represent to regularly update information. The responsibilities of the Expert Panel were to:

- Comment and agree on general study methods;
- Review and comment on work products throughout the study;
- Provide guidance on analytical tools employed and assumptions made as the study progressed; and
- Ensure that predictions matched actual Houston results.

The Study Team and the Expert Panel classified the land use into three land classes: Residential Development, Other Development, and Undeveloped land. Land classes were evaluated in terms of their response to change; stresses imposed and their capacity to withstand these stresses; pertinent regulations, standards, and development plans that establish thresholds (levels of stress beyond which the desired condition degrades); and their current status (baseline condition). The land use component was selected due to the potential for indirect and cumulative effects related to the Grand Parkway Segments E, F-1, F-2, and G Build Alternative. More detailed discussions of the Affected Environment are included in Volumes I and II, Section 3.

4.2.1 Estimating Land Use in 2025

The proposed action's potential for facilitating land development opportunities may have an indirect and cumulative effect beyond that of the No-Build Alternative. The proposed action is only one factor in creating favorable land development conditions. Other prerequisites for land development opportunities include the demand for new development, favorable local and regional economic conditions, adequate utilities, and supportive local land development regulations and policies. Development effects, both beneficial and adverse, would continue under the No-Build Alternative regardless of when or if the Grand Parkway is constructed, but the Build Alternative will compliment and reinforce the development pattern and effects. Land use is seen as the most influential cumulative effect for all resources, both human and natural, in the AOI.

TABLE 4-1
THE EXPERT PANEL

Expert Panel Member	Position or Affiliation
John Chiang	Member of Houston Planning Commission; Grand Parkway Board Member – Involved in apartment development
Alan Clark	Executive Director of the H-GAC – Oversees regional transportation planning for the eight-county Houston metropolitan area, including demographic forecasts and traffic modeling
Kim Coleman	Cy-Fair Independent School District – Cy-Fair is a suburban school district within the project area that has devoted considerable effort in acquiring property to meet projected growth
Charles Dean	Harris County Planning and Development
John deBessonet	Harris County Engineering Department, Park Planning – Parks are important to the quality of life for many people; appropriate expertise in this topic was necessary
Richard DeBose	H-GAC – Travel Modeling
John Fourqurean	Director of Planning, Research, and Evaluation; Cy-Fair Independent School District
Reeves Gilmore	Harris County Public Infrastructure Department – Oversees all plat applications and planning documents and coordinates with the city of Houston
Paul Hawkins, P.E.	Assistant Precinct Engineer, Harris County Precinct 3 – The Grand Parkway would intersect or parallel several precinct roads. This precinct is undergoing substantial development pressure
Robert Heineman	Vice President, Woodlands Operating Company – The Woodlands is Houston's largest master planned community, with development activities since the 1970s
Mike Inselmann	President, American Metro Study – Studied Houston's housing and development market and that of many other U.S. cities
John Jackson	City of Houston Planning and Development
Eric Lambe	City of Houston, Long Range Planning Group
Ray Laughter	North Harris Montgomery Community College District, Vice Chancellor, Center for Business and Economic Development
Madan Mangal	City of Houston Planning and Development
Mark Mooney, P.E.	Montgomery County Engineer – Montgomery County makes up nearly 25% of the project area and is undergoing current development pressures
Pamela Muhammad	H-GAC – Planning
Andy Mullins	Oversees the travel demand modeling effort for H-GAC; understands the relationship between households, income, and employment to traffic demand
Chris Olavson	Former Director of Transportation Planning, Houston District – TxDOT; currently in private consulting; brings years of experience in planning for the Houston area and working closely with H-GAC
Pamela Rocchi	Harris County Precinct 4 Engineering
Max Samfield	GIS Data Services Manager for H-GAC – Coordinated and analyzes geographic data between the demographers and the traffic engineers
David Schuelke	Tomball Independent School District

TABLE 4-1 (CONT.)
THE EXPERT PANEL

Expert Panel Member	Position or Affiliation
Ed Shackleford, P.E.	Precinct Engineer, Harris County Precinct 4 – The Grand Parkway would intersect or parallel several precinct roads; this precinct is undergoing substantial development pressure
Barton Smith, Ph.D.	University of Houston, Professor and Director, Center for Public Policy – Brings years of Houston-specific experience in real estate development, growth, and the economy
Jeff Taebel	H-GAC – Planning
Anthony Tangwa	City of Houston Planning
Ralph Taylor	Harris County Flood Control District – Flooding and runoff issues are critical in most of the project area; specific expertise was needed in this subject
Chris Van Slyke	H-GAC – Travel Modeling

Source: Expert Panel Sign-In Sheets, 2000

4.2.1.1 The Land Use Forecast Process: Assumptions and Methods

Regional demographic and travel forecasting typically starts with growth rates determined by H-GAC for population and employment in a given area. The growth rates are calculated based on the most recent data available. The resulting population and employment (people, households, and jobs) are then allocated to smaller geographic regions of the Houston metropolitan area.

The forecast presented here began from a different perspective to provide a more detailed look at land use. The Study Team and Expert Panel agreed that the land use categories would be drawn onto maps and the population and employment figures would then be generated from the land use maps. The No-Build and Build Alternative maps predict future development for each alternative. From these maps, the Study Team estimated the total number of households and jobs (employment) for the year 2025, with concurrence from the H-GAC and the city of Houston Planning Commission.

The Expert Panel was presented with the historic land use maps, which present snapshots of residential and other development from 1970, 1980, and 1995 (Exhibits G–24a through G–24c). These maps summarized land development (rates, patterns, and extent) over the past 30 years. The Expert Panel was also presented with a year 2000 base map (Exhibit G–24d) that contained existing residential and commercial development, parks and mitigation areas, wetlands, and floodplains, as well as development with plat approval.

The Expert Panel's goal was to provide a basis for the Study Team's assessment of future land use changes by predicting where, when and in what manner land within the AOI might develop under both the No-Build and Build Alternatives. From this, the Study Team could then determine what growth and hence what indirect and cumulative impacts could be attributed to the development of the Grand Parkway (Build Alternative). The Expert Panel convened

four times between January and June of 2000. The Expert Panel and Study Team determined that land within the AOI that was already developed would not change, planned developments would continue as planned, and parks, wetlands, and floodplains would not develop due to the additional cost, difficulty, and regulatory constraints associated with their development. Remaining land, free of these constraints, was then analyzed for development potential and land uses were allocated under both the No-Build and Build Alternatives. The land use categories developed by the Expert Panel are described in Table 4-2.

TABLE 4-2
LAND USE CATEGORIES DEFINED BY THE EXPERT PANEL

Land-Use Category[1]	Definition
Residential	Characterized by degree of density
R1	High density single family
R2	Low density single family
R3	Multi-family
Master Planned Community	A suburban plan that includes homes and commercial, work, educational and community facilities
Commercial	Characterized by type: retail, office, or industrial
Undeveloped/Constrained	Would remain undeveloped due to a form of an environmental constraint (e.g., parks, wetlands, and floodplains)
Undeveloped [2]	Would remain undeveloped due to a lack of demand

Notes: [1] The land use categories are those that the Expert Panel agreed were most reasonable and do not represent land use controls or regulations.
[2] Undeveloped land was defined as land with no visible buildings or infrastructure.
Source: Study Team and Expert Panel, 2000

4.2.2 USGS/National Oceanic and Atmospheric Administration (NOAA) Draft 2001 National Land Cover Database (NLCD)

In addition to the land use forecasting by the Study Team and the Expert Panel, the Study Team utilized USGS/NOAA Draft NLCD (2001) information to determine the vegetative composition of undeveloped land in the AOI. The NLCD 2001 Landsat data were acquired from the Coastal Change Analysis Program (C-CAP) data center of the NOAA. The dates of the images were chosen by the National Land Cover Characterization 2001 project, which is conducting a land use study to update the 1992 NLCD study. The 2001 NLCD data are a grid-based file with each 30-meter cell containing one of 21 possible land use categories (Table 4-3). The Landsat data are classified through computer software processes; however, other ancillary data sources were used to augment the final land classification. These sources include census, urban boundaries, NWI wetlands, and aerial photography. The use of these ancillary data adds to the overall accuracy of the final land cover classification.

TABLE 4-3
USGS/NOAA DRAFT 2001 NLCD – THEMATIC CLASSES

Class	Sub-class
10 Water	11 - Open Water 12 - Perennial Ice/Snow
20 Development	21 - Developed, Open Space 22 - Developed, Low Intensity 23 - Developed, Medium Intensity 24 - Developed, High Intensity
30 Barren	31 - Barren Land 32 - Unconsolidated Shore
40 Forested Upland	41 - Deciduous Forest 42 - Evergreen Forest 43 - Mixed Forest
50 Shrubland	52 - Scrub/Shrub
60 Non-Natural Woody	61 - Orchards/Vineyards/Other
70 Herbaceous Upland Natural/Semi-Natural Vegetation	72 - Grassland/Herbaceous
80 Herbaceous Planted/Cultivated	81 - Pasture/Hay 82 - Cultivated Crops
90 Wetlands	90 - Woody Wetlands 91 - Palustrine Forested Wetland 92 - Palustrine Scrub/Shrub 93 - Estuarine Forested Wetlands 94 - Estuarine Scrub/Shrub 95 - Emergent Herbaceous Wetland 96 - Palustrine Emergent Wetland (Persistent) 97 - Palustrine Emergent Wetland 98 - Palustrine Aquatic Bed

Source: EPA, 2001b

4.2.2.1 Landsat Imagery

The proposed land use analysis can be better understood through a more thorough discussion of Landsat imagery. The satellites of the Landsat program capture information though various spectral bands, each of which is sensitive to a small range of wavelength of light. When analyzed alone or in combination, these wavelength values produce unique arrays of data, which describe object properties such as the greenness of a plant or the reflectiveness of a surface. Features on the earth, whether natural or manmade, undergo changes in their properties becoming hot or cold, wet or dry at different times throughout the day, through the seasons, and year-to-year. The Landsat satellites acquire data over the same area every sixteen days along a path approximately 607 feet (185 meters) wide; two such paths comprise the AOI. For each

path, one scene is captured over the AOI leading to the possibility of two homogeneous scenes of the same day conditions. Even so, weather patterns and temperature differences can vary greatly. Cloud cover often renders scenes unusable and forces the selection of a scene at an opposing seasonal time period. Issues such as these often cause localized discrepancies; therefore careful consideration should be given when analyzing trends in land use change. For more information on Landsat imagery and its uses, please visit http://landsat.gsfc.nasa.gov/.

4.2.2.2 The USGS/NOAA Draft 2001 NLCD Limitations

Landsat imagery has a base scale of 1:100,000 for mapping applications. Maps of 1:100,000 scale and smaller (covering a larger area), are typically used for regional analyses, but are not appropriate for identifying individual species, or for permitting-type applications. The 1:100,000 scale maps are more suited to land cover and change analysis on a regional scale and zoning and planning applications. The data should not be evaluated at the single pixel level, which is below the minimum mapping unit of four pixels. The data are appropriate for capturing regional trends and changes even if single pixels are wrong. **The data in subsequent tables that utilize USGS/NOAA Draft 2001 NLCD are used for the indirect and cumulative analysis only and are meant to facilitate discussions of potential cumulative impacts to land use in the AOI resulting from the development of the Grand Parkway and not to replace the actual direct impacts analysis in Volume II, Section 4 (Environmental Consequences). Direct and indirect impacts in Volume II focus specifically on independent segments of the Grand Parkway and on specific alignment alternatives developed in each segment.**

4.3 INDIRECT EFFECTS

Indirect effects are defined as those "…which are caused by an action and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 CFR 1508.8). Indirect effects were assessed based on guidance described in the TRB's National Cooperative Highway Research Program (NCHRP) *Report 466: Desk Reference for Estimating the Indirect Effect of Proposed Transportation Projects* (TRB, 2002).

Examples of indirect effects could include the following:

- Development and land use changes due to improved access;
- Runoff increases due to changes in land use and increased development on land surrounding the proposed facility;
- Increased sedimentation of wetlands and streams and decreased water quality due to future development of land adjacent to the new facility;
- Loss of wildlife habitat and decreased habitat value in areas of increased land development spurred by the proposed project;

- Impact to cultural resource sites from development projects on private property that do not require cultural resource investigation because public funds or permits are not required;
- Increased use of parks and recreational areas due to more convenient access provided by the new facility; and
- Stimulation of the local economy from the circulation of construction spending; improved access to employment opportunities, markets, goods, or services such as health and education; an increased work force related to construction; and development stemming from the new facility.

Potential indirect development would be similar for all alignments of the Build Alternative. Resource specific indirect impacts were evaluated within the AOI and are discussed in the following sections. Where possible, the Study Team quantitatively determined the induced or indirect growth effect of the Build Alternative compared to the No-Build Alternative based on mapping developed by the Expert Panel (see Section 4.2). Unless otherwise noted, the anticipated growth and development under the No-Build Alternative would have similar indirect impacts to resources and issues as the Build Alternative.

4.3.1 Land Use

The Study Team determined that land use impacts would occur under both the Build and No-Build Alternatives. Under the Build Alternative, the Expert Panel determined that the Grand Parkway would likely induce indirect development in the AOI regardless of the alternative alignment selected. The Study Team's land use analysis determined that the Build Alternative would indirectly impact 11,373 acres (2 percent of the AOI) above that expected for the No-Build Alternative. Of this acreage, 10,651 acres were converted from undeveloped to developed land. The remaining 722 acres of developed land would convert from one type of development to another. This indirect development would likely include a variety of land use intensities such as convenience stores, gas stations, retail strip malls, restaurants, office buildings, and residential, including apartments. With the Build Alternative, land use around highway interchanges, along frontage roads, and at grade separations with entrance/exit ramps to the proposed Grand Parkway would likely have new commercial development or convert from residential to commercial land use. Under the No-Build Alternative, land development would still occur in these interchange areas, but would likely be residential in nature. Under either scenario, undeveloped land would continue to be converted to commercial and residential uses throughout the AOI.

4.3.2 Geology, Soils, and Farmland

Construction of the proposed Grand Parkway and associated indirect development would result in a direct loss of some soils because of soils being removed from construction sites. Future construction may expose some geologic resources to erosion, but this type of exposure would be of short duration and is usually associated with grading, excavation, and placement of fill material. Typically, soils would be removed from the ROW and the remaining soils would be subject to compaction and increased erosion potential. These effects would be short-term, localized, and manageable. Soil erosion

and increased sedimentation of area waterbodies from indirect development that disturbs one or more acres are required to obtain authorization under the TPDES storm water construction general permit, these impacts would be minimized through the requirement to prepare and obtain a TCEQ TPDES permit and associated SWPPP.

The construction of the proposed Grand Parkway would result in effects to prime farmland soils. Some prime farmland soils would be converted directly to a ROW use. Additionally, farmland soils could be impacted by indirect development outside of the project ROW. However, indirect impacts due to the construction of the project have been determined to be minimal by a formal scoring by the NRCS on June 9, 2005.

4.3.3 Social

Indirect development would occur because of the proposed Grand Parkway and could affect the daily lives of residents of the AOI. Potential indirect development would be similar for all alignments. The degree to which indirect development may occur is dependent on many variables and is difficult to predict. Existing residential areas may become more densely populated (i.e., conversion of undeveloped land to single-family residences, or conversion of undeveloped or single-family residences to multi-family residences), utility and social service responsibilities may increase, and forest pasture and croplands may be converted to additional residential areas or other urban forms of land use thereby decreasing area opportunities for a more rural life style.

All of the proposed project alternatives would provide an opportunity for alteration of land use patterns at or near entrance/exit ramps and highway interchanges and adjacent to frontage roads. This development would likely include gas stations, convenience stores, retail strip-malls, restaurants, office buildings, and apartments. In the long-term, these new developments would provide services, offices, and some housing for residents of the AOI, but would not have any disproportionate effects on minorities or low-income persons. This growth is likely to occur over an extended period of time and is likely to follow current residential growth patterns observed in the project area where local communities, planners, developers, and service providers have provided the basic infrastructure (utilities and roads) conducive to residential/commercial development.

Indirect development and potential community change can be perceived as positive or negative. To some, this change is unwanted and development is undesirable as land is converted to residential and commercial uses and area populations increase. For others, new development often means potential new jobs, increased economic utility, reduced travel times for users of the facility, and potentially reduced travel time for users on the current roadway network in the AOI because of reduced congestion.

4.3.4 Economics

Indirect economic impacts would be tied to potential indirect development. An increase in commercial development would provide increased income, employment and earnings opportunities, and additional tax revenues. Residential growth could also increase tax revenues, but local governments could in turn use these tax dollars to increase and improve community services, maintain and improve local roadways, and improve and provide public recreational opportunities. Growth in residential/commercial development would increase the demand for consumer services, including, but not limited to, retail, banking, medical, and recreational.

4.3.5 Pedestrian and Bicyclists

Pedestrians and bicyclists could benefit from the indirect development of residential and commercial streets, in conjunction with this project. This benefit could be further realized if pedestrian walkways and bicycle facilities are incorporated into transportation plans within the AOI. Proposed pedestrian walkways and bicycle facilities will be considered for incorporation to the proposed Grand Parkway where determined safe, reasonable, and feasible. All existing and planned facilities would be accommodated by the proposed project.

4.3.6 Air Quality

The network of future roadways and subdivision streets within the AOI are expected to contribute to further traffic improvements from the base year (2000). The Study Team's land use analysis determined that the Build Alternative would indirectly influence 11,373 acres (2 percent of the AOI) above that expected for the No-Build Alternative. Developing this area under the Build Alternative would indirectly contribute 6.7 tons of MSAT per year in 2025. If compared to the total 2025 Build Alternative MSAT in the entire AOI, the indirect MSAT account for approximately 2.25 percent of the AOI. Other potential indirect impacts of air quality could occur with increased industrial development in the AOI spurred by the proposed Grand Parkway. Generally, industrial facilities that emit air pollutants would be governed and permitted through the TCEQ.

4.3.7 Noise

Future increases in ambient noise levels associated with projected development are anticipated, especially in proximity to the proposed Grand Parkway. The network of future roadways and subdivision streets, in conjunction with this project, would be expected to contribute to increased ambient noise levels. The density and type of future development within the project area would contribute to the overall changes in noise levels.

4.3.8 Water Quality

Future increases in storm water runoff levels, non-point source pollution, and effects to groundwater associated with projected regional and local development are anticipated with the No-Build and Build Alternatives. The network of future roadways and subdivision streets, in conjunction with the proposed project, would contribute to increased runoff as

impermeable surface area increases. The density and type of future development within the AOI would contribute to the overall changes in runoff. The TPDES program will minimize the amount of pollutants flowing into nearby streams and reduce the impact to the streams' water quality. Appreciable differences in water quality are not anticipated between the No-Build and Build Alternatives with the implementation of the TPDES program.

4.3.9 Wetlands and Vegetative Communities

The Expert Panel determined that land use impacts, which include impacts to wetlands and vegetative communities, would occur under both the No-Build and Build Alternatives within the AOI. Based on USGS/NOAA Draft 2001 NLCD data, the Build Alternative could indirectly impact 823 acres of wetland (approximately 1 percent of the 66,098 acres of total wetlands within the AOI) above that expected for the No-Build Alternative. In addition, the Build Alternative could indirectly impact 2,829 acres of the Katy Prairie (approximately 2 percent of the 148,198 acres of Katy Prairie within the AOI) above that expected for the No-Build Alternative. The general public, resource agencies, and Study Team's technical experts identified impacts to wetlands and unique habitat, including the Katy Prairie, as key concerns during project development. Filling and dredging activities of wetlands are regulated under Section 404 of the CWA by the USACE and other permitting agencies.

4.3.10 Wildlife

The Expert Panel determined that land use impacts, which include impacts to wildlife habitat, would occur under both the No-Build and Build Alternatives within the AOI. The land use analysis determined that the Build Alternative would indirectly impact approximately 10,651 acres of undeveloped land or potential wildlife habitat (3 percent of the approximate 371,219 acres of undeveloped land in the AOI) above that expected for the No-Build Alternative. Removal or fragmentation of habitat due to the development of farmlands, forests, wetlands, and other habitat could impact the foraging, breeding, and roosting activities of many terrestrial wildlife species. Indirect development could impact aquatic species by increasing sedimentation in streams, wetlands, and other natural waterbodies and by decreasing water quality due to increased roadway runoff, other nonpoint source runoff, or point source toxic spills flowing into aquatic habitats.

4.3.11 Waterbody Modifications and Floodplains

Based on assumptions made by the Expert Panel, indirect project impacts would not be located within the AOI floodplains. Executive Order 11988 restricts development in the floodplains. Additionally, county and local ordinances regulate development in floodplains.

4.3.12 Wild and Scenic Rivers

The proposed project is not situated in the vicinity of any river either on the National Inventory of River Segments included in the National Wild and Scenic River System list (NPS, 2007) or on the Nationwide Rivers Inventory list (NPS, 2004); no direct or indirect impacts to Wild and Scenic Rivers would occur.

4.3.13 Coastal Barriers

The proposed project is wholly outside any coastal barrier systems and would not directly or indirectly impact coastal barrier resources.

4.3.14 Coastal Zone Management

The proposed project is not within the CMP boundary and therefore complies with the CZMA. Coordination with the CZMA is not required.

4.3.15 Essential Fish Habitat (EFH)

The proposed project does not intersect tidally influenced coastal waters and would have no direct or indirect impact on EFH. Coordination with the NMFS is not required.

4.3.16 Threatened and Endangered Species

No direct or indirect impacts to threatened and endangered species are expected to occur from the construction of the proposed project.

4.3.17 Cultural Resources

4.3.17.1 Non-Archeological Historic Resources

Potential indirect impacts to non-archeological historic resources may include visual, noise, atmospheric, or other types of effects at distances well removed from the area of project construction. Increased development could increase incidences of looting, vandalism, and non-scientific collecting to non-archeological historic resources. Regardless whether the No-Build or Build Alternative is selected for this project, patterns of development in the project area will likely continue in the future and will likely have an indirect impact on non-archeological historic resources.

4.3.17.2 Archeological Resources

Potential indirect impacts to archeological resources may include visual, noise, atmospheric, or other types of effect at distances well removed from the area of project construction. However, based on assumptions made by the Expert Panel, indirect project impacts would not be located within the AOI floodplains, which have a high probability for archeological resources. Increased development could also increase incidences of looting, vandalism, and non-scientific collecting to archeological resources. Regardless whether the No-Build or Build Alternative is selected for this project, patterns of development in the project area will likely continue in the future and will likely have an indirect impact on archeological resources.

4.3.18 Hazardous Materials

Potential indirect impacts to hazardous materials locations could occur because of land disturbing activities from potential development, infrastructure, or utility improvements. This risk could be minimized or avoided by conducting a Phase I Environmental Site Assessment to identify potential hazardous materials prior to property acquisition and development.

4.3.19 Visual and Aesthetic Qualities

The proposed Grand Parkway facility would alter the suburban setting in which it is constructed. Effects to visual quality would take two forms: views of the proposed facility from various points and views from the proposed Grand Parkway of the surrounding landscape. Indirect development would also affect visual quality of the areas in which a facility is constructed. These developments would likely include streetlights and/or security lighting that would be expected to result in incremental and localized increases in ambient light levels, glare, and nightglow.

4.4 CUMULATIVE EFFECTS

This section describes the CEA developed to address future land development, both with and without Grand Parkway, Segments E, F-1, F-2, and G, and to assess cumulative effects that are "caused" by the facilities' construction on resources, ecosystems, and human communities. This analysis follows the requirements and processes outlined in 23 CFR 771, the FHWA Technical Advisory T 6640.8A (1987), the CEQ's handbook, *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ, 1997), *Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process*, FHWA 2003, CEQ's memorandum, *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis* (CEQ, 2005), the California Department of Transportation (Caltrans) *Guidance for Preparers of Indirect and Cumulative Impact Assessments* (2005), and TxDOT's *Guidance on Preparing Indirect and Cumulative Impact Analyses* (TxDOT, 2006b). Figure 4-1 shows a conceptual model of the CEA and how it relates to land use.

While FHWA position papers and technical guidance require that cumulative effects be evaluated, the agency recognizes that there is no standard approach or methodology, area of effect, or predefined impact categories. Therefore, it is necessary to evaluate each project on an individual basis, define its AOI, and fully understand the current social and economic conditions and transportation infrastructure of the area.

The objective of this CEA is to evaluate land development and the corresponding environmental effects for two scenarios: the Build Alternative where Segments E, F-1, F-2, and G of the Grand Parkway are fully constructed and the No-Build Alternative where the facility is not constructed.

4.4.1 Cumulative Effects Analysis (CEA) Methods

The Study Team followed an 8-step approach to evaluate cumulative effects based on TxDOT (2006b) *Guidance on Preparing Indirect and Cumulative Impact Analyses* (Table 4-4). Steps 1 through 3 identify the study area, history, and health of each resource considered in the analysis. Steps 4 through 7 involve identifying and analyzing direct, indirect, and potential cumulative effects, and Step 8 involves assessing and discussing mitigating adverse effects and developing mitigation strategies as appropriate.

TABLE 4-4
GUIDELINES FOR IDENTIFYING AND ASSESSING CUMULATIVE EFFECTS

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 effect
5	Identify other reasonably foreseeable actions that may affect resources
6	Assess potential cumulative effects to each resource
7	Report the results
8	Assess and discuss mitigation issues for all adverse impacts

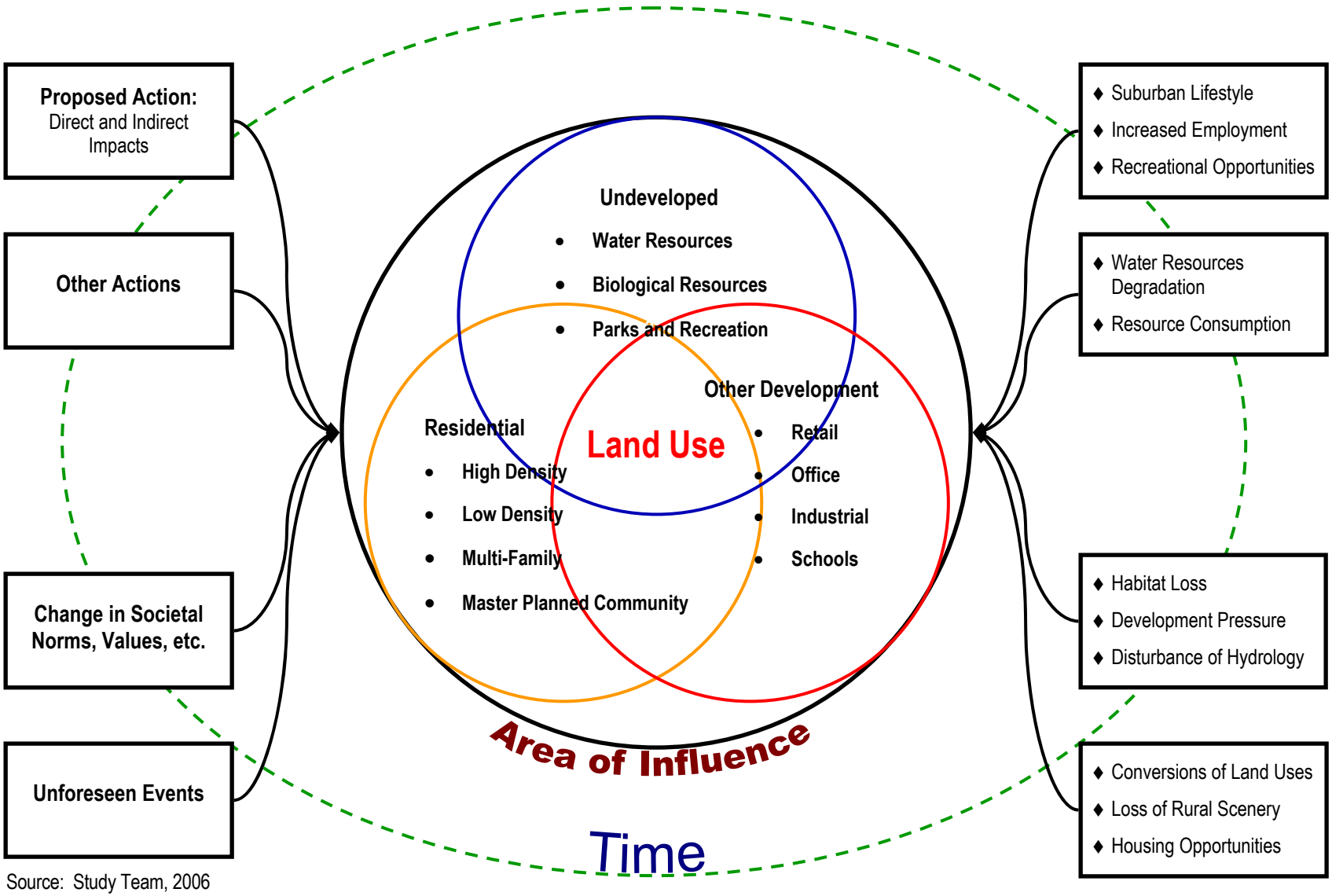
Source: TxDOT, 2006b

4.4.2 Cumulative Effects Analysis (CEA)

4.4.2.1 Step 1: Identify Resources to Consider

Step 1 requires the identification of cumulative effects issues associated with the project and the definition of assessment goals. Scoping with federal, state, local, regional, and local agencies (Table 4-5) was conducted to gather input on substantial issues in the proposed project area. In addition, numerous public meetings and workshops were conducted throughout the study area to solicit input on the proposed project and issues of concern. The Study Team used this information to evaluate the cumulative effects to all project resources and issues (Table 4-6). TxDOT (2006b) guidance (page 7) states, "If a project will not cause direct or indirect impacts on a resource, it will not contribute to a cumulative impact on that resource." The Study Team determined that if the Grand Parkway did not have a direct or indirect impact on a resource, then that resource would not be carried forward for detailed CEA. Furthermore, the AOI, as defined, delineates the area outside of which the Grand Parkway would not cause indirect (or direct) impacts to any resources. Therefore, all cumulative effects discussed are within the defined AOI.

FIGURE 4-1
CONCEPTUAL MODEL



Source: Study Team, 2006

TABLE 4-5
FORMAL AGENCY MEETINGS DURING THE SCOPING AND CORRIDOR STUDY

Date	Location	Attendees
August 18, 1999	GPA's Offices	TPWD, USACE, TCEQ, GLO, TxDOT, FHWA, GPA, Michael Baker Jr., PBS&J, and Brown and Gay Engineers
August 26, 1999	GPA's Offices	TPWD, USFWS, TxDOT, GPA, Michael Baker Jr., PBS&J, and Brown and Gay Engineers
February 2, 2000	Tomball College	TPWD, USACE, NRCS, FHWA, TxDOT, GPA, Michael Baker Jr., PBS&J, and Brown and Gay Engineers
February 24, 2000	USACE – Galveston District Office	USACE, FHWA, TxDOT, GPA, Michael Baker Jr., and PBS&J
February 24, 2000	USFWS – Clear Lake Office	USFWS, GPA, Michael Baker Jr., PBS&J, and Brown and Gay Engineers
March 3, 2000	TPWD – Clear Lake Office	TPWD, FHWA, GPA, Michael Baker Jr., and PBS&J
March 3, 2000	USFWS – Clear Lake Office	USFWS, FHWA, GPA, Michael Baker Jr., and PBS&J
November 6, 2000	EPA – Dallas Office	EPA, FHWA, TxDOT, GPA, H-GAC, and PBS&J
April 10, 2001	GPA – Houston Office	USACE, FHWA, TxDOT, GPA, Michael Baker Jr., and PBS&J
May 23, 2001	USACE- Galveston Office (Joint Evaluation Meeting)	USFWS, USACE, GLO, TCEQ, EPA, NMFS, GPA, Michael Baker Jr., PBS&J, and Brown and Gay Engineers
June 14, 2001	Michael Baker Jr., Inc	TPWD, USFWS, USACE, GLO, TCEQ, FHWA, TxDOT, GPA, Michael Baker Jr., PBS&J, and Brown and Gay Engineers
July 17, 2001	EPA – Dallas Office	EPA, FHWA, TxDOT, GPA, Michael Baker Jr. and PBS&J
July 31, 2001	Michael Baker Jr., Inc.	TPWD, USFWS, USACE, GPA, Michael Baker Jr., and PBS&J
October 1, 2001	GPA – Houston Office	TPWD, USFWS, TxDOT, GPA, Michael Baker Jr., and PBS&J
February 8, 2002	TxDOT ENV – Austin Office	EPA, FHWA, TxDOT, GPA, Michael Baker Jr.
March 27, 2002	EPA – Dallas Office	EPA, GPA, Michael Baker Jr.

Source: Study Team, 2002

TABLE 4-6
RESOURCES/ISSUES CARRIED FORWARD FOR FURTHER CONSIDERATION IN THE CUMULATIVE EFFECTS ANALYSIS (CEA) FOR SEGMENTS E, F-1, F-2, AND G OF THE GRAND PARKWAY

Resource/Issue		Current Health of Resource/Issue	Direct Impacts[1]	Indirect Impacts	Concerns Raised During Project Development	Pertinent Regulations	Further Study Necessary?[2]
Land Use		Changing – Existing land use continues to change due to increasing development. Changing land use from undeveloped to developed could contribute to the decline in health of natural resources.	Direct conversion of 2,664 acres of existing land use (0.4% of the AOI) (see Table 4-12).	11,373 acres of indirect impacts (2% of AOI) above No-Build Alternative. Indirect development in the AOI would be consistent with all local and state government plans and policies.	Concerns over impacts to this resource were raised during scoping and in comments received on the DEISs.	Local planning and building ordinances and selected zoning regulations where applicable.	Yes. Carried forward for further consideration in the CEA. See Section 4.4.2.2 (Step 2: Define the Study Area for Each Resource).
Geology, Soils, and Farmland		Farmland Resources declining - Land use would continue to be converted within the AOI due to suburban growth.	Completion of the formal CPA-106 NRCS form indicates no substantial direct impacts from any of the alternatives associated with the conversion of farmland soils.	Completion of the formal CPA-106 NRCS form indicates no substantial indirect impacts from any of the alternatives associated with the conversion of farmland soils.	The general public, resource agencies, and the Study Team's technical experts did not identify geology, soils, and farmland soils as a resource concern.	FPPA.	No. However see Section 4.4.2.2 (Step 2: Define the Study Area for Each Resource) for continued discussion of cumulative effects to land use.
Social Characteristics		Changing - Rural lifestyle is being replaced by expanding Houston metropolitan area. Land would continue to be converted to residential and commercial uses as area populations increase.	Direct impacts include residential, commercial, and industrial relocations (242 total displacements); impact to undeveloped school property and access to a church; and improved system linkage and mobility.	In the AOI, rural areas are expected to continue to transition to a suburban setting. New development provides potential for new jobs and increased economic utility.	Individual concerns over loss of rural lifestyle were raised during public meetings and in comments received on the DEISs.	EO 12898, Federal Actions to Address Environmental Justice (EJ) in Minority Populations and Low-Income Populations, 1994.	No. Within the AOI, rural areas would continue to transition to a suburban setting as Houston expands and land is converted to residential and commercial uses. New development provides potential for new jobs and increased economic utility.
Economics		Increasing - The greater Houston metropolitan area represents one of the fastest growing economies in the country.	Direct economic impacts of the project consist of construction-associated expenditures. Total cost is estimated to be $1.80 billion, affecting a total output of $4.04 billion, a total value added of $2.05 billion, business tax impact during construction of $105.8 million, and the temporary employment of approximately 28,540 persons in construction-related jobs.	At the county level, direct and indirect expenditures related to the project are predicted to account for an increase of 300 million dollars into the county economy as compared to the total gross product of 307 billion for Harris County and 9 billion dollars for Montgomery County (U.S. Census Bureau, 2002c).	The general public, resource agencies, and Study Team's technical experts did not identify economic impacts as a major concern associated with the proposed project.	In the context of transportation project related impacts, economy is not a regulated resource.	No. Within the AOI, increased commercial development would provide increased income, employment and earnings opportunities, and additional tax revenues. Residential growth could generate additional tax revenues, which could be used for increasing and improving community services, maintaining and improving local roadways, and improving and providing public recreational opportunities.
Air Quality	CO and Ozone	Air Quality is Improving - The Houston-Galveston-Brazoria (HGB) Area is currently classified as a "moderate" non-attainment area for ozone (EPA, 2006a). The state of Texas has requested a reclassification of the HGB non- attainment area from "moderate" to "severe" with an attainment date of June 15, 2019. Texas has made substantial progress over the past 15 years in addressing ozone in the HGB area. The 1-hour ozone rules, which will not be fully implemented until 2008, have already decreased the ozone design value from around 220 parts per billion (ppb) in 1991 to 169 ppb in 2005. TCEQ analysis predicts the area of exceedance of the 8-hour standard will decrease over 80% from 2000 to 2009. These decreases are expected to continue despite a rapid growth in the area's economy and population. The Houston-Galveston Area is currently in attainment for CO.	According to studies conducted by H-GAC and TCEQ, and based on ambient air monitors managed by TCEQ and approved by EPA, the 1-hour and 8-hour ozone design values for the HGB area from 1991 to 2005 have decreased over the past 15 years. The 2005 1-hour design value was 169 ppb, representing a 23% decrease from the value for 1991 (220 ppb). The 2005 8-hour design value was 103 ppb, a 13% decrease from the 1991 value of 119 ppb. These decreases occurred despite a 36% increase in area population. The Grand Parkway Segments E, F-1, and F-2 were included in the area's financially constrained 2025 RTP. Segments E, F-1, and F-2 were also included in H-GAC's conforming 2006-2008 TIP, while Segment G was included in the 2006-2008 TIP, Appendix D, as a project undergoing environmental review and scheduled for implementation beyond the three-year TIP time frame. The 2025 RTP and FY 2006-2008 TIP were adopted by H-GAC in April 2005 and found to conform to the SIP by the U.S. Department of Transportation (FHWA/FTA) on June 3, 2005 and October 31, 2005, respectively. The Grand Parkway Segments E, F-1, F-2, and G are included in H-GAC's 2035 RTP and FY 2008-2011 TIP, as amended. On August 24, 2007, the H-GAC adopted the 2035 RTP and FY 2008-2011 TIP. The U.S. Department of Transportation (FHWA/FTA) found the 2035 RTP and 2008-2011 TIP to conform to the SIP on November 9, 2007.	Any new transportation projects proposed in the Houston metropolitan area would be required to be analyzed and added to a conforming plan prior to construction.	Concerns over air quality were raised during public meetings and in comments received on the DEISs.	The CAA and amendments regulate emissions and air quality.	No. Analysis of CO indicated that concentrations are not expected to exceed the national standard. In addition, the Grand Parkway has been included in the area's financially constrained 2035 RTP and FY 2008-2011 TIP adopted on August 24, 2007 by H-GAC.

TABLE 4-6 (CONT.)
RESOURCES/ISSUES CARRIED FORWARD FOR FURTHER CONSIDERATION IN THE CUMULATIVE EFFECTS ANALYSIS (CEA) FOR SEGMENTS E, F-1, F-2, AND G OF THE GRAND PARKWAY

Resource/Issue		Current Health of Resource/Issue	Direct Impacts[1]	Indirect Impacts	Concerns Raised During Project Development	Pertinent Regulations	Further Study Necessary?[2]
Air Quality (Cont.)	CO and Ozone (Cont.)	(Cont.)	(Cont.) Changes in modeled parameters between the 2025 RTP and the updated 2035 RTP (such as traffic volumes, population, employment, number of households, and vehicle miles traveled) have been evaluated to determine if any additional analysis is warranted before FHWA takes final environmental action. This evaluation determined that changes in the modeled parameters were minor, and therefore no additional analysis is warranted. The analysis of 2025-2035 RTP modeled parameters can be found in the Administrative Record.	(Cont.)	(Cont.)	(Cont.)	(Cont.)
	Mobile Source Air Toxics	MSAT are Decreasing through 2025 – Results of MSAT modeling were found to be substantially lower in the future (years 2015 and 2025) compared to the year 2000. MSAT will continue to improve over time due to dramatic improvements in vehicle technology and fuels and traffic flow improvements realized over time.	The proposed project potentially could contribute 10.2 tons/year of MSAT in 2025.	The proposed project potentially could contribute an additional 6.7 tons/year of MSAT indirectly related to the proposed project by 2025.	Concerns related to air quality, specifically MSAT, were raised by the general public, resource agencies, and/or the Study Team's technical experts.	Clean Air Act, Section 202(1) requires the EPA to set standards to control hazardous air pollutants ("air toxics") from motor vehicles. Currently no NAAQS have been established for any of the priority MSAT.	Yes. Carried forward for further consideration in the CEA. See Section 4.4.2.2 (Step 2: Define the Study Area for Each Resource).
Noise		Changing – Existing land use and traffic conditions continue to change due to increasing development. These changes could contribute to the rise in ambient noise levels.	Direct project impacts to 752 sensitive receivers.	Future increases in ambient noise levels associated with projected development are anticipated, especially in proximity to the proposed Grand Parkway. The network of future roadways and subdivision streets, in conjunction with this project, would be expected to contribute to increased ambient noise levels.	Concerns over noise impacts were raised during public meetings and the scoping process and in comments received on the DEISs.	FHWA NAC (23 CFR 772).	No. The AOI would continue to change from a rural to suburban setting thereby altering ambient noise levels of the area. The H-GAC traffic demand model used as inputs to the traffic noise model already assumes reasonable and foreseeable development in the AOI; therefore the cumulative impacts of noise associated with the proposed project is accounted for in the existing noise analysis.
Water Quality		Improving – Overall water quality has been improving nationwide since the CWA was implemented in 1972. However, watersheds within the AOI contain streams listed on the 2006 Texas 303(d) List of Impaired Waters. Elevated levels of bacteria constitute the primary water quality concern for each listed stream segment.	Direct project impacts to resources that would affect water quality include impacts to wetlands, floodplains, and riparian areas as well as direct crossings of waterbodies (see Table 4-15). Project construction would result in temporary increase in sedimentation and turbidity. Construction impacts would be minimized through the incorporation of appropriate BMPs for erosion control.	10,651 acres of undeveloped land (3% of undeveloped land in the AOI) would be converted to residential and commercial use above the No-Build Alternative. New development indirectly caused by the project would result in an increase in impervious cover and greater volumes of runoff during storm events. Runoff could contain oil and grease constituents, which could be carried to off-site waterbodies. New residential development would also result in new municipal discharges from sewage treatment facilities and storm water runoff from new off system roadways.	Water Quality was identified by the Study Team's technical experts as a major environmental concern associated with the proposed project.	CWA and Amendments.	Yes. Carried forward for further consideration in the CEA. See Section 4.4.2.2 (Step 2: Define the Study Area for Each Resource).
Wetland and Vegetative Communities		Declining - Changes in land use due to suburban growth are expected to convert more of the Katy Prairie.	Based on USGS/NOAA Draft 2001 NLCD data, there would be 298 acres of direct project impacts -- < 1% of the 66,098 acres of wetlands within the AOI. Direct impacts because of the project include 1,133 acres of Katy Prairie impacts -- < 1% of the 148,198 acres of Katy Prairie within the AOI.	Based on USGS/NOAA Draft 2001 NLCD data, the Build Alternative could indirectly impact 823 acres of wetland (approximately 1% of the 66,098 acres of total wetlands within the AOI) above that expected for the No-Build Alternative. In addition, the Build Alternative could indirectly impact 2,829 acres of the Katy Prairie (approximately 2% of the 148,198 acres of Katy Prairie within the AOI) above that expected for the No-Build Alternative.	Concerns over impacts to wetland and unique habitat, including the Katy Prairie, were raised by the general public, resource agencies, and Study Team's technical experts.	Section 404 of the CWA regulates the discharge of dredge and fill materials into wetlands. However, Katy Prairie is not a regulated resource.	Yes. Wetlands and Katy Prairie are carried forward for further consideration in the CEA. See Section 4.4.2.2 (Step 2: Define the Study Area for Each Resource).

TABLE 4-6 (CONT.)
RESOURCES/ISSUES CARRIED FORWARD FOR FURTHER CONSIDERATION IN THE CUMULATIVE EFFECTS ANALYSIS (CEA) FOR SEGMENTS E, F-1, F-2, AND G OF THE GRAND PARKWAY

Resource/Issue	Current Health of Resource/Issue	Direct Impacts[1]	Indirect Impacts	Concerns Raised During Project Development	Pertinent Regulations	Further Study Necessary?[2]
Wildlife	Declining - Most wildlife species in the AOI are broadly distributed across southeastern Texas. While impacts to individuals may occur, population impacts are not anticipated. Changes in land use due to suburban growth are expected to convert more of the available wildlife habitat to other uses.	Direct impacts associated with the project could include an increase in wildlife mortality associated with vehicle collisions, which does not include threatened and endangered species and EFH.	Indirect impacts to wildlife include loss of habitat and/or habitat fragmentation– the land use analysis determined that the Build Alternative would indirectly impact 10,651 acres of undeveloped land or potential wildlife habitat (3% of the 371,219 acres of undeveloped land in the AOI) above that expected for the No-Build Alternative.	Concerns related directly to specific vegetative communities and unique habitats like wetlands, Katy Prairie, and Big Thicket, were raised during scoping and public meetings, and in comments on the DEISs.	MBTA requires that impacts to migratory birds, their nests, and their young be avoided.	No. However, see Section 4.4.2.2 (Step 2: Define the Study Area for Each Resource) for continued discussion of cumulative effects to land use, which would affect available wildlife habitat. Most wildlife species in the AOI are broadly distributed across southeastern Texas. While impacts to individuals may occur, population impacts are not anticipated.
Floodplains	Stable - Flooding in the Houston area continues to be an issue. Changes in land use due to suburban growth are expected to result in encroachment of the 100-year floodplain.	Direct impacts, because of the project, include 603 acres of impacts to floodplains - <1% of the 146,054 acres of floodplains within the AOI.	Based on the Expert Panel indirect development would not occur in the floodplains. Access points to the Grand Parkway have also been located outside of the floodplains to the greatest extent practicable to minimize any potential for future floodplain development. New development indirectly caused by the project would result in an increase in impervious cover and greater volumes of runoff during storm events.	Individual concerns over floodplains and drainage were raised during scoping and public meetings, and in comments on the DEISs.	EO 11988 requires federal agencies to evaluate and minimize impacts to floodplains. Additionally, county and local ordinances also regulate development in floodplains.	No. Cumulative effects to floodplains are expected to be minimal. Based on the Expert Panel indirect development would not occur in the floodplains. In addition, county and local ordinances regulate development in floodplains.
Wild and Scenic Rivers	None present in the AOI.	The proposed action is not situated in the vicinity of any river segment on the National Inventory of River Segments included in the National Wild and Scenic River System (NPS, 2007) or on the Nationwide Rivers Inventory list (NPS, 2004); no impacts to wild and scenic rivers would occur.	The AOI is outside any wild and scenic rivers; the proposed project would not have any indirect impacts to wild and scenic rivers resources.	The general public, resource agencies, and Study Team's technical experts did not identify wild and scenic rivers as an issue of concern.	The Wild and Scenic Rivers Act, (PL 90-542 as amended; 16 USC 1271-1287).	No. This resource is not present in the AOI.
Coastal Barriers	None present in the AOI.	The proposed Grand Parkway project area is wholly outside any coastal barrier systems; the proposed project would not have any impacts to coastal barrier resources.	The AOI is outside any coastal barrier systems; the proposed project would not have any indirect impacts to coastal barrier resources.	The general public, resource agencies, and Study Team's technical experts did not identify coastal barrier systems as an issue of concern.	Coastal Barrier Resources Act (PL 97–348, Approved Oct. 18, 1982, 96 Stat 1653 [As Amended Pub. L. 107–136, Jan. 24, 2002]).	No. This resource is not present in the AOI.
Coastal Zone Management	None present in the AOI.	The proposed project is not within the CMP boundary and therefore, complies with the CZMA. Coordination with the CZMA is not required.	The AOI is outside any coastal zone management; the proposed project would not have any indirect impacts to coastal zone management resources.	The general public, resource agencies, and Study Team's technical experts did not identify coastal zone management as an issue of concern.	CZMA of 1972, federal program development and approval regulations, and the Texas Coastal Coordination Act.	No. This resource is not present in the AOI.
Essential Fish Habitat (EFH)	None present in the AOI.	The proposed project does not intersect tidally influenced coastal waters and would have no impact on EFH. Coordination with NMFS is not required.	The AOI is outside any tidally influenced coastal waters; the proposed project would not have any indirect impacts to EFH.	The general public, resource agencies, and Study Team's technical experts did not identify EFH as an issue of concern.	Magnuson-Stevens Fishery Conservation and Management Act (67 FR 2343, January 17, 2002).	No. This resource is not present in the AOI.
Threatened and Endangered Species	Declining - Changes in land use due to suburban growth are expected to convert more of the available wildlife habitat to other uses that potentially encroach and disturb known and unknown species of concern.	No direct impacts to federally protected species are anticipated to occur with the proposed project. Coordination with USFWS and TPWD would continue in order to determine whether additional protected species investigations or consultation are required.	No indirect impacts to federally protected species are anticipated to occur in the AOI.	USFWS expressed concern for Texas prairie dawn.	Endangered Species Act (ESA)(16 USC 1531-1543).	No. No direct or indirect impacts; and therefore, no cumulative effects are anticipated to threatened and endangered species due to this project.
Non-Archeological Historic Resources	Declining - A continuing change in land use from rural to suburban setting is expected to encroach and disturb known and unknown cultural resource sites.	No known NRHP-listed or eligible non-archeological historic properties would be impacted by the alternative alignments.	There is a possibility for indirect impacts to non-archeological historic properties in the AOI as land is converted to residential and commercial uses. Existing patterns of development are equally likely to affect historic resources as the proposed project would.	The general public, resource agencies, and Study Team's technical experts did not identify issues of concern for non-archeological historic resources.	Texas Antiquities Code, National Historic Preservation Act, Section 4(f) of the Department of Transportation Act of 1966.	No. No substantial direct or indirect impacts to non-archeological historic resources are anticipated from this project; therefore cumulative effects to this resource, while possible, are expected to be minimal.

TABLE 4-6 (CONT.)
RESOURCES/ISSUES CARRIED FORWARD FOR FURTHER CONSIDERATION IN THE CUMULATIVE EFFECTS ANALYSIS (CEA) FOR SEGMENTS E, F-1, F-2, AND G OF THE GRAND PARKWAY

Resource/Issue	Current Health of Resource/Issue	Direct Impacts[1]	Indirect Impacts	Concerns Raised During Project Development	Pertinent Regulations	Further Study Necessary?[2]
Archeological Resources	Declining - A continuing change in land use from rural to suburban setting is expected to encroach and disturb known and unknown cultural resource sites.	Two previously recorded archeological sites are located within the ROW of the proposed project. Further study and coordination with the agencies will minimize impacts to these resources.	There is a possibility for indirect impacts to historic archeological resources in the AOI as land is converted to residential and commercial uses. Development in the floodplain would be minimized, thereby protecting the areas with some of the greatest potential for archeological resources.	The general public, resource agencies, and Study Team's technical experts did not identify issues of concern for archeological resources.	Texas Antiquities Code, National Historic Preservation Act, Section 4(f) of the Department of Transportation Act of 1966.	No. No substantial direct or indirect impacts to archeological resources are anticipated from this project; therefore cumulative effects to this resource, while possible, are expected to be minimal.
Visual and Aesthetic Qualities	Changing - Transition from a rural to suburban/developed landscape.	The proposed project would be predominately at grade with vegetated shoulders, right-of-way, and medians.	Increases in nighttime ambient light levels would not result in appreciable increases beyond that anticipated under the No-Build Alternative.	The general public, resource agencies, and Study Team's technical experts did not identify impacts to visual or aesthetic quality as a major environmental concern associated with the proposed project.	The visual environment is not a regulated resource.	No. The AOI would continue to change from a rural to suburban setting. From a visual standpoint, this change is neither positive nor negative, but would present a different visual landscape to the viewer from what is currently present.

Note: [1] Direct impacts were calculated from USGS/NOAA Draft 2001 NLCD data using the ROW of the Preferred Alternative Alignments for each of Segments E, F-1, F-2, and G of the proposed Grand Parkway at the time of this document production. Although other alignments could ultimately be selected as the Preferred Alternative Alignment within each segment, results of the indirect and cumulative impacts assessment (the purpose of this section of the EIS) would not be substantially affected.

[2] See Section 4.4.2.1 for a description of Step 1 of the CEA (Identify Resources to Consider).

Source: Study Team, 2006

The results of the Step 1 evaluation identified four major resources/issues that warrant more detailed discussion. These include:

1. Land Use – including farmland from a land use classification;
2. Air Quality;
    a. Mobile Source Air Toxics (MSAT)
3. Water Quality; and
4. Wetlands and Vegetative Communities, including:
    a. Wetlands, and
    b. Katy Prairie.

4.4.2.2 Step 2: Define the Study Area for Each Resource/Issue

Land Use

The cumulative effects resource study area for land use is described in Section 4.1 and is the AOI (Exhibit G–30). The AOI is over 600,000 acres (approximately 945 square miles) in the northwest Houston metropolitan area and includes the communities of Katy, Copperfield, Tomball, The Woodlands, Spring, and Kingwood. As defined, the area outside of the AOI would not experience direct, indirect, or cumulative effects to any resource because of the Grand Parkway project.

Mobile Source Air Toxics

The roads used for the MSAT traffic analysis includes all major roadways potentially affected by the proposed new transportation facility, in this case, the proposed Grand Parkway (Exhibit G–26). This analysis considers the on-road sources for the six priority MSAT (i.e., acetaldehyde, acrolein, benzene, 1,3 butadiene, diesel particulate matter [DPM], and formaldehyde) and is based on future volumes of traffic that have been projected using a travel model that includes all the roadway links within the total traffic study area.

Water Quality

The cumulative effects resource study area for water quality was developed by the Study Team by identifying the watersheds that intersect the AOI. The resource study area for water quality is over 1,646,000 acres (approximately 2,572 square miles) in the northwest Houston metropolitan area. Since the late 1980s, watershed organizations, tribes, and federal and state agencies have moved toward managing water quality by using a watershed approach (EPA, 2005d). In Texas, TCEQ manages the Water Pollution Control Program, the primary regulatory program to maintain, restore, and enhance water quality, by watershed (TCEQ, 2007). The cumulative effects resource study area boundary for water quality was formed by connecting the outermost limits of each of the watersheds that intersected in the AOI (Exhibit G–31) and included the watersheds of Lake Creek, Spring Creek, Cypress Creek, Buffalo Bayou Above Tidal, White Oak Bayou Above Tidal, Greens Bayou, Lake Houston, Peach Creek, West Fork San Jacinto River, and Caney Creek.

Wetland and Vegetative Communities

Wetlands

The cumulative effects resource study area for wetlands was developed by the Study Team using the watershed approach. Watersheds were used to establish the wetlands study area boundary because impacts to wetlands can affect the overall health of a watershed. Since the late 1980s, watershed organizations, tribes, and federal and state agencies have moved toward managing water quality by using a watershed approach (EPA, 2005d). Wetlands are important elements of a watershed because they serve as the link between land and water resources. This link has been demonstrated in practice by resource agency requirements for compensatory mitigation for wetland impacts within the same watershed whenever possible. Impacts to wetlands can greatly affect watershed health because wetlands are directly connected to watershed hydrology through sheet flow or direct hydrologic connections. Collectively, wetlands provide many watershed benefits, including pollutant removal, flood storage, wildlife habitat, groundwater recharge, and erosion control (Mitsch and Gosselink, 1986). The cumulative effects study area boundary for wetlands is identical to the watershed boundary developed for water quality and is shown on Exhibit G–31.

Katy Prairie

The Study Team conducted a literature review to determine the cumulative effects resource study area for the Katy Prairie. Previous studies have identified differing geographic boundaries for this resource based primarily on whether these investigations emphasized the prairie's relationship to historical tall-grass prairie habitats or rice fields/waterfowl habitats. Work conducted for the city of Houston's proposed Westside Airport depicted the study area for the Katy Prairie to be generally contained within Harris, Fort Bend and Waller Counties and bordered by Barker Cypress Road to the east, US 290 to the north, FM 359 as its western boundary to just north of Fulshear, with the southern border just south of the Barker Reservoir paralleling FM 1093 (Turner, Collie, and Braden, Inc., 1998). Hobaugh et al. (1989) and Robertson (1991) depict the Katy Prairie as centrally located between Harris, Waller, and Fort Bend Counties with the geographical center being located within the Katy city limits. These geographical boundaries are directly related to the primary rice prairies along the upper Texas coast.

Lobpries (1994) depicts the boundaries of the Katy Prairie as the Katy-Hockley Prairie and incorporates an area that is described as crops, other native and/or introduced grasses, and pecan-elm forest and pine hardwood forest based on the *Vegetation Types of Texas (*McMahan et al., 1984). This boundary is generally bordered by the Brazos River floodplain to the west and the southwest, the floodplain of Spring Creek to the north between Harris and Montgomery counties, the urban edge of the city of Houston and the pine hardwood forest to the northeast, the edge of Beltway 8 and the urban area of Harris County to the east, and the boundary of US 90 to the Brazos River to the south.

The similarity of the reviewed geographic boundary descriptions is that the Katy Prairie is located within Harris, Waller, and Fort Bend Counties, extends west and south to the Brazos River, and is generally bounded by Spring Creek to the north and urban Houston to the east. The Study Team identified the Katy Prairie cumulative effects resource study area (Exhibit G–32) as the area common to the selected *Vegetation Types of Texas* (McMahan et al., 1984), the rice prairie boundaries as identified by Hobaugh (1989) and Lobpries (1994), and the Grand Parkway AOI. The Brazos River serves as the western boundary of the cumulative effects resource study area as it represents a distinct and unique vegetative break from a grassland prairie to a forested system (riparian corridor). The northern boundary primarily follows Spring Creek and the edge of the native grasses vegetation type (McMahan et al., 1984) within Harris and Waller Counties. The eastern boundary follows SH 6, which generally parallels the boundary of the crops and urban vegetation types (McMahan et al., 1984). Development of the eastern boundary took into consideration the changes in land uses between 1984 and 2005 and incorporates a majority of the Addicks and Barker Reservoirs, which were historically part of the Katy Prairie. US 90 serves as the southernmost boundary of this study area because it generally coincides with Lobpries' (1994) boundaries and provides a logical split between the Katy Prairie and the Danbury Prairie historically located south of US 59.

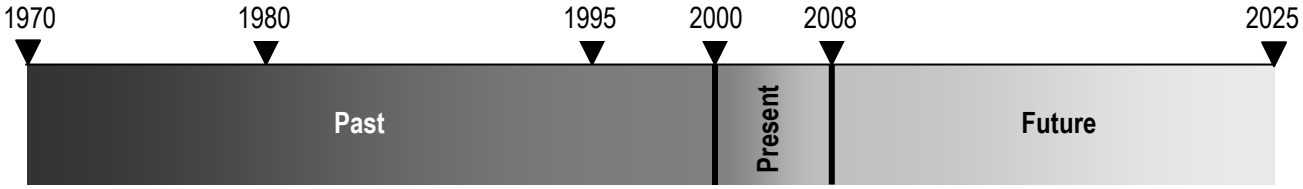
4.4.2.3 Step 3: Describe the Current Health and Historic Context for Each Resource/Issue

Land Use

The CEA integrated information from field reconnaissance; federal, state, regional, and local agencies coordination; public workshops and meetings; analysis of 2001 land-remote sensing satellite (Landsat) data; and 2005 aerial photography to update land use development in the AOI.

The overall time frame spans from 1970 to 2025. The past time frame is from 1970 to 2000, present time is considered 2000 to 2008, and the future time frame is from 2008 to 2025 (Figure 4-2). The Study Team examined aerial photos from 1970, 1980, and 1995 supplied by NRCS to understand land use changes that occurred in the past. Along with the historic aerial photos, a 1999-2000 base map was developed for the Expert Panel (see Section 4.2). The 2000 base map was then updated to 2007 (Exhibit G–33) using aerial photography from H-GAC for comparison with the prior years' photos.

FIGURE 4-2
TIME SCALE



Source: Study Team, 2008

Three basic land use categories were mapped to produce Exhibit G–24a-d and were used in this analysis:

- Residential Development (single and multi-family dwellings);
- Other Development (e.g., commercial, industrial, or other non-residential development); and
- Undeveloped (no visible buildings or infrastructure).

Table 4-7 presents a summary of land use within the AOI. The table shows, for example, that in 1970 12,318 acres of the 604,141-acre AOI was composed of Residential Development (2 percent).

TABLE 4-7
COMPOSITION OF LAND USE IN THE AOI BY YEAR

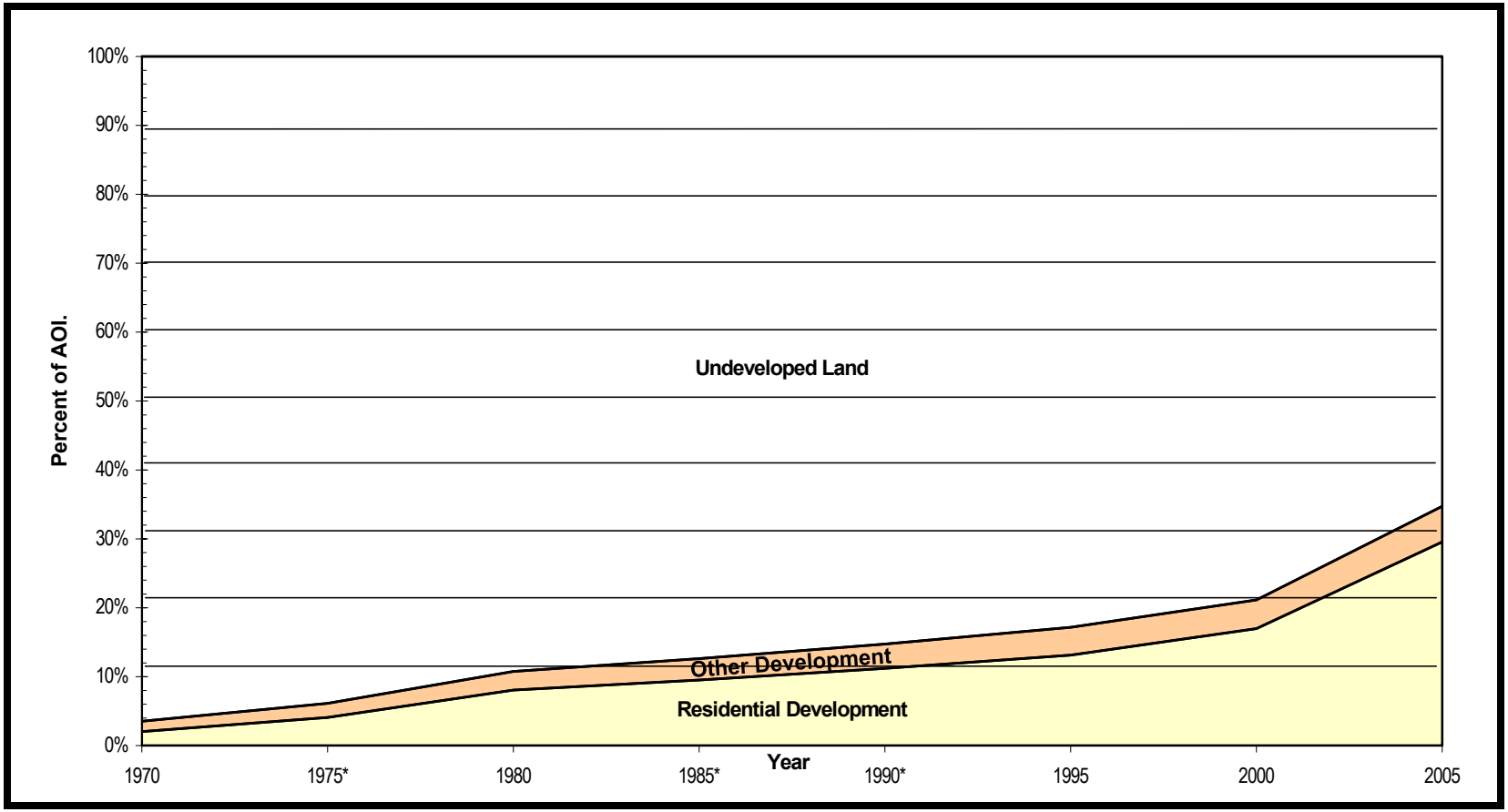
Time Frame	Year	Residential Development		Other Development		Undeveloped	
		Acres	% of AOI*	Acres	% of AOI *	Acres	% of AOI *
Past	1970	12,318	2.0%	9,060	1.5%	582,763	96.5%
	1980	48,671	8.1%	16,373	2.7%	539,097	89.2%
	1995	79,326	13.1%	24,378	4.0%	500,437	82.8%
Present	2000	102,599	17.0%	25,093	4.2%	476,449	78.9%
	2005	201,110	33.3%	31,812	5.3%	371,219	61.4%

Note: * Rounded percent of total acreage in the AOI (604,141 acres).
Source: Study Team, 2000; 2005 and NRCS, 2000b

In the period 1970 to 2000, 90,281 acres of new Residential Development occurred, which translates to a 7.3 percent compound annual growth rate. These data show an approximate 3.5 percent growth in Other Development from 1970 to 2000. As shown in Figure 4-3, Residential and Other Development properties experienced a development boom from 1970 to 1980. In 1980 to 1995, both Residential and Other Development slowed due to an economic downturn. Between 1995 and 2000, the residential market started to rebound, but Other Development remained stagnant, possibly due to utilization of existing structures that had been vacated during the 1980 to 1995 period. From 2000 to 2005, Residential Development has grown approximately 14.4 percent and Other Development has grown 4.9 percent. As development areas increased, undeveloped areas decreased proportionally. Undeveloped properties experienced a decline of 0.7 percent from 1970 to 2000 and 4.9 percent from 2000 to 2005.

