



**US Army Corps
of Engineers®**

**DRAFT ENVIRONMENTAL
ASSESSMENT
2008 UPDATED RIGHT-OF-WAY
ON THE
DETENTION ELEMENT
UPPER WATERSHED OF
BRAYS BAYOU**

HCFCD PROJECT ID D100-00-00-Y005

HARRIS COUNTY, TEXAS

August 2010

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1.0 PROJECT BACKGROUND

1.1 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) Galveston District (the lead federal agency) and the Harris County Flood Control District (HCFCD), the local sponsor, are evaluating additional stormwater storage locations within the Arthur Storey Park and Eldridge Detention Basin complexes within the upper watershed of Brays Bayou in Harris County, Texas. The additional storage areas are designed to replace detention that was originally identified to be located on land that has been developed since being originally identified in the Final Environmental Assessment, Brays Bayou at Houston, Texas, Flood Damage Prevention, Detention Element (USACE, 1998). This Environmental Assessment (EA) is to evaluate the proposed additional locations. This EA is prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and Council on Environmental Quality (CEQ) regulations to document findings concerning the environmental aspects of the proposed action. A project area map showing the locations of the Arthur Storey Park and Eldridge Detention Basin complexes is provided as Exhibit A.

The Brays Bayou Federal Flood Control Project was authorized by the 1990 WRDA, Public Law 101-640, as part of the comprehensive flood damage reduction plan for the Buffalo Bayou and Tributaries watershed. The authorized flood control project on Brays Bayou is documented in the report entitled, *Buffalo Bayou and Tributaries, Texas Feasibility Report, Flood Damage Prevention, May 1988*. The HCFCD then requested a separable element analysis of the authorized Brays Bayou project, which was initiated in November 1991. Two separate elements were identified for the project, the detention element and the diversion element. During the separable element analysis, the diversion element was no longer found to be feasible due to technical feasibility and public opposition, and an alternative to the diversion element was later evaluated. An EA was prepared in March 1998 for the detention element. A Finding of No Significant Impacts (FONSI) was issued by the USACE in April 1998. The approved detention element plan consisted of the following: 3.7 miles of channel modifications, construction of the 2,500-acre-foot Arthur Storey Park Detention Basin (HCFCD Unit D500-06-00), construction of the 3,200-acre-foot Eldridge Detention Basin (HCFCD Unit D500-04-00), and construction of the 2,400-acre-foot Old Westheimer Detention Basin (HCFCD Unit D500-01-00). This plan would provide flood damage reduction from the 2 percent chance flood event to urbanized areas of the basin and produce the maximum net economic benefits.

After HCFCD began purchasing tracts within the project areas of the authorized regional detention basins (Arthur Storey Park Detention Basin, Eldridge Detention Basin, and Old Westheimer Detention Basin). It was at this time that HCFCD learned that a substantial portion of the proposed Old Westheimer Detention Basin project area (approximately 70 acres) was no longer available for acquisition. Collectively, the

regional detention basins were planned to contain approximately 8,100 acre-feet of storage. Reductions in the overall storage capacity of the basins would render the detention basin plan incapable of obtaining the documented level of performance for the authorized project. HCFCD proposes to construct additional stormwater storage in new locations within the upper watershed of Brays Bayou to compensate for this loss in storage capacity at the Old Westheimer Detention Basin.

The proposed action involves the expansion of the other two detention basin complexes, Arthur Storey Park Detention Basin and Eldridge Detention Basin, to compensate for the reduction in storage at the Old Westheimer Detention Basin. The project area is defined as the footprint of the area of the proposed action. Additional right-of-way (ROW) in the amount of 188 acres is required to implement the proposed action. The ROW acquisition includes adding 35 acres to the Arthur Storey Park Detention Basin and 153 acres to the Eldridge Detention Basin. ROW acquisition would include the displacement of three commercial properties. The project area and tract numbers of proposed additional tracts are identified in Exhibits A and B.

The primary goal of the proposed action is to compensate for the approximate 70-acre loss in storage capacity at the Old Westheimer Detention Basin. Table 1-1 presents a summary of the project components. These components are identified in Exhibits A and B.

**Table 1-1
Proposed Action Summary**

DETENTION BASIN	LOCATION	DESCRIPTION
ARTHUR STOREY PARK BASIN (D500-06-00)	SOUTHWEST OF INTERSECTION OF BELTWAY 8 AND BELLAIRE BOULEVARD	ACQUISITION OF 4 TRACTS OF LAND TOTALING APPROXIMATELY 35 ACRES
ELDRIDGE BASIN (D500-04-00)	NORTH OF WESTPARK TOLLWAY BETWEEN STATE HIGHWAY 6 AND ELDRIDGE PARKWAY	ACQUISITION OF 21 TRACTS OF LAND TOTALING APPROXIMATELY 153 ACRES

This Draft EA has been prepared to evaluate the proposed modifications to the authorized plan, which involves the identification of additional tracts for construction of stormwater storage to replace that which was originally proposed, but is no longer feasible, within the authorized Old Westheimer Detention Basin. The purpose of this Draft EA is to evaluate the on-site conditions of the additional tracts and to identify potential effects on the human environment resulting from the implementation of the proposed action. Wetland delineations, protected species evaluations, cultural resource surveys, and hazardous material assessments were conducted as part of this assessment. The effects of the proposed action on socioeconomics, air quality, noise, and environmental justice were also considered and discussed in this Draft EA.

1.2 PREVIOUS FEDERAL FLOOD CONTROL PROJECTS

Previous actions each represent a milestone in the progression of identifying and implementing an effective flood damage reduction plan for the upper watershed of Brays Bayou. These actions are discussed in the following sections beginning with the large-scale feasibility study of Buffalo Bayou and its tributaries and concluding with the most recently approved site-specific plan that is currently under construction.

1.2.1 Authorized Plan

The Brays Bayou at Houston, Texas, project was authorized by the 1990 Water Resources Development Act (WRDA), Public Law 101-640, as part of the comprehensive flood damage reduction plan for the Buffalo Bayou and Tributaries watershed. A final environmental impact statement (FEIS) describing the environmental impacts of the authorized Brays Bayou plan was prepared and filed with the U.S. Environmental Protection Agency (EPA) in September 1988 (USACE, 1988).

The authorized improvements included:

- Channel enlargement of 3.2 miles of Brays Bayou, from approximately Old Westheimer Road to SH 6.
- Construction of regional detention basins on Brays Bayou with combined storage capacity of 11,000 acre-feet with outlet structures.
- Construction of 6.8 miles of new channels to divert stream flows from two tributaries (Keegans Bayou and Willow Waterhole Bayou) to the adjacent Sims Bayou watershed.
- Construction of diversion dams on Willow Waterhole Bayou and Fondren Ditch to divert flood flows to the detention basin on Sims Bayou.
- Construction of a 6,000-acre-foot detention basin in upper Sims Bayou area to temporarily store floodwaters.
- Modification or alteration of obstructive bridges and utility crossings along the alignment of Brays Bayou.

1.2.2 Separable Element Analysis

At the request of HCFCD, a separable element analysis of the authorized Brays Bayou plan was initiated in November 1991. Two separable elements were identified: the detention element and the diversion element. The detention element included channelization and regional detention basins in the upper

watershed of Brays Bayou. The diversion element consisted of channels and dams diverting flows from Keegans Bayou and portions of Willow Waterhole Bayou to a detention site on Sims Bayou.

HCFCFCD has decided to proceed to detailed design on the detention element plan and reevaluate the diversion element, as the diversion element plan is no longer feasible.

1.2.3 Detention Element Plan

The detention element plan was developed to reduce flood damages in the extensively urbanized area of southwest Houston in Harris County. The detention plan included three detention basins and a reach of earthen channel modification extending from Old Westheimer Road to State Highway 6 (SH 6) (Exhibit A). These components are described below. A broad range of solutions were evaluated during the feasibility planning, including No Action, structural, and non-structural measures. The approved detention element plan was recommended as it provided flood damage reduction to the urbanized areas of the basin and produced the maximum net economic benefits. Detailed descriptions of the plan's environmental design features, the recreational development plan, and the environmental impacts are provided in the Final EA (USACE, 1998). The USACE, Galveston District issued a FONSI statement in April 1998.

Channel Modifications. The channel feature is an earth-lined channel section 3.7 miles in length. The bottom width varies from 10 to 55 feet across and the side slopes have a ratio of 1:3 from SH 6 to east of Old Westheimer Road. Channel bottom width requirements decrease in the downstream direction as the discharges are reduced through detention basin storage. A drop structure will be constructed in the channel at the upstream end of the modified channel section to dissipate energy head losses downstream of SH 6.

Arthur Storey Park Detention Basin. The Arthur Storey Park Detention Basin (HCFCFCD Unit D500-06-00) is a multi-compartment, off-channel basin with four separate compartments totaling 150 acres (Exhibit B). It is located west of Beltway 8 and south of Bellaire Boulevard. At completion, the basin will contain 2,500 acre-feet of storage. The basin compartments will be wet detention except for an existing 20-acre dry off-channel basin. An in-line water control structure will be installed along Brays Bayou to regulate water flow. This structure will be a broad-crested overflow concrete weir with three side-by-side 10-foot by 10-foot box culverts to convey flows uniformly throughout the adjacent compartments and divert low flows to high flows.

Eldridge Detention Basin. The Eldridge Detention Basin (HCFCFCD Unit D500-04-00) is a 250-acre wet bottom detention facility designed to contain an estimated 3,200 acre-feet of storage (Exhibit C). It is located north of Westpark Tollway and east and west of Eldridge Parkway. The Eldridge Detention Basin is separated into multiple storage compartments by existing roads and utility corridors. Box culverts will

convey flows uniformly throughout the adjacent compartments and divert low flows to high flows. The detention facility will include an in-line water control structure to regulate water flow.

Old Westheimer Detention Basin. The Old Westheimer Detention Basin was planned as a 120-acre wet bottom, off-line detention storage basin designed to contain approximately 2,400 acre-feet of storage (Exhibit D). It is located north of Westpark Tollway and west of Old Westheimer Road.

1.2.4 Alternative to the Diversion Element Plan

HCFCDC completed a reevaluation of the previously authorized diversion element project and an alternative plan was identified. The General Reevaluation Report and Final EA was submitted to the USACE in February 2008 (updated December 2008). The plan for the alternative to the diversion element plan includes a combination of channel modifications, bridge modifications, and a detention basin, as well as soil placement areas. The primary goal of the plan is to increase the channel capacity in the middle and lower reaches of Brays Bayou to the extent that is economically optimum, thereby reducing flooding from heavy rainfall and stormwater runoff and preventing consequential flood damage. The USACE, Galveston District issued a FONSI statement on March 5, 2008. The Assistant Secretary for the Army approved the General Reevaluation Report on April 3, 2009.

1.3 PLANNING CONSIDERATIONS

In August 2006, the USACE Chief of Engineers initiated the "Actions for Change" in an effort to transform USACE planning, design, construction, and operation and maintenance principles and decision-making processes. This program has been further developed into a Campaign Plan. The Campaign Plan includes four goals for USACE. These goals are:

Goal 1: Ready for all Contingencies – Deliver USACE support to combat, stability, and disaster operations through forward deployed and reachback capabilities.

Goal 2: Engineering Sustainable Water Resources – Deliver enduring and essential water resource solutions through collaboration with partners and stakeholders.

Goal 3: Delivering Effective, Resilient, Sustainable Solutions – Deliver innovative, resilient, sustainable solutions to the Armed Forces and the Nation.

Goal 4: Recruit and Retain Strong Teams – Build and cultivate a competent, disciplined, and resilient team equipped to deliver high-quality solutions.

This proposed project complies with and supports the USACE Campaign Plan. Goals 2 and 3 pertain to water resources planning and to the updated ROW on the detention element project. These goals are described in more detail below.

1.3.1 Goal 2: Engineering Sustainable Water Resources

Goal 2a: *Deliver integrated, sustainable, water resources solutions.* The proposed project's primary goal is to construct additional stormwater storage in a new location within the upper watershed of Brays Bayou to compensate for this loss in storage capacity at the Old Westheimer Detention Basin. Implementing this proposed project would increase flood control, decrease property damage, and decrease potential loss of life.

Goal 2b: *Implement collaborative approaches to effectively solve water resources solutions.* The HCFCD meets with resource agencies (TPWD, EPA, TCEQ, and USFWS) approximately four times a year to discuss 211(f) projects, which includes this proposed project.

1.3.2 Goal 3: Delivering Effective, Resilient, Sustainable Solutions

Goal 3b: *Improve resilience and lifecycle investment in critical infrastructure.* The build alternative is most cost-effective alternative while meeting the purpose and needs of the project. The proposed project is expected to last over 50 years and benefits will still be derived from the project after 50 years.

Goal 3d: *Develop and apply innovative approaches to delivering quality infrastructure.* The proposed detention basins would provide more than just stormwater storage; they would also allow for recreational opportunities such as walking paths, bike trails, picnic areas, and nature learning stops. The design of the proposed project includes constructing wet bottom basins and planting wetland species within the detention basins. This created habitat could be used for attracting and benefiting terrestrial and aquatic wildlife.

2.0 NEED AND PURPOSE OF THE PROPOSED ACTION

Following approval of the detention element plan, HCFCD began purchasing tracts within the proposed project areas of the authorized regional detention basins (Arthur Storey Park Detention Basin, Eldridge Detention Basin, and Old Westheimer Detention Basin). It was at this time that HCFCD learned that a substantial portion of the proposed Old Westheimer Detention Basin project area (approximately 70 acres) was no longer available for acquisition. Collectively, the regional detention basins were planned to contain approximately 8,100 acre-feet of storage. Reductions in the overall storage capacity of the basins would render the detention basin plan incapable of obtaining the documented level of performance for the authorized project. The loss of acreage at the Old Westheimer Detention Basin equates to 1,800 acre-feet of storage. Therefore, the purpose of the proposed action is to construct additional stormwater storage in a new location within the upper watershed of Brays Bayou to compensate for this loss in storage capacity at the Old Westheimer Detention Basin.

2.1 PROJECT DESCRIPTION

HCFCD is proposing to compensate for the loss of storage at the Old Westheimer Detention Basin by increasing the storage capacities of both the Arthur Storey Park and Eldridge Detention Basin complexes. After evaluation of alternatives, HCFCD proposes to create an additional 1,000 acre-feet of storage at the Arthur Storey Park Detention Basin complex through the addition of approximately 35 acres of property and the excavation of approximately 1.07 million cubic yards of earthen material. HCFCD proposes to create an additional 1,466 acre-feet of storage at the Eldridge Detention Basin complex by increasing the overall size of the detention facility through the addition of 153 acres of property and the excavation of approximately 4.16 million cubic yards of earthen material.

3.0 DESCRIPTIONS OF ALTERNATIVES AND THE PROPOSED ACTION

A broad range of solutions to the storage shortage problem was evaluated, including "no action," relocation of the Old Westheimer Detention Basin, and expansion of the Arthur Storey Park Detention Basin and the Eldridge Detention Basin, the preferred proposed action. These alternatives are described in the following sections.

3.1 ALTERNATIVE 1 - NO ACTION ALTERNATIVE

The No Action Alternative was considered as an alternative. Adoption of this alternative plan implies acceptance of the existing situation, including the costs and the adverse effects of continued flooding in the Brays Bayou watershed. The No Action plan would forego the flood damage reduction benefits that would result from completing the authorized detention element plan, and prevent federal funding for the construction of the other elements. The implementation of this alternative plan would result in continued flood damages, including losses to property owners and potential loss of lives. This plan would result in the deterioration of property values in the watershed and would not be acceptable to the local community and local interests. Inhabitants of the watershed would continue to suffer the social and economic stresses associated with repetitive flooding. While the No Action Alternative fails to satisfy the goals and objectives of the proposed action, it is retained as a basis for comparison with the action alternatives carried forward for further study.

3.2 ALTERNATIVE 2 - RELOCATION OF OLD WESTHEIMER DETENTION BASIN

Once it was determined that the tracts previously identified for construction of the authorized Old Westheimer Detention Basin were no longer available, the immediate area surrounding the existing detention basin (HCFCD Unit D500-01-00) was evaluated for other available tracts. The available tracts that were identified were smaller than the originally proposed project area and were not contiguous. Hydrologic and hydraulic studies were performed to evaluate the feasibility and efficiency of constructing numerous smaller detention basins in lieu of a single, larger detention facility, and it was determined that the individual detention basins would be inefficient given their size and configuration (i.e., distance between each basin). Furthermore, it would be more costly to purchase the larger number of smaller tracts and construct the additional detention basins. For these reasons, this alternative plan was eliminated from further evaluation and no changes were proposed for the Old Westheimer Detention Basin.

3.3 ALTERNATIVE 3 - EXPANSION OF TWO EXISTING DETENTION BASINS (PROPOSED ACTION)

To ensure the detention element plan is still effective, HCFCD proposes to construct additional stormwater storage on approximately 188 acres of additional property adjacent to the project areas of the authorized Arthur Storey Park Detention Basin and Eldridge Detention Basin complexes to compensate for the loss in storage capacity at the Old Westheimer Detention Basin. The proposed action would adhere to the authorized plan's design criteria and construction methods (USACE, 1998).

Arthur Storey Park Detention Basin. The Arthur Storey Park Detention Basin (HCFCD Unit No. D500-06-00) is located west of Beltway 8 and south of Bellaire Boulevard. A total of four tracts, totaling an estimated 35 acres, were identified for proposed expansion of this regional detention facility (Exhibit B).

The authorized design storage capacity of the Arthur Storey Park Detention Basin is 2,500 acre-feet. HCFCD proposes to create an additional 1,000 acre-feet of storage by adding 35 acres of additional property and increasing the overall size of the authorized detention facility. Under the authorized plan, approximately 4.03 million cubic yards of earthen material would be excavated. The proposed action would require the excavation of approximately 1.07 million cubic yards of additional earthen materials. Construction began in 1995; therefore, the baseline date for evaluation of this detention basin is 1995.

Eldridge Detention Basin. The Eldridge Detention Basin (HCFCD Unit D500-04-00) is located west of Eldridge Road and east of SH 6. A total of 21 tracts, totaling approximately 153 acres, were identified for the proposed expansion activities at this regional detention facility (Exhibit C).

The authorized design storage capacity of the Eldridge Detention Basin is 3,200 acre-feet. HCFCD proposes to create an additional 1,466 acre-feet of storage by increasing the overall size of the detention facility through the addition of 153 acres of property. Under the authorized plan, an estimated 5.16 million cubic yards of earthen material would be excavated. The proposed action requires the excavation of approximately 4.16 million cubic yards of additional earthen materials. Construction began in 1998; therefore, the baseline date for evaluation of this detention basin is 1998.

3.4 SOIL PLACEMENT AREAS

Approximately 5.23 million cubic yards of earthen material would be excavated as part of the proposed action. Based on extensive previous experience, HCFCD plans for the excavated materials to be sold by the contractor(s). The contractor(s) would be required to submit all proposed soil placement areas to HCFCD for evaluation and approval. Soil is anticipated to be disposed of within the community to develop roads and building pad sites. If use becomes necessary, Records of Environmental Consideration

(REC) will be prepared to document evaluation of potential environmental impacts and coordination of the use of these disposal sites.

4.0 AFFECTED ENVIRONMENT

This section summarizes the findings of the detailed investigations conducted to inventory the potential environmental constraints within each of the proposed additional tracts at the Arthur Storey Park Detention Basin and the Eldridge Detention Basin complexes. Investigations included literature and record reviews, remote sensing, and field surveys. Cited references are listed in Section 9.0 of this Draft EA. Copies of these investigation reports are available at HCFCFCD's office.

4.1 PHYSICAL SETTING

4.1.1 General Location

The Brays Bayou watershed consists of approximately 137 square miles and is located in central and southwestern Harris County. The Brays Bayou channel is approximately 31 miles long and generally flows west to east from its headwaters in Fort Bend County to its confluence with Buffalo Bayou at the Houston Ship Channel below the Turning Basin. The Arthur Storey Park Basin is located on the southwest corner of Bellaire Boulevard and Beltway 8, and the Eldridge Basin is located on the northeast corner of SH 6 and Alief-Clodine Road.

4.1.2 Climate

The Brays Bayou watershed is situated within a humid region of Texas, which maintains subtropical weather during all parts of the year, especially the summer, primarily due to the proximity of the Gulf of Mexico. This area of Texas is subject to both intensive local thunderstorms of relatively short duration and thunderstorms that may stall and persist for several days. In addition, this region is subject to violent storms associated with tropical disturbances, including occasional hurricanes.

Annual rainfall in the Houston area is generally 45 inches per year. The distribution of rainfall throughout the year is somewhat bimodal with the months of June and September accounting for peak rainfall months. The mean relative humidity ranges from a minimum of approximately 60 percent at noon to a maximum of 91 percent at 6:00 a.m.

The average daily temperature is 70°F (21°C). There is an average of seven days per year in which the temperature falls below freezing and an average of 82 days per year in which the temperature reaches 90°F (32°C) or higher.

4.1.3 Geology

The Brays Bayou watershed lies within the Gulf Coastal Plain. This physiographic region consists of continental and marine sediments dating to the Cenozoic Era; these sediments are a result of the advance

and retreat of the Gulf of Mexico. The regional geologic strata lie parallel to the coast, and the outcrops are progressively younger seaward. The entire project area lies within the Beaumont geologic formation. The Beaumont formation, dating from the Pleistocene age, has an almost featureless surface and is characterized by relict river channels shown by meander patterns and pimple mounds on meanderbelt ridges, separated by areas of low, relatively smooth, featureless, backswamp deposits without pimple mounds. This formation is comprised of silt, sand, and clay, and includes mainly stream channel, point-bar, natural levee, backswamp, and to a lesser extent, coastal and mud-flat deposits; concretions of calcium carbonate, iron oxide, and iron manganese oxides are found in the zone of weathering. This layer has a thickness of approximately 100 feet.

4.1.4 Soils and Farmland Protection Policy Act

The soil mapping units within the project area include Bernard clay loam, Clodine loam, and Lake Charles clay, 0 to 1 percent (Natural Resources Conservation Service [NRCS], 1976). The Bernard Series consists of very deep, somewhat poorly drained, very slowly permeable soils. The Clodine Series consists of very deep, somewhat poorly drained, moderately permeable soils. The Lake Charles Series consists of very deep, moderately well drained, very slowly permeable soils.

The purpose of the Farmland Protection Policy Act (FPPA), Subtitle I of Title XV of the Agricultural and Food Act of 1981 (Pub. L. 97-98), is to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of prime, unique, and other farmlands of statewide or local importance to non-agricultural uses. Bernard clay loam, Clodine loam, and Lake Charles clay, 0 to 1 percent, are designated as Prime Farmland Soils by the NRCS (NRCS, 2003) and are considered potentially subject to the FPPA.

4.2 LAND USE

The proposed additional tracts at the Arthur Storey Park Detention Basin and the Eldridge Detention Basin are currently undeveloped. The vast majority of southern Harris County was once dominated by a thriving agricultural community. Eighteen acres of the Arthur Storey Park Detention Basin project area for instance, was once part of a cattle ranch that contained a feedlot, stockyard, and cattle auction facility, and was in operation for at least 80 years. Within the Eldridge Detention Basin project area, 47 acres were formerly used as pastureland, and 62 acres were formerly a golf practice facility. Today, the development of residential subdivisions and commercial properties is slowly transforming the surrounding area into a suburban community. Based on 1995 aerial photographs, approximately 34 percent of the Arthur Storey Park Basin project area was undeveloped and based on 1998 aerial photography, approximately 50 percent of the Eldridge Detention Basin project area was undeveloped.

4.3 BIOLOGICAL RESOURCES

4.3.1 Vegetation

Brays Bayou is located within the West Gulf Coastal Plain, which extends from the Mississippi Alluvial Plain southwest to the Republic of Mexico. The Brays Bayou watershed and tributaries are located in the vegetational zone of Texas known as the Gulf Prairies and Marshes (Texas Parks and Wildlife Department [TPWD], 2004). Formerly, the bottoms of this area of coastal rivers were covered in forests of sugar hackberry (*Celtis laevigata*), pecan (*Carya illinoensis*), elm (*Ulmus* spp.), and oak (*Quercus* spp.). Extensive open prairies dominated by little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), and various sedges (*Carex* spp.) were found on the uplands between rivers.

Today, few areas within this region exist in this natural state, and none exist within the project area. Urbanization has reduced most of the native habitat in the region to fragmented and isolated remnants. Adjacent to the project area, the primary land use is residential and commercial development. As a result, much of the native vegetation has been displaced through urban development. Vegetation within the project area is a mixture of invasive species, ornamental plants, and remnants of native vegetation.

Undeveloped areas that were noted within the project area during the field reconnaissance included 49.53 acres of upland pasture, 25.61 acres of upland scrub-shrub, 9.15 acres of upland forest, 3.25 acres of scrub-shrub wetland, and 1.89 acres of forested wetland. The breakout of these habitat communities per detention basin are provided in Table 4-1.

A habitat assessment based on habitat evaluation procedures (HEP) developed by the U.S. Fish and Wildlife Service (USFWS) was conducted for the project area. HEP is a species-habitat approach that quantifies habitat quality for selected evaluation species through the use of a habitat suitability index (HSI). The HSI value is derived from an evaluation of the ability of key habitat components to provide the life requisites of selected species of wildlife (USFWS, 1980a). HEP is based on the assumption that habitat for selected species can be described by an HSI. The species HSI or the average HSI for multiple species is multiplied by the area of available habitat to determine the total habitat units (HU) for the species for particular cover types in the study area. HU's are the index value from the product of the habitat quality (in terms of HSI scores) and the habitat quantity.