The NLCD 2001 data classification provides an overview of the major land use features of the AOI (Exhibit G–34). Tabulations and area calculations provide a comprehensive dataset in terms of the overall landscape and the types and amount of land use categories present in the AOI (Table 4-8). The 21 possible land use categories (Table 4-3) were summarized into eight broader classes for this analysis.

FIGURE 4-3
PERCENT OF LAND USE OVER TIME



Note: * 1975, 1985, and 1990 were extrapolated using rate of growth for known data points (1970, 1980, and 1995)

Source: Study Team, 2006

TABLE 4-8
USGS/NOAA DRAFT 2001 NLCD – LAND USE/LAND CLASSIFICATION OF THE AOI

Description	Acres	% of Total AOI
Open Water	4,607	<1%
Developed	146,271	24%
Barren	5,740	<1%
Forested Upland	150,025	25%
Scrub/Shrub	33,528	6%
Herbaceous Upland	28,409	5%
Herbaceous Planted/Cultivated	169,463	28%
Wetlands	66,098	11%
Total	**604,141**	**100%**

Source: USGS/NOAA, 2001

Mobile Source Air Toxics

Historic Context

The Air Pollution Control Act of 1955 (APCA) was passed "to provide research and technical assistance relating to air pollution control." This law is the predecessor for all future clean air legislation including the Federal CAA of 1970. The CAA of 1970 was based on the CAA of 1963, which was amended in 1965, 1966, 1967, and 1969. The CAA of 1970 law required the EPA to publish the NAAQS for specific pollutants within 120 days of the signing of the law. The "criteria pollutants" to be regulated included carbon monoxide, nitrogen oxides, sulfur oxides, photochemical oxidants, hydrocarbons, and particulate matter, with standards set for each of the criteria pollutants based upon a collection of the most current research and information with a built-in margin of safety. Currently, the CAA was last amended in 1990 and addressed five main areas: air-quality standards, motor vehicle emissions and alternative fuels, toxic air pollutants, acid rain, and stratospheric ozone depletion.

The EPA is the lead federal agency for administering Section 202 of the CAA and has certain responsibilities regarding the health effects of MSAT (EPA400-F-92-004, August 1994). In 2001, the EPA issued a final rule on controlling emissions of hazardous air pollutants (HAPs) from mobile sources (66 FR 17229, March 29, 2001). This rule was issued under the authority in the CAA, and the rule's preamble provides the following summary information regarding the effects and control of MSAT:

> HAPs refer to a range of compounds that are known or suspected to have serious health or environmental impacts. Motor vehicles are substantial contributors to national emissions of several HAPs, notably benzene, formaldehyde, 1,3-butadiene, acetaldehyde, and DPM and diesel exhaust organic gases (DEOG).

Twenty-one compounds are emitted from motor vehicles that are known or suspected to cause cancer or other serious health effects. The MSAT list includes various VOCs and metals, as well as DPM and DEOG. In its final rule, the EPA also examines the mobile source contribution to national inventories of these emissions and the impacts of existing and newly promulgated mobile source control programs, including the reformulated gasoline (RFG) program, national low emission vehicle (NLEV) standards, Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and the EPA's proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements (EPA, 2000b). Between 2000 and 2020, the EPA projects these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 to 65 percent, and reduce on-highway DPM emissions by 87 percent (EPA, 2007a).

In an ongoing review of MSAT, the EPA completed another set of rules under the authority of CAA Section 202(l) to further reduce MSAT emissions. The EPA issued a set of final rules on Control of Hazardous Air Pollutants from Mobile Sources (72 FR 8427, February 26, 2007) under 40 CFR 59, 80, 85, and 86. As a result of this review, EPA adopted the following new requirements to substantially lower emissions of benzene and the other MSAT toxics by: 1) lowering benzene content in gasoline; 2) reducing exhaust emissions from passenger vehicles operated at cold temperatures (under 75 degrees); and 3) reducing emissions that evaporate from, and permeate through, portable fuel containers (EPA, 2007a).

Beginning in 2011, refiners must meet an annual average gasoline benzene content standard of 0.62 percent by volume on all their gasoline, both reformulated and conventional, nationwide. The national benzene content of gasoline in 2007 is about 1.0 percent by volume. EPA adopted standards to reduce non-methane hydrocarbon (NMHC) exhaust emissions from new gasoline-fueled passenger vehicles. The standards phase in between 2010 and 2013 for the lighter vehicles, and between 2012 and 2015 for the heavier vehicles. In addition, EPA is adopting more stringent evaporative emission standards for new passenger vehicles. The new standards are equivalent to California's standards, with implementation in 2009 for lighter vehicles and in 2010 for the heavier vehicles. Starting with portable gas containers manufactured in 2009, the standard limits evaporation and permeation emissions from these containers to 0.3 grams of hydrocarbons per gallon per day (EPA, 2007a).

In addition to the reductions from the 2001 rule, by 2030, the new rules should further reduce annual national emissions by 330,000 for MSAT, (including 61,000 tons of benzene), volatile organic compounds by more than 1,000,000 tons, and $PM_{2.5}$ by more than 19,000 tons.

Current Levels of MSAT in the Greater Houston Area, Available TCEQ Monitor Data

TCEQ and other local entities operate air quality monitors in the Houston area. In the Houston area, there are 57 active monitors. This network of monitors measures the air quality and determines the levels of the various pollutants in the air. With this in mind, the following paragraphs discuss the monitors nearest to the project (Table 3-7), as well as ambient monitors that have detected levels of MSAT.

The closest air quality monitors are between approximately 0.8 miles and 6.1 miles of the Grand Parkway segments (Table 4-9). The closest air quality monitor is about 0.8 miles from Segment F-1. The closest $PM_{2.5}$ monitor used for compliance with the $PM_{2.5}$ NAAQS is about 27.4 miles from Segment G. The official monitor data are found on EPA's national air quality monitor web site (www.epa.gov/air/data). Not all monitors sample for the same pollutants, and not all monitors have one year of complete data to compile an annual average for any given pollutant (Table 4-9).

The Mayor of Houston has recently organized a task force to help reduce air quality health risks in Houston. The main focus of this task force is to "…review and summarize the available evidence on the health risks associated with air pollution in the Houston region, recommend areas of research needed to allow regional leaders to make the best decisions on strategies for reducing pollution, within established legal timetables, and to provide guidance to the City on strategies for reducing health risks."

TABLE 4-9
LOCAL MONITOR DATA

Air Monitor	Activation Date	Average Ozone 2006	Annual Average $PM_{2.5}$ 2006	Average Benzene 2006**	Average 1,3 Butadiene 2006**	Distance from GP/Segment
CAMS 26	April 1997	0.0445 ppm (Standard is a 3 year average which must be 0.080 ppm or below)	N/A	9.48 ug/m^3	0.17 ug/m^3	0.8 miles from F-1
CAMS 555	April 2004	N/A	N/A	N/A	N/A	6.0 miles from G
CAMS 309	February 2001	N/A	11.59 ug/m^3 *	N/A	N/A	5.6 miles from G
CAMS 557	February 2004	N/A	N/A	N/A	N/A	5.7 miles from F-2
CAMS 554	January 2004	N/A	N/A	N/A	N/A	6.1 miles from E
CAMS 148	August 1998	N/A	10.25 ug/m^3 (Standard is a 3 year annual average below 15 ug/m^3)	10.41 ug/m^3	0.69 ug/m^3	Closest $PM_{2.5}$ compliance monitor to any GP segment (27.4 miles from Segment G)

Notes: EPA disclaimer regarding these data: "Readers are cautioned not to infer a qualitative ranking order of geographic areas based on AirData reports. Air pollution levels measured in the vicinity of a particular monitoring site may not be representative of the prevailing air quality of a county or urban area. Pollutants emitted from a particular source may have little impact on the immediate geographic area, and the amount of pollutants emitted does not indicate whether the source is complying with applicable regulations."

* Not a regulatory monitor for $PM_{2.5}$ - these monitors do not use the same collection and analysis methods for measuring $PM_{2.5}$ data and are therefore not used for compliance monitoring.

** Currently, no NAAQS have been established for any of the priority MSAT. The EPA is in the process of assessing the risks of exposure to these pollutants. For more information, see the MSAT Technical Report in Appendix F or http://www.epa.gov/iris for potential human health effects that may result from exposure to various MSAT.

Source: EPA, 2007b

Existing MSAT Levels

A basic quantitative analysis for the total mass of six priority MSAT emissions within the traffic study area of Segments E, F-1, F-2, and G was completed. The traffic study area used for this traffic analysis includes all major roadways potentially affected by the proposed new transportation facility, in this case the Grand Parkway. The traffic study area is generally bounded by IH 10 to the south, US 59 to the east, and extends just beyond the proposed Grand Parkway to the north and west. These areas appear graphically in Exhibit G–26.

A discussion of how total MSAT emissions were estimated, and some of the limitations and cautions regarding these estimations is contained in Volume II, Section 3.6.2 and Appendix F. A summary of these emissions for the base year is shown in Table 4-10 and Figure 4-4. Total MSAT emissions for just for the proposed Grand Parkway roadway are shown in Table 4-14.

TABLE 4-10
BASE YEAR (2000) TOTAL MSAT EMISSIONS FOR THE ENTIRE TRAFFIC STUDY AREA (SEGMENTS E, F-1, F-2, AND G)

Compound	2000 Base Year (tons/year)
Acetaldehyde	77
Acrolein	10
Benzene	446
Butadiene	66
Formaldehyde	258
Diesel Particulate Matter	659
Total MSAT	**1,516**

Source: Study Team, 2006

Water Quality

Historic Context

Water quality issues in Texas can be historically linked to early 19th century European settlement. The conversion of mature forests and native landscapes contributed to water quality declines through increased sedimentation and erosion. As agricultural practices evolved from small, subsistence family farms to the large-scale mechanized post World War II operations, water quality continued to decline. In addition to agriculture, exploration and development of oil and gas resources in the early 20th century also contributed to water quality concerns. The 20th century also introduced fertilizers, pesticides, concentrated animal wastes, household chemicals, and pollutants from automobiles as potential water contaminants.

Growing public awareness and concern for controlling water pollution led to enactment of the CWA of 1972. The CWA set water quality standards for major rivers and lakes and required discharge permits for both public and private facilities. The act was strengthened in 1977 in an effort to address the most visible causes of water pollution. It explicitly prohibited the discharge into waterways of hazardous substances, including industrial waste, sewage, accidental spills, toxics, and other point sources. Today, TCEQ is the primary agency responsible for water quality management in the state and the EPA is ultimately responsible for insuring that these efforts meet federal water quality standards.

Current Health

Pollution has to some degree affected all of Texas' 15 inland river basins and eight coastal basins, several of its reservoirs, and all of its estuaries, coastal wetlands, and bays. TCEQ regularly monitors the condition of the state's surface waters and assesses the status of water quality every two years. The agency produces an inventory of all state surface waters, and a list of the waters that do not meet one or more of the standards established to ensure the beneficial use of the waterbody, the 303(d) List. In general, the period of record for water quality data and information used in the 2006 Inventory and List is December 1, 1999 to November 30, 2004.

For 2006, the TCEQ surveyed approximately 12 percent of Texas streams (TCEQ, 2007). Many miles of streams and rivers did not have sufficient data to determine if they met state water quality standards, and in fact, TCEQ identified hundreds of miles of streams and rivers with water quality "concerns" but with insufficient data to meet their methodology for calling a stream or river "impaired."

Waterbodies that do not support their water quality standards, and for which existing controls are not adequate, are placed on the 303(d) List of Impaired Waterbodies (as required under Clean Water Act [CWA] Section 303[d]). With an increase in data since the 2004 303(d) List, TCEQ added several segments (e.g., Lake Houston) within the West Fork San Jacinto sub-basin for inclusion on the 2006 303(d) List. Now, with the exception of Lake Creek, all of the stream segments located within the watershed cumulative effects study area appear on TCEQ's 2006 Texas Water Quality Inventory and 303(d) List. Although many segments throughout Texas were removed from the list, none of the segments within the watershed cumulative effects study area were among those delisted.

The primary reason stream segments were listed was for bacteria levels not suitable for the designated use of contact recreation. Reasons found for the elevated bacteria were both non-point and point sources, including urban runoff/storm sewers, on-site treatment systems, sanitary sewer overflows, municipal sources, and unknown sources (TCEQ, 2007). Many of the segments in the watershed cumulative effects study area were listed as Category 5a in the 2006 303(d) List, meaning they require remedial action by the state to restore water quality. The state must develop a TMDL scientific model for the stream segment and a plan to implement it.

Vegetative Communities - Wetlands

Historic Context

Approximately 392 million acres of fresh water and estuarine wetlands existed in 1780 in lands that now form the United States. Of that, 221 million acres were in the conterminous 48 states. As of the 1980s, the lower 48 states support only an estimated 103.3 million acres, a 53 percent loss from the original wetland acreage (TPWD, 1997).

Between the mid-1970s and the mid-1980s, the lower 48 states lost over 2.6 million acres of wetlands, with freshwater systems sustaining 98 percent of that loss. By the mid-1980s, an estimated 97.8 million acres of freshwater wetlands and 5.5 million acres of estuarine (coastal) wetlands remained. Wetlands losses in this period resulted from conversion to agricultural land use (54 percent) and other land uses (41 percent). "Other" uses include land uses that are not classified as agriculture or urban. Urban expansion resulted in 5 percent of the losses (TPWD, 1997). Between 1986 and 1997, an estimated 58,500 acres of wetlands were lost each year in the conterminous United States (EPA, 2006c). Various factors have contributed to the decline in the loss rate including implementation and enforcement of wetland protection measures and elimination of some incentives for wetland drainage. Public education and outreach about the value and functions of wetlands, private land initiatives, coastal monitoring and protection programs, and wetland restoration and creation actions have also helped reduce overall wetland losses (EPA, 2006c).

Statewide

Although wetlands comprise less than 5 percent of its land area, Texas has the fourth greatest wetland acreage in the lower 48 states (following Florida, Louisiana, and Minnesota). An estimated 7,000,000 acres of wetlands were present in Texas in the 1970s. Texas wetlands are particularly important because they provide one of the most important wintering areas for waterfowl (TPWD, 1997).

Prior to the settlement of Texas, an estimated 16 million acres of bottomland hardwood and other forested wetlands existed. These floodplain forests are among the most severely altered ecosystems in the United States. Between 1820 and 1920, most of East Texas' virgin timber, including floodplain forests, were removed for building, commercial logging, grazing, and farming. Bottomland forests have since been impacted by mining and petroleum extraction, urban development, reservoirs, agriculture, lack of forest management, pollution, and minor floodplain modifications. Forested wetlands totaled approximately 6,068,000 acres in 1980, including 5,973,000 acres of bottomland hardwood and other forested riparian vegetation and 95,000 acres of swamps, a 63 percent loss of the original pre-settlement bottomland forests (TPWD, 1997).

The USFWS assessed the status and trends of coastal Texas wetlands to provide detailed information regarding coastal wetland loss rates (Moulton et al., 1997). An estimated 4,105,343 acres of coastal Texas wetlands existed in 1955 and an estimated 3,894,753 acres existed in 1992. Overall, estuarine wetlands decreased by approximately 9.5 percent and

freshwater or non-tidal wetlands decreased by 4.3 percent. Nearly one in three acres of coastal freshwater emergent marshes has been lost, while 11 percent of the coastal freshwater-forested wetlands have disappeared since 1955.

Historically, wetlands in the southeastern portion of the AOI were dominated by coastal prairie wetlands, riparian zones and few forested wetlands. The former tall grass prairies dotted with shallow, ephemeral prairie wetlands and meandering bayous, creeks, and rivers have been replaced by agricultural fields in response to an increased market demand for rice and other crops (Stutzenbaker and Weller, 1989). Wetlands in the central portion of the AOI consisted of forested and non-forested wetlands, which were used for farming and timber production. The majority of wetlands in the northeastern portion of the AOI historically consisted of forested wetlands used for timber production and grazing.

Current Health

Based on the USGS/NOAA Draft 2001 NLCD data for the AOI (Exhibit G–34), 194,687 acres of wetlands are within the wetlands cumulative effects resource study area. Of that total, 66,098 acres (34 percent) are within the AOI (Table 4-11 and Exhibit G–32).

TABLE 4-11
USGS/NOAA DIRECT 2001 NLCD WETLANDS IN CUMULATIVE EFFECTS STUDY AREA

Watershed	Total Wetlands within Watershed (acres)	Wetlands within AOI (acres)	% of Watershed Wetlands within AOI
Buffalo Bayou Above Tidal	18,426	12,867	70%
Caney Creek	18,912	4,282	23%
Cypress Creek	11,887	9,730	82%
Greens Bayou	8,449	70	1%
Lake Creek	31,253	2,987	10%
Lake Houston	37,661	2,100	6%
Peach Creek	12,480	469	4%
Spring Creek	27,135	20,601	76%
West Fork San Jacinto River	28,041	12,974	46%
White Oak Bayou Above Tidal	443	18	4%
Total	**194,687**	**66,098**	**34%**

Source: Study Team, 2006; USGS/NOAA, 2001

The NLCD data identified three major palustrine wetland types within the AOI. Palustrine wetlands include all nontidal or freshwater wetlands dominated by trees, shrubs, and emergent herbaceous vegetation traditionally called freshwater marshes, swamps, bogs, fens, and wet prairies, found throughout the United States. Within the AOI, these wetlands are of greatest concern to the public and to state and federal regulatory agencies.

Non-forested or Palustrine Emergent and Palustrine Scrub-Shrub (Cowardin et al., 1979) wetlands are scattered throughout the AOI. Many of the non-forested wetlands observed are considered early successional communities experiencing secondary succession. Various non-forested wetlands observed within Segment E and portions of Segment F-1 are remnant prairie-pothole wetlands that are known to have occurred historically throughout the Katy Prairie. Many of these wetlands occur within agricultural areas and have been converted for producing crops.

Many of the non-forested wetlands found in the AOI within Segments F-2 and G were most likely forested wetlands prior to conversion to pastureland or agricultural lands. Although these areas may have been forested wetlands in the past, the length of time these wetlands have been converted indicates that the observed community represents the new normal circumstance or expected community type. Due to ongoing agricultural practices and increasing urban development within the project area, the probability for these areas to revert to climax forested wetland communities is minimal.

Forested, or Palustrine Forested (Cowardin et al., 1979) wetlands, occur in isolated depressions and bottomland hardwood areas of floodplains throughout the AOI. However, the greatest concentration forested wetlands occurs within Segment G associated with floodplains, oxbows, sloughs, and remnant channels of Spring Creek and the West Fork of the San Jacinto River. The majority of the forested wetlands within Segments F-2 and G are considered mid to late successional forested wetland communities. In addition to the mid to late successional forested wetland communities, several forested wetlands located throughout the project area, especially within Segments E and F-1, appear to be early successional forested wetlands or herbaceous wetlands converting to forested wetlands.

Katy Prairie

The Katy Prairie, sometimes locally referred to as the Katy-Hockley Prairie, originally encompassed approximately 200,000 acres loosely bounded by the Brazos River bottom on the west and southwest, pine-hardwood forest on the north and northeast, and the city of Houston on the east and southeast (Vallette, 1994). Approximately one-quarter of that area has been developed by the westward expansion of the city of Houston (Vallette, 1994). Within the Grand Parkway study area, the Katy Prairie begins at IH 10 and extends northward to approximately Little Cypress Creek, north of US 290 and east to SH 249 (Segments E and F-1).

Historically, the Katy Prairie was part of the tall grass prairie of the North American Great Plains that consisted of a mosaic of tall grass prairie and emergent wetland habitats dissected with riparian corridors and dotted with tree “islands” (Smeins, 1994). In the late 1800s, the first settlers of the Katy Prairie began to raise corn, potatoes, and cattle and started to attract market hunters and sportsmen (Gore, 1994). At the turn of the century, rice farmers appeared creating 30-acre fields (Katy Prairie Conservancy [KPC], 2002). The Katy Prairie has since been converted from its historical tall grass prairie habitat to agriculture (primarily rice), ranching, and commercial/residential development. Agricultural and ranching areas still contain extensive wetland habitats, both natural and human-induced (e.g., rice fields, waterfowl roost

ponds, etc.). The North American Waterfowl Management Plan identifies wetlands within the Katy Prairie as having international significance (Texas Mid-Coast Initiative Team, 1990).

Concurrent with the increase in rice farming during the 1950s and 1960s, expansion of the city of Houston began to encroach on the Katy Prairie. In this post World War II era, new industries began to form along Buffalo Bayou and the Houston Ship Channel and growth expanded to the southwest, west, and northwest to areas outside the influence of the chemical plants (Henry, 1994). Mima mounds were scraped and pushed into lower areas and changed the micro-topographic landscape of the prairies to form areas that retained water for wetland crops (rice, sugarcane). During this period, land ownership shifted from families to investors, rice prices decreased, and as rice farming increased in production costs (BFI Waste Systems, Inc. [BFI], 1998), farmers turned to cattle production. Additionally, the demand for low-cost housing accelerated prairie development and resulted in the loss of approximately 100,000 acres between 1978 and 1983 to urban use (residential development, industrial, retail) (KPC, 2002). The area of rice fields decreased from 66,000 acres from 1977 to less than 17,000 acres in 1993 and soybean fields dropped from 50,000 acres in 1979 to 2,000 acres in 1993 (Woods, 1994). In 1978 alone, 32,000 acres of the Katy Prairie was converted to urban land uses and it was estimated in 1993 that 134,000 acres or nearly 70 percent of the historic prairie had been developed (Henry, 1994). The pre-settlement Katy Prairie no longer exists except for a few remnant pockets and has been replaced by the land uses described previously (Eubanks, 1994).

Health of Resource

The Katy Prairie has been substantially reduced from its historical extent and continues to be reduced by development and growth from the Houston metropolitan area. Henry (1994) reported a nearly 70 percent reduction of the historic Katy Prairie due to changing land uses in the early 1990s and this trend has continued through 2006. The vast majority of the Katy Prairie continues to be affected by encroaching development. The Katy Prairie cumulative effects resource study area totaled 505,905 acres of which 148,198 acres (approximately 30 percent) are within the AOI of the proposed project (Exhibit G–32).

With the advance of urban development, the Katy Prairie landscape currently providing wildlife habitat and outdoor recreation opportunities would be reduced. Many of the functions and values of the Katy Prairie would be lost as a result of the increased development pressures to the area. The Katy Prairie lies within a major migratory bird flyway, with between 350 and 400 species of birds over-wintering in the area, including approximately 18 species of ducks and four species of geese, important game birds within the region (Smeins, 1994). Waterfowl surveys conducted on the Katy Prairie by the USFWS, in 1992 recorded 184,000 snow geese (*Chen caerulescens*), approximately 23 percent of the wintering snow goose population on the Texas coast (Lobpries, 1994). Sport hunting is a sizeable industry in and around the Katy Prairie due to the large numbers of wintering waterfowl and the prairie's convenient location west of metropolitan Houston (Gore, 1994). Conservation and education efforts are underway by organizations such as the KPC, private

landowners, and the Katy-Cypress Wetlands Mitigation Bank (KCWMB). The KCWMB establishes a mitigation bank within the Cypress Creek watershed and provides the ability to enhance and create wetlands within a 579 acres tract near Katy Hockley Cutoff Road and Jack Road (KCWMB, 1996).

There has been a growing trend within the Katy Prairie of exotic and/or nuisance vegetation species invasion. Chinese tallow-tree (*Sapium sebiferum*) is one of these species. Extensive measures are being made by conservation groups, resource agencies, and private/public partners to help eradicate and/or control these species in an effort to restore native plant communities including tall grass prairie on the Katy Prairie.

Due to the developmental pressures on this area, the public and state and federal resource agencies have joined together to slow development and to protect the remaining Katy Prairie habitat. The KPC was formed in 1992 to preserve, protect, and enhance sustainable portions of the Katy Prairie ecosystem. Their goals and missions are to protect areas of the Katy Prairie either in its current state (agricultural) or enhancing and restoring wetlands and prairie habitats (KPC, 2002). The KPC is taking an active role in trying to conserve approximately 30,000 – 60,000 acres of the Prairie, promoting education and ecotourism, and acquiring, managing, conserving, and enhancing existing prairie habitats so that they may be protected in the future (KPC, 2002). The KPC provides opportunities for formal and informal education, and outdoor recreation (including birding, nature walks, hunting, and fishing). Outreach education and ecotourism by the KPC is evident throughout the Prairie with the inclusion of several viewing locations along the Upper Coastal Birding Trail, a part of the Great Texas Coastal Birding Trail.

The BFI Katy Prairie Mitigation Bank was established in western Harris County to provide high quality upland/wetland ecosystems that would offset functions and values lost by proposed dredge/fill activities. This bank serves the Katy Prairie area and associated coastal prairie ecosystems/habitats within the counties surrounding the Houston metropolitan area. The purpose of this mitigation bank is to reestablish historic tall grass prairie environments along with depressional wetlands that, within time, will resemble Katy Prairie habitats. The BFI Katy Prairie Mitigation Bank area will also reestablish historical species usage, eliminating invasive non-native flora and the reintroduction of native plant seed. Microtopography will also be recreated to mimic historic prairie habitats. The BFI Katy Prairie Mitigation Bank is approximately 570 acres in size (BFI, 1998).

4.4.2.4 Step 4: Identify Direct and Indirect Impacts that May Contribute to a Cumulative Effect

For the CEA, the Study Team defined the direct impacts of the project to be those for the ROW of the Preferred Alternative Alignments for each of Segments E, F-1, F-2, and G of the proposed Grand Parkway at the time of this document production. Although other alignments could ultimately be selected as the Preferred Alternative Alignment within each segment, results of the indirect and cumulative impacts assessment (the purpose of this section of the EIS) would not be substantially affected, which corresponds to the Expert Panel decision that determined that indirect

development would be similar for all alignments of the Build Alternative. In addition, for the resources/issues discussed in the subsequent cumulative effects sections, the direct impacts are not appreciably different for the various alignments of the Build Alternative given the area within which this analysis occurs, and results are reported with the AOI comprising 604,141 acres.

Land Use

Potential direct and indirect land use impacts were calculated for the Build Alternative using the USGS/NOAA Draft 2001 NLCD data (Table 4-12 and Table 4-13). The wetland impacts reported in this analysis do not replace the actual direct impacts analysis in Volume II, Section 4 (Environmental Consequences). Direct and indirect impacts in Volume II focus specifically on independent segments of the Grand Parkway and on specific alignment alternatives developed in each segment. The Build Alternative would impact or convert 2,664 acres to a roadway use. Based on mapping developed by the Expert Panel (see Section 4.2.1.1), the Build Alternative would indirectly impact 11,373 acres (2 percent of the AOI) above that expected for the No-Build Alternative (Exhibit G–35).

TABLE 4-12
DIRECT USGS/NOAA DRAFT 2001 NLCD LAND USE IMPACTS

Description	Acres	% of AOI
Open Water	4	<0.01%
Developed	204	0.03%
Barren	10	<0.01%
Forested	793	0.13%
Scrub/Shrub	107	0.02%
Grassland/Herbaceous	113	0.02%
Herbaceous Planted/Cultivated	1,135	0.19%
Wetlands	298	0.05%
Total	**2,664**	**0.44%**

Notes: Direct impacts were calculated from USGS/NOAA Draft 2001 NLCD data using the ROW of the Preferred Alternative Alignments for each of Segments E, F-1, F-2, and G of the proposed Grand Parkway at the time of this document production. Although other alignments could ultimately be selected as the Preferred Alternative Alignment within each segment, results of the indirect and cumulative impacts assessment (the purpose of this section of the EIS) would not be substantially affected.

Source: Expert Panel, 2000; Study Team, 2006; USGS/NOAA, 2001

TABLE 4-13
INDIRECT USGS/NOAA DRAFT 2001 NLCD LAND USE IMPACTS IN AOI

Description	Acres	% of AOI
Open Water	27	<0.01%
Developed	722	0.12%
Barren	40	0.01%
Forested	4,360	0.72%
Scrub/Shrub	1,573	0.26%
Grassland/Herbaceous	1,041	0.17%
Herbaceous Planted/Cultivated	2,787	0.46%
Wetlands	823	0.14%
Total	**11,373**	**1.88%**

Source: Expert Panel, 2000; Study Team, 2006; USGS/NOAA, 2001

Mobile Source Air Toxics

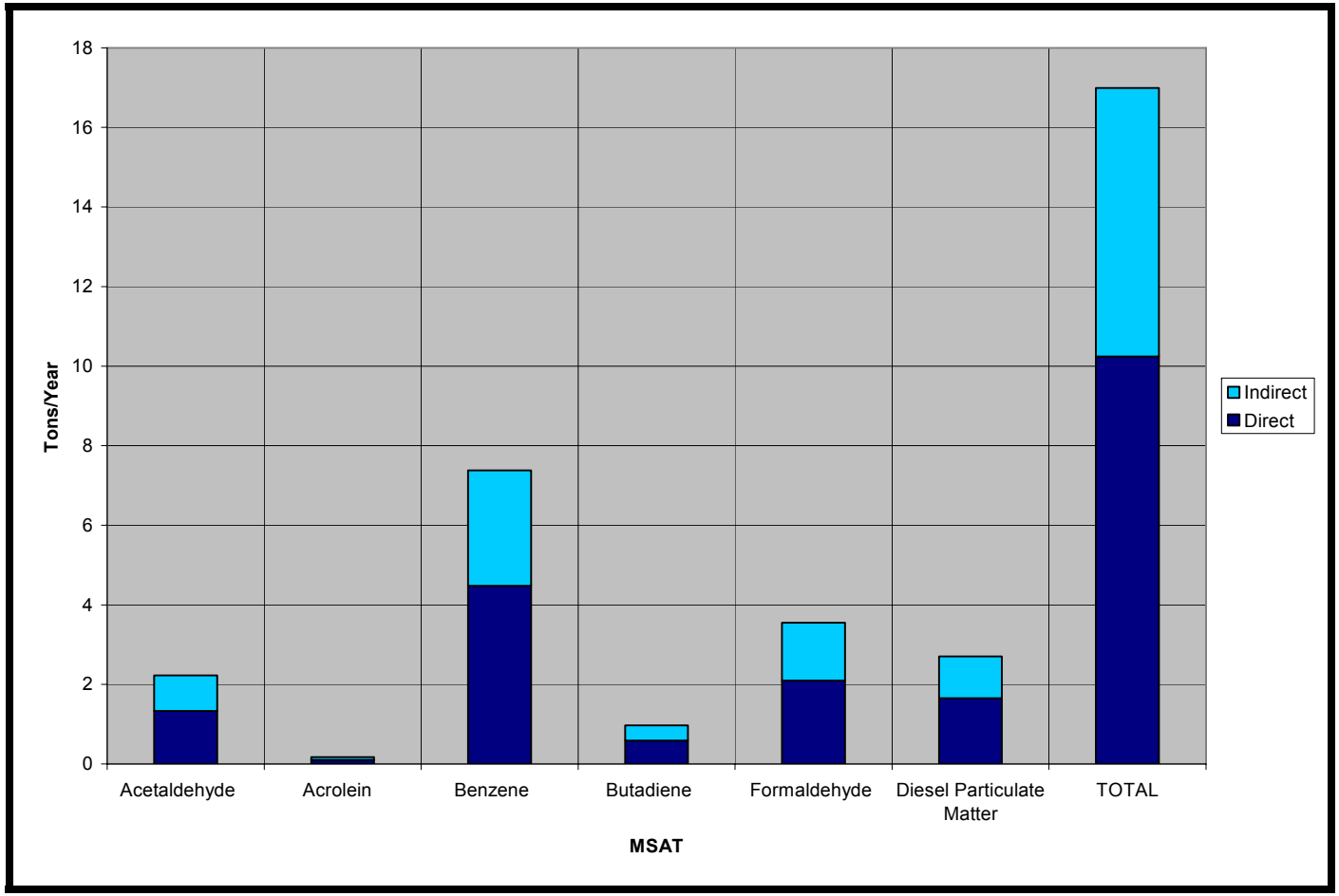
The projected MSAT that would result from the proposed Grand Parkway project are 10.2 tons/year from direct effects and 6.7 tons/year from indirect effects (Table 4-14 and Figure 4-4). Potential indirect development would be similar for all alignments of the Build Alternative and were based on the traffic study area where induced or indirect growth effect of the Build Alternative compared to the No-Build Alternative based on mapping developed by the Expert Panel (see Section 4.2.1.1).

TABLE 4-14
GRAND PARKWAY SEGMENTS E, F-1, F-2, AND G LINKS ONLY - MSAT EMISSIONS (TONS/YEAR)

MSAT	2025	
	Direct	Indirect
Acetaldehyde	2,658 lbs. or 1.3 tons	1,787 lbs. or 0.9 tons
Acrolein	202 lbs. or 0.1 tons	140 lbs. or 0.1 tons
Benzene	8,953 lbs. or 4.5 tons	5,802 lbs. or 2.9 tons
Butadiene	1,173 lbs. or 0.6 tons	762 lbs. or 0.4 tons
Formaldehyde	4,189 lbs. or 2.1 tons	2,910 lbs. or 1.5 tons
Diesel Particulate Matter	3,312 lbs. or 1.7 tons	2,093 lbs. or 1.0 tons
Total	**20,488 lbs. or 10.2 tons**	**13,492 lbs. or 6.7 tons**

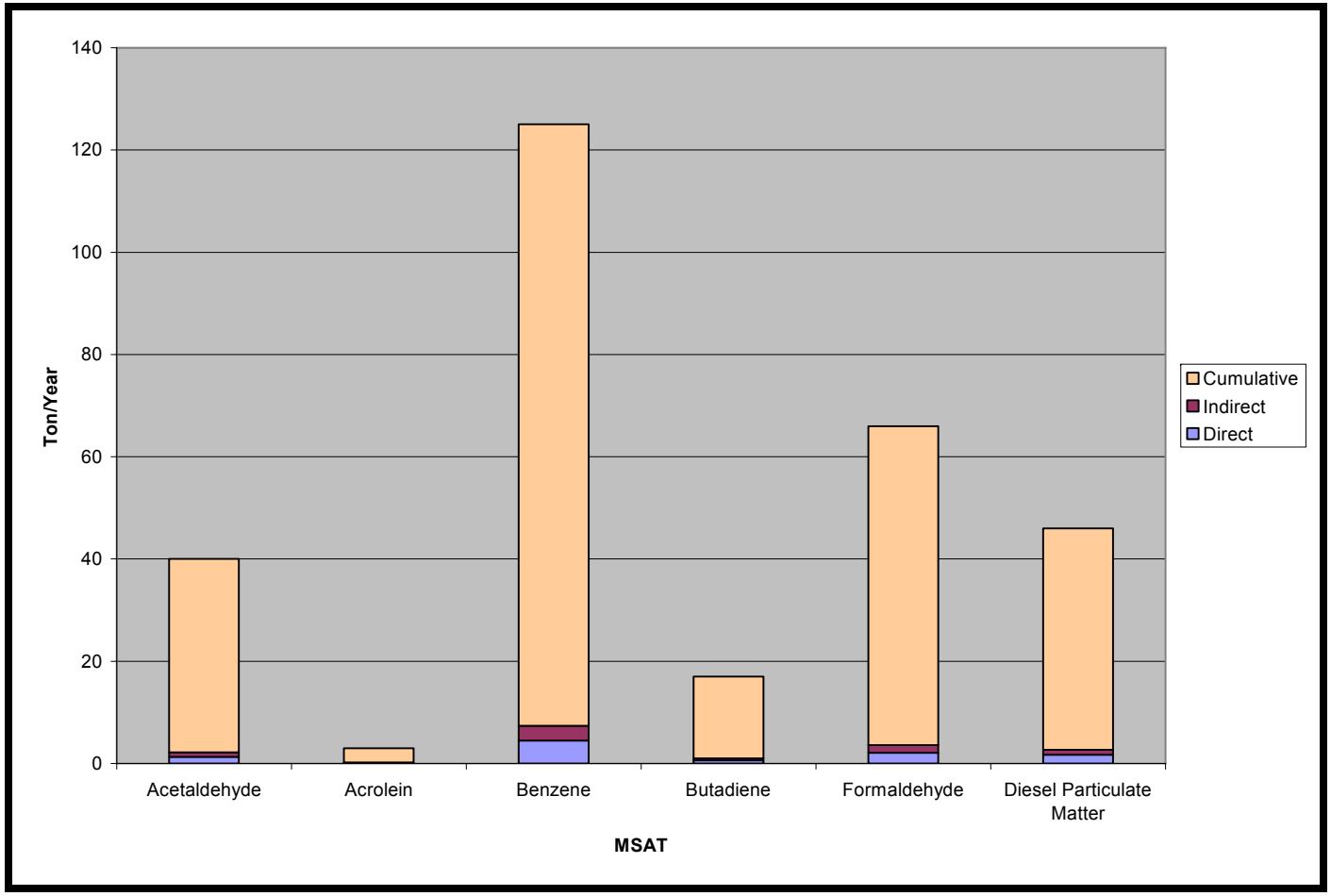
Source: Study Team, 2006

FIGURE 4-4
DIRECT AND INDIRECT MSAT EMISSIONS BY COMPOUND - 2025



Source: Study Team, 2006

FIGURE 4-5
CUMULATIVE EFFECTS OF MSAT BY COMPOUND - 2025



Note: Acrolein direct and indirect impacts are displayed, but minimal.

Source: Study Team, 2007

Water Quality

Direct impacts to resources, which would affect water quality associated with the proposed project, are listed in Table 4-15. Construction would also result in direct impacts to water quality, albeit temporary in nature. During construction, soils could enter runoff and contribute to turbidity and sediment loading of downstream waterbodies. From an operational perspective, direct effects to surface water quality would include an increase in storm water runoff associated with new impervious cover created by paved surfaces of the facility. Runoff could contain oil and grease constituents, which could be carried to off-site waterbodies.

TABLE 4-15
DIRECT IMPACTS TO WATER-RELATED RESOURCES

Scenario	Wetlands[1]	Waterbodies[2]	Floodplains[3]	Riparian[4]	Wells[5]
Build Alternative	298 acres	34 crossings	603 acres	140 acres	73

Notes: Direct impacts were calculated using the ROW of the Preferred Alternative Alignments for each of Segments E, F-1, F-2, and G of the proposed Grand Parkway at the time of this document production. Although other alignments could ultimately be selected as the Preferred Alternative Alignment within each segment, results of the indirect and cumulative impacts assessment (the purpose of this section of the EIS) would not be substantially affected.

[1] Wetland impacts were calculated from USGS/NOAA Draft 2001 NLCD data

[2] Includes stream crossings, lakes, and ponds

[3] Includes floodway and 100-year floodplain impacts

[4] Includes impacts to riparian forest and bottomland hardwood forest

[5] Well impacts include the displacement of private wells and the crossing of public wellhead protection areas

Source: USGS/NOAA, 2001 and Study Team, 2007

Based on the Expert Panel, new development would continue in the AOI and would likely consist of new residential subdivisions and associated infrastructure. Any new development indirectly caused by the project would result in an increase in impervious cover and greater volumes of runoff during storm events. New residential development would also result in new municipal discharges from sewage treatment and storm water runoff from new off system roadways.

In addition to this new development, the project could also change the type of development adjacent to the new facility. Under the No-Build Alternative, the project corridor would likely consist predominantly of residential development. Should the proposed project be constructed, areas adjacent to the new facility and areas at the new interchanges would likely develop commercially. Commercial developments could include gas stations with above or underground storage tanks, restaurants with grease traps and other types of commercial development, which could result in discharges of pollutants into groundwater or local surface waterbodies.

Wetlands and Vegetative Communities

Wetlands

Direct and indirect impacts to USGS/NOAA Draft 2001 NLCD Classified Wetlands in the AOI are shown in Table 4-16. The Build Alternative would directly impact 298 acres of wetlands and could indirectly impact 823 acres of wetlands above that expected for the No-Build Alternative. Wetlands within the cumulative effects resource study area totaled 194,687 acres of which 66,098 acres or 34 percent are in the AOI. The Build Alternative direct and indirect wetland impacts would be 1,121 acres or less than 2 percent of the wetlands within the AOI or less than 1 percent of the wetlands within the cumulative effects resource study area.

Katy Prairie

Direct and indirect impacts to the USGS/NOAA Draft 2001 NLCD Classified Katy Prairie in the AOI are shown in Table 4-16. The Build Alternative would directly impact 1,133 acres of prairie and could indirectly impact 2,829 acres of prairie above that expected for the No-Build Alternative. The Katy Prairie cumulative effects resource study area totaled 505,905 acres of which 148,198 acres or 29 percent are within the AOI. The Build Alternative direct and indirect impacts to the Katy Prairie would be 3,962 acres or approximately 3 percent of the prairie within the AOI or approximately 1 percent of the Katy Prairie within the cumulative effects resource study area.

TABLE 4-16
POTENTIAL DIRECT AND INDIRECT VEGETATIVE COMMUNITIES WETLAND AND KATY PRAIRIE IMPACTS IN AOI

Resource	Direct Impacts		Indirect Impacts		Total Impacts	
	No-Build	Build	No-Build	Build	No-Build	Build
Wetlands	0	298	0	823	0	1,121
Katy Prairie	0	1,133	0	2,829	0	3,962

Notes: Direct impacts were calculated from USGS/NOAA Draft 2001 NLCD data using the ROW of the Preferred Alternative Alignments for each of Segments E, F-1, F-2, and G of the proposed Grand Parkway at the time of this document production. Although other alignments could ultimately be selected as the Preferred Alternative Alignment within each segment, results of the indirect and cumulative impacts assessment (the purpose of this section of the EIS) would not be substantially affected.

Source: USGS/NOAA, 2001 and Study Team, 2007

4.4.2.5 Step 5: Identify Other Reasonably Foreseeable Actions that May Affect Resources

Reasonably foreseeable actions are those that are likely to occur, or are probable, rather than those that are merely possible. Many of these reasonably foreseeable actions in the AOI include moderate to large master planned residential communities and linear transportation projects. The Study Team contacted local officials (Table 4-17), community groups (Table 4-8), and independent school districts (ISDs) (Katy, Cy-Fair, Tomball, Klein, Spring, Conroe, New Caney) to determine the location of existing or proposed reasonably foreseeable projects.

TABLE 4-17
LOCAL OFFICIALS MEETING

Date	Name	Affiliation
August 1999	Peter R. McStravick	Tomball Area Chamber of Commerce - Mobility and Transportation Committee
	Brad Brown	Grand Parkway Subcommittee
	Kent McLemore	Houston Airport System
	Warren Driver	City Manager of Tomball
	Carol Sigler	Representative Paul Hilbert
	Clayne Stouall	City Council of Tomball
	Bruce Hillegeist	Tomball Area Chamber of Commerce
	James Jackson	Port of Houston Authority
	Paul Hawkins	Precinct 3, Harris County
	Mary Schneider	U.S. Senator Kay Bailey Hutchison
	Rose Hernandez	Judge Eckels
	Ed Shackelford	Precinct Engineer, Harris County, Precinct 4
	Senator Jon Lindsay	Senator, NHA
	Catherine Wray	NHA
	John Jackson	City of Houston – Planning and Development
	Anthony Tangwa	City of Houston – Planning and Development
	Joe Crabb	State Representative
	Lisa Gonzales	Engineering Manager – HCTRA
	Kristen Bishop	H-GAC
	Art Salinas	Montgomery County, Precinct 3, Ed Chance
October 2000	Peter R. McStravick	Tomball Area Chamber of Commerce - Mobility and Transportation Committee
	Brad Brown	Grand Parkway Subcommittee
	Kent McLemore	Houston Airport System
	Warren Driver	City Manager of Tomball
	Carol Sigler	Representative Paul Hilbert
	Clayne Stouall	City Council of Tomball
	Bruce Hillegeist	Tomball Area Chamber of Commerce
	James Jackson	Port of Houston Authority
	Paul Hawkins	Precinct 3, Harris County
	Mary Schneider	U.S. Senator Kay Bailey Hutchison
	Rose Hernandez	Judge Eckels
	Ed Shackelford	Precinct Engineer, Harris County, Precinct 4
	Senator Jon Lindsay	Senator, NHA

TABLE 4-17 (CONT.)
LOCAL OFFICIALS MEETING

Date	Name	Affiliation
October 2000 (Continued)	Catherine Wray	NHA
	John Jackson	City of Houston – Planning and Development
	Anthony Tangwa	City of Houston – Planning and Development
	Joe Crabb	State Representative
	Lisa Gonzales	Engineering Manager – HCTRA
	Kristen Bishop	H-GAC
	Art Salinas	Montgomery County, Precinct 3, Ed Chance

Source: Sign-In Sheets from August 1999 and October 2000

TABLE 4-18
COMMUNITY GROUPS

Home Owner Associations (HOAs)/ Residential Subdivisions	Presentation Date
Bridgestone HOA or MUD	3/15/2001*, 6/12/2001, 7/9/2001, 5/25/2005**
Candle Light	3/15/2001*
Dove Meadows	3/15/2001*, 6/25/2001
Fairfield Village	11/4/2002, 5/28/2003
Five Oaks	3/15/2001*
Forest North	6/5/2000, 3/15/2001*, 5/25/2005**
Fox Hollow West	5/25/2005**
Fox Run	3/15/2001*, 4/2/2001, 4/19/2001
Gleannloch Farms	12/6/2000, 11/4/2002, 5/13/2004, 5/24/2004, 6/16/2004
Grayson	1/17/2003
Greengate Acres	3/15/2001*
Hampton Oaks	3/15/2001*
Hannover Forest	3/15/2001*
Londonderry	3/15/2001*
Mossy Oaks	3/15/2001*, 5/25/2005**
Normandy Forest	3/15/2001*
Northampton HOA or MUD	3/15/2001*, 5/24/2001, 6/5/2001, 6/14/2001, 1/21/2003, 5/13/2004
Northgate Crossing	12/6/1999, 3/15/2001*, 9/13/2001, 6/25/2002
Northwood Park	3/15/2001*
Spring Creek Oaks	3/15/2001*, 6/11/2001, 9/1/2004
Spring Stuebner Estates	3/15/2001*, 5/25/2005**

TABLE 4-18 (CONT.)
COMMUNITY GROUPS

Home Owner Associations (HOAs)/ Residential Subdivisions	Presentation Date
Willow Glen	10/25/2000, 11/9/2000, 5/25/2005**
Windrose (wrote article for HOA)	10/17/2001
Amegy Bank Advisory Board	5/25/2005
American Metro Study Corporation	10/21/1999, 1/18/2000, 3/1/2000, 8/5/2004
Century 21 Executive Northwest	4/10/2001
City of Houston, Airport System	1/12/2000
Conroe Noon Lion's Club	9/6/2000
Continental Airlines	1/6/2000
CREN – Commercial Real Estate Network	6/3/2005
Cy-Fair Area Chamber of Commerce	4/1/1999, 6/1/2000, 11/7/2002
Cy-Fair Area Chamber of Commerce, Transportation Committee	11/7/2002, 11/3/2003
Excalibur Construction	3/29/2000
FM 1960 Forum Transportation Symposium	9/22/1999
Greater Houston Builders Association	3/6/2002, 9/22/2004
Hooks Airport	5/25/2001, 1/31/2002, 3/13/2002, 7/29/2002, 8/5/2002, 1/6/2003, 1/15/2004, 2/18/2004, 7/20/2004
Houston Association of Realtors Northwest	4/10/2002, 6/20/2002
Humble Area of Chamber of Commerce	3/11/2003, 5/20/2003, 2/14/2006
Katy Chamber of Commerce	11/18/2004
Katy Area Economic Development Corporation	4/19/2001, 5/5/2004, 11/9/2004
Katy Prairie Conservancy (KPC)	10/29/1993, 3/20/2000
Klein Bank Advisory Board, Transportation Forum	9/20/2000
Klein Methodist Church, Building Committee	11/30/2000, 5/12/2001
Klein Methodist Church, Men's Club	5/12/2001
Legacy Land Trust	7/22/2004, 9/1/2004
Lion's Club, Old Town Spring	7/20/2000
Midway Companies	2/16/2000
New Light Church	8/29/2002, 11/7/2002, 3/4/2004
North Houston Association (NHA)	8/18/1999, 12/20/1999, 7/16/2001, 2/22/2002, 10/30/2002, 1/22/2003, 2/26/2003, 1/4/2006
North Houston Chamber of Commerce	9/5/2000
Northwest Houston Chamber of Commerce	5/19/2004
Porter First Baptist Church, Senior Citizens Group	4/20/2005
River of Praise Church	11/6/2002, 2/5/2003, 3/2/2004, 8/26/2004, 9/9/2004

TABLE 4-18 (CONT.)
COMMUNITY GROUPS

Home Owner Associations (HOAs)/ Residential Subdivisions	Presentation Date
Sierra Club, Lone Star Chapter	7/24/2001
Society of American Mechanical Engineers	4/17/2002
Society of American Military Engineers	7/19/2000, 2/26/2002
South Montgomery County Woodlands Chamber of Commerce	10/28/1998, 7/12/2002, 7/15/2003, 6/15/2004, 2/21/2006
Spring Tabernacle Church	2/5/2001, 3/15/2001
Spring Volunteer Fire Department	5/3/2001
Tomball Area Chamber of Commerce and Transportation Committee	9/15/1998, 10/26/1998, 8/18/1999, 6/13/2000, 3/13/2001, 7/9/2002, 3/13/2001, 7/9/2002, 2/26/2003, 11/11/2003, 11/22/2003
United to Save Our Spring	7/26/2001, 8/23/2001, 10/25/2001
West Houston Association (WHA)/Transportation Committee	4/12/2000, 10/10/2001, 3/20/2003, 11/30/2005
Women's Council of Realtors	6/12/2002
Woodlands Operation Company, Mobility Team	2/17/1998, 10/19/1999, 1/18/2000, 3/1/2000, 11/1/2001
Woodlands Rotary Club	11/1/2001
Media	
1) 8/11/1999—Telephone interview with Graham Harvey of the *Conroe Courier*	
2) 3/9/2001—Interviewed by Kevin Green, Channel 13	
3) 3/12/2001—Telephone interview by Deborah Wrigley, Channel 13 News	
4) 3/16/2001—Radio talk show call-in	
5) 7/26/2001—Telephone interview with Doug Miller, Channel 11 News	
6) 7/30/2001—Interview with Kim Canon, *Houston Chronicle*, This Week reporter	
7) 8/10/2001—Interviewed by Eric Aikin of the *1960 Sun*	
8) 3/7/2002—Media interview with Dave Fehling, Channel 11 news reporter	
9) 3/4/2003—Telephone interview with David Schafer, *Houston Chronicle*, re: Segment E DEIS	
10) 3/17/2003—Telephone interview with Matthew Trana of the *Kingwood Observer*	
11) 11/6/2003—Met with Kim Canon of the *Houston Chronicle*	
12) 12/10/2003—Telephone media interview with Beth Kuhles of the *Houston Chronicle*	
13) 1/8/2004—Met with Brandon Moeller of the *Tomball Tribune News*	
14) 3/10/2004—Telephone interview with Kim Canon of the *Houston Chronicle*	
15) 3/11/2004—Telephone interview with Kim Canon of the *Houston Chronicle*	
16) 3/23/2004—In-house media interview with KHOU Channel 11 reporter Mike Zientek	
17) 6/7/2004—Attended North Houston Association Press Conference	
18) 6/10/2004—On-site media interview with Channel 2 news reporter Mary Benton	
19) 6/15/2004—Telephone media interview with Lauren Hutton of the *Conroe Courier*	

TABLE 4-18 (CONT.)
COMMUNITY GROUPS

Media
20) 7/1/2004—Telephone media interview with Kim Canon of the *Houston Chronicle*
21) 8/10/2004—Telephone interview with Beth Kuhles of the *Houston Chronicle*
22) 10/4/2004—Media telephone interview with Kathy Parks of the *Observer* newspaper
23) 11/19/2004—Media telephone interview with Kathy Parks of the *Observer* newspaper, re: public relations with State Representative Debbie Riddle
24) 11/22/2004—Media telephone interview with Kathy Parks of the *Observer* newspaper, re: public relations with State Representative Debbie Riddle
25) 1/26/2005—Media telephone interview with Kim Jackson of the *Houston Chronicle*
26) 4/11/2005—In-house KHOU Channel 11 media interview with Carolyn Campbell

Notes: * 3-15-2001—Presentation was made at the Spring Tabernacle Church. This meeting was arranged by the "Citizens for Construction of the Grand Parkway along the Historical Alignment," Segment F-2, Reach 7" led by Mr. David Eastwood. Estimated attendance was 750-1,000 citizens from the neighborhoods indicated.

** 5/25/2005—Presentation was made at the Klein Collins High School. This meeting was arranged by local homeowners associations.

Source: Study Team, 2005

In addition, developers were contacted to determine location, percent build-out (as of September 2006), proposed build-out date, and approximate total number of structures proposed in each subdivision currently under construction or proposed within the study area for Grand Parkway Segments E, F-1, F-2, and G (Table 4-19). Subdivisions not under construction, but that have approved plats were considered reasonably foreseeable projects.

TABLE 4-19
STATUS OF DEVELOPMENTS IN THE STUDY AREA

Contact[1]	Subdivision[2]	% Build-Out	Year Build-Out	Lots
Segment E				
KB Homes	Enclave at Bridgewater	100%	2005	168
First General Realty	Morton Creek Ranch	0%	2020	~2,500
Beazer Homes	Waterstone	0%	N/A	2,000
Rouse	Bridgelands	8%	2024	19,000
Segment F-1				
Mustang Development	Lakes of Fairhaven (formerly Stable Creek) Section 1	100%	2007	320
Friendswood Development	Fairfield	55%	2011	7,000
Land Tejas Development	Canyon Gate at Northpointe	100%	2005	1,091
Kerry R. Gilbert	Cypress Lake Crossing	0%	N/A	N/A
--	Stone Lake	35%	N/A	67

TABLE 4-19 (CONT.)
STATUS OF DEVELOPMENTS IN THE STUDY AREA

Contact[1]	Subdivision[2]	% Build-Out	Year Build-Out	Lots
Segment F-2				
Meridian Homes	Three Lakes	100%	2004	N/A
Meridian Homes	Three Lakes East	100%	2004	249
D.R. Horton	Stonepine	55%	~2008	235
Willow Falls Development Ltd/Gehan Homes	Willow Falls	98%	~2008	421
KB Homes	Springbrook	100%	2007	561
KB Homes	Northern Point	5%	2008	527
Great America Company	Inverness Estates	5%	2014	710
Meritage	Miramar Lakes	80%	2008	267
Elan Development, L.P.	Willow Trace	50%	2008	560
Elan Development/Centex Homes	Willow Dell	100%	2004	241
Elan Development, L.P/ ObrA Homes	Fox Hollow South	100%	2005	110
Beazer Homes	Northcrest Village	15%	2009	690
D.R. Horton	Bella Sera	95%	~2008	180
--	Bridgestone Lakes	100%	2007	318
Centex Homes	Spring Terrace	98%	2008	600
Brighton Homes	Gosling Pines Section 1	95%	2008	216
Glenn Champions	Gleannloch Farms	100%	2007	3,200
DR Horton	Rhodes Landing	100%	2005-2006	192
Sowell Property	Meadow Hill Run	60%	2008	226
Royce Builders	Hannover Springs	75%	2009	174
Lennar Homes	Hannover Village	100%	2006/2007	396
Steve Costello	Hannover Estates	100%	2005	139
Steve Costello	Hannover Forest	100%	2005	189
Alexander Engineering, Inc.	Lakes of Avalon	5%	2009	800
Segment G				
Charter Development	Northgate Crossing	100%	2007	534
Land Tejas Development	Legends Ranch	80%	2008	1,626
KB Homes	Legends Run	70%	2007/2008	1,240
Elan Development	Estates of Legends Ranch	100%	2007	195
Midway Spring Trails Partner	Spring Trails	15%	2015	4,000
Lipar Group	Benders Landing	50%	2010	747
Lipar Group	Creekside Village	30%	2010	637
Lipar Group	Benders Landing Estates	0%	2018	1,394

TABLE 4-19 (CONT.)
STATUS OF DEVELOPMENTS IN THE STUDY AREA

Contact[1]	Subdivision[2]	% Build-Out	Year Build-Out	Lots
Segment G (Cont.)				
Vogt Engineering, LP	Riverwalk (Northern Section)	5%	2011	~1,000
Mark Martin	Cumberland Crossing	30%	2013/2014	1,200
Mark Martin	Timberland Estates	100%	2000	200
Mark Martin	Timberland Ranchettes	100%	2003	15
Mark Martin	Timberland Grove	100%	2003	65
Mark Martin	Timberland North	40%	2011	300
Signorelli Holdings, Ltd	Valley Ranch	10%	2011/2012	3,500
The Signorelli Company	Forest Colony	85%	2008	354
Elan Development	Legends Trace	0%	2015	1,300
Clint Pendleton	Spring Bridge Trails	0%	N/A	66

Notes: [1] With the permission of the developer or builder, detailed contact information can be provided if requested.
[2] May not represent a complete list due to the continuing growth in the study area.
Source: Study Team, 2008

Other reasonably foreseeable actions include approximately 425 ($6.96 billion) transportation improvement projects that H-GAC has developed in the 2025 RTP (Appendix C). Major reasonably foreseeable transportation-related actions within the AOI include:

- IH 10 (Katy Freeway Improvements):
  - FHWA signed a ROD in January of 2002 to improve IH 10 (Katy Freeway) from Loop 610 to the Fort Bend County line (Brazos River). The project is currently under construction and completion is anticipated by spring 2009;
- US 290:
  - The TxDOT-Houston District is considering improvements in the US 290 corridor from IH 610 to FM 2920, a distance of approximately 38 miles (including the Hempstead Highway corridor and the connections to the IH 610 West Loop). The MIS has been completed and the project is moving forward with an EIS study and Schematic Design. In a separate study on US 290, HCTRA is in the process of evaluating toll lanes from IH 610 to SH 99 (Grand Parkway);
- SH 249 (Bypass):
  - TxDOT will construct a bypass from Willow Creek to Brown Road in two phases. Phase I will build two three-lane frontage roads and an overpass at FM 2920. Frontage road construction began in summer 2005 and completion is anticipated within three years. The second phase will build the six main lanes and could begin construction as early as fall 2006, and

- For the rest of SH 249 from Westlock to Willow Creek, the project has been divided into two phases. Plans call for constructing the road to six lanes, building two three-lane frontage roads, and relocating the Boudreaux Road intersection;

- SH 249 Extension:
  - The SH 249 MIS was completed in the winter of 2002/2003. The study was initiated in June 2000 and was conducted by TxDOT Houston District. The purpose of this study was to identify transportation needs and potential solutions for the corridor, as well as recommend the "most feasible" alignment for the extension of SH 249 between FM 149 in Pinehurst and FM 1774 in Todd Mission. The project corridor is an approximate 14-mile segment extending through Montgomery, Waller, and Grimes Counties. The MIS selected Alternative E3 as the recommended most feasible alternative and recommended widening FM 1774 to a four-lane facility between Pinehurst and FM 1486 to relieve the projected congestion along this section;
- IH 45/North-Hardy Corridor:
  - METRO, TxDOT, and H-GAC, along with the FTA and FHWA, are conducting a planning study to develop future transportation options. The study is currently in the phase of preparing a DEIS, sponsored by the FTA, to evaluate transit improvements in the North-Hardy Corridor of the Houston metropolitan area;
- Grand Parkway, Segments H and I-1:
  - On April 28, 2005, the Texas Transportation Commission authorized the GPA to perform the route and environmental studies on Segments H and I-1. A request for proposal (RFP) was issued in July 2005 for the project with all proposals to be submitted by August 19, 2005. The project is a tiered NEPA corridor study for the development of SH 99 from US 59 (North) to IH 10 (East) in Montgomery, Harris, Liberty, and Chambers Counties, a distance of approximately 36 miles. Tier One studies will examine a broad study area to determine a corridor for ROW preservation only. A future second tier NEPA document, not included as a part of this project, will examine the best location within the identified corridor to build a final route alignment for Segments H and I and will include a detailed evaluation of potential effects to the natural and human environment. Tier Two studies will be initiated when construction of the facility, or segments thereof, is imminent and will include the preparation of schematic plans and all required permitting and mitigation; and

Reasonably foreseeable actions would involve:

- The conversion of rangeland/forest land to residential/commercial uses;
- Potential temporary and permanent degradation or loss of water resources from surface runoff;
- A change in the economic and social environment due to the increased employment and housing opportunities;
- An increase in usage and acreage of park and recreational activities related to development; and
- Potential degradation of habitats and wildlife populations from construction and ongoing operation.

Other future actions not included in an approved Regional Transportation Plan are therefore not reasonably foreseeable but currently under study:

- IH 69/Trans-Texas Corridor (TTC-69) Study (Houston Area):
  - TxDOT is conducting an environmental study for the TTC-69 project. This study is being conducted in two phases (known as tiers). Tier One studies have examined a broad area that is approximately 20 to 50 miles wide, extending from northeast Texas to the Texas/Mexico border. This study has determined that the Grand Parkway Segments E, F-1, F-2, and G are not within the IH 69/TTC Recommended Reasonable Corridors (see I-69/TTC Recommended Reasonable Corridors map in Appendix G). The Grand Parkway falls within an area identified as a Modal Transition Zone within which TTC and locally developed facilities will be incorporated to best serve the various transportation modes (auto, truck, freight rail, etc.) and their respective destinations. Details of the connections will be studied during the Tier Two environmental and planning process.

4.4.2.6 Step 6 and 7: Assess Potential Cumulative Effects to Each Resource and the Results

Step 6 analyzes the magnitude and significance of potential cumulative effects for the specific resource categories of interest. For the purpose of this analysis, magnitude relates to quantity and significance is discussed in terms of its geographic extent (i.e., how widespread the effect might be), as well as in terms of duration and/or frequency (i.e., temporary, short-term, or long-term).

Land Use

No-Build Alternative

The Expert Panel devoted substantial time to a discussion of the No-Build Alternative. The general consensus of the Expert Panel was that while the cumulative effects under the No-Build Alternative would be relatively consistent with the Build Alternative, the pattern and density would differ. Without the improved access provided by the proposed Grand Parkway, land between existing arterials would be designated low-density single family (R2) (Table 4-20). The Expert Panel concluded that high-density single family (R1) residential development would be concentrated along major arterials in the No-Build condition. Historic growth patterns would cause R1 and R2 to maintain their designations even in the No-Build Alternative. Some tracts on the outer reaches of the AOI could remain undeveloped. Exhibit G–36 presents the No-Build Alternative Land Use Map with the 2005 Study Team updates.