The first step in the analysis is to identify the baseline habitat, which is based on 1995 conditions for the Arthur Storey Park Detention Basin and 1998 for the Eldridge Detention Basin. The baseline assessment describes the habitat conditions in terms of HU's for the project area. Analysis of the habitat types resulted in a total of 45.33 HU's (Table 4-1). The Baseline Habitat Assessment Report is included in Appendix A.

**Table 4-1
Habitat Communities and Habitat Units Within Project Area**

Habitat Classification	Total Baseline Habitat Area (Acres)	Habitat Units
Arthur Storey Park Detention Basin		
Upland Scrub-Shrub	10.97	1.10
Upland Pasture	1.06	0.90
Scrub-Shrub Wetland	0.01	0.004
Basin Total	12.04	2.00
Eldridge Detention Basin		
Upland Pasture	48.47	38.77
Upland Scrub-Shrub	14.64	1.46
Upland Forest	9.15	1.60
Scrub-Shrub Wetland	3.24	1.17
Forested Wetland	1.89	0.33
Basin Total	77.39	43.33
Total	89.43	45.33

Predominant vegetation observed within the upland pasture community included vasey grass (*Paspalum urvillei*), fringed windmill grass (*Chloris ciliata*), eastern false-willow (*Baccharis halimifolia*), Brazilian vervain (*Verbena brasiliensis*), dallisgrass (*Paspalum dilatatum*), frog fruit (*Phyla lanceolata*), western ragweed (*Ambrosia psilostachya*), southern dewberry (*Rubus trivialis*), and peppervine (*Ampelopsis arborea*).

Predominant vegetation observed within the upland scrub-shrub community included Chinese tallow-tree (*Sapium sebiferum*), eastern false-willow, southern dewberry, poison ivy (*Toxicodendron radicans*), giant ragweed (*Ambrosia trifida*), western ragweed, Brazilian vervain, goldenrod (*Solidago* sp.), curly dock (*Rumex crispus*), and powder puff mimosa (*Mimosa strigillosa*).

Predominant vegetation observed within the upland forested community included American elm (*Ulmus americana*), cedar elm (*Ulmus crassifolia*), common hackberry (*Celtis occidentalis*), willow oak (*Quercus phellos*), pecan, roughleaf dogwood (*Cornus drummondii*), yaupon holly (*Ilex vomitoria*), Chinese privet (*Ligustrum sinense*), poison ivy, common greenbrier (*Smilax rotundifolia*), dwarf palmetto (*Sabal minor*), Cherokee sedge (*Carex cherokeensis*), inland sea-oats (*Chasmanthium latifolium*), and wild onion (*Allium drummondii*).

Predominant vegetation observed within the wetland scrub-shrub community included Chinese tallow (sapling), eastern false-willow, poison ivy, swamp smartweed (*Polygonum hydropiperoides*), green flatsedge (*Cyperus virens*), and small spikerush (*Eleocharis parvula*).

Predominant vegetation observed within the small area of forested wetland included Chinese tallow, willow oak, cedar elm, swamp smartweed, green flatsedge (*Cyperus virens*), and small spikerush.

4.3.1.1 Invasive Species

An "invasive species" is defined as a species that is non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (EO 13112). Invasive species grow and spread rapidly and establish over large areas. Invasive species succeed due to favorable environmental conditions and lack of competitors and diseases that normally regulate their populations (TIO, 2010).

An assessment of the current invasive species was conducted in June 2008 for the project area. Current invasive species within the project area include Brazilian vervain, dallisgrass, Chinese privet, Chinese tallow-tree, and vasey grass.

4.3.2 Wildlife

The Brays Bayou watershed lies within the Houston Metropolitan Area, which has been highly impacted by human activities. The degree and extent of the changes in habitat have directly influenced the numbers and species of wildlife found in the area. Indiscriminate hunting, predator control, use of pesticides, and various forms of air, water, and land pollution have been responsible for declines in wildlife resources. The wildlife that remains lives in a modified natural habitat within the immediate influence of an encroaching urban complex. The wildlife species found in the watershed are typical of those found in highly urbanized areas. In residential areas adjacent to the project area, common wildlife species tolerant of man's activities include the following terrestrial and aquatic species identified below.

Coordination with the USFWS resulted in an agreement between the USFWS and HCFCD that a Planning Aid Letter ("PAL"), located in Appendix B, would be prepared by USFWS. The PAL states that although the proposed project will result in permanent habitat impacts, it will have minimal impact on fish and wildlife resources. Additionally, USFWS made recommendations to the HCFCD for the proposed project. These recommendations include; provide mitigation for unavoidable impacts, develop and implement a plan to control exotic and invasive species, provide success criterion for plantings, conduct surveys to identify habitat being utilized by wildlife to design similar habitats in future flood damage reduction projects, use excavated and mounded material beneficially or dispose of in an appropriate manner, modify channels so that they mimic natural stream features, comply with the Migratory Bird treaty Act and survey all suitable nesting areas prior to construction, and plant detention

basins with native vegetation after construction to minimize erosion. HCFCD has noted the recommendations made within the PAL and will consider them in determining the final plans for the proposed project.

4.3.2.1 Terrestrial Species

Wildlife resources in the project area are limited due to extensive urban development and consist of species adapted to an urban setting where disturbance and adaptations to foraging, nesting, and loafing habitats can be made. Typical resident species of amphibians and reptiles within the project area would include the northern green treefrog (*Hyla cinerea*), green anole (*Anolis carolinensis*), ground skink (*Scincella lateralis*), red-eared slider (*Chrysemys scripta elegans*), Texas rat snake (*Elaphe obsoleta lindheimeri*), diamondback water snake (*Nerodia rhombifer rhombifer*), eastern hog-nosed snake (*Heterodon platyrhinos*), and Gulf Coast ribbon snake (*Thamnophis proximus*).

Bird species identified during site visits included great blue heron (*Ardea herodias*), mourning dove (*Zenaida macroura*), kill deer (*Charadrius vociferus*), common grackle (*Quiscalus quiscula*), American crow (*Corvus brachyrhynchos*), cattle egret (*Bubulcus ibis*), anhinga (*Anhinga anhinga*), rock dove (*Columba livia*), great egret (*Casmerodius albus*), double-crested cormorant (*Phalacrocorax auritus*), and pied-billed grebe (*Podilymbus podiceps*).

Mammals that are likely to occur in the project area include hispid cotton rat (*Sigmodon hispidus*), deer mouse (*Peromyscus maniculatus*), eastern fox squirrel (*Sciurus niger*), eastern gray squirrel (*Sciurus carolinensis*), common raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), eastern cottontail rabbit (*Sylvilagus floridanus*), and swamp rabbit (*Sylvilagus aquaticus*).

In a natural state—without urban development—the above species would likely occur along with white-tailed deer (*Odocoileus virginianus*), American beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), wood duck (*Aix sponsa*), canebrake rattlesnake (*Crotalus horridus*), and alligator snapping turtle (*Macrochelys temminckii*).

4.3.2.2 Aquatic Species

Flow within Brays Bayou is primarily derived from urban rainfall runoff and wastewater treatment plant effluent. As a result, Brays Bayou generally provides a poor aquatic habitat. This low habitat value can be attributed to the sources of stream flow, fluctuating water levels, high nutrient levels and algal growth, shallow water depths, and high water temperatures.

Based on a survey of Greens Bayou (City of Houston, 1999), another tributary of Buffalo Bayou, several fish species are also likely to occur in the earthen downstream reach of Brays Bayou. Dominant fish species included red shiner (*Cyprinella lutrensis*), western mosquitofish (*Gambusia affinis*), and sailfin

molly (*Poecilia latipinna*). Other fishes collected included sheepshead minnow (*Cyprinodon variegatus*), bullhead minnow (*Pimephales vigilax*), and Rio Grande cichlid (*Cichlasoma cyanoguttatum*). Larger fish species collected included spotted gar (*Lepisosteus oculatus*), yellow bullhead (*Ameiurus natalis*), channel catfish (*Ictalurus punctatus*), bluegill (*Lepomis macrochirus*), longear sunfish (*Lepomis megalotis*), and striped mullet (*Mugil cephalus*).

The red-eared slider and various amphibians spend part of their time in the bayou as well. Invertebrates such as gastropods, insect larvae, and several species of crayfish also can tolerate the nutrient load and fluctuating water levels. These species are expected to occur within Upper Brays Bayou as well. A significant sport fishery does not exist in Upper Brays Bayou since species diversity and abundance of game fish are kept low by the fluctuating water levels and limited water quality.

4.4 THREATENED AND ENDANGERED SPECIES

There are 15 U.S. Fish and Wildlife Service (USFWS) federally listed threatened and endangered species and an additional 30 TPWD state listed rare, threatened, and endangered species that have the potential to occur within Harris County (TPWD, 20010). These species, their preferred habitat, and the determination if this habitat is within the project area are listed in Table 4-2.

Table 4-2
State and Federal Threatened and Endangered Species of Harris County, Texas

Species Scientific Name	Federal Status	State Status	Habitat	Habitat Present Within Project Area
Amphibians				
Houston toad <i>Anaxyrus houstonensis</i>	LE	E	Endemic; sandy substrate, water in pools, ephemeral pools, stock tanks; breeds in spring especially after rains; burrows in soil of adjacent uplands when inactive; associated with soils of the Sparta, Carrizo, Goliad, Queen City, Recklaw, Weches, and Willis geologic formations	No
Fishes				
Creek chubsucker <i>Erimyzon oblongus</i>		T	Tributaries of the Red, Sabine, Neches, Trinity, and San Jacinto rivers; small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in headwater rivulets or marshes; spawns in river mouths or pools, riffles, lake outlets, upstream creeks	No
Smalltooth sawfish <i>Pristis pectinata</i>	LE	E	Young found very close to shore in muddy and sandy bottoms, seldom descending to depths of greater than 32 feet; in sheltered bays, on shallow banks, and in estuaries or river mouths; adult sawfish are encountered in various habitat types (mangrove, reef, seagrass, and coral) and in varying salinity regimes and temperatures, and at various water depths.	No
Birds				
American peregrine falcon <i>Falco peregrinus anatum</i>	DL	T	Year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in U.S. and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands	No
Arctic peregrine falcon <i>Falco peregrinus tundrius</i>	DL		Migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.	No
Bald eagle <i>Haliaeetus leucocephalus</i>	DL	T	Found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds	No
Brown pelican <i>Pelecanus occidentalis</i>	DL	E	Largely coastal and near shore areas, where it roosts and nests on islands and spoil banks	No
Peregrine falcon <i>Falco peregrinus</i>	DL	T	Both subspecies migrate across the state from more northern breeding areas in U.S. and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.	No
Red-cockaded woodpecker <i>Picoides borealis</i>	LE	E	Cavity nests in older pine (60+ years); forages in younger pine (30+ years); prefers longleaf, shortleaf, and loblolly	No

Species Scientific Name	Federal Status	State Status	Habitat	Habitat Present Within Project Area
White-faced Ibis <i>Plegadis chihi</i>		T	Prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats	No
White-tailed hawk <i>Buteo albicaudatus</i>		T	Near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral	No
Whooping crane <i>Grus americana</i>	LE	E	Potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties	No
Wood stork <i>Mycteria americana</i>		T	Forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including saltwater; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960	No
Mammals				
Louisiana black bear <i>Ursus americanus luteolus</i>	LT	T	Possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas	No
Rafinesque's big-eared bat <i>Corynorhinus rafinesquii</i>		T	Roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures	No
Red wolf <i>Canis rufus</i>	LE	E	Extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies	No
Mollusks				
Louisiana pigtoe <i>Pleurobema riddellii</i>		T	Streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins	No
Sandbank pocketbook <i>Lampsilis satura</i>		T	Small to large rivers with moderate flows and swift current on gravel, gravel-sand, and sand bottoms; east Texas, Sulfur south through San Jacinto River basins; Neches River	No
Texas pigtoe <i>Fusconaia askewi</i>		T	Rivers with mixed mud, sand, and fine gravel in protected areas associated with fallen trees or other structures; East Texas River basins, Sabine through Trinity Rivers as well as San Jacinto River	No
Reptiles				
Alligator snapping turtle <i>Macrolemys temmincki</i>		T	Perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October	No
Green sea turtle <i>Chelonia mydas</i>	LT	T	Gulf and bay system; shallow water seagrass beds, open water between feeding and nesting areas, barrier island beaches; adults are herbivorous feeding on sea grass and seaweed; juveniles are omnivorous feeding initially on marine invertebrates, then increasingly on sea grasses and seaweeds; nesting behavior extends from March to October, with peak activity in May and June	No
Kemp's ridley sea turtle <i>Lepidochelys kempii</i>	LE	E	Gulf and bay system, adults stay within the shallow waters of the Gulf of Mexico; feed primarily on crabs, but also snails, clams, other crustaceans and plants, juveniles feed on sargassum and its associated fauna	No

Species Scientific Name	Federal Status	State Status	Habitat	Habitat Present Within Project Area
Leatherback sea turtle <i>Dermochelys coriacea</i>	LE	E	Gulf and bay systems and widest-ranging open water reptile; omnivorous, shows a preference for jellyfish; in the U.S. portion of their western Atlantic nesting territories, nesting season ranges from March to August	No
Loggerhead sea turtle <i>Caretta caretta</i>	LT	T	Gulf and bay system primarily for juveniles, adults are most pelagic of the sea turtles; omnivorous, shows a preference for mollusks, crustaceans, and coral	No
Smooth green snake <i>Liochlorophis vernalis</i>		T	Gulf Coastal Plain; mesic coastal shortgrass prairie vegetation; prefers dense vegetation	No
Texas horned lizard <i>Phrynosoma cornutum</i>		T	Open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive	No
Timber/canebrake rattlesnake <i>Crotalus horridus</i>		T	Swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto	No
Plants				
Texas prairie dawn-flower <i>Hymenoxys texana</i>	LE	E	Endemic; in poorly drained depressions or base of mima mounds in open grasslands or almost barren areas on slightly saline soils; flowering March-early April	No

LE, LT - Federally Listed Endangered/Threatened; P/E, P/T - Federally Proposed Endangered/Threatened; E/SA, T/SA - Federally Endangered/Threatened by Similarity of Appearance; DL - De-Listed; C1 - Federal Candidate, Category 1, information supports proposing to list as endangered/threatened; E,T - State Endangered/Threatened; N - no habitat present; "blank" under State status - no listing status; "blank" under Federal status - not listed by USFWS. *Species appearing on these lists do not all share the same probability of occurrence. Some species are migrants or wintering residents only, or may be historic or considered extirpated.*

The vegetation communities located within the project area do not provide suitable habitat for any threatened and endangered species. Presence/absence surveys for the Texas prairie dawn-flower (*Hymenoxys texana*) were conducted by Dr. Larry E. Brown in 2004 and 2005. Neither Texas prairie dawn populations nor suitable habitat for Texas prairie dawn-flower were discovered during the field surveys. Copies of the Texas prairie dawn-flower surveys are on file at HCFCD offices. In addition, field surveys did not identify the presence of other threatened and endangered species. A literature review of the TPWD Texas Natural Diversity Database (TxNDD) system was conducted in August 2002 and July 2008 to identify known occurrences of threatened/endangered species within the vicinity of the project area. No documented occurrences of federally threatened or endangered species were listed in the TxNDD within the project area or within 1,000 feet of the project area.

Based on the absence of threatened and endangered species and potential threatened and endangered species habitat, a determination of "no effect" for the proposed activities was concluded. The USFWS e-mail correspondence is provided in Appendix C.

4.5 FLOODPLAINS, DRAINAGE, AND WATER QUALITY

4.5.1 Floodplains

The Federal Emergency Management Agency (FEMA) effective floodplain boundaries are used to determine the existing 100-year floodplains within the Brays Bayou project area. Approximately 148 acres, or 79 percent, of the project area is located within the 100-year floodplain.

4.5.2 Drainage

The Brays Bayou watershed encompasses approximately 128 square miles in southwest Harris County and eastern Fort Bend County, Texas. The watershed is approximately 95 percent developed. The two major tributaries in the watershed are Willow Waterhole Bayou, which drains approximately 4.3 square miles, and Keegan's Bayou, which drains approximately 18.4 square miles.

The Brays Bayou channel is approximately 31 miles long and flows east from its headwaters near the Barker Reservoir in Fort Bend County to its confluence with Buffalo Bayou. Within the project area, there is general overland street flow of stormwater. Drainage channels D122-00-00 and D120-02-00, which drain into Brays Bayou, are located within the Arthur Storey Park Detention Basin. Drainage channels D129-00-00 and D131-00-00 are located within the Eldridge Detention Basin complex. No drainageways are within or adjacent to the additional tracks within the Arthur Storey Park Detention Basin. One drainageway, D131-00-00, is located adjacent to the additional tracts of land within the Eldridge Detention Basin, south of Brays Bayou.

4.5.3 Water Quality

Within the project area, Brays Bayou has been designated as stream segment 1007B (above tidal) by the Texas Commission on Environmental Quality (TCEQ) (2008a) in the biannual 303(b) report. Stream segments represent quantifiable reaches of stream channels where processes or impacts make a noticeable difference in water quality (positive or negative). In the case of Brays Bayou, it has been segmented at the limits of tidal influence. Segment 1007B, from the upstream limits of the tidal segment to SH 6, is 23 miles in length.

Segment 1007B is unclassified by TCEQ. A stream segment is unclassified if studies on the waste load and nutrient capacity of the stream have not been fully assessed. According to the TCEQ, there are several reasons for a stream segment not being classified, including not many discharge locations into the stream, few complaints, not much development, or no noticeable water quality issues, such as fish kills. Table 4-3 provides known water quality data available for Segment 1007B.

The water quality of Brays Bayou is generally poor. The TCEQ has documented contamination of fish tissues (PCB's, chlordane, dieldrin, dioxin, and heptachlor epoxide) in the 2008 303(d) report. Segment 1007B data (TCEQ, 2008a) fully supports Aquatic Life Use; Fish Consumption Use was not assessed. Overall Recreation Use is not supported by Segment 1007B and there is concern for certain screening levels for general use. Nitrite, orthophosphorus, total phosphorus, and ammonia are all listed as "concerns." Sediment contamination and fish tissue contamination were not assessed.

Brays Bayou is effluent-dominated, with over 75 percent of its base flow originating from sewage treatment plants. Even though the wastewater effluent is within the limits of the National Pollutant Discharge Elimination System (NPDES) limits, the treatment plants are considered a prime cause of the water quality degradation (USACE, 1998). The effluent contributes to the nutrient loading of Brays Bayou, as indicated by total nitrogen, orthophosphorus, and total phosphorus concentrations (Table 4-3). A summary of the field measurements and water chemistry (TCEQ, 2008a) is provided in Table 4-3.

**Table 4-3
Field Measurements and Water Chemistry
Stream Segment 1007B Houston Brays Bayou above Tidal**

Parameter	Segment	Standard Criteria	# of Samples	# of Samples in Exceedances
Water temp. (°C)	1007B	-35.00	NA	NA
Dissolved oxygen (units) 24-hour average	1007B	2.00-3.00	762	2
Ph	1007B	-6.50-9.00	NA	NA
Ammonia (mg/l)	1007B	0.33	1,015	598
Nitrite (mg/l)	1007B	2.00	166	129
Orthophosphorus (mg/l)	1007B	0.37	20	19
Total phosphorus (mg/l)	1007B	0.69	205	160
Chlorophyll-a (fg/l)	1007B	21.00	20	0
E. Coli	1007B	126.00	436	400
Fecal coliform (#/100 ml)	1007B	400.00	413	364

Source: TCEQ, 2008a.

Note: Chlordane, dieldrin, dioxin, heptachlor epoxide, and PCB's were evaluated based on other information.

4.6 AQUATIC ENVIRONMENT

4.6.1 Streams

No major streams are located within the project area. As noted in Section 4.5.2, drainage channels are located within the Arthur Storey Park and Eldridge Detention Basin complexes. While these drainage channels are located within the respective basins, they are not located within the project area.

4.6.2 Wetlands

Recent U.S. Geological Survey (USGS) topographic maps, National Wetland Inventory (NWI) maps, and aerial photography were reviewed and on-site delineations were conducted in order to identify and evaluate wetlands within the project area. Based on the results of the delineations, a total of 5.14 acres of wetlands were identified within the proposed additional tracts (Berg Oliver, 1995; Carter and Burgess, 1994; ENTRIX, 2004 and 2005; and PBS&J, 2004). Please refer to Exhibits B and C for tract numbers and locations of the wetlands.

Arthur Storey Park Detention Basin. One palustrine scrub-shrub (PSS) wetland area totaling an estimated 0.01 acre was identified (ENTRIX, 2004). The dominant vegetation within this wetland area includes Brazilian verbena (*Verbena brasiliensis*), seaside goldenrod (*Solidago sempervirens*), bushy aster (*Aster dumosus*), sea myrtle (*Baccharis halimifolia*), southern dewberry, giant ragweed, and western ragweed. This wetland area (WB03) is shown on Exhibit B.

Eldridge Detention Basin. Two palustrine forested (PFO) wetland areas totaling an estimated 1.56 acres were identified during field surveys within Tract 29-001.0 (PBS&J, 2004). Both of these areas have been disturbed. The dominant vegetation includes green ash (*Fraxinus pennsylvanica*) and Chinese tallow-tree. A PSS wetland totaling 1.59 acres is located within Tract 29-024.0. The dominant vegetation includes marsh elder (*Iva annua*), Maximilian sunflower (*Helianthus maximiliani*), Canada goldenrod (*Solidago canadensis*), and Bahia grass (*Paspalum spp.*). There is one 0.33-acre PFO wetland area within Tract 29-029.0 (PBS&J, 2004). This wetland area is a natural depression with dominant vegetation, including Chinese tallow-tree, American elm, common hackberry, broad-leaf witchgrass (*Dichanthelium latifolium*), southern dewberry, rough button-weed (*Diodia teres*), Japanese honeysuckle (*Lonicera japonica*), soft rush (*Juncus effusus*), poison ivy, and green flatsedge. Four PSS wetland areas were identified within Tract D001-24, totaling 0.07 acre (ENTRIX, 2005). One PSS wetland area totaling 1.58 acres was identified that extends into Tracts D001-19, D001-21, D001-22, D001-47, D001-48, D001-49, D001-54, and D001-55 (ENTRIX, 2005). These wetland areas are shown on Exhibit C.

Table 4-4 identifies the wetland habitat classification, total wetland habitat area, and the HU's based on the habitat assessment. The results of the analysis are presented in Table 4-4. Impacts to wetlands and wetland habitat quality are discussed in Chapter 5, Section 5.7.2. Mitigation of wetland impacts are discussed in Chapter 5, Section 5.16. The Habitat Assessment Reports are included in Appendix A.

**Table 4-4
Wetland Acreage and Habitat Units Within the Project Area**

Habitat Classification	Evaluation Species	Total Wetlands (Acres)	Baseline Wetland Habitat Units
Arthur Storey Park Detention Basin			
Scrub-Shrub Wetland	Veery	0.01	0.004
Eldridge Detention Basin			
Forested Wetland	Veery and eastern gray squirrel	1.89	0.33
Scrub-Shrub Wetland	Veery	3.24	1.17
Total Wetlands		5.14	1.504

4.6.3 Navigable Waters

The proposed action would not require the construction or modification of any bridge or causeway across a navigable waterway of the U.S. because no navigable waters are present within the area; therefore, coordination with the U.S. Coast Guard (USCG) is not required under Section 9 of the Rivers and Harbors Act of 1899.

4.6.4 Wild and Scenic Rivers

There are no rivers or river segments listed on the U.S. Department of Interior's National Inventory of River Segments in the National Wild and Scenic River System in the vicinity of the project area.

4.6.5 Coastal Barriers

There are no coastal barrier islands within the project area.

4.7 CULTURAL RESOURCES

4.7.1 Regional Overview

The project area in Harris County, Texas, is located in the Southeast Texas Archeological Region as described by the Texas Historical Commission (THC) (Kenmotsu and Perttula, 1993). The culture sequence for the area is as follows: The earliest generally accepted culture of the Americas, the Paleoindian, ranged over most, if not all, of North America by the close of the Pleistocene and is characterized by well-made, lanceolate, parallel-flaked projectile points. The Paleoindian period is followed by the Archaic period, further subdivided into Early, Middle, and Late Archaic. During the Archaic, artifact assemblages became more varied and there is evidence for the emergence of group territoriality (Aten, 1983). Populations increased during the Late Archaic (Fields, et al., 1983), and an adaptive pattern of a seasonal round with group dispersal in coastal areas during the summer and consolidation in inland areas during winter months appears to have developed in Brays Bayou (Story, 1980). The Archaic period is followed by the Late Prehistoric period, a time of relatively static environment that lasted until European contact. Hallmarks of the Late Prehistoric period are the advent of ceramic production approximately A.D. 100 and the introduction of the bow and arrow approximately A.D. 600 (Aten, 1983). Population during the Late Prehistoric tended to increase until European-introduced disease decimated the aboriginal inhabitants. The historic period for the project area begins with the initial explorations of the Gulf of Mexico and the American Southwest by Spanish explorers Pineda (1519) and De Vaca (1528). These explorers were sanctioned and supported by the Spanish Crown in their quest to observe and record the character and economic potential of the territory and its people.

Anglo-American settlement in the Harris County area began in the early 1820's, with a number of Mexican land grants awarded in 1824 (Moore, 2005). The modern boundaries of the county were established as Harrisburg County by the Texas Congress in 1836, and it was renamed Harris County in 1839. The presence of the highly navigable Buffalo Bayou stimulated economic development of the county and of the city of Houston in particular. The establishment of six railroad lines in the area prior to the Civil War further stimulated economic prosperity and helped lure a steady stream of settlers to the region. By the second decade of the 20th century, the growing gas and oil industry was competing with agricultural interests and helped create a significant boom in population.