Build Alternative

The Expert Panel concluded that the Build Alternative could change the development pattern by causing the higher density development to occur both inside and along the proposed Grand Parkway. Higher density residential development could be concentrated along major radial facilities such as US 290, SH 249, and IH 45, although development would not extend as far north and west as in the No-Build Alternative. Higher density residential development could occur at intersections with the Grand Parkway and in areas where dense residential development would occur otherwise. The Expert Panel located two master planned communities on large tracts of land under single ownership. Since the Expert Panel's predictions in 2000, residential development has increased over 50 percent and four

large master planned communities have now been established (Valley Ranch, Bridgelands, Spring Trails, and Legends Ranch).

The Expert Panel concluded that land in the northern and western portions of the AOI (extending beyond the Grand Parkway) would be developed as R2, or less dense. Areas with limited access, or where development has historically been slow, would also experience less dense development. As in the No-Build Alternative, some tracts on the outer reaches of the AOI would remain undeveloped. Exhibit G–37 presents the Build Alternative Land Use Map. Table 4-20 presents the land use for the 2025 No-Build and Build Alternatives.

TABLE 4-20
COMPARISON OF PREDICTED CUMULATIVE AND INDIRECT EFFECTS TO 2025 LAND USE FOR THE NO-BUILD AND BUILD ALTERNATIVES

Land Use	2025 No-Build Alternative Predicted from 2005 Data (acres)	2025 Build Alternative Predicted from 2005 Data (acres)	Difference/Change Between 2025 No-Build and Build	
			Acres	Percent
Residential Development *	165,960	176,228	10,268	6.2%
Other Development	8,349	9,369	1,020	12.2%
Undeveloped	196,910	185,622	-11,288	-5.7%
Existing Development	232,922	232,922	0	0.0%
Total	**604,141**	**604,141**	**N/A**	**N/A**

Note: * Residential Development contains R1 (high density single family), R2 (low density single family), R3 (multi-family), and master planned community. (The Residential and Other Development figures are for the area the Expert Panel "developed.")
Source: Study Team (2000, 2005) and Expert Panel (2000)

Population and Employment Forecasts

The land use maps were a critical step toward the generation of 2025 household and employment projections. Exhibits G–20 through G–23 present the population and employment statistics for present and past years used for predictions of 2025 development (Exhibits G–36 and G–37).

Households

The land use described in Table 4-2 was used to provide a forecast of households. Four residential land use categories were developed as follows:

- R1: 63 percent of the total acreage as R1 would be allocated at a higher density of two houses per acre (master planned communities were included in the R1 category);
- R2: 77 percent of the total acreage designated as R2 was allocated to residences at a lower density of one house per 3.5 acres;
- R3: 3 percent of the total R1 and R2 acreage were allocated as multi-family housing (R3) at a density of 15 units per acre; and
- Remaining acreage was allocated to ancillary urban development that included commercial and institutional uses, parks, ROW, and undeveloped lands.

Employment

The Expert Panel agreed that four categories would characterize future employment: commercial-retail, commercial-office, commercial-industrial, and institutional. Employment projections within the commercial-retail and institutional categories were correlated with population and were derived from standard formulas utilized by the Urban Land Institute (ULI, 1988). Projections within the commercial-office and commercial-industrial categories were based on national data, as verified by local data and experience.

Retail: The calculation for projecting total commercial retail employment incorporated the following information: population, per capita income, dollar amount of sales per square foot, and retail employee per square foot. The population generated from the land use maps was assigned a per capita income reflective of the region ($22,000). ULI data were then applied to this basic retail need to generate the total number of retail employees likely to be present in the AOI.

Institutional: Institutional employment was generated using a combination of national standards assembled by the ULI and local information from Expert Panel members. The ULI's Development Impact Assistance Handbook (1994) has established ratios correlating population to the number of professionals required in the fields of health, public safety, public works, and municipal services. The accuracy of these ratios was enhanced by incorporating local data whenever possible to provide projections that better reflected the region under study. The number of school employees was generated from information obtained from school districts within the AOI. Total institutional employment reflects the sum of these categories.

Office and Industrial: Projections for employment within the commercial-office and commercial-industrial categories were based on three factors: Expert Panel predictions for office and industrial employment, percentage of land allocated to office and industrial uses, and localized data covering employment densities of similar office park/industrial sites.

2025 Households and Employment

The Expert Panel estimate of households and employment growth expected by 2025 under the No-Build Alternative is 402,096 households and 226,970 employees. The Build Alternative estimates 460,729 households and 244,512 for employment growth by 2025. These figures include baseline data generated by H-GAC for the year 2005.

The number of new households is 58,633 greater in the Build than in the No-Build Alternative. This difference is primarily due to the greater amount of R1 (higher density) development, which is expected to occur along the proposed Grand Parkway. Without the Grand Parkway, it is expected that the area in between arterials would develop, but at a lower density (R2). In addition, there is a greater amount of multi-family housing anticipated under the Build Alternative.

The number of new employees is 17,542 greater in the Build Alternative than in the No-Build Alternative. The greater number of households in the Build Alternative commands a higher amount of commercial-retail and institutional employment. In addition, the improved access provided by the proposed Grand Parkway is likely to encourage the location of office complexes along or near its route, further increasing the amount of employment within the AOI.

The annual average growth rates for each scenario are presented in Table 4-21. For context, the table also provides projected annual average growth rates for surrounding counties, the city of Houston, and the state of Texas.

TABLE 4-21
COMPOUND ANNUAL HOUSEHOLD GROWTH RATE COMPARISON (2025)

Scenario	Household Growth Rate
No-Build Alternative (AOI) [1]	3.02%
Build Alternative (AOI) [1]	3.73%
H-GAC Projection (AOI)	3.35%
Harris County [2]	1.31%
Fort Bend County [2]	2.72%
Montgomery County [2]	2.87%
Houston Metro [2]	1.18%
Texas [2]	1.54%

Sources: [1] Study Team and Expert Panel, 2000, 2005
[2] TWDB, 2000a and 2000b

The projected growth rates for the No-Build and Build Alternatives are comparable to growth rates for selected other counties within the Houston metropolitan area. While the AOI growth rates are higher than those of the city of Houston, Harris County, and the state of Texas, the Expert Panel anticipates intense growth within the AOI both with and without construction of the Grand Parkway. The household and employment projections for the AOI are a reflection of this consensus opinion.

Projections to 2025

The household and employment figures are derived from the Expert Panel's land use maps. Although it was necessary for the Study Team to project household and employment growth likely to occur by 2025, the Expert Panel agreed that rate and timing at which the growth in each category would occur was difficult to predict. The Expert Panel agreed that complete build-out was unlikely by 2025 based on a comparison of average high growth rates for different portions of the Houston metropolitan area.

In an effort to define the development most likely to occur by 2025, the Study Team evaluated the time frames for development of projects similar to those expected to occur. Residential development is usually first to be constructed in a suburban setting such as Segments E, F-1, F-2, and G.

Retail and institutional construction, directly linked to area population, follows close behind residential development in time. There is typically a substantial time lag between residential development and office/industrial growth.

The Study Team combined these trends with actual household and employment growth rates of zones throughout the Houston metropolitan area, as supplied by H-GAC, to arrive at a most reasonable development schedule. The Expert Panel estimated that the percentage of households would increase to 90 percent based on the growth history of the region. A similar concept was applied to employment data. When area-reflective growth patterns were applied to commercial-office and commercial-industrial employment, the Expert Panel projected that this type of development would have reached 40 percent of its build-out capacity by 2025.

This employment adjustment was applied only to the commercial-office and commercial industrial employment. As a result, commercial-retail and institutional employment figures remained correlated with the 90 percent population build-out anticipated by 2025.

Potential 2001 NLCD Land Use Cumulative Effects

The Study Team overlaid the 2025 No-Build and Build Alternatives developed by the Expert Panel and the Study Team onto the USGS/NOAA Draft 2001 NLCD to determine the extent of potential cumulative effects (see Table 4-22, Figure 4-6, and Exhibits G–38 and G–39). Forested land use has the greatest decline from 150,025 acres in 2001 to 45,339 acres under the No-Build Alternative and 40,979 acres under the Build Alternative for 2025, while development land use increases from 146,271 acres in 2000 to 429,752 acres in the No-Build Alternative and 440,403 acres in the Build Alternative for 2025 (see Table 4-22).

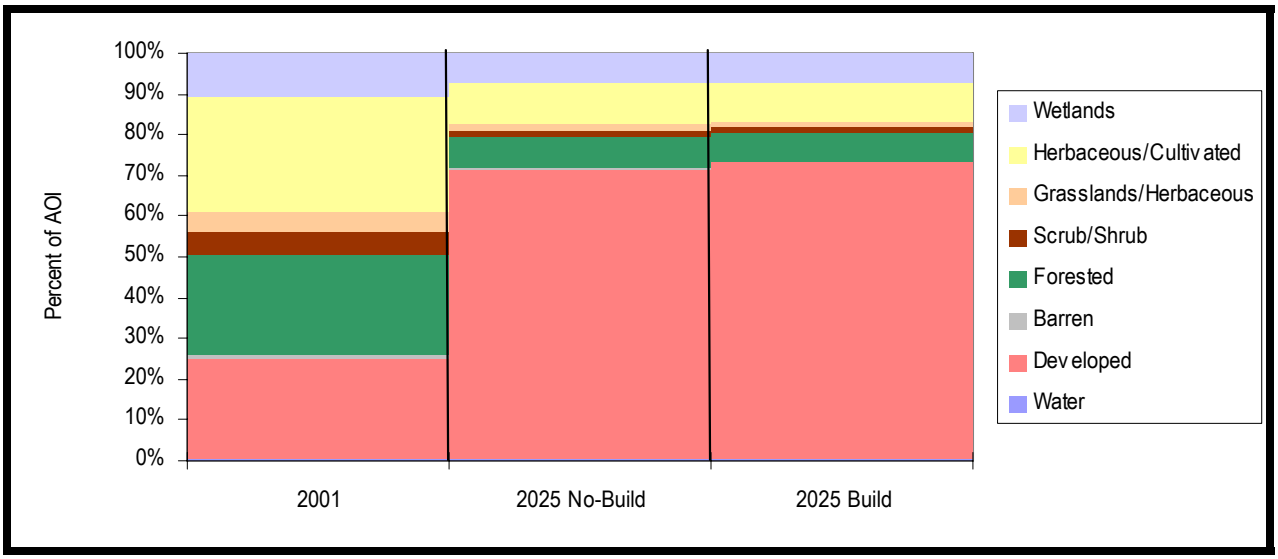
TABLE 4-22
COMPARISON OF 2001 LAND USE AND PREDICTED 2025 LAND USE UNDER THE NO-BUILD AND BUILD ALTERNATIVES

Description	2001 AOI		2025 No-Build AOI		2025 Build AOI		Difference Between Build and No-Build Alternatives
	Acres	% of the AOI	Acres	% of the AOI	Acres	% of the AOI	
Open Water	4,607	0.8%	2,750	0.5%	2,723	0.5%	-27
Developed	146,271	24.2%	429,752	71.1%	440,403	72.9%	10,651
Barren	5,740	1.0%	2,298	0.4%	2,258	0.4%	-40
Forested	150,025	24.8%	45,339	7.5%	40,979	6.8%	-4,360
Scrub/Shrub	33,528	5.5%	10,121	1.7%	8,548	1.4%	-1,573
Grasslands/Herbaceous	28,409	4.7%	9,113	1.5%	8,072	1.3%	-1,041
Herbaceous Planted/Cultivated	169,463	28.1%	61,646	10.2%	58,859	9.7%	-2,787
Wetlands	66,098	10.9%	43,121	7.1%	42,298	7.0%	-823
Total	**604,141**	**100%**	**604,141**	**100%**	**604,141**	**100%**	

Note: Totals may appear not to match sum of parts because of rounding.
Source: Study Team, 2006 and Expert Panel, 2000

The difference between the No-Build and Build Alternative potential cumulative wetland impacts is the indirect impact of 823 acres. This amount was determined by the Study Team and the Expert Panel based on available land and with the assumption that if the Grand Parkway were not built, that the potential direct impact acreage (298 acres) of the Grand Parkway would be developed (e.g., where land has been set aside for ROW, the development would just fill it in with more houses). Therefore, the only difference is the indirect impact of the proposed Grand Parkway.

FIGURE 4-6
COMPARISON OF 2001 LAND USE AND PREDICTED 2025 LAND USE UNDER THE NO-BUILD AND BUILD ALTERNATIVES



Note: The color scheme in this figure corresponds to the color scheme in Exhibits G-38 and G-39.
Source: Study Team, 2006 and Expert Panel, 2000

The difference between the No-Build and Build Alternative potential cumulative Katy Prairie impacts is the indirect impact of 2,829 acres. This amount was determined by the Study Team and the Expert Panel based on available land and with the assumption that if the Grand Parkway were not built, that the potential direct impact acreage (1,133 acres) of the Grand Parkway would be developed (e.g., where land has been set aside for ROW, the development would just fill it in with more houses). Therefore, the only difference is the indirect impact of the proposed Grand Parkway.

Water Quality/Wetlands

TCEQ is the primary agency responsible for water quality management in the state of Texas and the EPA is ultimately responsible for insuring that these efforts meet federal water quality standards. Cumulative effects to water quality and wetlands would include direct and indirect effects to water quality and wetlands discussed in Section 4.4.2.4, as well as the effects caused by the projects listed in Section 4.4.2.5. It should be noted that effects caused by projects listed in Section 4.4.2.5 would be common to the No-Build and Build Alternatives. The most common cause and effect issue is land conversion from undeveloped to developed land, primarily wetlands and other waterbodies, as well as vegetation. Because of such development, stresses on wetlands may include water quality effects, changes in water levels, and

overall effects from urban development and agricultural activities. Effects to water quality and wetlands from the construction of the Grand Parkway, Segments E, F-1, F-2, and G, and associated indirect development would be limited based on the current regulations as presented by TxDOT, FHWA, TCEQ, EPA, and the USACE. Projects require an approved SWPPP to avoid impacts to water quality and a compensatory mitigation plan for any unavoidable impacts to wetlands. Because of the federal mandate with regard to wetlands, "no net loss" of wetlands from future proposed land use would be anticipated. The cumulative effects study area boundary for wetlands is identical to the watershed boundary developed for water quality and is shown on Exhibit G–31. Table 4-23 summarizes the cumulative effects to wetlands in the AOI.

TABLE 4-23
SUMMARY OF POTENTIAL CUMULATIVE WETLAND IMPACTS

Resource	Impact Type						Difference Between No-Build and Build Alternatives*
	Direct		Indirect		Cumulative		
	No-Build	Build	No-Build	Build	No-Build	Build	
Wetlands (acres)	0	298	0	823	22,977	23,800	823

Notes: Direct impacts were calculated from USGS/NOAA Draft 2001 NLCD data.
*Includes direct, indirect, and cumulative effects
Source: Study Team, 2006

Katy Prairie

Cumulative effects to Katy Prairie would include direct and indirect effects to the Katy Prairie as discussed in the previous section (Section 4.4.2.4), as well as the effects caused by the projects listed in Section 4.4.2.5. It should be noted that effects caused by projects listed in Section 4.4.2.5 would be common to the No-Build and Build Alternatives. Conversion of prairie land to developed land primarily results from population and employment growth. Even under the No-Build Alternative, as Texas continues to grow, the conversion of prairie land to accommodate development would likely continue due to the future projected population and employment growth. Transportation projects may influence land conversion by inducing development in some locations. The construction of the proposed facility may accelerate the conversion of rural land in some locations, particularly where interchanges are constructed. Table 4-24 summarizes the cumulative effects to Katy Prairie Land Use in the AOI.

TABLE 4-24
SUMMARY OF POTENTIAL CUMULATIVE KATY PRAIRIE IMPACTS

Resource	Impact Type						Difference Between No-Build and Build Alternatives*
	Direct		Indirect		Cumulative		
	No-Build	Build	No-Build	Build	No-Build	Build	
Katy Prairie (acres)	0	1,133	0	2,829	68,382	71,211	2,829

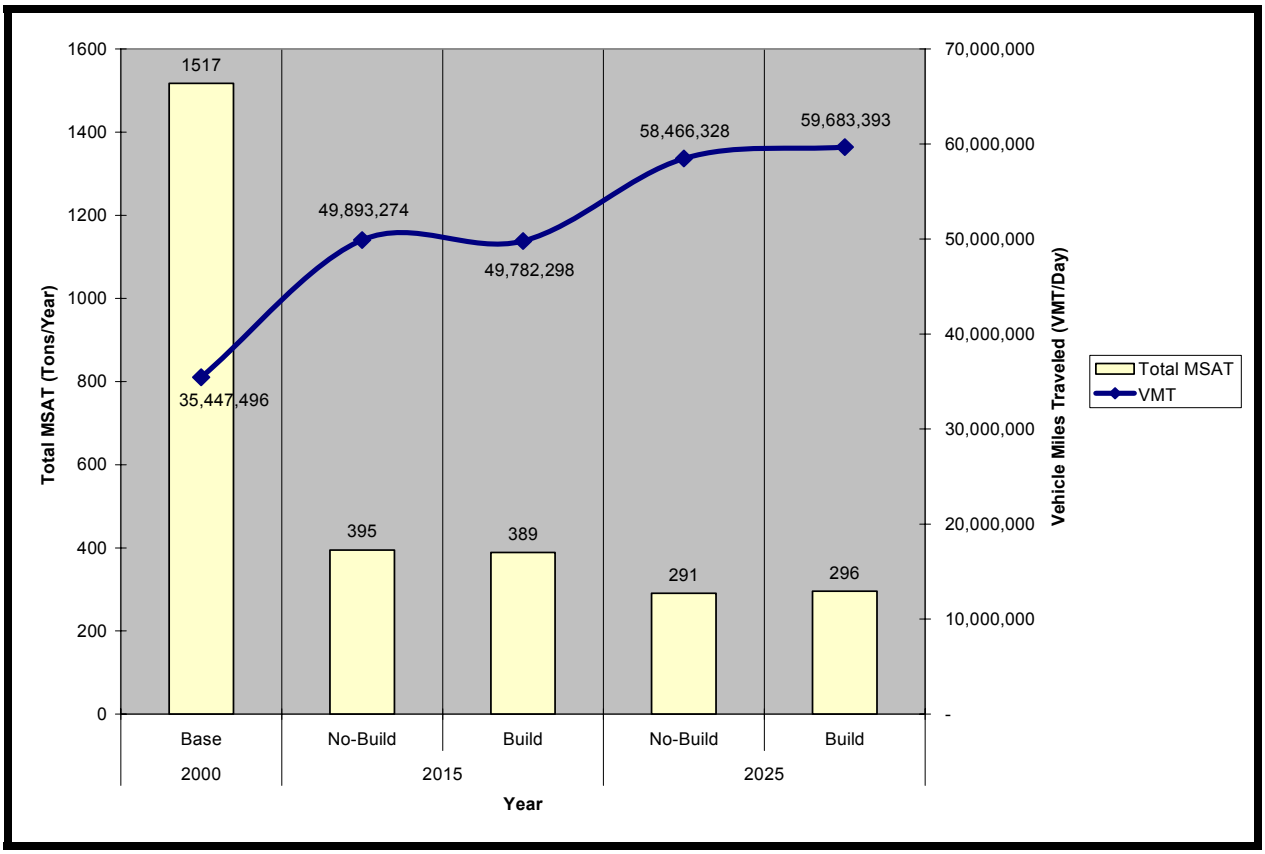
Note: * Includes direct, indirect, and cumulative effects
Source: Study Team, 2006

Mobile Source Air Toxics

The cumulative impacts projected by the MSAT analysis indicates a substantial decrease in MSAT emissions that can be expected for both the No-Build and Build Alternatives (2015 and 2025) versus the base year (2000). The emission trends obtained in this analysis and VMT (Vehicle Miles Traveled) are illustrated in Figure 4-7 for the Grand Parkway, Segments E, F-1, F-2, and G. Emissions of total MSAT are expected to decrease by more than 81 percent in 2025 compared with 2000 levels due to newer technology vehicles, a change in vehicle fuels, both gasoline and diesel fuel, and a change in emission standards that both light-duty and heavy-duty on-highway motor vehicles must meet.

Of the six priority MSAT compounds, the cumulative impact from benzene and DPM contribute the most to the emissions total (see Figure 4-8a-f). The amount of DPM emitted in 2000 is higher than the amount of benzene emitted. In future years a substantial decline in benzene is anticipated (more than a 72 percent reduction in benzene from 2000 to 2025, No-Build), and an even larger reduction in DPM emissions is predicted (about a 93 percent decrease from 2000 to 2025, No-Build).

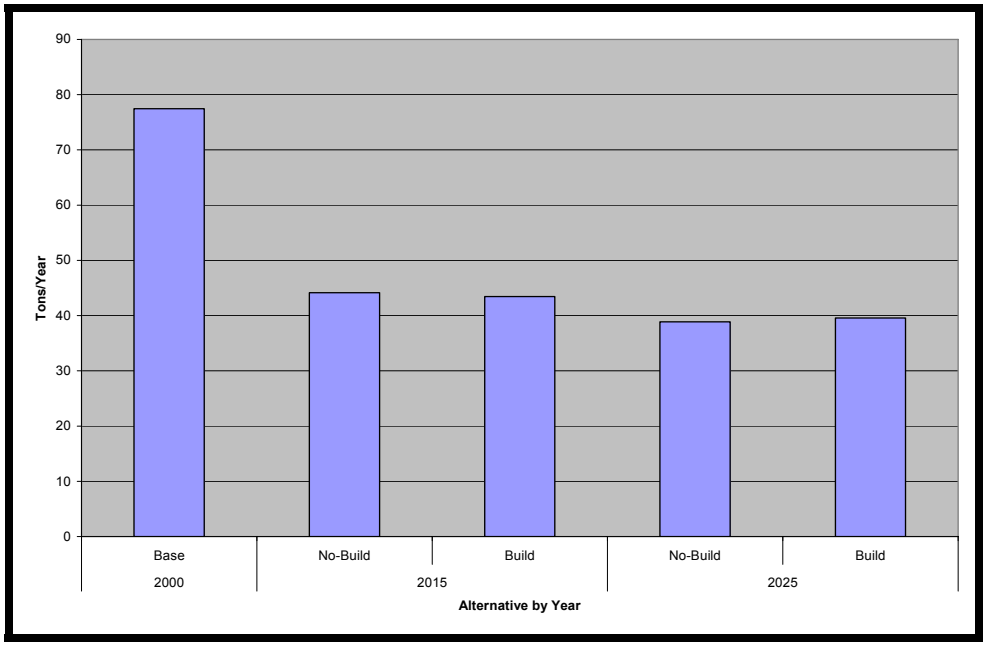
FIGURE 4-7
COMPARISON OF THE GRAND PARKWAY SEGMENTS E, F-1, F-2, AND G
TOTAL MSAT EMISSIONS AND VMT OVER TIME (ENTIRE TRAFFIC STUDY AREA)



Note: Total MSAT results were calculated using the EPA MOBILE6.2 model (see Appendix F, Part 4 for detailed methodology), which does not include the emission reductions associated with EPA's 2007 final rule, "Control of Hazardous Air Pollutants from Mobile Sources," as published in the Federal Register (EPA, 2007a).

Source: Study Team, 2006

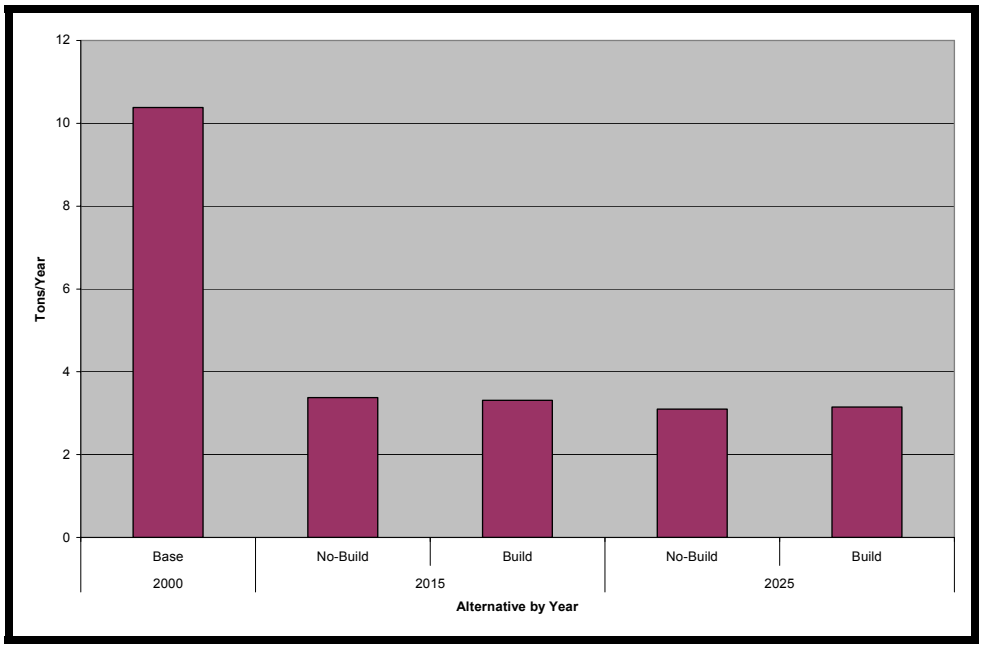
FIGURE 4-8a
COMPARISON OF ACETALDEHYDE BY ALTERNATIVE (ENTIRE TRAFFIC STUDY AREA)



Note: Results were calculated using the EPA MOBILE6.2 model (see Appendix F, Part 4 for detailed methodology), which does not include the emission reductions associated with EPA's 2007 final rule, "Control of Hazardous Air Pollutants from Mobile Sources," as published in the Federal Register (EPA, 2007a).

Source: Study Team, 2006

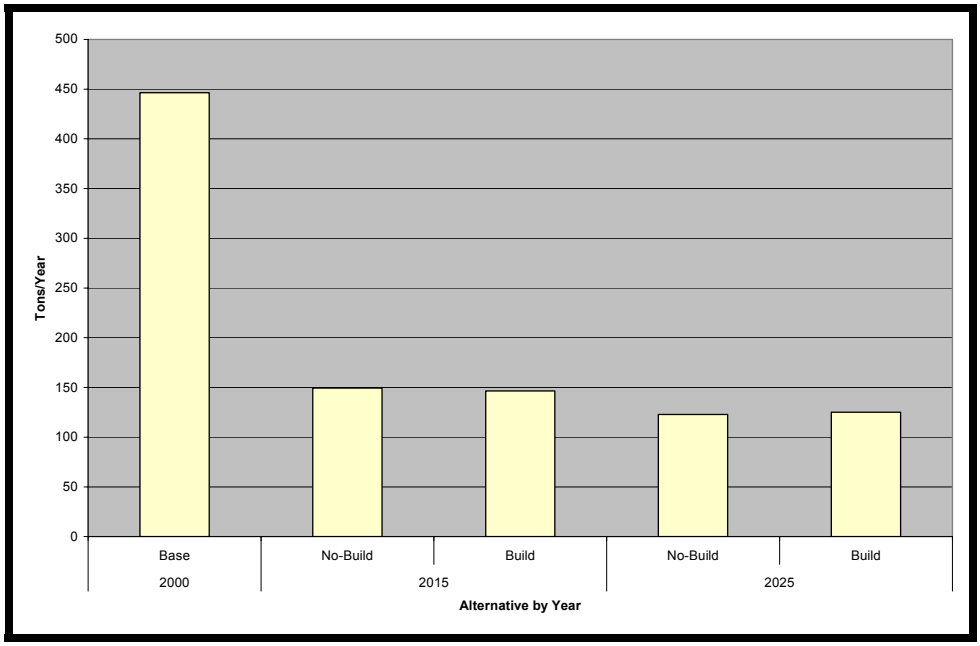
FIGURE 4-8b
COMPARISON OF ACROLEIN BY ALTERNATIVE (ENTIRE TRAFFIC STUDY AREA)



Note: Results were calculated using the EPA MOBILE6.2 model (see Appendix F, Part 4 for detailed methodology), which does not include the emission reductions associated with EPA's 2007 final rule, "Control of Hazardous Air Pollutants from Mobile Sources," as published in the Federal Register (EPA, 2007a).

Source: Study Team, 2006

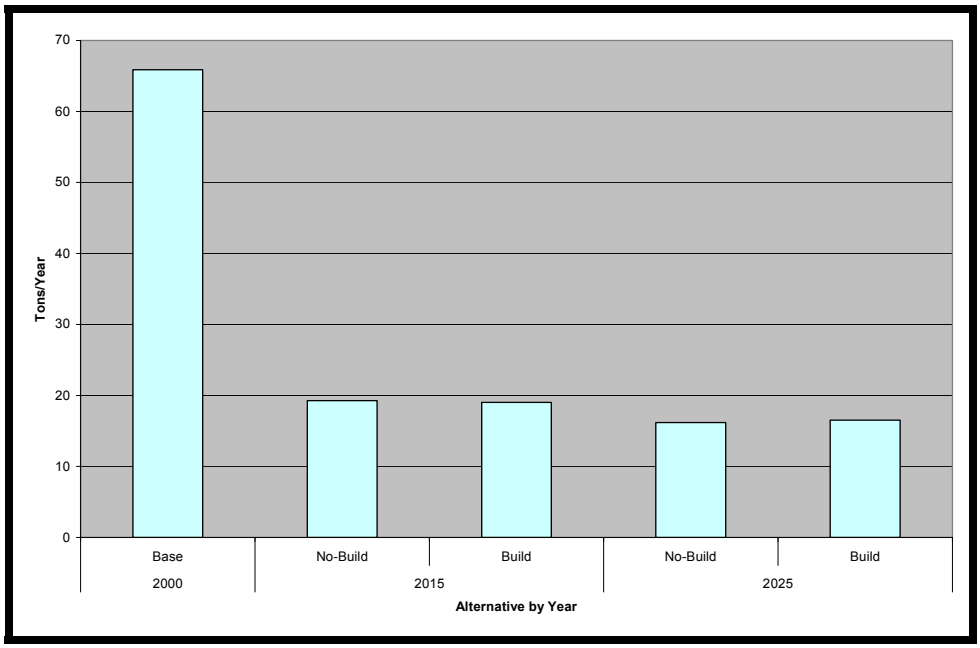
FIGURE 4-8c
COMPARISON OF BENZENE BY ALTERNATIVE (ENTIRE TRAFFIC STUDY AREA)



Note: Results were calculated using the EPA MOBILE6.2 model (see Appendix F, Part 4 for detailed methodology), which does not include the emission reductions associated with EPA's 2007 final rule, "Control of Hazardous Air Pollutants from Mobile Sources," as published in the Federal Register (EPA, 2007a).

Source: Study Team, 2006

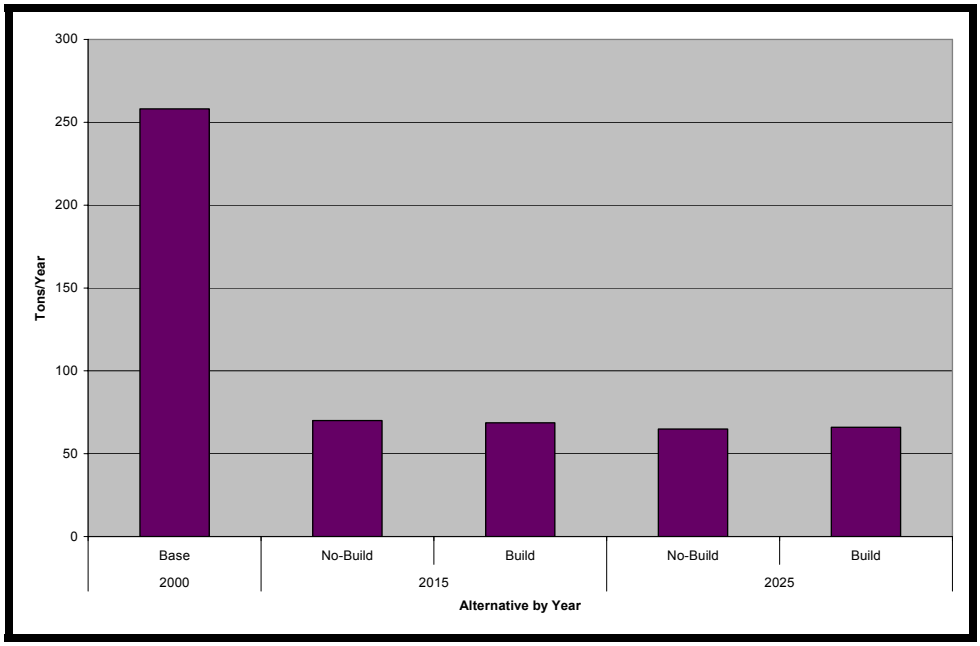
FIGURE 4-8d
COMPARISON OF 1,3 BUTADIENE BY ALTERNATIVE (ENTIRE TRAFFIC STUDY AREA)



Note: Results were calculated using the EPA MOBILE6.2 model (see Appendix F, Part 4 for detailed methodology), which does not include the emission reductions associated with EPA's 2007 final rule, "Control of Hazardous Air Pollutants from Mobile Sources," as published in the Federal Register (EPA, 2007a).

Source: Study Team, 2006

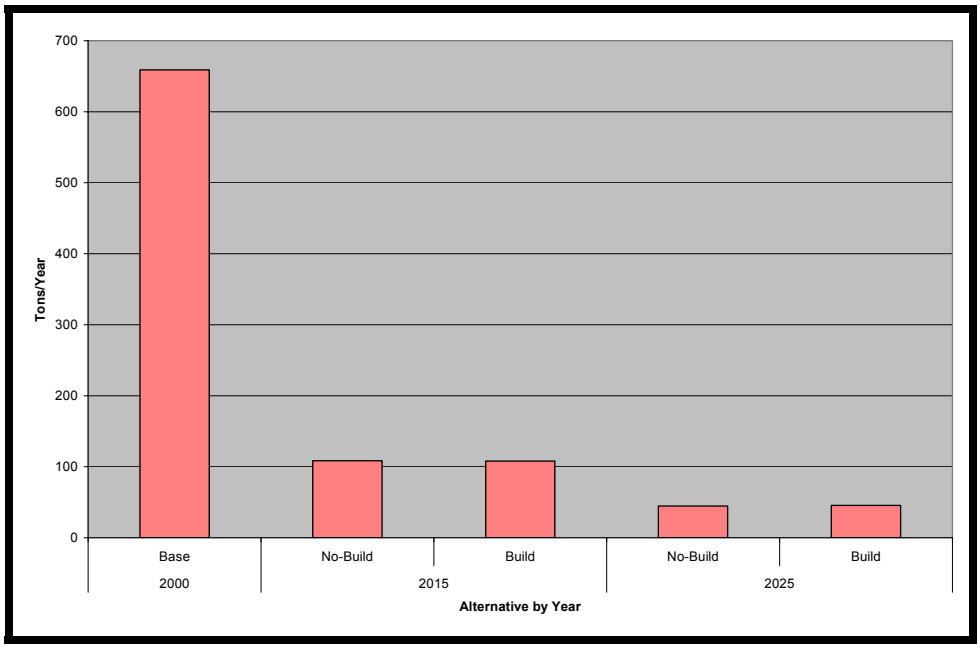
FIGURE 4-8e
COMPARISON OF FORMALDEHYDE BY ALTERNATIVE (ENTIRE TRAFFIC STUDY AREA)



Note: Results were calculated using the EPA MOBILE6.2 model (see Appendix F, Part 4 for detailed methodology), which does not include the emission reductions associated with EPA's 2007 final rule, "Control of Hazardous Air Pollutants from Mobile Sources," as published in the Federal Register (EPA, 2007a).

Source: Study Team, 2006

FIGURE 4-8f
COMPARISON OF DIESEL PARTICULATE MATTER BY ALTERNATIVE (ENTIRE TRAFFIC STUDY AREA)



Note: Results were calculated using the EPA MOBILE6.2 model (see Appendix F, Part 4 for detailed methodology), which does not include the emission reductions associated with EPA's 2007 final rule, "Control of Hazardous Air Pollutants from Mobile Sources," as published in the Federal Register (EPA, 2007a).

Source: Study Team, 2006

As shown in Figures 4-7 and 4-8a-f, MSAT emission levels are projected to decrease, even if VMT increases and shown in Figure 4-7. These results are consistent with an FHWA analysis which states that even if VMT increases over time, reductions in MSAT can be anticipated from 2000 to 2020 (TxDOT, 2006a). The reasons for these dramatic improvements are two fold: a change in vehicle fuels, both gasoline and diesel fuel; and a change in emission standards that both light-duty and heavy-duty on-highway motor vehicles must meet. The EPA predicts substantial future air emission reductions as the agency's new light-duty and heavy-duty on-highway fuel and vehicle rules come into effect (Tier 2, light-duty vehicle standard, Heavy-Duty Diesel Vehicle and (HDDV) standards and low sulfur diesel fuel, and the EPA's proposed Off-Road Diesel Engine and Fuel Standard). These projected air emission reductions will be realized even with the expected continued growth in VMT (EPA, 2000b; EPA, 1999b; EPA, 1997; TNRCC [currently TCEQ], 1997).

Growth in the Houston area is expected to remain robust through 2025. Population is expected to increase 64.1 percent and employment growth is expected to increase by 56.2 percent from 2000 through 2025 (H-GAC, 2003). The Study Team tracked the growth in the AOI since 1999 and, through coordination and discussions with the Expert Panel, agencies, and private landowners, has attempted to address some of the consequential increase in traffic within the greater Houston area.

Table 4-25 and Figure 4-9 show projected emissions of the six priority MSAT by alternative from base year 2000 to 2025 for the entire Grand Parkway traffic study area, Segments E, F-1, F-2, and G (see also Exhibit G–26). The following table and figure are for all the links of the Grand Parkway AOI. These numbers represent the amount of MSAT being released into the AOI. The fate of MSAT and the concentrations at any specific receptor are unknown due to the current technical shortcomings of emission and dispersion models. In addition, due to the limitations of dispersion modeling and the fact that the EPA has not established health-based standards for air toxics, the potential health impacts of the MSAT emissions from this project on the public cannot be determined.

TABLE 4-25
MSAT EMISSIONS BY ALTERNATIVE (TONS/YEAR)
(ENTIRE TRAFFIC STUDY AREA, SEGMENTS E, F-1, F-2, AND G)

Compound	Year / Alternative				
	2000	2015*		2025	
	Base Year	No-Build	Build	No-Build	Build
Acetaldehyde	77	44	43	39	40
Acrolein	10	3	3	3	3
Benzene	446	149	147	123	125
Butadiene	66	19	19	16	17

TABLE 4-25 (CONT.)
MSAT EMISSIONS BY ALTERNATIVE (TONS/YEAR)
(ENTIRE TRAFFIC STUDY AREA, SEGMENTS E, F-1, F-2, AND G)

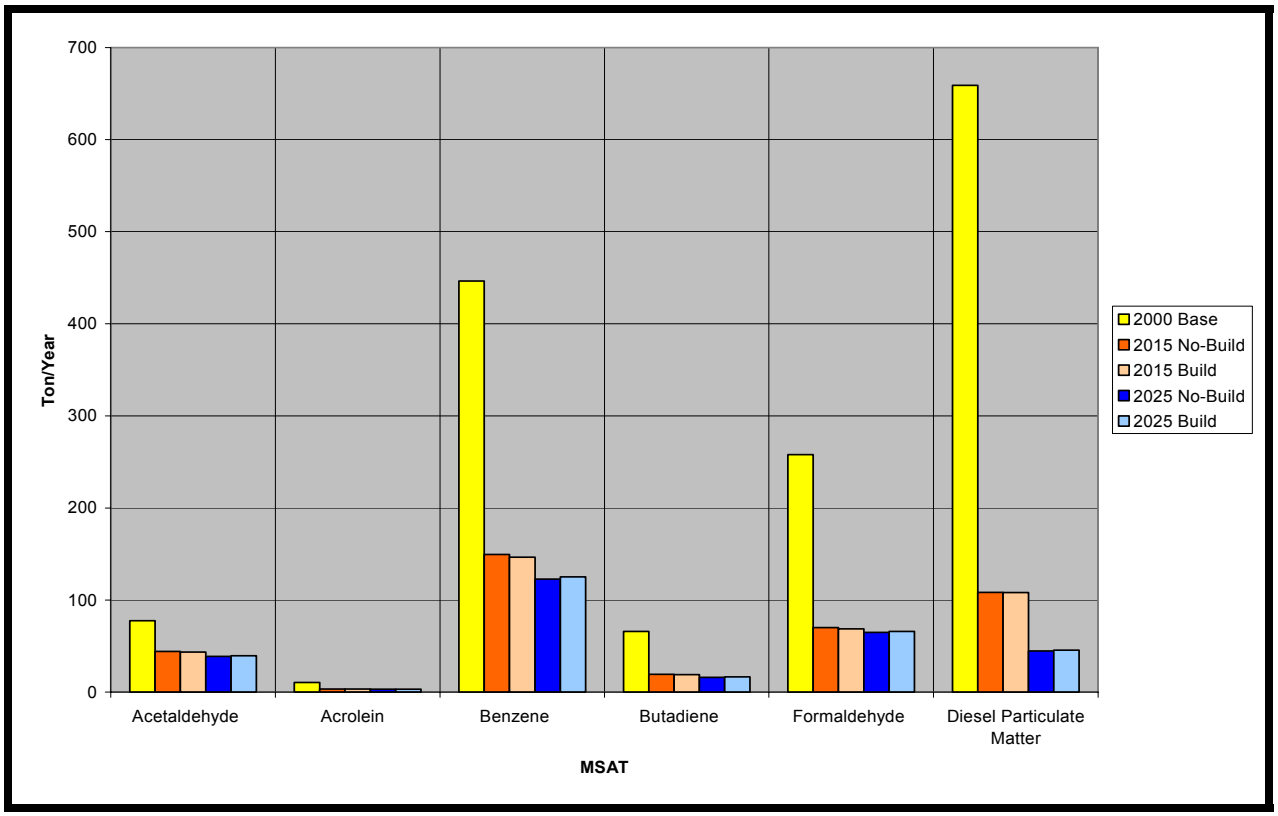
Compound	Year / Alternative				
	2000	2015*		2025	
	Base Year	No-Build	Build	No-Build	Build
Formaldehyde	258	70	69	65	66
Diesel Particulate Matter	659	108	108	45	46
Total MSAT	**1,516**	**393**	**389**	**291**	**297**

Note: * 2015 No-Build Alternative is higher due to more traffic congestion on local roadway links without the proposed Grand Parkway.

Results were calculated using the EPA MOBILE6.2 model (see Appendix F, Part 4 for detailed methodology), which does not include the emission reductions associated with EPA's 2007 final rule, "Control of Hazardous Air Pollutants from Mobile Sources," as published in the Federal Register (EPA, 2007a).

Source: Study Team, 2006

FIGURE 4-9
PROJECTED CHANGES IN MSAT EMISSIONS BY ALTERNATIVE OVER TIME
(ENTIRE TRAFFIC STUDY AREA, SEGMENTS E, F-1, F-2, AND G)



Note: Results were calculated using the EPA MOBILE6.2 model (see Appendix F, Part 4 for detailed methodology), which does not include the emission reductions associated with EPA's 2007 final rule, "Control of Hazardous Air Pollutants from Mobile Sources," as published in the Federal Register (EPA, 2007a).

Source: Study Team, 2006

The TxDOT 2006 Air Quality Guidelines state that an MSAT analysis is required for road projects that have, or are expected to have, more than 140,000 ADT. Segments E, F-1, F-2, and G do not reach the 140,000 ADT threshold as can be seen in Table 4-26. However, US 290, SH 249, IH 45, and US 59 are expected to approach 140,000 ADT at the crossing of the Grand Parkway by the year 2025.

TABLE 4-26
SEGMENT ADT ROADWAY BY YEAR

Segment	2000*	2015	2025
E	N/A	33,400	38,400
F-1	N/A	26,400	31,000
F-2	N/A	45,100	59,500
G	N/A	43,400	64,500
Total	**N/A**	**148,300**	**193,400**

Note: * The year 2000 is the base year for air toxics modeling and excludes the Grand Parkway.
Source: Study Team, 2006

4.4.2.7 Step 8: Assess and Discuss Mitigation Issues for All Adverse Impacts

Consideration of potential mitigation measures as specified in 40 CFR 1508.20 for this project included:

(a) Avoiding the impact altogether by not taking a certain action or parts of an action;

(b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation;

(c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;

(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and

(e) Compensating for the impact by replacing or providing substitute resources or environments.

Section 4 (Environmental Consequences) of Volume II discusses potential mitigation measures for all project resources. Step 8 of this CEA provides additional mitigation discussions for those resources carried through this process.

The magnitude and significance of negative cumulative effects of the Grand Parkway project on the resources in the AOI are expected to be limited and controllable. Efforts have been made to avoid and minimize project effects to all resources at both the corridor and alignment development phases of the project, and measures would be implemented to mitigate the loss of resources where practicable. When project alternatives were developed, several environmental issues were considered that influenced the location of the Grand Parkway including the potential for involvement with § 4(f)/§ 6(f) resources, avoiding and minimizing the filling of wetlands and floodplains, and sensitive biological communities. Other factors affecting the proposed action were also studied including compatibility with local land use plans/policies, housing and business displacements, socioeconomic issues, and community interests. The alternatives evaluation process was

based on the philosophy of avoidance first, minimization second and mitigation last. All project-specific commitments and conditions of approval, including resource agency permitting, compliance, and monitoring requirements, are stated in Volume II of the FEISs and in the RODs prepared for the Grand Parkway project, Segments E, F-1, F-2, and G. These project-specific commitments and conditions for approval may vary depending on which alternative is identified as the Preferred Alternative Alignment. Mitigation monitoring would be conducted by the GPA, TxDOT, and other appropriate federal, state, and local agencies to ensure compliance with the agreed upon mitigation measures.

Land Use

All of the alternative alignments developed were consistent with state and local government plans and policies on land use and growth within the project area. Direct land use impacts were mitigated through avoidance and minimization. All of the alternative alignments would result in the reduction of forest and other vegetative communities. Activities to minimize the impacts to vegetative or undeveloped habitats from construction include minimizing devegetation of the construction area wherever safety allows, decreasing the amount of fill placement, and implementation of BMPs, including an erosion and sedimentation control plan. Specific impact minimization to wetland, floodplain, and stream areas may include: the roadway design (use of bridge crossings instead of filled embankment); the use of retention basins and revegetated swales to minimize runoff, sedimentation, turbidity, leaching of soil nutrients, and leaching of chemicals from petroleum products, pavement, and waste material; and maintaining flow patterns to ensure wetland hydrology in spite of roadway design requirements. Indirect impacts to land use would be similar to that of the direct project impacts, but would occur throughout the AOI. As TxDOT and FHWA do not have the authority to implement zoning or planning regulations, mitigation for cumulative effects to land use or continued conversion of undeveloped land to developed land would require the collaborative efforts of local, county, and regional planners, the public, and private developers. These parties all have a stake in the ultimate landscape in which they reside and only proactive, cooperative interactions would provide the optimum blend of natural and developed communities.

Water Quality/Wetlands/Katy Prairie

Proposed construction activities associated with the Grand Parkway would directly impact wetlands and aquatic systems to varying degrees. Land clearing during construction activities would remove vegetative cover. These activities may increase surface runoff during storm events and could lead to erosion. If runoff is allowed to flow into streams without erosion and sediment control measures, increased turbidity and sedimentation may modify water chemistry due to elevated levels of sediments, nutrients and pollutants, which would also diminish suitable habitat for aquatic species, including littoral zone plants. To aid in minimizing such impacts, placement and monitoring of erosion control measures at the start of, during, and after construction will be incorporated into project plans according to TxDOT SWPPP guidelines. Re-vegetation along the ROW will adhere to TxDOT re-vegetation guidelines. Indirect and cumulative effects to wetland resources would be similar.

Wetland impacts, whether direct, indirect, or cumulative, are regulated through the USACE Section 404 permit process. Natural resource agencies (including TPWD, USFWS, USACE, EPA, and TCEQ) will be involved in decisions regarding appropriate wetland mitigation ratios and the location, size, and character of the mitigation. A compensatory mitigation plan will be submitted to the USACE as part of the Section 404 permit review process.

Non-regulated portions of the Katy Prairie could be mitigated through avoidance and minimizations efforts and through collaboration with local, county, and regional planners, the public, private developers, the KPC, and other conservation groups dedicated to protection and preservation of this natural resource. Future cumulative effects to this resource would continue if land use and conservation plans are not developed to protect and preserve the remaining acreage of this important ecosystem.

Mobile Source Air Toxics

Research has found that the ability to discern differences in MSAT emissions among transportation alternatives is very difficult given the uncertainties associated with forecasting travel activity and air emissions 25 years or more into the future. When evaluating the future options for upgrading a transportation corridor, the major mitigating factor in reducing MSAT emissions is the implementation of EPA's new motor vehicle emission control standards. Substantial decreases in MSAT emissions will be realized from the base year (2000) through an estimated time of completion and its design year some 25 years in the future. Even accounting for anticipated increases in VMT and varying degrees of efficiency of vehicle operation, total MSAT emissions were expected to decline approximately 81 percent from 2000 to 2025 (No-Build). While benzene emissions were expected to decline about 72 percent (No-Build), emissions of DPM were expected to decline even more at 93 percent (No-Build).

MSAT are not expected to increase above the base year (2000). The major air toxics from mobile sources especially benzene have dropped dramatically since 1995 and are expected to continue dropping, as demonstrated by the quantitative analysis presented here. The introduction of RFG has lead to a substantial part of this improvement. In addition, Tier 2 automobiles introduced in model year 2004 will continue to help reduce MSAT. Diesel exhaust emissions have been falling since the early 1990s with the passage of the CAAA. The CAAA provided for improvement in diesel fuel through reductions in sulfur and other diesel fuel improvements. EPA also has called for dramatic reductions in NOx emissions, and particulate emissions from on-road and off-road diesel engines.

MSAT were modeled and were found to be substantially lower in the future (2015 and 2025) than the existing conditions (2000). MSAT will continue to improve over time because of dramatic improvements in vehicle technology and fuels, and traffic flow improvements realized over time. Other potential air quality impacts could occur with the continued existence of industrial complexes in the area. Generally, industrial facilities that emit air pollutants will be governed and permitted through TCEQ. Because of the proposed Grand Parkway, MSAT are not expected to increase overall air toxics in the Houston area in the future years investigated.

Unavailable Information for Project Specific MSAT Impact Analysis

This document includes a basic analysis of the likely MSAT emission impacts of this project. However, available technical tools do not enable us to predict the project-specific health impacts of the emission changes associated with the alternatives in this document. Because of 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 MSAT on a proposed highway project would involve several elements, including emissions modeling, dispersion modeling to estimate ambient concentrations from the estimated emissions, exposure modeling to estimate human exposure to the estimated concentrations, and 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 MSAT health impacts of this project.

- **Emissions:** The EPA tools to estimate MSAT emissions from motor vehicles are not sensitive to key variables of emissions of MSAT 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, which 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 PM, the model results are not sensitive to average trip speed, although the other MSAT emission rates do change with changes in trip speed. In addition, the emission rates used in MOBILE6.2 for both PM and MSAT are based on a limited number of tests of mostly older technology vehicles, and the model does not include the emission reductions associated with EPA's 2007 final rule, "Control of Hazardous Air Pollutants from Mobile Sources," as published in the Federal Register (EPA, 2007a). 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 MSAT 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 the FHWA and TxDOT and may function adequately for larger-scale projects for comparison of alternatives.

- **Dispersion:** The tools to predict how MSAT disperse are also limited. The EPA's current regulatory models, CALINE 3 and CAL3QHC, were developed and validated more than a decade ago to predict episodic concentrations of carbon monoxide to determine compliance with the NAAQS. Dispersion models are more accurate for predicting maximum concentrations that can occur at some time at some location within a geographic area. This limit 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 National Cooperative Highway Research Program is conducting research on best practices in applying models and other technical methods in the analysis of MSAT. This work will also focus on identifying appropriate methods of documenting and communicating MSAT impacts in an environmental impact assessment to the public. Along with these general limits of dispersion models, the FHWA is also faced with a lack of monitoring data in most areas for establishing project-specific MSAT background concentrations.

- **Exposure Levels and Health Effects:** Finally, even if emission levels and concentrations of MSAT could be accurately predicted, shortcomings in current techniques for exposure assessment and risk analysis preclude one from reaching meaningful conclusions about project-specific health impacts. Exposure assessments are complicated, which is because it is difficult to accurately calculate annual concentrations of MSAT near roadways and to determine the period of time that people are 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 about changes in travel patterns and vehicle technology (which affect emissions rates) over 70 years. There is also considerable uncertainty with current estimates of toxicity of MSAT, 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 uncertainty of the calculated 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 MSAT

Research into the health impacts of MSAT is ongoing. For different emission types, many studies show that MSAT are either statistically associated with adverse health outcomes through epidemiological studies (frequently based on emission 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 several EPA efforts. The agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of human exposure at the county level. While not intended for use as a measure or benchmark of 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's current evaluation of the potential hazards and toxicity of the six priority MSAT is listed by chemical in Section 3.6.2, and can be found at http://www.epa.gov/iris. For several of the MSAT, carcinogenicity either cannot be determined or is listed as probable.

There is currently a broad lack of consensus among both the scientific community and the regulatory community on the level at which MSAT may cause a negative health impact. This lack of consensus prevents any meaningful conclusion about the level of MSAT that must be experienced by a population before a health effect is found. Such limits make the study of MSAT concentrations, exposures, and health impacts difficult and uncertain. Thus, accurate and reliable estimates of actual human health or environmental impacts from transportation projects and MSAT are not scientifically

possible at this time. This lack of consensus further prevents decisions from being made about alignments, grade elevations, and even selection of the No-Build Alternative versus the Build Alternative based solely on estimated MSAT levels.

Therefore, the analysis of MSAT presented here is provided as background information on the current levels of MSAT, anticipated future levels of MSAT, and assumptions on what effect the Grand Parkway Segment G project may have on MSAT. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research MSAT hot spots near roadways, 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.[1] Much of this research is not specific to MSAT, 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 the agency to perform a more comprehensive evaluation of the health impacts specific to this project. In addition, as mentioned previously, EPA has not developed health-based standards for MSAT, and instead has focused on regulations to substantially reduce on-road and non-road MSAT emissions.

On February 26, 2007, the EPA issued a final rule on the "Control of Hazardous Air Pollutants from Mobile Sources." In the preamble to this final rule, the EPA summarized recent studies by stating, "Significant scientific uncertainties remain in our understanding of the relationship between adverse health effects and near-road exposure, including the exposures of greatest concern, the importance of chronic versus acute exposures, the role of fuel type (e.g., diesel or gasoline) and composition (e.g., % aromatic), relevant traffic patterns, the role of co-stressors including noise and socioeconomic status, and the role of differential susceptibility within the 'exposed' populations" (EPA, 2007a).

Use of Available Information

Because of the uncertainties outlined above, an assessment of the effects of MSAT emissions impacts on human health cannot be made at the project level. While available tools do allow us to predict relative MSAT emissions changes between alternatives for a proposed project of this magnitude, the amount of MSAT emissions from each of the Segment G project alternatives (Build Alternative and No-Build Alternative) are presented here for consideration of alternatives and for disclosure purposes and are not intended for estimating potential human exposure or health impacts. Therefore, the

[1] *Multiple Air Toxic Exposure Study-II (MATES II)*, South Coast Air Quality Management District (2000); *Highway Health Hazards*, The Sierra Club (2004) summarizing 24 studies on the relationship between health and air quality; *NEPA's Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles*, Environmental Law Institute (2005), with health studies cited therein; the US 95 Nevada Study and associated case law; and *Recent Research Findings: Health Effects of Particulate Matter and Ozone Air Pollution*, California Environmental Protection Agency - Air Resources Board and American Lung Association of California (2004).

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 human health" as related to MSAT emissions.

4.5 CONCLUSION

This analysis follows the requirements and processes outlined in 23 CFR 771, the FHWA Technical Advisory T 6640.8A (1987), CEQ's handbook, *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ, 1997), *Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process* (FHWA, 2003), CEQ's memorandum *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis* (CEQ, 2005), and TxDOT's *Guidance on Preparing Indirect and Cumulative Impact Analyses* (TxDOT, 2006b).

The objective of this CEA is to evaluate land development and the corresponding environmental effects for two scenarios: the Build Alternative where Segments E, F-1, F-2, and G of the Grand Parkway are fully constructed and the No-Build Alternative where the facility is not constructed. The Study Team defined an AOI within which possible indirect development and potential cumulative effects could occur (Exhibit G–30). In 2000, an Expert Panel was assembled to assist the Study Team in conducting a detailed land use forecasting model for both the No-Build and Build Alternatives within the AOI. In addition to the land use forecasting by the Study Team and the Expert Panel, the Study Team utilized USGS/NOAA Draft NLCD (2001) information to determine the vegetative composition of undeveloped land in the AOI and future effects of the undeveloped land under both of the scenarios of future land use modeling.

The Study Team has continued to solicit input from agency scoping, public meetings, and workshops to determine issues of concern and to evaluate the cumulative effects to all project resources and issues (Table 4-6). Following TxDOT (2006b) guidance (page 7) states that "if a project will not cause direct or indirect impacts on a resource, it will not contribute to a cumulative impact on that resource"; therefore the Study Team identified four major resources/issues that warrant more detailed discussion. These include:

1. Land Use – including farmland from a land use classification;
2. Mobile Source Air Toxics;
3. Water Quality; and
4. Wetlands and Vegetative Communities, including:
    a. Wetlands, and
    b. Katy Prairie.

TABLE 4-27
SUMMARY OF CUMULATIVE EFFECTS

Resource	2001 AOI	Impact Type						Difference Between No-Build and Build Alternatives[1]
		Direct		Indirect 2025		Cumulative 2025		
		No-Build	Build	No-Build	Build	No-Build[1]	Build[2]	
Open Water (acres)	4,607	0	4	0	27	1,857	1,884	27
Developed (acres)	146,271	0	204	0	722	283,481	294,132	722
Barren (acres)	5,740	0	10	0	40	3,442	3,482	40
Forested (acres)	150,025	0	793	0	4,360	104,686	109,046	4,360
Scrub/Shrub (acres)	33,528	0	107	0	1,573	23,407	24,980	1,573
Grassland/Herbaceous (acres)	28,409	0	113	0	1,041	19,296	20,337	1,041
Herbaceous Planted/ Cultivated (acres)	169,463	0	1,135	0	2,787	107,817	110,604	2,787
Wetlands (acres)	66,098	0	298	0	823	22,977	23,800	823
Katy Prairie (acres)	148,198	0	1,133	0	2,829	68,382	71,211	2,829
MSAT (tons/year)	1,516	0	10.2	0	6.7	291	297	6

Notes: [1] The Cumulative No-Build Alternative would include the Direct Build Alternative's acreage due to development even without the proposed project.

[2] The 2025 Build Alternative's cumulative impacts include direct and indirect effects.

Source: Study Team, 2006

The Grand Parkway AOI is undergoing rapid population and employment growth. The 2 percent (11,373 acres) difference between the No-Build and Build Alternatives indirect land use impacts indicates that this growth is anticipated to continue through the year 2025 and beyond under the No-Build Alternative regardless of when or if the Grand Parkway is constructed. However, the Build Alternative will compliment and reinforce the development pattern and effects. The subdivisions discussed (Table 4-19) are already planned and/or under construction. The Grand Parkway may affect the dispersion pattern of growth. Local and regional government agencies continue to plan for this growth and have adopted various land use and transportation plans for the area such as the 2035 RTP. The Grand Parkway Segments E, F-1, F-2, and G, combined with other local/regional development efforts, would serve to accommodate growth and development, either present or planned. In addition, a number of regulatory mechanisms are in place to offset or minimize the adverse effects of social and economic growth (e.g., the ESA [Endangered Species Act], Section 404 permitting processes, and Clean Air Act requirements).

The objective of this CEA was to evaluate land use and corresponding environmental effects against the No-Build and Build Alternatives by using field reconnaissance, agency and public interaction, past and present aerial photography, Draft NLCD 2001 land use, and an Expert Panel to allocate future land use. From these allocations, the expected annual growth rate of the No-Build (3.02 percent) and the Build (3.73 percent) imply that the Grand Parkway, Segments E, F-1, F-2, and G, would have a minor cumulative effect to the rapidly growing AOI.

SECTION 5: AGENCY AND PUBLIC COORDINATION

FHWA, TxDOT, and the GPA have engaged governmental agencies and the public in an extensive coordination effort to both inform others of progress in the planning process and solicit input from them. The Grand Parkway project has been open to comments by any person and all views on the scope of the proposed project, alternative actions, environmental impacts, and any other matter concerning the proposed Grand Parkway. FHWA, TxDOT, and the GPA have considered all comments to date and will continue to consider all comments in its planning process into the future.

The Study Team documented the public and agency coordination process. The following items are included at the end of this section:

- Notices of Intent;
- Response to Segment E Scoping, 1993;
- Resource Agency Coordination – meeting agendas, sign-in sheets, and minutes presented in chronological order ;
- Preliminary Public Workshops, August 1999 – materials, comment form, and summaries of comments received;
- Public Scoping Meetings, February 2000 – materials, comment form, and summaries of comments received; and
- Public Workshops, October 2000 – materials, comment form, and summaries of comments received.

Note: The materials included herein span all agency and public coordination conducted for Segments E, F-1, F-2, and G. All public and agency meetings were open to comments on all segments, regardless of location or venue. Comments regarding one study area could have been submitted during the meetings held in other study areas.

In addition, Volume IV of the FEIS includes materials specifically related to the Public Hearing conducted for an individual segment of the Grand Parkway.

5.1 NOTICE OF INTENT (NOI)

TxDOT and FHWA filed an NOI to prepare and consider an EIS for Segment E of the Grand Parkway on August 3, 1993. The NOI was published in the *Federal Register* on August 12, 1993 and in the *Texas Register* on August 13, 1993. The NOI was mailed to agencies, government organizations, landowners, and other individuals. Notification to the public was published in the *Houston Chronicle* on August 24 and September 13, 1993; the *Katy Times* on August 25 and September 12, 1993; and the *Houston Post* on August 24 and September 13, 1993.

For Segments F-1, F-2, and G, NOIs were issued December 23, 1999 and published in the *Federal Register* on January 5, 2000, as well as the *Texas Register* on January 21, 2000. Notification to the public was published in the *Houston Chronicle* on December 29, 1999. Copies of the NOIs are included at the end of this section.

5.2 SCOPING AND CORRIDOR STUDY

Scoping involved the early and open process for determining the scope of issues to be addressed and for identifying the issues related to the Grand Parkway. A Preferred Alternative Corridor was identified through an interdisciplinary approach involving active agency participation and an outreach program. The scoping and outreach process included the involvement and participation of the public, local officials, resource agencies, and other interested parties. The following summarizes efforts for scoping and the corridor study phase of Segments E, F-1, F-2, and G of the Grand Parkway.

5.2.1 Public Involvement

The public was directly involved in the development of a Preferred Alternative Corridor for the Grand Parkway Segments E, F-1, F-2, and G. Comments provided and questionnaires completed at the August 1999 and February 2000 meetings were used in combination with comments from local officials and resource agencies to develop a Preferred Alternative Corridor.

5.2.1.1 September 1993

After issuance of the Segment E NOI, a Public Scoping Meeting was held on September 23, 1993 at Katy High School in Katy, Texas. Both oral and written comments were received covering a wide variety of topics broadly categorized as physical environment issues, biological issues, and socioeconomic issues. A list of concerns is included in a project memorandum dated November 17, 1993, presented at the end of this section.

5.2.1.2 August 1999

Prior to issuance of the NOIs for Segments F-1, F-2, and G in December 1999, a series of three Public Workshops were held in August 1999. Since environmental documentation for Segment E had not progressed since the NOI in 1993, these workshops also included discussion of the Segment E study area between IH 10 and US 290. The workshops were advertised in local newspapers. Details regarding their dates and locations are presented in Table 5-1.