4.7.2 Results of Archival Research and Records Review

An intensive archival search was conducted to determine the existence of historic properties within the project area, including review of Texas Archeological Research Laboratory (TARL) and THC records. Pedestrian surveys, including systematic shovel testing and visual examination for surface exposure of cultural materials, were conducted for the project area by Moore Archeological Consulting in 1998, 1993, 2002, 2004, and 2005.

Arthur Storey Park Detention Basin. No prehistoric sites were identified within any of the proposed additional tracts (Driver, 2004; and Moore, et al, 1993 and 2002). No historic sites were identified within Tracts 22-004.0 and 22-005.0 (Driver, 2004). Several highly-disturbed areas containing historic remains associated with the former cattle ranch within Tracts 22-008.0 and 22-009.0 were noted. These areas are not historically significant and are not recommended eligible for listing on the National Register of Historic Places (NRHP) (Moore, et al, 1993).

Eldridge Detention Basin. No prehistoric or historic sites occur within any of the proposed additional tracts (Driver, 2005; Magnum and Moore, 2002; and Meyers, 1998).

4.8 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

Agency database searches, historical records review, personal interviews, and site reconnaissance surveys were completed from 1994 to 2004 in an effort to identify potential recognized environmental concerns associated with the proposed additional tracts. The following federal and state agency databases were reviewed to identify listed Hazardous, Toxic, and Radioactive Wastes (HTRW) sites on or adjacent to the proposed additional tracts:

- EPA's National Priority List (NPL)
- EPA's Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)
- EPA's Resource Conservation and Recovery Information System (RCRIS)

- EPA's Emergency Response Notification System (ERNS)
- TCEQ's Aboveground Storage Tank (AST) List
- TCEQ's Underground Storage Tank (UST) List
- TCEQ's Leaking Underground Storage Tank (LUST) List
- TCEQ's State Spill Incident List
- TCEQ's Municipal Solid Waste Landfills
- Texas Railroad Commission Oil and Gas Wells/Pipelines

Arthur Storey Park Detention Basin. None of the proposed additional tracts are listed as HTRW sites and there is no obvious evidence of hazardous materials on any of the proposed additional tracts (Carter and Burgess, 1998a; Environmental Data Resources [EDR], 2004a; and Berg and Associates, 1994). The adjacent properties are vacant and have been cleared as part of the authorized plan. None of these properties pose an environmental risk to the additional tracts. There are no known oil and gas wells or pipelines within any of the proposed additional tracts. None of the listed HTRW sites within a 1-mile search distance pose an environmental risk to the proposed additional tracts given their status and distance from the proposed additional tracts.

Eldridge Detention Basin. There is one UST site listed within the additional tracts (Turner, Collie & Braden, 2000). This facility, the Walker-Kurth Lumber Yard located at 14000 Alief-Clodine Road, was listed as having one 10,000-gallon diesel steel tank and one 2,500-gallon gasoline steel tank. According to the TCEQ petroleum tank storage registration database, both tanks are reported permanently filled in place as of August 31, 1987. None of the remaining proposed additional tracts are listed as HTRW sites and there is no obvious evidence of hazardous materials on any of the proposed additional tracts (Carter & Burgess, 1998b, 1999a, 1999b, 2000, and EDR, 2004b). The adjoining properties are vacant and have been cleared as part of the authorized plan. None of these properties pose an environmental risk to the additional tracts. There are no known oil and gas wells and pipelines within any of the proposed additional tracts. None of the listed HTRW sites within a 1-mile search distance pose an environmental risk to the proposed additional tracts based on their status and distance from the proposed additional tracts.

4.9 AIR QUALITY

The project area is located within the metropolitan planning area boundary of the Houston-Galveston Area Metropolitan Planning Organization (MPO). The area within this boundary is in attainment for all National Ambient Air Quality Standards (NAAQS) criteria pollutants except ozone and is designated as

being in "severe" non-attainment. The EPA, under its jurisdiction, sets the NAAQS for the seven pollutants found in Table 4-5.

**Table 4-5
National Ambient Air Quality Standards**

Standards^a Pollutant	Timeframe	Primary	Secondary	Basis
Ozone (O)	Maximum 1 hour	0.12 ppm	0.12 ppm	Not to exceed more than once per year
Carbon Monoxide (CO)	Maximum 8 hour	10 mg/m ³	10 mg/m ³	Not to exceed more than once per year
CO	Maximum 1 hour	40 mg/m ³	40 mg/m ³	Not to be exceeded more than once per year
Sulfur Dioxide (SO ₂)	Annual (Arithmetic Mean) ^b	80 µg/m ³	NA	Annual arithmetic mean never to be exceeded
	Maximum 24 hour	365 µg/m ³	NA	Not to be exceeded more than once per year
	Maximum 24 hour	NA	1,300 µg/m ³	Not to be exceeded more than once per year
Nitrogen Dioxide (NO ₂)	Annual (Arithmetic Mean)	100 µg/m ³	100 µg/m ³	Annual arithmetic mean never to be exceeded
PM ₁₀ ^c	Annual (Arithmetic Mean)	50 µg/m ³	50 µg/m ³	Annual arithmetic mean never to be exceeded
	Average 24 hour	150 µg/m ³	150 µg/m ³	Not to be exceeded more than once per year
Lead	Maximum Quarterly (Arithmetic Mean)	1.5 µg/m ³	1.5 µg/m ³	Maximum arithmetic mean never to be exceeded for a calendar quarter

^aPrimary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

ppm = parts per million; mg/m³ = milligrams per cubic meter; µg/m³ = micrograms per cubic meter

^bArithmetic mean is the most common measure of the central tendency. It is the sum of the data collected during the given period divided by the number of observations in the same period.

^cPM₁₀ Particulate Matter: particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers. This pollutant was changed from Total Suspended Particulates (TSP) by the EPA on July 1, 1987.

The EPA established the General Conformity Rule in Title I, Section 176, of the Clean Air Act (CAA). The citations for the General Conformity Rule can be found in Title 40 of the CFR, Part 51, Subpart W, and in Title 30 of the Texas Administrative Code (TAC), Part 101.30. These rules mandate that the federal government not engage, support, provide financial assistance for licensing or permitting, or approve any activity not conforming to an approved CAA implementation plan in coordination with and as part of the National Environmental Policy Act (NEPA) process.

The General Conformity Rule applies to all federal actions except programs and projects requiring funding or approval from the U.S. Department of Transportation (USDOT), the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), or a Metropolitan Planning Organization. The proposed action is a federal action to which the General Conformity Rule applies. In Harris County, Texas, the current approved CAA implementation plan is the *Revisions to the State Implementation Plan for the Control of Ozone Air Pollution, Houston-Galveston-Brazoria (HGB) Eight-*

Hour Ozone Nonattainment Area dated May 23, 2007. The Houston-Galveston area is categorized as a severe non-attainment area for ozone. A conformity determination is required for federal actions that result in total direct or indirect emissions equal to or exceeding 25 tons per year (TPY) of nitrogen oxides (NOx) and 25 TPY of volatile organic compounds (VOC) prior to June 15, 2004; 100 TPY of NOx or 100 TPY of VOC after June 15, 2004; and 25 TPY of NOx and 25 TPY of VOC after October 1, 2008 (40 CFR 51.853).

4.10 NOISE

Noise is identified as "unwanted sound." Noise emanates from many different sources, such as transportation noise, industrial noise, construction noise, household noise, and people and animal noise. In the past, the EPA coordinated all federal noise control activities through its Office of Noise Abatement and Control. However, in 1981, the Administration at that time concluded that noise issues were best handled at the state or local government level. As a result, the EPA phased out the office's funding in 1982 as part of a shift in federal noise control policy to transfer the primary responsibility of regulating noise to state and local governments. However, the Noise Control Act of 1972 and the Quiet Communities Act of 1978 were not rescinded by Congress and remain in effect today, although essentially unfunded.

The majority of the proposed project is paralleled by existing roadways with adjacent residential communities and commercial areas at major intersections. Therefore, traffic noise is the major contributor to ambient noise levels in the project area. Standard decibel ranges for the existing noise levels in the study area can be found in Table 4-6.

Table 4-6
Examples of Existing Noise Levels

Outdoor Location	Decibel Range	Subjective Evaluation
Residential Neighborhoods	30-70	Faint to Loud
Retail Shops	40-70	Moderate to Loud
Residential Streets	65-80	Loud to Very Loud
Busy Urban Streets	70-105	Loud to Very Loud
Highway	80-105	Very Loud

Source: HUD 1985. U.S. Department of Housing and Urban Development, "The Noise Guidebook," Washington D.C.

4.11 SOCIOECONOMICS

As shown in Table 4-7, population growth in Harris County during the 1980's was moderately high (17.0 percent). Population growth in the City of Houston during the 1980's (2.2 percent) was very slow

and was significantly lower than that of Harris County. During the 1990's, the population growth rates for Harris County and the City of Houston were all very similar and exhibited moderately high growth.

**Table 4-7
Population Trends in the Project Area**

Location	1980	1990	2000	% Change 1980 to 1990	% Change 1990 to 2000
City of Houston	1,595,138	1,630,553	1,953,631	2.2	19.8
Harris County	2,409,547	2,818,199	3,400,578	17.0	20.7

Source: U.S. Bureau of Census, 1983, 1990, and 2000

The population projections for Harris County and the City of Houston from 2000 to 2030 are summarized in Table 4-8 (TWDB, 2004). Future residential development and population growth in the Houston metro area is expected primarily in areas that are outside of central Houston, and as a consequence, population growth is expected to be higher for Harris County than for the City of Houston during the 30-year period. Population growth rates for Harris County and the City of Houston are expected to taper off (the rate of population increase will decrease over time) throughout the 30-year period.

**Table 4-8
Future Population Projections**

Location	2000	2010	2020	2030	Percent Change		
					2000 to 2010	2010 to 2020	2020 to 2030
City of Houston	1,953,631	2,240,974	2,520,926	2,798,278	14.7	12.5	11.0
Harris County	3,400,578	3,951,682	4,502,786	5,053,890	16.2	14.0	12.2

Source: TWDB, 2004

Based on a review of the civilian labor force data available for the City of Houston and Harris County, the documented growth of the civilian labor force in Harris County was much higher than that of the City of Houston during the 1980's, and slightly lower than the City of Houston during the 1990's. The negative growth of the civilian labor force in the City of Houston shown during the 1980's is reflective of the oil bust during that period. The growth in civilian labor force for the City of Houston during the 1990's was moderately high and similar to Harris County. Table 4-9 summarizes the trends in the civilian labor force between 1980 and 2000.

**Table 4-9
Civilian Labor Force of the Project Area**

Location	Civilian Labor Force				
	1980	1990	2000	% Change 1980-1990	% Change 1990-2000
City of Houston	988,667	871,321	1,024,339	-0.12	18.0
Harris County	1,297,098	1,551,207	1,793,463	20.0	15.6

Note: Civilian labor force data for the City of Houston shown in the 1980 column is from 1982 (U.S. Bureau of Census, 1983).

Source: Texas Workforce Commission, 2004; and U.S. Bureau of Census, 1983.

The project area contains two census tracts; the additional tracts at the Arthur Storey Park Detention Basin are located within Census Tract 4531, and the additional tracts at the Eldridge Detention Basin are located within Census Tract 4518. For the socioeconomic analysis, the project area will be compared to a study area, with the study area consisting of census tracts adjacent to the project area. The project area contains a population of 1,978, 78 percent of which are ethnic minorities. The study area contains eight census tracts with a population of 54,889, 69 percent of which are ethnic minorities. Population, race, and ethnicity of the census tracts within the project area and study area are identified for the analysis (see Table 4-10).

Table 4-10
Population, Race, and Ethnicity for the Project Area and Study Area

Area/2000 Census Tract	Total 2000 Population	White		Black/African American		Native American/ Alaska Native		Asian		Native Hawaiian or Other Pacific Islander		Some Other Race ¹		Hispanic or Latino	
		Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
4518	4350	1575	36%	799	18%	5	<1%	720	17%	0	0%	208	5%	1043	24%
4531	4611	403	9%	1525	33%	0	0%	868	19%	0	0%	77	2%	1738	38%
Total Project Area	8961	1978	22%	2324	26%	5	<1%	1588	18%	0	0%	285	3%	2781	31%
4331	3494	154	4%	1744	50%	0	0%	214	6%	0	0%	74	2%	1308	37%
4516	7534	5584	74%	269	4%	14	0%	643	9%	8	0%	360	5%	656	9%
4519	9059	3221	36%	2105	23%	48	1%	1519	17%	0	0%	281	2%	1885	21%
4523	2678	391	15%	567	21%	0	0%	893	33%	0	0%	20	1%	807	30%
4526	6495	793	12%	2364	36%	18	0%	1418	22%	0	0%	217	3%	1685	26%
4530	7809	1514	19%	1272	16%	0	0%	1198	15%	0	0%	118	1%	3707	47%
4532	6986	793	11%	3380	48%	0	0%	700	10%	0	0%	201	3%	1912	27%
4543	10,834	4318	40%	1888	17%	0	0%	1318	12%	10	0%	324	3%	2976	27%
Total of Study Area	54,889	16,768	31%	13589	25%	80	0%	7903	14%	18	0%	1595	3%	14,936	27%
City of Houston	1,954,848	601,105	31%	487,094	25%	3,851	<1%	101,393	5%	549	<1%	29,176	1%	731,680	37%
Harris County	3,400,578	1,429,684	42%	618,551	18%	8,014	<1%	170,080	5%	1098	<1%	52,526	2%	1,120,625	33%

¹ – Some Other Race also includes population of two or more races.
Source: U.S. Bureau of Census, 2000.

Twenty-six percent of the population within Census Tract 4531 in 1999 was living below the poverty level, which is higher than that of the study area, the City of Houston, and Harris County. The median household income in 1999 (\$26,786) was lower than that of the study area, the City of Houston, and Harris County. Table 4-11 summarizes the poverty status and median household income of the project area and study area.

In 1999, 6.8 percent of the population within Census Tract 4518 was living below the poverty level, which is substantially lower than that of Harris County (15.0 percent) and the City of Houston (19.0 percent). The median household income in 1999 (\$52,536) was greater than that of the study area, Harris County, and the City of Houston.

Table 4-11
Poverty Status and Median Household Income of Project Area and Study Area

Location	Total Population (2000)	# of Poverty Status Persons (1999)	% of Population At or Below Poverty Status	Median Household Income (1999)
Census Tract 4531	4,611	1,184	26	\$26,786
Census Tract 4518	4,350	296	7	\$52,536
Project Area	8,961	1,480	17	\$39,661¹
Census Tract 4331	3,494	1,016	30	\$23,287
Census Tract 4516	7,534	222	3	\$76,718
Census Tract 4519	9,059	680	8	\$41,024
Census Tract 4523	2,678	311	12	\$44,650
Census Tract 4526	6,495	1,652	25	\$31,709
Census Tract 4530	7,809	1,022	13	\$40,759
Census Tract 4532	6,986	1,416	20	\$26,591
Census Tract 4543	10,834	945	9	\$47,090
Study Area	54,889	7,264	13	\$41,479²
City of Houston	1,953,631	369,045	19	\$36,616
Harris County	3,400,578	503,234	15	\$42,598

1 Median Household Income of Project Area is the average of the census tracts.

2 Median Household Income of Study Area is the average of the census tracts.

Source: U.S. Bureau of Census, 2000

4.12 ENVIRONMENTAL JUSTICE

4.12.1 Minority and Low-Income Populations

Executive Order (EO) 12898 requires that minority and low-income populations not receive disproportionately high adverse human health or environmental impacts and that representatives of any minority or low-income population that could be affected by the proposed action be involved in the

community participation and public involvement process. Disproportionate environmental impacts from the exposure to an environmental hazard occur when the risk to a minority population or low-income population exceeds the risk to the general population.

A minority population is defined as a group of people and/or a community experiencing common conditions of exposure or impact that consists of persons classified by the U.S. Bureau of the Census as Negro/Black/African-American; Hispanic; Asian or Pacific Islander; American Indian, Eskimo, or Aleut; or other non-White persons.

According to the U.S. Bureau of the Census, a low-income population is defined as a group of people and/or community that as a whole lives below the national poverty level. Based on Health and Human Services (HHS) data, the average poverty level threshold for a family of four people living in the 48 contiguous states and the District of Columbia for the year 2008 was a total annual income of \$21,200.

As defined by the Council on Environmental Quality (CEQ), a minority population is defined as either: (a) the minority population of the affected area exceeds 50 percent, or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population, or other appropriate geographical analysis. For this analysis, census tracts within the project area were compared to adjacent census tracts within the study area. As stated in Section 4.11, the population living within the project area is primarily comprised of Hispanic or Latino persons (31 percent), followed by Black or African American persons (26 percent), White persons (22 percent), Asian persons (18 percent), and other ethnicities (3 percent). The population living within the study area is primarily comprised of White persons (31 percent), followed by Hispanic or Latino persons (27 percent), Black or African American persons (25 percent), Asian persons (14 percent), and other ethnicities (3 percent). The percentage of minorities within the project area (78 percent) is greater than 50 percent and is greater than the minority population of the census tracts within the study area (69 percent). However, minority populations within the Eldridge Detention Basin complex are not greater than the minority populations within the study area.

As stated in Section 4.11, the median household incomes for the project area range from \$26,786 to \$52,536 and are above the 2008 HHS poverty guidelines; therefore, the project area is not considered a low-income population.

4.12.2 Limited English Proficiency

EO 13166, "Improving Access to Services for Persons with Limited English Proficiency (LEP)," signed by President Clinton on August 11, 2000, calls for all agencies to ensure that their federally-conducted programs and activities are meaningfully accessible to LEP individuals.

According to the 2000 U.S. Department of Commerce, Bureau of the Census, data for "Ability to Speak English" for the population of age five years and over indicates 17 percent of the population within the project area speaks English "Not Well" or "Not at All." The languages spoken by LEP populations include Spanish (56 percent), Asian and Pacific Island languages (38 percent), and Indo-European languages (6 percent).

4.13 RECREATION

There are no existing structural recreation facilities located within any of the proposed additional tracts at the Arthur Storey Park Detention Basin or Eldridge Detention Basin; however, there is the potential for inherent recreational opportunities, such as bird-watching, wildlife photography, and hiking within the project area. According to the Houston-Galveston Area Council (HGAC), there are no hike-and-bike trails that are designated as transportation control measures with the Houston-Galveston-Brazoria Air Quality State Implementation Plan within any of the proposed additional tracts. A copy of this correspondence can be found in Appendix C.

5.0 ENVIRONMENTAL CONSEQUENCES

This section discusses the potential impacts that would occur should the proposed action be implemented. The proposed action has been designed to follow mitigation sequencing of avoidance, minimization, and compensation for unavoidable impacts to resources, with priority being avoidance of impacts.

5.1 SOILS IMPACTS

The contractor(s) would be required to submit all proposed soil placement areas to HCFCD for evaluation and approval. Soil is anticipated to be disposed of within the community to develop roads and building pad sites. If the disposal site becomes necessary, REC's will be prepared for each proposed site to document the evaluation of potential environmental impacts and coordination of the use of these disposal sites. The No Build Alternative would not require soil placement areas.

5.2 PRIME FARMLAND PROTECTION POLICY ACT IMPACTS

Based on information provided by the NRCS-Harris County office, the project areas of both the Arthur Storey Park Detention Basin and the Eldridge Detention Basin consist of Prime Farmland Soils (NRCS, 2003). These prime farmland soils would be converted for use to detention areas. Therefore, a Farmland Conversion Impact Rating (AD-1006) was completed for the 188 acres of additional ROW to complete the proposed action. In June 2005, NRCS verified a score of 102 for this project, and a score of less than 160 needs no further consideration. A copy of this correspondence is provided in Appendix C.

The No Build Alternative will have no impacts to prime farmland soils.

5.3 LAND USE IMPACTS

The proposed additional tracts would be converted to detention areas as part of the Arthur Storey Park Detention Basin and Eldridge Detention Basin complexes. The detention basins would be grass-lined. Implementation of the proposed action would not result in adverse impacts to schools or parklands within the project area. Impacts to businesses include the displacement of three commercial properties, which are discussed in Section 5.12.

The No Build Alternative would not have any impact on the land use; however, development by others is likely in the future.

5.4 BIOLOGICAL RESOURCES IMPACTS

5.4.1 Vegetation

As described in Chapter 4, Section 4.3.1, the project area contains 89.43 acres of upland pasture, upland scrub-shrub, upland forest, scrub-shrub wetlands, and forested wetlands. The project area has been disturbed through past modifications and urban development. Commercial, industrial, and residential developments abut the proposed detention basins throughout the project area. Table 5-1 identifies the impacts to habitat within the project area from the construction of the proposed additional tracts. A total of 89.43 acres of existing habitat would be impacted by the proposed project.

**Table 5-1
Habitat Impacts**

Habitat Classification	Impact to Habitat Area (acres)
Arthur Storey Park Detention Basin	
Upland scrub-shrub	10.97
Upland pasture	1.06
Scrub-shrub wetland	0.01
Basin Total	12.04
Eldridge Detention Basin	
Upland pasture	48.47
Upland scrub-shrub	14.64
Upland forest	9.15
Scrub-shrub wetland	3.24
Forested wetland	1.89
Basin Total	77.39
Total	89.43

5.4.1.1 Invasive Species

Due to the construction methods of the proposed project, invasive species may propagate in disturbed areas. Invasive species would be managed within the basin. Control technologies include flooding, mowing, herbicide, and mechanical removals, or some combination thereof. Mowing would be conducted approximately three times per year in grassy areas. Removal of Chinese tallow-trees and other exotics from tree clusters where mowing may be inaccessible would occur annually. Should species such as cattail develop, management would occur on an annual basis.

5.4.2 Wildlife

5.4.2.1 Terrestrial

The wildlife habitat value within the additional tracts is marginal and fragmented due to the invasive nature of the plant communities on these sites, as well as the surrounding urban development. The wildlife in these areas consists of species adapted to an urban setting.

The loss of marginal habitat in these areas from excavation would result in the displacement of some wildlife. Many of these species that are adapted to human disturbance would vacate the habitat during construction, populating similar habitat in the area, and would likely return after habitat has been reestablished.

Although the proposed detention basins are cleared and graded during construction, most of these areas would be planted with grasses following construction. A variety of native tree and shrub plantings in parts of the basins are included in the design features of the detention basins. In addition, portions of the wet bottom detention basins may naturally develop into wetland habitat.

Following construction, the change in habitat would result in a minor change in types of wildlife species, with some of the wildlife returning to the project area and some wildlife reestablishing in the surrounding areas. The proposed construction of the detention basins, including the planting of native trees and shrubs and creation of wetlands, would provide different proportions of habitat types than currently exist at the detention sites. This new habitat may attract different species of wildlife than those species currently inhabiting the area, thereby potentially increasing wildlife diversity in the overall area.

The Migratory Bird Treaty Act (MBTA) (1918) protects migratory birds, active nests, eggs, and/or young. It should be noted that the project will be implemented in full compliance with all provisions and regulations outlined in and pursuant to the MBTA. To prevent effects to migratory birds and their habitat, construction will be avoided during the peak nesting season (March 1 to September 1). In the event that migratory birds are encountered on-site during project construction, every effort will be made to avoid harm to the birds, their nests, eggs, and/or young. If necessary, old nests will be removed from structures following the nesting season prior to the start of construction. Preventative measures will be taken to dissuade birds from building new nests within the project area. Details on some migratory bird species common within the project area can be found in Section 4.3.2.1 and in Table 4-2.

5.4.2.2 Aquatic

Impacts to aquatic species are anticipated to be minor and temporary given the condition of the existing water quality and the nature of the proposed action. While short-term disruption of sediments and elevated turbidity levels would occur, elevated turbidity levels are not expected to last after construction activities are finished. Under the Texas Pollutant Discharge Elimination System (TPDES) stormwater

program, the HCFCFCD would ensure that appropriate steps are taken to control water pollution during construction to reduce impacts to fish species. Fish species that presently occupy the channel are expected to leave the construction area during construction and would return after construction is complete. The aquatic species found within the channel are well adapted to the urban environment and therefore would not be adversely impacted by the proposed action.

The No Action Alternative would not involve impacts to any wildlife within the project area. However, future development by private developers may occur, causing impacts to wildlife and their habitats.

5.5 THREATENED AND ENDANGERED SPECIES

A literature review of the TxNDD was performed to identify known occurrences of threatened/ endangered species within the vicinity of the project area in August 2002 and July 2008. Field surveys were conducted in 2002, 2004, 2005, and 2008. Based on the TxNDD and field surveys, there are no documented occurrences of federally threatened or endangered species within the project area or within 1,000 feet of the project area, vegetation communities located within the project area do not provide suitable habitat for any threatened and endangered species, and threatened and endangered species populations were not observed within the project area. Therefore, the proposed action would have no effect on threatened or endangered species or their habitat. The USFWS and TPWD were notified of the proposed action on December 9, 2004, June 2, 2005, and January 15, 2009. USFWS responded on January 26, 2009, and stated that USFWS does not provide concurrence on a "no effect" determination. These coordination letters are located in Appendix C. A draft Biological Assessment (BA) was prepared for the proposed action and is included in Appendix D. This draft BA has been sent to the USFWS for review and concurrence.

5.6 FLOODPLAINS, DRAINAGE, AND WATER QUALITY IMPACTS

5.6.1 Floodplains

Implementation of the proposed action is designed to compensate for the loss of floodplain storage at the Old Westheimer Detention Basin. No increase in flood levels for the project area is predicted. There would be no adverse impacts on floodplain areas within the project area as a result of implementation of the proposed action.

The No Action Alternative would not involve any impacts to floodplains within the project area. Alternatively, the loss of floodplain storage at the Old Westheimer Detention Basin would not be compensated, causing adverse impacts to the floodplain.