TABLE 5-1
PUBLIC WORKSHOPS, AUGUST 1999

Date	Segment	Location of Meeting
August 18, 1999	Segment F-1	Tomball College, 30555 Tomball Parkway (SH 249), Tomball
August 18, 1999	Segment F-2	Tomball College, 30555 Tomball Parkway (SH 249), Tomball
August 24, 1999	Segment E	Langham Creek High School, 17610 FM 529, Houston
August 26, 1999	Segment G	Kingwood College, 20000 Kingwood Drive, Kingwood

Source: Study Team, 1999

Over the course of all three meetings, 70 citizens attended the August 1999 Workshops, where a video presented an explanation of the study approach and project schedule. Aerial photomaps of the study area were available for review, and Study Team members were available to answer questions and take comments. Citizens were asked to complete a

questionnaire regarding their viewpoints on existing traffic congestion and expected usage of the Grand Parkway, if constructed. Table 5-2 presents a portion of the questionnaire results, as summarized over all three meetings. Of those who attended, 55 citizens completed questionnaires. The entire list of questions and results from the four meetings can be found at the end of this section.

TABLE 5-2
OPINIONS ON GRAND PARKWAY USAGE COLLECTED DURING AUGUST 1999 PUBLIC WORKSHOPS

Comment	Public Response				
To relieve existing traffic congestion, Segments E, F and G are:	Greatly Needed 43%	Needed 26%	Somewhat Needed 7%	Not Needed 24%	
To relieve future traffic congestion, Segments E, F and G are:	Greatly Needed 47%	Needed 23%	Somewhat Needed 9%	Not Needed 21%	
Segments E, F, and G would improve my travel time to:	Work 20%	Schools 5%	Shopping Areas 20%	Visit Friends 31%	Visit Relatives 24%

Note: 55 of the 70 attending citizens completed questionnaires.
Source: Comments received from August 1999 Workshops

Citizen concerns and/or comments regarding the proposed project focused on impacts to Spring Creek, Cypress Creek, and San Jacinto River floodplain; loss of wetlands, wildlife resources and their habitat; impacts to the Katy Prairie; the proposed highway's proximity to and loss of property; potential routing around Hooks Airport; increase in traffic and pollution; desire for a roadway with less curves; suggestion of setting aside local natural areas for mitigation; lack of need for a highway; population growth's requiring new transportation facilities; desire for expedited construction schedule; and request that the Grand Parkway not be a toll road.

5.2.1.3 February 2000

After the NOIs for Segments F-1, F-2, and G were issued, a series of formal Public Scoping Meetings took place in February 2000. Scoping for Segment E was readdressed at this time as well. Details regarding the dates and locations of these workshops are provided in Table 5-3.

TABLE 5-3
PUBLIC SCOPING MEETINGS, FEBRUARY 2000

Date	Segment	Location of Meeting
February 1, 2000	Segment E	Langham Creek High School, 17610 FM 529, Houston
February 2, 2000	Segment F-1	Tomball College, 30555 Tomball Parkway (SH 249), Tomball
February 2, 2000	Segment F-2	Tomball College, 30555 Tomball Parkway (SH 249), Tomball
February 3, 2000	Segment G	Kingwood College, 20000 Kingwood Drive, Kingwood

Source: Study Team, 2000

The Public Scoping Meetings were held to inform the public about the proposed project, discuss alternatives, and receive public input on any issues or concerns associated with the location of the project. The meetings consisted of an initial

public workshop and a formal question-and-answer period. A video summarized the history of the project and explained the information being presented at the workshop. The presentation also reviewed the project schedule, environmental issues, and the public involvement process. Preliminary corridor alternatives were shown on detailed aerial photomaps of the study area. Study Team members were available to answer questions and take comments.

Over the course of the three-day period, 134 citizens attended the meetings. Citizens were asked to complete a questionnaire regarding their viewpoints on existing traffic congestion, expected need for and purpose of the Grand Parkway, and which corridor, if any, they preferred in each reach of the project. Of those who attended, 67 completed questionnaires. Table 5-4 presents the choice of Preferred Alternative Corridor by the attendees. At this time, only Corridor options A, B and C had been developed.

TABLE 5-4
PREFERRED ALTERNATIVE CORRIDOR BY REACH IDENTIFIED BY FEBRUARY 2000 WORKSHOP PARTICIPANTS

Corridor	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7
A	16%	17%	16%	20%	34%	39%	36%
B	53%	49%	47%	40%	36%	22%	30%
C	31%	34%	37%	40%	30%	39%	34%

Note: 67 of the 134 attending citizens completed questionnaires.
Source: Comments received from February 2000 Workshops

Citizens provided comments on the project both at the workshop and through the mail. Citizens supporting construction of the Grand Parkway cited a need for the facility due to heavy development; time savings for trips to work, school, or shopping; and diversion of trucks and other traffic from existing congested roadways in Houston. Others noted that the Grand Parkway is vital to continued economic growth. Reasons cited for supporting the No-Build Alternative included concern for continued urban sprawl, air quality issues, and impacts to wetlands, riparian habitat, and wildlife species. A copy of the notice for these workshops, the questionnaire provided to meeting attendees, and a summary of the questionnaire responses from all three meetings are provided at the end of this section.

5.2.2 Local Official Involvement

5.2.2.1 August 1999

On August 18, 1999, a meeting was conducted to initiate coordination with local officials and provide an overview of the study process being implemented for Segments E, F-1, F-2, and G. Table 5-5 provides a list of attendees and their affiliation. At the meeting, a public education video summarizing the project for the upcoming public workshops was screened. Discussion focused primarily on socioeconomic issues and issues of procedure for the environmental documentation. Comments from this meeting were used in combination with public and resource agency comments to determine a Preferred Alternative Corridor for Segments E, F-1, F-2, and G of the Grand Parkway.

TABLE 5-5
LOCAL OFFICIALS/ORGANIZATIONS MEETING, AUGUST 1999 AND OCTOBER 2000

Name	Affiliation
Peter R. McStravick	Tomball Area Chamber of Commerce - Mobility and Transportation Committee
Brad Brown	Grand Parkway Subcommittee
Kent McLemore	Houston Airport System
Warren Driver	City Manager of Tomball
Carol Sigler	Representative Paul Hilbert
Clayne Stouall	City Council of Tomball
Bruce Hillegeist	Tomball Area Chamber of Commerce
James Jackson	Port of Houston Authority
Paul Hawkins	Precinct 3, Harris County
Mary Schneider	U.S. Senator Kay Bailey Hutchison
Rose Hernandez	Judge Eckels
Ed Shackelford	Precinct Engineer, Harris County, Precinct 4
Senator Jon Lindsay	Senator, North Houston Association (NHA)
Catherine Wray	NHA
John Jackson	City of Houston – Planning and Development
Anthony Tangwa	City of Houston – Planning and Development
Joe Crabb	State Representative
Lisa Gonzales	Engineering Manager – Harris County Toll Road Authority (HCTRA)
Kristen Bishop	H-GAC
Art Salinas	Montgomery County, Precinct 3, Ed Chance

Source: Sign-In Sheet from August 1999 and October 2000

5.2.3 Resource Agency Involvement

Coordination with various agencies indicated that a number of issues needed to be addressed before identification of a Preferred Alternative Corridor. These issues included identification of remnant prairie elements, forested wetlands and forested floodplains, potential wetland mitigation sites, and state plant species of special concern. These issues were addressed through photo-interpretation, coordination with resource agency representatives, and/or meetings with proposed land developers and city and county officials. The corridor resource inventory was revised, recalculated, and reviewed with the TPWD, USACE, and USFWS (Volume I, Section 2, Table 2-1 [Corridor Resources Inventory for Segments E, F-1, F-2, and G]).

In response to comments received during the public outreach program, a partial corridor, Corridor CB, was developed to avoid remnant prairie topography that is potential habitat for the federally protected Texas prairie dawn species, and to avoid areas that were targeted for development in the following three to five years. Corridor D, a new full-length corridor, was also developed. Corridor D consisted of portions of Corridors A, B, and C as well as five areas where shifts were

made to avoid or minimize potential impacts. Copies of agendas and minutes from resource agency scoping and corridor study meetings for Segments E, F-1, F-2, and G are found at the end of this section.

5.2.3.1 July 1993

In July 1993, TxDOT sent federal and state resource agencies a revised report entitled, "Environmental Overview - Grand Parkway (SH 99)" and a letter requesting input on early evaluation of potential effects of Segment E. Copies of the response letters are included at the end of this section. The following agencies provided written responses to the request for input:

- Department of the Army, Galveston District, USACE;
- U.S. Department of the Interior, Bureau of Mines; and
- U.S. Department of the Interior, USFWS.

5.2.3.2 August 1999

On August 18, 1999, a meeting was conducted at the GPA offices with resource agency representatives, listed in Table 5-6. The meeting was conducted to initiate agency coordination, to review the study process for Segments E, F-1, F-2, and G, and to solicit comments and suggestions from agencies on the issues and useful methodologies for addressing the issues. The Study Team requested feedback from the agencies on resources to be studied in the corridor study. Although not all resource categories and specifics of study methods were discussed, the group reached a general consensus on the following topic areas:

- **Wetlands:** NWI wetlands, supplemented with aerial photo interpretation, would be appropriate for the corridor study. Delineations would be conducted, with right-of-entry, for wetlands within the alternative alignments.
- **Non-Regulatory Impacts:** Route studies should not be solely based on regulatory issues and mitigation costs, but should also consider non-regulatory impacts and avoidance and minimization of those impacts. Mitigation of non-regulatory resources such as upland habitats should be considered and possibly included in mitigation planning for regulatory resources. In this category of non-regulated resources are large expanses of contiguous habitat, such as prairies, bottomland hardwoods, and forests. It was agreed that the Study Team would prepare a land cover map of these resources for use in the corridor and alignment studies and review it with the agency representatives.
- **Resource Maps:** The Study Team would also distribute current project area mapping for attendees to identify any known areas of importance. It was agreed that these could be turned around within one month of receipt from the Study Team.
- **NEPA/Section 404 Joint Processing:** The Study Team noted that the Study Team may employ an integrated NEPA/404 process for the project and as such, it is important that early studies, like the corridor review, satisfy the Section 404(b)(1) guidelines. A USACE representative noted that the study process presented by the Study Team appeared to satisfy the intent of the guidelines.

On August 26, 1999, a meeting was conducted at the GPA offices with resource agency representatives, listed in Table 5-6. The meeting was conducted to discuss on-going project coordination in general, agency involvement in data collection, and TPWD's role in Section 404 permitting

Agency involvement in data collection was discussed. All concurred to the importance of agency involvement and cooperation early in the project and prior to the typical regulatory and permitting phase. As part of this early coordination, the TPWD representatives agreed to provide available environmental inventory data 30 days following written request by the GPA. TPWD representatives agreed to assist in identifying agency specific as well as general environmental issues that should be considered in the analysis.

5.2.3.3 February 2000

On February 2, 2000, resource agencies met to conduct project scoping and review the corridor alternatives. Table 5-6 lists the attendees of this meeting. Principal issues addressed included the mapping of prairie and bottomland hardwoods, prior converted croplands, and general coordination procedures.

On February 24, 2000, a USACE Coordination Meeting was conducted at the USACE office. Attendees of this meeting are listed in Table 5-6. It was announced that the FHWA would send a letter requesting that the USACE participate in the DEISs as a "Cooperating Agency." Additionally, principal issues addressed included bottomland hardwoods and preliminary preferences for corridor selection in each reach.

On February 24, a USACE Coordination Meeting took place at the Clear Lake USFWS office. Attendees of this meeting are listed in Table 5-6. Principal issues addressed included mitigation sites and conservation of high quality habitat, indirect impacts, riparian corridors, the NEPA/404 process, Texas prairie dawn, and preliminary preferences for corridor selection in each reach.

TABLE 5-6
FORMAL AGENCY MEETINGS DURING THE SCOPING AND CORRIDOR STUDY

Date	Location	Attendees
August 18, 1999	GPA's Offices	TPWD, USACE, TCEQ, General Land Office (GLO), TxDOT, FHWA, GPA, Michael Baker, Jr., PBS&J, and Brown and Gay Engineers
August 26, 1999	GPA's Offices	TPWD, USFWS, TxDOT, GPA, Michael Baker, Jr., PBS&J, and Brown and Gay Engineers
February 2, 2000	Tomball College	TPWD, USACE, NRCS, FHWA, TxDOT, GPA, Michael Baker, Jr., PBS&J, and Brown and Gay Engineers
February 24, 2000	USACE – Galveston District Office	USACE, FHWA, TxDOT, GPA, Michael Baker, Jr., and PBS&J
February 24, 2000	USFWS – Clear Lake Office	USFWS, GPA, Michael Baker, Jr., PBS&J, and Brown and Gay Engineers

Source: Sign-In Sheets from Scoping and Corridor Study Meetings

5.2.3.4 Additional Coordination

Following the February outreach period, meetings were held with TPWD, USACE, and USFWS and comments were provided by the agencies (Table 2-2 of this volume). The Study Team then met with TxDOT and FHWA officials to discuss the process followed during the corridor study, issues considered, comments received, and the recommendation for the Preferred Alternative Corridor.

5.2.3.5 Preferred Alternative Corridor Recommendation

Results of the resource inventory analysis and public and agency coordination led to the development and selection of Corridor D as the Preferred Alternative Corridor (Exhibit G–14). Therefore, Corridor D was carried forward for the alignment study for Segments E, F-1, F-2, and G.

5.3 ALIGNMENT STUDY

Alternative alignments were developed within the selected corridor to fulfill the need for and purpose of the project and minimize potential environmental impacts. The corridor-level data, supplemented with field-collected data, were used as a guide to determine the alignments that provide the best opportunity to avoid and minimize adverse environmental effects. The following section summarizes outreach efforts conducted during the alignment study phase of Segments E, F-1, F-2, and G.

5.3.1 Public Involvement

5.3.1.1 October 2000

During the preparation of the DEISs, public workshops were conducted in October 2000. The purpose of the workshops was to update the public on the project progress and to receive comments on the environmental inventory and preliminary alternative alignments. The workshops were advertised in local newspapers, including the *Houston Chronicle* on September 22 and October 13, 2000. Details regarding the dates and locations of these workshops are provided in Table 5-7. Materials related to these public workshops, including a summary of responses to questionnaires from all three meetings, can be found at the end of this section.

TABLE 5-7
PUBLIC WORKSHOPS, OCTOBER 2000

Date	Segment	Location of Meeting
October 23, 2000	Segment E	Langham Creek High School, 17610 FM 529, Houston
October 25, 2000	Segment F-1	Tomball College, 30555 Tomball Parkway (SH 249), Tomball
October 25, 2000	Segment F-2	Tomball College, 30555 Tomball Parkway (SH 249), Tomball
October 26, 2000	Segment G	Kingwood College, 20000 Kingwood Drive, Kingwood

Source: Study Team, 2000

The objectives of the workshops were to present preliminary alternative alignments and to obtain citizens' opinions on the overall study and any additional issues that should be evaluated in the DEIS prepared for each segment. A video presentation summarized the project progress to date and explained information being presented at the workshop. Preliminary alternative alignments were shown on detailed aerial photographs. Study Team members were available to answer questions and take comments.

In total, 287 citizens attended the workshops over the three-day period. Citizens were asked to complete a questionnaire regarding their viewpoints on existing traffic congestion, expected need for and usage of the Grand Parkway, and which alternative alignment they preferred in each reach of the project. Of those who attended, 125 completed questionnaires. Table 5-8 shows a summary of the preliminary alternative alignment preferences.

TABLE 5-8
PRELIMINARY PREFERRED ALTERNATIVE ALIGNMENT BY REACH IDENTIFIED BY OCTOBER 2000 WORKSHOP PARTICIPANTS

Alternative Alignment	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Reach 8	Reach 9	Reach 10	Reach 11	Reach 12
A	50%	55%	59%	24%	34%	48%	50%	58%	32%	32%	57%	56%
B	35%	36%	28%	49%	56%	14%	21%	27%	35%	39%	26%	32%
C	15%	9%	13%	27%	10%	39%	29%	16%	32%	29%	17%	12%

Note: 125 of the 287 attending citizens completed questionnaires. Shading indicates alternative preferred by the highest number of respondents. While there were seven reaches for the corridor study, there were twelve reaches for the alignment study.
Source: Comments received from October 2000 Workshops

Citizens provided comments on the project both at the workshop and through the mail. Citizens supporting construction of the Grand Parkway cited a need for the facility due to heavy development; time savings for trips to work, school, or shopping; and diversion of trucks and other traffic from existing congested roadways in Houston. Others noted that the Grand Parkway is vital to continued economic growth. Reasons cited for supporting the No-Build Alternative included concern for continued urban sprawl, air quality issues, and impacts to wetlands, riparian habitat, and wildlife species.

5.3.1.2 March 2001

A special Town Hall Meeting was held in the spring on March 15, 2001 to discuss alignment selection within Segment F-2. The meeting was arranged by "Citizens for Construction of the Grand Parkway Along the Historical Alignment" and sponsored by the Spring Tabernacle Church, where the meeting was conducted. The GPA fulfilled a request to participate in a town hall meeting. The public was notified of the meeting by mail and word-of-mouth. The estimated attendance ranged between 750 and 1,000 people (available sign-in sheets were quickly filled by over 400 attendees).

The format of the meeting was a panel discussion and open forum for fielding questions from the attending citizens. The topic of discussion was the on-going study of alternative alignments located specifically within Reach 7 of Segment F-2.

A representative of the GPA sat on the panel and provided a summary of the project, reviewing the need for and purpose of the project, the anticipated schedule, status of environmental studies, and the three preliminary alternative alignments as of March 2001.

Comments of the public focused on socioeconomic concerns with the preliminary alternative alignments. For instance, there was concern voiced for increases in crime, light and noise, changes in property values, impacts to school and bus routes, and fire department response times. Many comments related to the desire for inclusion of the "Historic Route" as one of the alignment alternatives.

Based on public input from the Town Hall Meeting, Alternative Alignment D, which closely follows the "Historical Alignment" of the Grand Parkway, was added in Reaches 7 and 8 of the Segment F-2 Preferred Alternative Corridor. Alternative Alignment E was created as an alternative to Alignment D due to increasing encroachment from economic development. These new alignments required a realignment of Union Pacific Railroad (UPRR) tracks and costs for these modifications were included with Alternative Alignments D and E in Reaches 7 and 8 of Segment F-2. The inclusion of the two new alignments was deemed necessary after evaluating public opinion and project specifications.

5.3.1.3 DEIS Public Hearings

For each of the Segments E, F-1, F-2, and G, a DEIS has been released. Table 5-9 presents a synopsis of the Public Hearings that have taken place after the release of DEISs related to these four segments of the Grand Parkway. Details regarding the Public Hearing for an individual segment are presented in Volume II, Section 6 (Agency and Public Coordination) and Volume IV, Section 1.

TABLE 5-9
DEIS PUBLIC HEARINGS

Segment	Date(s)	Location(s)
E	March 25, 2003	Thornton Middle School in Katy
F-1	November 18, 2003	Salem Lutheran Church in Tomball
F-2	March 23, 2004 June 10, 2004	Believer's Fellowship in Spring M.O. Campbell Educational Center in Houston
F-2 (Revised DEIS hearings)	July 11 and July 12, 2006	Klein Collins High School in Spring
G	March 7, 2007 March 8, 2007	Oak Ridge High School in Conroe New Caney High School 9th Grade Campus in Porter

Source: Study Team, 2007

5.3.2 Local Official Involvement

5.3.2.1 October 2000

On October 26, 2000, local officials were given a separate opportunity to view the preliminary alternative alignments for Segments E, F-1, F-2, and G and provide feedback. The meeting was held at Kingwood College, 20000 Kingwood Drive, Kingwood. The meeting consisted of a video screening and discussion of the alternative alignments. Table 5-5 provides a list of the twenty attendees and their organizational affiliation.

TABLE 5-10
LOCAL OFFICIALS/ORGANIZATIONS MEETING, OCTOBER 26, 2000

Name	Affiliation
Peter R. McStravick	Tomball Area Chamber of Commerce - Mobility and Transportation Committee
Brad Brown	Grand Parkway Subcommittee
Kent McLemore	Houston Airport System
Warren Driver	City Manager of Tomball
Carol Sigler	Representative Paul Hilbert
Clayne Stouall	City Council of Tomball
Bruce Hillegeist	Tomball Area Chamber of Commerce
James Jackson	Port of Houston Authority
Paul Hawkins	Precinct 3, Harris County
Mary Schneider	U.S. Senator Kay Bailey Hutchison
Rose Hernandez	Judge Eckels
Ed Shackelford	Precinct Engineer, Harris County, Precinct 4
Senator Jon Lindsay	Senator Jon Lindsay
Catherine Wray	NHA
John Jackson	City of Houston – Planning and Development
Anthony Tangwa	City of Houston – Planning and Development
Joe Crabb	State Representative
Lisa Gonzales	Engineering Manager – HCTRA
Kristen Bishop	H-GAC
Art Salinas	Montgomery County, Precinct 3, Ed Chance

Source: Sign-In Sheet from October 2000

5.3.3 Resource Agency Involvement

During the preparation of the DEISs, numerous meetings were held with resource agencies in order to address specific concerns and to provide updates on the study process. Dates, locations, and attendees of these meetings are listed in Table 5-11, and further detail is provided in the following sections. Copies of the agendas and minutes from resource agency alignment study meetings for Segments E, F-1, F-2, and G are found at the end of this section.

TABLE 5-11
FORMAL AGENCY MEETINGS DURING THE ALIGNMENT STUDY

Date	Location	Attendees
March 3, 2000	TPWD – Clear Lake Office	TPWD, FHWA, GPA, Michael Baker Jr., and PBS&J
March 3, 2000	USFWS – Clear Lake Office	USFWS, FHWA, GPA, Michael Baker Jr., and PBS&J
November 6, 2000	EPA – Dallas Office	EPA, FHWA, TxDOT, GPA, H-GAC and PBS&J
April 10, 2001	GPA – Houston Office	USACE, FHWA, TxDOT, GPA, Michael Baker Jr., and PBS&J
May 23, 2001	USACE- Galveston Office (Joint Evaluation Meeting)	USFWS, USACE, GLO, TCEQ, EPA, NMFS, GPA, Michael Baker Jr., PBS&J, and Brown and Gay Engineers
June 14, 2001	Michael Baker Jr., Inc.	TPWD, USFWS, USACE, GLO, TCEQ, FHWA, TxDOT, GPA, Michael Baker Jr., PBS&J, and Brown and Gay Engineers
July 17, 2001	EPA – Dallas Office	EPA, FHWA, TxDOT, GPA, Michael Baker Jr., and PBS&J
July 31, 2001	Michael Baker Jr., Inc.	TPWD, USFWS, USACE, GPA, Michael Baker Jr., and PBS&J
October 1, 2001	GPA – Houston Office	TPWD, USFWS, TxDOT, GPA, Michael Baker Jr., and PBS&J
February 8, 2002	TxDOT ENV – Austin Office	EPA, FHWA, TxDOT, GPA, Michael Baker Jr.
March 27, 2002	EPA – Dallas Office	EPA, GPA, Michael Baker Jr.

Source: Study Team, 2002

5.3.3.1 U.S. Environmental Protection Agency (EPA)

Throughout the alternative alignment study process, meetings have been held specifically with members of the EPA at the EPA Region 6 office in Dallas. On November 6, 2000, the Study Team provided an overview of the project's progress, the status of the EIS, and the mapping of environmental constraints. On July 17, 2001, an overview of the same issues was provided to EPA, and the organization of the EIS documents was explained and discussed (i.e., the multi-volume approach). Further discussion focused on reviewing methodologies for data collection, indirect and cumulative effects, and mitigation options. On February 8 and March 27, 2002, the Study Team again provided EPA with updates on the project progress, status of the EIS, and document organization. At all meetings, the Study Team fielded any questions or concerns the agency had regarding the process, methodologies, or other issues.

5.3.3.2 U.S. Army Corps of Engineers (USACE)

An additional meeting was held specifically with the USACE to provide an update on the project's progress and to present the status of the EIS, including a review of the multi-volume approach for Segments E, F-1, F-2, and G. The meeting took place on April 10, 2001 and was conducted at the GPA office in Houston. In addition to the issues listed previously, discussion focused on the calculation of wetland impacts and the selection of a Recommended Alternative Alignment.

5.3.3.3 Additional Resource Agency Meetings

On May 23, 2001, members of the Study Team met with several agency representatives (see Table 5-11) for a Joint Evaluation Meeting at the USACE, Galveston District office. Topics discussed included: a review of the project to date

and of the EIS status and schedule, explanation of the EIS organization, the traffic study, air quality impacts, and demographics.

On June 14, 2001, a meeting (18 attendees) with resource agencies took place at the Michael Baker Jr., Inc. office in Houston. The meeting began with a bus tour of the project area. A bound workbook entitled, "Summary and Status of the Grand Parkway Segments E, F-1, F-2 and G" was provided to each attendee. In addition to general review of the project, the principal issues discussed included: wetlands, threatened and endangered species, selection of a Recommended Alternative Alignment, and potential mitigation.

State and federal resource agencies were invited to participate in a field tour and discussion on the preliminary alignments throughout the project area on July 31, 2001. This meeting began with a drive-through of the project area and concluded at the Michael Baker Jr., Inc. office. In addition to general review of the project, the principal issues discussed at this meeting included: methodology in determining bottomland hardwoods and riparian forest; potential impacts to wildlife and wetlands; Lake Houston Park; hydrologic studies; selection of a Recommended Alternative Alignment; and mitigation. After the July 31st meeting, the Study Team in coordination with the resource agencies identified bottomland hardwoods and riparian forest within the project area of Segments E, F-1, F-2, and G. Appendix B contains a TxDOT letter (August 30, 2001) that discusses TxDOT's commitment to developing Segment G, and the possible future development of Segment H, without disrupting the continuity of Lake Houston Park.

On October 1, 2001, a meeting with resource agencies took place at the GPA office. A map identifying the locations of the bottomland hardwoods and riparian forest within the project area was distributed to all the attendees. After reviewing and approving the map, the other topics discussed included selection of preliminary alignments, and threatened and endangered species.

5.4 ADDITIONAL COORDINATION

5.4.1 Expert Panel

Early in the study process, the Study Team recognized the need to involve not only the public and resource agencies as described previously, but also knowledgeable Houston citizens with first hand experience in planning and/or development in the government, education, and private sectors. Consequently, an Expert Panel was assembled, drawing from a large professional base able to assist the Study Team. Names and organizational affiliations of the Expert Panel are provided in Table 4-1 of this volume. Meetings of the Expert Panel were held on the following dates: January 18, 2000; March 1, 2000; May 3, 2000; and June 14, 2000, at the GPA offices. Participants at one or more of the meetings included H-GAC, Houston Planning Commission, city of Houston, Cy-Fair ISD, Harris County Planning and Development, Harris County Engineering Department/Park Planning, Harris County Public Infrastructure Department, Woodlands Operating Company, American Metro Study, North Harris Montgomery Community College District, Harris County Precinct 3, Harris County Precinct 4, HCFCD, TxDOT, and FHWA. Although the Expert Panel initially convened in 2000 to address the land use

issues, members of the Study Team have continued to coordinate with members of the panel or the organizations they represent to regularly update information.

5.4.2 Community Groups

The GPA has coordinated extensively with community groups with an interest in the Grand Parkway project. The GPA accepted all invitations to speak to any group or organization concerning the Grand Parkway project. These community groups, listed in Table 5-12, were provided presentations that typically include the history of the Grand Parkway project, the general status of all segments of the Grand Parkway, and specific information about their particular area and interests. Through 2007, over 170 meetings were held with homeowner associations, the media, and other community groups.

The presentations last approximately 10 to 20 minutes and then are followed by a question and answer period. Handouts may be given to the participants, including schedules, maps, and/or contact information. The level of detailed information is dependent on what stage the process is currently undergoing. The presentations are updated at the time of each request to reflect the most current information. The GPA and the Study Team have also been responsive in providing information for other public media and community newsletters.

TABLE 5-12
COMMUNITY GROUPS

Home Owner Associations (HOAs)/ Residential Subdivisions	Presentation Date
Bridgestone HOA or MUD	3/15/2001*, 6/12/2001, 7/9/2001, 5/25/2005**
Candle Light	3/15/2001*
Dove Meadows	3/15/2001*, 6/25/2001
Fairfield Village	11/4/2002, 5/28/2003
Five Oaks	3/15/2001*
Forest North	6/5/2000, 3/15/2001*, 5/25/2005**
Fox Hollow West	5/25/2005**
Fox Run	3/15/2001*, 4/2/2001, 4/19/2001
Gleannloch Farms	12/6/2000, 11/4/2002, 5/13/2004, 5/24/2004, 6/16/2004
Grayson	1/17/2003
Greengate Acres	3/15/2001*
Hampton Oaks	3/15/2001*
Hannover Forest	3/15/2001*
Londonderry	3/15/2001*
Mossy Oaks	3/15/2001*, 5/25/2005**
Normandy Forest	3/15/2001*
Northampton HOA or MUD	3/15/2001*, 5/24/2001, 6/5/2001, 6/14/2001, 1/21/2003, 5/13/2004
Northgate Crossing	12/6/1999, 3/15/2001*, 9/13/2001, 6/25/2002

TABLE 5-12 (CONT.)
COMMUNITY GROUPS

Home Owner Associations (HOAs)/ Residential Subdivisions	Presentation Date
Northwood Park	3/15/2001*
Spring Creek Oaks	3/15/2001*, 6/11/2001, 9/1/2004
Spring Stuebner Estates	3/15/2001*, 5/25/2005**
Willow Glen	10/25/2000, 11/9/2000, 5/25/2005**
Windrose (wrote article for HOA)	10/17/2001
Other Community Groups	**Presentation Date**
Amegy Bank Advisory Board	5/25/2005
American Metro Study Corporation	10/21/1999, 1/18/2000, 3/1/2000, 8/5/2004
Century 21 Executive Northwest	4/10/2001
City of Houston, Airport System	1/12/2000
Conroe Noon Lion's Club	9/6/2000
Continental Airlines	1/6/2000
CREN – Commercial Real Estate Network	6/3/2005
Cy-Fair Area Chamber of Commerce	4/1/1999, 6/1/2000, 11/7/2002
Cy-Fair Area Chamber of Commerce, Transportation Committee	11/7/2002, 11/3/2003
Excalibur Construction	3/29/2000
FM 1960 Forum Transportation Symposium	9/22/1999
Greater Houston Builders Association	3/6/2002, 9/22/2004
Hooks Airport	5/25/2001, 1/31/2002, 3/13/2002, 7/29/2002, 8/5/2002, 1/6/2003, 1/15/2004, 2/18/2004, 7/20/2004
Houston Association of Realtors Northwest	4/10/2002, 6/20/2002
Humble Area of Chamber of Commerce	3/11/2003, 5/20/2003, 2/14/2006
Katy Chamber of Commerce	11/18/2004
Katy Area Economic Development Corporation	4/19/2001, 5/5/2004, 11/9/2004
Katy Prairie Conservancy (KPC)	10/29/1993, 3/20/2000
Klein Bank Advisory Board, Transportation Forum	9/20/2000
Klein Methodist Church, Building Committee	11/30/2000, 5/12/2001
Klein Methodist Church, Men's Club	5/12/2001
Legacy Land Trust	7/22/2004, 9/1/2004
Lion's Club, Old Town Spring	7/20/2000
Midway Companies	2/16/2000
New Light Church	8/29/2002, 11/7/2002, 3/4/2004
North Houston Association (NHA)	8/18/1999, 12/20/1999, 7/16/2001, 2/22/2002, 10/30/2002, 1/22/2003, 2/26/2003, 1/4/2006
North Houston Chamber of Commerce	9/5/2000
Northwest Houston Chamber of Commerce	5/19/2004

TABLE 5-12 (CONT.)
COMMUNITY GROUPS

Other Community Groups	Presentation Date
Porter First Baptist Church, Senior Citizens Group	4/20/2005
River of Praise Church	11/6/2002, 2/5/2003, 3/2/2004, 8/26/2004, 9/9/2004
Sierra Club, Lone Star Chapter	7/24/2001
Society of American Mechanical Engineers	4/17/2002
Society of American Military Engineers	7/19/2000, 2/26/2002
South Montgomery County Woodlands Chamber of Commerce	10/28/1998, 7/12/2002, 7/15/2003, 6/15/2004, 2/21/2006
Spring Tabernacle Church	2/5/2001, 3/15/2001
Spring Volunteer Fire Department	5/3/2001
Tomball Area Chamber of Commerce and Transportation Committee	9/15/1998, 10/26/1998, 8/18/1999, 6/13/2000, 3/13/2001, 7/9/2002, 2/26/2003, 11/11/2003, 11/22/2003
United to Save Our Spring	7/26/2001, 8/23/2001, 10/25/2001
West Houston Association (WHA)/Transportation Committee	4/12/2000, 10/10/2001, 3/20/2003, 11/30/2005
Women's Council of Realtors	6/12/2002
Woodlands Operation Company, Mobility Team	2/17/1998, 10/19/1999, 1/18/2000, 3/1/2000, 11/1/2001
Woodlands Rotary Club	11/1/2001
Media	
1) 8/11/1999—Telephone interview with Graham Harvey of the *Conroe Courier*	
2) 3/9/2001—Interviewed by Kevin Green, Channel 13	
3) 3/12/2001—Telephone interview by Deborah Wrigley, Channel 13 News	
4) 3/16/2001—Radio talk show call-in	
5) 7/26/2001—Telephone interview with Doug Miller, Channel 11 News	
6) 7/30/2001—Interview with Kim Canon, *Houston Chronicle*, This Week reporter	
7) 8/10/2001—Interviewed by Eric Aikin of the *1960 Sun*	
8) 3/7/2002—Media interview with Dave Fehling, Channel 11 news reporter	
9) 3/4/2003—Telephone interview with David Schafer, *Houston Chronicle*; re: Segment E DEIS	
10) 3/17/2003—Telephone interview with Matthew Trana of the *Kingwood Observer*	
11) 11/6/2003—Met with Kim Canon of the *Houston Chronicle*	
12) 12/10/2003—Telephone media interview with Beth Kuhles of the *Houston Chronicle*	
13) 1/8/2004—Met with Brandon Moeller of the *Tomball Tribune News*	
14) 3/10/2004—Telephone interview with Kim Canon of the *Houston Chronicle*	
15) 3/11/2004—Telephone interview with Kim Canon of the *Houston Chronicle*	
16) 3/23/2004—In-house media interview with KHOU Channel 11 reporter Mike Zientek	
17) 6/7/2004—Attended North Houston Association Press Conference	
18) 6/10/2004—On-site media interview with Channel 2 news reporter Mary Benton	
19) 6/15/2004—Telephone media interview with Lauren Hutton of the *Conroe Courier*	
20) 7/1/2004—Telephone media interview with Kim Canon of the *Houston Chronicle*	

TABLE 5-12 (CONT.)
COMMUNITY GROUPS

Media
21) 8/10/2004—Telephone interview with Beth Kuhles of the *Houston Chronicle*
22) 10/4/2004—Media telephone interview with Kathy Parks of the *Observer* newspaper
23) 11/19/2004—Media telephone interview with Kathy Parks of the *Observer* newspaper; re: public relations with State Representative Debbie Riddle
24) 11/22/2004—Media telephone interview with Kathy Parks of the *Observer* newspaper; re: public relations with State Representative Debbie Riddle
25) 1/26/2005—Media telephone interview with Kim Jackson of the *Houston Chronicle*
26) 4/11/2005—In-house KHOU Channel 11 media interview with Carolyn Campbell.

Notes: * 3-15-2001—Presentation was made at the Spring Tabernacle Church. This meeting was arranged by the "Citizens for Construction of the Grand Parkway along the Historical Alignment," Segment F-2, Reach 7" led by Mr. David Eastwood. Estimated attendance was 750-1,000 citizens from the neighbor hoods indicated.
** 5/25/2005—Presentation was made at the Klein Collins High School. This meeting was arranged by local homeowners associations.
Source: Study Team, 2005

5.4.3 Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP)

The 2035 RTP and the 2008-2011 TIP identify the addition of toll facilities, including the Grand Parkway, as needed to address congestion and growth. The transportation needs identified during the development of the 2035 RTP and 2008-2011 TIP are consistent with those found by the Grand Parkway public outreach process. To define regional transportation needs, H-GAC conducted an extensive public involvement program to gather input from citizens, neighborhood and business groups, governmental bodies, and transportation agencies. Eight public meetings, including five with formal comment periods, were held before the 2008-2011 TIP was adopted.

The Grand Parkway Segments E, F-1, F-2, and G are included in the H-GAC's 2035 RTP and FY 2008-2011 TIP, as amended. On August 24, 2007, the H-GAC adopted the 2035 RTP and FY 2008-2011 TIP. USDOT (FHWA/FTA) found the 2035 RTP and 2008-2011 TIP to conform to the SIP on November 9, 2007.

Changes in modeled parameters between the 2025 RTP and the 2035 RTP (such as traffic volumes, population, employment, number of households, and vehicle miles traveled) have been evaluated to determine if any additional analysis is warranted before FHWA takes final environmental action. This evaluation confirmed that the changes in the modeled parameters were minor, and therefore no additional analysis is warranted. The analysis of 2025-2035 RTP modeled parameters can be found in the Administrative Record.

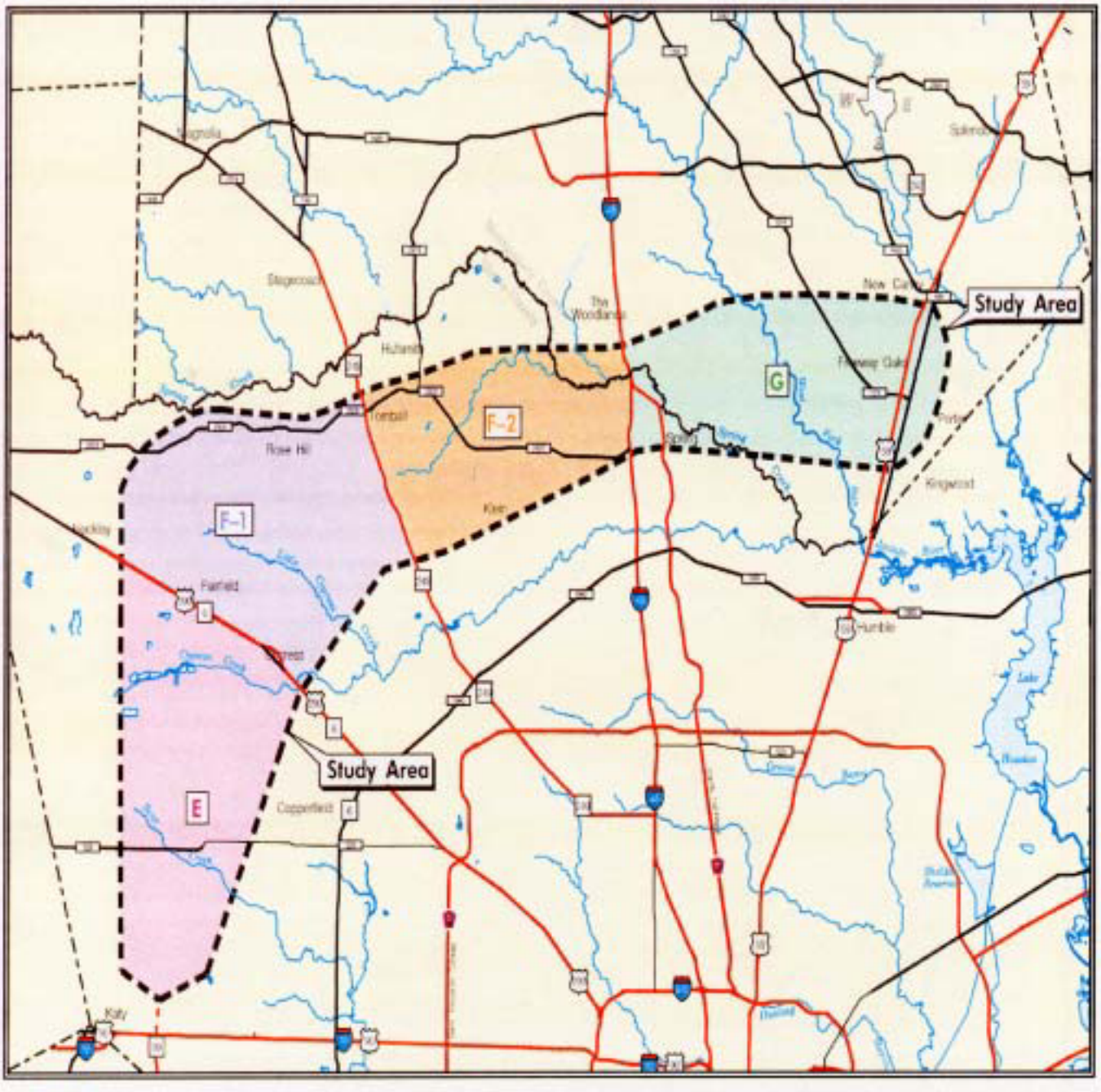
5.4.4 Website

The GPA website address is www.grandpky.com. The website is updated routinely with current news items, segment progress, and project materials. The website also includes a place for interested parties to register for the project mailing list.

The GPA maintains an open office concept that allows any individual to telephone or drop by the office to request information. Faxes and e-mails are used to transmit information. The GPA will also meet with anyone at his or her convenience at locations outside of the GPA office to answer questions, provide maps and detailed information, or to receive information. These contacts could include the general public, small groups or special interest organizations, agencies, or elected officials.

Notices of Intent

Grand Parkway
Segments E, F1, F2 and G
From IH-10 West to US 59 North



Texas Department of Transportation

The Grand Parkway Association

agencies, and to private organizations and citizens who have previously expressed or are known to have an interest in this project. After approval of the Draft EIS, public meetings will be held in the study area prior to public hearings. A formal scoping meeting will be scheduled later.

To ensure that the full range of issues related to this proposed action are addressed and all significant issues identified, comments and suggestions are invited from all interested parties.

Comments or questions concerning this proposed action and the EIS should be directed to the FHWA at the address provided above.

Issued on: August 5, 1993.

Dave Leighow,

Environment/Right-of-way Specialist.

[FR Doc. 93-19438 Filed 8-11-93; 8:45 am]

BILLING CODE 4910-22-M

Environmental Impact Statement: Harris County, TX

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Notice of intent.

SUMMARY: The FHWA is issuing this notice to advise the public that an environmental impact statement will be prepared for a proposed highway project in Harris County, Texas.

FOR FURTHER INFORMATION CONTACT: Mr. G.E. Olvera, 826 Federal Building, 300 East 8th Street, Austin, Texas 78701. Telephone: (512) 482-5516. Mr. Kenneth C. Bohuslav, P.E., Texas Department of Transportation, Division of Highway Design, 125 East 11th Street, Austin, Texas, 78701. Telephone: (512) 416-2606.

SUPPLEMENTARY INFORMATION: The FHWA, in cooperation with the Texas Department of Transportation (TxDOT) and the Grand Parkway Association, is considering an upgrade to the existing road network in Harris County. Under this proposed action, a limited access freeway (State Highway 99) will be constructed between IH 10 and US 290, a distance of approximately 14.7 miles. Ultimate construction will produce a six-lane facility with overpasses at major thoroughfares and direct connection ramps at US 290. The highway will be constructed on primarily donated right-of-way. The majority of this corridor crosses relatively undeveloped properties in western Harris County. Cities in the region include Katy and Houston.

The FHWA is considering funding participation for the proposed State Highway 99 to provide improved transportation characteristics in the region, including additional northbound capacity for hurricane evacuation. Reasonable alternative routes for Segment E of State Highway 99 will be evaluated in the draft EIS, including the no action alternative. Impacts caused by the construction and operation of State Highway 99 will vary according to the alternative alignment utilized.

Letters describing the proposed action and soliciting comments will be sent to appropriate federal, state, and local agencies, and to private organizations and citizens who have previously expressed interest or are reasonably expected to be interested in this proposal. A public scoping meeting will be held to explain the proposal and to offer an opportunity for the public and agencies to identify significant issues that should be focussed upon in the EIS. A public hearing will be held after the draft EIS is completed. Public notice will be given of the time and place of the scoping meeting and the public hearing. The Draft EIS will be available for public and agency review and comment prior to the public hearing.

To insure that the full range of issues related to this proposed action are addressed and significant issues identified, comments and suggestions are invited from interested parties. Comments or questions concerning this proposed action and the EIS should be directed to the FHWA at the address provided above.

(Catalog of Federal Domestic Assistance Program 20.205, Highway Planning and Construction. The regulations implementing Executive Order 12372 regarding Intergovernmental consultation on Federal Programs and activities apply to this program)

Issued on: August 3, 1993.

G.E. Olvera,

District Engineer, Austin, Texas.

[FR Doc. 93-19433 Filed 8-11-93; 8:45 am]

BILLING CODE 4910-22-M

Environmental Impact Statement, New River Parkway Extension, Hinton to I-77, or to US 460, Mercer and Summers Counties, WV

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Notice of intent.

SUMMARY: The FHWA is issuing this notice to advise the public that an Environmental Impact Statement will be prepared for a proposed highway project extending from Hinton to either I-77 (West Virginia Turnpike) or to US 460 in Mercer County and Summers County, West Virginia.

FOR FURTHER INFORMATION CONTACT: Mr. Billy R. Higginbotham, Division Administrator, Federal Highway Administration, 550 Eagan Street, suite 300, Charleston, West Virginia 25301, Telephone (304) 347-5329, or Mr. Ben L. Hark, West Virginia Department of Transportation, Division of Highways, Building 5, room A830, 1900 Kanawha Boulevard East, Charleston, West Virginia 25305-0430, Telephone (304) 558-3236.

SUPPLEMENTARY INFORMATION: The FHWA, in cooperation with the West Virginia Department of Transportation, will prepare an Environmental Impact Statement (EIS) for a proposed new highway known as the New River Parkway Extension. Most of the highway will likely be on new right of way, but existing roadways will also be utilized. The New River Parkway Extension (Parkway Extension) is a planned touring Scenic Parkway designed to link the rich and diverse historical, cultural, recreational, scenic, and natural resources of the middle New River basin.

The intent of the Parkway Extension is to provide for a pleasant and leisurely driving experience along the New River, Bluestone Lake, and the surrounding Appalachian highlands, through scenic and essentially undisturbed examples of historic West Virginia community lifestyle. Access to nearby recreation facilities is a primary consideration. Pursuant to these objectives, functional, operational and physical deficiencies of existing WV 20, in combination with the narrow local roadways that now lead to most resources, compel this action.

Project alternatives will involve the No-Action Alternative, and a combination of Corridor Alternatives.

The EIS will assess the corridors and their environmental effects through detailed studies of socioeconomic, natural, visual, and cultural resources; air quality; noise impacts; secondary and cumulative effects; energy utilization; hazardous wastes; utilities; and permitting. Joint development prospects, the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources which would be involved in the proposed action will be determined.

A Plan of Study describing the proposed action and studies, and soliciting comments will be forwarded to appropriate Federal, State, and local agencies. Agencies will be invited to attend a scoping meeting where aspects of the proposed action will be

Published in The Houston Chronicle on Tuesday, August 24, 1993, Section E, Page 21
Published again on Monday, September 13, 1993

Katy Times, Wednesday, August 25, 1993 and Sunday, September 12, 1993
Houston Post, Tuesday, August 24, 1993 and Monday, September 13, 1993

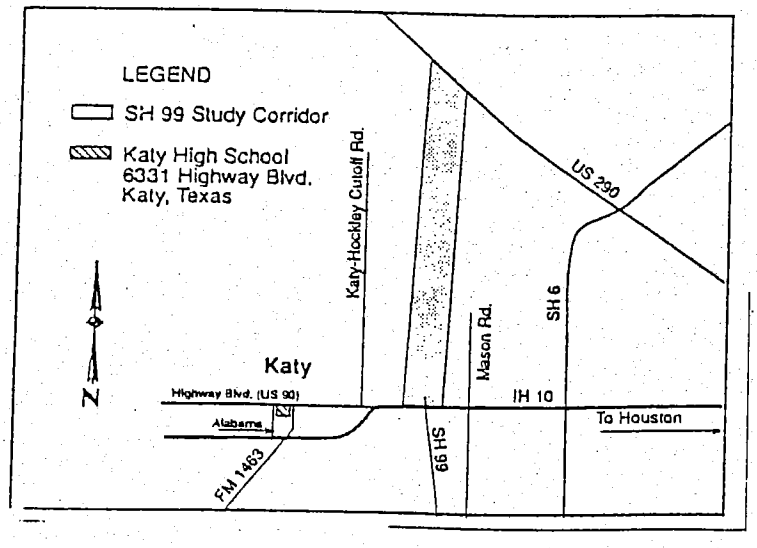
NOTICE OF PUBLIC SCOPING MEETING

The Grand Parkway Association (GPA) in association with the Federal Highway Administration (FHWA) and the Texas Department of Transportation (TxDOT) will conduct a public scoping meeting on Thursday, September 23, 1993, at Katy High School Auditorium, 6331 Highway Blvd., Katy, Texas, 77494 (see map below). The public scoping meeting will begin at 7:00 p.m. with a brief presentation by the study team followed by a public commenting period. There will be an informal hour prior to the meeting with informational exhibits available for viewing. The purpose of the scoping meeting is to obtain comments from the public, interested organizations, and agencies regarding the preparation of National Environmental Policy Act documentation for proposed State Highway 99 (the Grand Parkway) in Harris County, Texas. After the scoping meeting, the GPA, in cooperation with the FHWA and the TxDOT, will prepare a draft environmental impact statement (EIS) for a proposal to construct SH 99 in Harris County. The proposed improvements include the construction of a limited access freeway from IH 10 to US 290 (Segment E of the Grand Parkway), a distance of approximately 14.7 miles.

Reasonable alternative routes for SH 99 will be evaluated in the draft EIS. The no action alternative will also be evaluated. The build alternatives include the use of new location right-of-way, which will be primarily donated right-of-way. The majority of the study corridor crosses relatively undeveloped properties in western Harris County. Impacts caused by the construction and operation of SH 99 will vary according to the alternative alignment utilized. Comments on the proposed action and alternatives will be requested at the scoping meeting.

Persons interested in attending the scoping meeting who have special communication or accommodation needs are encouraged to contact the TxDOT District 12 Public Affairs Officer at (713) 802-5072 at least two days prior to the meeting. Since the scoping meeting will be conducted in English, any requests for language interpreters or other special communication needs should also be made at least two days prior to the public scoping meeting. TxDOT will make every reasonable effort to accommodate these needs.

To insure that the full range of issues related to this proposed action are addressed and significant issues identified, comments and suggestions are invited from interested parties. The written statements and/or questions concerning this proposal should be mailed to: Director of Project Development, Texas Department of Transportation, 7721 Washington Avenue, P. O. Box 1386, Houston, Texas, 77251-1386 or to the office of the Grand Parkway Association located at 5757 Woodway, Suite 140 East, Houston, Texas, 77057.



TRD-200000090
R. Yvette Clark
General Counsel
Stephen F. Austin State University
Filed: January 5, 2000

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Texas Department of Transportation

Notice of Intent, Segment F-1 EIS

Notice of Intent, Segment F-1 EIS: Pursuant to 43 TAC §2.43, the Texas Department of Transportation (TxDOT) is issuing this Notice of Intent (NOI) to advise the public that an Environmental Impact Statement (EIS) will be prepared for a proposed project to develop Segment F-1 of State Highway 99 (the Grand Parkway) from U.S. Highway 290 to State Highway 249 in Harris County, Texas.

TxDOT and the Grand Parkway Association, in cooperation with the Federal Highway Administration (FHWA) are considering an upgrade of the transportation network in Harris County. A Draft Environmental Impact Statement (DEIS) will evaluate transportation alternative strategies, including different combinations of modes of transportation to address existing and projected traffic demand. This study is authorized pursuant to the Texas Transportation Commission Minute Order No. 107844 issued May 27, 1999. The majority of the study corridor crosses relatively undeveloped properties in Harris County, although subdivision has occurred in portions. Cities and towns in the region include Hockley and Tomball.

A public scoping meeting will be held on February 2, 2000, at Tomball College, 30555 Tomball Parkway (off S.H. 249), Tomball, Texas, from 4 p.m. to 7 p.m. Large scale maps with environmental and social features will be available at the meeting, and several corridors will be shown on these maps. These maps and corridors will reflect input from public workshops held in August 1999. The scoping process will continue throughout the development of the environmental document.

Alternatives under consideration include taking no action (the no-build alternative), Transportation System Management (TSM) alternative, mass transit alternative, or roadway build alternative. Impacts caused by the construction and operation of the facility will vary according to the transportation alternative utilized. Generally, the impacts would include, but not be limited to, transportation impacts (construction detours, construction traffic, mobility improvements and evacuation route improvement), air and noise impacts from construction equipment and operation of the facility, water quality impacts from construction area and roadway storm water runoff, impacts to water of the United States including wetlands from right of way encroachment, and impacts to residents and businesses based on potential displacements. These alternatives will be analyzed in further detail during the EIS review process.

Letters describing the proposed action and soliciting comments will be sent to appropriate Federal, State, and local agencies, and to private organizations and citizens who have previously expressed or are known to have interest in this proposal. To ensure that the full range of issues related to this proposed action are addressed and all significant issues identified, comments and suggestions are invited from all interested parties.

Agency Contact: Comments or questions concerning this proposed action and the EIS should be directed to Dianna F. Noble, P.E., Texas Department of Transportation, Environmental Affairs Division, 150 E. Riverside Drive, Building 118, Austin, Texas 78704; phone 512-416-2734.

TRD-200000182
Bob Jackson
Deputy General Counsel
Texas Department of Transportation
Filed: January 12, 2000

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Notice of Intent, Segment F-2 EIS

Notice of Intent, Segment F-2 EIS: Pursuant to 43 TAC §2.43, the Texas Department of Transportation (TxDOT) is issuing this Notice of Intent (NOI) to advise the public that an Environmental Impact Statement (EIS) will be prepared for a proposed project to develop Segment F-2 of State Highway 99 (the Grand Parkway) from State Highway 249 to Interstate Highway 45 (North) in Harris County, Texas.

TxDOT and the Grand Parkway Association, in cooperation with the Federal Highway Administration (FHWA) are considering an upgrade of the transportation network in Harris County. A Draft Environmental Impact Statement (DEIS) will evaluate transportation alternative strategies, including different combinations of modes of transportation to address existing and projected traffic demand. This study is authorized pursuant to the Texas Transportation Commission Minute Order No. 107844 issued May 27, 1999. The majority of the study corridor crosses rapidly developing properties in Harris County. Cities and towns in the region include Tomball and Spring.

A public scoping meeting will be held on February 2, 2000, at Tomball College, 30555 Tomball Parkway (off S.H. 249), Tomball, Texas, from 4 p.m. to 7 p.m. Large scale maps with environmental and social features will be available at the meeting, and several corridors will be shown on these maps. These maps and corridors will reflect input from public workshops held in August 1999. The scoping process will continue throughout the development of the environmental document.

Alternatives under consideration include taking no action (the no-build alternative), Transportation System Management (TSM) alternative, mass transit alternative, or roadway build alternative. Impacts caused by the construction and operation of the facility will vary according to the transportation alternative utilized. Generally, the impacts would include, but not be limited to, transportation impacts (construction detours, construction traffic, mobility improvements and evacuation route improvement), air and noise impacts from construction equipment and operation of the facility, water quality impacts from construction area and roadway storm water runoff, impacts to water of the United States including wetlands from right of way encroachment, and impacts to residents and businesses based on potential displacements. These alternatives will be analyzed in further detail during the EIS review process.

Letters describing the proposed action and soliciting comments will be sent to appropriate Federal, State, and local agencies, and to private organizations and citizens who have previously expressed or are known to have interest in this proposal. To ensure that the full range of issues related to this proposed action are addressed and all significant issues identified, comments and suggestions are invited from all interested parties.

Agency Contact: Comments or questions concerning this proposed action and the EIS should be directed to Dianna F. Noble, P.E., Texas Department of Transportation, Environmental Affairs Division, 150 E. Riverside Drive, Building 118, Austin, Texas 78704; phone 512-416-2734.

TRD-200000183

Bob Jackson
Deputy General Counsel
Texas Department of Transportation
Filed: January 12, 2000

✦ ✦ ✦

Notice of Intent, Segment G EIS

Notice of Intent, Segment G EIS: Pursuant to 43 TAC §2.43, the Texas Department of Transportation (TxDOT) is issuing this Notice of Intent (NOI) to advise the public that an Environmental Impact Statement (EIS) will be prepared for a proposed project to develop Segment G of State Highway 99 (the Grand Parkway) from Interstate Highway 45 (North) to U.S. Highway 59 (North) in Harris County, Texas and Montgomery County, Texas.

TxDOT and the Grand Parkway Association, in cooperation with the Federal Highway Administration (FHWA) are considering an upgrade of the transportation network in Harris and Montgomery counties. A Draft Environmental Impact Statement (DEIS) will evaluate transportation alternative strategies, including different combinations of modes of transportation to address existing and projected traffic demand. This study is authorized pursuant to the Texas Transportation Commission Minute Order No. 107844 issued May 27, 1999. The majority of the study corridor crosses relatively undeveloped properties in Harris and Montgomery counties, although subdivision has occurred in portions. Cities and towns in the region include Spring, New Caney, and Porter.

A public scoping meeting will be held on February 3, 2000, at Kingwood College, 20000 Kingwood Drive, Kingwood, Texas, from 4 p.m. to 7 p.m. Large scale maps with environmental and social features will be available at the meeting, and several corridors will be shown on these maps. These maps and corridors will reflect input from public workshops held in August 1999. The scoping process will continue throughout the development of the environmental document.

Alternatives under consideration include taking no action (the no-build alternative), Transportation System Management (TSM) alternative, mass transit alternative, or roadway build alternative. Impacts caused by the construction and operation of the facility will vary according to the alternative alignment utilized. Generally, the impacts would include, but not be limited to, transportation impacts (construction detours, construction traffic, mobility improvements and evacuation route improvement), air and noise impacts from construction equipment and operation of the facility, water quality impacts from construction area and roadway storm water runoff, impacts to water of the United States including wetlands from right of way encroachment, and impacts to residents and businesses based on potential displacements. These alternatives will be analyzed in further detail during the EIS review process.

Letters describing the proposed action and soliciting comments will be sent to appropriate Federal, State, and local agencies, and to private organizations and citizens who have previously expressed or are known to have interest in this proposal. To ensure that the full range of issues related to this proposed action are addressed and all significant issues identified, comments and suggestions are invited from all interested parties.

Agency Contact: Comments or questions concerning this proposed action and the EIS should be directed to Dianna F. Noble, P.E., Texas Department of Transportation, Environmental Affairs Division, 150 E. Riverside Drive, Building 118, Austin, Texas 78704; phone 512-416-2734.

[Federal Register: January 5, 2000 (Volume 65, Number 3)]
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From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr05ja00-107]

DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

Environmental Impact Statement: Harris County, Texas

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Notice of Intent.

SUMMARY: The FHWA is issuing this notice to advise the public that an environmental impact statement will be prepared for a proposed transportation improvement project in Harris County, Texas.

FOR FURTHER INFORMATION CONTACT: Mr. John Mack, P.E., Federal Highway Administration, Texas Division, 826 Federal Bldg., 300 East 8th Street, Austin, Texas 78701, Telephone: 512-916-5516.

SUPPLEMENTARY INFORMATION: The FHWA, in cooperation with the Texas Department of Transportation (TxDOT) and The **Grand Parkway** Association, will prepare an environmental impact statement (EIS) on a proposal to upgrade the existing road network in Harris County. The proposed improvements being considered, as shown in the

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Region's Long-Range Transportation Plan, are a multilane controlled access facility in northern Harris County which would be part of a third circumferential loop (State Highway 99) around Houston. The proposed improvement length is approximately 13 miles. Improvements in this area are necessary to provide mobility to the growing area of northwest Harris County.

A Draft EIS will evaluate various transportation alternatives between State Highway 290 and State Highway 249 near Tomball. The majority of this corridor crosses relatively undeveloped properties in Harris County. Among the alternatives to be studied are the ``No-action'' alternative, Transportation System Management (TSM) alternative, Mass Transit alternative and Roadway Build alternative. Cities and towns in this region include Hockley and Tomball. This study is authorized pursuant to the Texas Transportation Commission Minute Order No. 108744 issued May 27, 1999.

The scoping meeting will be on February 2, 2000, at Tomball College, 30555 Tomball **Parkway** (SH 249) from 4 p.m. to 7 p.m. Large scale maps with environmental and social features will be available at the meeting, and several corridors will be shown on these maps. These maps and corridors will reflect input from public workshops held in August 1999. The scoping process will continue throughout the development of the environmental document.

Impacts caused by the construction and operation of the facility will vary according to the transportation alternative utilized. Generally, impacts would include the following: transportation impacts (construction detours, construction traffic, mobility improvement and evacuation route improvement), air and noise impacts from construction equipment and operation of the facility, water quality impacts from construction area and roadway storm water runoff, impacts to waters of the United States including wetlands from right of way encroachment,

and impacts to residents and businesses based on potential displacements.

Letters describing the proposed action soliciting comments will be sent to appropriate Federal, State and local agencies, and to private organizations and citizens who have previously expressed or are known to have interest in this proposal. To ensure that the full range of issues related to this proposed action are addressed and all significant issues identified, comments and suggestions are invited from all interested parties. Comments or questions concerning this proposed action and the Environmental Impact Statement should be directed to the FHWA at the address provided above.

(Catalog of Federal Domestic Assistance Program Number 20.205 Highway Planning and Construction. The regulations implementing Executive Order 12372 regarding governmental consultation on Federal programs and activities apply to this program)

Issued on: December 23, 1999.

Wilbur Lee Gibbons,
Urban Program Engineer, Austin, Texas.

[FR Doc. 00-199 Filed 1-4-00; 8:45 am]
BILLING CODE 4910-22-M

[Federal Register: January 5, 2000 (Volume 65, Number 3)]
[Notices]
[Page 550]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr05ja00-106]

DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

Environmental Impact Statement: Harris County, Texas

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Notice of Intent.

SUMMARY: The FHWA is issuing this notice to advise the public that an environment impact statement will be prepared for a proposed transportation improvement project in Harris County, Texas.

FOR FURTHER INFORMATION CONTACT: Mr. John Mack, P.E., Federal Highway Administration, Texas Division, 826 Federal Bldg., 300 East 8th Street, Austin, Texas 78701, Telephone 512-916-5516.

SUPPLEMENTARY INFORMATION: The FHWA, in cooperation with the Texas Department of Transportation (TxDOT) and The **Grand Parkway** Association, will prepare an environmental impact statement (EIS) on a proposal to upgrade the existing road network in Harris County. The proposed improvements being considered, as shown in the Region's Long-Range Transportation Plan, are a multilane controlled access facility in northern Harris County which would be part of a third circumferential loop (State Highway 99) around Houston. The proposed improvement length is approximately 13 miles. Improvements in this area are necessary to provide mobility to the growing area of northwest Harris County.

A Draft EIS will evaluate various transportation alternatives between State Highway 249 near Tomball and Interstate Highway 45 (North) near the northern terminus of the Hardy Toll Road. The majority of this corridor crosses relatively undeveloped properties in Harris County. Among the alternatives to be studied are the ``No-action'' alternative, Transportation System Management (TSM) alternative, Mass Transit alternative and Roadway Build alternative. Cities and towns in this region include Tomball and Spring. This study is authorized pursuant to the Texas Transportation Commission Minute Order No. 108744 issued May 27, 1999.

The scoping meeting will be on February 2, 2000, at Tomball College, 30555 Tomball **Parkway** (SH 249) from 4 p.m. to 7 p.m. Large scale maps with environmental and social features will be available at the meeting, and several corridors will be shown on these maps. These maps and corridors will reflect input from public workshops held in August 1999. The scoping process will continue throughout the development of the environmental document.