5.6.2 Drainage

The purpose of the proposed action is to compensate for the loss of floodplain storage at the Old Westheimer Detention Basin. Impacts to drainage by the proposed action would be improved. The improved drainage would be a positive impact to the Brays Bayou watershed.

The No Action Alternative would not involve any impacts to drainage within the project area.

5.6.3 Water Quality

The proposed action would have no long-term adverse effects on water quality. Temporary impacts would be associated with localized increases in turbidity levels caused by suspension of sediments excavated or otherwise disturbed during construction activities associated with detention basin construction. These intermittent effects would dissipate shortly after completion of construction activities. Temporary impacts would be minimized and eliminated through the implementation of Best Management Practices (BMP) in accordance with the Clean Water Act of 1977, including the use of silt fencing, hay bales, and seeding or sodding of bare areas to prevent erosion.

Water quality is expected to improve within Brays Bayou from the filtration created by the wet bottom marshes located in the detention basin. In addition, the proposed wetlands would filter rainfall runoff prior to its entry into the basins and Brays Bayou. Since the proposed action does not involve the need for subsurface water, no effect on groundwater or the water table is anticipated.

5.7 AQUATIC ENVIRONMENT IMPACTS

5.7.1 Streams

No impacts are anticipated to occur to streams within the project area as a result of the proposed action. A Storm Water Pollution Prevention Plan (SWPPP) would be implemented and followed during construction activities to avoid unnecessary impacts and to minimize unavoidable impacts to Brays Bayou. An SWPPP was prepared for each component in accordance with the guidelines set forth by the Stormwater Management Joint Task Force (2005). The proposed action is consistent with the existing SWPPP. Copies of the SWPPP's are on file at HCFCD.

5.7.2 Wetlands

Of the approximate 188 acres required for detention basin construction, a total of 5.14 acres are considered wetlands. This includes approximately 1.89 acres of PFO wetlands and 3.25 acres of PSS wetlands. HU's, using the HSI score and acreages, were calculated for each wetland patch. The HU's were calculated by multiplying the HSI score by the area of the wetland patch. The baseline, without project and with project impacts, was calculated in terms of Average Annual Habitat Units (AAHU). AAHU is defined as the total number of HU's gained or lost as a result of the proposed action, divided by

the life of the action. Based on the habitat assessment project impact analysis, 1,343 fewer AAHU's would be available every year during the period of analysis than would be available if the proposed action were not constructed. Table 5-2 identifies the wetland habitat and impacts within the project area. The wetland habitat impacts are also broken down by basin. The Habitat Assessment Project Impact and Mitigation Alternatives Analysis Report is included in Appendix A.

**Table 5-2
Wetland Habitat and Impacts**

Habitat Classification	Evaluation Species	Total Wetlands (Acres)	Total Area of Habitat at Year of Impact (Acres)	Baseline Wetland Habitat Units	"With Project" AAHU's	"Without Project" AAHU's	Net Impact (AAHU's)
Arthur Storey Park Detention Basin							
Scrub-shrub wetland	Veery	0.01	0.01	0.004	0.001	0.005	0.004
Eldridge Detention Basin							
Forested wetland	Veery and eastern gray squirrel	1.89	3.54	0.33	0.091	0.800	0.709
Scrub-shrub wetland	Veery	3.24	1.59	1.17	0.222	0.852	0.630
Total		5.14	5.14	1.504	0.314	1.657	1.343

Arthur Storey Park Detention Basin. A total of 0.01 acre of scrub-shrub wetlands are located within the proposed additional tracts within this basin and would be impacted. The baseline wetland habitat assessment for the scrub-shrub wetlands totals 0.004 HU.

Over the period of the analysis, the scrub-shrub wetlands within the project area would provide 0.001 average AAHU of habitat (based on the species selected for the habitat modeling for scrub-shrub wetlands) with the proposed action and 0.005 AAHU of habitat without the proposed action. The proposed action would impact 0.01 acre (100 percent) and approximately 0.004 AAHU of the scrub-shrub wetlands within the proposed additional tracts.

Eldridge Detention Basin. A total of 1.89 acres of forested wetlands and 3.24 acres of scrub-shrub wetlands are located within the proposed additional tracts within this basin and would be impacted. The baseline wetland habitat assessment for the wetlands totals 1.50 HU's.

Over the period of the analysis, the forested wetlands within the project area would provide 0.091 AAHU (based on the species selected for the habitat modeling for forested wetlands) with the proposed action and 0.800 AAHU's of habitat without the proposed action. The proposed action would impact 1.89 acres (100 percent) and 0.709 AAHU's of the forested wetlands within the proposed additional tracts.

Over the period of the analysis, the scrub-shrub wetlands within the project area would provide 0.222 AAHU of habitat (based on the species selected for the habitat modeling for scrub-shrub wetlands) with the proposed action and 0.852 AAHU of habitat without the proposed action. The proposed action would impact 3.24 acres (100 percent) and approximately 0.630 AAHU of the scrub-shrub wetlands within the proposed additional tracts.

Discussion of the mitigation alternatives for the forested and scrub-shrub wetland habitats and mitigation plan is in Section 5.16.

5.7.3 Navigable Waters Impacts

There are no navigable waters within the project area; therefore, no impacts to navigable waters would occur.

5.7.4 Wild and Scenic Rivers Impacts

There are no rivers or river segments listed on the U.S. Department of Interior's National Inventory of River Segments in the National Wild and Scenic River System in the vicinity of the proposed action; therefore, no impacts would occur.

5.7.5 Coastal Consistency Impacts

The proposed action is not located within the Coastal Zone Management Plan boundaries; therefore, coordination with the CCC is not required and no impacts would occur.

5.7.6 Coastal Barriers Impacts

The proposed action would not affect any coastal barriers along the Texas Gulf Coast; therefore, no impacts would occur.

5.8 CULTURAL RESOURCES

No prehistoric or historic sites would be impacted by the proposed action. THC concurred with the findings of the reports and considered the permit requirements complete. Please see Appendix C for copies of this correspondence. In the event that archeological deposits or features are encountered during construction, construction activities would cease immediately and the THC would be contacted.

5.9 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

The probability of encountering hazardous materials during the proposed action is minimal. No oil wells, gas wells, or pipelines would be impacted by the proposed action. If hazardous materials are encountered during the proposed action, construction activities would be halted immediately and the appropriate local and state authorities would be contacted.

5.10 AIR QUALITY

The EPA, under its jurisdiction, sets the NAAQS for six pollutants, including ozone and carbon monoxide. The EPA has determined that the Houston-Galveston area (including Harris County) is in non-attainment for the ozone air quality standard and under its regulations has given the area until 2019 to attain the standard. The TCEQ, the state environmental agency, has the responsibility for developing a plan for attaining the air quality standard in the Houston-Galveston non-attainment area. This plan, which is submitted to and approved by the EPA and is called the State Implementation Plan (SIP), describes how the area will reach attainment of the air quality standard. The SIP sets emissions budgets for point sources such as power plants and manufacturers, area-wide sources such as dry cleaners and paint shops, off-road mobile sources such as boats and lawn mowers, and on-road sources such as cars, trucks, and motorcycles. Based on the SIP, a conformity determination is required for federal actions that result in total direct or indirect emissions equal to or exceeding 25 TPY of NO_x or VOC prior to June 15, 2004; 100 TPY of NO_x or VOC after June 15, 2004; and 25 TPY of NO_x or VOC after October 1, 2008 (40 CFR 51.853). An air analysis was completed for the proposed action to estimate annual emissions from construction activities (Appendix E). Based on the findings, concentrations of NO_x and VOC are not expected to exceed national standards for any given period of time, and thus the proposed action

conforms to the SIP. Therefore, a general conformity determination is not required for the proposed action. A summary of the results is provided in Table 5-3.

**Table 5-3
Summary of Estimated Annual Construction Emissions**

Year of Construction	General Conformity Threshold (tons per year)	NOx (tons per year)	VOC (tons per year)
2004 (Prior to June 15)	25	13.89	1.78
2004 (After June 15)	100	60.17	7.71
2005	100	90.94	11.72
2006	100	90.94	11.72
2007	100	0	0
2008 (Prior to October 1)	100	12.35	1.53
2008 (After October 1)	100	4.12	0.51
2009	25	16.46	2.04

5.11 NOISE IMPACTS

The FHWA's manual, Highway Construction Noise: Measurement, Prediction, and Mitigation, states that criteria for evaluating construction noise have not been developed. Therefore, users of their manual should select criteria considering the following factors:

- The difference between the existing noise environment and the expected construction noise levels.
- The absolute level of expected construction noise.
- Adjacent land uses.
- The duration of construction.

The EPA lists typical construction site equipment sound levels, including those that would be associated with earth-moving and bridge construction activities for the Brays Bayou project. Table 5-4 presents a partial list of equipment normally used for bridge construction and channel/detention basin excavation. The equipment sound levels listed in Table 5-4 appear to be significantly above those of ambient noise levels. However, after adjustment for distance, attenuation, length of exposure, and corresponding indoor noise levels, the actual sound levels would be lower.

**Table 5-4
Typical Construction Site Equipment Sound Levels (in dBA)**

Type of Construction Equipment	Typical Sound Level at 50 Feet
Pile Driver	101
Truck	88
Dozer	87
Paver	89
Scraper	88
Backhoe	85
Pneumatic tool	85
Mobile crane	83

Source: ORI (1980) Construction Noise Control Technology Initiatives task report.
Prepared for the EPA Office of Noise Abatement and Control.

A slight increase in noise levels during construction is expected from operation of equipment, work crew activities, and a possible increase in traffic levels on local roadways. These impacts would be short-term in nature and are not expected to interfere with surrounding land uses. To the greatest extent practicable, construction activities would be limited to daylight hours when higher noise levels are more tolerable.

5.12 SOCIOECONOMIC IMPACTS

The proposed action would have no effect on population growth or demographics within the area. Construction activities would have a temporary adverse effect on adjacent neighborhoods and local businesses, as heavy equipment and construction materials would be transported on local roadways and construction activities would increase the noise and dust levels in the area. The benefits during the construction phase would include a small boost in local employment and a small amount of indirect spending within the local economy as purchases are made locally for fuel, food, and possibly building materials. Long-term benefits to the local population would include reduced flood damages, preservation of natural areas, and the addition of recreational amenities. The effects of the proposed action would be largely positive for the local population.

The detention basin complexes require the acquisition of approximately 188 acres of land. Of this, approximately 35 acres are required at the Arthur Storey Park Detention Basin complex and approximately 153 acres are required at the Eldridge Detention Basin complex. The ROW acquisitions would result in three commercial displacements. These acquisitions are structural measures of the proposed action and not for buyout purposes to remove the structures from the floodplain. Use of these sites for detention removes these areas from potential future development.

5.13 ENVIRONMENTAL JUSTICE IMPACTS

5.13.1 Minority and Low-Income Populations

EO 12898 requires that minority and low-income populations not receive disproportionately high adverse human health or environmental impacts and that representatives of any minority or low-income population that could be affected by the proposed action be involved in the community participation and public involvement process. Disproportionate environmental impacts from the exposure to an environmental hazard occur when the risk to a minority population or low-income population exceeds the risk to the general population.

For this analysis, census tracts within the project area were compared to census tracts within the study area. As stated in Section 4.12 the population living within the project area is primarily comprised of Hispanic or Latino persons (31 percent), followed by Black or African American persons (26 percent), White persons (22 percent), Asian persons (18 percent), and other ethnicities (3 percent). The population living within the study area is primarily comprised of White persons (31 percent), followed by Hispanic or Latino persons (27 percent), Black or African American persons (25 percent), Asian persons (14 percent) and other ethnicities (3 percent). The percent minorities within the project area (78 percent) are greater than 50 percent and are greater than the minority population of the census tracts within the study area (69 percent). However, minority impacts within the Eldridge Detention Basin complex (64 percent) are not greater than the minorities within the study area (69 percent). Therefore, minority populations within the project area do not receive disproportionate impacts.

As stated in Section 4.11, the median household incomes for the project area range from \$26,786 to \$52,536 and are above the 2008 HHS poverty guideline; therefore, the project area is not considered a low-income population.

The proposed action requires the displacement of three commercial properties within the Eldridge Detention Basin complex. The number of displacements within this area is not disproportionately high when compared to the entire project area. Therefore, no impacts are anticipated to occur as a result of the proposed action that would disproportionately impact minority or low-income populations, and the proposed action is in compliance with EO 12898.

5.13.2 Limited English Proficiency

Approximately 17 percent of the population age of five years and above within the census tracts along the project area speaks English "Not Well" or "Not at All." Other languages spoken by LEP populations include Spanish (56 percent), Asian and Pacific Island languages (38 percent), and Indo-European languages (6 percent). HCFCD would continue to publish all future notices in English, Spanish, and

Asian newspapers and would provide means of communication to LEP individuals at future public involvement activities.

5.14 RECREATION

No impacts to parkland, trails, or other recreational areas would occur from the proposed action; therefore, the proposed action would have no adverse impacts on recreation. Conversely, the proposed action as part of the complete project would create recreational opportunities once complete by providing trails and greenspace.

5.15 CUMULATIVE IMPACTS

5.15.1 Introduction

Identifying major cumulative effects involves defining the direct and indirect effects of the proposed action on the resources, ecosystems, and human communities affected and determining which of these effects are important from a cumulative effect perspective. In assessing cumulative effect, consideration is given to (1) the degree to which the proposed action affects public health or safety; (2) the unique characteristics of the geographic area; (3) the degree to which the effects on the quality of the human environment are likely to be highly controversial; (4) the degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks; and (5) whether the action is related to other actions with individually insignificant but cumulatively significant impacts on the environment.

Cumulative effects can result from many different activities, including the addition of materials to the environment from multiple sources, repeated removal of materials or organisms from the environment, and repeated environmental changes over large areas or long periods. More complicated cumulative effects occur when stressors of different types combine to produce a single effect or suite of effects. Cumulative effects may also occur when the timing of perturbations are so close that the effects of one have not dissipated before the next occurs or when the timing of perturbations are so close in space that their effects overlap.

Since no standard approach or methodology is available to quantify cumulative effects or to define the geographic scope of the area that would be impacted by the proposed action, it is necessary to evaluate each project on an individual basis, define its area of influence, and understand the current social and economic conditions and transportation infrastructure of the area.

5.15.2 Area of Influence

The area of influence (AOI) identified for the proposed action generally includes the Brays Bayou watershed. The majority of the watershed is located within the city of Houston and Harris County. For

the air analysis, the eight-county area identified by the HGAC as the HGB area was used. The proposed acquisitions are adjacent to the existing Arthur Storey Park and Eldridge Detention Basins and are located within the AOI.

Assessing potential cumulative effects related to the proposed action involves a summary and assessment of other projects occurring within the AOI. A number of actions that have been (or are likely to be) undertaken by federal and non-federal agencies within the AOI are discussed in this Cumulative Impacts section. All of the listed projects would have some degree of direct or indirect impact on the environment.

The potential impacts of general trends in population growth, economic development, habitat resources, etc., plus all of the projects described below as well as the proposed action, combine and interact to result in cumulative effects upon the AOI. These cumulative effects are discussed in the following sections. Beneficial effects include new economic opportunities, housing alternatives, employment opportunities, and recreational resources. As development occurs, the need for additional infrastructure and services (schools, transportation, utilities, fire, police, and emergency medical services) would increase. Potentially adverse cumulative effects associated with the continued development of the AOI include loss of habitat, water quality impacts, and the conversion of land uses.

5.15.3 Land Use

According to the City of Houston Planning Department, between 1990 and 2000 Houston experienced an approximately 20 percent change (increase) in population, exceeding the growth rates of New York, Los Angeles, and Chicago. This is the third largest increase in the country behind San Antonio and Phoenix. Residential development in the AOI has been occurring at a relatively rapid pace and primarily involves the mass construction of a large number of homes as well as the infrastructure necessary to support this development. Additional housing, infrastructure, and commercial and public land uses required to serve the population growth projections for the area would result in continued development and land use changes in the region.

Extensive residential development is proposed in many of the surrounding communities in the AOI. The City of Houston issued 33,074 building permits for new construction for the years 1992-2000 (Houston Land Use and Demographic Profile 2000, City of Houston Planning and Development Department). Virtually all of the surrounding areas are currently undergoing residential construction or are planning for development within the next five years.

Each of the municipal areas in the AOI has plans for commercial development. Restaurants, retail shops, office complexes, business parks, and convenience stores are among the commercial developments currently being designed or constructed.

Development impacts associated with normal growth in the region are expected to result in conversion of wetland, riparian habitat, and agricultural lands into commercial, residential or industrial expansion, as well as additional infrastructure and services as people continue to move into the area. The detention basin complexes would potentially create open areas that may create fringe wetland habitat around the edge of some of the basins. Conversely, these sites would no longer be available for residential and/or commercial development. Land use impacts from the proposed action would reduce flood damages to the surrounding areas.

5.15.4 Transportation

Transportation improvement projects in the region include highway, road, bridge, or overpass construction, reconstruction, widening, or upgrades to accommodate current and projected traffic in the area. The cumulative effects of development on transportation facilities and traffic volumes in the region depend largely on the origin and destination points associated with traffic-generating developments. The proposed action is not a traffic-generating development and thus is not expected to have a cumulative effect upon transportation in the AOI.

5.15.5 Social and Economic Impacts

Residential, commercial, office, and industrial development are accompanied by increased economic opportunity and area employment. The degree and type of employment hinges on the economy and area demand. In Harris County, major employment sectors are retail trade, manufacturing, administrative and support, waste management, and remediation services.

According to the Texas Workforce Commission, because employment growth has exceeded labor force growth over the past 10 years, unemployment rates have dropped during the period. Statewide, the unemployment rate dropped from 6.4 percent in year 1990 to 4.4 percent in year 2000. Unemployment for the Houston Metropolitan Statistical Area was 4.3 percent in year 2000.

According to the Greater Houston Partnership and the Texas Workforce Commission as of September 2007, Houston's unemployment rate dropped below the national average in late 1989 and generally remained marginally below it well into 1992. Over the past 15 years, the two rates have crisscrossed, but only rarely have differed significantly from each other.

December 2000 saw Houston's unemployment rate plunge to 3.5 percent, the lowest unemployment rate recorded in Houston since early 1981. From that point, both the Houston and the national rates moved upward through mid-2003 and have trended downward since.

The influx of southern Louisiana residents fleeing Hurricane Katrina in September 2005 abruptly expanded Houston's labor force, interrupting this trend and producing an atypical upward shift in

Houston's unemployment rate through late 2005. By February 2006, however, the Houston and U.S. unemployment rates again were essentially equal (no rates are seasonally adjusted).

Labor availability remains better here than in many other metropolitan areas. Because Houston's labor force is large, its April 2008 unemployment rate of 3.7 percent translates into 38,663 unemployed workers seeking jobs.

The proposed action is not expected to have a cumulative effect on the economy or employment of the AOI.

5.15.6 Terrestrial Habitat (Including Wetlands)

There have been significant losses to wetlands and other significant habitats and in turn wildlife habitat diversity since the 1950's and the continued urbanization and industrialization of the Houston-Galveston area would cause continued pressure on these habitats and the ecosystem. Impacts to wetlands within the AOI would be avoided, minimized, or mitigated by compliance with existing federal statutes that apply to private and government interests. The USACE (under Section 404 of the CWA) and the USFWS (under the Endangered Species Act) have legislative mandates and program implementation policies to reduce or avoid significant adverse impacts to resources on an individual as well as a cumulative basis. These regulations would minimize adverse effects on resources as a cumulative consequence of continuing historic development patterns. Regardless, the obvious trend is continued development in the region and complete avoidance of impacts is not practical.

5.15.7 Water Quality and Hydrology

Various existing and planned developments in the area have a cumulative water quality impact on the receiving water bodies due to wastewater discharges and urban runoff. Surface water quality impacts of new development include point source and non-point source discharges. Point source discharges are regulated by the TPDES, which is administered by the TCEQ to protect the quality of the receiving waterbodies. Runoff from developed sites is a major contributor of non-point source discharges. These discharges are regulated under the TPDES stormwater program for construction, industrial multi-sector, and municipal separate storm sewer system (MS4) activities. In accordance with stormwater regulations, the water quality impacts of runoff are generally mitigated by BMP's utilized to the extent practicable.

Impervious cover increases as a result of development and in turn leads to higher runoff volume as well as higher peak runoff rates, and as a result, the residences and businesses along the bayous are frequently inundated by floodwaters. Flood control projects such as the proposed action are being constructed to improve the hydraulics of the major waterways in an attempt to prevent future flood damage to residences and businesses without worsening existing flood conditions in other areas.

While impacts on water quality and benthic habitat can be anticipated during implementation of the proposed action, these impacts tend to be temporary and localized. Similar activities for other projects in the region can be expected to have similar temporary and localized effects on water quality and habitat. Based on the historic data available regarding effects of detention basins, the proposed action is not expected to make a major contribution to cumulative water quality impacts.

5.15.8 Air Quality

The area for assessing cumulative effects is generally located within the HGB Air Quality Control Region, also referred to as the HGB. This area includes Harris County and the seven surrounding counties of Montgomery, Liberty, Chambers, Galveston, Brazoria, Fort Bend, and Waller.

Ozone is the only criteria pollutant for which the HGB fails to meet the NAAQS. The HGB is categorized as a severe non-attainment area for ozone.

The TCEQ has the responsibility for developing a plan for attaining the air quality standard in the HGB. This plan, which was submitted to and approved by the EPA, is termed the SIP. The SIP describes how the area would reach attainment of the air quality standard for ozone. The SIP sets emissions budgets for point sources such as power plants and manufacturers, area-wide sources such as dry cleaners and paint shops, off-road mobile sources such as boats and lawn mowers, and on-road sources such as cars, trucks, and motorcycles.

The HGB is expected to experience growth in the regional population and economy, resulting in increased traffic and industrial capacity. The network of future roadways and subdivision streets resulting from cumulative effects, in addition to existing and planned industrial facilities within the AOI, would be expected to contribute to additional and varying amounts of air pollution emissions.

Possible cumulative impacts of reasonably foreseeable actions may result from projects related to transportation improvement, industrial facilities, and navigation improvements. Specific factors inherent to these actions impacting air quality include emissions from construction activities, operations, and transportation. Construction activities, such as those included in the proposed action, would result in exhaust emissions from the combustion of fuel in construction equipment and emissions of dust from land disturbance. Emissions from industrial activities result from the operation of the facilities, including combustion emissions from fuel-burning equipment and fugitive emissions of particulate matter (PM) and VOC's. Navigation-related activities would result in emissions from the combustion of fuel in dredge and support vessels and the placement of dredged material.

Air quality impacts associated with the construction of planned transportation and industrial projects would result in a temporary impact on air quality through dust and exhaust gases associated with construction equipment. Measures to control dust would be considered and incorporated into construction

specifications. Emissions from these activities would be intermittent and of relatively short duration, generally ending when the construction activity ends. Although somewhat localized, emissions from the construction of transportation projects would be spread throughout the HGB as different project segments are completed. Emissions from the construction of industrial projects would be more localized, resulting from on-site construction equipment and worker vehicles. As it is likely that the construction activities related to reasonably foreseeable actions and the proposed action are spatially separated by considerable distances, the potential short-term cumulative air quality impacts due to construction activities associated with the foreseeable and proposed actions would be limited and would not result in the deterioration of air quality to exceed applicable standards. Potential long-term cumulative air quality impacts due to reasonably foreseeable actions would be limited and would not result in deterioration that would exceed applicable ambient air quality standards.

5.15.9 Hazardous Materials

The risk of contamination of soils, surface water, and groundwater as a result of construction of the proposed action is small. Several factors contribute to this conclusion, including the type of proposed activities, the nature of the proposed action, and the Storm Water Pollution Prevention Plan (SW3P) and spill control measures to be implemented during construction. As a result, construction of the proposed action is not expected to make a substantial contribution to cumulative effects of the use of hazardous materials on the environment in the region.

5.15.10 Present and Future Actions

Specific actions that may contribute to overall cumulative effects in the area are described in the following sections.

5.15.10.1 Transportation

TxDOT

Several planned roadway and highway projects and studies would impact the AOI. These include improvements along US 59 and West Loop IH 610. TxDOT is the local state agency on these projects with FHWA as the federal lead agency.

Transportation Improvement Plan

The Transportation Improvement Plan (TIP) is a staged three- to five-year prioritized program of transportation projects in the metropolitan planning area. It is designed to be consistent with the Regional Transportation Plan (RTP). This program is required for a locality to receive federal transit and highway grants. The TIP also contains an annual or biennial element that lists all transportation project activities that would receive federal funding for a given one- or two-year period. The MPO and state and transit operators are required to cooperatively develop the TIP. The MPO for Harris County is the HGAC.

5.15.10.2 Federal Flood Control Projects

In addition to the navigation channel projects, several Federal Flood Control projects, such as the proposed action, are under consideration or have been constructed by HCFC and the USACE. These projects include modifying existing channels as well as excavating detention basins to reduce flood damage to residences and businesses within those watersheds. Accounts of past and present Federal Flood Control projects are provided below:

The following seven Federal Flood Control projects have been completed (year completed):

1. Addicks and Barker Reservoirs (1948)
2. Brays Bayou (1968)
3. White Oak Bayou (1976)
4. Vince Bayou (1980)
5. Little Vince Bayou (1988)
6. Cypress Creek (2001)
7. Clear Creek, second outlet (1997)

The following two Federal Flood Control projects are currently under construction (year started):

1. Sims Bayou (1994)
2. Brays Bayou, Section 211(f), Detention Element (1994) (the authorized detention element plan)

The following Federal Flood Control project studies have been completed, but construction has not yet begun:

1. Greens Bayou, Section 211(f)
2. Brays Bayou, Alternative to Diversion Element, Section 211(f)

The following five Federal Flood Control projects are currently being studied:

1. Hunting Bayou, Section 211(f)
2. White Oak Bayou, Section 211(f)
3. Halls Bayou, Section 211(f)
4. Buffalo Bayou and Lower White Oak, Section 211(f)
5. Clear Creek Flood Damage Reduction and Ecosystem Restoration Study

All the previously constructed or permitted flood control projects help alleviate flooding and damages in the surrounding areas, as well increase the potential for development in these areas. The proposed action would have the same effects. The aforementioned projects and the proposed action would also potentially reduce habitat for some species while increasing habitat for others. The proposed action would provide

better habitat for terrestrial species, potentially improve water quality within the bayou, and provide food for other species.