Impacts caused by the construction and operation of the facility will vary according to the transportation alternative utilized. Generally, impacts would include the following: transportation impacts (construction detours, construction traffic, mobility improvement and evacuation route improvement), air and noise impacts from construction equipment and operation of the facility, water quality impacts from construction area and roadway storm water runoff, impacts to waters of the United States including wetlands from right of way encroachment, and impacts to residents and businesses based on potential displacements.

Letters describing the proposed action soliciting comments will be

sent to appropriate Federal, State and local agencies, and to private organizations and citizens who have previously expressed or are known to have interest in this proposal. To ensure that the full range of issues related to this proposed action are addressed and all significant issues identified, comments and suggestions are invited from all interested parties. Comments or questions concerning this proposed action and the Environmental Impact Statement should be directed to the FHWA at the address provided above.

(Catalog of Federal Domestic Assistance Program Number 20.205 Highway Planning and Construction. The regulations implementing Executive Order 12372 regarding government consultation on Federal programs and activities apply to this program)

Issued on: December 23, 1999.
Wilbur Lee Gibbons,
Urban Program Engineer, Austin, Texas.
[FR Doc. 00-198 Filed 1-4-00; 8:45 am]
BILLING CODE 4910-22-M

[Federal Register: January 5, 2000 (Volume 65, Number 3)]
[Notices]
[Page 549-550]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr05ja00-105]

DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

Environmental Impact Statement: Harris and Montgomery Counties, **Texas**

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Notice of intent.

SUMMARY: The FHWA is issuing this notice to advise the public that an environment impact statement will be prepared for a proposed transportation improvement project in Harris and Montgomery Counties, **Texas**.

FOR FURTHER INFORMATION CONTACT: Mr. John Mack, P.E., Federal Highway Administration, **Texas** Division, 826 Federal Bldg., 300 East 8th Street, Austin, **Texas** 78701, Telephone 512-916-5516.

SUPPLEMENTARY INFORMATION: The FHWA, in cooperation with the **Texas** Department of Transportation (TxDOT) and The **Grand Parkway** Association, will prepare an environmental impact statement (EIS) on a proposal to upgrade the existing road network in Harris and Montgomery Counties. The proposed improvements being considered, as shown in the Region's Long-Range Transportation Plan, are a multilane controlled access facility in northern Harris and Montgomery Counties which would be part of a third circumferential loop (State Highway 99) around Houston. The proposed improvement length is approximately 13 miles. Improvements in this area are necessary to provide mobility to the growing area of northwest Harris and Montgomery Counties. A Draft EIS will evaluate various transportation alternatives between Interstate 45 (North) and United States Highway 59 (North). The majority of this corridor crosses relatively undeveloped properties in Harris and Montgomery Counties, although subdivision has occurred in portions. Among the alternatives to be studied are the ``No-action'' alternative, Transportation System Management (TSM) alternative, Mass Transit alternative and Roadway Build alternative. Cities and towns in this region include Spring, New Caney and Porter. This study is authorized pursuant to the **Texas** Transportation Commission Minute Order No. 108744 issued May 27, 1999.

The scoring meeting will be on February 3, 2000, at Kingwood College, 20000 Kingwood Drive from 4 p.m. to 7 p.m. Large scale maps with environmental and social features will be available at the meeting, and several

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corridors will be shown on these maps. These maps and corridors will reflect input from public workshops held in August 1999. The scoping process will continue throughout the development of the environmental document.

Impacts caused by the construction and operation of the facility

.ll vary according to the transportation alternative utilized. :nerally, impacts would include the following: transportation impacts :onstruction detours, construction traffic, mobility improvement and 'acuation route improvement), air and noise impacts from construction quipment and operation of the facility, water quality impacts from)nstruction area and roadway storm water runoff, impacts to waters of ıe United States including wetlands from right of way encroachment, ıd impacts to residents and businesses based on potential .splacements.

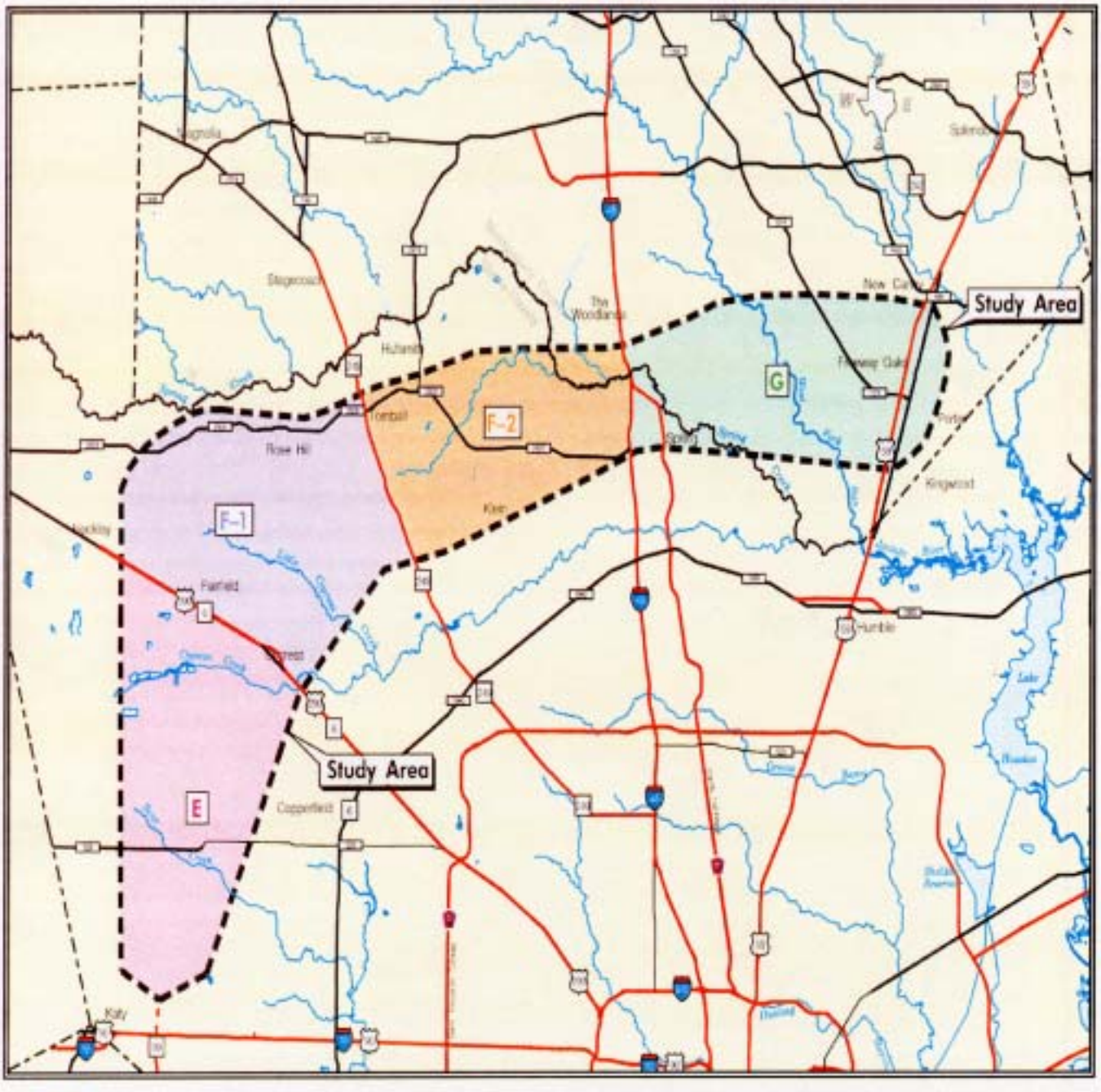
Letters describing the proposed action soliciting comments will be ent to appropriate Federal, State and local agencies, and to private :ganizations and citizens who have previously expressed or are known) have interest in this proposal. To ensure that the full range of ssues related to this proposed action are addressed and all ignificant issues identified, comments and suggestions are invited :om all interested parties. Comments or questions concerning this :oposed action and the Environmental Impact Statement should be irected to the FHWA at the address provided above.

Catalog of Federal Domestic Assistance Program Number 20.205 ighway Planning and Construction. The regulations implementing xecutive Order 12372 regarding governmental consultation on Federal rograms and activities apply to this program.)

Issued on December 23, 1999.
ilbur Lee Gibbons,
.E., Urban Program Engineer, Austin, Texas.
FR Doc. 00-200 Filed 01-04-00; 8:45 am]
ILLING CODE 4910-22-M

Public Workshop No. 1 /Project Initiation Workshops
Summary Report
August 18, August 24 and August 26, 1999

Grand Parkway
Segments E, F1, F2 and G
From IH-10 West to US 59 North



Texas Department of Transportation

The Grand Parkway Association

The Grand Parkway Association

Notice of Public Workshop

The Grand Parkway Association, in cooperation with the Federal Highway Administration, will prepare an Environmental Overview for the segments of the Grand Parkway located in Harris and Montgomery Counties, between Interstate 10(W) and U.S. 59(N). The majority of this corridor crosses relatively undeveloped areas in Harris and Montgomery Counties, although subdivision has occurred in some portions. Cities and towns in this region include Katy, Hockley, Cypress, Tomball, Spring, The Woodlands, Porter, Humble, New Caney, and Kingwood. This overview will supplement an overview prepared in June, 1993 for the entire Grand Parkway.

This study is authorized pursuant to the Texas Transportation Commission Minute Order No. 108744 issued May 27, 1999. Consequently, this project will commence with an Environmental Overview to review issues that the northwest segments (E, F and G) have in common, including, but not limited to, (1) purpose and need, (2) Geographic Information System mapping, (3) alternatives development, (4) secondary and cumulative impacts, and (5) wetland mitigation.

Comments are invited on both the area-wide impacts of the project or impacts related to specific locations. Workshop hours will be from 7 p.m. to 9 p.m. Interested parties are encouraged to attend anytime during workshop hours to ask questions, study maps, and review prior studies. Individuals that are unable to attend a workshop may mail their comments to the Grand Parkway Association, 4544 Post Oak Place, #222, Houston, TX, 77027.

Workshop Locations
(Workshops will be identical and run from 7 p.m. to 9 p.m.)

1. **Wednesday, August 18 at Tomball College 30555 Tomball Parkway (SH 249)**
2. **Tuesday, August 24 at Langham Creek High School, 17610 FM 529**
3. **Thursday, August 26 at Kingwood College, 20000 Kingwood Drive**

Topics to be discussed are: study methods, schedule, future meetings, how to stay involved and issues of general concern to be considered in the new work effort. There will be no alignments presented at this meeting. However, a general study area will be shown as a basis of discussion. Based on the purpose and need of the project, the Overview will make recommendations for continued development of this project. Work to assemble information for possible inclusion in the Draft Environmental Impact Statement(s) will start after the Overview is completed.

All meeting locations are wheelchair accessible. Individuals with special communication or other accommodation needs should call (713) 802-5071 at least 3 days before the workshop.

The Grand Parkway
Segments E, F and G

The Grand Parkway
Segments E, F and G

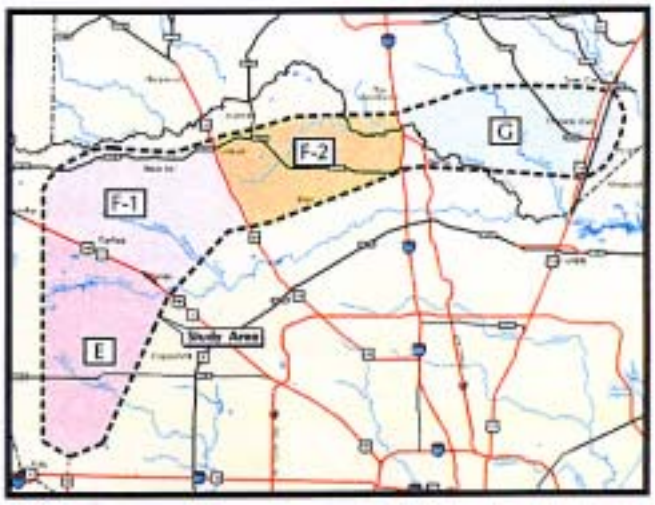
SUMMARY OF AUGUST 1999 PUBLIC WORKSHOPS

A series of Public Involvement Meetings for the extension of the Grand Parkway between IH 10 West and US 59 North was held on August 18, 24, and 26 of 1999. The extension is known as Segments E, F-1, F-2, and G. Seventy citizens attended the workshops with fifty-five completing a questionnaire. The objectives of the meetings were to explain the new study just starting up and to identify the citizens' opinions on the benefits and concerns of these proposed segments of the Grand Parkway.

A video presented an explanation of the study approach and project schedule. Aerial photo maps of the study area were available for review. After viewing the video and reviewing the displays, citizens were asked to complete a questionnaire regarding their viewpoints on existing traffic congestion and expected usage of the Grand Parkway, if constructed.

Specific questions focused on citizens' knowledge of, or concerns about, environmental issues in the study area. Grand Parkway study team members were available all evening to answer questions and provide additional information.

GRAND PARKWAY SEGMENTS E, F AND G



OPINIONS ON GRAND PARKWAY USAGE COLLECTED DURING THE WORKSHOPS

To relieve existing traffic congestion, Segments E, F, and G of the Grand Parkway are:		Greatly Needed 43%	Needed 26%	Somewhat Needed 7%	Not Needed 24%
The Grand Parkway, Segments E, F, and G would improve my travel time to:	Work 20%	Schools 5%	Shopping Areas 20%	Visit Friends 31%	Visit Relatives 24%

Environmental Comments

- Impacts to Spring Creek, Cypress Creek, and San Jacinto Floodplain
- Loss of wetlands, wildlife and their habitat
- Impacts to the Katy Prairie
- Highway's proximity to and loss of property
- Potential routing around Hooks Airport
- Increase in traffic and pollution

General Comments

- Make highway with less curves
- Would like to see local natural areas set aside for mitigation
- No need for additional highway in F-1 region
- Need new roadways to keep up with population growth
- The construction schedule should be expedited
- Do not make the Grand Parkway a toll road

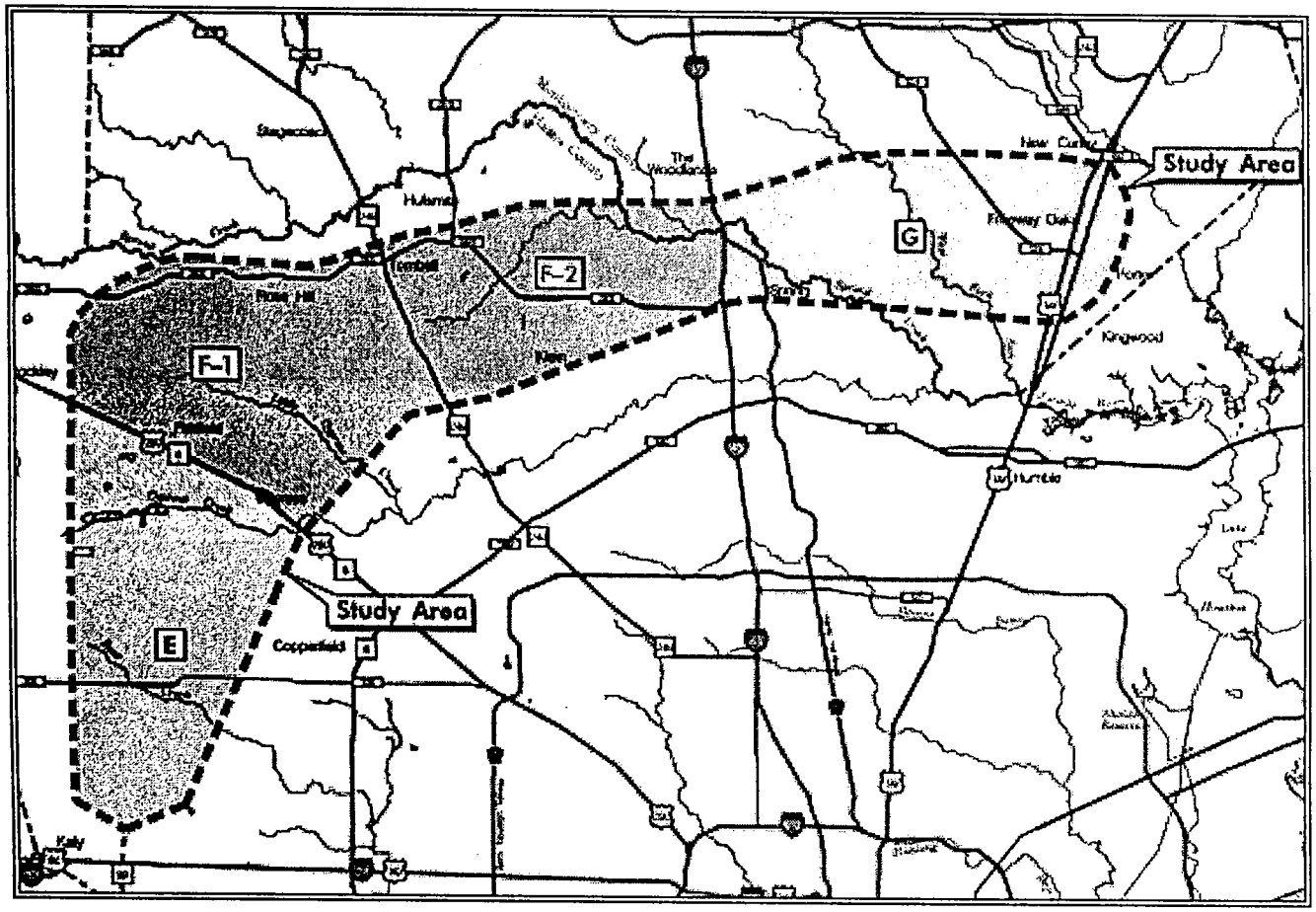
For more information, contact:
Michael Baker Jr., Inc. 16340 Park Ten Place, Suite 320, Houston, TX 77084 281-579-4579, or
The Grand Parkway Association 4544 Post Oak Place, Suite 222, Houston, TX 77027 713-965-0871

Resource Agency Coordination

Resource Agencies

- General Land Office (GLO)
  - Coastal Permit Assistance Office
- Harris County Flood Control District (HCFCD)
- Texas Commission on Environmental Quality (TCEQ) (Formerly Texas Natural Resources Conservation Commission (TNRCC))
- Texas Parks and Wildlife Department (TPWD)
- U. S. Army Corps of Engineers (USACE)
- U. S. Environmental Protection Agency (USEPA)
- U. S. Fish and Wildlife Service (USFWS)

The Grand Parkway Segments E, F and G



The Grand Parkway Association

Texas Department of Transportation

HARRIS COUNTY TOLL ROAD AUTHORITY

BAKER-PBS&J-BROWN&GAY

Baker

in association with

BROWN & GAY ENGINEERS, INC.

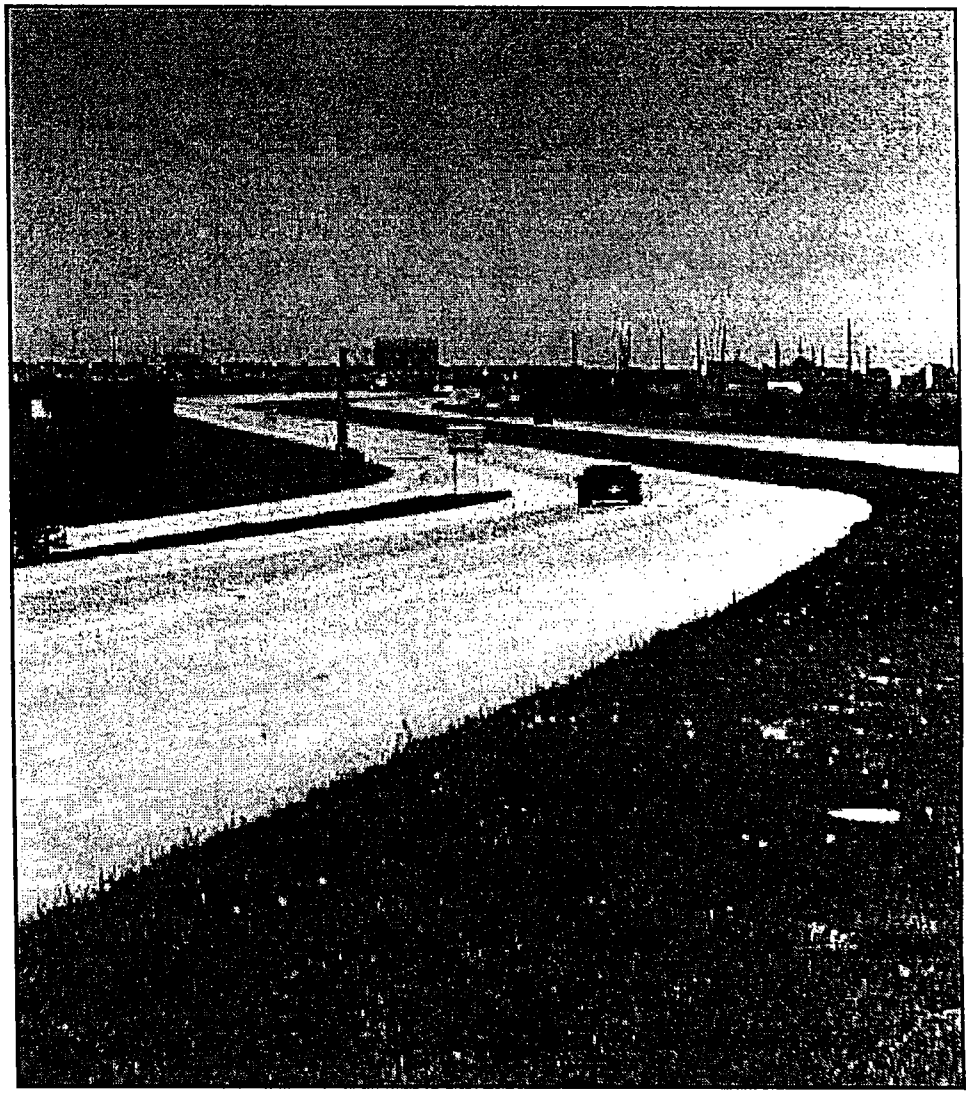
PBS&J

This Video

- Background on Grand Parkway Association
- Project status
- Current study in Harris and Montgomery counties
- Public Outreach Program

The Grand Parkway

- 170-mile outer beltway
- Serve the transportation needs of the greater Houston metropolitan area
- Scenic parkway design

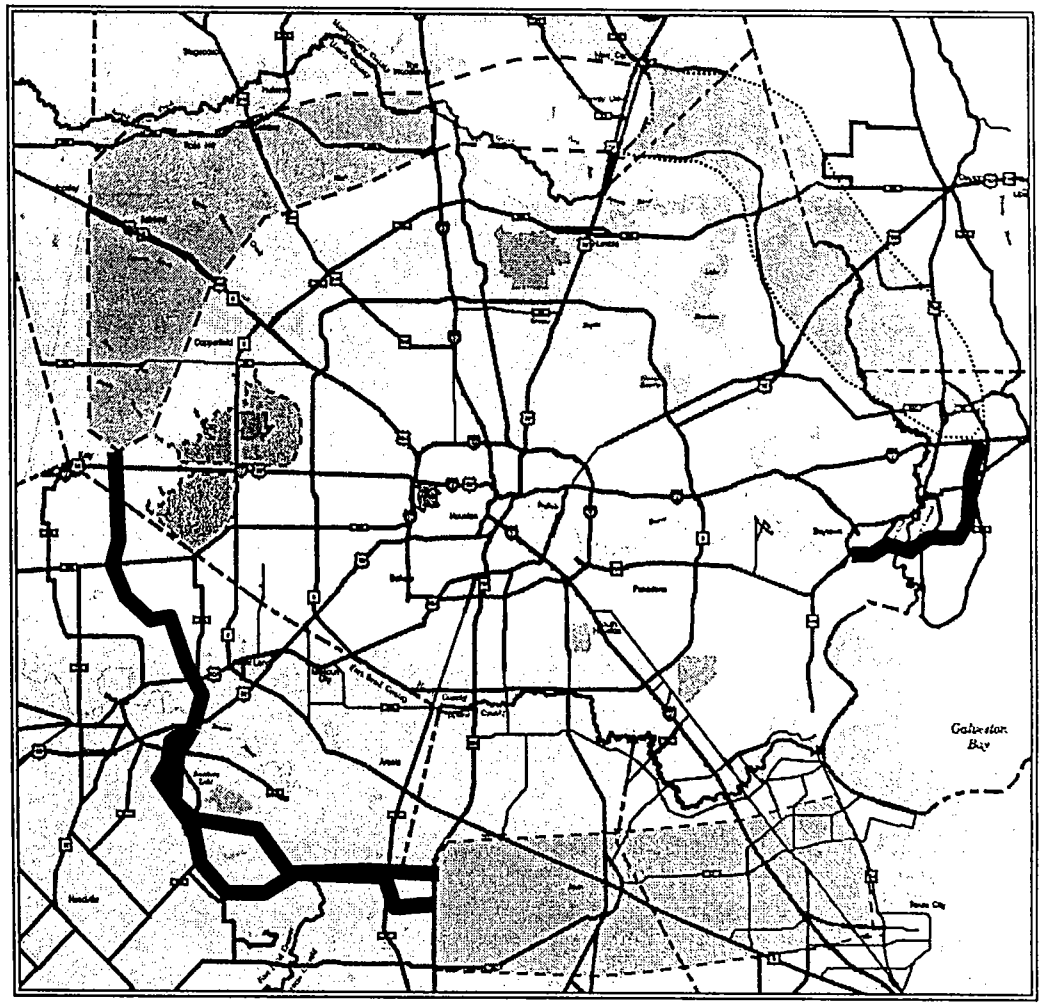


Grand Parkway History

- Grand Parkway Association - established 1984
- Mission: conduct studies and secure right-of-way

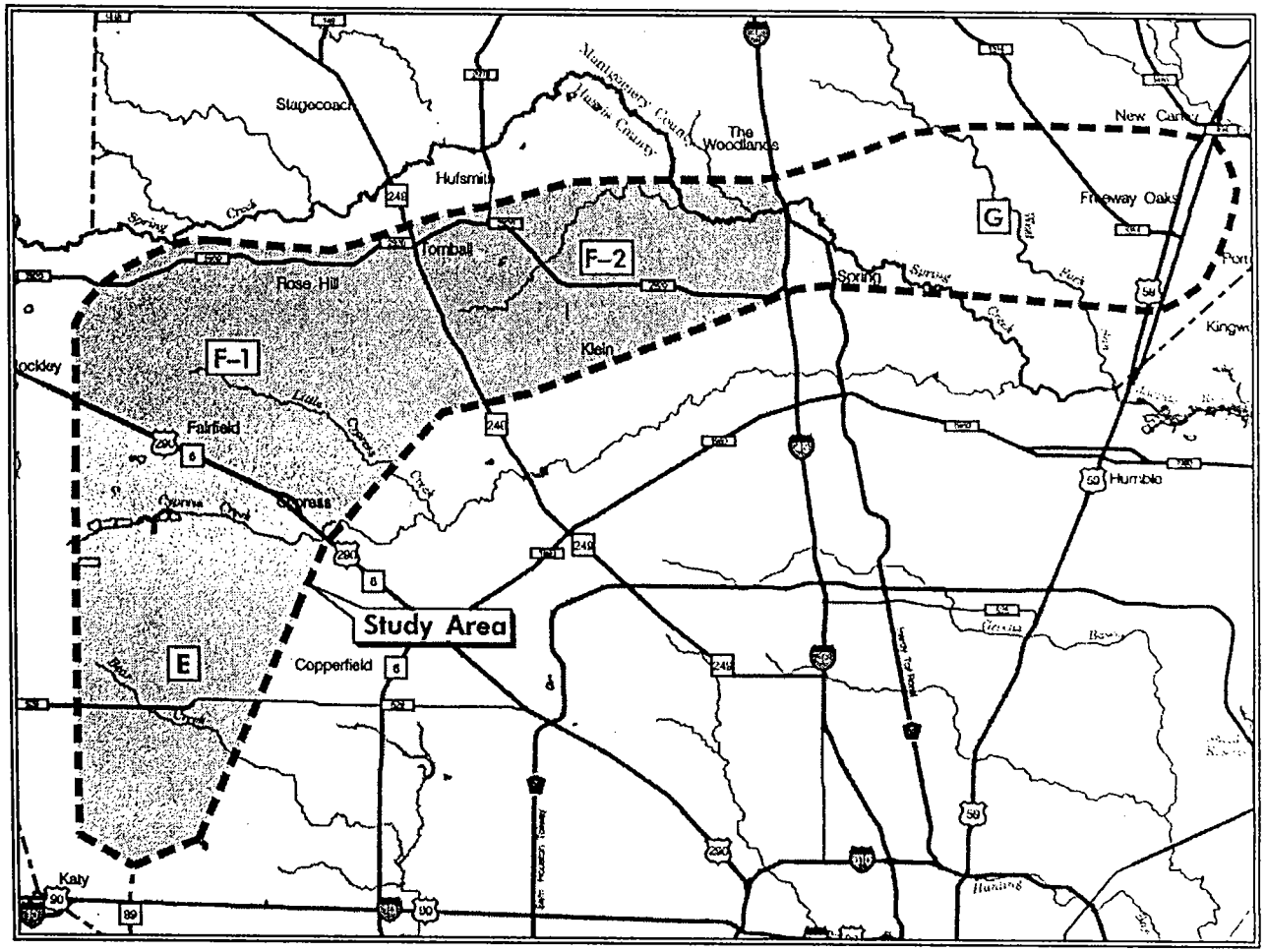
Grand Parkway History

- Segment D: completed
- Segment I-2: design phase
- Segments C, E, F-1, F-2 & G: under study
- Segments A, B, H & I-1: future study



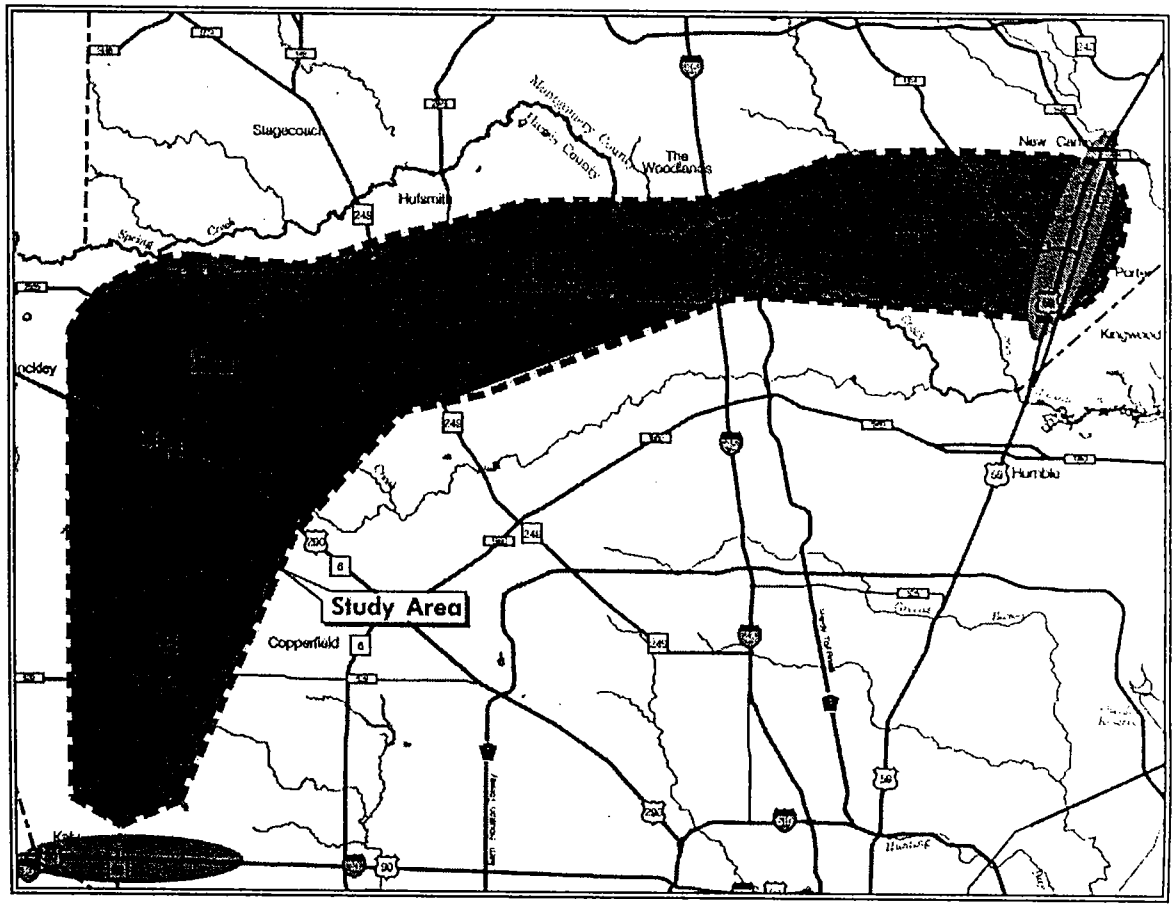
Segments E, F-1, F-2 and G

- Through Harris and Montgomery Counties
- 52-mile reach of the Grand Parkway

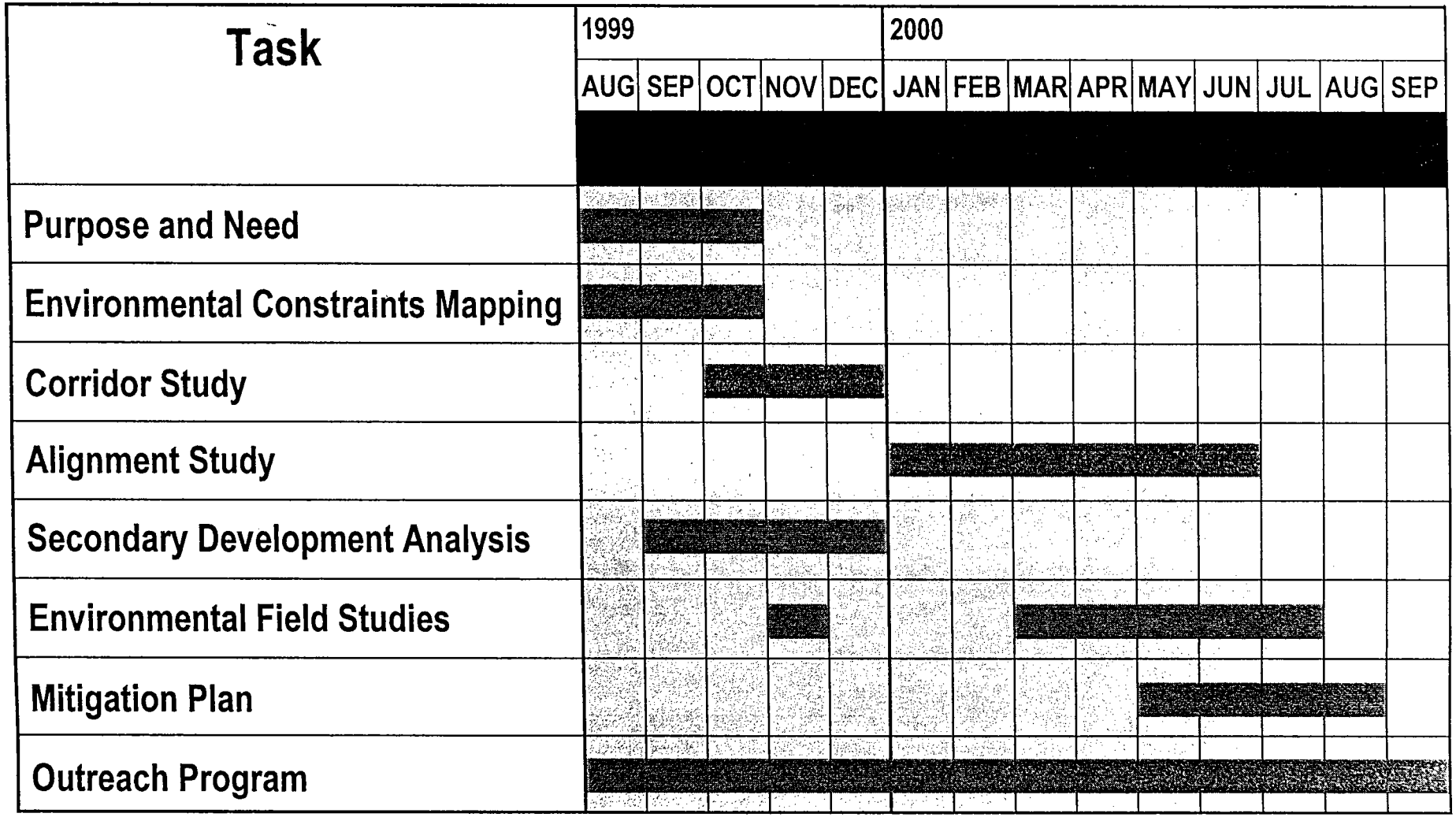


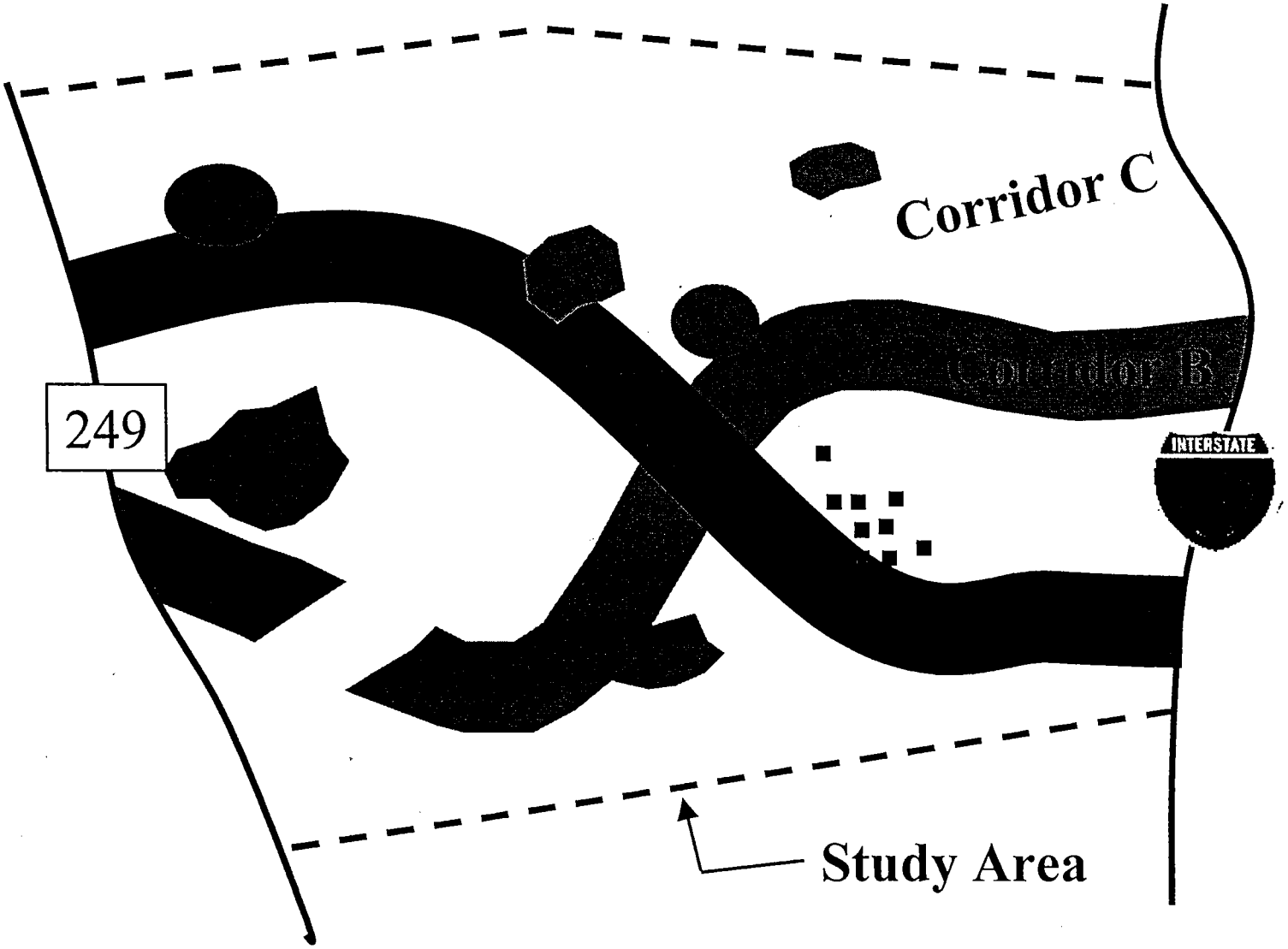
Current Study

- Initiated in August 1999
- Goal: determine the route from IH 10 to US 59
- Phase 1 - Location and Environmental Study
- Phase 2 - Environmental Documentation



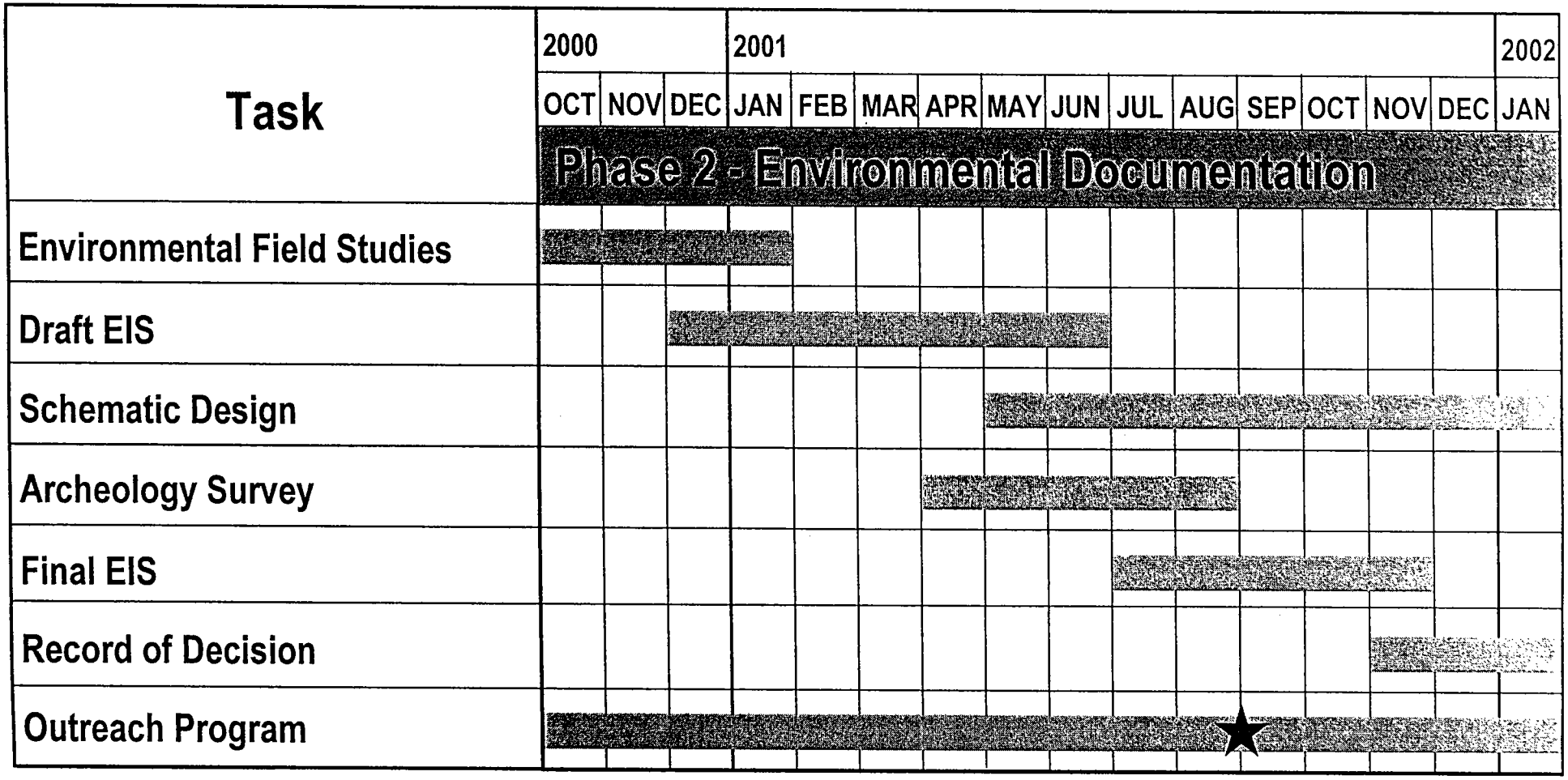
Study Process

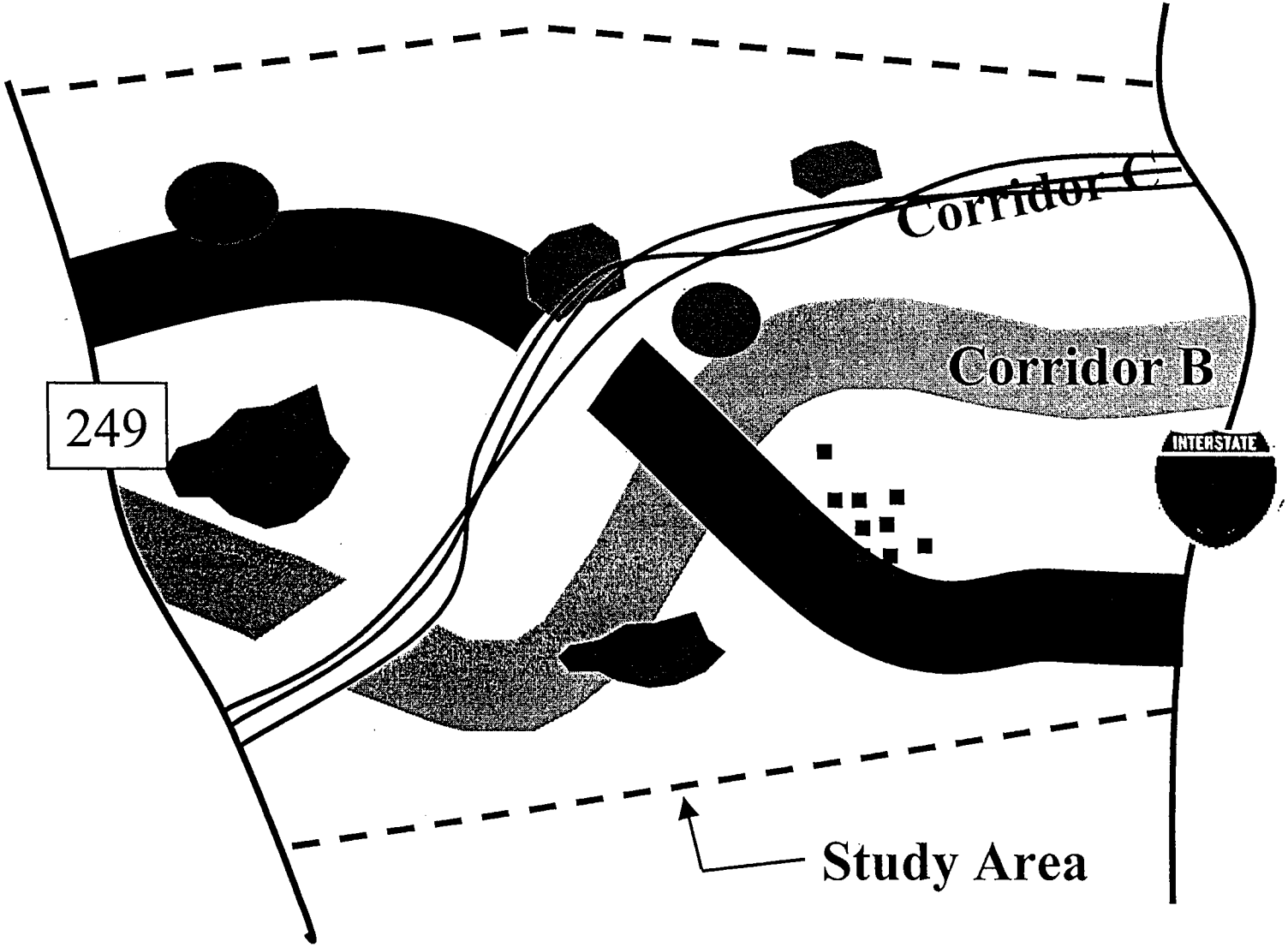



Corridor C
Corridor B
249
INTERSTATE
Study Area

The Grand Parkway
Segments E, F and G

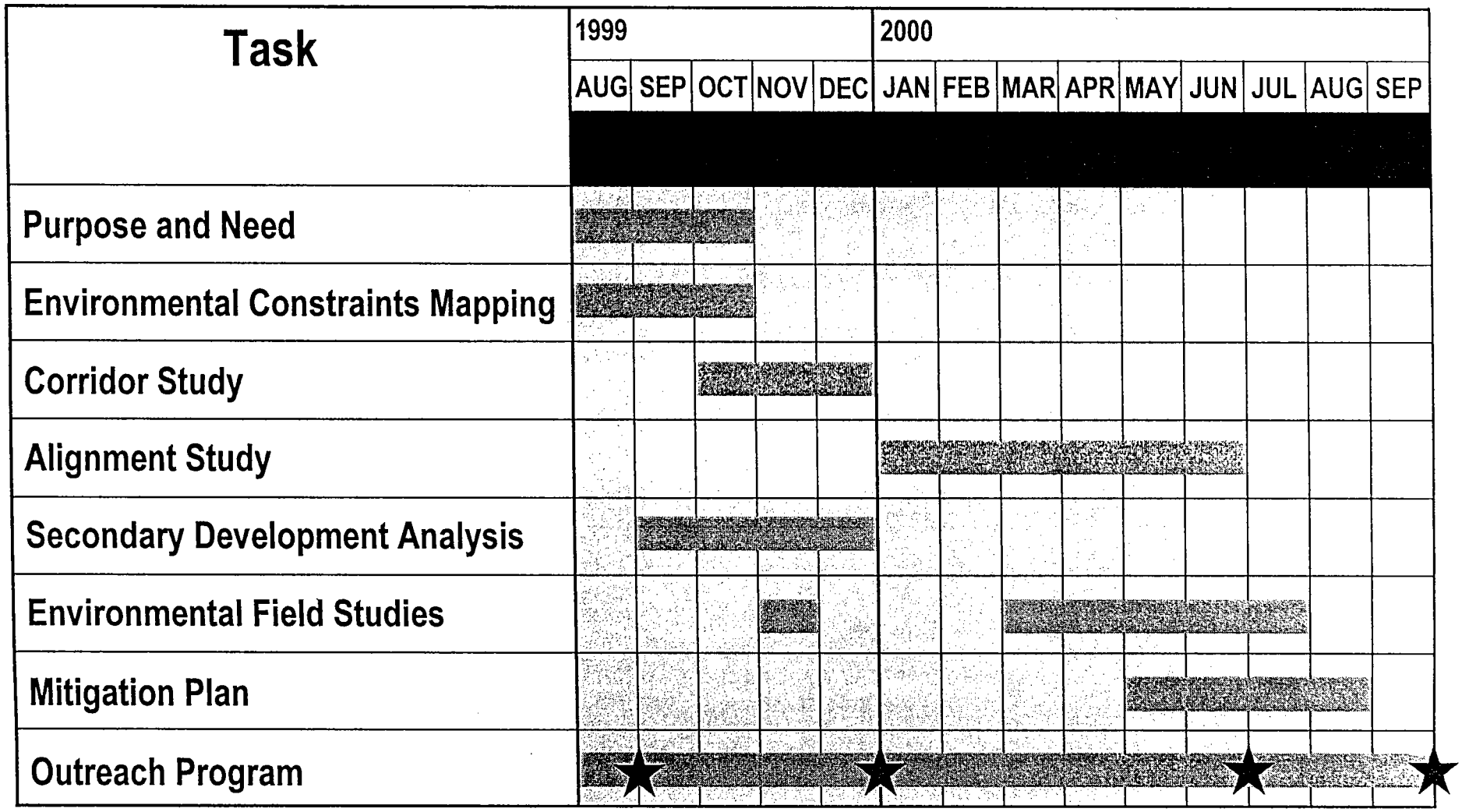
Study Process




Corridor C
Corridor B
249
INTERSTATE
Study Area

The Grand Parkway
Segments E, F and G

Study Process



Outreach Program

- Public, Elected Officials, State and Federal Agencies
- Workshops
- Project Website - www.grandpky.com
- Newsletters
- Call us at:
  - Grand Parkway Association 713-965-0871
  - Study Team 281-579-4579

Next Outreach Event

Segments E, F-1, F-2 and G
Corridor Alternatives
January 2000

The Grand Parkway
Segments E, F and G

Agency Coordination Committee
Project Initiation Meeting

August 18, 1999
Grand Parkway Association Office
10:00 am

Agenda

Introductions & Opening Remarks	Diane Schenke	5 min
Segments E, F and G Overview Video	All	10 min
Project Approach Presentation	Patty Gesing	15 min
Discussion Study Process Q & A Study Area Constraints Preferred Corridor Constraints Mitigation Discussion Future Coordination	All	60 min
Closing	Diane Schenke	10 min

The Grand Parkway
Segments E, F and G

Meeting Minutes

Meeting:	Agency Coordination
Purpose:	First Outreach Period - Agency Coordination Meeting
Meeting Date:	August 18, 1999
Location:	GPA Offices
Attendance:	See attached sign-in sheet

1. Diane Schenke called the meeting to order at 10:00 am. The meeting had three main purposes: to initiate coordination with agency representatives, to provide an overview of the study process being implemented for Segments E, F and G and to solicit comments and suggestions on the issues and methodology for addressing those issues.
2. A brief video was shown that summarizes the project for presentation at upcoming public workshops. This video provided an overview of the study process.
3. Diane Schenke and Patty Gesing of Baker provided a detailed explanation of the study process to the agency representatives. Special note was given to the global aspects of the study to be evaluated in Phase 1, including purpose and need, secondary development and cumulative impacts, GIS constraints mapping, alternatives development and mitigation. It was noted that EIS preparation would occur simultaneously in Phase 2 for the individual EISs that are ultimately prepared.
4. A discussion ensued as to how the number of EISs would actually be determined. Diane Schenke replied that this would most likely be based on what issues and impacts are identified in the corridor study and how different they are from segment to segment. It is expected that this determination will occur early in Phase 1 of the study (or about 6 months.)
5. Diane Schenke noted that wetland mitigation would likely be handled in one to two large sites for all segments. She was explicitly questioned about mitigation for upland habitat. She pointed out that the regulations do not require such mitigation but that this whole issue was developing in several major permit applications now under consideration. She noted that upland habitat mitigation would be considered, and certainly, as this topic area evolves over the course of the study, that it would continue to be discussed. Dwayne Johnson added that mitigation measures relative to the Section 404 process handled by the Corps, while not in place for upland habitat mitigation, can include these areas in a mitigation plan for wetlands.
6. Patty Gesing explained the screening process to evaluate location alternatives, starting with broad corridors (up to two miles in width), screening to one corridor based on known, or secondary source information, then developing detailed alignment alternatives within that preferred corridor. Field data (primary source) information would be collected and used for impact assessment in the alignment study. The study team expects to be able to identify one corridor as the preferred, based on the large body of known information and participation by resource agencies, local elected officials and the public. However, the team is prepared, if necessary, to carry forward more than one corridor or parts of more than one corridor into the alignment study. The alignment width is expected to be roughly 300 feet.

7. Patty Gesing asked for feedback from the group on resources to be studied both in the corridor study and the alignment study. Although all resource categories and specifics of study methods were not discussed, the group reached a general consensus on the following topic areas:

   - ***Wetlands:*** NWI wetlands, supplemented with aerial photointerpretation, would be appropriate for the corridor study. Delineations will be conducted, with right of entry, for wetlands impacted by the alignment alternatives.

   - ***Non-Regulatory Impacts***: Route studies should not be solely based on regulatory issues and mitigation costs, but should also consider non-regulatory impacts and avoidance and minimization of those impacts. Robin Sterry noted that this is indeed the approach that TXDOT would like to take for all resources. Mitigation of non-regulatory resources such as upland habitats should be considered and possibly included in mitigation planning for regulatory resources. In this category of non-regulated resources are large expanses of contiguous habitat, such as prairies, bottomland hardwoods and pine forests. It was agreed that the study team would prepare a land cover map of these resources for use in the corridor and alignment studies and review it with the agency representatives.

   - ***Resource Maps***: The consultant team will also distribute current project area mapping (attached) for attendees to identify any known areas of importance. It was agreed that these could be turned around within one month of receipt from the study team.

   - ***Segment G Termini***: The US 59 crossing location is critical to avoid or minimize impacts to Lake Houston state park in Segment H. The consultant team agreed to extend existing mapping to the east to include the park so the terminus location of Segment G considered this resource. A follow-on meeting is planned to discuss this resource.

   - ***NEPA/Section 404 Joint Processing***: Patty Gesing noted that the study team may employ an integrated NEPA/404 process for the project and as such, it is important that early studies, like the corridor review, satisfy the Section 404(b)(1) guidelines. Dwayne Johnson noted that the study process presented by the team appears to satisfy the intent of the guidelines.

8. A question was asked as to how the agencies could stay informed of the public comments received on the project at upcoming workshops. Diane Schenke offered to provide the group with summaries of the meetings in either a GPA newsletter, the website, or an informational flyer.

9. Diane Schenke emphasized that this early coordination meeting was critical to a cooperative effort and efficient processing of the documents for these segments of the Grand Parkway and asked the group for continued attendance and assistance. The GPA, consultant team and attendees will undertake on-going coordination through individual contact and group meetings throughout the Segment E, F, and G study.

10. Diane Schenke thanked the group for their time and active participation and adjourned the meeting at 11:30 am.

The Grand Parkway
Segments E, F and G

Resource Agency Workshop

August 18, 1999

NAME/Tele. (Please Print)	AGENCY NAME & ADDRESS
Gary Johnson	FHWA 826 Fed Office Bldg Austin TX 78701 (512) 916-5516
KATHY DIMPSEY (512) 916-5917	FHWA 300 E. 8th St. Rm 826, Austin TX 78701
ROBIN STERRY 713-802-5248	TxDOT-Houston 7721 Washington Ave, Houston Tx 77251-1386
Mike LEARY (512) 916-5917	FHWA 826 Fed Bldg Austin 78701
JOHN KOROS 713-684-4019	HCFCD 9900 NW. Freeway Houston 77018
Lee Gibbons	FHWA 300 E 8th Austin Tx 78701 (512) 916 5516
GARY GREEN	HCFCD (713 684-4151) 9900 NW FREEWAY Houston 77092
Dwayne Johnson (409-766-6853)	COE 2000 Fort Point Rd. Galveston TX 77555
TED HOLLINGSWORTH	TPWD 105 SAN JACINTO LAPORTE TX 77571
DAVID GORNET	GPA 713.965.0871 4544 Post Oak Place, Houston, TX 77027
Woody Woodum	TPWD
Diane Dismukes	TxDOT (512) 416-2632
Julie Lane	TxDOT - ENV (512) 416-2612
Andrew Cooper	Baker 281 579 7850
Jim Gregory jfgregory@pbsj.com	PBSJ 3200 Wilcrest, Ste 200 Hou 77042
Chris Cotter	Brown & Gay Engrs. 11490 Westheimer, Ste 700 Hou. 77077
Jim Darden 713 802 5241	TxDOT 7721 Washington PO Box 1386 77251-1386
Bob Arroyave 281 558-8700	Brown & Gay Engrs. 11490 Westheimer, Ste 700 Hou 77077

The Grand Parkway
Segments E, F and G

Resource Agency Workshop

August 18, 1999

NAME (Please Print)	AGENCY NAME & ADDRESS
Glenn Graham	PBS&J 3200 Wilcrest #200, Houston, Tx 77042 (713)781-8800 glgraham@PBSJ.com
Patty Eusing	Baker 281/519 785 16340 Park Ten Plaza /320 Houston, TX 77084
Tom Couling	"
Kristie Denton	PBS+J 206 Wild Basin Rd. Suite 300 Austin TX 78746
Diane Schenke 713 965-0871	GPA 4544 Post Oak Pl #222, Hou 77027 (512) 327-6840

Public Meeting Workshop No. 1
Wednesday, August 18, 1999
Tomball College

Comment
Box

Comment
Box

Public Meeting Workshop No. 1
Tuesday, August 24, 1999
Langham Creek High

The Grand Parkway
Segments E, F and G

Meeting Minutes

Meeting:	Agency Coordination
Purpose:	First Outreach Period - Agency Coordination Meeting
Meeting Date:	August 26, 1999
Location:	GPA Offices
Attendance:	See attached sign-in sheet

1. Diane Schenke Called the meeting to order at 1:30 pm. The purpose of the meeting was to continue on-going project coordination in general and to discuss Texas Parks and Wildlife Department interests concerning alignment development in the vicinity of Lake Houston State Park.

2. The meeting opened with Diane Schenke and Patty Gesing of Baker providing an explanation of the study process. A discussion ensued as to the scope of the analysis and whether all three corridors identified in the location study would be analyzed in the EIS. Patty Gesing responded that only one corridor would be evaluated in the EIS. She explained that the intent of the location study was to screen feasible corridors to identify one corridor for alignment development and analysis in the EIS. She added that the screening process for identifying the preferred corridor would be fully documented in the DEIS and that the project schedule calls for screening corridors down to one over the next year followed by alignment review the following year. She did add, however, that the process could result in identification of the best corridor within four to five months.

3. The number of EIS documents to be prepared was discussed. Diane Schenke explained that the ultimate number of EIS documents to be prepared was yet to be determined. However, for segments E, F1, F2, and G, up to four EIS documents could be prepared – one for each segment – based on the fact that each segment had independent utility, had separate termini and possessed regional variation in resources and issues. She added that preparing EIS documents for each segment would enable construction of the Parkway in segments should funding or resolution of individual segment issues dictate such.

4. Agency involvement in data collection was discussed. All concurred to the importance of agency involvement and cooperation early in the project and prior to the typical regulatory and permitting phase. As part of this early coordination, the Department representatives agreed to provide available environmental inventory data 30 days following written request by the Grand Parkway Association. Patty Gesing also requested the Department representatives assist in identifying agency specific as well as general environmental issues that should be considered in the analysis. Department representatives agreed.

5. The role of the Grand Parkway Association (GPA) in the project was discussed. Diane Schenke explained the GPA was preparing the location study and EIS(s) in cooperation with TXDOT and the FHWA. She added the GPA is a transportation corporation formed to assist TXDOT in building roadways. She explained the GPA's goal is to complete the studies and

to undertake corridor preservation activities through various means including purchase and donation. Agency representative asked if the GPA had powers of condemnation. Diane Schenke responded that the GPA did have this power, but acquisition through donation was the GPA goal.

6. The role of Texas Parks and Wildlife Department in permitting was discussed. Department representatives stated permitting role of the Agency in the Grand Parkway project would be as a coordinating agency in the Section 404 wetland permitting process. In this regard, Department representatives stated a preference for an inter-agency agreement to expand the habitat type required for mitigation under Section 404 to go beyond wetlands to a area-wide mitigation concept based on habitat type. Department representatives explained that this would increase habitat mitigation beyond the statutory wetland classes of habitat to include low land bottomland forest and prairie habitiats.

7. Other permitting requirements were discussed. Patty Gesing stated that impacts to navigatible waterways may require permits if encountered. However, she stated that Section 404 was the major permitting requirement for the project and that concurrent processing of the EIS and Section 404 permit was being considered.

8. Lake Houston State Park was discussed. The Department representatives stressed the importance of continued coordination to determine the best route in the vicinity of the Park. Department representatives explained the park is 4,900 acres of low land habitat for wildlife such as bobcat, dear and alligator. It is a priority of the Department to maintain this resource in its unfragmented state and to avoid breaking the park up by infrastructure. Department representatives added that the Texas Parks and Wildlife Department has deliberately delayed developing facilities within the park until the Grand Parkway alignment is know so park development can be localized and minimized. Once developed and promoted Department representatives anticipate 400,000 to 500,000 visitors per year at the park. David Gornet explained that the GPA will work with Texas Parks and Wildlife Department to determine the best route for the Parkway and explained that while the terminus of segment G will be a consideration when assessing future park impacts, additional means of avoidance, such as alignment alterations in Segment H would be possible to further avoid park impacts.

9. Threatened and Endangered species issues were discussed. Department representatives agreed to work with the GPA to identify potential habitat and sites for T&E species.

10. On-going coordination throughout the project was discussed. It was agreed that on-going coordination and information exchange was critical throughout the project. Department representatives stated that the level of their involvement would increase once alignments were defined and the Section 404 permitting process was initiated. Diane Schenke stressed the need for active agency involvement and coordination prior to this stage. Department representatives agreed and suggested development of ground rules directing coordination process between the two agencies.

GRAND PARKWAY ASSOCIATION
Sign-in Sheet

TPWD/USFWS Meeting

August 26, 1999

Name (please print)	Affiliation and Address (please include city & zip code)	Telephone No. with Area Code
Robin K Sterry	TxDOT - Houston District	713-802-5248
Andy Sipocz	TPWD - Clear Lake	(281) 461-4071 x 27
Jim Gregory	PBSJ 3200 Wilcrest Suite 200 Houston, TX 77042	713-781-8800 jfgregory@pbsj.com
CARL WOODWARD	PBSJ "	713-781-8800 cwoodward@pbsj.com
TED HOLLINGSWORTH	TPWD	(281) 471-3200 ext. 229
Bob Spain	TPWD	(512) 389-4635
Woody Woodrow	TPWD - Jarrett.Woodrow@TPWD.state.tx.us	281 461 4071 x22
☆ Edith Ertling	FWS 17627 El Camino Real Houston	281-286-8252
DAVID GORNET	GPA	713-965-0871
~~BOB ARROYAVE~~	~~B&G~~	
Patty Gesing	Baker - EIFaly Team	

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GRAND PARKWAY ASSOCIATION

Sign-in Sheet

TPWD/USFWS Meeting

August 26, 1999

Name (please print)	Affiliation and Address (please include city & zip code)	Telephone No. with Area Code
Tom Cowling	Baker - EF&G Study Team	
Bob Arroyave	Brown & Gay Engineers - C Study Team; E F & G Study Team	(281) 558-8700
LINTON ARDOIN	TPWD - LA PORTE OFFICE	(281) 471-3200
DIANE SCHENKE	GRAND PKWY ASSN	713/965-0109

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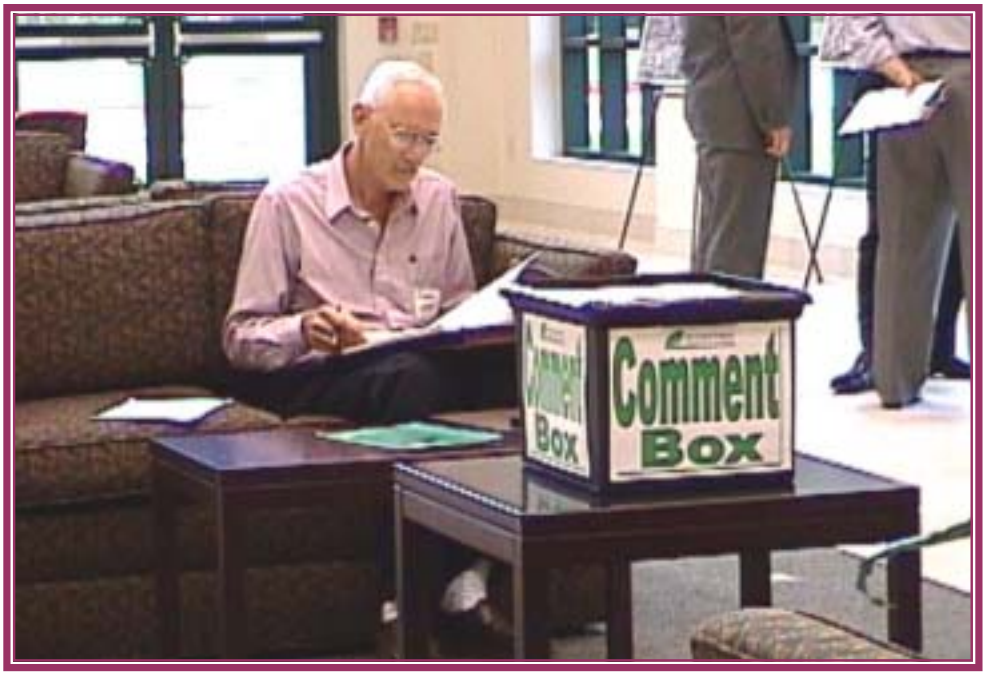
Public Meeting Workshop No. 1
Thursday, August 26, 1999
Kingwood College

Comment
Box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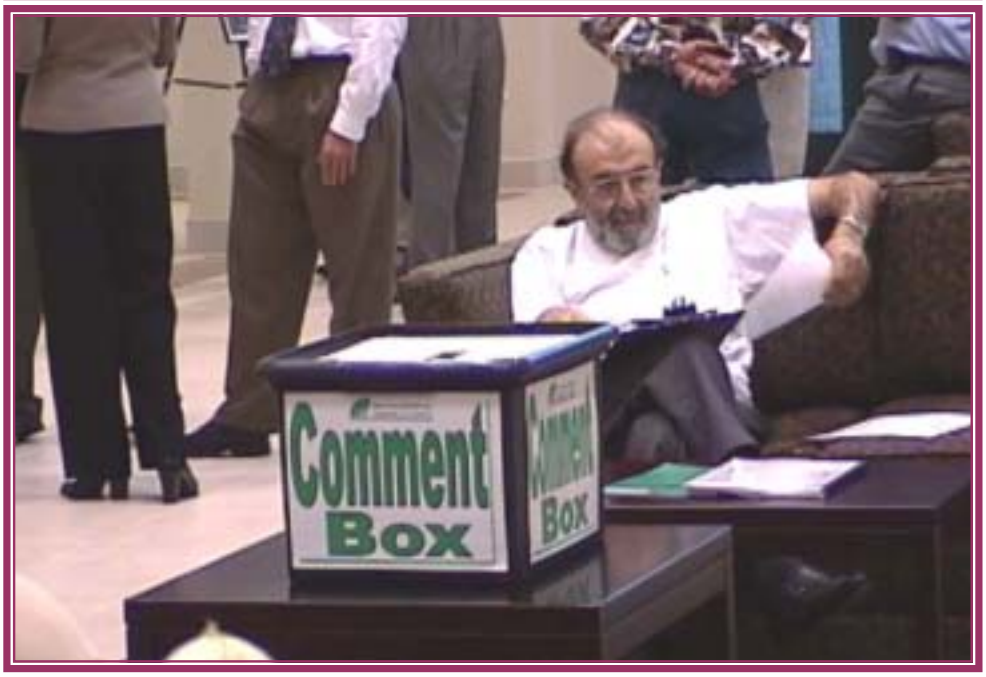
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Comment
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The Grand Parkway
Segments E, F and G

August 1999 Workshops Comment Form

Name _____ **Street Address** _____

City _____ **State** _____ **Zip** _____

Phone No. _____

Meeting Attended:
❑ **August 18** ❑ **August 24**
❑ **August 26** ❑ **Mailed-in**

1. Where do you live? (Give segment and community.)
   E _____;
   F-1 _____;
   F-2 _____;
   G _____;
   Other _____.

2. Which segment of the Grand Parkway would you use? ❑ E, ❑ F-1, ❑ F-2, ❑ G, ❑ Other _____.

3. I would use the Grand Parkway to travel from: (Eg: Tomball to The Woodlands)
   _____to_____.

4. If Segments E, F and G of the Grand Parkway were built, I would use it _____.
   ❑ daily ❑ infrequently
   ❑ weekly ❑ not at all

5. The Grand Parkway, Segments E, F and G would improve my travel time to_____.
   ❑ work ❑ shopping areas
   ❑ visit relatives ❑ schools
   ❑ hospitals ❑ all of the above
   ❑ visit friends ❑ none of the above

6. I would travel ____ miles to use the Grand Parkway, Segments E, F and G.
   ❑ 1-5 miles ❑ 10-20 miles
   ❑ 5-10 miles ❑ 0 (would not use)

7. Please give the zip code where you work_____.

8. What is the approximate distance you travel to work each day (one way)?
   ❑ 0-5 miles ❑ 20-30 mile
   ❑ 5-10 miles ❑ 30 + miles
   ❑ 10-20 miles

9. In my opinion the level of existing traffic congestion is _____.
   ❑ acceptable ❑ not acceptable

10. In my opinion the level of traffic congestion in the future will be_____.
    ❑ acceptable ❑ not acceptable

11. In my opinion, the Grand Parkway, Segments E, F and G are _____ to relieve existing traffic congestion.
    ❑ greatly needed ❑ somewhat needed
    ❑ needed ❑ not needed

12. In my opinion, the Grand Parkway, Segments E, F and G are _____ to relieve future traffic congestion.
    - ❑ greatly needed ❑ somewhat needed
    - ❑ needed ❑ not needed

13. If the Grand Parkway, Segments E, F and G were built, what would be your biggest concern?
    - ❑ potential effects on your community
    - ❑ potential effects on the natural environment
    - ❑ potential effects on historic resources
    - ❑ other _____.

14. Please explain any concerns identified and if possible identify their approximate location.

_____

_____

_____

_____

_____

_____

_____

15. Do you have any other ideas of how the public can be involved?

_____

_____

_____

16. Should you wish to make additional comments, please do so in the space below.

_____

_____

_____

Contact us at: Phone: (281) 579-4579
Web Site: www.grandpky.com

TRI-FOLD STARTING HERE WITH ADDRESS SIDE SHOWING AND STAPLE

Return Address

Place
Stamp
Here

Michael Baker Jr., Inc.
16340 Park Ten Place
Suite 320
Houston, Texas 77084

Attn: Patricia Gesing

Grand Parkway Segment E, F, & G
August 18, 1999 Public Workshop

Where do you live?

E	F-1	F-2	G	Other
2	12	12	2	3
6%	39%	39%	6%	10%

Which segment of the Grand Parkway would you use?

E	F-1	F-2	G	Other
13	17	11	6	0
28%	36%	23%	13%	0%

If Segments E, F and G of the Grand Parkway were built, I would use it:

Weekly	Daily	Infrequently	None
7	5	9	7
25%	18%	32%	25%

The Grand Parkway, Segments E, F and G would improve my travel time to:

Schools	Work	Shopping Areas	Visit Relatives	Visit Friends
1	8	3	6	7
4%	32%	12%	24%	28%

How many miles would you travel to use the Grand Parkway, Segments E, F and G?

1 to 5	5 to 10	10 to 20	None
15	2	2	5
63%	8%	8%	21%

How many miles do you approximately travel to work each day?

0 to 5	5 to 10	10 to 20	20 to 30	30 +
14	1	2	3	3
61%	4%	9%	13%	13%

In my opinion the level of existing traffic congestion is:

Acceptable	Not Acceptable
14	12
54%	46%

In my opinion the level of traffic congestion in the future will be:

Acceptable	Not Acceptable
14	10
58%	42%

In my opinion, to relieve existing traffic congestion, Segments E, F and G of the Grand Parkway are:

Needed	Not Needed	Greatly Needed	Somewhat Needed
8	11	6	2
30%	41%	22%	7%

In my opinion, to relieve future traffic congestion, Segments E, F and G of the Grand Parkway are:

Needed	Not Needed	Greatly Needed	Somewhat Needed
7	8	6	3
29%	33%	25%	13%

Grand Parkway Segment E, F, & G
August 18, 1999 Public Workshop (Cont.)

If the Grand Parkway, Segments E, F and G were built, your biggest concern would be with the potential effects on:

Historic Resources	Your Community	Natural Environment	Other
1	13	8	6
4%	46%	29%	21%

Concerns Identified:

1) Urban sprawl, Katy Prairies, Brazos Bend State Park, and flooding
2) To close to many houses, and loss of property
3) Wetlands Mitigation of Spring Creek and San Jacinto Flood Plain
4) How much land would one lose and how much taxes would one pay
5) Cypress Rosehill Rd. - Concerned if new roadway would block entrance to pasture
6) Potential routing around Hooks Airport, the F-2 area
7) Lack of the roadways true utility - more harmful and less beneficial
8) Loss of animal habitat in the Katy Prairies and the Northwest
9) Community does not have to subsidize Cinco Ranch Realtors

Other ideas of how the public can be involved:

1) More publicity
2) The leaders of the project must inform more of the public
3) Continue public hearings throughout effected areas
4) group the transportation committee of Chambers and area associations along the corridor
5) Put maps in the newspaper and on television
6) Make the environmental groups give money

Additional comments:

1) No need for additional freeways in F-1 region
2) Need mileage scale to answer #6
3) Would like to see local natural areas set aside as mitigation
4) Why add a third loop when the Beltway is not congested
5) Wants to know if the Grand Parkway will affect him

Grand Parkway Segment E, F, & G
August 24, 1999 Public Workshop

Where do you live?

E	F-1	F-2	G	Other
5	1	1	1	3
45%	9%	9%	9%	27%

Which segment of the Grand Parkway would you use?

E	F-1	F-2	G	Other
10	8	8	3	0
34%	28%	28%	10%	0%

If Segments E, F and G of the Grand Parkway were built, I would use it:

Weekly	Daily	Infrequently	None
6	0	5	1
50%	0%	42%	8%

The Grand Parkway, Segments E, F and G would improve my travel time to:

Schools	Work	Shopping Areas	Visit Relatives	Visit Friends
2	2	6	5	9
8%	8%	25%	21%	38%

How many miles would you travel to use the Grand Parkway, Segments E, F and G?

1 to 5	5 to 10	10 to 20	None
3	6	0	1
30%	60%	0%	10%

How many miles do you approximately travel to work each day?

0 to 5	5 to 10	10 to 20	20 to 30	30 +
2	2	5	0	2
18%	18%	46%	0%	18%

In my opinion the level of existing traffic congestion is:

Acceptable	Not Acceptable
2	10
17%	83%

In my opinion the level of traffic congestion in the future will be:

Acceptable	Not Acceptable
1	11
8%	92%

In my opinion, to relieve existing traffic congestion, Segments E, F and G of the Grand Parkway are:

Needed	Not Needed	Greatly Needed	Somewhat Needed
2	2	7	1
17%	17%	58%	8%

In my opinion, to relieve future traffic congestion, Segments E, F and G of the Grand Parkway are:

Needed	Not Needed	Greatly Needed	Somewhat Needed
3	2	6	0
27%	18%	55%	0%

Grand Parkway Segment E, F, & G
August 24, 1999 Public Workshop (Cont.)

If the Grand Parkway, Segments E, F and G were built, your biggest concern would be with the potential effects on:

Historic Resources	Your Community	Natural Environment	Other
1	5	6	1
8%	38%	46%	8%

Concerns Identified:

1) Loss of duck habitat and more development
2) Katy Prairies
3) Increase in traffic and pollution, and losing federal highway funds
4) The wildlife on the Katy Prairies
5) Need new roadways to keep up with population growth
6) Cypress Creek watershed

Other ideas of how the public can be involved:

1) Have frequent public discussions
2) If Grand Parkway is a toll road, let the taxpayers vote on the issue

Additional comments:

1) Do not make the Grand Parkway a toll road

Grand Parkway Segment E, F, & G
August 18, 24, and 26 1999 Public Workshops

Where do you live?

E	F-1	F-2	G	Other
7	14	15	12	12
12%	23%	25%	20%	20%

Which segment of the Grand Parkway would you use?

E	F-1	F-2	G	Other
31	33	28	20	2
27%	29%	25%	18%	2%

If Segments E, F and G of the Grand Parkway were built, I would use it:

Weekly	Daily	Infrequently	None
23	5	21	8
40%	8%	37%	15%

The Grand Parkway, Segments E, F and G would improve my travel time to:

Schools	Work	Shopping Areas	Visit Relatives	Visit Friends
4	15	15	18	23
5%	20%	20%	24%	31%

How many miles would you travel to use the Grand Parkway, Segments E, F and G?

1 to 5	5 to 10	10 to 20	None
24	12	6	6
50%	26%	12%	12%

How many miles do you approximately travel to work each day?

0 to 5	5 to 10	10 to 20	20 to 30	30 +
21	3	10	4	6
48%	7%	23%	9%	13%

In my opinion the level of existing traffic congestion is:

Acceptable	Not Acceptable
18	36
33%	67%

In my opinion the level of traffic congestion in the future will be:

Acceptable	Not Acceptable
16	36
31%	69%

In my opinion, to relieve existing traffic congestion, Segments E, F and G of the Grand Parkway are:

Needed	Not Needed	Greatly Needed	Somewhat Needed
14	13	23	4
26%	24%	43%	7%

In my opinion, to relieve future traffic congestion, Segments E, F and G of the Grand Parkway are:

Needed	Not Needed	Greatly Needed	Somewhat Needed
11	10	21	5
23%	21%	47%	9%

Grand Parkway Segment E, F, & G
August 18, 24, and 26 1999 Public Workshops (Cont.)

If the Grand Parkway, Segments E, F and G were built, your biggest concern would be with the potential effects on:

Historic Resources	Your Community	Natural Environment	Other
3	23	17	11
6%	43%	31%	20%

Concerns Identified:

1) Make highway with less curves
2) Local congestion
3) Wetlands mitigation of Spring Creek and San Jacinto flood plain
4) Loss of wetlands, wildlife and their habitat
5) Increase in traffic and pollution
6) Need new roadways to keep up with population growth
7) Highway's proximaty to and loss of property
8) Potential routing around Hooks Airport

Other ideas of how the public can be involved:

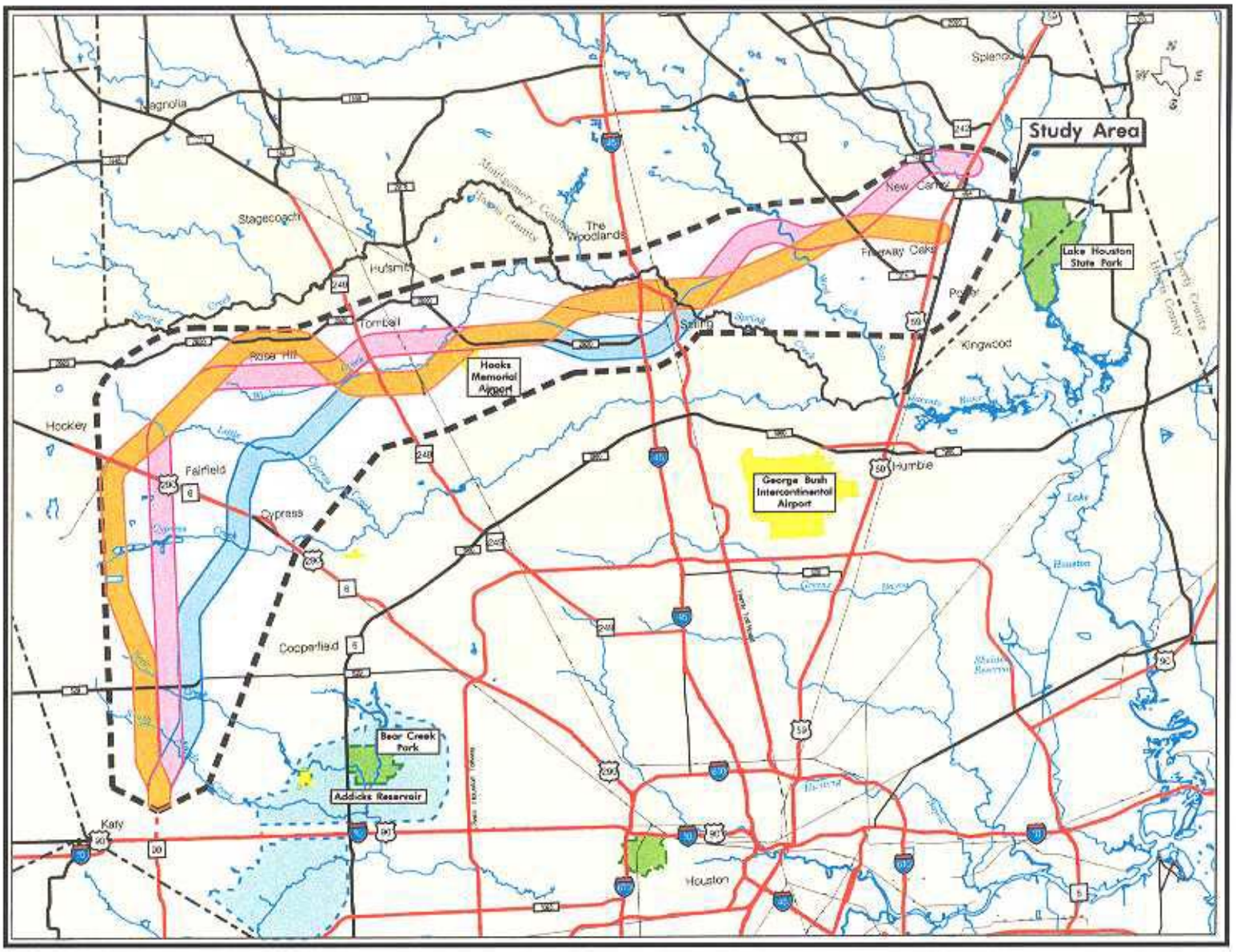
1) More publicity on the effected areas through newspapers and television
2) Informing the public on the amount of acres used to complete Segments E, F, and G
3) less involvement will help expedite completion
4) group the transportation committee of Chambers and area associations along the corridor

Additional comments:

1) The construction schedule should be expedited
2) No need for additional highway in F-1 region
3) Would like to see local natural areas set aside as mitigation
4) Do not make the Grand Parkway a toll road

Public Workshop No. 2 / Preliminary Corridors Workshops
Summary Report
February 1, February 2 and February 3, 2000

Grand Parkway
Segments E, F1, F2 and G
From IH-10 West to US 59 North



Texas Department of Transportation

The Grand Parkway Association

The Grand Parkway
Segments E, F and G

NOTICE OF PUBLIC WORKSHOPS

The Grand Parkway Association, in cooperation with the Texas Department of Transportation and the Federal Highway Administration, will be holding four public workshops in conjunction with its continuing study of Segments E, F-1, F-2 and G of the Grand Parkway. These workshops will serve as scoping sessions for the comprehensive study from IH 10 West to U.S. 59 North that began in August 1999.

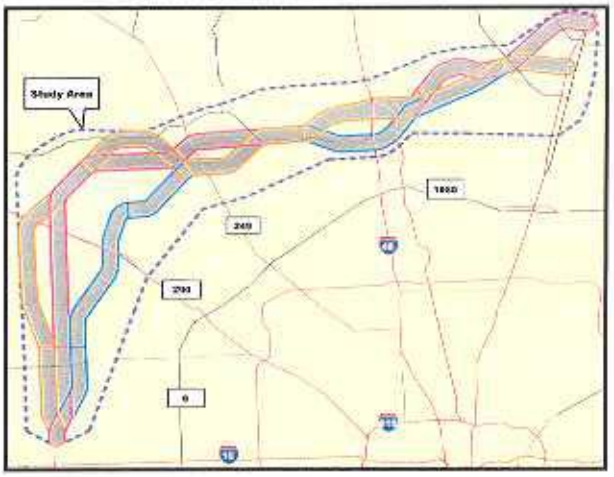
An environmental inventory for the entire study area will be presented. Mapped information includes residential areas, wetlands, floodplains, parks, schools, cemeteries, sensitive natural and cultural resources, water, oil and gas wells.

Preliminary corridor alternatives will also be presented that have been developed to avoid or minimize impacts to the mapped resources. The study team will be taking comments on a number of corridors that are 5,000' in width. This width will allow for the development of several routes, or alignments, within a corridor.

Workshop Locations
All Workshops are from 4:00 p.m. to 7:00 p.m.

Segment E:	February 1, 2000 Langham Creek High School 17610 FM 529
Segment F-1:	February 2, 2000 Tomball College 30555 Tomball Parkway
Segment F-2:	February 2, 2000 Tomball College 30555 Tomball Parkway
Segment G:	February 3, 2000 Kingwood College 20000 Kingwood Drive

GRAND PARKWAY SEGMENTS E, F AND G PRELIMINARY CORRIDORS



Comments are invited on the resource mapping and the preliminary corridors. Comments will also be taken on the overall scope of the study and any additional significant issues that should be evaluated in the Environmental Impact Statement prepared for each segment.

Each workshop will focus on one segment, however, information on the entire study will be available at all workshops. Workshops will be open forum and interested persons are encouraged to visit anytime between the hours of 4:00 p.m. and 7:00 p.m. at the planned locations.

All meeting locations are wheelchair accessible. Individuals with special communication or accommodation needs should call 713-965-0871 at least 3 days before the workshop. Since the workshops will be conducted in English, any requests for language interpreters or other communication needs should also be made at least 3 days prior to the workshop. Every reasonable effort will be made to accommodate these needs. Written comments may be directed to the Grand Parkway Association.

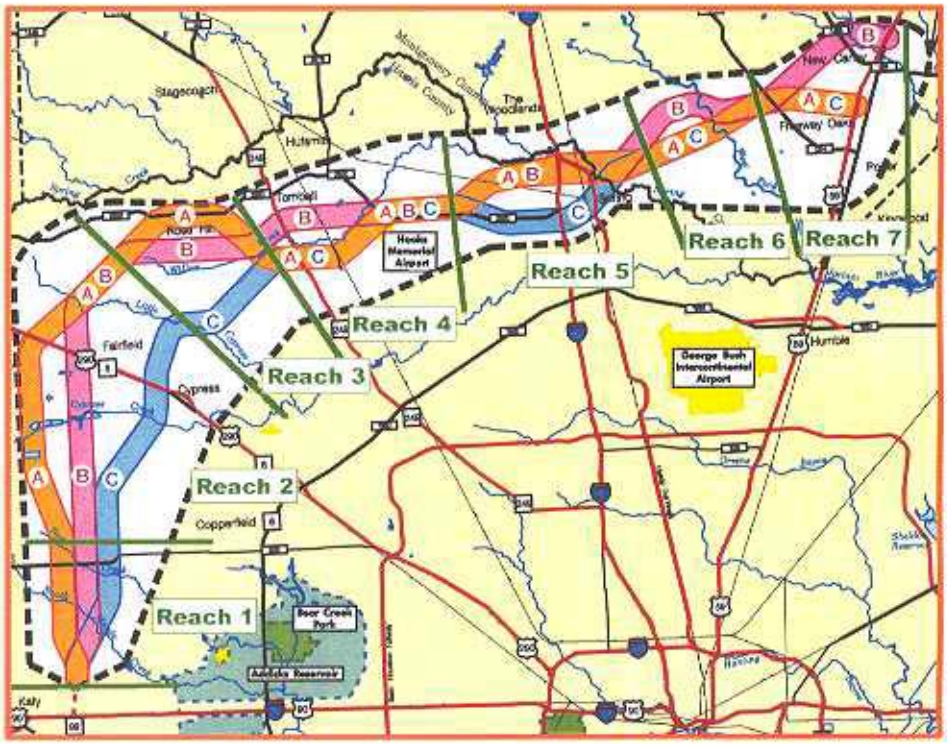
For more information, contact:
Michael Baker Jr., Inc. ■ 16340 Park Ten Place, Suite 320 ■ Houston, TX 77084 ■ 281-579-4579 *or*
The Grand Parkway Association ■ 4544 Post Oak Place, Suite 222 ■ Houston, TX 77027 ■ 713-965-0871

1/7/2000

The Grand Parkway
Segments E, F and G

SUMMARY OF FEBRUARY 2000 PUBLIC WORKSHOPS

A series of public workshops for the scoping session of the extension of the Grand Parkway between IH 10 West and US 59 North was held on February 1, 2, and 3 of 2000. The extension is known as Segments E, F-1, F-2, and G of the Grand Parkway, SH 99. One hundred thirty-four citizens attended the workshops over the three day period. The objectives of the workshops were to present preliminary corridor alternatives and to obtain citizens' opinions on the overall scope of the study and any additional significant issues that should be evaluated in the Environmental Impact Statements (EISs).



A video summarized the progress to date and explained the information that was being presented at the workshop. Preliminary corridor alternatives on detailed aerial photomaps of the study area were available for review. Grand Parkway study team members were available throughout the evening to answer questions and to provide additional information.

Citizens were asked to complete a questionnaire regarding their viewpoints on existing traffic congestion, expected need for and usage of the Grand Parkway, and which corridor, if any, they preferred in each reach of the project. The reaches were set to identify points at which a corridor "switch" could be made. Citizens supporting construction of the Grand Parkway cited an existing need for the facility due to heavy development within the study area, time savings for trips to work, school or shopping, and diversion of trucks and other traffic from existing congested roadways in Houston. Others noted that the Grand Parkway is vital to continued economic growth.

THE PREFERRED CORRIDOR IDENTIFIED BY PUBLIC WORKSHOP PARTICIPANTS

Corridor	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7
A	16%	17%	16%	20%	**34%**	**39%**	**36%**
B	**53%**	**49%**	**47%**	**40%**	**36%**	22%	30%
C	31%	34%	37%	**40%**	30%	**39%**	**34%**

The No-Build alternative will be carried forward throughout this study as the baseline against which benefits and impacts of the project are compared. The EISs will include a description of the No-Build alternative and corresponding traffic volumes, cost, effects on land use and other impacts that may result from its selection. Some citizens attending the workshops, as well as others providing their opinion by mail, support the No-Build alternative. Reasons cited include concerns about continued urban sprawl, resulting secondary development, air quality issues, and impacts to the wetlands, riparian habitat and wildlife species in the study area.

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The Grand Parkway Association ■ 4544 Post Oak Place, Suite 222 ■ Houston, TX 77027 ■ 713-965-0871

PUBLIC NOTICE

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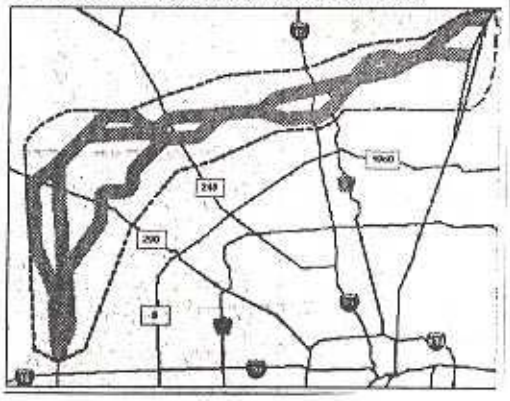

1745 LEGAL NOTICES 1745 LEGAL NOTICES

PUBLIC NOTICE

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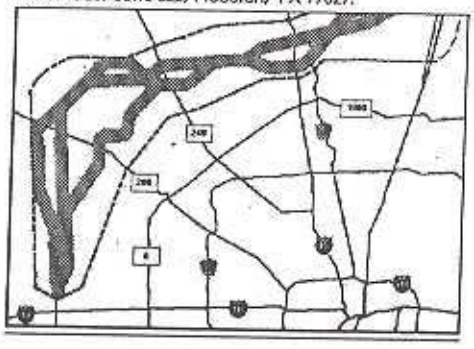


STATE OF TEXAS

COUNTY OF Harris

AD# 11115541
AD# 11202277

Before me, the undersigned authority, on this day personally appeared Vicki Eubanks who being by me duly sworn, deposes and says that (s)he is the Acct. Rec. Supervisor of the Houston Chronicle, that said newspaper is regularly published in Harris, Galveston, Ft. Bend, Chambers, Wharton, Brazoria, Waller, Austin, Liberty, Colorado, Montgomery and Matagorda Counties, Texas and that the attached notice was published in said newspaper on the following date(s), to wit: December 29, 1999 and January 21, 2000.

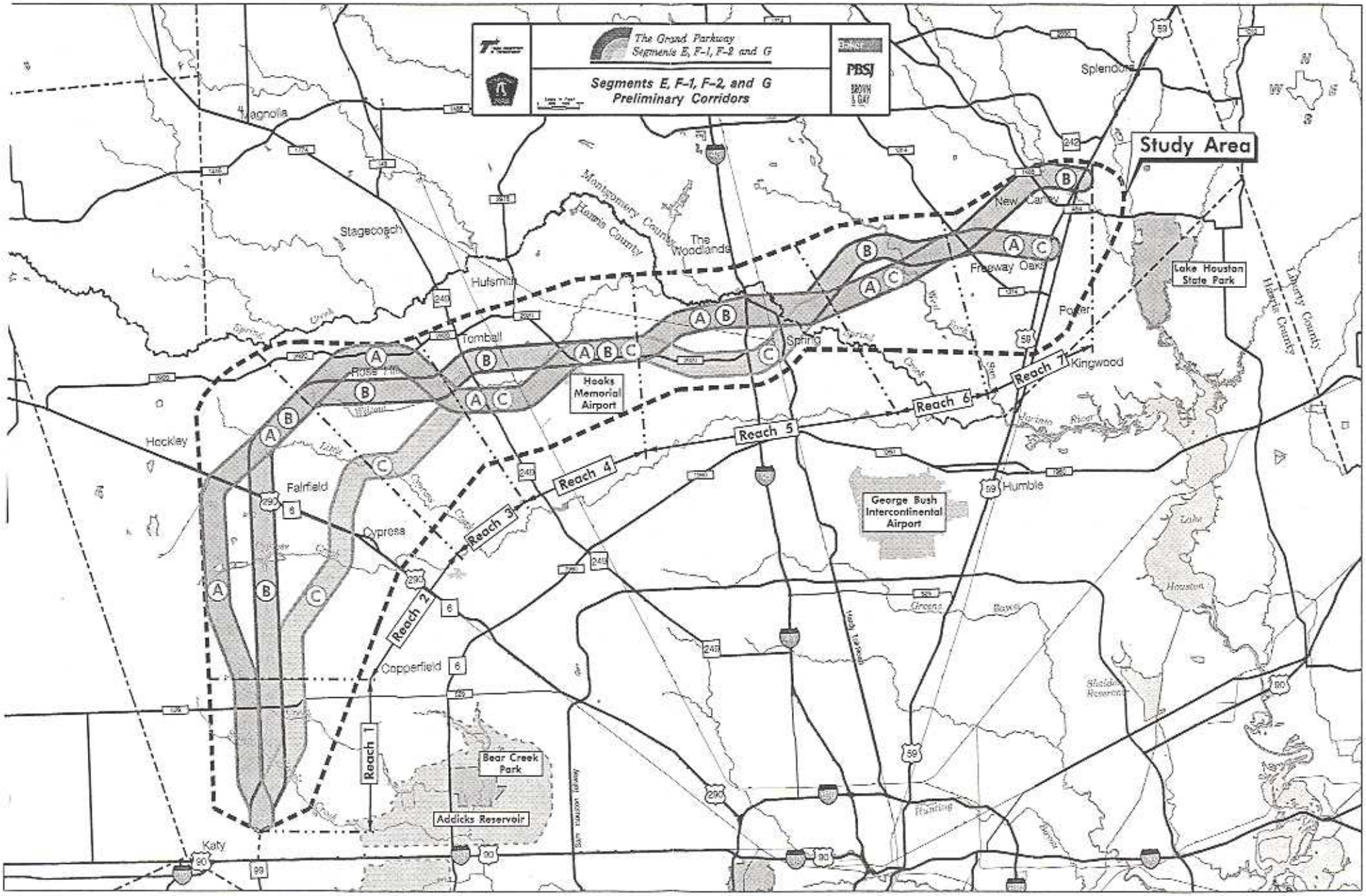
Vicki Eubanks
Newspaper Representative Signature

Subscribed and sworn to before me this the 1st day of February, 2000, to certify which witness my hand and seal of office.

Jacque W Brown
Notary Public in and for
the State of Texas

My Commission Expires 6-19-00

JACQUE W. BROWN
Notary Public, State of Texas
Commission Expires 06-19-2000


The Grand Parkway
Segments E, F-1, F-2 and G
Segments E, F-1, F-2, and G
Preliminary Corridors
Baker
PBSJ
BROWN & GAY
Study Area
Magnolia
Stagecoach
Hufsmith
Tomball
Rose Hill
Hockley
Fairfield
Cypress
Copperfield
Katy
Montgomery County
Harris County
The Woodlands
Spring
Splendora
New Caney
Freeway Oaks
Porter
Kingwood
Humble
Liberty County
Hooks Memorial Airport
George Bush Intercontinental Airport
Lake Houston State Park
Bear Creek Park
Addicks Reservoir
Reach 1
Reach 2
Reach 3
Reach 4
Reach 5
Reach 6
Reach 7
A
B
C
N
W
E
S

The Grand Parkway
Segments E, F and G

Corridor Resource Inventory*

Corridors are approximately 5000 feet wide

Baker

PBSJ

BROWN & GAY

Reach	Corridor	Meets Project Purpose and Need	Length (miles)	Residential Area (acres)	School Properties	Churches	Cemeteries	Golf Courses	Parks	Natural Resources					Cultural Resources			Oil and Gas Wells	Potential Hazardous Waste Sites	Water Wells	
										Special Resource Areas	Wetlands (acres)	Prior Converted Wetlands (acres)	100 year Floodplain (acres)	Prime Farmland (acres)	Recorded Archaeology Sites	Candidate Historic Structures	High Probability Area (acres)			Public	Private
No-Build		No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	A	Yes	6.3	90	-	-	-	-	-	1	287	181	2197	3728	-	10	-	23	-	-	1
	B	Yes	6.3	495	-	-	-	-	-	1	170	129	1815	3733	-	14	-	35	-	4	3
	C	Yes	6.5	101	-	-	-	-	-	2	253	59	894	3850	-	15	-	14	-	1	1
2	A	Yes	13.1	34	-	-	-	-	-	2	819	647	1709	7809	-	18	91	2	1	-	7
	B	Yes	11.9	30	-	-	-	-	-	1	586	1263	1501	7140	1	22	105	3	-	-	12
	C	Yes	9.7	172	-	1	2	2	1	2	320	1307	1469	5858	2	27	59	38	-	-	5
3	A	Yes	7.6	529	-	1	1	-	1	1	349	-	287	4525	-	53	-	143	3	5	6
	B	Yes	6.0	156	-	-	-	-	-	-	215	-	932	3556	-	14	-	68	-	2	1
	C	Yes	4.7	424	1	-	-	-	1	2	356	-	601	2813	-	25	29	34	1	-	-
4	A	Yes	8.0	529	1	-	-	-	2	-	476	-	353	4820	-	39	153	65	10	11	7
	B	Yes	8.1	91	1	-	1	1	2	-	437	-	654	4671	-	36	214	152	14	12	10
	C	Yes	7.9	489	1	-	-	-	2	-	474	-	277	4721	-	39	153	61	10	11	7
5	A	Yes	8.2	602	1	1	1	-	2	-	358	-	964	4008	-	111	1707	70	7	7	6
	B	Yes	8.2	620	1	1	1	-	2	-	340	-	963	4008	-	113	1608	69	7	7	6
	C	Yes	8.8	702	3	8	1	-	2	-	377	-	444	4284	-	80	636	30	18	29	15
6	A	Yes	5.3	40	-	-	-	-	-	1	369	-	1160	106	1	-	350	-	-	-	-
	B	Yes	5.9	40	-	-	-	-	-	1	444	-	1383	176	-	7	960	2	-	-	1
	C	Yes	5.3	40	-	-	-	-	-	1	375	-	1177	109	1	-	350	-	-	-	-
7	A	Yes	4.1	495	-	-	-	-	-	-	329	-	399	799	-	2	366	1	-	-	3
	B	Yes	6.4	492	-	-	-	-	-	-	378	-	749	1438	-	-	296	3	-	4	2
		Yes	4.1	495	-	-	-	-	-	-	329	-	399	799	-	2	366	1	-	-	3

* NOTE: Data represents the total inventory within a corridor reach. Actual impacts would be substantially less for a 300-400 foot right of way.

Source: Michael Baker Jr., Inc.

February 2000

The Grand Parkway
Segments E, F and G

Agency Coordination Committee
Scoping Outreach Meeting

February 2, 2000
Tomball College
2:00 p.m.

Agenda

Introductions & Opening Remarks	Diane Schenke	5 min
Segments E, F and G Overview Video	All	10 min
Presentation	Patty Gesing	15 min
Comments from the Committee	All	40 min
Closing	Diane Schenke	10 min

The Grand Parkway
Segments E, F and G

Meeting Minutes

FINAL

Meeting: Agency Coordination Committee
Purpose: Scoping Process and Corridor Alternatives Workshop
Meeting Date: February 2, 2000; 1:00 PM
Location: Tomball College
Attendance: See attached list.

1. Diane Schenke introduced the study team and reviewed the agenda for the afternoon agency coordination meeting and evening public workshop.
2. A 12 minute video prepared for the public workshop was shown to the group. The video presented the scoping process, study efforts to date, the corridor alternatives and environmental inventory.
3. Comments from agencies:

   - *TPWD (Sipocz/Woodrow)* – Andy and Woody felt that the process does not allow for input by agency staff until critical decisions are already made.

     Study Team: The study team respectfully disagreed. The study team has made no decisions other than where to locate the alternative corridors. The outreach period currently in progress is being presented to local officials, agencies and the public for comment. We will continue to coordinate with the agencies and perhaps on a more regular basis.

   - *TPWD (Sipocz/Woodrow)* – Andy and Woody felt that the study team does not respond to data that is provided by agency staff. Therefore, TPWD feels that their input is not "valued" or recognized until the DEIS is released.

     Study Team: While "prairie" and "bottomland hardwoods" (BLHW) were identified as resources of concern at the August meeting, agency staff did not provide details until January 10. While we had not mapped those resources by February 2, we have agreed to consider these unregulated resources in the planning process and to try to avoid or minimize impacts to the extent practicable. The next version of maps produced by the study team will identify these resources.

     Resolution: A meeting has been scheduled for February 24 at which time the study team will provide inventory information on prairie and bottomland hardwoods based on the data provided by agencies in January as well as the team's interpretation of bottomland hardwoods.

     Resolution: The study team would like to maintain a cooperative, working relationship with the agencies. All agreed that meetings, phone calls and data sharing (all communications) should occur on a more regular, informal basis and should be as responsive as possible.

   - *Corps of Engineers (Johnson)* – Prior Converted (PC) cropland may be jurisdictional. The Corps maintains regulatory authority over linear projects and other projects that constitute a change in land use from agricultural production to something other than agricultural production. The Natural Resource Conservation Service (NRCS) is the regulatory agency that identifies PC cropland for purposes of the Food Security Act (1985 as amended) and farming programs.

NRCS PC determinations are based solely on hydric soil mapping units and frequently do not involve sampling to verify that hydric conditions exist. The Corps' 1987 Manual should be utilized to identify wetlands along selected alignments and the PC status of any property does not mean that a property is "exempt" from CWA regulation.

Study Team: The study team is aware of the "change in land use" clause in the CWA and FSA. The Corps' 1987 Manual will be uniformly applied along the project corridor(s).

Response: The study team will use only photointerpreted wetlands and those that have already been delineated for the wetland inventory in the corridor decision-making process.

- *Corps (Johnson)* – is there some degree of flexibility afforded the study team after decisions have been made, especially if an unknown environmental constraint is encountered during the study?
- *Study Team*: Yes. The study process is designed to respond to new information. Once a preferred corridor is identified, alignment studies will continue in that corridor. If new information is obtained regarding resources that must be avoided, a corridor modification would be made. The GIS environmental inventory process in use should eliminate these possibilities, but by virtue of the system, changes can be accommodated, if necessary.

4. The meeting adjourned at approximately 3:15 PM with several continuing conversations taking place at the public workshop to resolve the issues discussed. The resolutions have been included in the minutes above.

The Grand Parkway
Segments E, F and G

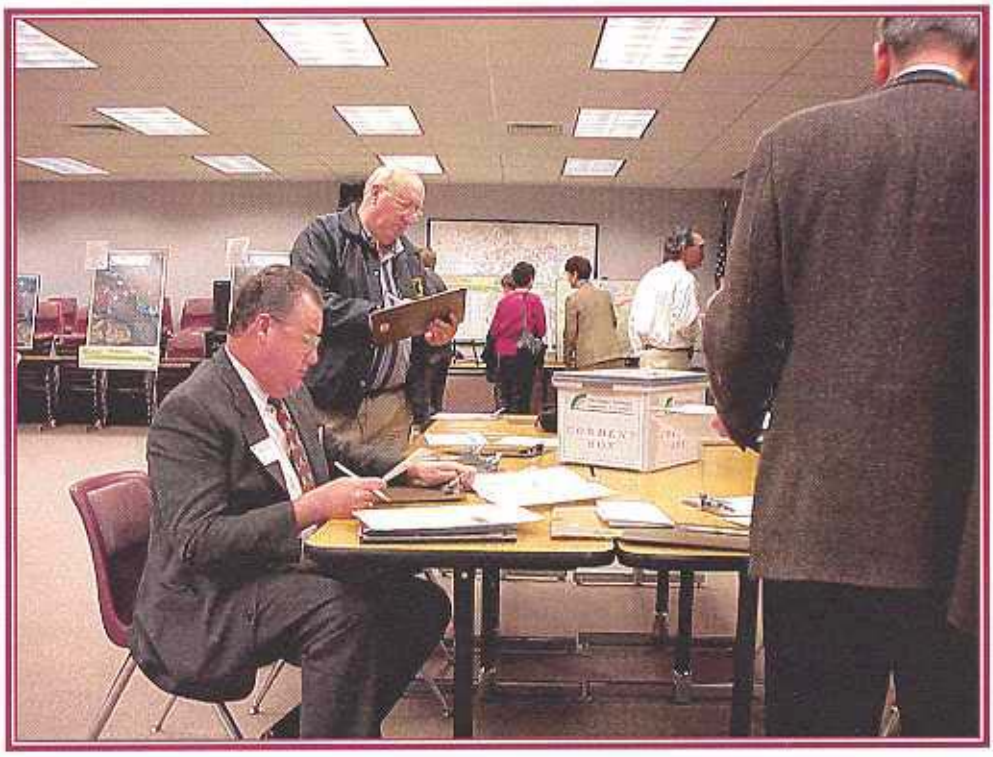
Resource Agency Workshop

February 2, 2000 ◆ Tomball College

NAME (Please Print)	ADDRESS (Street, City, State, Zip)
STAN COOPER	7721 WASHINGTON AVE, HOUSTON 77257-1354
Ken Sheblak	9900 N.W. Fwy Houston, TX 77092
Lee Gibbons	FHWA Austin Tx
Gary Johnson	826 Fed Office Bldg 300E 8th Austin 78701
Alan Ho	" " " " " " " "
Dwayne Johnson	USACE PO Box 1229 Galveston TX 77550
Jim Darden	TxDot Houston
DAVID GORNETT ✓	GPA
Andy Sipocz	Texas Parks & Wildlife 17629 El Camino Real Ste 175 Houston 77058
TOM BRUECHERT	TxDOT ENV 125 E 11th St FAX: 512-416-2746 AUSTIN TX 78701
Jim Gregory ✓	PBSJ
Jean Beeman	TxDOT, ENV
Christie Denton ✓	PBSJ
Paula Bostic	16151 Cairnway #107E Hst TX 77084 (Harris Co. SWCD & USDA, Natural Resources)
Diane Schenke ✓	GPA

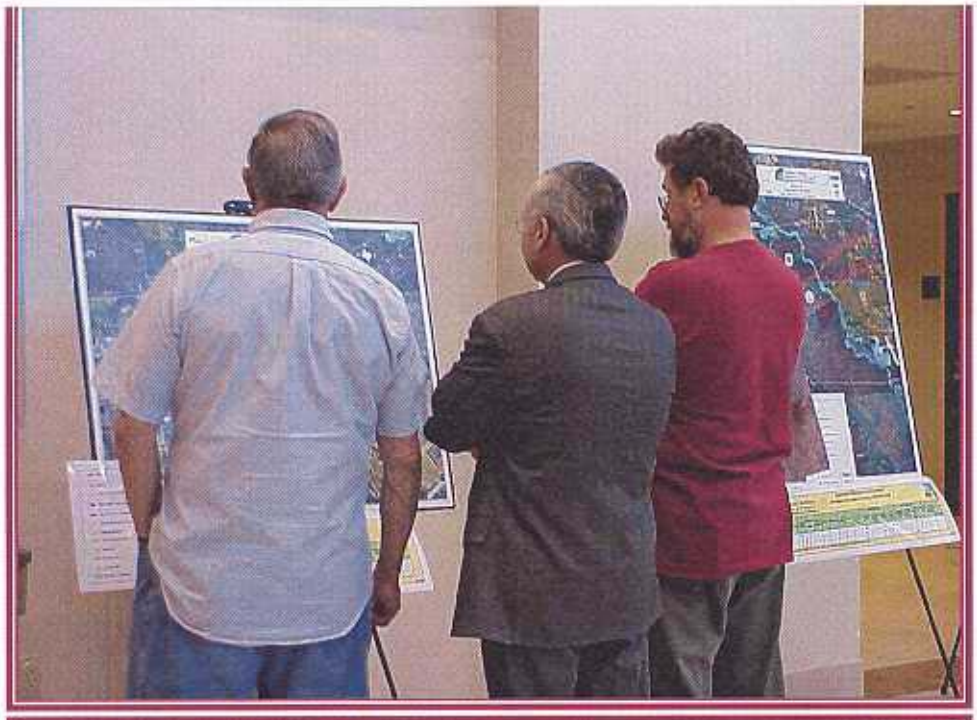
GP/Outreach/signinAgency

Public Meeting Workshop No. 2
Wednesday, February 2, 2000
Tomball College

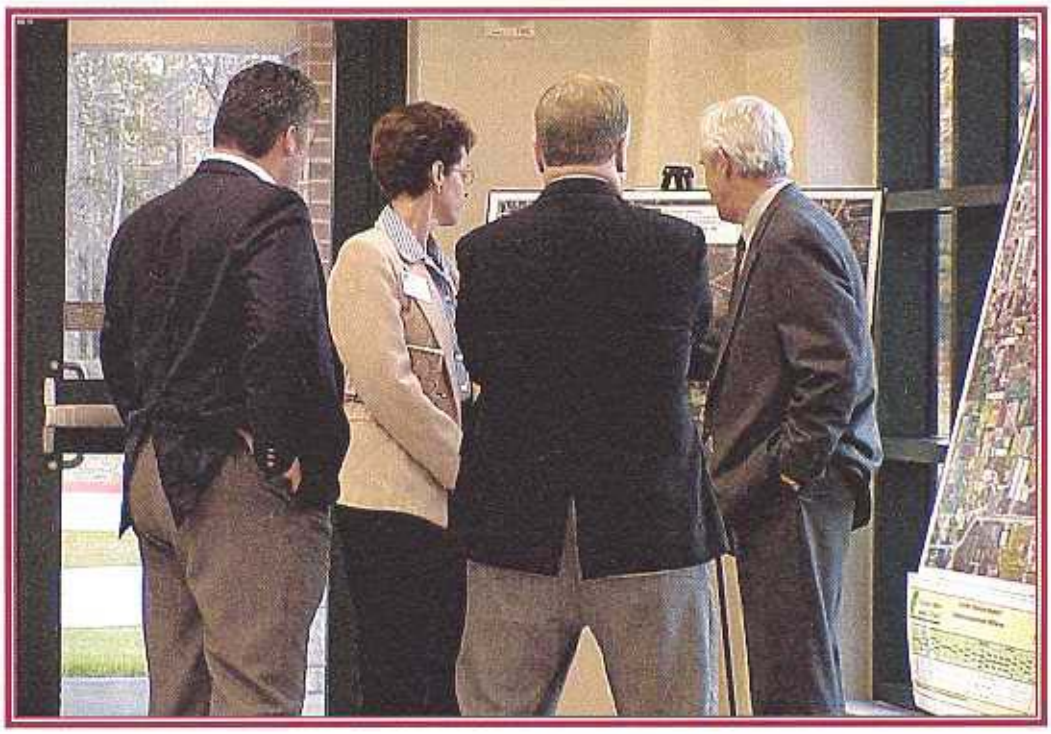


COMMENT BOX
COMMENT BOX

Public Meeting Workshop No. 2
Thursday, February 3, 2000
Kingwood College



COMMENT
BOX



THANK YOU!

The Grand Parkway
Segments E, F and G

Scoping and Corridor Workshops
February 2000
Comment Form

Name _____

Phone Number *(optional)* _____

Street Address _____

City _____ State _____ Zip _____

Meeting Attended:
- ☐ Segment E: Feb 1 – Langham Creek HS
- ☐ Segment F-1: Feb 2 – Tomball College
- ☐ Segment F-2: Feb 2 – Tomball College
- ☐ Segment G: Feb 3 – Kingwood College

Please answer the following questions:

1. Where do you live?
   - ☐ Segment E ☐ Segment F-1
   - ☐ Segment F-2 ☐ Segment G
   - ☐ Other _____
2. Where do you work? Please give location and zip code.

   _____
3. If constructed, which segment of the Grand Parkway would you use?
   - ☐ Segment E ☐ Segment F-1
   - ☐ Segment F-2 ☐ Segment G

   For what purpose?
   - ☐ work ☐ school
   - ☐ shopping ☐ social
   - ☐ medical trips ☐ all of the above
   - ☐ none of the above
4. Regarding environmental consequences of constructing the Grand Parkway, what significant issues concern you?

   _____
   _____
   _____
   _____
5. If the Grand Parkway were built, what would be your biggest concern?
   - ☐ potential effects on your community
   - ☐ potential effects on the natural environment
   - ☐ potential effects on historic resources
   - ☐ other _____
6. Please indicate below if you have a corridor preference (A, B, or C) in each reach as defined on the maps and video:

Reach 1:	☐ A	☐ B	☐ C
Reach 2:	☐ A	☐ B	☐ C
Reach 3:	☐ A	☐ B	☐ C
Reach 4:	☐ A	☐ B	☐ C
Reach 5:	☐ A	☐ B	☐ C
Reach 6:	☐ A	☐ B	☐ C
Reach 7:	☐ A	☐ B	☐ C

   ☐ No-Build
7. Please explain your reasons for the corridor preferences identified above.

   _____
   _____
   _____
8. In your opinion, the Grand Parkway is _____ to alleviate existing or anticipated future traffic congestion.
   - ☐ greatly needed ☐ needed
   - ☐ not needed

01/31/00

9. Your knowledge of the project area can help identify resources that should be considered in the study. If you know of any additional cemeteries, special natural areas, or hazardous waste areas, please identify these.

_____

_____

10. Do you feel the maps adequately depict existing and planned development in your area?

_____

_____

11. Do you have any other comments or concern not addressed at this public meeting?

_____

_____

_____

For further information, contact:

The Grand Parkway Association at 713-965-0871

Michael Baker Jr., Inc. at 281-579-4579

Web Site: www.grandpky.com

_____

_____

_____

Place
Postage
Here

The Grand Parkway Association
4544 Post Oak Place
Suite 222
Houston, TX 77027

01/31/00

Grand Parkway Segment E, F & G
February 1, 2000 Public Workshop
Langham Creek - Segment E

Where do you live?

E	F-1	F-2	G	Other
4	3	1	0	3
36%	27%	9%	0%	27%

If Segments E, F and G of the Grand Parkway were constructed, I would use :

E	F-1	F-2	G
9	7	5	3
38%	29%	21%	13%

For what purpose:

Schools	Work	Shopping	Social	Medical	All the above
1	4	4	4	1	6
5%	20%	20%	20%	5%	30%

If the Grand Parkway were built, what would be your biggest concern:

Historic Resources	Your Community	Natural Environment	Other
0	3	1	2
0%	50%	17%	33%

Please indicate if you have a corridor preference in each reach as defined on the maps

	A	%A	B	%B	C	%C
Reach 1:	2	33%	4	67%		0%
Reach 2:	2	50%	2	50%		0%
Reach 3:	3	50%	3	50%		0%
Reach 4:	1	33%	2	67%		0%
Reach 5:	1	50%	1	50%		0%
Reach 6:	2	50%		0%	2	50%
Reach 7:	2	50%	1	25%	1	25%
Reach 8	2	100%		0%		
Reach 9		0%			2	
Reach 10		0%			2	
Reach 11	1	50%			1	
Reach 12	1	0.5			1	

No build:	1	

In my opinion, to alleviate existing or future congestion, Segments E, F and G of the Grand Parkway are:

Greatly Needed	Needed	Not Needed
6	1	
86%	14%	0%

Do the maps adequately depict existing and planned development in your area?

Yes	No
7	0
100%	0%

Additional information: No Response

Comments or Concerns identified:

1) Increased Development

Regarding environmental consequences of constructing the Grand Parkway, what significant issues concern you?

1) Air quality
2) Surface water and drainage
3) Mitigation for wetlands

Grand Parkway Segment E, F & G
February 2, 2000 Public Workshop
Tomball - Segment F-1 and F-2

Where do you live?

E	F-1	F-2	G	Other
0	13	12	0	10
0%	37%	34%	0%	29%

If Segments E, F and G of the Grand Parkway were constructed, I would use :

E	F-1	F-2	G
8	14	14	9
18%	31%	31%	20%

For what purpose:

Schools	Work	Shopping	Social	Medical	All the above
5	11	8	12	3	
13%	28%	21%	31%	8%	0%

If the Grand Parkway were built, what would be your biggest concern:

Historic Resources	Your Community	Natural Environment	Other
6	20	15	12
11%	38%	28%	23%

Please indicate if you have a corridor preference in each reach as defined on the maps

	A	%A	B	%B	C	%C
Reach 1:	4	29%	7	50%	3	21%
Reach 2:	5	31%	7	44%	4	25%
Reach 3:	4	22%	8	44%	6	33%
Reach 4:	5	23%	8	36%	9	41%
Reach 5:	8	38%	6	29%	7	33%
Reach 6:	6	40%	2	13%	7	47%
Reach 7:	5	28%	7	39%	6	33%

No build:	8	

In my opinion, to alleviate existing or future congestion, Segments E, F and G of the Grand Parkway are:

Greatly Needed	Needed	Not Needed
12	4	15
39%	13%	48%

Do the maps adequately depict existing and planned development in your area?

Yes	No
11	5
69%	31%

Additional information:

1) Mobile home park on Boudreaux
2) Willow Glen Subdivision
3) Sugarberry Place trailer park
4) Willowcreek - wildlife

Comments or Concerns identified:

1) Why have the previous alignments - south of Boudreaux been changed?
2) Great idea and presentation
3) Information inadequately dispersed to interested citizens
4) Independent status of segments makes it unlikely the Grand Parkway will be completed as a continuous loop
5) I believe the Grand Parkway is vital to the continued growth in the Houston area
6) Not a good idea routing I-69 with the Grand Parkway
7) Grand Parkway will increase crime, noise, traffic and it will lower real estate values

Regarding environmental consequences of constructing the Grand Parkway, what significant issues concern you?

1) Pollution
2) Effects on Hooks Airport
3) Loss of Wildlife and their habitat
4) Ground water pollution
5) Potential change in floodplain
6) Loss of homes
7) Increase of traffic at intersections with major thoroughfares
8) Need to save green areas
9) Urban sprawl
10) Katy Prairies

Grand Parkway Segment E, F & G
February 3, 2000 Public Workshop
Kingwood - Segment G

Where do you live?

E	F-1	F-2	G	Other
0	0	1	11	4
0%	0%	6%	69%	25%

If Segments E, F and G of the Grand Parkway were constructed, I would use :

E	F-1	F-2	G
11	13	13	16
21%	25%	25%	30%

For what purpose:

Schools	Work	Shopping	Social	Medical	All the above
1	9	8	11	2	
3%	29%	26%	35%	6%	0%

If the Grand Parkway were built, what would be your biggest concern:

Historic Resources	Your Community	Natural Environment	Other
0	8	6	3
0%	47%	35%	18%

Please indicate if you have a corridor preference in each reach as defined on the maps

	A	%A	B	%B	C	%C
Reach 1:	0	0%	5	71%	2	29%
Reach 2:	0	0%	5	63%	3	38%
Reach 3:	1	11%	5	56%	3	33%
Reach 4:	2	18%	6	55%	3	27%
Reach 5:	4	31%	8	62%	1	8%
Reach 6:	3	43%	4	57%	0	0%
Reach 7:	8	42%	6	32%	5	26%
No build:	1					

In my opinion, to alleviate existing or future congestion, Segments E, F and G of the Grand Parkway are:

Greatly Needed	Needed	Not Needed
13	3	0
81%	19%	0%

Do the maps adequately depict existing and planned development in your area?

Yes	No
6	1
86%	14%

Additional information: No Response

Comments or Concerns identified:

1) There should be fewer entrance and exit locations
2) Segments E, F and G should not be delayed due to rapid development
3) Divert truck traffic around Houston

Regarding environmental consequences of constructing the Grand Parkway, what significant issues concern you?

1) Wetlands
2) Restrictions of development
3) Increased flooding
4) Pollution from vehicles
5) Rerouting waterways to reduce flooding

Grand Parkway Segment E, F & G
February 1, 2 and 3, 2000 Public Workshops
Total

Where do you live?

E	F-1	F-2	G	Other
5	17	16	12	17
7%	25%	24%	18%	25%

If Segments E, F and G of the Grand Parkway were constructed, I would use :

E	F-1	F-2	G
31	37	34	30
23%	28%	26%	23%

For what purpose:

Schools	Work	Shopping	Social	Medical	All the above
8	26	22	30	7	7
8%	26%	22%	30%	7%	7%

If the Grand Parkway were built, what would be your biggest concern:

Historic Resources	Your Community	Natural Environment	Other
7	33	26	18
8%	39%	31%	21%

Please indicate if you have a corridor preference in each reach as defined on the maps

	A	%A	B	%B	C	%C
Reach 1:	7	23.3%	18	60.0%	5	16.7%
Reach 2:	8	26%	16	52%	7	23%
Reach 3:	9	25%	18	50%	9	25%
Reach 4:	10	25%	17	43%	13	33%
Reach 5:	14	36%	15	38%	10	26%
Reach 6:	13	43%	6	20%	11	37%
Reach 7:	17	38%	14	31%	14	31%

No build:	22	23

In my opinion, to alleviate existing or future congestion, Segments E, F and G of the Grand Parkway are:

Greatly Needed	Needed	Not Needed
32	11	17
53%	18%	28%

Do the maps adequately depict existing and planned development in your area?

Yes	No
22	6
79%	21%

Additional information:

1) Mobile home park on Boudreaux
2) Willow Glen Subdivision
3) Sugarberry Place trailer park
4) Willowcreek - wildlife

Comments or Concerns identified:

1) Why have the previous alignments - south of Boudreaux been changed?
2) Great idea and presentation
3) Information inadequately dispersed to interested citizens
4) Independent status of segments makes it unlikely the Grand Parkway will be completed as a continuous loop
5) I believe the Grand Parkway is vital to the continued growth in the Houston area
6) Not a good idea routing I-69 with the Grand Parkway
7) Grand Parkway will increase crime, noise, traffic and it will lower real estate values
8) There should be fewer entrance and exit locations
9) Segments E, F and G should not be delayed due to rapid development
10) Divert truck traffic around Houston

Regarding environmental consequences of constructing the Grand Parkway, what significant issues concern you?

1) Air quality
2) Surface water and drainage
3) Add Lake Houston and Brazos Bend to the map system
4) Mitigation for wetlands
5) Effects on Hooks Airport
6) Loss of Wildlife and their habitat
7) Potential change in floodplain
8) Loss of homes
9) Increase of traffic at intersections with major thoroughfares
10) Need to save green areas
11) Urban sprawl
12) Katy Prairies
13) Restrictions of development
14) Rerouting waterways to reduce flooding

Grand Parkway Segment E, F & G
February 3, 2000 Public Workshop
Mailed in Comments

Where do you live?