The impacts from the proposed action are not considered significant, even when considered cumulatively with impacts from the past, present, and reasonably foreseeable future actions.

5.16 MITIGATION

5.16.1 Wetland Mitigation Alternatives

Wetlands were identified as the only significant resource warranting compensatory mitigation. Of the approximate 188 acres required for detention basin construction, a total of 5.14 acres are considered wetlands and would be impacted by the proposed action.

As discussed in Sections 4.6.2 and 5.7.2, habitat modeling was conducted to determine the habitat quality of the wetlands within the project area. The project impact analysis projects future habitat conditions over the period of analysis in terms of AAHU's and determines the net impact of the proposed action in terms of AAHU's. The net impact of the proposed action is 0.634 AAHU of PSS wetlands and 0.709 AAHU's of PFO wetlands, for a total of 1.343 AAHU's.

The acreage required for mitigation is based on the HSI scores for each alternative mitigation area and the AAHU's needed. The AAHU's were divided by the HSI scores to determine the mitigation acreage requirements for each habitat type (AAHU/HSI = acres). The Habitat Analysis Project Impact and Mitigation Alternatives Analysis report is included in Appendix A.

Compensatory wetland mitigation would be provided for all or part of the 5.14 acres of wetlands that are impacted. Five alternatives for compensatory mitigation for the excavation or filling of the wetlands within the proposed action were initially evaluated, as discussed below. A Cost Effectiveness/ Incremental Cost Analysis (CE/ICA) was completed using the USACE's IWR Planning Suite software for four of these mitigation alternatives for the purpose of evaluating the cost in terms of AAHU's.

The five alternatives include:

Alternative 1 Creation of wetlands on-site within the Eldridge Detention Basin (HCFC Unit No. D500-04-00) equal to 3.917 AAHU's.

Alternative 2 Creation of wetlands on-site within the Arthur Storey Park Detention Basin (HCFC Unit No. D500-06-00) equal to 3.917 AAHU's. This alternative was dismissed prior to the CE/ICA due to recreational features planned within the basin, which could potentially impact wetland mitigation plantings.

Alternative 3 Acreage in the Greens Bayou Wetlands Mitigation Bank (GBWMB) Subdivision B equal to 1.343 AAHU's.

Alternative 4 Creation of wetlands on additionally purchased property equal to 3.917 AAHU's.

Alternative 5 Creation of wetlands on-site within the Eldridge Detention Basin (HCFCD Unit No. D500-04-00) equal to 20 acres, or 14.056 AAHU's.

Based on the results of the CE/ICA, two of the alternatives are best buy alternatives: Alternative 3, acreage in the GBWMB Subdivision B equal to 1.343 AAHU's; and Alternative 5, the on-site creation of wetlands equal to 20 acres, or 14.056 AAHU's. Figure 1 shows the costs and outputs for all mitigation alternatives differentiated by cost effectiveness.

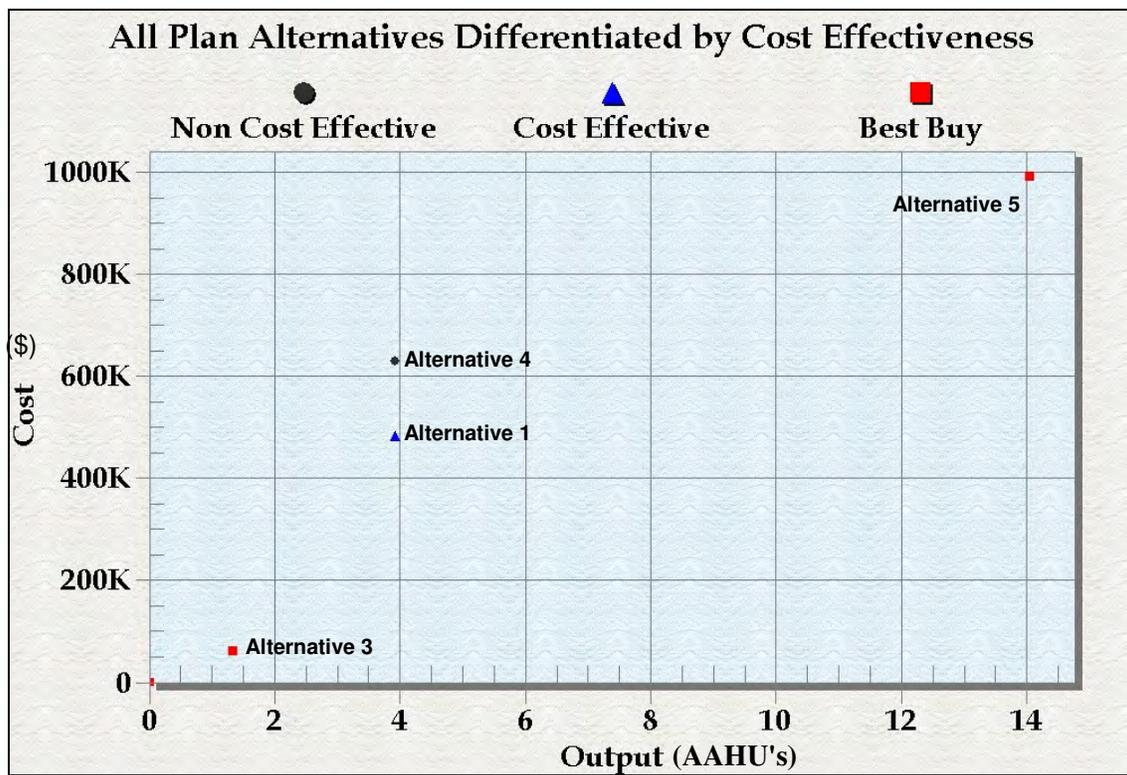


Figure 1
Cost and Output for All Mitigation Alternatives

Alternative 3 provides the lowest average cost per AAHU and the lowest incremental cost per unit of output (AAHU) while providing the 1.343 AAHU's required to mitigate for wetland impacts associated with the proposed action. Alternative 5 provides 12.713 additional AAHU's above those provided by Alternative 3 and increases the cost by \$929,766. Alternative 3 is selected to provide the required

AAHU's for the lowest cost (as described in following section). The CE/ICA report is provided in Appendix F.

5.16.2 Wetland Mitigation Plan

The wetland mitigation plan would consist of purchasing 2.58 acres from the GBWMB Subdivision B to mitigate for impacts to each wetland cover type. The 1,250-acre GBWMB became effective in 1995 based on the Memorandum of Agreement (MOA) between HCFCD and the Mitigation Bank Review Team (MBRT), comprised of the USACE, USFWS, TPWD, Texas General Land Office (GLO), EPA, TCEQ, and the National Marine and Fisheries Service (NMFS). Current development consists of Subdivision B, totaling approximately 165 acres. Subdivision B had 100.76 credits deposited on July 19, 2005. Credits still remain available for purchase at Subdivision B. Subdivision B was evaluated using habitat assessment procedures and was noted to consist of emergent and forested wetlands. Scrub-shrub wetland impacts would be mitigated through the purchase of forested wetland acres; however, no scrub-shrub wetland habitat would be provided by this alternative. Mitigation would require a total of 2.58 acres of forested wetland acres. The cost of purchasing credits at the GBWMB is estimated to be \$24,100 per acre of wetland impacted, for a total cost of \$62,178. Maintenance and monitoring requirements for this area is already established through the GBWMB approved Mitigation Banking Instrument.

In addition to wetland mitigation occurring at the GBWMB, native emergent wetland vegetation species would be planted at the detention basins. After initial wetland planting occurs in the basins, the contractor would conduct a survival survey of the area no less than 30 days from the date of planting. At this time, a "Satisfactory Stand" would be determined if: (1) planting areas have a survival rate of at least 90 percent, and/or (2) contiguous planting covering areas less than 100 square feet have a survival rate of at least 50 percent. The contractor would be required to replant any areas that do not achieve the "Satisfactory Stand" requirements. All required replanting will be initiated within 30 days from the date of the survival survey determination (i.e., no more than 60 days from the initial date of planting). Replanting activities must be completed within 30 days of the replanting start date.

The contractor would complete a second survival survey no less than 90 days from the date of the planting. At this time, a "Successful Stand" would be determined if planting areas have a survival rate of at least 80 percent. Viable herbaceous plants will be indicated by the evidence of one or more new live plant shoots arising from each separate plant plug or clump and will be determined by HCFCD. Monitoring would continue to occur within 180 days from the date of planting and 270 days from the date of planting, for a total of one year. Replanting would continue to occur if survival rates are not met. Written reports detailing survival rates and areal coverage would be submitted by the contractor to HCFCD after each survey. The planting sites would be managed to control the proliferation of noxious species, including alligatorweed (*Alternanthera philoxeroides*), cattails (*Typha spp.*), hydrilla (*Hydrilla*

sp.), Chinese tallow-tree, giant ragweed, water hyacinth (*Eichhornia crassipes*), vasey grass, Johnson grass (*Sorghum halepense*), rattle-bush (*Sesbania drummondii*), and other species identified by HCFCD.

6.0 COORDINATION WITH OTHERS

Coordination letters were sent to the following federal, state, and local agencies requesting their review of the proposed action. Copies of all correspondence are provided in Appendix C. The agencies' responses are summarized below. Federal, state, and local agencies and special interest groups and citizens will be afforded the opportunity to review and comment on this document.

6.1 FEDERAL AGENCIES

U.S. Fish and Wildlife Service (USFWS). Coordination letters were sent to the USFWS on December 9, 2004 and January 15, 2009. It has been determined the proposed action would have "no effect" on any threatened or endangered species. USFWS responded on January 26, 2009, and stated that USFWS does not provide concurrence on a "no effect" determination. Copies of correspondence with the USFWS are included in Appendix C.

Natural Resource Conservation Service (NRCS). A coordination letter was sent to NRCS on November 19, 2004. In December 2004, the NRCS-Harris County office determined that the project areas of both the Arthur Storey Park Detention Basin and the Eldridge Detention Basin consist of Prime Farmland Soils. Therefore, on June 7, 2005, PSB&J completed a Farmland Conversion Impact Rating (AD-1006) for the proposed action. On June 27, 2005, NRCS verified a score of 102 for this project, and a score of less than 160 needs no further consideration and is found consistent with the FPPA.

6.2 STATE AGENCIES

Texas Parks and Wildlife Department (TPWD). As part of the Fish and Wildlife Coordination Act, a coordination letter was sent to TPWD regarding the proposed project. To date, no response has been received.

Texas Historical Commission (THC). No prehistoric or historic sites would be impacted by the proposed action. THC concurred with the findings of the reports and considered the permit requirements complete on November 5, 2002; June 1, 2004; and June 28, 2005.

Texas Commission on Environmental Quality (TCEQ). Coordination letters were sent to TCEQ on November 19, 2004, and June 14, 2005, requesting information on possible environmental constraints that are present in the areas proposed for expansion. To date, no response has been received.

Texas General Land Office (GLO) – Coastal Coordination Council (CCC). A coordination letter was sent to the CCC on November 19, 2004. On December 29, 2004, CCC determined the proposed action is outside of the Texas Coastal Management Program boundary and therefore not subject to review.

6.3 LOCAL

Houston-Galveston Area Council (HGAC). Coordination letters were sent to HGAC on November 19, 2004, and June 14, 2005. On June 22, 2005, HGAC found no air quality constraints with respect to on-road transportation-generated emissions in the areas proposed for expansion.

6.4 PUBLIC INVOLVEMENT

During development of the authorized detention element plan, coordination was conducted with the Harris County Commissioners, HCFCD, Harris County Precinct 3, City of Houston, Houston Parks Department, Brays Bayou Civic Association, and interested citizens. The proposed action is part of the Project Brays initiative. Through this initiative a website has been developed that posts the latest project information. Newsletters with updated information are also sent by e-mail and standard mail to community members along Brays Bayou. Information is further presented and feedback gained through presentations to homeowners associations and community organizations, community breakfast meetings, and a Project Brays Hotline number and e-mail address. Table 6-1 presents all public meetings conducted since 2001.

**Table 6-1
Public Involvement Meetings**

Public Meeting	Date	Location	Purpose
No. 1	07/18/2001	11203 Oakcenter	Overview of Project Brays Emphasis on the upstream portion
No. 2	07/24/2001	Alief Library 7979 S Kirkwood	Overview of Project Brays Emphasis on the upstream portion
No. 3	09/26/2002	Helfin Elementary School 3303 Synott	Update on Project Brays
No. 4	03/21/2004	West Houston Christian Center Fellowship Hall 11300 Wilcrest Green Drive	Project update and information on regional stormwater detention
No. 5	06/10/2004	Westside Police Station	Presentation and Q&A session on Project Brays
No. 6	10/06/2005	Helfin Elementary School 3303 Synott	Update on Project Brays
No. 7	11/08/2005	1228 N Shadow Cove	Update on Project Brays
No. 8	03/30/2006	Shadow Lake	Update on current and upcoming projects
No. 9	05/05/2006	Art Storey Park	Update on current and upcoming projects
No. 10	11/02/2006	Lazy Daisy Garden Club 8827 Tanager	Presentation and Q&A session on Project Brays
No. 11	01/17/2008	Temple 13944 Shiller Rd.	Update on Project Brays
No. 12	12/11/2008	Brays Bayou Tour	Update on Project Brays

7.0 RELATIONSHIP OF THE PROPOSED ACTION TO ENVIRONMENTAL REQUIREMENTS

The following requirements and required coordination were taken into account during the development of the proposed action.

7.1 NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

This Act established a broad national framework for protecting the environment. NEPA's basic policy is to assure that all branches of government give proper consideration to the environment prior to undertaking any major federal action that significantly affects the environment.

This document, prepared in accordance with Council on Environmental Quality regulations, identifies, assesses, and compares the environmental, economic, and social consequences of the reasonable alternatives. In accordance with NEPA, the findings of this Draft EA were used to select the alternative plan that meets the purpose and need and has the least adverse effects on the human environment. This plan is referred to as the proposed action.

7.2 FARMLAND PROTECTION POLICY ACT (FPPA)

This Act minimizes the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses, and to assure that federal programs are administered in a manner that, to the greatest extent practicable, would be compatible with state and local governments and private programs and policies to protect farmland.

A Farmland Conversion Impact Rating (AD-1006) was completed for the proposed action, and in June 2005 NRCS verified a score of 102. A score of less than 160 needs no further consideration. Therefore, the proposed action is consistent with the FPPA.

7.3 EXECUTIVE MEMORANDUM – ENVIRONMENTALLY AND ECONOMICALLY BENEFICIAL PRACTICES ON FEDERAL LANDSCAPED GROUNDS

This presidential memorandum, signed August 10, 1995, requires agencies to, where cost-effective and to the extent practicable, use beneficial landscaping practices. It states that agencies would: (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. The created and enhanced natural habitat areas within the regional detention facilities would be constructed in accordance with these guidelines.

7.4 EXECUTIVE ORDER 13112 – INVASIVE SPECIES

This Order requires federal agencies to prevent the introduction of invasive species and provide for their control, and then to minimize the economic, ecological, and human health impacts that invasive species cause. Native plant species of grasses, shrubs, or trees would be used in the landscaping and in the seed mixes where practicable. No noxious species would be used to revegetate the disturbed areas, and soil disturbance would be minimized, to the greatest extent practical, to ensure that invasive species do not establish within the detention facilities.

7.5 FISH AND WILDLIFE COORDINATION ACT

This Act authorizes the Secretaries of Agriculture and Commerce to provide assistance to and cooperate with federal and state agencies to protect, rear, stock, and increase the supply of game and fur-bearing animals, as well as to study the effects of domestic sewage, trade wastes, and other polluting substances on wildlife. This Act proposes to assure that fish and wildlife resources receive equal consideration with other values during the planning of water resources development projects.

As amended in 1946, the Act requires consultation with the USFWS and state fish and wildlife agencies where the "waters of any stream or other water body are proposed or authorized, permitted or licensed to be impounded, diverted...or otherwise controlled or modified" by any agency under a federal permit or license. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources." Coordination letters were submitted to the TPWD and the USFWS as part of the Fish and Wildlife Coordination Act. Copies of this correspondence are included in Appendix C. Additionally, the USFWS prepared a Planning Aid Letter, which is included in Appendix B..

7.6 MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act, originally passed in 1918, provides protection for migratory birds. Under this Act, it is unlawful to take, import, export, possess, buy, sell, purchase, or barter any migratory bird. Feathers or other parts, nests, eggs, and products made from migratory birds are also covered by the Act. Take is defined as pursuing, hunting, shooting, poisoning, wounding, killing, capturing, trapping, or collecting.

The Migratory Bird Treaty Act (MBTA) (1918) protects migratory birds, active nests, eggs, and/or young. It should be noted that the project will be implemented in full compliance with all provisions and regulations outlined in and pursuant to the MBTA. To prevent effects to migratory birds and their habitat, construction should be avoided during the peak nesting season (March 1 to September 1). In the event that migratory birds are encountered on-site during project construction, every effort will be made to avoid harm to the birds, their nests, eggs, and/or young. If necessary, old nests will be removed from structures following the nesting season prior to the start of construction. Preventative measures will be

taken to dissuade birds from building new nests within the project area. Details on some migratory bird species common within the project area can be found in Section 4.3.2.1 and in Table 4-2.

7.7 ENDANGERED SPECIES ACT (ESA) OF 1973

This Act provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. Section 7(a)(2) of this Act requires each federal agency to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any listed species. The USFWS was consulted regarding the proposed action. Based on NDD data and site surveys, there would be no effect to threatened or endangered species from the proposed action and the project area is not located within officially designated critical habitat. Copies of all correspondence are provided in Appendix C. In compliance with this Act, the USFWS would be afforded the opportunity to review this Draft EA and comment on the potential impacts of the proposed action. Their comments and recommendations will be included in the Final EA document. A draft BA was prepared for the proposed action and is included in Appendix D. This draft BA has been sent to the USFWS for review and concurrence.

7.8 EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT

This Order requires agencies to take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

The proposed action requires construction of the detention facilities within or partially within the 100-year floodplain to fulfill the proposed action's purpose and need, which is to construct additional stormwater storage within the upper watershed of Brays Bayou to reduce flood damages along Brays Bayou. The proposed action would not induce increased flooding in developed areas and would not contribute to increased future flooding damages.

7.9 CLEAN WATER ACT OF 1977

This Act is an amendment to the Federal Water Pollution Control Act of 1972 and it sets the basic structure for regulating discharges of pollutants into waters of the U.S. The Act makes it unlawful to discharge stormwater from construction sites into a water of the U.S. without a permit.

Greater than 3 acres of wetlands would be impacted by the proposed action. Under TCEQ guidance, the proposed action qualifies as a Tier II project. Tier II projects require completion of a 401 Certification Questionnaire form and an Alternatives Analysis checklist. These completed forms are included in Appendix G. Water quality certification would be obtained from TCEQ prior to issuance of a FONSI by the USACE. Findings of this Section 404(b)(1) evaluation demonstrate that the proposed action would be in compliance with this Act (see Appendix G).

Because this project would disturb more than 5 acres of land, HCFCFCD is required to comply with the TCEQ TPDES General Permit for Construction Storm Water Runoff. A Notice of Intent stating that an SW3P has been developed would be filed with the TCEQ prior to the beginning of construction. Implementation of the SW3P would minimize damage as required by Section 402 (p) of this Act.

At least one control from each of the three categories (erosion, sedimentation, and post-construction total suspended solids) must be implemented. The controls, known as BMP's (best management practices) are utilized to comply with the proposed action. Sod would be used to deal with erosion control. Silt fences would be set up to control sedimentation. Vegetative filter strips would be used to control total suspended solids. Other control techniques may be employed as conditions warrant on the construction sites.

7.10 EXECUTIVE ORDER 11990, PROTECTION OF WETLANDS

This Order requires agencies to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. Impacts to wetlands were minimized to the greatest possible extent. The purchase of wetlands within the GBWMB is proposed to compensate for the unavoidable destruction, loss, or degradation of the wetlands identified within the additional tracts.

7.11 COASTAL ZONE MANAGEMENT ACT OF 1972

This Act encourages states to preserve, protect, develop, and where possible, restore or enhance valuable natural coastal resources, such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats.

Coordination with the CCC was initiated to confirm the project area is outside of the Coastal Zone Management Plan boundary. Copies of correspondence are provided in Appendix C. It was determined that the proposed action occurs outside the limits of the Coastal Zone Management Plan boundary and the proposed action would not impact any wetlands within the extended wetland jurisdictional area of the Coastal Zone Management Plan boundary. A certification of consistency is not required for the proposed action (Section 5.7.5).

7.12 COAST GUARD AUTHORIZATION ACT OF 1982

This Act authorizes the U.S. Coast Guard to regulate the construction of bridges across navigable waters of the U.S.

Implementation of the proposed action would not require replacement or modification of any bridges; therefore, coordination with the U.S. Coast Guard is not required under the proposed action.

7.13 NATIONAL HISTORIC PRESERVATION ACT (NHPA) OF 1966, AS AMENDED

This Act establishes as federal policy the protection of historic properties or places and their values in cooperation with other nations and with state and local governments. Section 106 of the Act requires federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Places a reasonable opportunity to comment.

The effects of the proposed action on historic properties were assessed as required under Section 106 of this Act. No prehistoric or historic sites would be impacted by the proposed action. THC concurred with the findings of the reports and considered the permit requirements complete. Copies of correspondence with the THC are included in Appendix C.

7.14 23 CODE OF FEDERAL REGULATIONS 771.135, SECTION 4(F)

These regulations establish as federal policy the protection of publicly-owned parklands and recreational areas, wildlife and waterfowl refuge lands, and historic sites of national, state, or local significance as determined by the federal, state, or local officials having jurisdiction.

There are no public parks or pathways located within the project area. Implementation of the proposed action would not require the taking of a Section 4(f) property. No temporary construction easements and no additional ROW are required from any parks. A Section 4(f) evaluation is not required.

7.15 CLEAN AIR ACT OF 1970

This Act is the comprehensive federal law that regulates air emissions from area, stationary, and mobile sources. This law authorizes the EPA to establish NAAQS to protect public health and the environment.

Pursuant to the General Conformity Rule, the state must make a determination and document that the total of direct and indirect emissions from the action, or portion thereof, would result in a level of emissions that, together with all other emissions in the HGB non-attainment area, would not exceed the emissions budgets specified in the SIP. Based on evaluation of the proposed action emissions, the NO_x and VOC emissions do not exceed the current *de minimis* threshold of 25 TPY prior to June 15, 2004; 100 TPY after June 15, 2004; and 25 TPY after October 1, 2008, for the duration of the proposed action. As a result, proposed action emissions are deemed to be in general conformity with the HGB SIP and no further analysis is required.

7.16 EXECUTIVE ORDER 12898, FEDERAL ACTION TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS

This Order, signed on February 11, 1994, requires all federal agencies to address the impact of their programs with respect to environmental justice. The Order requires that ethnic minority and low-income populations not receive disproportionately high adverse human health or environmental impacts and require that representatives of any low-income or ethnic minority populations that could be affected by the proposed action be involved in the community participation and public involvement process.

The proposed action would have no substantial adverse effects on ethnic minorities or poverty status persons living within the vicinity of the proposed action.

7.17 EXECUTIVE ORDER 13166, IMPROVING ACCESS TO SERVICES FOR PERSONS WITH LIMITED ENGLISH PROFICIENCY

This EO, signed by President Clinton on August 11, 2000, calls for all agencies to ensure that their federally-conducted programs and activities are meaningfully accessible to LEP individuals.

LEP populations within the project area were identified. HCFCD would publish future public meeting notices in English, Spanish, and Asian newspapers and would provide means of communication to LEP individuals at future public involvement activities in accordance with the requirements of EO 13166.

7.18 MEMORDANUM OF AGREEMENT – AIRCRAFT-WILDLIFE STRIKES

This MOA among the Federal Aviation Administration (FAA), the U.S. Air Force (USAF), the U.S. Army, the EPA, the USFWS, and the U.S. Department of Agriculture (USDA) provides established procedures necessary to coordinate their missions to more effectively address existing and future environmental conditions contributing to aircraft-wildlife strikes throughout the United States. These efforts are intended to minimize wildlife risks to aviation and human safety, while protecting the Nation's valuable environmental resources.

The FAA's Advisory Circular Hazardous Wildlife Attractants on or Near Airports (USDOT, 1997) recommends a distance of 5 statute miles between a wildlife attractant area and an airport's approach or departure airspace. The proposed project area is located approximately 7 miles northeast of the Sugar Land Regional Airport (SGR). Due to the distance between the proposed project and SGR, the proposed action would have no substantial effect on aircraft-wildlife strikes within the vicinity of the proposed action.

8.0 CONCLUSIONS

Based on the findings of this Draft EA, the proposed action would not have any significant adverse environmental impacts on the quality of the human environment. Since no significant adverse impacts were identified, an Environmental Impact Statement is not required. Factors considered were effects on soils; land use; biological resources; threatened and endangered species; floodplains, drainage, and water quality; aquatic environment; cultural resources; HTRW sites; air quality; noise; socioeconomics; environmental justice; recreation; and cumulative impacts. The proposed action would result in unavoidable impacts to existing wetland areas. Wetland mitigation at the GBWMB and the creation of new wetland areas would compensate for this loss. Beneficial effects of implementing the proposed action include reduction of flood damages, conservation and preservation of natural resources, and the creation of new habitat. After consideration of the alternatives, the proposed action is considered economically sound, environmentally acceptable, and in the public interest.

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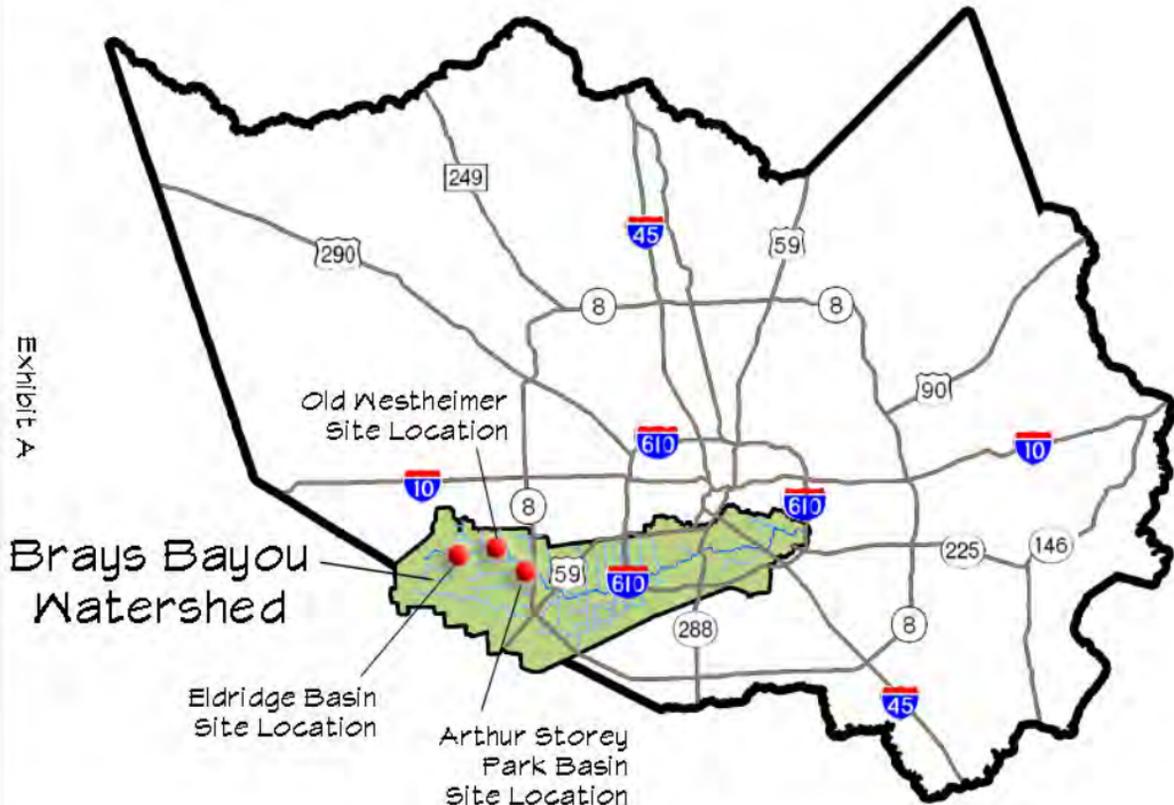
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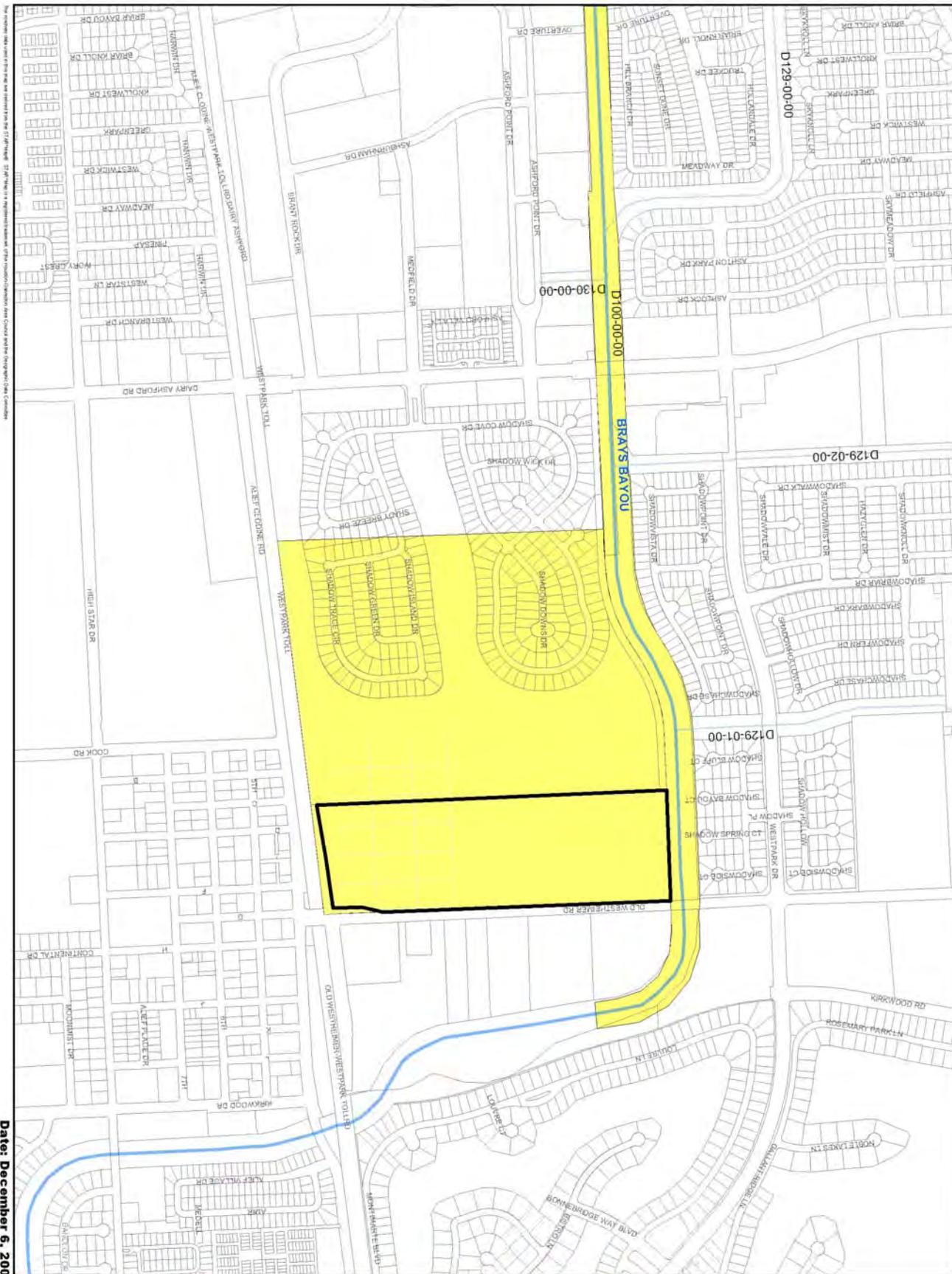
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Exhibits

Exhibit A





Date: December 6, 2005

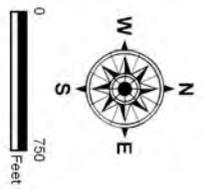
D500-04-00

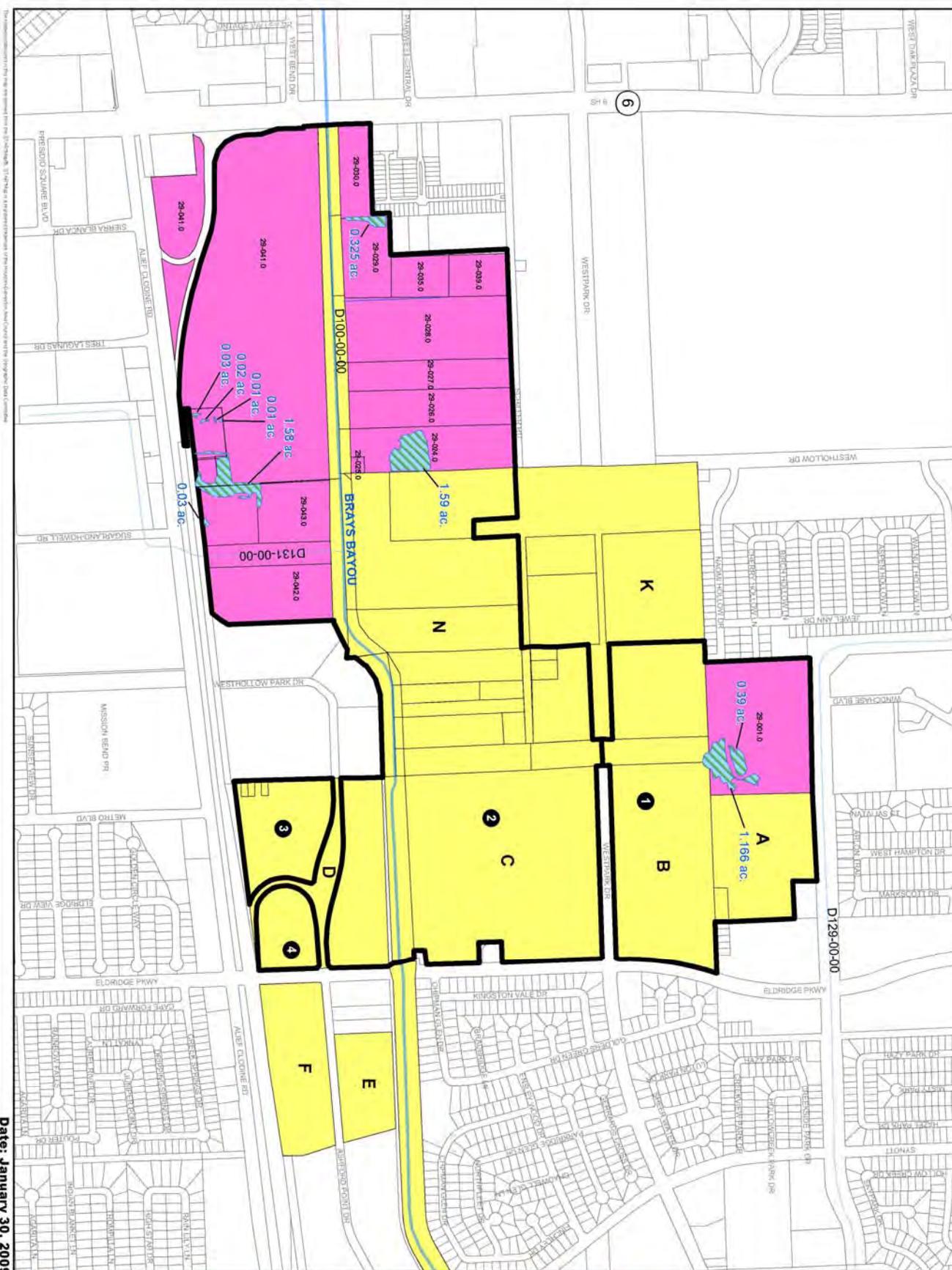


Legend	
	Additional Tract
	Authorized Tract
	Compartment

D500-01-00 Old Westheimer Basin

EXHIBIT D





Date: January 30, 2009

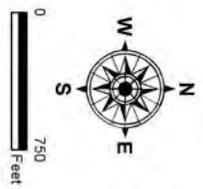
PROJECT BRAYS
The Brays Bayou Flood Storage and Treatment Project
D500-04-00

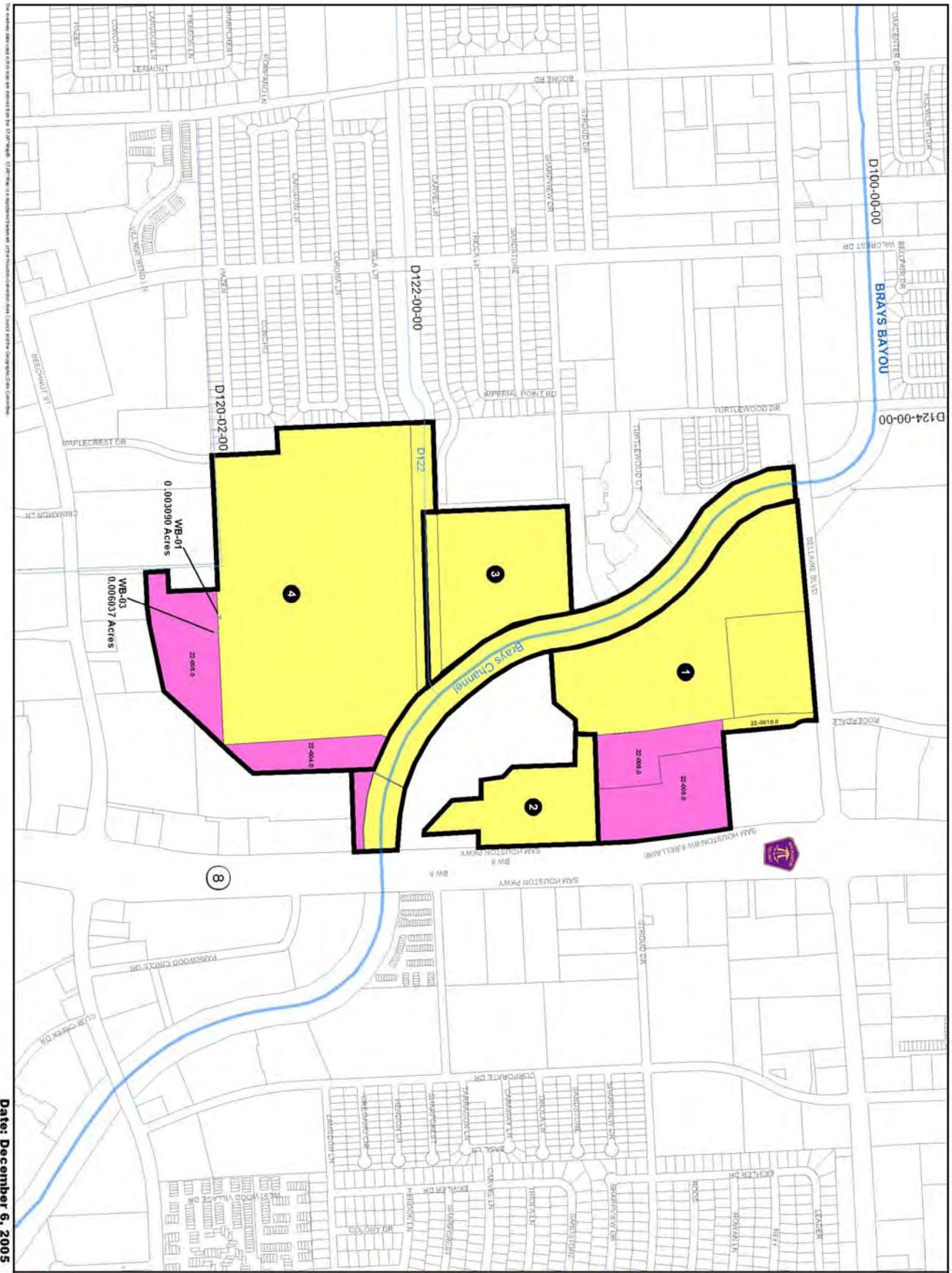
Legend

- Authorized Tract
- Additional Tract
- Wetlands
- Proposed Project Compartment Authorized Compartment

D500-04-00 Eldridge Basin

EXHIBIT C





This document shall not be used for any other purpose than that for which it was prepared. It is the responsibility of the user to verify the accuracy of the information contained herein.

Date: December 6, 2005

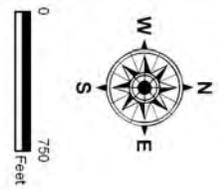


Legend

- Authorized Tract
- Additional Tract
- Wetlands
- Proposed Project Component

D500-06-00 Arthur Storey Park Basin

EXHIBIT B



Appendix A

Summary of Habitat Assessment Baseline Report and Habitat Assessment Project Impact and Mitigation Alternatives Analysis

Summary of Habitat Assessment 2008 Updated Right-Of-Way on the Detention Element, Upper Watershed of Brays Bayou HCFCD Project ID 100-00-00-Y005 Harris County, Texas

This text is a summary of the habitat assessment conducted on the Eldridge Detention Basin and Arthur Storey Park Basin within the upper watershed of Brays Bayou in Harris County, Texas. Initially, HCFCD had planned construction on three basins; however, following approval of the detention element plan, HCFCD learned that a substantial portion of the proposed Old Westheimer Basin project area (approximately 70 acres) was no longer available for acquisition. HCFCD purchased additional properties to construct additional storm water storage within the upper watershed of Brays Bayou to compensate for this loss in storage capacity at the Old Westheimer Basin. The additional properties total approximately 188 acres, which includes approximately 153 acres at the Eldridge Detention Basin and approximately 35 acres at the Arthur Storey Park Detention Basin.

Construction of the Eldridge Detention Basin began in 1998, while construction within the Arthur Storey Detention Basin began in 1995. Construction within the Eldridge Detention Basin is ongoing and construction within the Arthur Storey Park Detention Basin is complete. Therefore, much of the habitat present in 1995 and 1998 no longer exists. Habitat types within these basins prior to construction were determined using historic aerial photography and include upland forest, upland pasture, upland scrub-shrub, palustrine forested (PFO) wetlands, palustrine scrub-shrub (PSS) wetlands, and disturbed or developed. The purpose of the habitat assessment is to evaluate the quality of the habitat types within these detention basins as they existed before construction in order to determine the impacts associated with the proposed project and the appropriate mitigation.

The habitat assessment methodology is based on habitat evaluation procedures (HEP). HEP uses a baseline assessment consisting of (1) defining the sampling location; (2) HSI sampling methodology; (3) selecting evaluation species; and (4) characterizing the study area in terms of habitat units (HU).

HEP, developed by the U.S. Fish and Wildlife Service (USFWS), is a species-habitat approach to impact assessment that quantifies habitat quality for selected evaluation species through the use of a habitat suitability index (HSI). The HSI is multiplied by the area of available habitat to determine the total HU's for that species in the study area. The objective of a baseline assessment is to calculate the number of HU's at one point in time for the entire study area. Three HEP species were selected for the analysis: eastern gray squirrel (*Sciurus carolinensis*), veery (*Catharus fuscescens*), and eastern meadowlark (*Sturnella magna*). Based on the cover types, six sampling sites were created within the Eldridge Basin

and Arthur Storey Park Basin. The upland pasture (Site 4 and Site 6), forested wetland (Site 2 and Site 5), upland forest (Site 5), scrub-shrub wetland (Site 3), and upland scrub-shrub (Site 1) habitat types within the project area were sampled for the data required by the HSI models for the species mentioned above.

Data results were applied to individual HSI models to obtain an HSI score for individual evaluation species within each representative habitat. The HSI score for the individual species was multiplied by the patch size to determine HU's.

In the Eldridge Detention Basin analysis of the habitat types resulted in a total of 43.33 HU's (Table 1).

Table 1
Habitat Units Within the Eldridge Basin

Habitat Type	Size of Patch (acres)	Habitat Units (HU's)
Upland Forest	9.15	1.60
Forested (PFO) Wetland	1.89	0.33
Upland Scrub-Shrub	14.64	1.46
Scrub-Shrub (PSS) Wetland	3.24	1.17
Upland Pasture	48.47	38.77
Total	77.39	43.33

Analysis of the habitat types within the Arthur Storey Park Detention Basin resulted in a total of 5.02 HU's (Table 2).

Table 2
Habitat Units Within the Arthur Storey Park Basin

Habitat Type	Size of patch (acres)	Habitat Units (HU's)
Upland Pasture	1.06	0.90
Upland Scrub-Shrub	10.97	1.10
Scrub-Shrub Wetland	0.01	0.004
Total	12.04	2.00

Summary of Habitat Assessment Project Impact and Mitigation Alternatives Analysis 2008 Updated Right-Of-Way on the Detention Element Upper Watershed of Brays Bayou HCFCD Project ID D100-00-00-Y005

The Habitat Assessment Project Impact and Mitigation Alternatives Analysis 2008 Updated ROW on the Detention Element Upper Watershed of Brays Bayou HCFCD Project ID D100-00-00-Y005 report presents the final steps in the habitat assessment analysis: the project impact analysis and mitigation alternatives analysis. The results of this report will be used to complete a Cost Effectiveness/Incremental Cost Analysis (CE/ICA).

The mitigation alternatives analysis evaluates the habitat associated with two mitigation alternatives (on-site wetland creation and purchasing credits from the Greens Bayou Wetland Mitigation Bank [GBWMB]). The project impact analysis projects future habitat conditions over the period of analysis in terms of average annual habitat units (AAHU) and determines the net impact of the proposed project.

Based on the analysis that was conducted for this report, the proposed project would result in a total net impact of 1.343 AAHU's. Approximately 5.76 acres of on-site wetland creation would be required to mitigate for the 1.343 AAHU's. Mitigation within the GBWMB would require a purchase of wetland credits equal to a total of 2.58 acres.

The results of the project impact analysis and mitigation alternatives analysis will be used to complete a CE/ICA. The cost effectiveness analysis will evaluate the relationship between the cost and environmental output (AAHU) associated with five mitigation alternatives. The CE/ICA will determine the most cost-effective wetland mitigation alternative.



Appendix B
Planning Aid Letter



United States Department of the Interior FISH AND WILDLIFE SERVICE

Division of Ecological Services
17629 El Camino Real #211
Houston, Texas 77058-3051
281/286-8282 FAX: 281/488-5882



August 6, 2010

Ingrid Fairchild
Harris County Flood Control District
9900 Northwest Freeway
Houston, Texas 77092

Dear Ms. Fairchild:

This planning aid letter serves to provide the U.S. Fish and Wildlife Service's (Service) comments and recommendations regarding the Brays Bayou Federal Flood Control Project; identify and describe existing fish and wildlife resources within the proposed project area; evaluate and compare currently proposed alternatives; identify potentially significant impacts; identify modifications or alternatives which address fish and wildlife related problems, opportunities, or planning objectives; and recommend measures for resource protection early in the project planning process. Our comments are provided in accordance with the provisions of the Fish and Wildlife Coordination Act (16 U.S.C. 661-667(e)), the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), the Migratory Bird Treaty Act (16 U.S.C. 703 et seq.), the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.) and are intended to assist in the preparation of any further project assessments. This information does not represent a final report of the Secretary of the Interior within the meaning of Section 2(b) of the Fish and Wildlife Coordination Act. Previous Service input into this study included letters dated March 18, 1986, February 26, 1993, and January 21, 1997 and two Fish and Wildlife Coordination Act reports prepared in 1987 and 1997.

Project Background

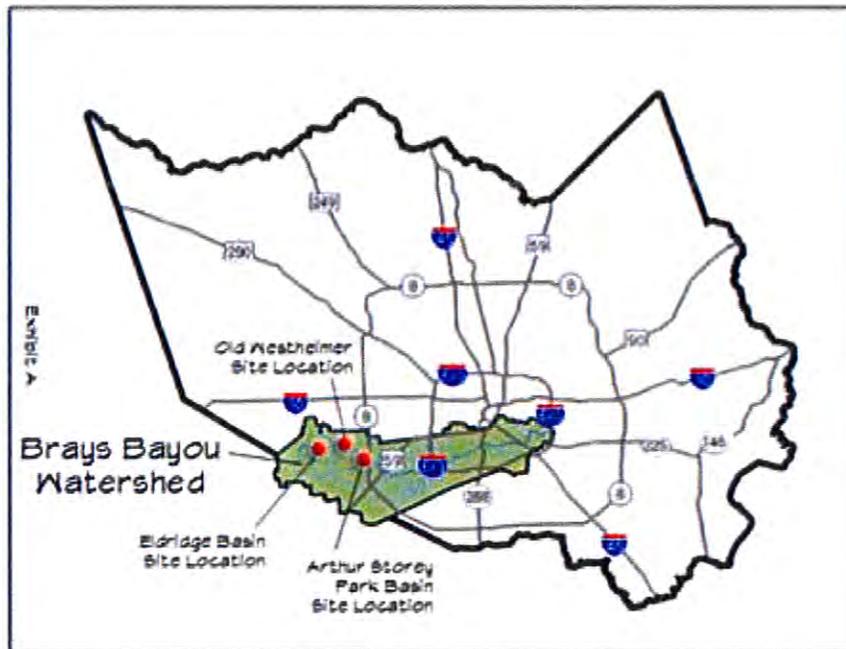
The first Federal Flood Control Project for Brays Bayou was authorized by the Flood Control Act of 1954 and was designed by the U.S. Army Corps of Engineers (Corps) in 1953 and 1954, with construction completed in 1971 (LJA Engineering et al. 2000). The Feasibility Report on Buffalo Bayou and Tributaries was prepared in May 1988 and approved by the Board of Engineers for Rivers and Harbors in June 1989. Congress authorized the current Brays Bayou project as part of the 1988 Feasibility Report under the Water Resources Development Act of 1990, Public Law 101-640. In 1991, Harris County Flood Control District (District) requested a separate elemental analysis to include diversion and detention elements of the authorized Brays Bayou project. Further analysis found that the diversion element was no longer feasible due to technical feasibility and public opposition. The diversion element was formally withdrawn in August 1993 through action of the District Commissioners Court (LJA Engineering et al. 2000). A comprehensive flood reduction plan, authorized in 1990, provided flood damage reduction in the upper watershed of Brays Bayou from the 2 percent chance flood event. The plan consisted of the 2,500 acre-feet Arthur Storey Park Detention Basin, the 3,200 acre-feet Eldridge Detention Basin and the 2,400 acre-feet Old Westheimer Detention Basin. However, as the District began



purchasing land tracts within the authorized detention basins, they learned that much (approximately 70 acres) of the land identified for the Old Westheimer Detention Basin was no longer available. The District determined that the resulting reduction in the proposed project storage capacity (8,100-acre feet) would compromise the authorized 1990 comprehensive plan and would no longer meet District flood reduction goals and objectives. Therefore, the District currently proposes to expand the Arthur Storey Park and Eldridge Detention Basins to provide additional storm water storage capacity within the upper portions of the Brays Bayou watershed.