E	F-1	F-2	G	Other
1	1	2	1	0
20%	20%	40%	20%	0%

If Segments E, F and G of the Grand Parkway were constructed, I would use :

E	F-1	F-2	G
3	3	2	2
30%	30%	20%	20%

For what purpose:

Schools	Work	Shopping	Social	Medical	All the above
1	2	2	3	1	1
10%	20%	20%	30%	10%	10%

If the Grand Parkway were built, what would be your biggest concern:

Historic Resources	Your Community	Natural Environment	Other
1	2	4	1
13%	25%	50%	13%

Please indicate if you have a corridor preference in each reach as defined on the maps

	A	%A	B	%B	C	%C
Reach 1:	1	33%	2	67%	0	0%
Reach 2:	1	33%	2	67%	0	0%
Reach 3:	1	33%	2	67%	0	0%
Reach 4:	2	50%	1	25%	1	25%
Reach 5:	1	33%	0	0%	2	67%
Reach 6:	2	50%	0	0%	2	50%
Reach 7:	2	50%	0	0%	2	50%

No build:	12	23

In my opinion, to alleviate existing or future congestion, Segments E, F and G of the Grand Parkway are:

Greatly Needed	Needed	Not Needed
1	2	2
20%	40%	40%

Do the maps adequately depict existing and planned development in your area?

Yes	No
0	0

Additional information: No Response

Comments or Concerns identified:

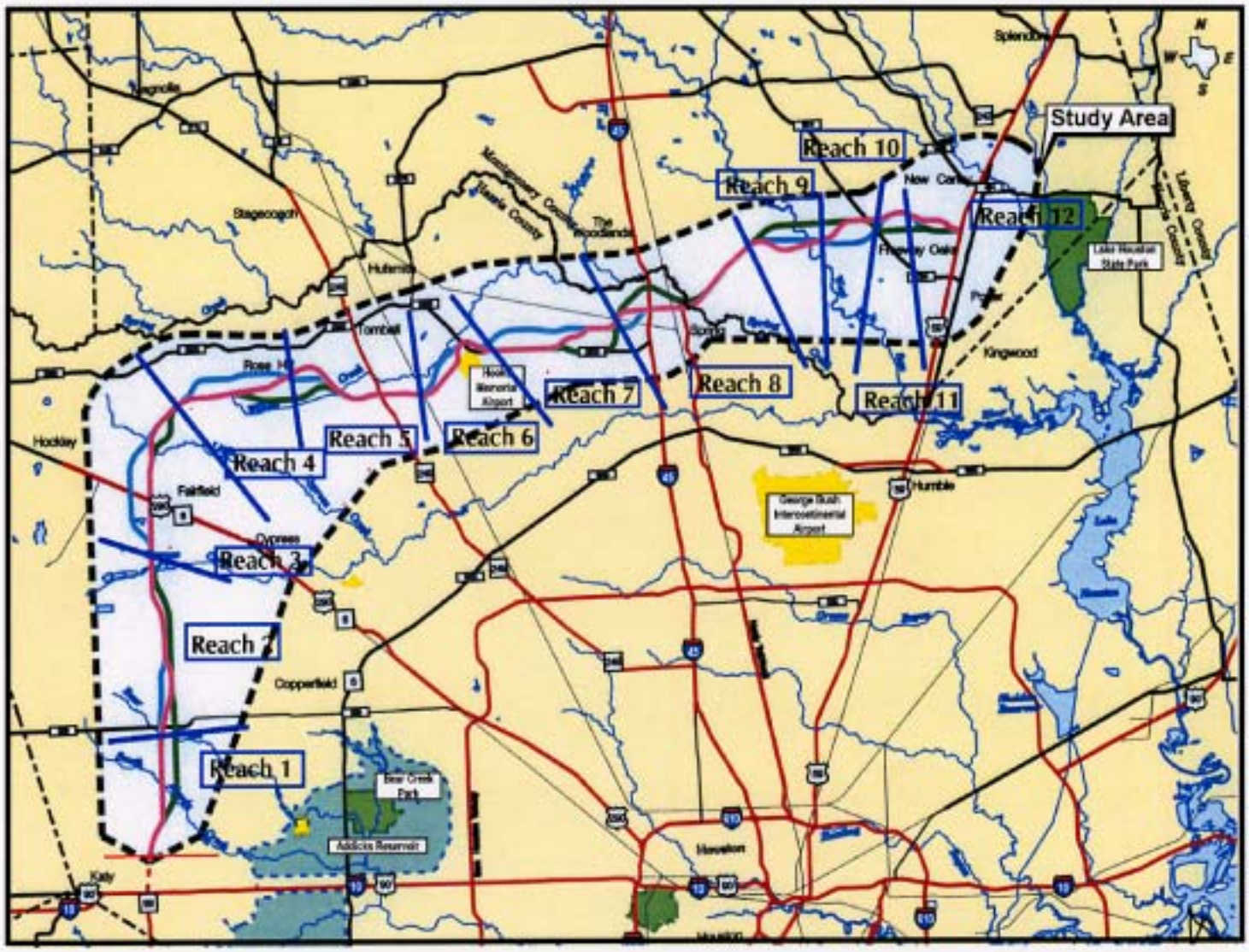
1) There should be fewer entrance and exit locations
2) Segments E, F and G should not be delayed due to rapid development
3) Divert truck traffic around Houston

Regarding environmental consequences of constructing the Grand Parkway, what significant issues concern you?

1) Wetlands
2) Restrictions of development
3) Increased flooding
4) Pollution from vehicles
5) Rerouting waterways to reduce flooding

Public Workshop No. 3 /Preliminary Alignment Workshops
Summary Report
October 23, October 25 and October 26, 2000

Grand Parkway
Segments E, F1, F2 and G
From IH-10 West to US 59 North



Texas Department of Transportation

The Grand Parkway Association

The Grand Parkway
Segments E, F and G

NOTICE OF PUBLIC WORKSHOPS

The Grand Parkway Association, in cooperation with the Texas Department of Transportation and the Federal Highway Administration, will be holding public workshops in conjunction with its continuing study of Segments E, F-1, F-2 and G of the Grand Parkway. These workshops will serve as updates for the comprehensive study from IH 10 West to U.S. 59 North that began in August 1999.

An environmental inventory for the entire study area will be presented. Mapped information includes residential areas, wetlands, floodplains, parks, schools, cemeteries, sensitive natural and cultural resources, water, oil and gas wells.

Preliminary alignments will also be presented that have been developed within the preferred corridor (of approximately 1-mile) to avoid or minimize impacts to the mapped resources. The study team will be taking comments on several alignments that are 400' in width.

Comments are invited on the resource mapping and the preliminary alignments. Comments will also be taken on the overall update of the study and any additional significant issues that should be evaluated in the Environmental Impact Statement prepared for each segment.

Each workshop will focus on one segment. However, information on the entire study will be available at all workshops. Workshops will be open forum and interested persons are encouraged to visit anytime between the hours of 4:00 p.m. and 7:00 p.m. at the planned locations.

All meeting locations are wheelchair accessible. Individuals with special communication or accommodation needs should call 713-965-0871 at least 3 days before the workshop. Since the workshops will be conducted in English, any requests for language interpreters or other communication needs should also be made at least 3 days prior to the workshop. Every reasonable effort will be made to accommodate these needs. Written comments may be directed to the Grand Parkway Association at the workshops or by mail.

Workshop Locations

All Workshops are from 4:00 p.m. to 7:00 p.m.

Segment E: October 23, 2000
Langham Creek High School
17610 FM 529

Segment G: October 26, 2000
Kingwood College
20000 Kingwood Drive

Segment F-1: October 25, 2000
Tomball College
30555 Tomball Parkway

Segment F-2: October 25, 2000
Tomball College
30555 Tomball Parkway

For more information, contact:

Michael Baker Jr., Inc. ■ 16340 Park Ten Place, Suite 320 ■ Houston, TX 77084 ■ 281-579-4579 *or*
The Grand Parkway Association ■ 4544 Post Oak Place, Suite 222 ■ Houston, TX 77027 ■ 713-965-0871

10/2/2000

The Grand Parkway
Segments E, F and G

SUMMARY OF OCTOBER 2000 PUBLIC WORKSHOPS

A series of public workshops for the extension of the Grand Parkway between IH 10 West and US 59 North was held on October 23, 25 and 26 of 2000. The extension is known as Segments E, F-1, F-2, and G of the Grand Parkway, SH 99. Two hundred eighty-seven citizens attended the workshops over the three day period. The objectives of the workshops were to present preliminary alignment alternatives and to obtain citizens' opinions on the overall study and any additional significant issues that should be evaluated in the Draft Environmental Impact Statement (DEIS) prepared for each segment.

A video summarized the progress to date and explained the information that was being presented at the workshop. Preliminary alignment alternatives on detailed aerial photomaps of the study area were available for review. Grand Parkway study team members were available throughout the evening to answer questions and to provide additional information.

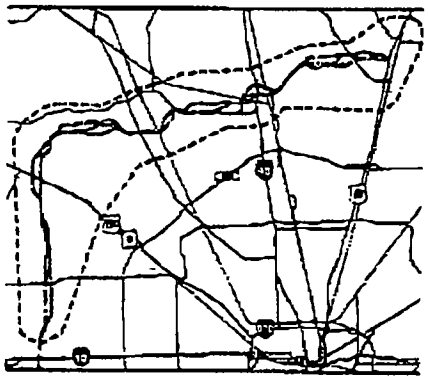
Citizens were asked to complete a questionnaire regarding their viewpoints on existing traffic congestion, expected need for and usage of the Grand Parkway, and which corridor, if any, they preferred in each reach of the project. The reaches were set to identify points at which an alignment "switch" could be made. Citizens supporting construction of the Grand Parkway cited an existing need for the facility due to heavy development within the study area, time savings for trips to work, school or shopping, and diversion of trucks and other traffic from existing congested roadways in Houston. Others noted that the Grand Parkway is vital to continued economic growth. Some citizens attending the workshops, as well as others providing their opinion by mail, support the No-Build alternative. Reasons cited include concerns about continued urban sprawl, resulting secondary development, air quality issues, and impacts to the wetlands, riparian habitat and wildlife species in the study area.

The No-Build alternative will be carried forward throughout this study as the baseline against which benefits and impacts of the project are compared. The DEIS will include a description of the No-Build alternative and corresponding traffic volumes, cost, effects on land use and other impacts that may result from its selection.

For more information, contact:
Michael Baker Jr., Inc. ■ 16340 Park Ten Place, Suite 320 ■ Houston, TX 77084 ■ 281-579-4579 *or*
The Grand Parkway Association ■ 4544 Post Oak Place, Suite 222 ■ Houston, TX 77027 ■ 713-965-0871

PUBLIC NOTICE

The Grand Parkway Association, in cooperation with the Texas Department of Transportation and the Federal Highway Administration, will be holding public workshops in conjunction with the continuing study of Segments E, F-1, F-2 and G of the Grand Parkway. These workshops will serve as updates for the comprehensive study from IH 10 West to U.S. 59 North that began in August 1999. An environmental resource inventory and preliminary alignment alternatives will be presented. Comments will be taken on the resource inventory, the preliminary alignments, the scope of the study, and any additional significant issues that should be evaluated in the Environmental Impact Statement prepared for each segment. Each workshop will focus on one segment; however, information on the entire study will be available at all workshops. Workshops will be open forum and interested persons can attend anytime between the hours of 4:00 p.m. and 7:00 p.m. at the following locations: Segment E, October 23, 2000, Langham Creek High School, 17610 FM 529; Segment F-1, October 25, 2000, Tomball College, 30555 Tomball Parkway; Segment F-2, October 25, 2000, Tomball College, 30555 Tomball Parkway; Segment G, October 26, 2000, Kingwood College, 20000 Kingwood Drive. All meeting locations are wheelchair accessible. Individuals with special communication or accommodation needs should call 713-965-0871 at least 3 days before the workshop. Since the workshops will be conducted in English, any requests for language interpreters or other communication needs should also be made at least 3 days prior to the workshop. Every reasonable effort will be made to accommodate these needs. Written comments may be directed to The Grand Parkway Association, 4544 Post Oak Place, Suite 222, Houston, TX 77027.



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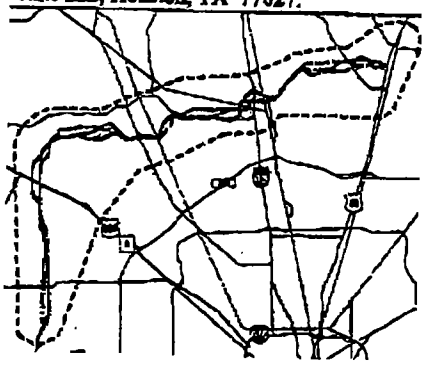
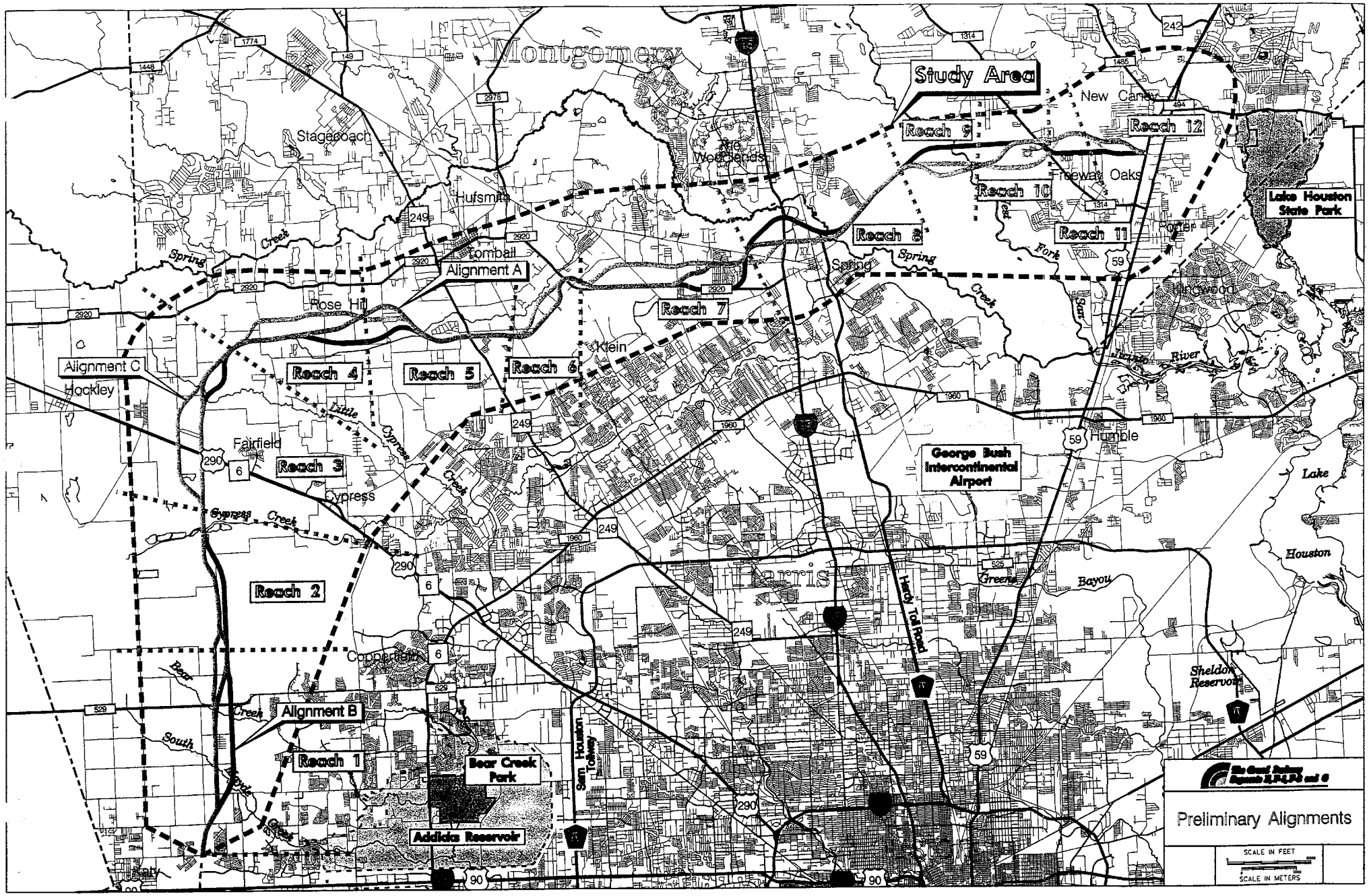



Study Area
Montgomery
Harris
Stagecoach
Hufsmith
Tomball
Rose Hill
Klein
Spring
Hockley
Fairfield
Cypress
Copperfield
New Caney
Freeway Oaks
Porter
Humble
Kingwood
Alignment A
Alignment B
Alignment C
Reach 1
Reach 2
Reach 3
Reach 4
Reach 5
Reach 6
Reach 7
Reach 8
Reach 9
Reach 10
Reach 11
Reach 12
Lake Houston State Park
George Bush Intercontinental Airport
Bear Creek Park
Addicks Reservoir
Sheldon Reservoir
Lake Houston
Spring Creek
Little Cypress Creek
Cypress Creek
Bear Creek
South Mayde Creek
East Fork
Sam Houston Tollway
Hardy Toll Road
Greens Bayou
Preliminary Alignments
SCALE IN FEET
SCALE IN METERS

The Grand Parkway
Segments E, F and G

Alignment Resource Inventory

Alignments are 400 feet wide

Baker
PBSJ
BROWN & GAY

Reach	Alignment	Meets Project Purpose and Need	Length (miles)	Residences	Commercial	School Properties	Churches	Cemeteries	Parks	Natural Resources: Special Resource Areas	Natural Resources: Wetlands (acres)	Natural Resources: Remnant Prairie Topography (acres)	Natural Resources: 100 year Floodplain (acres)	Natural Resources: Prime Farmland (acres)	Cultural Resources: Recorded Historic Farms	Cultural Resources: Candidate Historic Structures	Cultural Resources: High Probability Area (acres)	Oil and Gas Wells	Potential Hazardous Waste Sites	Water Wells: Public	Water Wells: Private
No-Build		No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	A	Yes	7.1	-	-	-	-	-	-	1	20.7	0.0	113	340	-	-	-	3	-	-	-
	B	Yes	7.2	-	-	-	-	-	-	-	2.1	0.0	91	343	-	-	-	3	-	-	1
	C	Yes	7.0	-	-	-	-	-	-	1	21.2	0.0	192	337	-	-	-	1	-	-	-
2	A	Yes	4.9	-	-	-	-	-	-	-	12.7	0.0	62	232	-	-	-	0	-	-	-
	B	Yes	4.9	-	-	-	-	-	-	-	9.9	0.0	62	224	-	-	-	1	-	-	-
	C	Yes	4.9	-	-	-	-	-	-	-	13.9	0.0	62	233	-	-	-	0	-	-	-
3	A	Yes	5.9	-	1	-	-	-	-	-	9.6	0.3	30	284	-	-	6	0	-	-	4
	B	Yes	5.8	-	1	-	-	-	-	-	8.7	0.0	24	282	-	-	10	0	-	-	4
	C	Yes	6.5	-	-	-	-	-	-	-	17.1	0.0	68	313	-	-	6	0	-	-	1
4	A	Yes	4.5	1	-	-	-	-	-	-	5.0	0.1	15	219	2	-	-	2	-	-	-
	B	Yes	4.4	2	-	-	-	-	-	-	4.4	0.0	58	215	1	1	-	0	-	-	-
	C	Yes	4.8	9	-	-	-	-	-	-	5.7	0.0	9	233	2	1	-	2	-	-	-
5	A	Yes	5.6	2	-	-	-	-	-	-	6.7	3.6	34	272	1	-	-	6	-	2	1
	B	Yes	5.3	2	-	-	-	-	-	-	3.5	0.4	96	258	-	-	-	3	-	2	1
	C	Yes	5.4	2	-	-	-	-	-	-	6.4	8.1	38	260	1	1	-	8	-	2	1
6	A	Yes	3.5	9	-	-	-	-	-	-	4.9	0.0	0	168	-	1	-	1	-	1	3
	B	Yes	3.5	9	-	-	-	-	-	-	4.9	0.0	0	168	-	1	-	1	-	1	3
	C	Yes	3.4	53	-	-	1	-	-	-	4.6	0.0	1	163	-	-	33	2	-	-	2
7	A	Yes	6.1	13	5	2	-	-	-	-	3.4	0.0	1	296	-	1	-	0	3	-	-
	B	Yes	6.7	14	12	2	-	-	-	-	3.5	0.0	1	325	-	1	-	1	5	1	-
	C	Yes	6.4	38	9	-	-	-	-	-	3.9	0.0	1	310	1	5	-	4	2	3	2
8	A	Yes	6.2	12	1	-	-	-	-	-	13.2	0.0	59	128	-	1	49	0	-	-	-
	B	Yes	6.6	20	1	-	-	1	-	-	4.1	0.0	59	152	-	1	125	2	-	-	-
	C	Yes	5.8	12	1	-	-	-	-	-	11.5	0.0	59	111	-	1	49	0	-	-	-
9	A	Yes	3.0	-	-	-	-	-	-	1	10.9	0.0	52	6	-	-	32	0	-	-	-
	B	Yes	3.0	-	-	-	-	-	-	-	4.1	0.0	74	5	-	-	49	0	-	-	-
	C	Yes	2.9	-	-	-	-	-	-	1	11.8	0.0	74	0	-	-	81	0	-	-	-
10	A	Yes	2.5	-	-	-	-	-	-	-	0.0	0.0	5	1	-	-	2	0	-	-	-
	B	Yes	2.4	-	-	-	-	-	-	-	0.0	0.0	0	22	-	-	-	0	-	-	-
	C	Yes	2.5	-	-	-	-	-	-	-	4.3	0.0	11	24	-	-	8	0	-	-	-
11	A	Yes	1.2	-	-	-	-	-	-	-	0.0	0.0	0	1	-	-	-	0	-	-	-
	B	Yes	1.4	35	-	-	-	-	-	-	3.6	0.0	0	35	-	-	-	0	-	-	-
	C	Yes	1.4	-	-	-	-	-	-	-	0.0	0.0	0	0	-	-	-	0	-	-	-
12	A	Yes	2.3	-	-	-	-	-	-	-	3.9	0.0	34	44	-	-	56	0	-	-	-
	B	Yes	1.9	-	-	-	-	-	-	-	3.4	0.0	18	35	-	-	23	0	-	-	-
	C	Yes	2.3	-	-	-	-	-	-	-	2.8	0.0	20	33	-	-	23	0	-	-	-

Source: Michael Baker Jr., Inc.

*Reaches 9 thru 12 are waiting for leaf off to perform wetland analysis

October 2000

The Grand Parkway
Segments E, F and G

Public Workshops
October 2000
Comment Form

Name _____

Phone Number *(optional)* _____

Street Address _____

City _____ State _____ Zip _____

Meeting Attended:
- ☐ Segment E: Oct 23 – Langham Creek HS
- ☐ Segment F-1: Oct 25 – Tomball College
- ☐ Segment F-2: Oct 25 – Tomball College
- ☐ Segment G: Oct 26 – Kingwood College

Please answer the following questions:

1. Where do you live?
   - ☐ Segment E ☐ Segment F-1
   - ☐ Segment F-2 ☐ Segment G
   - ☐ Other _____
2. Where do you work? Please give location and zip code.

   _____
3. If constructed, which segment of the Grand Parkway would you use?
   - ☐ Segment E ☐ Segment F-1
   - ☐ Segment F-2 ☐ Segment G

   For what purpose?
   - ☐ work ☐ school
   - ☐ shopping ☐ social
   - ☐ medical trips ☐ all of the above
   - ☐ none of the above
4. Regarding environmental consequences of constructing the Grand Parkway, what significant issues concern you?

   _____

   _____

   _____

   _____
5. If the Grand Parkway were built, what would be your biggest concern?
   - ☐ potential effects on your community
   - ☐ potential effects on the natural environment
   - ☐ potential effects on historic resources
   - ☐ other _____
6. Please indicate below if you have an alignment preference (A, B, or C) in each reach as defined on the maps and video:

Reach 1:	☐ A	☐ B	☐ C
Reach 2:	☐ A	☐ B	☐ C
Reach 3:	☐ A	☐ B	☐ C
Reach 4:	☐ A	☐ B	☐ C
Reach 5:	☐ A	☐ B	☐ C
Reach 6:	☐ A	☐ B	☐ C
Reach 7:	☐ A	☐ B	☐ C
Reach 8:	☐ A	☐ B	☐ C
Reach 9:	☐ A	☐ B	☐ C
Reach 10:	☐ A	☐ B	☐ C
Reach 11:	☐ A	☐ B	☐ C
Reach 12:	☐ A	☐ B	☐ C

   ☐ No-Build
7. Please explain your reasons for the alignment preferences identified above.

   _____

   _____

   _____

8. In your opinion, the Grand Parkway is _____ to alleviate existing or anticipated future traffic congestion.

   ☐ greatly needed ☐ needed

   ☐ not needed

9. Other than those shown on the displays, do you know of any additional cemeteries, special natural areas, hazardous waste areas, or additional features, please identify these.

   _____

   _____

10. Do you feel the maps adequately depict existing and planned development in your area?

    _____

    _____

11. Do you have any other comments or concern not addressed at this public meeting?

    _____

    _____

    _____

For further information, contact:

The Grand Parkway Association at 713-965-0871

Michael Baker Jr., Inc. at 281-579-4579

Web Site: www.grandpky.com

_____

_____

_____

Place
Postage
Here

The Grand Parkway Association
4544 Post Oak Place
Suite 222
Houston, TX 77027

10/23/00

Grand Parkway Segment E, F & G
October 23, 2000 Public Workshop
Langham Creek - Segment E

Where do you live?

E	F-1	F-2	G	Other
4	3	1	0	3
36%	27%	9%	0%	27%

If Segments E, F and G of the Grand Parkway were constructed, I would use:

E	F-1	F-2	G
9	7	5	3

For what purpose:

Schools	Work	Shopping	Social	Medical	All the above
1	4	4	4	1	6

If the Grand Parkway were built, what would be your biggest concern:

Historic Resources	Your Community	Natural Environment	Other
0	3	1	2
0%	50%	17%	33%

Please indicate if you have a alignment preference in each reach as defined on the maps

	A	%A	B	%B	C	%C
Reach 1:	2	33%	4	67%		0%
Reach 2:	2	50%	2	50%		0%
Reach 3:	3	50%	3	50%		0%
Reach 4:	1	33%	2	67%		0%
Reach 5:	1	50%	1	50%		0%
Reach 6:	2	50%		0%	2	50%
Reach 7:	2	50%	1	25%	1	25%
Reach 8	2	100%		0%		0%
Reach 9		0%		0%	2	100%
Reach 10		0%		0%	2	100%
Reach 11	1	50%		0%	1	50%
Reach 12	1	50%		0%	1	50%

No-Build:	1

In my opinion, to alleviate existing or future congestion, Segments E, F and G of the Grand Parkway are:

Greatly Needed	Needed	Not Needed
6	1	0
86%	14%	0%

Do the maps adequately depict existing and planned development in your area?

Yes	No
7	0
100%	0%

Additional information: No Response

Comments or Concerns identified:

1) Increased Development

Regarding environmental consequences of constructing the Grand Parkway, what significant issues concern you?

1) Air quality
2) Surface water and drainage
3) Mitigation for wetlands

Grand Parkway Segment E, F & G
October 25, 2000 Public Workshop
Tomball - Segment F-1 and F-2

Where do you live?

E	F-1	F-2	G	Other
1	35	36	4	16
1%	38%	39%	4%	17%

If Segments E, F and G of the Grand Parkway were constructed, I would use:

E	F-1	F-2	G
18	47	50	17

For what purpose:

Schools	Work	Shopping	Social	Medical	All the above
2	20	18	20	6	23

If the Grand Parkway were built, what would be your biggest concern:

Historic Resources	Your Community	Natural Environment	Other
10	51	29	18
9%	47%	27%	17%

Please indicate if you have a alignment preference in each reach as defined on the maps

	A	%A	B	%B	C	%C
Reach 1:	14	64%	4	18%	4	18%
Reach 2:	12	55%	8	36%	2	9%
Reach 3:	16	57%	7	25%	5	18%
Reach 4:	10	24%	18	43%	14	33%
Reach 5:	11	33%	18	55%	4	12%
Reach 6:	16	47%	5	15%	13	38%
Reach 7:	23	48%	11	23%	14	29%
Reach 8:	21	58%	9	25%	6	17%
Reach 9:	9	41%	8	36%	5	23%
Reach 10:	9	41%	9	41%	4	18%
Reach 11:	13	59%	6	27%	3	14%
Reach 12:	13	57%	8	35%	2	9%

No-Build:	10

In my opinion, to alleviate existing or future congestion, Segments E, F and G of the Grand Parkway are:

Greatly Needed	Needed	Not Needed
20	18	19
35%	32%	33%

Do the maps adequately depict existing and planned development in your area?

Yes	No
26	6
81%	19%

Additional information:

1) Rosehill Cemetary
2) Fairfield Church
3) Historic Home and Property
4) New Private School off of Gosling and 2920
5) Additional Water Well
6) Caped Oil and Gas Wells

Comments or Concerns identified:

1) Access to North Forest Subdivision
2) Increased Development
3) Access to Hooks Airport
4) Depressed Road at 2920 and Boudreaux
5) Loss of Home or Buisiness

Regarding environmental consequences of constructing the Grand Parkway, what significant issues concern you?

1) Pollution
2) Effects on Hooks Airport
3) Loss of Wildlife and their habitat
4) Ground water pollution
5) Potential change in floodplain
6) Need to save green areas
7) Katy Prairies

Grand Parkway Segment E, F & G
October 26, 2000 Public Workshop
Kingwood - Segment G

Where do you live?

E	F-1	F-2	G	Other
0	0	0	13	9
0%	0%	0%	59%	41%

If Segments E, F and G of the Grand Parkway were constructed, I would use:

E	F-1	F-2	G
5	7	7	18

For what purpose:

Schools	Work	Shopping	Social	Medical	All the above
0	7	4	7	0	6

If the Grand Parkway were built, what would be your biggest concern:

Historic Resources	Your Community	Natural Environment	Other
0	8	4	3
0%	53%	27%	20%

Please indicate if you have a alignment preference in each reach as defined on the maps

	A	%A	B	%B	C	%C
Reach 1:	1	17%	4	67%	1	17%
Reach 2:	4	57%	2	29%	1	14%
Reach 3:	4	80%	1	20%		0%
Reach 4:	1	17%	5	83%		0%
Reach 5:	2	33%	4	67%		0%
Reach 6:	3	50%	1	17%	2	33%
Reach 7:	4	67%		0%	2	33%
Reach 8:	3	43%	3	43%	1	14%
Reach 9:	1	14%	3	43%	3	43%
Reach 10:	1	14%	3	43%	3	43%
Reach 11:	6	55%	3	27%	2	18%
Reach 12:	5	56%	3	33%	1	11%

No-Build:	1

In my opinion, to alleviate existing or future congestion, Segments E, F and G of the Grand Parkway are:

Greatly Needed	Needed	Not Needed
7	1	0
88%	13%	0%

Do the maps adequately depict existing and planned development in your area?

Yes	No
6	0
100%	0%

Additional information: No Response

Comments or Concerns identified:

No responses

Regarding environmental consequences of constructing the Grand Parkway, what significant issues concern you?

1) Wetlands
2) Drainage
3) Loss of natural areas

Grand Parkway Segment E, F & G
October 23, 25, and 26 2000 Public Workshop
Total

Where do you live?

E	F-1	F-2	G	Other
5	38	37	17	28
4%	30%	30%	14%	22%

If Segments E, F and G of the Grand Parkway were constructed, I would use:

E	F-1	F-2	G
32	61	62	38

For what purpose:

Schools	Work	Shopping	Social	Medical	All the above
3	31	26	31	7	35

If the Grand Parkway were built, what would be your biggest concern:

Historic Resources	Your Community	Natural Environment	Other
10	62	34	23
8%	48%	26%	18%

Please indicate if you have a alignment preference in each reach as defined on the maps

	A	%A	B	%B	C	%C
Reach 1:	17	50%	12	35%	5	15%
Reach 2:	18	55%	12	36%	3	9%
Reach 3:	23	59%	11	28%	5	13%
Reach 4:	12	24%	25	49%	14	27%
Reach 5:	14	34%	23	56%	4	10%
Reach 6:	21	48%	6	14%	17	39%
Reach 7:	29	50%	12	21%	17	29%
Reach 8:	26	58%	12	27%	7	16%
Reach 9:	10	32%	11	35%	10	32%
Reach 10:	10	32%	12	39%	9	29%
Reach 11:	20	57%	9	26%	6	17%
Reach 12:	19	56%	11	32%	4	12%

No-Build:	12

In my opinion, to alleviate existing or future congestion, Segments E, F and G of the Grand Parkway are:

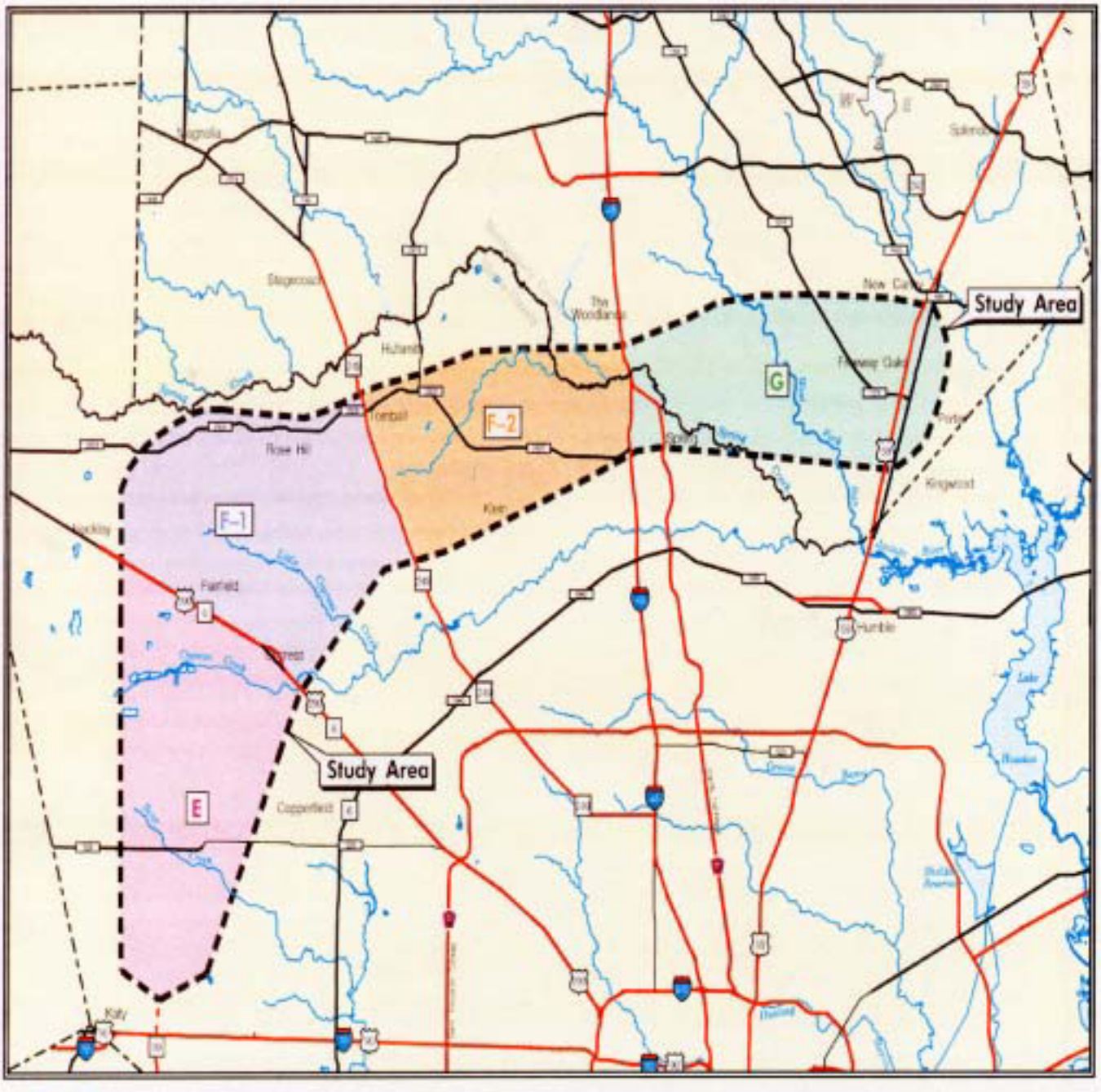
Greatly Needed	Needed	Not Needed
33	20	19
46%	28%	26%

Do the maps adequately depict existing and planned development in your area?

Yes	No
39	6
87%	13%

Agency Coordination Meetings and Letters

Grand Parkway
Segments E, F1, F2 and G
From IH-10 West to US 59 North



Texas Department of Transportation

The Grand Parkway Association

The Grand Parkway
Segments E, F and G

Meeting Minutes

FINAL

Meeting: Corps of Engineers Coordination Meeting
Purpose: Comments on Corridors and NEPA/404 Process
Meeting Date: February 24, 2000; 10:00 am
Location: Corps of Engineers, Galveston District Office
Attendance: See attached list.

1. Diane Schenke opened the meeting with a review of the Segment E, F and G project progress to date for those who were new to the study.
2. FHWA will send a signed letter to the Colonel requesting that they participate in the DEIS as a Cooperating Agency.
3. Fred Anthamatten raised the issue of the scope of the study and how decisions are being made relative to the 404 (b)(1) guidelines. The study team responded that both the Corridor Study (in – progress) and the Alignment Study within the preferred corridor were designed with the resource agencies and would consider avoidance and minimization of impacts. Fred noted that it was important that the DEIS document the corridor study results because it is integral to the final decision of the highway.
4. A fairly long discussion took place regarding bottomland hardwoods and the many different opinions of what exactly constitutes such habitat. It was confirmed by Fred that the Corps will consider only jurisdictional wetlands per the Corps' 1987 manual. It was agreed that other forested habitat was an important resource to be considered in the study, but that the two are rather separate issues, and that only wetlands are regulated by the Corps.
5. Dwayne Johnson presented his "choices" (focused solely on resources) and rationale for a preferred corridor in each reach as follows. This is based on the information to date and should be considered preliminary.

Reach	Corridor	Comments
1	C	Closer to existing development so that growth is further from Katy Prairie, less floodplains
2	C (or B)	Closer to existing development so that growth is further from Katy Prairie, fewer floodplain impacts; moderate amount of wetlands; less prior converted wetlands
3	C (or B)	After we reviewed the latest information on housing plans, B was acceptable in Reaches 2 and 3
4	A /C	Best for resources; need more detailed alignment studies to further demonstrate avoidance
5	C	East of Hardy Toll Road, detailed alignment studies must further demonstrate avoidance and minimization of wetland impacts
6	B	Detailed alignment study must further demonstrate avoidance and minimization of wetland impacts

7	A/C	Minimizes wetland impacts; closer in; lower floodplain impacts

6. A lengthy discussion ensued regarding the number of EISs to be prepared for these segments. The various pros and cons were discussed. It was agreed that while much thought went into the decision for Segments E, F-1, F-2 and G to have independent utility and that each had logical termini, this does not dictate four separate EISs. If two or more segments are combined, the traffic study results and the EIS can state that each segment is indeed a stand-alone feasible project with logical termini and independent utility.
7. The meeting adjourned at 11:45 am.

The Grand Parkway
Segments E, F and G

Meeting Minutes

FINAL

Meeting: Fish and Wildlife Service Coordination Meeting
Purpose: Comments on Corridors and NEPA/404 Process
Meeting Date: February 24, 2000; 1:00 PM
Location: Fish and Wildlife Service Office, Clearlake
Attendance: See attached list.

1. Diane Schenke opened the meeting and stated the importance of the Study Teams' March 3, 2000 deadline for the close of the comment period. Fred stated that he was not ready to provide comments on Segment G (reaches 6 and 7); his comments today are directed at Segments E and F.
2. Fred Werner and Diane Schenke discussed some mitigation sites for the Grand Parkway overall. Fred noted that the Service was interested in conserving high quality habitat.
3. Fred Werner stressed the importance that the Service places on indirect or secondary impacts but noted that from his assessment of the study area, the development is occurring now in Segments E and F and will not be caused, and perhaps not even hastened by the Grand Parkway. He noted that wetland impacts due to construction of the Grand Parkway's would be nearly insignificant compared to impacts from the current and future residential and commercial development of the study area.
4. In general, the Service's biggest concern regarding natural resources was the impact on riparian corridors as these are some of the last remaining forested areas in the study area. The other major concern was species of special concern in Segment F. While these plant species currently receive no federal protection, USFWS is concerned about plant impacts associated with the Grand Parkway development. In fact, this may be the most valid secondary impact.
5. A very general discussion took place regarding any preferences for a corridor in some reaches. This information has been revised to address the Services' views in its March 16, 2000 letter to the Grand Parkway Association.

Reach	Corridor	Comments
1	B or C	
2	B	Closer to existing development so that growth is further from Katy Prairie, fewer floodplain impacts
3		no preference – note concerns in Item 4 above
4		See March 16 letter
5	C	To avoid forest stand impacts
6		See March 16 letter
7		See March 16 letter

6. The possibility of preparing the Section 404 permit with the DEIS was discussed and we agreed that it may be possible to provide the detail needed to satisfy concerned parties. The USFWS prefers to address all resource issues during the EIS process so that no unresolved issues remain for the permit approval.

7. Edith discussed the prairie dawn locations she was aware of and provided some additional information on candidate species and species of concern. While these species receive no protection under the Act, the study team should be aware of their locations. With respect to potential prairie dawn habitat, it was agreed that the new aerial photography could be used to identify potential habitat before any alignments were developed.
8. The meeting adjourned at 3:00 PM.

The Grand Parkway
Segments E, F and G

Meeting Minutes

FINAL

Meeting: Texas Parks and Wildlife Coordination Meeting
Purpose: Comments on Corridor Alternatives
Meeting Date: March 3, 2000; 9:00 am
Location: TPWD Offices, Clearlake
Attendance: Lee Gibbons, FHWA; Woody Woodrow, TPWD; Diane Schenke, David Gornet, Patty Gesing and Jim Gregory, GPA study team.

1. The meeting started with a brief discussion of I-2 mitigation.
2. Woody discussed the agency's views on each reach with the study team. He questioned why Corridor C (in Reaches 2 and 3) was presented as a viable alternate if we have thrown it out. The study team replied that we only just learned of new information at the outreach meetings that rendered Corridor C a less viable option in these reaches due to new planned developments. The table below summarizes the agency's preferences in each reach and the comments received by the study team.

Reach	Corridor	Comments
1	C	Closer to existing development; would involve less secondary impacts; although more wetlands in C; the floodplains are narrower – recommend minimizing impacts to riparian forests whenever possible
2	C, then B	Fewer homes but then recommends following Corridor C up to Cypress Rosehill Road then connect to B
3	B	Corridor B avoids prairie habitat in C along Telge Road
4	B then A /C	Corridor B from Reach 3, then down to A/C – positive response to Boudreaux Rd concept
5	-	Corridor C is very busy with Splashtown and other development; decision may be cost driven; minimize floodplain impacts where A/B/C meet at east end of Reach 5 near Hardy Toll Road
6	-	Neither corridor is good – TPWD receptive to our ideas about following natural features and higher ground in B
7	A/C	OK with A/C but suggest using US 59 or some other means to stay out of Lake Houston State Park

3. Woody commented on the growth rate of the study area as being some of the highest growth rates in the Houston area. At that point, it was mentioned that the CDC - Houston tract while currently undeveloped, is privately owned and likely would develop soon. Major efforts on the part of the study team to avoid this area may be for nothing.
4. The "preferred corridor fatal flaws" field check was discussed with Woody for his comments or suggestions. At the end of the discussion, there was a consensus by all that the facility location should be dictated by the plan that provides the most benefit to the public with the least impact to the environment – some suggested this should occur regardless of cost.

5. There was a brief discussion of TPWD's position on mitigation on the Katy Prairie.
6. Patty Gesing explained the draft corridor study report that the team would prepare and forward to agencies for comments/concurrence on the recommended preferred corridor.
7. The meeting adjourned at 10:30 am.

GRAND PARKWAY ASSOCIATION
Sign-in Sheet

Meeting with EPA, FHWA, H-GAC, TxDOT, GPA

1:00 p.m., November 6, 2000
EPA Office, Dallas

Please Print All Information

Name	Representing/Address	Telephone No.
Wayne Young	TxDOT 125 E 11th Austin 78701	512 416-2890
Julie Lane	TxDOT 125 E. 11th ST Austin Tx 78701	(512) 416-2612
J. Behnam	EPA . 1445 Ross Ave, Dallas, TX 75202	(214) 665-7247
M. Janisch	EPA . 1445 Ross Ave, Dallas TX 75202	214 665-7457
Rob Lawrence	EPA Office of Planning & Coordination 1445 Ross Ave Dallas TX 75202	214. 665. 8150
Dominique Lueckenhoff	EPA 1445 Ross Ave, Dallas 75202 (6EN-XP)	
Mike Leahy	FHWA, 826 Federal Bldg, Austin, 78701	512 536-5943
Alan Clark	H-GAC, POBox 22777, Houston Tx 77227	713 993 4585
Lee Gibbons	FHWA 826 Fed Off Bldg Austin Tx 78701	512 536 5961
David Gornet	GPA	
Diane Schenke		

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GRAND PARKWAY ASSOCIATION
Sign-in Sheet

Meeting with EPA, FHWA, H-GAC, TxDOT, GPA

1:00 p.m., November 6, 2000
EPA Office, Dallas

Please Print All Information

Name	Representing/Address	Telephone No.
Glenn Graham	PBS&J 3200 Wilcrest, #200, Hou. Tx 77042	(713)781-8800

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The Grand Parkway Association

4544 Post Oak Place, Suite 222, Houston, TX 77027
Phone 713-965-0871 • Fax 713-993-0106
www.grandpky.com

August 28, 2001

Mr. John R. Mack, P.E.
District Engineer, Texas Division
Federal Highway Administration
300 E. 8th Street, Room 874
Austin, TX 78701

Re: DEIS Review Time Extension - Segments E, F-1, F-2 and G

Dear Mr. Mack:

This letter is to confirm my understanding of previous telephone discussions that have been held with your office, the Texas Department of Transportation (TxDOT) Houston District, TxDOT Environmental Affairs Division and myself. A request has been made to extend the review period of the Draft Environmental Impact Statements (DEISs) for Segments E, F-1, F-2 and G of the Grand Parkway to 180 days instead of the required 45 days. The request has been made by the Sierra Club and United Save Our Spring. In our discussions, the decision was made to extend the required 45-day review period to a 90-day review period. If you concur with this decision, please respond by letter so that I might forward this information to the groups that have made the request before the DEISs are released for public review and comment in the next few months.

Thank you for your attention to this matter. Please do not hesitate to call if you have any requests for additional information.

Sincerely,

Robin K. Sterry

Robin K. Sterry
Assistant Executive Director

RKS:dls

cc: Jim Darden, TxDOT-Houston
Ken Bohuslav, TxDOT ENV, Austin
Lee Gibbons, FHWA
Robb Fishman, Michael Baker, Jr. Inc.
David Gornet, Grand Parkway Association

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Board of Directors

U.S. Department
of Transportation

**Federal Highway
Administration**

Texas Division Office
300 E. 8th Street, Rm. 826
Austin, Texas 78701

September 19, 2001

In Reply Refer To:

HB-TX

Harris County
SH 99 (The Grand Parkway) Segments E, F-1, F-2 and G
DEIS Review Time Extension

Ms. Robin K. Sterry, P.E.
Assistant Executive Director
The Grand Parkway Association
4544 Post Oak Place, Suite 222
Houston, Texas 77027

RECEIVED
SEP 24 2001
GRAND PARKWAY ASSOCIATION

Dear Ms. Sterry:

Your letter of August 28, 2001, requested an extension of the review period of the Draft Environmental Impact Statements (DEISs) on the above projects. As stated in our telephone discussions, the 90-day review period is approved.

Sincerely,

John R. Mack, P.E.
District Engineer

Cc: Mr. David Gornet, P.E.
Executive Director
The Grand Parkway Association

Mr. Jim Darden, P.E.
Director, Transportation Planning and Development
Texas Department of Transportation
P.O. Box 1386
Houston, Texas 77251-1386

Mr. Ken Bohuslav, P.E.
Deputy Division Director, Environmental Affairs Division
Texas Department of Transportation
125 E. 11th Street
Austin, Texas 78701

Mr. Tom Bruechert, P.E.
Project Manager, Branch Supervisor
Environmental Affairs Division
Texas Department of Transportation
125 E. 11th Street
Austin, Texas 78701

Mr. Robb Fishman, AICP
Senior Environmental Scientist
Michael Baker, Jr., Inc.
16340 Park Ten Place, Suite 320
Houston, Texas 77084

Texas Department of Transportation

P.O. BOX 1386 • HOUSTON, TEXAS 77251-1386 • (713) 802-5000

August 30, 2001

Grand Parkway (SH 99)
Segments G and H
Lake Houston State Park

CONTACT: DPD

RECEIVED
SEP 05 2001
GRAND PARKWAY ASSOCIATION

Mr. Andrew Sansom, Executive Director
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, Texas 78744-3291

Dear Mr. Sansom:

The Grand Parkway Association (GPA), along with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration, has been in the early coordination process with the federal and state resource agencies for Segments E, F-1, F-2 and G of the Grand Parkway (SH 99) in the Houston metropolitan area. A number of workshops and meetings have been held. A workshop was held on Tuesday, July 31, 2001, with Mr. Bob Spain, Mr. Woody Woodrow and Mr. Andy Sipocz of your office; Mr. Kerry Stanley of the U. S. Army Corps of Engineers; and Ms. Edith Erfling of the U. S. Fish and Wildlife Service in attendance. An issue raised by Texas Parks and Wildlife representatives has been the proposed eastern terminus point of Segment G and its relationship to Lake Houston State Park.

It is with this letter that TxDOT is demonstrating its commitment to develop Segment G and the possible future development of Segment H in a manner that shows a responsiveness to the concerns of the Texas Parks and Wildlife Department with respect to the Lake Houston State Park.

Attached is an exhibit showing the proposed eastern terminus of Segment G of US 59 and the minimum distance of approximately 3.3 miles to Lake Houston State Park. Also shown are a number of alignment locations that could be considered that would allow Segment H of the Grand Parkway to proceed from US 59 to the east without disrupting the continuity of Lake Houston State Park. These possible alignments reflect opportunities for the avoidance and minimization of park impacts. It is with the understanding that this exhibit in no way replaces the federally mandated process that will occur once Segment H has been authorized to proceed. TxDOT and GPA feel that the options utilizing the proposed terminus of Segment G, as well as the options to utilize US 59 either to the north or to the south for the western terminus of Segment H and possible alignments both to the north and to the south of the park, offer ample

alternatives for Segment H that addresses the concerns that have been voiced by the Texas Parks and Wildlife Department.

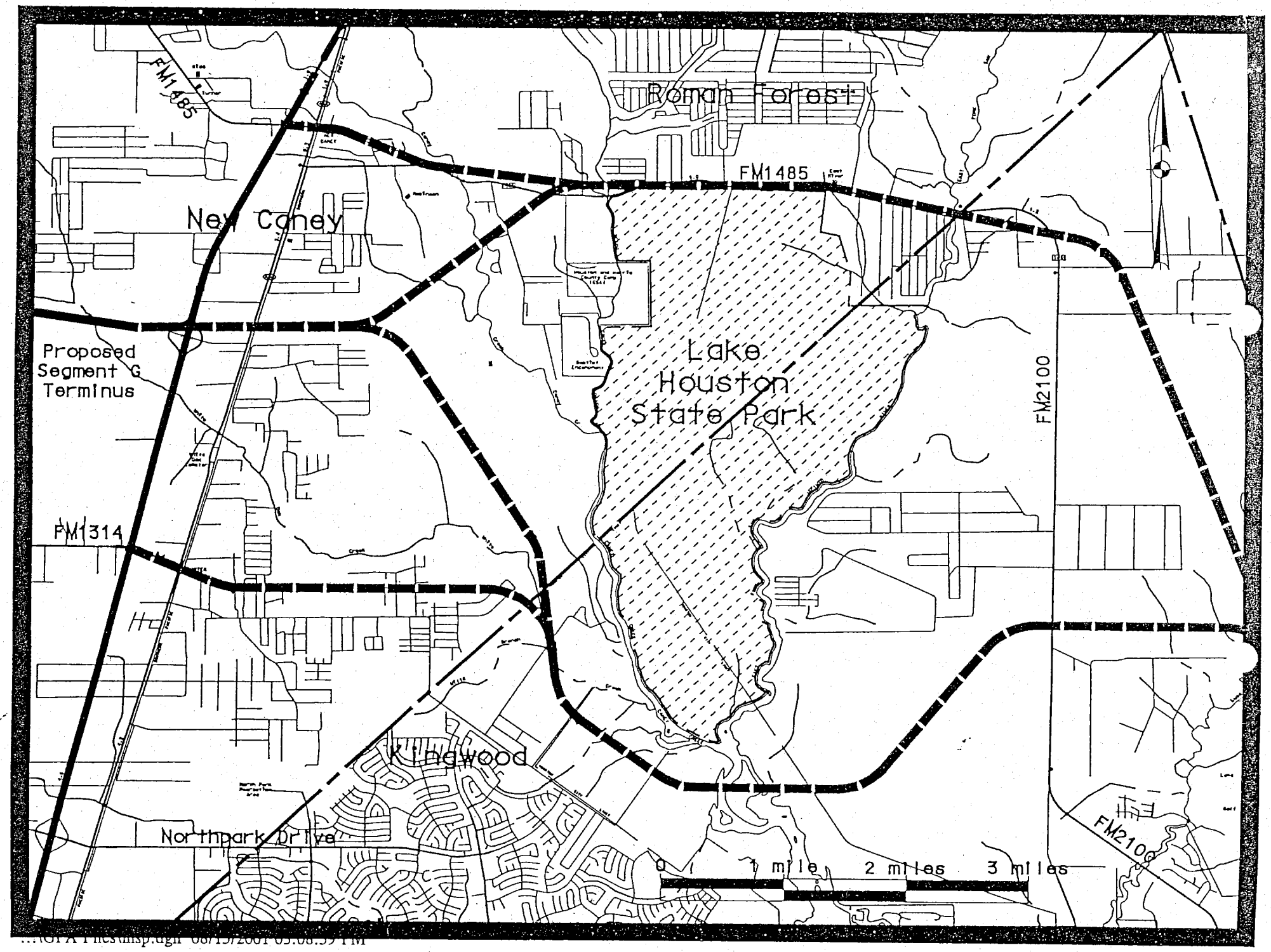
TxDOT and GPA hope to continue to work cooperatively with your office in a manner that reflects our concerns for the natural environment while addressing the transportation needs of the area.

If you have any questions or require additional information, feel free to contact Mr. James G. Darden, P.E., at TxDOT at (713) 802-241 or Ms. Robin Sterry at the Grand Parkway Association at (713) 965-0871.

Sincerely,

Gary K. Trietsch, P.E.
District Engineer
Houston District

Attachment
cc w/attachment: Mr. James G. Darden, P.E.
Ms. Julie Perales, TxDOT Environmental Affairs Division, Austin
Mr. Lee Gibbons, Federal Highway Administration
Mr. Kerry Stanley, U. S. Army Corps of Engineers
Ms. Edith Erfling, U. S. Fish and Wildlife Service
Mr. Robb Fishman, Michael Baker Jr., Inc.
Ms. Robin K. Sterry, Grand Parkway Association
Mr. David W. Gornet, Grand Parkway Association



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The Grand Parkway
Segments E, F and G

Grand Parkway - Segments E, F-1, F-2, and G Corridor/Alignment Selection Process

April 10, 2001

1. Introductions & Opening Remarks – David Gornet

2. Overview of progress to date – Mike Hegarty
   - Study Area Limits
   - Corridor(s) Selection and Limits
   - Alignment Selection by Segment/Reach

3. Determining Wetland/Waterbody Impacts (*Other Topics*) Matt Stahman
   - Mapping – NWI, CIR Aerial Phot, Helicopter, Field Surveys
   - Isolated vs. Adjacent

4. Study Process constraints mapping - and impact matrix explanation Mike Hegarty
   - Selction of Preferred Alignment for Segment E
   - Selection of Preferred Alignment for Segment F-1
   - Discusions of Issues in Segment F-2
   - Discussion of Issues in Segment G

5. Agency Questions/Concerns - Agencies

6. Action Item List - All

The Grand Parkway
Segments E, F and G

Meeting Minutes

Meeting:	Corps of Engineers, TXDOT, FHWA
Purpose:	Updating agencies and obtaining feedback
Meeting Date:	April 10, 2001
Location:	Grand Parkway Association Office
Attendance:	See attached list

1. Introduction and Opening – Mike Hegerty of Baker informed Keri Stanley of USCOE that we had met with TXDOT and FHWA and had made a **preliminary** preferred choice on an alignment through Segments E and F-1. Mike then informed Keri that one of the purposes of this meeting was obtain some feedback from him and the rest of the group on the alignments, the methodology of the Corridor Study, and our breakdown of wetlands. Mike asked Keri Stanley of USCOE if our wetland process and breakdown was comparable to the new court ruling on isolated and adjacent wetlands.

2. Mike Hegerty briefed the attendees on the reasons for selecting the alignment through Segment E and F-1 and why we have not selected an alignment through Segments F-2 and G. Following the briefing, the meeting was opened for questions.

3. Matt Stahman of PBS&J enlightened the group on how we got the wetland numbers. In the corridor phase, we used NWI wetland locations to help avoid as many wetlands as possible. Once a corridor was selected, we groud-truthed all the properties we had access to. Where we did not have access, we photo-interpreted the wetlands. In segment G, since we have had very limited access, we have relied on the NWI locations and photo-interpretations for data on properties without access. Matt emphasized that alignment D in Reach 7 has not been ground-truthed because this alignment has been added due to the public's request. Matt emphasized that we did not depend on all the NWI data in E, F-1 and F-2 because of its inconsistency.

   Notes and comments:

   - *Keri* – Do not eliminated isolated wetlands from the matrix because the USCOE might have jurisdiction on a few. Indicated that the USCOE will always have jurisdiction on adjacent wetlands.
   - *Mike* – Informed the group that Baker is currently wrapping up Segment E and wanted to use it as a guide for the other segments once we received comments from the Study Team and Agencies.
   - Mike – Indicated the reasons for selecting Alignment B in Reach 1 was due to the lower wetland numbers and other constrains were lower in this alignments. This alignment was preferred by TXDOT and FHWA.
   - *Robin Sterry* – While talking about the decision made in Reach 1, we took into account that certain agencies informed us to stay as far east as possible.

- *David Cornet* – Indicated the reasons for selecting Alignment A in Reach 2 was due to the minimal effects to wetlands, this location was on the city maps and the land owner decision to sue if we selected the other two possible alignments.
- *Mike* - Reason for selecting alignment B in Reach 3 of Segment E was the lower numbers of wetlands, which now equate into 0 adjacent wetlands, and the lower impacts to the other constraints.
- *Mike and David* – Both indicated that the reasons for selecting Alignment B in within Segment F-1 was because the *resident impacts were the least, less direct impacts to wetlands, and it was the publics choice*
- *David* – Mentioned that the we studied each alignment at 400ft *i*. Indicated that the this was being used because it was the minimum distance that could be used for interchanges and that 300 ft. could be used for other parts of the highway without ramps and interchanges.
- *Lee Gibbons (FHWA)* – Mentioned that if we use retention ponds in the willow creek area, we need to find all Haz-waste areas and waste materials. Also mentioned that we could possibly use detention ponds outside floodplain for fill material and location.
- *Mike* – Back on the topic of Segment E, Mike mention that we used many agency comments because of little public/citizen comments.
- *Mike* – Most of our public comments have come from Segment F-2. Neighborhood groups have mobilized and voiced their comments in adding Alignment D in Reach 7. This "alignment" was apparent on the city of Houston .thoroughfare plan
- *Robin* – Subdivisions are fighting with each other for the positioning of the Grand Parkway through Reach 7.
- *Mike* – Brought up the U.P. Rail yard location and noted that if is built, it would be a 24/7 operation and noise would be existent
- *Mike* – At Hooks Airport, the Grand Parkway would be depressed under FM 2920 with the use of a pump station for water drainage. Mentioned that there will be impacts in Reach 7, we are trying to find the least impactive and costly route.
- *Mike* – For Segment G, the Toll Road Authority does not like the Grand Parkway being a part of the Hardy Toll Road near I-45. Resource agencies want us to follow alignment along the power lines (Alignment s A and C) and for us to follow Riley Fusel. There would be very few interchanges along and past Riley Fusel.
- *Keri* – USCOE would accept a good reason to stay north in Reaches 9 and 10. The reasons already present – Taking the northern alignment would allow for the least amount of development and use documentation from Parks and Wildlife that states their concern and reasons why to take the northern alignment
- *Mike* – At the end of Segment G, the mobile home park presents a problem and the developer is not willing to work with the Grand Parkway.
- *David* – This mobile home park will have one-acre lots with their own septic systems.
- David – With Alignment D in Reach 7, it will be considered with the other three alignments. Multiple problems exist in this reach: With Alignment D: The UP Rail-yard – hesitant to cross it because of cost. Citizens got word that we knew of the rail yard and thought we were

not considering this alignment because we were bought off by Union Pacific. With Alignment A and B – Making frontage roads possible would be expensive along 2920 and the daily changes that are being made along this road due to new construction. With Alignment C – There are a lot of businesses and historic sites along Spring Steubner and the Fish and Wildlife do not want us going through the trees west of I-45.

- *Keri* – Use documentation – even though you make more impacts to wetlands, make sure you note that the safety of the road, aesthetics, and noise pollution would exist and use it as a tool for choice of alignment

Action Items

Matt – Group Landowner Access in to three categories: 1. Have Access, 2. No Access, and 3. Waiting list

Need to set up meeting with the Corps Joint Resource Agency Meeting

The Grand Parkway
Segments E, F and G

Sign-In Sheet

USACE Mtg #2

April 10, 2001 ◆ Grand Parkway Office

NAME (Please Print)	Phone and Fax Number		E-Mail Address
ROBB FISHMAN (BAKER)	281-579-4579	(281)579-4646	rfishman@mbakercorp.com
MATT STAHMAN (PBSJ)	(281)-493-5100	(281)493-1047	mgstahman@pbsj.com
Robin K Sterry (TxDOT)	(713)802-5248	(713)802-5896	rsterry@dot.state.tx.us
David Millikan (Baker)	281-579-4579	(281) 579-4646	dmillikan@mbakercorp.com
Mike Hegarty (Baker)	"	"	mhegarty@mbakercorp.com
David Gornet (GPA)	713 ~~281~~ 9650871	713.993.0106	dgornet@grandpky.com
Lee Gibbons (FHWA	512 536 5961	512 536 5990	
Eddie George (Baker)	281 579 4541		egeorge@mbakercorp.com
Kerry M. Stanley (Corps)	409 766-6345	409 766-6301	kerry.m.stanley@swg02.usace.army.mi

The Grand Parkway
Segments E, F and G

Agenda

Grand Parkway - Segments E, F-1, F-2, and G

Joint Evaluation Meeting (JEM)
U.S. Army Corps of Engineers - Galveston District
May 23, 2001, 2:00 – 4:00 p.m.

1)	Introductions & Opening Remarks	GPA
2)	Overview of progress to date a. Study Area Limits b. Corridor(s) Selection and Limits c. Alignment Selection by Segment/Reach	Team
3)	EIS Status (Segments E, F-1, F-2, and G a. EIS Process, i.e., Vol. I and Vol. II b. Draft EIS Status for Segments E, F-1, F-2, and G c. Schedule	GPA
4)	Study Process Constraints Mapping and Impact Matrix Explanation	Team
5)	Determining Natural Resource Impacts a. Wetland/Watershed Impacts b. Habit Impacts c. Endangered and Threatened Species Impacts	Team
6)	Mitigation Options	Team
7)	Agency Questions/Concerns	Agencies
8)	Action Items	All

Agencies – ACOE, FWS, TPWD, NMFS, GLO, EPA, TNRCC, TxDOT, and FHWA
GPA – Grand Parkway Association
Team – Michael Baker Jr., Inc., PBS&J, and Brown & Gay

The Grand Parkway
Segments E, F and G

Joint Evaluation Meeting (JEM)

Meeting Date: May 23, 2001 (2:00 p.m. to 4:30 p.m.)