Description of the Project Area

The Brays Bayou watershed (Figure 1) is located in southwestern Harris and eastern Fort Bend Counties and is approximately 137 square miles. Brays Bayou flows in a west to east direction from its headwaters in Fort Bend County (just east of the Barker Reservoir) to its confluence with Buffalo Bayou below the Houston Ship Channel Turning Basin. Brays Bayou is 31 miles long, is affected by tidal action for a third of its length from the mouth, and is heavily urbanized along its entire length by residential, commercial, agricultural, and industrial development.



Source: PBS&J 2010

Figure 1 Brays Bayou Watershed with Eldridge and Arthur Storey Park Detention Basins.

Two major tributaries make up Brays Bayou. Willow Waterhole Bayou provides drainage to almost 9,300 acres of residential and commercial properties in the mid section of the watershed. Keegans Bayou provides drainage for 9,980 acres of urban properties in northeast Fort Bend County (Service 1997). The proposed action (defined in the Alternatives section) has identified additional undeveloped tracts of land at the Arthur Storey Park Detention Basin (southwest of the intersection of Beltway 8 and Bellaire Blvd.) and the Eldridge Detention Basin (north of Westpark Tollway between SH6 and Eldridge Parkway) within a growing suburban community.

Appendices A & B illustrate the Arthur Storey Park and Eldridge Detention Basins, respectively, with yellow defined as “Authorized tracts” and pink as “Additional tracts” (PBS&J 2010).

In order to implement the proposed action, the District requires an additional 188 acres. Specifically, the District requires the addition of 35 acres to the Arthur Storey Park Detention Basin and 153 acres to the Eldridge Detention Basin.

The Corps completed a federally constructed channel rectification project on Brays Bayou in the late 1960’s. Channel bottom widths throughout the project ranged from 40 to 80 feet and consisted of a grass lined trapezoidal channel with riprap from the mouth of the Bayou to Calhoun Street. From Calhoun Street to U.S. 59, the lined channel was a combination of concrete and grass and upstream of U.S. 59, the project consisted of a grass-lined channel.

For the purpose of this planning aid letter, the defined project area is a combination of the Arthur Storey Park, Eldridge Detention Basins, and the additional tracts of land. Appendices A and B show the project area, which is further described in the Preferred Alternative section below.

Alternatives Under Consideration

No Action Alternative

The No Action Alternative presumes that there would be no action taken from the proposed plan and flood damage would continue, incurring additional costs and loss of property to residential and commercial stakeholders along Brays Bayou. This alternative could deteriorate property values in the watershed, would not be acceptable to the local community and fails to satisfy the flood reduction goals and objectives of the proposed action (see below) (PBS&J 2010).

Alternative 2 – Relocation of Old Westheimer Detention Basin

After the District determined that previously identified tracts were no longer available for purchase for the Old Westheimer Detention Basin, a search began to identify additional tracts of land in the surrounding area of the existing detention basin (HCFCFD Unit D500-01-00). Identified tracts were not contiguous and evaluated as individual basins. An analysis found that these individual basins would be inefficient given their size and distance from each other, would be too costly, and would not meet the overall goals and objectives of the authorized project.

Preferred Alternative (Proposed Action)

With this alternative, the District proposes to compensate for the acreage loss at Old Westheimer Detention Basin by constructing additional storm water storage at the Arthur Storey Park Detention Basin and Eldridge Detention Basin complexes. The District anticipates that 188 acres of property adjacent to the complexes would be acquired and the size of the authorized detention basins would be expanded. The current capacity of the Arthur Storey Park Detention Basin is 2,500 acre-feet and the District proposes to increase this volume by 1,000 acre-feet through the addition of 35 acres to the basin. The District has already removed 4.03 million cubic yards of earthen material; however, this alternative will require excavation of an additional 1.07 million cubic yards. The Eldridge Detention Basin’s capacity is 3,200 acre-feet and acquisition of 153 acres would increase the storage capacity by an additional 1,466 acre-feet through the removal of

9.32 million cubic yards of earthen material. This alternative best meets the planning goals and objectives for the District.

Biological Resources

Vegetation

The project area lies within the Houston metro area, which has been highly developed over the last 70 plus years. Historically, this area was coastal prairie dominated by little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*) and a variety of sedges (*Carex* spp.) between the rivers, and has since been converted to agricultural, residential, commercial and industrial uses. Areas along the coastal rivers were covered in forests of sugar hackberry (*Celtis laevigata*), pecan (*Carya illinoensis*), elm (*Ulmus* spp.), and oak (*Quercus* spp.) (PBS&J 2010). Diamond and Smeins (1984) and Smeins et.al. (1991) believe that less than three percent of the historic coastal prairie remains in Texas due to conversion to industrial, agriculture, and residential development. Remnant coastal prairie patches have become a focus for the Service and other natural resource agencies due to its scarcity. For 150 years, a trend of steady loss, degradation and fragmentation of native prairie has led to species-poor communities that are low in endemics (McFarlane 1995).

Vegetation within the upland pasture communities includes vasey grass (*Paspalum urvillei*), fringed windmill grass (*Chloris ciliata*), eastern baccharis (*Baccharis halimifolia*), Brazilian vervain (*Verbena brasiliensis*), dallisgrass (*Paspalum dilatatum*), lanceleaf frog fruit (*Phyla lanceolata*), western ragweed (*Ambrosia psilostachya*), southern dewberry (*Rubis trivialis*) and peppervine (*Ampelopsis arborea*) (PBS&J 2010).

Vegetation observed in the upland forested community includes American elm (*Ulmus americana*), cedar elm (*Ulmus crassifolia*), common hackberry (*Celtis occidentalis*), willow oak (*Quercus phellos*), pecan, roughleaf dogwood (*Cornus drummondii*), yaupon holly (*Ilex vomitoria*), Chinese privet (*Ligustrum sinense*), poison ivy (*Toxicodendron radicans*), common greenbriar (*Smilax rotundifolia*), dwarf palmetto (*Sabal minor*), Cherokee sedge (*Carex cherokeensis*), inland sea oats (*Chasmanthium latifolium*) and wild onion (*Allium drummondii*) (PBS&J 2010).

Wetlands

A review of aerial photography, National Wetlands Inventory maps, and site visits by the District's consultants (1994, 1995, 2004, and 2005) identified a total of 5.14 acres of wetlands within the proposed additional tracts. The Arthur Storey Park Detention Basin expansion site contains one wetland (0.01 acre) that is dominated by scrub shrub vegetation consisting of Brazilian vervain, seaside goldenrod (*Solidago semprevirens*), bushy aster (*Aster dumosus*), eastern baccharis, southern dewberry, great ragweed (*Ambrosia trifida*), and western ragweed. The Eldridge Detention Basin has three palustrine forested wetland areas totaling 1.89 acres. Dominant vegetation within the palustrine forested wetlands include green ash (*Fraxinus pennsylvanica*), Chinese tallow (*Triadica sebifera*) American elm, common hackberry, broad lead switchgrass (*Dichanthelium latifolium*), southern dewberry, rough buttonweed (*Diodia radula*), Japanese honeysuckle (*Lonicera japonica*), common rush (*Juncus effusus*), poison ivy, and green flatsedge (*Cyperus virens*). Six palustrine scrub-shrub wetlands totaling 3.24 acres

were identified and consisted of marsh elder (*Iva annua*), Maximillian sunflower (*Helianthus maximiliani*), Canada goldenrod (*Solidago canadensis*) and Bahia grass (*Paspallum spp.*).

Forested areas and associated wetlands generally provide high quality feeding and breeding habitats for amphibians, reptiles, and mammals. They also provide important resting and feeding habitat for neotropical migrant and residential songbirds. In addition, these wetland areas serve other important functions related to flood/storm protection and water purification.

Wildlife Resources

Herptofauna

There are at least 20 anuran species, 6 salamander and newt species, 9 lizard species, 32 snake species, and 10 turtle species that commonly occur or have occurred in Harris County (Dixon 2000). Common amphibian and reptile species in the project area may include Blanchard's cricket frog (*Acris crepitans blanchardi*), northern green tree frog (*Hyla cinerea*), green anole (*Anolis carolinensis*), Southern Gulf Coast toad (*Incillius valliceps* (Frost 2010)), eastern six-lined racerunner (*Cnemidophorus sexlineatus*), Mediterranean house gecko (*Hemidactylus turcicus*), Texas ratsnake (*Elaphe obsoleta*), eastern hog-nosed snake (*Heterodon platirhinos*), several species of water snake (*Nerodia spp.*), snapping turtle (*Chelydra serpentina*), stinkpot (*Sternotherus odoratus*), and red-eared slider (*Trachemys scripta elegans*) (Dixon 2000).

Avifauna

The project area supports a diverse group of avifauna. The upland and riparian woodland areas provide habitat for resident and migratory birds, and may provide critical stopover habitat for neotropical songbirds during long migrations. Species common to the study area may include turkey vulture (*Cathartes aura*), eastern screech owl (*Megascops asio*), chuckwill's-widow (*Caprimulgus carolinensis*), red-bellied woodpecker (*Melanerpes carolinus*), American crow (*Corvus brachyrhynchos*), tufted titmouse (*Baeolophus bicolor*), northern mockingbird (*Mimus polyglottos*), cedar waxwing (*Bombycilla cedrorum*), northern cardinal (*Cardinalis cardinalis*), painted bunting (*Passerina ciris*), and American goldfinch (*Carduelis tristis*) (Lockwood and Freeman 2004; Richardson et al. 1998). Riparian corridors provide habitat for species such as black-bellied whistling duck (*Dendrocygna autumnalis*), wood duck (*Aix sponsa*), black-crowned night heron (*Nycticorax nycticorax*), red-shouldered hawk (*Buteo lineatus*), barred owl (*Strix varia*), and belted kingfisher (*Megaceryle alcyon*) (Lockwood and Freeman 2004; Richardson et al. 1998).

In general, prairies and marshes provide habitat for numerous migratory avian species, waterfowl, several species of raptors, and a variety of songbirds. Texas is one of the most significant waterfowl wintering regions in North America, with 3 to 5 million waterfowl annually wintering in the state (NOAA 1996). Common avian species found in prairies and marshes include greater Canada goose (*Branta canadensis*), gadwall (*Anas strepera*), northern shoveler (*Anas clypeata*), northern pintail (*Anas acuta*), northern harrier (*Circus cyaneus*), killdeer (*Charadrius vociferus*), mourning dove (*Zenaida macroura*), scissor-tailed flycatcher (*Tyrannus forficatus*), barn swallow (*Hirundo rustica*), white-crowned sparrow (*Zonotrichia leucophrys*), and meadowlarks (*Sturnella spp.*) (Lockwood and Freeman 2004; Richardson et al. 1998).

Avian species identified during a site visit included great blue heron (*Ardea Herodias*), mourning dove (*Zenaida macroura*), killdeer, common grackle (*Quiscalus quiscula*), American crow (*Corvus brachyrhynchos*), cattle egret (*Bubulcus ibis*), anhinga (*Anhinga anhinga*), rock dove (*Columba livia*), great egret (*Casmerodius albus*), double-crested cormorant (*Phalacrocorax auritus*), and pied-billed grebe (*Podilymbus podiceps*).

Mammals

Blair (1950) describes the project area as being located between the Texas and Austroriparian biotic provinces in Texas, with most of the project area located in the Texas biotic province and only the far eastern portion located in the Austroriparian Province. The Texas Biotic Province does not have any endemic species but rather supports species also found in the neighboring provinces. The Austroriparian species are confined to the forest, bogs, and marshes. Grassland species typically found in the prairie habitats enter from the west. Wildlife habitats found in the project area include scrub/shrub, upland forests, palustrine forested wetlands, scrub/shrub palustrine wetlands, and remnant coastal prairie.

Common Austroriparian province mammals within Texas include: Virginia opossum (*Didelphis virginiana*), eastern mole (*Scalopus aquaticus*), eastern pipistrelle (*Pipistrellus subflavus*), eastern red bat (*Lasiurus borealis*), eastern gray squirrel (*Sciurus carolinensis*), eastern flying squirrel (*Glaucomys volans*), Baird's pocket gopher (*Geomys breviceps*), white-footed mouse (*Peromyscus leucopus*), hispid cotton rat (*Sigmodon hispidus*), eastern woodrat (*Neotoma floridana*), eastern cottontail (*Sylvilagus floridanus*) and swamp rabbit (*Sylvilagus aquaticus*).

Fisheries

Rainfall runoff and wastewater treatment effluent influence flow rates within Brays Bayou. Factors such as fluctuating water levels, high nutrient levels, shallow water depths and high water temperatures may contribute to the overall poor aquatic health of the bayou. The City of Houston surveyed Greens Bayou in 1999 and found several species of fish that are also likely to occur in Brays Bayou due to its connection with Buffalo Bayou and notably similar habitats. The dominant fish species were red shiner (*Cyprinella lutrensis*), western mosquitofish (*Gambusia affinis*), and sailfin molly (*Poecilia latipinna*). Other fish noted in the area included sheepshead minnow (*Cyprinodon variegates*), bullhead minnow (*Pimephales vigilax*), Rio Grande cichlid (*Cichlasoma cyanoguttatum*), spotted gar (*Lepisosteus oculatus*), yellow bullhead (*Ameiurus natalis*), channel catfish (*Ictalurus punctatus*), bluegill (*Lepomis macrochirus*), longear sunfish (*Lepomis megalotis*), and striped mullet (*Mugil cephalus*).

Threatened and Endangered Species and Species of Conservation Concern

A review of Service records indicates the following delisted (DM) and endangered (E) species occur in Harris County:

- bald eagle (*Haliaeetus leucocephalus*) – DM
- Texas prairie dawn-flower (*Hymenoxys texana*) – E

The bald eagle, removed from the protection of the Endangered Species Act in August 2007, is still protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection

Act. The Service has developed National Bald Eagle Management Guidelines to assist landowners and land managers in determining whether their project may disturb bald eagles. These guidelines are available at <http://www.fws.gov/migratorybirds/baldeagle.htm>. Eagles are particularly vulnerable to disturbance throughout the nesting season, which in Texas is October 1 through May 30.

The Texas prairie dawn-flower is not expected to occur in the project area due to lack of suitable habitat. There is no designated critical habitat for listed species in Harris County. The Service provided information on federally listed or proposed threatened or endangered species within the project area in letters dated March 18, 1986, February 26, 1993, and January 21, 1997.

The Service published the *Birds of Conservation Concern 2008* (BCC) in December 2008. The BCC divides the nation into Bird Conservation Regions (BCR) and identifies the migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent our highest conservation priorities to draw attention to species in need of conservation action (Service 2008). Four species from the Gulf Coastal Prairie BCR and the West Gulf Coastal Plain/Ouachitas BCR occur in the project area; however, additional BCR listed species may use the area (Appendices C and D):

Reddish egret (*Egretta rufescens*) - coastal marshes and ponds;
Painted bunting (*Passerina ciris*) – woodlands edge, brushy tangles
Dickcissel (*Spiza americana*) – open pasturelands or weed patches
Short-eared owl (*Asio flammeus*) – grasslands and prairies

It is important to survey all habitats thoroughly prior to any construction activities. Birds (not only those listed above) can utilize grassland and forested habitats for foraging, nesting, and breeding activities.

Modeling Efforts

Habitat Evaluation Procedures (HEP) were used to evaluate the proposed project's impacts. HEP quantifies habitat quality for selected species with a habitat suitability index (HSI) and requires an evaluation of baseline habitats. HSI models were derived by evaluating the ability of key habitat components to provide the life requisites of selected species of wildlife (Service 1980). HEP can be adapted to meet the level of effort desired by the user or to determine a site's response to a particular design. The HSI model can be used in one or more cover types to reflect the complex interdependencies that are critical to the species or community's presence. The HSI model uses a single formula to express the relationship between quality and carrying capacity for the site, regardless of how many cover types are used within the model. The HEP combines both the habitat quality (HSI) and the size of the site (usually measured in acres) to form a measure of change called Habitat Units (HUs), where $HU = HSI \times \text{site area}$. Under the HEP, one HU is equivalent to one acre of optimal habitat. Finally, Average Annual Habitat Units (AAHUs) are determined. AAHU represents the total number of HUs gained or lost because of the proposed action, divided by the life of the action. This quantitative value is used to determine the acreage needed to compensate for any wetland habitat lost because of the project.

The Arthur Storey Park Detention Basin and Eldridge Detention Basin were constructed in 1995 and 1998, respectively. Baseline conditions for the HEP reflected these dates and totaled 45.33 HUs.

A detailed analysis of the HEP is available in PBS&J 2010; however, a summary is provided here. One palustrine scrub-shrub wetland of 0.01 acre and 0.004 AAHUs was identified in the Arthur Storey Park Detention Basin. The Eldridge Detention Basin has 1.89 acres of forested wetlands and 3.24 acres of scrub-shrub wetlands, with determined 0.709 and 0.0630 AAHUs, respectively.

Mitigation

The District plans to purchase a total of 2.58 acres from the Greens Bayou Wetland Mitigation Bank Subdivision B to mitigate for impacts to each of the wetland types. Subdivision B has emergent and forested wetlands.

In addition, the District will plant native emergent wetland vegetation species in the detention basins and monitoring efforts would continue for a five-year period post wetland construction, vegetation and tree planting activities. At a minimum, a five-year period is necessary to meet success criteria. In the event survival rates are below the success criteria, the District would replant the basin and continue monitoring efforts.

Summary and Recommendations

An expansion of Arthur Storey Park and Eldridge Detention Basins was initiated due to the unavailability of previously identified land tracts for the Old Westheimer Detention Basin. Review of the District's project documentation, aerial photographs, and Service files indicate that the Preferred Alternative will permanently impact 5.14 acres of wetlands. The District has proposed purchasing 2.58 acres (forested wetland acres) from the Greens Bayou Wetland Mitigation Bank Subdivision B to mitigate for impacts to each of the wetland types.

Although the proposed project will result in permanent habitat impacts, the Service believes that the preferred alternative will have minimal impacts to fish and wildlife resources. Both detention basins and the proposed additions have been previously impacted and are surrounded by commercial and residential development, and as a result, provide low to medium quality habitat for wildlife. Fish species within the project area can avoid any construction activities and areas that may experience increased turbidity levels. In addition, expected wildlife loss will be minimal since terrestrial species may be able to migrate to areas where there is no construction.

There is an opportunity to create habitat for both resident and migratory bird and wildlife species that have adapted to urban development. Planting native tree species will provide necessary stop over habitat, foraging opportunities, and nesting habitat for a variety of bird species. Native grasses should be planted and allowed to reseed before mowing. Grasses provide microhabitats for a variety of herptofauna and mammalian species. The Service can assist the District in selecting grass species that are native and beneficial for wildlife in the area.

The following are additional recommendations for the Brays Bayou Federal Flood Control Project:

- Provide mitigation for unavoidable impacts to upland forested habitats. The Service welcomes the opportunity to work with the District to identify suitable mitigation.
- Develop and implement a plan to control exotic and invasive species at the detention and mitigation sites that is based on the success criteria used in the monitoring plan. Natural resource agencies should be given the opportunity to review and comment on the plan, which should be applied to all of the District's flood reduction projects.
- Provide success criterion for all plantings (tree, grasses, and emergent plants) for review. We request an opportunity to review and provide comments on the monitoring plan and success criteria.
- Conduct surveys in the fall and spring to identify avifauna, mammals, fish, amphibians, and reptiles that are utilizing the project area and provide the resulting data to natural resource agency staff at coordination meetings. This data will assist in designing habitats that attract wildlife at future flood damage reduction projects.
- All excavated material and mounded dredge material should be used beneficially or disposed of in an appropriate manner. The Service should be provided an opportunity to assess and comment on any proposed new disposal sites for excavated material.
- Channel modifications should mimic natural stream features such as riffles and pools to provide habitats for fish species during varied life cycle stages.
- The District comply with the Migratory Bird Treaty Act and field survey all areas of suitable nesting habitat for bird nests prior to construction.
- After construction, the detention basins should be planted with native grasses, forbs and trees (from local seed banks) to minimize erosion.

We appreciate the opportunity to participate in the planning of the 2008 Updated Right-of-Way on the Detention Element Upper Watershed of Brays Bayou project. If you have any questions or comments concerning this planning aid letter, please contact staff biologist Donna Anderson at 281/286-8282.

Sincerely,



Edith Erfling
Acting Field Supervisor, Clear Lake ES Office

cc:

Carolyn Murphy, U.S. Army Corps of Engineers, Galveston, TX
Jaime Schubert, Texas Parks and Wildlife Department, Dickinson, TX
Jeanene Peckham, U.S. Environmental Protection Agency, Dallas, TX
Rusty Swafford, National Marine Fisheries Service, Galveston, TX
Peter Schafer, Texas Commission on Environmental Quality, Austin, TX

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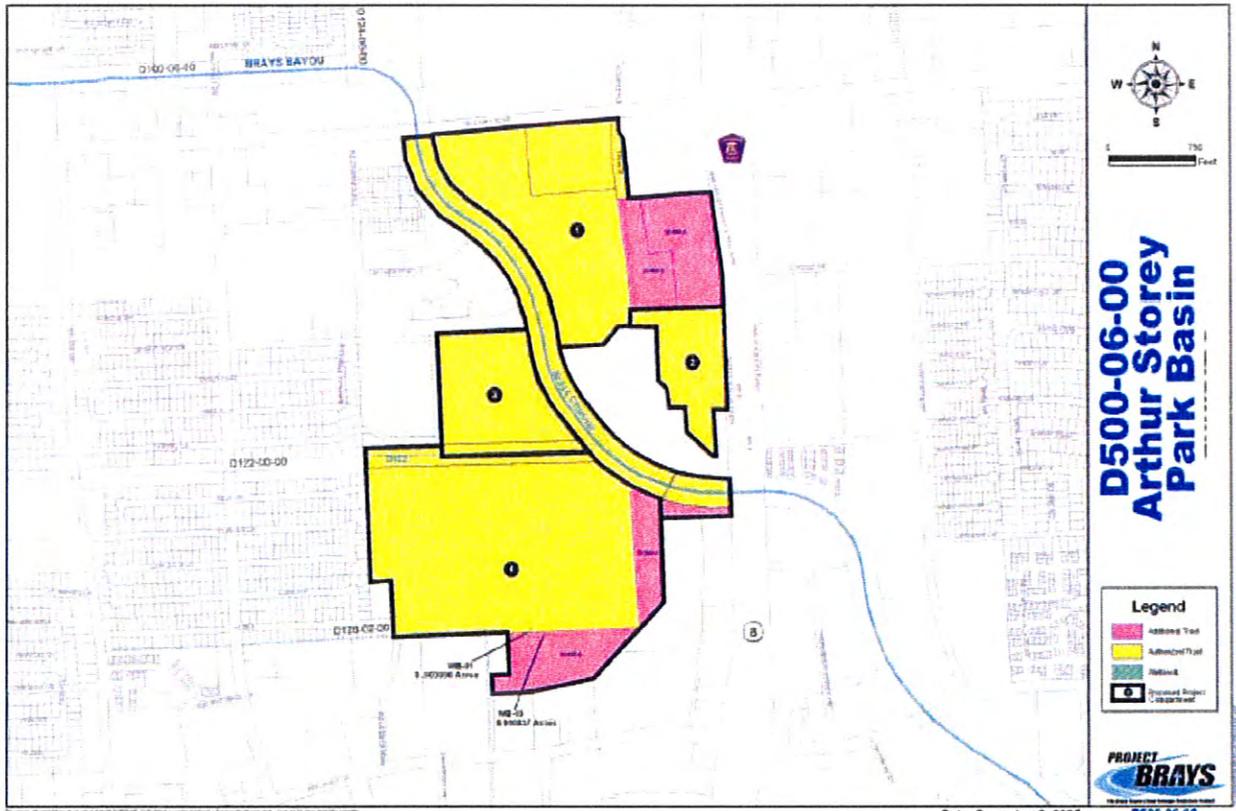
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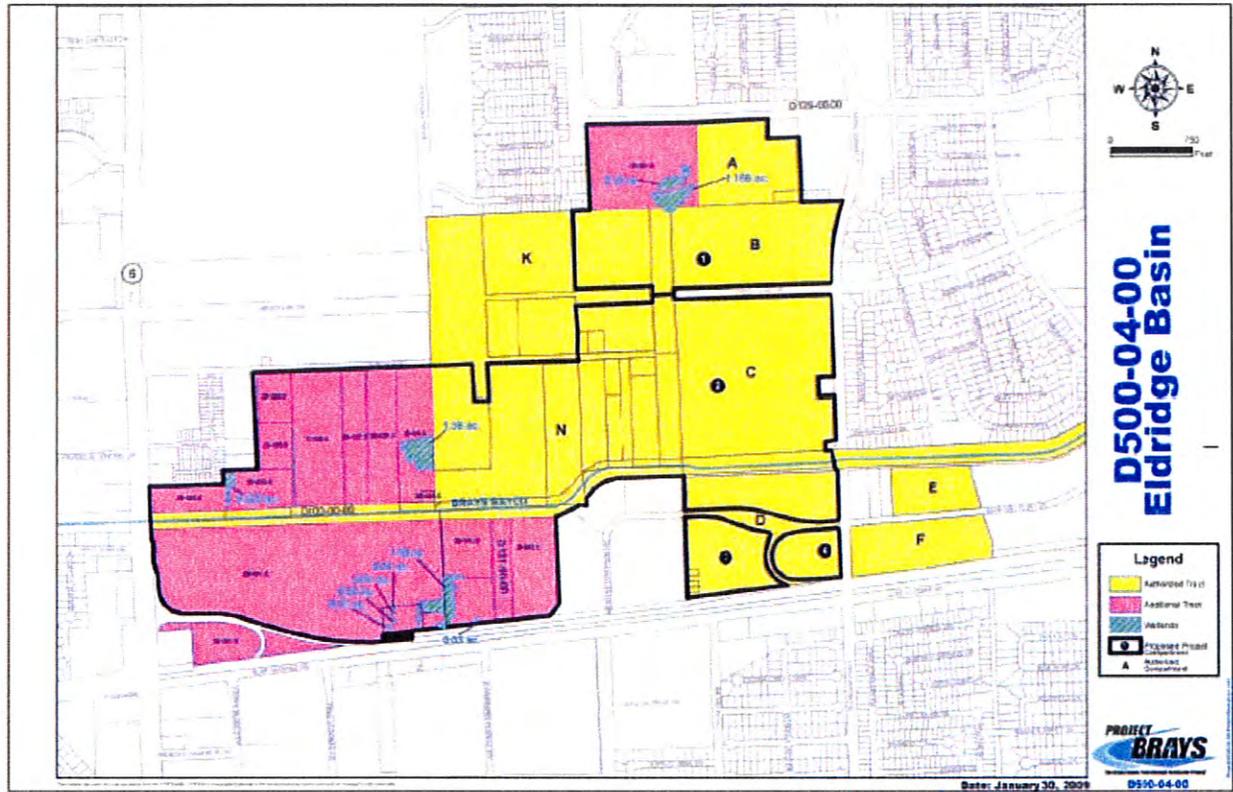
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Appendices

Appendix A
Current Arthur Storey Park Detention Basin and Proposed Expansion Areas



Appendix B
Current Eldridge Detention Basin and Proposed Expansion Tracts



Appendix C

Table 23 BCR 25 (West Gulf Coastal Plain/Ouachitas) *BCC 2008* list.