Meeting Location: U.S. Army Corps of Engineers – Galveston District

Meeting Organization: Meeting was arranged by U.S. Army Corps of Engineers – Galveston District to discuss project status for the Grand Parkway Segments E, F-1, F-2, and G.

Meeting Format: Open discussion to discuss status of the on-going studies.

Attendance:

GPA personnel: 2 (Mr. David Gornet and Ms. Robin Sterry)

TxDOT personnel: 3 (Mr. Stan Cooper, Mr. Manny Francisco and Ms. Susan Peterson)

TxDOT ENV. personnel: 2 (Mr. Wayne Young (conference call) and Ms. Melissa Nelly (conference call))

FHWA personnel: 3 (Mr. Lee Gibbions, Mr. Mike Leary, and Mr. Tony Palacios)

HGAC Personnel: 3 (Mr. Andy Mullins, Mr. Alan Clark and Mr. Earl Washington)

Consultants: Michael Baker Jr., Inc. 3(Mr. Robb Fishman, Mr. Mike Hegarty and Mr. Paul Prideaux (conference call)).

Media: None

Notices: Notice of meeting was provided in advance to all meeting participants, teleconference number was provided to participants unable to attend meeting.

Meeting Summary :

Mike H. Provided an over view of the project and the current status of the traffic analysis to date.

Paul P. Noted that the Build 3 (90/40) numbers are currently being rerun as Build 4 (80/30).

Alan C. Noted that looking at additional thoroughfare improvements may be necessary to adequately model local trips.

Mike L. Voiced concerns about differing demographics between H-GAC & Expert Panel.

Alan C. H-GAC will update portions of the SIP for air quality next summer.

Lee G. Noted on Segment C of the Grand Parkway that they utilized H-GAC's " lower traffic numbers".

David G. Is concerned that the demographics must appear to be similar to those of H-GAC and that the traffic volumes will then reflect current conditions.

Alan C. Noted that the differences in traffic volumes cannot go to far with revising major thoroughfare.

Alan C. stated that the following steps should be taken:

Step 1. Re-run the 80/30 scenario. See if demographics are within a comfortable range with H-GAC numbers.

Step 2. Consider changes to the model connectivity (cross-street lineage) to get the traffic volumes within a closer range once the demographics are reasonable.

Step 3. Look at no-build so that totals between H-GAC & expert panel are similar.

Andy M. Noted that a few of the RAZ's seem to be high on multi-family houses, especially west of Katy. Need to re-evaluate the multi-family housing numbers.

Mike L. Explain in DEIS about the expert panel and how the demographics will be used for H-GAC's confirm analysis.

Andy M. To look at RAZ's and reallocate so that a new TAZ data set can be run by end of week. Re-run the 80/30 scenario to get demographics close. Both the build and no-build regional (8 County) totals appear to be very similar.

Alan C. Mentioned to be careful about portraying just the presence of the Grand Parkway as "Economical Stimulus".

Alan C. Next TAC for HGAC around 6/13
Consider a presentation to the Group

JEM - May 23, 2001

NAME	Org.	Phone #
Kerry M. Stanley	Corps	409/766-6345
Pat Alba	Coastal Permit Assistance Office	(361) 825-3050
Robert Burgess	TNRCC	(512) 239-3163
Moni DeVora	USFWS	(281) 286-8282
Mike Hegarty	BAKER	(281) 579-4579
Robin K Sterry	GPA	713-965-0871
Edith Ertling	FWS	281-286-8282
John Mack	PHWA	(512) 536-5960
Matt Brannen	Brown & Gay Eng.	(281) 558-8700
Robb Fishman	BAKER	281-579-4579
Matt Stahman	PBS&J	281-493-5100
Dan Wallace	BAKER	412 269-4626
Julie Morse	PBS&J	281-493-5100
David Gornet	GPA	713-965-0871

The Grand Parkway
Segments E, F and G

Agenda

Grand Parkway - Segments E, F-1, F-2, and G
Resource Agency Workshop
June 14, 2001, 8:00 a.m. – 5:00 p.m.

Meeting Location
Michael Baker Jr., Office
16340 Park Ten Place, Suite 320
Houston, TX 77084

1)	Drive Through of Project Area (8:00 a.m. – 1:00 p.m.)	All
2)	Introductions & Opening Remarks (Working Lunch)	GPA
3)	Overview of progress to date a. Study Area Limits b. Corridor(s) Selection and Limits c. Alignment Selection by Segment/Reach	Team
4)	EIS Status (Segments E, F-1, F-2, and G) a. EIS Process, i.e., Vol. I, Vol. II, and Vol. III b. Draft EIS Status for Segments E, F-1, F-2, and G c. Schedule	GPA
4)	Study Process, Constraints Mapping and Impact Matrix Discussion	Team
5)	Determining Natural Resource Impacts a. Wetland/Watershed Impacts b. Habit Impacts c. Endangered and Threatened Species Impacts	Team
6)	Mitigation Options	Team
7)	Agency Questions/Concerns	Agencies
8)	Action Items	All

Agencies – ACOE, FWS, TPWD, NMFS, GLO, EPA, TNRCC, TxDOT, FHWA, and H-GAC
GPA – Grand Parkway Association
Team – Michael Baker Jr., Inc., PBS&J, Brown & Gay, and Community Awareness Services

The Grand Parkway
Segments E, F and G

Resource Agency Workshop/Field Tour

Meeting Date:	June 14, 2001		
Meeting Location:	Michael Baker Jr., Inc. 16340 Park Ten Place, Suite 320 Houston, TX 77084		
Meeting Organization:	Workshop/Field Tour was arranged by Mr. Robb Fishman (Michael Baker Jr., Inc.) to update and discuss issues and concerns with the proposed Grand Parkway in Segments E, F-1, F-2, and G.		
Meeting Format:	Started with a field tour through the Grand Parkway study area and finished with a Workshop/meeting to discuss alignment options in Segments E, F-1, F-2 and G. (see attached agenda)		
Field Tour Attendance:	U.S. Army Corps of Engineers:		Mr. Kerry Stanley
	Permit Assistance Office:		Mr. Pat Alba
	TNRCC:		Ms. Lili Lytle
	Grand Parkway Association:		Mr. David Gornet Ms. Robin Sterry
	TxDOT:		Ms. Julie Perales Ms. Susan Patterson
	FHWA:		Mr. Lee Gibbons Mr. Gary Johnson Mr. Antonio Palacios Mr. John Mack
	Consultants:	Michael Baker Jr., Inc.:	Mr. Robb Fishman Mr. David Millikan Mr. Eddie George
		PBS&J:	Mr. Matt Stahman Ms. Julie Morse
Meeting Attendance:	All the Field Tour attendees with the addition of:		
	TXPWD:		Mr. Ted Hollingsworth
	Consultants:	Brown and Gay Engineers:	Mr. Bob Arroyave Mr. Matt Brannen
Notices:	Meeting set-up over the telephone and confirmed by e-mail.		

Meeting Summary: The meeting was conducted in an open meeting format. The meeting started with a bus tour of the study area for Segments E, F-1, F-2 and G. The field tour was lead by Mr. David Gornet and Mr. Robb Fishman. Mr. Gornet and Mr. Fishman identified the issues to date and the reasoning for the placement of the various alignments. In addition to identifying the alignments, opportunities to practice avoidance of resources were identified. After the bus tour was completed, all the attendees were brought back to the Michael Baker Jr., Inc. office for a working lunch. After lunch, the meeting continued in an open meeting format. Large-scale aerial maps that contained constraints were presented to the attendees. As we went through each map, segment by segment, the attendees were asked for their imput, questions and knowledge of the areas surrounding the project.

Mr. Stanley indicated that upon application for the Corps permit, we will need to field verify all wetlands. Mr. Fishman mentioned that mitigation would likely take place at two locations within the two eco-regions associated with the project. The two eco-regions include the Katy Prairie and the forested bottomland hardwood wetland areas in Segments F-2 and G, along Spring Creek.

Mr. Stanley indicated that the Corps would have jurisdiction over adjacent wetlands. He also indicated that isolated wetlands are not jurisdictional, but will be considered in reviewing the entire project.

Mr. Hollingsworth mentioned that TPWD are mostly involved in mitigating biological resources more than an acre for acre compensation for wetlands. He stated to minimize the impact to the extent possible, possibly using longer bridges over floodplains and avoid wetlands.

Mr. Stanley stated that mitigation should first include avoidance of the resources, then to explore mitigation options adjacent to the highway. The corps would prefer one large mitigation area in lieu of several smaller areas adjacent to the highway. However, all options should be explored and presented to the agencies for their concurrence.

Segment F-1
Matt Stahman confirmed to Ted that we have avoided Hymenoxys texana and that we were able to verify this past spring that the proposed alignments only had one location where this endangered plant was found. That alignment is not one of the preferred alignments.

Ted mentioned that we need to make sure we include mitigation and maintenance of habitat. Also mentioned that if we could preserve mima mound habitat, they would appreciate it.

Segment F-2
Reaches 5 and 6 – the preferred alignment is alignment B.
Reach 7 – Alignments A, B and C are not preferred by the public. The public wanted us to draw an alignment that reflected the location of the Key Map location. We have done so and now that alignment is identified as Alignment D.

Mr. Hollingsworth mentioned that economics will likely dictate the ultimate location of the alignment and mentioned that the area alignment D traverses is already fragmented.

Mr. Stanley noted that from an environmental standpoint, he would prefer Alignment E, but does not have a strong preference and understands why political realities might push it to D. He does prefer D on the far east end of reach 7 due to the possible fragmentation of the large wooded tract off of Spring Stuebner and I-45.

Ms. Sterry mentioned that a sandpit was located off of Spring Creek and would be an ideal place for a detention pond. May be opportunities for benefiting multiple agencies.

Segment G
No one liked the idea of using the Hardy Toll Road as an option and preferred alignment A.

Mr. Stahman mentioned that the rookery in this segment is based upon 1976 data and needs to be field verified.

Mr. Hollingsworth mentioned that TPWD would be interested in GPA extending Bar woods to the north with the Grand Parkway standing at the northern boundary. This would prevent development south of the Grand Parkway.

Mr. Gornet believes the tract in that area may be leased for sand mining operations. Ms. Sterry will verify where it is.

Mr. Hollingsworth mentioned that we should focus on preserving the total biological values.

Ms. Sterry proposed to give color plots of the San Jacinto River Crossing and ask TNRCC, USACOE, TPWD and USFWS to look at it and suggest a alignment crossing of the San Jacinto River and east to U.S. 59. Above referenced attendees went away from the meeting with the homework assignment.

Ms. Lytle mentioned that mitigation along river crossings within roadside ditches might be desirable to assist in water quality improvements in the streams and rivers. She will give GPA the streams that are listed as endangered streams.

The meeting was adjourned at 5:00 p.m.

Attachment

The Grand Parkway
Segments E, F and G

RESOURCE AGENCY WORKSHOP
(FIELD TOUR)
June 14, 2001 ◆ Michael Baker Jr., Inc.

NAME (Please Print)	REPRESENTING	E-MAIL ADDRESS	TELEPHONE NO.
ROBB FISHMAN	Michael Baker Jr	RFishman@MBakerCorp.com	281-579-4597
Julie Morse	PBS+J	jemorse@pbsj.com	281-493-5100
Matt Stahman	PBS+J	mgstahman@pbsj.com	" " "
David Millikan	Michael Baker Jr. Inc.	dmillikan@mbakercorp.com	281-579-4648
Lee Gibbons	FHWA	lee.gibbons@fhwa.dot.gov	512 536 5961
Gary Johnson	FHWA	gary.johnson@fhwa.dot.gov	(512) 536 5964
ANTONIO PALACIOS	"	Antonio.Palacios@FHWA.dot.gov	536 5946
Julie Perales	TxDOT - ENV	jperale@dot.state.tx.us	(512) 416-2612
Susan Patterson	TxDOT - HOU	spatter@dot.state.tx.us	(713) 802-5247
John Mack	FHWA	john.mack@fhwa.dot.gov	(512) 536 5960
DAVID GORNET	GPA	dgornet@grandpky.com	713.965.0871
ROBIN STERRY	GPA	rsterry@grandpky.com	713-965.0871
PAT Alba Jr	Permit Assistance Office	patricia.alba@glo.state.tx.us	(361) 885-3850
Kerry M. Stanley	US Army Corps	kerry.m.stanley@swg02.usace.army.mil	409/766-6345
LILI LYTLE	TNRCC	llytle@tnrcc.state.tx.us	512-239-4596

The Grand Parkway
Segments E, F and G

RESOURCE AGENCY WORKSHOP
(WORKSHOP)
June 14, 2001 ◆ Michael Baker Jr., Inc.

NAME (Please Print)	REPRESENTING	E-MAIL ADDRESS	TELEPHONE NO.
Robb Fishman	Michael Baker JR., Inc.	RFishman@MBakerCorp.com	281-579-4597
John Mack	FHWA	john.mack@fhwa.dot.gov	512-536-5960
Julie Perales	TxDOT - ENV	jperale@dot.state.tx.us	512-416-2612
Susan Patterson	TxDOT - HOV	spatter@dot.state.tx.us	(713) 802-5247
Julie Morse	PBS+J	jemorse@pbsj.com	281-493-5100
LILI LYTLE	TNRCC	llytle@tnrcc.state.tx.us	512 239-4596
Kerry M. Stanley	Corps	kerry.m.stanley@swg02.usace.army.mil	409/766-6345
Bob Arroyave	Brown & Gray Eng.	barroyave@brongay.com	(281) 558-8200
David GORNET	GRAND PARKWAY ASSOC.	dgornet@grandpky.com	713·965·0871
Lee Gibbons	FHWA	lee.gibbons@fhwa.dot.gov	512 536 5961

The Grand Parkway
Segments E, F and G

RESOURCE AGENCY WORKSHOP
(WORKSHOP)
June 14, 2001 ◆ Michael Baker Jr., Inc.

NAME (Please Print)	REPRESENTING	E-MAIL ADDRESS	TELEPHONE NO.
David Millikan	Michael Baker Jr. Inc.	dmillikan@mbakercorp.com	281-579-4648
Matt Brannen	Brown & Gray Engineers	mbrannen@browngray.com	281-558-8700
Pat Alba Jr.	Permit Assistance Office	patricio.alba@glo.state.tx.us	(361) 825-3050
MATT STAHMAN	PBSJ	mgstahman@pbsj.com	281 493-5100
ANTONIO PALACIOS	FHWA	Antonio.Palacios@Fhwa.dot.gov	512 536-5946
Robin Sterry	GPA	rsterry@grandpky.com	713-965-0104
TED HOLLINGSWORTH	TPW	ted.hollingsworth@tpwd.state.tx.us	(281)471-3200 ext. 229
Gary Johnson	FHWA	gary.johnson@fhwa.dot.gov	512 536 5964

The Grand Parkway Association

EPA Workshop

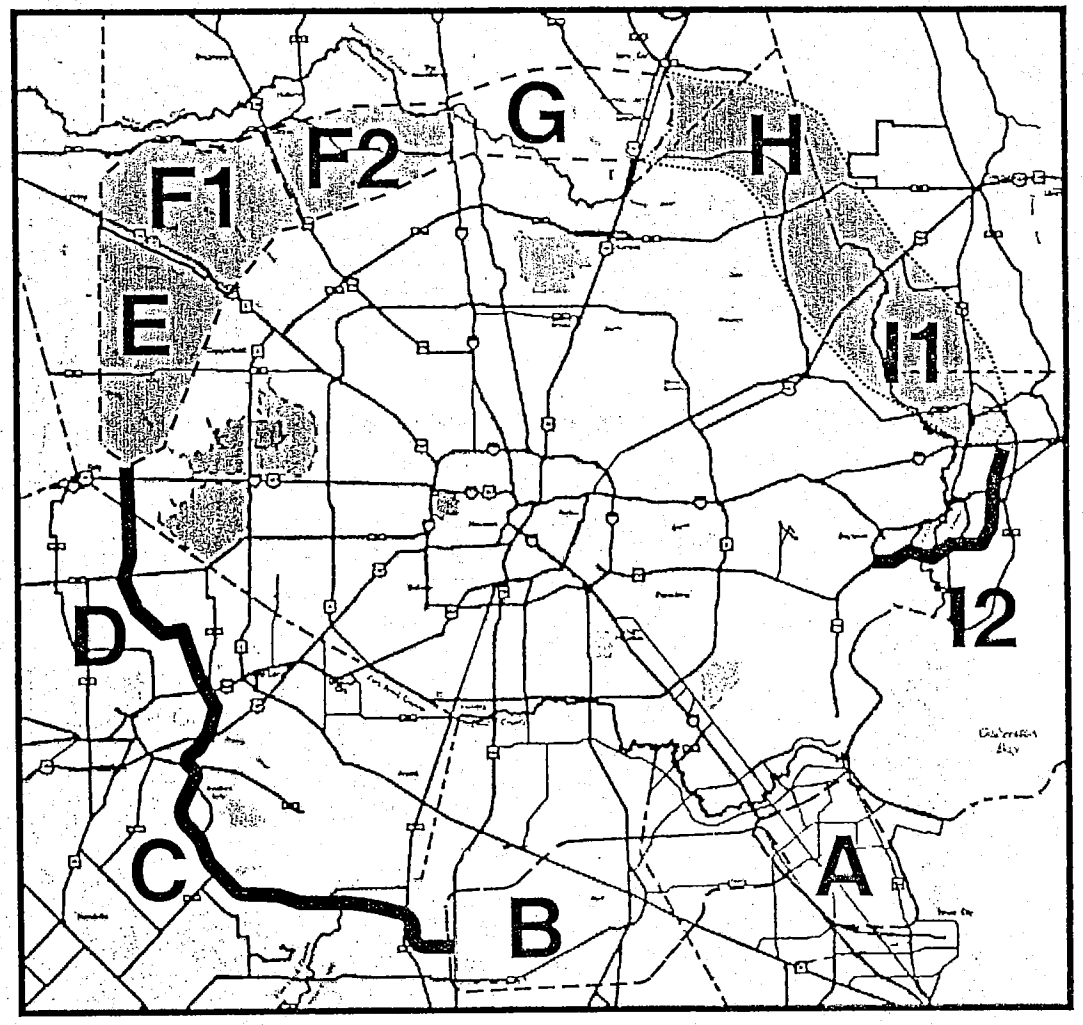
Segments E, F1, F2 & G

July 17, 2001

The Grand Parkway Association

Grand Parkway Overview

- Established in 1984
- Authorized to pursue the development of SH99, the third loop around Houston, a 170 mile project
- Three employees
- Seven member Board of Directors
- Reports to TxDOT



The Grand Parkway Association

Grand Parkway Project Benefits

- Enhances regional mobility
- Addresses existing and projected congestion
- Minimizes overall impacts to both the human and natural environments
- Improves hurricane evacuation
- Exemplifies Responsible Planning
  - Meets needs identified in regional mobility plans
  - Provides for a limited access highway
  - Develops a scenic parkway compatible with various adjacent land uses
  - Reduces time and cost for project implementation

The Grand Parkway Association

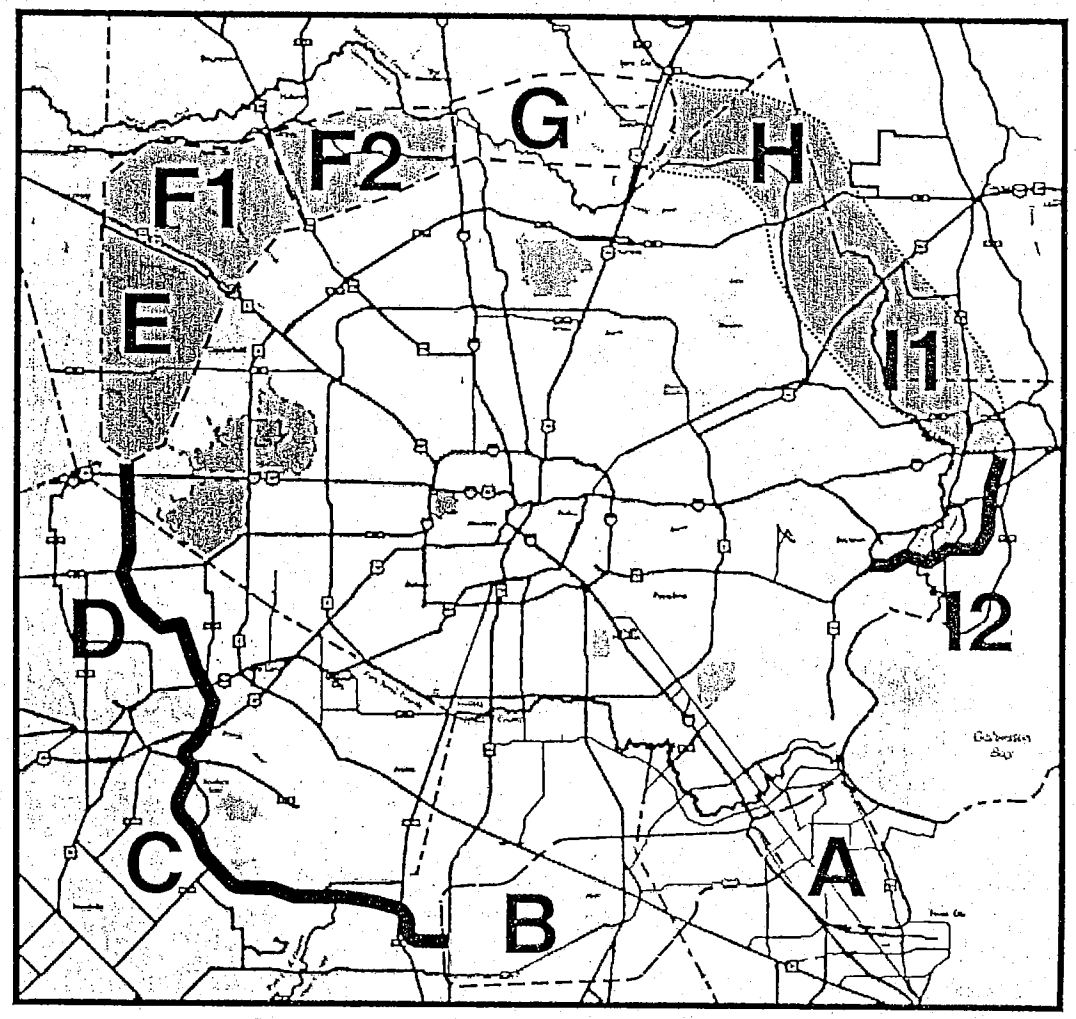
Grand Parkway Project Planning Process

- Request for action from local government
- Sponsoring Agencies
  - Texas Department of Transportation
  - Federal Highway Administration
- Coordination with Resource Agencies
  - US Army Corps of Engineers
  - US Fish and Wildlife Service
  - US Environmental Protection Agency
  - Texas Parks and Wildlife Service
  - Texas Natural Resources Conservation Commission
- Public Involvement, Scoping Meetings, Workshops, Hearings
- State and Federal Planning Guidelines
  - Avoidance
  - Minimization
  - Mitigation

The Grand Parkway Association

Segment Status
Overall Project Status

- Segment D - 20 miles, opened in 1994
- Segment I2 - 14 miles, Construction Let in 4Q '01
- Segment C - 26 miles, Study initiated 3/98
- Segment B – 25 miles, Start Project in Sept 2001
- Segment A – 6 miles, No Studies underway
- Segments H&I1 - 34 miles, No Studies underway
- Segments E,F&G – 52 miles, Study initiated 7/99



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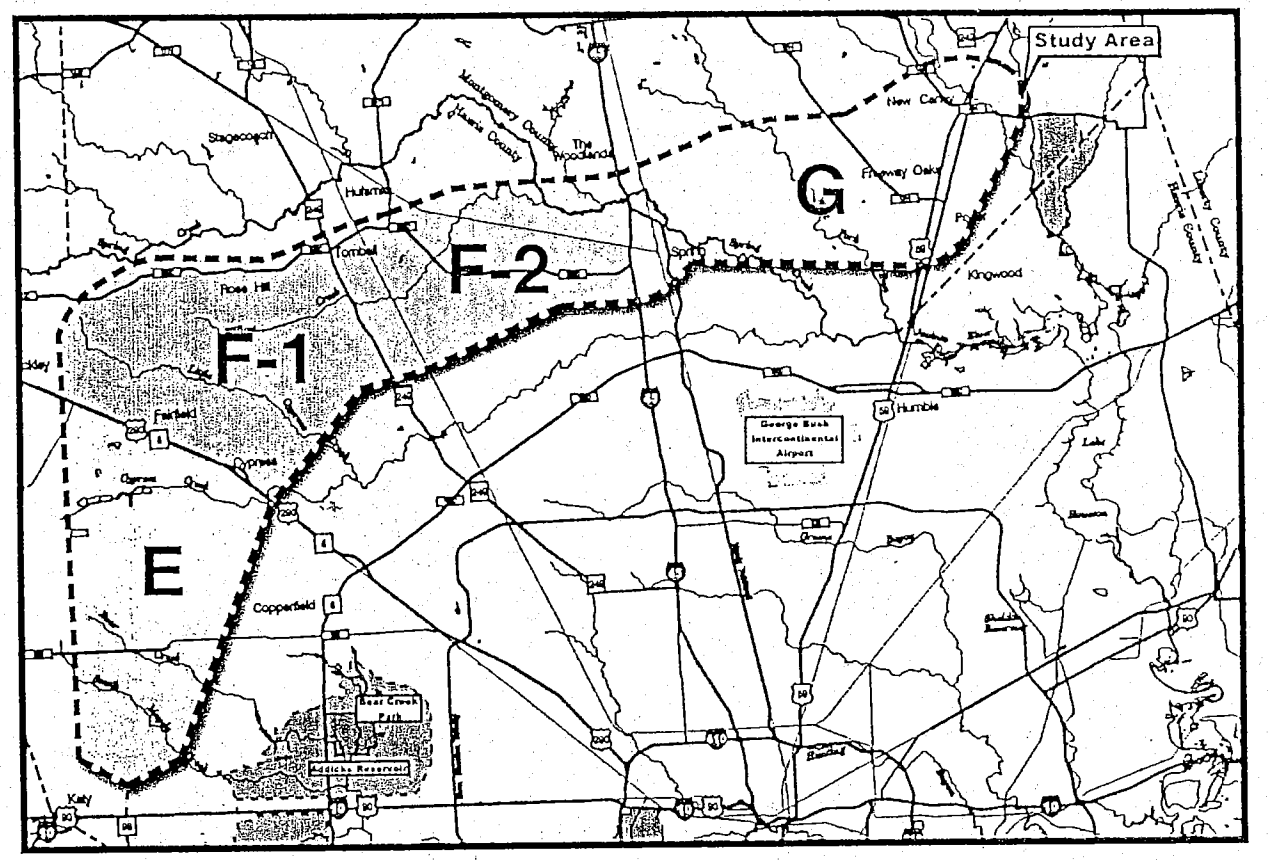
Segments E, F1, F2 & G
IH10(W) to US59(N)

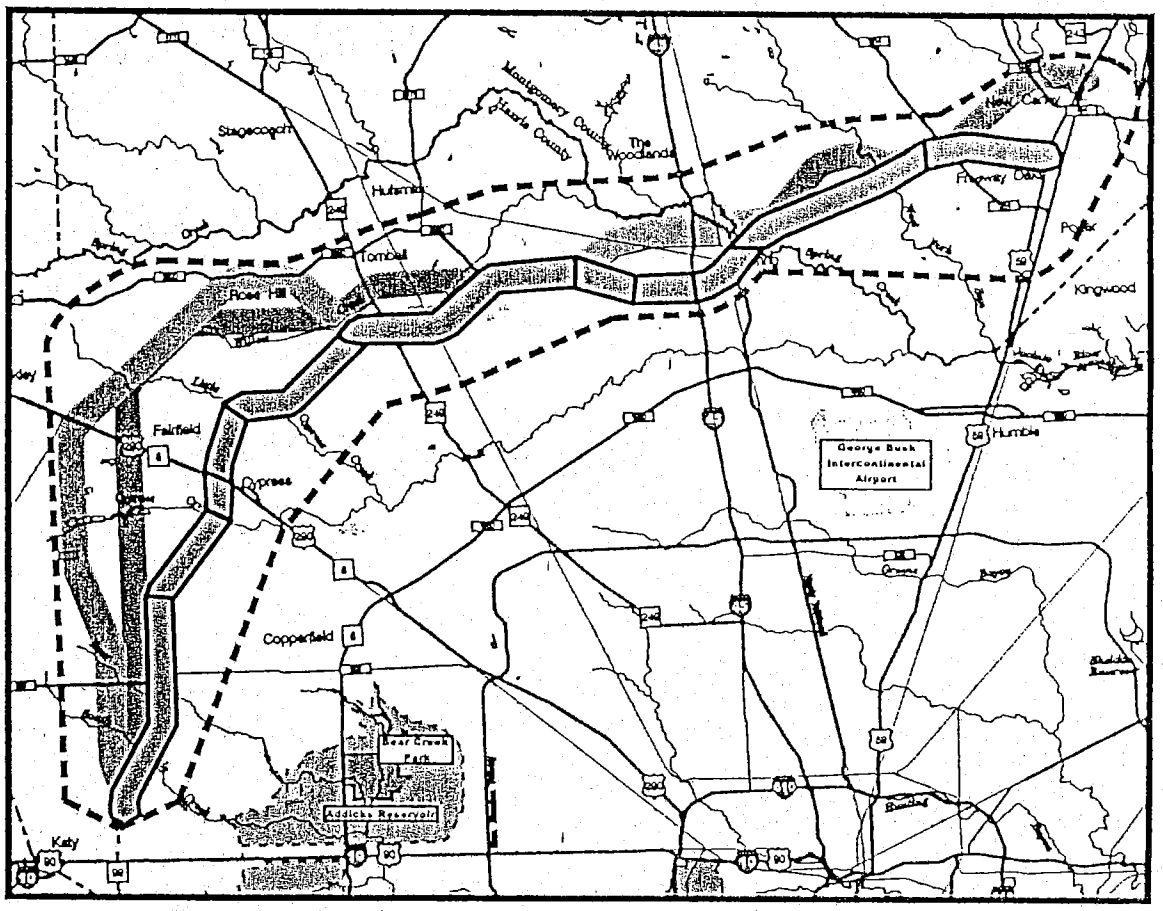
- 52 miles in length
- Traverses Harris and Montgomery Counties
- Study initiated in July 1999
- Four EIS documents
- Possible toll road
- Designated I69?



The Grand Parkway Association

Segments E, F1, F2 & G Project Progress

- Study Area presented at the August 1999 meetings
- Corridors presented at the February 2000 meetings
- Preferred Corridor selected June 2000
- Alignment alternatives presented at Public Meetings in October 2000



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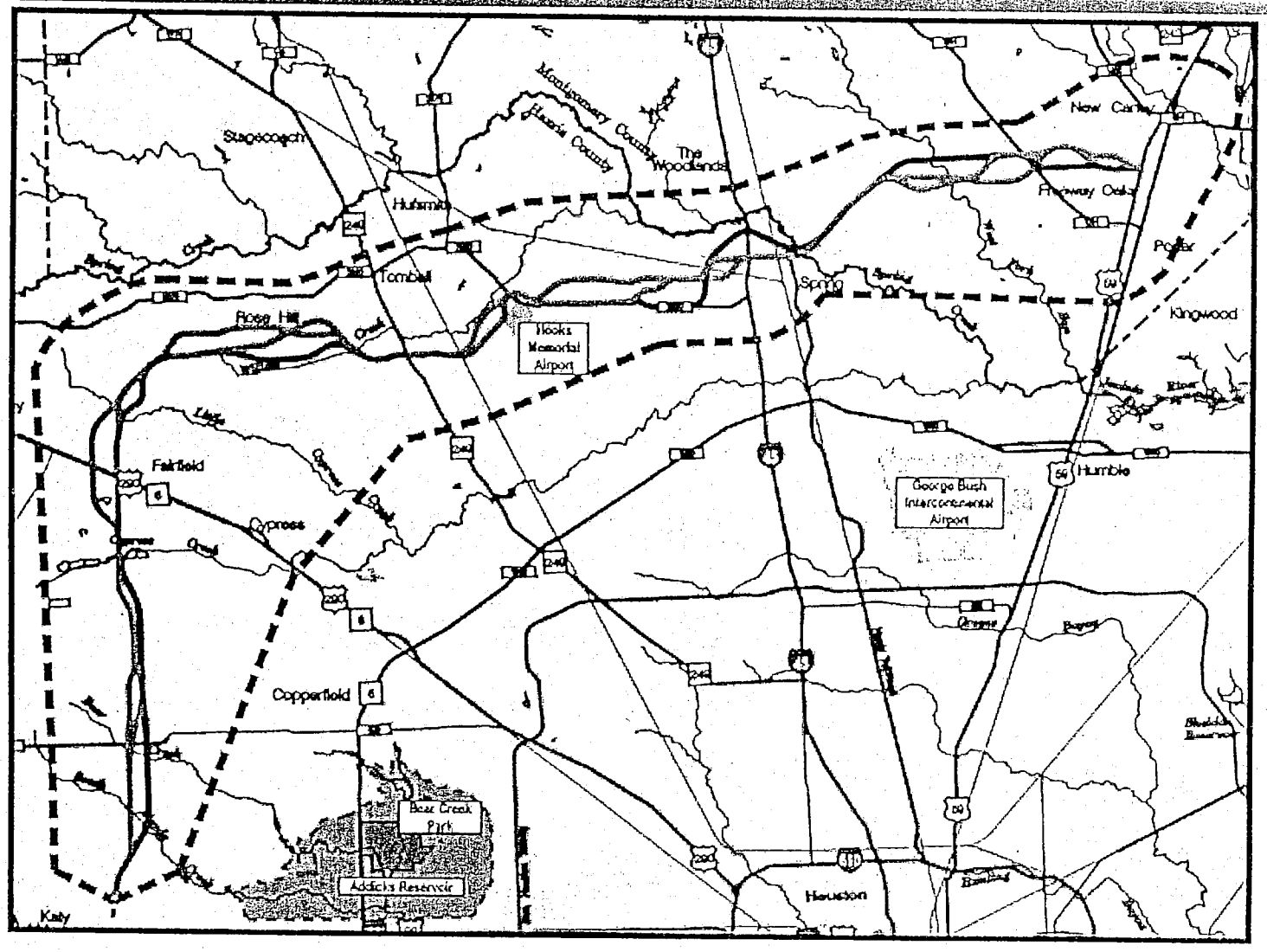
Segments E, F1, F2 & G Constraints

- Wetlands
- Bottomland Hardwoods
- Threatened & Endangered Species
  - Texas Bitterweed
  - Bald Eagle
  - Red-Cockaded Woodpecker
- Floodplains
- Historic Structures/Districts
- Existing Development
- Property Issues
- Fast pace of new Development

The Grand Parkway Association

Segments E, F1, F2 & G Alternative Alignments



The Grand Parkway Association

Segments E, F1, F2 & G Schedule of Activities

Joint Evaluation Meeting	5/01
Resource Agency Workshop	6/01
EPA Workshop	7/01
Publish Draft EIS	9/01
Hold Public Hearing on DEIS	11/01
Publish FEIS	5/02
Record of Decision	10/02
Begin Final Design (earliest)	11/02
Begin Construction (earliest)	1/04

The Grand Parkway
Segments E, F and G

Agenda

Grand Parkway - Segments E, F-1, F-2, and G
Environmental Protection Agency
July 17, 2001, 1:00 p.m. – 4:00 p.m.

Meeting Location
Environmental Protection Agency – Region 6
1445 Ross Avenue
Dallas, TX 75202-2733
Conference Room – Houston Toad Room, 9th Floor

1) Introductions & Opening Remarks — GPA

2) Overview of progress to date — Team
   a. Study Area Limits
   b. Corridor(s) Selection and Limits
   c. Alignment Selection by Segment/Reach

3) EIS Status (Segments E, F-1, F-2, and G) — Team
   a. Draft EIS Status for Segments E, F-1, F-2, and G
   b. Schedule

4) Determining Impacts to the Human Environment — Team
   a. Land Use/Farmland
   b. Socioeconomic Conditions (i.e., Neighborhood/Community Cohesion, Environmental Justice, Traffic and Public Safety, Travel Patterns and Accessibility, and Community/Public Resources)
   c. Relocation and Displacements
   d. Noise
   e. Air Quality
   f. Cultural Resources
   g. Hazardous Materials

5) Determining Impacts to the Natural Environment — Team
   a. Aquatic Resources including Jurisdictional Wetlands
   b. Endangered and Threatened Species Impacts
   c. Ecological Resources (i.e., CZMP, Floral/Faunal, Migratory Bird Treaty Act, Beneficial Landscaping Design, Invasive Species, and Essential Fish Habitat)

6)	Study Process, Constraints Mapping and Impact Matrix Discussion (Packets)	Team
7)	Secondary and Cumulative Impacts	Team
8)	Mitigation Options	Team
9)	EPA Questions/Concerns	EPA
10)	Action Items	All

Agencies – EPA Region 6
GPA – Grand Parkway Association
Team – Michael Baker Jr., Inc., PBS&J, Brown & Gay, and Community Awareness Services

The Grand Parkway
Segments E, F and G
Project Update

Tuesday, July 17, 2001

Name	Agency	Phone
Michael P. Jansky	U.S. EPA	214-665-7451
Robin Sterry	Grand Parkway Assn	713-965-0871
Jim Gregory	PBS&J jfgregory@pbsj.com	281-493-5100
David GORNET	Grand Parkway Assoc.	713.965.0871
ROBB FISHMAN	Michael Baker	281-579-4597
Joe Swick	EPA	214-665-7456
Lee Gibbons	FHWA	512 536 5961
Tom Bruehert	TxDOT	(512) 416 2735
J. Behnam	US EPA	(214) 665-7247
Rob [illegible]	[illegible]	[illegible]
John Mack	FHWA	(512) 536-5960
Gary Johnson	FHWA	(512) 536-5964
Julie Perales	TxDOT	(512) 416-2612
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The Grand Parkway
Segments E, F and G

Agenda

Grand Parkway - Segments E, F-1, F-2, and G
Resource Agency Workshop
July 31 2001, 8:00 a.m. – 5:00 p.m.

Meeting Location
Michael Baker Jr., Office
16340 Park Ten Place, Suite 320
Houston, TX 77084

1)	Drive Through of Project Area (8:00 a.m. – 1:00 p.m.)	All
2)	Introductions & Opening Remarks (Working Lunch)	GPA
3)	Overview of progress to date a. Study Area Limits b. Corridor(s) Selection and Limits c. Alignment Selection by Segment/Reach	Team
4)	EIS Status (Segments E, F-1, F-2, and G) a. Draft EIS Status for Segments E, F-1, F-2, and G b. Schedule	GPA
4)	Study Process, Constraints Mapping and Impact Matrix Discussion	Team
5)	Determining Impacts to the Natural Environment a. Aquatic Resources including Jurisdictional Wetlands b. Endangered and Threatened Species c. Ecological Resources (i.e., CZMP, Floral/Faunal, etc.)	Team
6)	Secondary and Cumulative Impacts	
7)	Mitigation Options	Team
8)	Agency Questions/Concerns	Agencies
9)	Action Items	All

Agencies – ACOE, FWS, TPWD, TxDOT, and FHWA
GPA – Grand Parkway Association
Team – Michael Baker Jr., Inc., PBS&J, Brown & Gay, and Community Awareness Services

The Grand Parkway
Segments E, F and G

Resource Agency Workshop/Field Tour

Meeting Date: July 31 2001

Meeting Location: Michael Baker Jr., Inc. Office

Meeting Organization: Workshop/Field Tour was arranged by Mr. Robb Fishman (Michael Baker Jr., Inc.) to update and discuss project status for the Grand Parkway Segments E, F-1, F-2, and G and to obtain comments from the Agencies.

Meeting Format: Started with a field tour through the Grand Parkway study area and finished with a Workshop/meeting to discuss and present our current Recommended Alignments in Segments E, F-1 and F-2 and to discuss the alignment options in G. (see attached agenda).

Attendance:

GPA:		Ms. Robin Sterry
TPWD:		Mr. Woody Woodrow Mr. Andy Sipocz Mr. Bob Spain
USFWS:		Ms. Edith Erfling
USACOE:		Mr. Keri Stanley
Consultants:	Michael Baker Jr., Inc.:	Mr. Robb Fishman Mr. Eddie George
	PBS&J:	Mr. Matt Stahman

Handouts: Agenda; Updated Matrix for Segments E, F-1, F-2, and G; Participants were requested to bring the Summary and Status of The Grand Parkway Segments E, F-1, F-2, and G provided at June 14, 2001 meeting.

Notices: Notice of meeting was provided in advance to all meeting participants.

Meeting Summary: Matt presented to the group the method we used to determine Bottomland Hardwoods. The method consisted of using 1995 infared photos, NWI wetlands, photo-interpreted wetlands, field-verified wetlands, and the 100-year floodplain. Matt asked the group if they had any other sources we could use or if they had any knowledge of any materials that could assist the GPA in determining Bottomland Hardwoods.

Andy informed us that we should use the 1982 infared maps because that year was wet and that the area surround Segment G was not heavily cut for timber. Andy informed us that the USFWS office had these maps

Matt or Eddie is to call Edith to see if they have the maps that cover the Study Area for the Grand Parkway Segments E, F-1, F-2 and G.

Somewhere in the 1996 period, Andy and Woody saw some Bald Eagles south of the study area in Segment G, along the San Jacinto River.
Andy noted that the three alignments that cross the San Jacinto River in Segment G were crossing an area that is pristine and untouched relative to other potential river crossings. TPWD would prefer the Grand Parkway to move the proposed river crossing further to the north, closer to the gravel operations.

Robb presented a possible solution with our current alignments. He proposed that within the 400' right of way, the Grand Parkway would limit the ability of Sand and Gravel operations to occur in close proximity to the bridge structure thereby protecting the river. TPWD did not like the idea and insisted that we move Alignment B further to the north. TPWD would work with the Sand and Gravel Operators to protect the river.

Matt asked the group about certain forested areas along Little Cypress Creek and South Mayde Creek. He questioned this area being identified as Bottomland Hardwoods and asked them for their opinion. Woody called these areas a riparian area/ mixed forest. Woody insisted that we include this riparian area into our matrix.

TPWD added that in Segment G, if an area has been timbered, you must still include it as a Bottomland Hardwood area because of its potential to grow back.

Robb asked TPWD if they wanted a set of maps to mark new alignments for Segment G. They said that they already had a set but would like a new set of maps with all the updates we have included since our last meeting in June. They would then look at reasonable alignment options located in Segment G.

TPWD wants the GPA to come up with a feasible corridor that does not directly affect Lake Houston State Park in Segment H or a letter from the GPA confirming that the park will not be directly affected by the Grand Parkway.

Robb is to set up a time with TPWD in regards to drawing up new alignments in Segment G. A follow-up meeting will be scheduled in the not so distant future to discuss the various options within Segment G.

Andy asked us to try to avoid the Waller Ponds near Hwy 59 and the wetlands near Interstate 45. They want us to try and field verify the wetland near Interstate 45.

Robin stated that she is meeting with the landowners near Interstate 45 and will ask permission to access their property.

Note: additional meeting notes were taken by PBS&J (Mr. Matt Stahman), please see attached.

GRAND PARKWAY SEGMENTS E, F1, F2 AND G
AGENCY MEETING
JULY 31, 2001

Purpose: Meeting was held to allow USFWS, TPWD and USACE to drive through the project area and become familiar with issues considered in determining alignment alternatives. Main focus was alternatives and potential impacts through Segment G.

Attendees: Andy Sipokz (TPWD), Woody Woodrow (TPWD), Bob Spain (TPWD), Edith Erfling (USFWS), Eddie George (Baker), Robb Fishman (Baker), Matt Stahman (PBSJ), Robin Steary (GPA)

Notes:

PSL's

Andy told the group during the drive through that the EIS needs to address the locations of borrow areas and any other Project Specific Locations (PSL's). Robin discussed problems with addressing those issues up front because the contractor's are left to find their own sources of borrow material. She did say that she would bring up the issue again with TXDOT. Edith mentioned that having the contractor sign an agreement with TXDOT might serve as an acceptable compromise. The agreement would state that all borrow areas/PSL's would be located so as to avoid/minimize impacts to wetlands, protected species, etc. and would require documentation to that effect be submitted for agency review and be kept in the contractor's files.

Drainage Study

Andy mentioned that a drainage study needed to be done and included in the DEIS. Robin agreed and told Andy that this was being done for the DEIS on Segments E, F1, F2 and G. It was now being done for the FEIS on Segment C.

Bald Eagles

Andy and Woody noted that they have seen a pair of Bald Eagles in the vicinity of the West Fork of the West Fork of the San Jacinto River back in 1996. The area they indicated is south of the Bahr Mitigation Area and outside the project area of Segment G.

Edith suggested we continue to coordinate with Chris Gregory at TPWD to pinpoint the location of the Eagle's nest on Spring Creek near Segment F1. She did say that she knew it was in Montgomery County. She noted that the nest has recently been found inactive and that the Eagles may be on the move.

San Jacinto River Crossing

Andy and Woody noted that the proposed crossings of the San Jacinto River coincide with a segment of the river considered relatively undisturbed and pristine by TPWD. They suggested evaluating another alignment that archs slightly further north and crosses a section of the river already impacted by sand and gravel mining operations.

Woody suggested that TXDOT use as much span as possible across San Jacinto River bottom to reduce impacts to wildlife movement and habitat.

Lake Houston State Park

TPWD (Bob, Andy and Woody) all felt that the end point of Segment G posed a future threat to Lake Houston State Park. They were concerned that future constraints (i.e. development) would push the alignment through the park. They wanted assurances that this "loaded gun" would not result in an

alignment for Segment H that would fragment the park. They suggested drawing a feasible alignment on a map for Segment H that avoided the park and giving it to TPWD. Robin responded that GPA could not do this at this time because that would require a full-blown alignment study and NEPA review as with Segs EFG. She noted that alternatives for Segment H had not determined and evaluation of H's need was far in the future. TPWD still wanted an assurance and Robin suggested a letter from GPA association stating that Segment H would not go through the park. Interestingly, Jim Gregory mentioned after the meeting that he remembered a letter from TPWD several years ago allowing Segment H to go through the park. This is as yet unconfirmed.

Bottomland Hardwoods

Woody and Andy seemed generally satisfied with Matt's methodology for determining BLHW impacts using aerial photo interpretation. They suggested that 1982 CIR aerial photography also be reviewed, especially in the vicinity of the San Jacinto River. Woody stated that the 1995 photography was too red. Subsequently, Matt and Eddie reviewed the project area again using the 1982 and 1989 CIR aerial photography at USFWS's Clear Lake Field Office. Edith supervised the review and provided input.

Matt asked Woody whether or not he would characterize wooded areas along Little Cypress Creek and the creeks in Segment E (i.e. creeks within the historic limits of the Katy Prairie) as BLHW. Woody felt that they were better characterized as "riparian forest" instead and not counted as impacts to BLHW. Edith agreed and noted that these impacts to "riparian forest" should also be addressed.

Waller Ponds

Andy requested that alignments be adjusted to avoid impacts to "Waller Ponds" located at the end of Segment G. Waller Ponds are wind blown depressions that typically form in Waller Soils that provide semi-permanent water sources for wildlife. Andy also requested that they not be ditched through or drained.

Forested Area in Segment F2 west of I-45

Andy requested avoiding impacts to several large isolated wetlands within the forested area west of I-45. Edith suggested bridging over them. Andy also suggested we get on the ground to determine the quality of the habitat associated with the wetlands versus the quality of the forest that would be impacted to avoid them and compare. Evaluation of both habitats would allow better determination of the most preferable option; avoid wetlands or avoid forest.

Re-evaluation of Alignments

TPWD and USFWS only suggested re-evaluation of current alignments in three locations:

- San Jacinto River Crossing,
- end of Segment G, and in the
- forested area in Segment F2 west of I-45.

All three issues are discussed above.

The Grand Parkway
Segments E, F and G

RESOURCE AGENCY WORKSHOP
(FIELD TOUR)
July 31, 2001 ◆ Michael Baker Jr., Inc.

NAME (Please Print)	REPRESENTING	E-MAIL ADDRESS	TELEPHONE NO.
MATT STAHMAN	PBSJ	mgstahman@pbsj.com	(281) 493-5100
Edith Erfling	FWS	edith_erfling@fw.gov	281-286-8282
Kerry M Stanley	Corps	kerry.m.stanley@swg02.wace.army.mil	409/766-6345
Bob Spain	TPWD	bob.spain@tpwd.state.tx.us	512-389-4635
Andy Sipocz	TPWD	andrew.sipocz@tpwd.state.tx.us	281-335-0798x27
Woody Woodson	TPWD	[illegible]	281 335-0798x22
Robin Sterry	GPA	rsterry@grandpky.com	713-965-0871

The Grand Parkway
Segments E, F and G

RESOURCE AGENCY WORKSHOP
(WORKSHOP)
July 31, 2001 ◆ Michael Baker Jr., Inc.

N A M E (Please Print)	REPRESENTING	E-MAIL ADDRESS	T E L E P H O N E N O.

The Grand Parkway
Segments E, F and G

Agenda

Grand Parkway - Segments E, F-1, F-2, and G
Resource Agency Workshop
October 1, 2001, 9:00 A.M. – 12:00 P.M.

Meeting Location
Grand Parkway Association Office
4454 Post Oak Place, Suite 222
Houston, TX 77027

1)	Introductions & Opening Remarks	GPA
2)	Overview of progress to date (E, F-1, F-2, and G) a. Study Area Limits b. Corridor(s) Selection and Limits c. Alignment Selection by Segment/Reach	Team
3)	EIS Status (Segments E, F-1, F-2, and G) a. Draft EIS Status for Segments E, F-1, F-2, and G b. Schedule	Team
4)	Study Process, Constraints Mapping and Impact Matrix Discussion a. Bottomland Hardwoods	Team
5)	Segment G – Alternative Alignments a. Existing Alignments/Others b. Preferred Alignment	Team
6)	Agency Questions/Concerns	Agencies
7)	Action Items	All

Agencies – ACOE, FWS, TPWD, TxDOT, and FHWA
GPA – Grand Parkway Association
Team – Michael Baker Jr., Inc., PBS&J, Brown & Gay, and Community Awareness Services

The Grand Parkway
Segments E, F and G

Resource Agency Workshop

Meeting Date: October 1, 2001

Meeting Location: Grand Parkway Association (GPA) Office
4544 Post Oak Place, Suite 222
Houston, Texas 77027

Meeting Organization: Workshop was arranged by Mr. Robb Fishman (Michael Baker Jr., Inc.) to update and discuss project status for the Grand Parkway Segments E, F-1, F-2, and G and to obtain input from the Agencies.

Meeting Format: This was a Workshop/meeting in which the Grand Parkway presented our current Recommended Alignment for Segments E, F-1 and F-2 and discussed the alignment options in G. (see attached agenda).

Attendance:

GPA:		Ms. Robin Sterry
TPWD:		Mr. Woody Woodrow Mr. Andy Sipocz
USFWS:		Ms. Edith Erfling
USACOE:		**Unable to Attend
TXDOT:		Ms. Susan Patterson
Consultants:	Michael Baker Jr., Inc.	Mr. Robb Fishman Mr. Eddie George
	PBS&J	Mr. Matt Stahman Ms. Julie Morse

Handouts: Agenda; Updated Matrix for Segments E, F-1, F-2 and G, Draft Meeting Minutes from the June 14, 2001 and July 31, 2001 meetings were reviewed and finalized; and the Bottomland Hardwoods Map for Segments E, F-1, F-2 and G.

Notices: Notice of meeting was provided in advance via email to all meeting participants.

Meeting Summary: Robb updated everyone on what has happened since our last meeting in July. He noted that we are still waiting on the traffic numbers from H-GAC. Robb estimates that once we receive the numbers from H-GAC, we should have the Segment E DEIS ready in 5 weeks for internal GPA review.

Robb noted that after the July 31 meeting, Matt Stahman and Eddie George went to the USFWS office in Clear Lake to photo-interpret the Bottomland Hardwoods and Riparian Forested Area. The criteria used for Bottomland Hardwoods was based upon the 100-year floodplain, any wetland that was inside the 100 year floodplain, and areas that didn't contain a majority of pine trees. The definition used to determine Riparian Forest Habitat consisted of a narrow band of forested corridor in a stream channel within an otherwise unforested area. Matt is to finalize this definition soon.

As for the Crimean Tract and the UP Tract in F-2:

> UP Tract – It would be a long, expensive and difficult process to gain access to this tract.
>
> Crimean Tract – it is anticipated that we get access sometime this week (10-05-01). This tract is managed on a 20-year harvest program for timber production. TPWD is interested in the ponded areas on this tract. Robb will inquire about the future plans of this property.
>
> Andy – USFWS has a HEP for Spring Creek Reservoir. Edith will look for it. He also noted that this area was mixed pine and hardwoods.

Andy asked about the option of going from Alignment D to A in Reach 7 near I-45. Robb said that had already been looked at and that it was not a favorable route at this time by the FHWA and TxDOT due to engineering constraints and significant safety concerns.

Andy noted just west of I-45, the further you move the alignment southeast the better because we would be affecting less photo-interpreted wetlands.

Robb informed everyone that a rough schematic design will be included in the DEIS. The 400-ft. ROW is a worst-case scenario for the Recommended Alignment, which is why we are studying the entire 400 feet for the entire project.

Edith – likes the matrix but is concerned that for future widening of the Grand Parkway will claim that all impacts within the ROW will have already been determined based on the original impact study.

Robin – noted that Baker's Mitigation Tracking system goes through multiple phases of updating each site, all the way up to mitigation.

Woody – Are you going to use Baker's process?

Robin – Yes, up to the schematic process

Robb – offered to go down to USFWS and TPWD to give them a packet on the Baker Mitigation System and explain the mitigation process further.

Segment G Discussion

Robb – at the beginning of Segment G, Alignment B has safety issues with the Toll Road. There is currently a rapid surge in development in the Northgate Forest Area. More plats have been submitted that encompasses the area where alignment A and C are. The homebuilder has received confirmation from the GPA that the studies for Segment G are continuing. Due to the continuing studies, the homebuilder will hold on to the 300' corridor in this area.

Riley Fuzzel already has commitments from the County that it will be made into a 4-lane road. The Grand Parkway will try to co-mingle the use of Riley Fuzzel and the Grand Parkway.

Woody – you will still have two separate roads in the Grand Parkway and Riley Fuzzel?

Robb – Yes, and Riley Fuzzel will act as an access road. We will have one alternative once you get to Riley Fuzzel. Frontage Roads will stop once you get past the neighborhood of Bender's Landing.

Andy – Will the road be elevated over the pond near Camp Pine Tree?

Robb – We will go over Spring Creek but there are not a lot of options. We have to hit Spring Creek at a 90-degree angle.

TPWD questioned the accurateness of the hydraulic data (floodplain). Robb noted that the information was obtained from FEMA. Robb also stated that for Harris Co., Baker is currently working on the re-mapping of floodplains for the Tropical Storm Allison recovery project (TSARP) FEMA project. Once we have this completed, we will incorporate this data into our project.

Robin – Hydrologic Study will be addressed in FEIS but not the DEIS.

Woody – Any new information on PSL's?

Robin – Talked with Diane Noble (TXDOT). Diane mentioned that TXDOT had a meeting in July in which this topic was discussed. Nothing has definite has come about from this meeting but there was talk that TXDOT might have more oversight on the PSL issue.

Andy – TPWD has a vegetative map for Texas. One vegetative type is categorized as Bottomland Hardwoods. Andy requested that we use these designations during fieldwork. He noted that some of the areas that are not designated as Bottomland Hardwoods on our map are areas that have a lot of pine but have sandy soils due to the water flow of the San Jacinto River. There is also a mixing of Bottomland Species such as River Birch and Sweetgum in this area.

Robb – we are having access problems because when we go out on the property we will be making jurisdictional determination on wetland (wet or not). Some landowners that originally said no to access are letting us on now because we promised that we would not make that assumption.

Robb – met with a landowner in Segment G Reach 9 and noted that they would prefer to use the northern alignment (B) because it would not bisect their property.

Robb – The Grand Parkway would be on bridge structure through a significant portion of Reach 10 due to the floodway of the San Jacinto River. With this in mind, the gravel operations could not use any of the land under or near the Grand Parkway as a location for operations.

Andy - asked if we could move the alignment north in Reach 9 (Alignment D)

Andy – Mentioned that the landowner on the East Side of the San Jacinto River does not intend to use her land for gravel operations.

Robin – After drawing the preliminary Alignment D (new) with TPWD and USFWS oversight. Robin noted that it looks like there would be fewer impacts to floodplains and therefore less bridge structure.

Reach 11

Robin - is there any preference to go either on the North or South side of the Mobile Home Park

Andy – Would rather us use Alignment A.

Rob – The contractor for this mobile home park is having permit problems because of a wastewater plant.

Reach 12

Robin – Mentioned TXDOT sent a letter to TPWD stating they would not go through Sam Houston State Park in Segment H

Andy – Does not like Alignment A because it goes through a waller pond and it also affects more floodplains. TPWD and USFWS prefer Alignment C in Reach 12 only if we tweak it to avoid a wetland.

Robb – the shift in Reach 12 will be a shift in the current alignment (C), but the alignment in Reach 10 will be a new alignment, Alignment D.

Robb – There will be 11X17 photos of the interchanges in the DEIS. In addition, once we have the new alignments digitized in Segment G, we will send the Agencies the new Segment G map.

Mitigation

Robin mentioned that we are open for suggestions on mitigation opportunities. The GPA has had talks with Fred LeBlanc of the Woodlands Corporation about mitigation possibilities. Robin noted that Ted had some ideas of using the Bar Woods Tract in Segment G

Woody – What about the Isolated Wetlands.

Robin – The MOU Guidelines will be followed.

Matt – Mentioned that Kerry Stanley said that there would have to be mitigation for secondary impacts to the isolated wetlands.

Robb – we are leaning toward using two large tracts for the mitigation plan because of the different habitat that exists in both regions. The two areas where these mitigation sites might exist - the Katy area for the prairies habitat and along Spring Creek for the wooded habitat. TPWD agreed with that approach.

Robin – Asked TPWD that once we agree on a tract for mitigation, who would like to manage it. There would be a management fee included to perform this task.

Julie – Segment D, TXDOT is responsible for monitoring the mitigation tract with the Katy Prairie Conservancy.

Andy – Noted that the Van Reit Bank is good to use.

Woody – There is a book that TPWD had that lists land trust organizations and the Legacy Land Trust is good organization to use.

Woody – A good group to ask for managing mitigation sites would be the County Parks, but there would have to be a conservation easement (such as no use of tract for parks)

Woody – Agreed that Spring Creek would be a great choice for mitigation.

Andy – Bar Woods and Spring Creek are your best options for mitigation for the wooded areas. He noted the Legacy Land Trust is managing the Bar Woods Tract but the management is up for question. Spring Creek might be your best cost-effective option. You need to have a conservation easement (perpetuity agreement) on the mitigation site.

** GPA and Michael Baker Jr., Inc. met with Mr. Kerry Stanley with the USACOE on November 29, 2001 to brief him on the October 1, 2001 Workshop. Mr. Stanley was very supportive of all the decisions that were made and the direction the study is headed.

The Grand Parkway
Segments E, F and G

Agency Meeting

October 1, 2001 ◆ Grand Parkway Office

	NAME (Please Print)	Phone and Fax Number	E-Mail Address
TxDOT	Susan Patterson	713 802 5247	spatter@dot.state.tx.us.
PBSJ	MATT STAHMAN	281 493-5100	Mgstahman@pbsj.com
Baker	EDDIE GEORGE	281 599 3498	egeorge@mbakercorp.com
USFWS	Edith Erfling	281-286-8282 / 281-488-5882	edith_erfling@fws.gov.
Baker	Robb Fishman	281-579-4597	RFishman@MBakerCorp.com
PBSJ	Julie Morse	281-493-5100	jemorse@pbsj.com
TPWD	Andy Sipocz	281 335 0798 x27	andrew.sipocz@tpwd.state.tx.us
TPWD	Woody Woodrow	" x22	jarrett.woodrow@tpwd.state.tx.u

Meeting Attendees Feb 8, 2002 (EPA, FHWA, TxDOT, GPA, Baker)

Name	Representation	Phone	Email
EPA			
Dominique Lueckenhoff	EPA	512/916-5012	lueckenhoff.dominique@epamail.epa.gov
FHWA			
Neel Vanikar	FHWA - Environmental Coordinator	512/536-5917	neel.vanikar@fhwa.dot.gov
Lee Gibbons	FHWA		lee.gibbons@fhwa.dot.gov
Mike Leary	FHWA-Austin	512/536-5943	michael.leary@fhwa.dot.gov
Gary Johnson	FHWA-Austin	512/536-5964	gary.johnson@fhwa.dot.gov
John Mack	FHWA		john.mack@fhwa.dot.gov
TxDOT			
Tom Bruechert	TxDOT-ENV Project Management Section	512/416-2735	tbrueche@dot.state.tx.us
Norm King	TxDOT-ENV WRM	512/416-2705	nking@dot.state.tx.us
Dan Neal	TxDOT-ENV HMM	512/416-2667	dneal@dot.state.tx.us
AC Bettis	TxDOT-ENV CRM	512/416-2747	abettis@dot.state.tx.us
Sue McClenahan	TxDOT-ENV NRM	512/416-3209	scclen@dot.state.tx.us
Melissa Neeley	TxDOT-ENV Planner	512/416-2620	mneeley@dot.state.tx.us
Jenise Walton	TxDOT-ENV Project Management Section	512/416-2763	jwalton@dot.state.tx.us
Cherise Bell	TxDOT-ENV CRM	512/416-2619	cbell@dot.state.tx.us
Wayne Young	TxDOT-ENV AIR	512/416-2890	wyoung@dot.state.tx.us
Dr. Stan Cooper	TxDOT - Houston District	713/802-5896	scooper@dot.state.tx.us
Susan Patterson	TxDOT-Houston District	713/802-5247	spatter@dot.state.tx.us
Grand Parkway Association			
David Gornet, P.E.	Grand Parkway Association	713/572-1731	dgornet@grandpky.com
Robin Sterry	Grand Parkway Association	713/965-0104	rsterry@grandpky.com
Michael Baker Jr.			
David Millikan	Baker	281/579-4579	dmillikan@mbakercorp.com
Robb Fishman	Baker	281/579-4597	rfishman@mbakercorp.com

The Grand Parkway
Segments E, F and G

Agenda

Grand Parkway - Segments E, F-1, F-2, and G
Environmental Protection Agency
March 27, 2002, 10:00 a.m. – 12:00 noon

Meeting Location
Environmental Protection Agency – Region 6
1445 Ross Avenue
Dallas, TX 75202-2733
Conference Room – Houston Toad Room, 9th Floor

1)	Introductions & Opening Remarks	GPA
2)	Overview of progress to date a. Study Area Limits b. Corridor(s) Selection and Limits c. Alignment Selection by Segment/Reach	Team
3)	Study Process, Constraints Mapping and Impact Matrix Discussion	Team
4)	EIS Status (Segments E, F-1, F-2, and G) a. EIS Layout a. Draft EIS Status for Segments E, F-1, F-2, and G b. Schedule	Team
5)	EPA Questions/Concerns	EPA

Agencies – EPA Region 6
GPA – Grand Parkway Association
Team – Michael Baker Jr., Inc., PBS&J, Brown & Gay, and Community Awareness Services

The Grand Parkway
Segments E, F and G

EPA Meeting

March 27, 2002 ◆ EPA Office, Dallas

Name/Agency/Title (Please Print)	Phone	E-Mail Address
ROBIN STERRY GRAND PARKWAY ASSN	713-965-0871	rsterry@grandpky.com
Norm Sears - EPA - Tex Wetlands Coordinator	214.665-8336	sears.Norman@epa.gov
Guy Donaldson - EPA - Air Planning	214-665-7242	Donaldson.Guy@EPA.GOV
MIKE JANSKY - EPA	214-665-7451	JANSKY.Michael@EPA.GOV
DAVID GORNET - GPA	713.965.0871	dgornet@grandpky.com
BOBB FISHMAN - Michael Baker Jr., Inc.	281-579-4597	RFishman@MBakerCorp.com

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