Least Bittern	Wood Thrush
Little Blue Heron	Sprague's Pipit (nb)
Swallow-tailed Kite	Prairie Warbler
Bald Eagle (b)	Cerulean Warbler
American Kestrel (<i>paulus</i> ssp.)	Prothonotary Warbler
Yellow Rail (nb)	Worm-eating Warbler
Solitary Sandpiper (nb)	Swainson's Warbler
Hudsonian Godwit (nb)	Louisiana Waterthrush
Buff-breasted Sandpiper (nb)	Kentucky Warbler
Chuck-will's-widow	Bachman's Sparrow
Red-headed Woodpecker	Henslow's Sparrow (nb)
Loggerhead Shrike	Smith's Longspur (nb)
Brown-headed Nuthatch	Painted Bunting
Bewick's Wren (<i>bewickii</i> ssp.)	Orchard Oriole

25 (a) ESA candidate, (b) ESA delisted, (c) non-listed subspecies or population of Threatened or Endangered species, (d) MBTA protection uncertain or lacking, (nb) non-breeding in this BCR

Appendix D

Table 35 BCR 37 (Gulf Coastal Prairie U.S. portion only) *BCC 2008* list.

Audubon's Shearwater (nb)	Red Knot (<i>roselaari</i> ssp.) (nb)
Band-rumped Storm-Petrel (nb)	Red Knot (<i>rufa</i> ssp.) (a) (nb)
American Bittern	Buff-breasted Sandpiper (nb)
Least Bittern	Short-billed Dowitcher (nb)
Reddish Egret	Least Tern (c)
Swallow-tailed Kite	Gull-billed Tern
Bald Eagle (b)	Sandwich Tern
White-tailed Hawk	Black Skimmer
Peregrine Falcon (b) (nb)	Short-eared Owl (nb)
Yellow Rail (nb)	Loggerhead Shrike
Black Rail	Sedge Wren (nb)
Snowy Plover (c)	Sprague's Pipit (nb)
Wilson's Plover	Prothonotary Warbler
Mountain Plover (nb)	Swainson's Warbler
American Oystercatcher	Botteri's Sparrow
Solitary Sandpiper (nb)	Grasshopper Sparrow
Lesser Yellowlegs (nb)	Henslow's Sparrow (nb)
Upland Sandpiper (nb)	LeConte's Sparrow (nb)
Whimbrel (nb)	Nelson's Sharp-tailed Sparrow (nb)
Long-billed Curlew	Seaside Sparrow (c)
Hudsonian Godwit (nb)	Painted Bunting
Marbled Godwit (nb)	Dickcissel

37 (a) ESA candidate, (b) ESA delisted, (c) non-listed subspecies or population of Threatened or Endangered species, (d) MBTA protection uncertain or lacking, (nb) non-breeding in this BCR

Appendix C
Agency Coordination



TEXAS
HISTORICAL
COMMISSION

The State Agency for Historic Preservation

RICK PERRY, GOVERNOR

JOHN L. NAU, III, CHAIRMAN

F. LAWRENCE OAKS, EXECUTIVE DIRECTOR

November 5, 2002

Roger Moore, Ph.D.
Moore Archeological Consulting, Inc.
3511 Houston Avenue, Suite B
Houston, TX 77009

Re: - Project Review under the Antiquities Code of Texas
Final Report: *Archeological Survey of the Proposed Brays Bayou Detention Basin, Harris County, Texas* Antiquities Permit #2895 (HCFCD, T2, T3)
PERMIT COMPLETE

Thank you for your correspondence describing the above referenced project. This letter presents the comments of the Executive Director of the Texas Historical Commission, the state agency responsible for administering the Antiquities Code of Texas.

The Archeology Division is in receipt of twenty copies of the final report and a completed *Abstracts in Texas Contract Archeology* form for the above referenced permit. The submission of twenty copies of the final report and abstract form demonstrates completion of your permit requirements under Permit #2895.

Thank you for your cooperation in this state review process, and for your efforts to preserve the irreplaceable heritage of Texas. **If you have any questions concerning our review or if we can be of further assistance, please contact Lillie Thompson at 512/463-1858.**

Sincerely,

A handwritten signature in cursive script, appearing to read "William A. Oaks".

for
F. Lawrence Oaks, State Historic Preservation Officer

FLO/ft



03-172

**TEXAS
HISTORICAL
COMMISSION**

The State Agency for Historic Preservation

RICK PERRY, GOVERNOR

JOHN L. NAU, III, CHAIRMAN

F. LAWRENCE OAKS, EXECUTIVE DIRECTOR

June 1, 2004

Roger Moore, Ph.D.
Moore Archeological Consulting, Inc.
3511 Houston Avenue, Suite B
Houston, TX 77009

Re: Project Review under the Antiquities Code of Texas
Final Report: *A Cultural Resource Survey for the Proposed Brays Bayou Regional
Detention Basin, Harris County*
Texas Antiquities Permit #3316 (TxDOT, T2, T3)
PERMIT COMPLETE

Dear Colleague:

Thank you for your correspondence describing the above referenced project. This letter presents the comments of the Executive Director of the Texas Historical Commission, the state agency responsible for administering the Antiquities Code of Texas.

The Archeology Division is in receipt of twenty copies of the final report and a completed *Abstracts in Texas Contract Archeology* form for the above referenced permit. The submission of twenty copies of the final report and abstract form demonstrates completion of your permit requirements under Permit #3316.

Thank you for your cooperation in this state review process, and for your efforts to preserve the irreplaceable heritage of Texas. **If you have any questions concerning our review or if we can be of further assistance, please contact Lillie Thompson at 512/463-1858.**

Sincerely,

A handwritten signature in black ink, appearing to read "F. Lawrence Oaks".

for

F. Lawrence Oaks, State Historic Preservation Officer

FLO/ft



05-18

TEXAS
HISTORICAL
COMMISSION

The State Agency for Historic Preservation

RICK PERRY, GOVERNOR

JOHN L. NAU, III, CHAIRMAN

F. LAWRENCE OAKS, EXECUTIVE DIRECTOR

June 28, 2005

David Driver
Moore Archeological Consulting, Inc.
3511 Houston Avenue Suite B
Houston, TX 77009

Re: Project review under the Antiquities Code of Texas
Final Report: *A Cultural Resource Survey for the Proposed Brays Bayou
Detention Basin, Harris County*
Texas Antiquities Permit #3690
PERMIT COMPLETE

Dear Colleague:

Thank you for your correspondence describing the above referenced project. This letter presents the comments of the Executive Director of the Texas Historical Commission, the state agency responsible for administering the Antiquities Code of Texas.

The Archeology Division is in receipt of twenty copies of the final report and a completed *Abstracts in Texas Contract Archeology* form for the above referenced permit. The submission of twenty copies of the final report and abstract form demonstrates completion of your permit requirements under Permit #3690.

Thank you for your cooperation in this state review process, and for your efforts to preserve the irreplaceable heritage of Texas. **If you have any questions concerning our review or if we can be of further assistance, please contact Lillie Thompson at 512/463-1858.**

Sincerely,

A handwritten signature in black ink, appearing to read "F. Lawrence Oaks".

for

F. Lawrence Oaks, State Historic Preservation Officer

FLO/ft



An employee-owned company

November 19, 2004

Mr. Raul Villarreal
NRCS - Harris County
10808 Huffmeister Road
Houston, Texas 77065-3106

PN 460927.07

Dear Mr. Villarreal:

Re: Proposed Expansion of Sam Houston Parkway Basin and Eldridge Basin
Upper Brays Bayou Watershed
Harris County, Texas

PBS&J has been retained by Harris County Flood Control District (HCFCD, also referred to as "the District") to prepare an Environmental Assessment (EA) document for the proposed expansion of the above-referenced regional detention basins located in the upper watershed of Brays Bayou, Harris County, Texas (Exhibit A). The Sam Houston Parkway Basin (HCFCD ID No. D500-06-00) is located west of Beltway 8 between Bellaire Boulevard and Beechnut Street (Exhibit B). The Eldridge Basin (HCFCD ID No. D500-04-00) facility is located east of Highway 6 at Westpark Drive (Exhibit C).

The Sam Houston Parkway Basin and Eldridge Basin were authorized as part of the comprehensive flood damage reduction plan for the Buffalo Bayou and Tributaries watershed in 1990. A third basin, Old Westheimer Basin, was also authorized. During acquisition of the proposed project areas, a substantial portion of proposed Old Westheimer Basin project area was no longer available for purchase. The District is therefore currently proposing to expand the Sam Houston Parkway Basin and Eldridge Basin to compensate for the loss in storage capacity at the Old Westheimer Basin. The authorized tracts and the additional tracts identified for construction of the additional storage, which are the focus of this EA, are denoted on Exhibits B and C.

PBS&J is requesting information regarding prime farmland designation, hydric soil classification, recommended erosion and sedimentation control techniques, Conservation Resource Protection Lands (CRP), and recommended native seed mixtures for construction and restoration planning, as applicable to the above-referenced project.

We appreciate your timely review of this project. If you have any questions or need additional information, please contact Melinda Goelz or me.

Very truly yours,

Nicolle Esquivel
Project Biologist

NE:SC
Enclosure

c: Melinda Goelz, PBS&J
Glenn Laird, HCFCD



Natural Resources Conservation Service
101 South Main Street
Temple, TX 76501-7602

June 27, 2005

PBS&J
1880 S. Dairy Ashford Street
Suite 300
Houston, Texas 77077

Attention: Casey Kneupper, Environmental Scientist

Subject: LNU-Farmland Protection-
Sam Houston Parkway Basin and Eldridge Basin
Upper Brays Bayou Watershed
Montgomery and Harris Counties, Texas

We have reviewed the information provided concerning the proposed expansion of the Sam Houston Parkway Drainage Basin and the Eldridge Drainage Basin in Harris County, Texas as outlined in your letter of June 8, 2005. This is part of NEPA evaluation for the Harris County Flood Control District and the U.S. Army Corps of Engineers. We have evaluated the proposed site as required by the Farmland Protection Policy Act (FPPA).

The proposed project does contain Important Farmland Soils and is subject to the FPPA law. Although part of the project may be considered as already converted we have developed a composite rating of the soils in the project area and completed Part II, through V of the AD-1006 for you submitted. You have previously completed Part VI and the total points in Part VII is 102. The FPPA law states that sites with a score less than 160 will need no further consideration.

I have attached the completed AD-1006 (Farmland Conversion Impact Rating) form for this project. Thanks for the resource materials you submitted to evaluate this project. If you have any questions please call James Greenwade at (254)-742-9960, Fax (254)-742-9859.

Thanks,

A handwritten signature in cursive script that reads "James M. Greenwade".

James M. Greenwade
Soil Scientist
Soil Survey Section
USDA-NRCS, Temple, Texas

FARMLAND CONVERSION IMPACT RATING

PART I (To be completed by Federal Agency)		Date Of Land Evaluation Request	6/7/05
Name Of Project	Sam Houston Pkwy & Eldridge Basin Expansion	Federal Agency Involved	COE
Proposed Land Use	Regional Stormwater Detention	County And State	Harris County, Texas

PART II (To be completed by NRCS)	Date Request Received By NRCS
--	-------------------------------

Does the site contain prime, unique, statewide or local important farmland? (If no, the FPPA does not apply -- do not complete additional parts of this form).		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Acres Irrigated	9438	Average Farm Size	477		
Major Crop(s)	Grain Sorghum	Farmable Land In Govt. Jurisdiction	Acres: 820,200	%	73	Amount Of Farmland As Defined in FPPA	Acres: 769,800	%	69
Name Of Land Evaluation System Used	LESA	Name Of Local Site Assessment System	NONE		Date Land Evaluation Returned By NRCS	6/27/05			

PART III (To be completed by Federal Agency)	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	187.8			
B. Total Acres To Be Converted Indirectly	0.0			
C. Total Acres In Site	187.8	0.0	0.0	0.0

PART IV (To be completed by NRCS) Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland	187.8			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	0.0001			
	15			

PART V (To be completed by NRCS) Land Evaluation Criterion				
Relative Value Of Farmland To Be Converted (Scale of 0 to 100 Points)	0	100	0	0

PART VI (To be completed by Federal Agency)	Maximum Points				
Site Assessment Criteria (These criteria are explained in 7 CFR 658.5(b))					
1. Area In Nonurban Use	15	0			
2. Perimeter In Nonurban Use	10	1			
3. Percent Of Site Being Farmed	20	0			
4. Protection Provided By State And Local Government	20	0			
5. Distance From Urban Builtup Area	15	0			
6. Distance To Urban Support Services	15	0			
7. Size Of Present Farm Unit Compared To Average	10	0			
8. Creation Of Nonfarmable Farmland	10	0			
9. Availability Of Farm Support Services	5	1			
10. On-Farm Investments	20	0			
11. Effects Of Conversion On Farm Support Services	10	0			
12. Compatibility With Existing Agricultural Use	10	0			
TOTAL SITE ASSESSMENT POINTS	160	2	0	0	0

PART VII (To be completed by Federal Agency)				
Relative Value Of Farmland (From Part V)	100	100	0	0
Total Site Assessment (From Part VI above or a local site assessment)	160	2	0	0
TOTAL POINTS (Total of above 2 lines)	260	102	0	0

Site Selected: Site A	Date Of Selection	6/7/05	Was A Local Site Assessment Used?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
-----------------------	-------------------	--------	-----------------------------------	------------------------------	--

Reason For Selection: To reduce flood damage in the area of southwest Houston in Harris County and be economically sound, environmentally acceptable, and in the public interest.



An employee-owned company

June 14, 2005

Ms. Susan Whitworth
Houston-Galveston Area Council
3555 Timmons Lane, Suite 120
Houston, Texas 77027

PN 460927.07

Dear Ms. Whitworth:

Re: Proposed Expansion of Sam Houston Parkway Basin and Eldridge Basin
Upper Brays Bayou Watershed; Harris County, Texas

This letter has been prepared to follow up on a previous letter that was sent to you on November 11, 2004. As was stated, PBS&J has been retained by Harris County Flood Control District (HCFCD) to prepare an Environmental Assessment (EA) document for the proposed expansion of the above-referenced regional detention basins located in the upper watershed of Brays Bayou, Harris County, Texas (Exhibit A). This is a joint HCFCD/U.S. Army Corp of Engineers (COE) 211(f) project. The Sam Houston Parkway Basin (HCFCD ID D500-06-00) is located west of Beltway 8 between Bellaire Boulevard and Beechnut Street (Exhibit B). The Eldridge Basin (HCFCD ID D500-04-00) facility is located east of State Highway 6 (SH 6) at Westpark Drive (Exhibit C).

The Sam Houston Parkway Basin and the Eldridge Basin were authorized as part of the comprehensive flood damage reduction plan for the Buffalo Bayou and Tributaries watershed in 1990. A third basin, Old Westheimer Basin, was also authorized. During acquisition of the proposed project areas, a substantial portion of the proposed Old Westheimer Basin project area was no longer available for purchase. HCFCD is therefore currently proposing to expand the Sam Houston Parkway Basin and the Eldridge Basin to compensate for the loss in storage capacity at the Old Westheimer Basin. The authorized tracts and the additional tracts identified for construction of the additional storage, which are the focus of this EA, are denoted on Exhibits B and C.

PBS&J is requesting information regarding air quality constraints that may be present within the areas being proposed for expansion. Your comments will assist HCFCD in preventing future flood damage while avoiding substantial environmental impacts.

We appreciate your timely review of this project. If you have any questions or need additional information, please contact Melinda Jones or me.

Very truly yours,

Casey Kneupper
Environmental Scientist

CK:SC/Enclosures

c: Glenn Laird - HCFCD
Melinda Jones - PBS&J



Houston-Galveston Area Council

PO Box 22777 • 3555 Timmons • Houston, Texas 77227-2777 • 713/627-3200

June 22, 2005

Ms. Casey Kneupper
PBSJ
1880 S Dairy Ashford St.,
Suite 300
Houston, TX 77077

Re: Proposed Expansion of Sam Houston Parkway Basin and Eldridge Basin
Upper Brays Bayou Watershed; Harris County, Texas

Dear Ms. Kneupper:

This letter is to inform you that we have reviewed all the areas proposed for expansion, and we have found no air quality constraints with respect to on-road transportation generated emissions. Neither did we find any hike and bike trails that are designated as Transportation Control Measures with the Houston-Galveston-Brazoria Air Quality State Implementation Plan.

If you have any questions or need additional information, please feel free to contact me.

Sincerely,

A handwritten signature in cursive script that reads "Shelley A. Whitworth".

Shelley A. Whitworth
Program Manager





An employee-owned company

November 19, 2004

Ms. Janet Fathere
Council Secretary
Coastal Coordination Council
Texas General Land Office
1700 North Congress Street, Room 617
Austin, Texas 78701-1495

PN 460927.07

Dear Ms. Fathere:

Re: Proposed Expansion of Sam Houston Parkway Basin and Eldridge Basin
Upper Brays Bayou Watershed
Harris County, Texas

PBS&J has been retained by Harris County Flood Control District (HCFCD, also referred to as "the District") to prepare an Environmental Assessment (EA) document for the proposed expansion of the above-referenced regional detention basins located in the upper watershed of Brays Bayou, Harris County, Texas (Exhibit A). The Sam Houston Parkway Basin (HCFCD ID No. D500-06-00) is located west of Beltway 8 between Bellaire Boulevard and Beechnut Street (Exhibit B). The Eldridge Basin (HCFCD ID No. D500-04-00) facility is located east of Highway 6 at Westpark Drive (Exhibit C).

The Sam Houston Parkway Basin and Eldridge Basin were authorized as part of the comprehensive flood damage reduction plan for the Buffalo Bayou and Tributaries watershed in 1990. A third basin, Old Westheimer Basin, was also authorized. During acquisition of the proposed project areas, a substantial portion of proposed Old Westheimer Basin project area was no longer available for purchase. The District is therefore currently proposing to expand the Sam Houston Parkway Basin and Eldridge Basin to compensate for the loss in storage capacity at the Old Westheimer Basin. The authorized tracts and the additional tracts identified for construction of the additional storage, which are the focus of this EA, are denoted on Exhibits B and C.

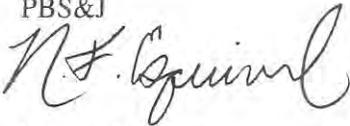
PBS&J is requesting information on the Texas Coastal Management Program as it applies to the "additional tracts" of these regional detention basins. Our understanding is that only the tidally influenced portion of Brays Bayou, the portion within 0.7 mile upstream of Buffalo Bayou, is within the Coastal Management Zone. PBS&J is requesting confirmation that the "additional tracts" are not located within the Coastal Management Zone and that the proposed project is in compliance with the Coastal Management Program.

Ms. Janet Fathere
Page 2
November 19, 2004

We appreciate your timely review of this project. If you have any questions or need additional information, please contact Melinda Goelz or me.

Very truly yours,

PBS&J

A handwritten signature in cursive script, appearing to read "N. Esquivel".

Nicolle Esquivel
Project Biologist

NE:SC
Enclosure

c: Melinda Goelz - PBS&J
Glenn Laird - HCFC

Received 1/4/05



Coastal Coordination Council

P.O. Box 12873 ♦ Austin, Texas 78711-2873 ♦ (512) 475-3514 ♦ FAX (512) 475-0680

Chairman

Jerry Patterson
Texas Land Commissioner



Members

Victor Carrillo
Broad Commission of Texas

Mayor Victor Pierson
Coastal Government
Representative

John Barrett
Agriculture Representative

Memo Benavides
Texas State Soil & Water
Conservation Board

Mark Gibson
Retail Business Representative

Jack Hunt
Texas Water Development Board

John W. Johnson
Texas Transportation Commission

Robert Jones
Coastal Resident Representative

Larry R. Soward
Texas Commission on
Environmental Quality

Robert R. Stickney
Sea Grant College Program

Mark E. Watson, Jr.
Wildlife Commission
of Texas



Gwen Spriggs
Council Secretary

Joe Solis, Jr.
Service Center
1-866-894-3578

December 29, 2004

Ms. Nicolle Esquivel
PBS&J
Suite 300
1880 S. Dairy Ashford Street
Houston, Texas 77077-4760

Re: Proposed Expansion of Sam Houston Parkway Basin and Eldridge Basin

Dear Ms. Esquivel:

It has been determined that the project referenced above is outside the Texas Coastal Management Program (CMP) boundary. Therefore, it is not subject to consistency review under the Texas CMP.

Sincerely,

Tammy S. Brooks
Program Specialist
Coastal Coordination
Texas General Land Office



An employee-owned company

June 14, 2005

Mr. Hector Gonzales
Texas Commission on Environmental Quality
1804 West Jefferson Avenue
Harlingen, Texas 78550-5247

PN 460927.07

Dear Mr. Gonzales:

Re: Proposed Expansion of Sam Houston Parkway Basin and Eldridge Basin
Upper Brays Bayou Watershed; Harris County, Texas

This letter has been prepared to follow up on a previous letter that was sent to you on November 11, 2004. As was stated, PBS&J has been retained by Harris County Flood Control District (HCFCD) to prepare an Environmental Assessment (EA) document for the proposed expansion of the above-referenced regional detention basins located in the upper watershed of Brays Bayou, Harris County, Texas (Exhibit A). This is a joint HCFCD/U.S. Army Corp of Engineers (COE) 211(f) project. The Sam Houston Parkway Basin (HCFCD ID D500-06-00) is located west of Beltway 8 between Bellaire Boulevard and Beechnut Street (Exhibit B). The Eldridge Basin (HCFCD ID D500-04-00) facility is located east of State Highway 6 (SH 6) at Westpark Drive (Exhibit C).

The Sam Houston Parkway Basin and the Eldridge Basin were authorized as part of the comprehensive flood damage reduction plan for the Buffalo Bayou and Tributaries watershed in 1990. A third basin, Old Westheimer Basin, was also authorized. During acquisition of the proposed project areas, a substantial portion of the proposed Old Westheimer Basin project area was no longer available for purchase. HCFCD is therefore currently proposing to expand the Sam Houston Parkway Basin and the Eldridge Basin to compensate for the loss in storage capacity at the Old Westheimer Basin. The authorized tracts and the additional tracts identified for construction of the additional storage, which are the focus of this EA, are denoted on Exhibits B and C.

PBS&J is requesting information regarding environmental constraints that may be present within the areas being proposed for expansion. Your comments will assist HCFCD in preventing future flood damage while avoiding substantial environmental impacts.

We appreciate your timely review of this project. If you have any questions or need additional information, please contact Melinda Jones or me.

Very truly yours,

Casey Kneupper
Environmental Scientist

CK:SC/Enclosures

c: Glenn Laird - HCFCD
Melinda Jones - PBS&J



An employee-owned company

June 2, 2005

Mr. Andy Sipocz
Texas Parks and Wildlife Department
1502 Pine Drive
Dickinson, Texas 77539

PN 460927.07

Dear Mr. Sipocz:

Re: Proposed Expansion of Sam Houston Parkway Basin and Eldridge Basin
Upper Brays Bayou Watershed
Harris County, Texas

PBS&J has been retained by Harris County Flood Control District (HCFCD) to prepare an Environmental Assessment (EA) document for the proposed expansion of the above-referenced regional detention basins located in the upper watershed of Brays Bayou, Harris County, Texas (Exhibit A). This is a joint HCFCD/U.S. Army Corp of Engineers (COE) 211(f) project. The Sam Houston Parkway Basin (HCFCD ID D500-06-00) is located west of Beltway 8 between Bellaire Boulevard and Beechnut Street (Exhibit B). The Eldridge Basin (HCFCD ID D500-04-00) facility is located east of State Highway 6 (SH 6) at Westpark Drive (Exhibit C).

Sam Houston Parkway Basin and Eldridge Basin were authorized as part of the comprehensive flood damage reduction plan for the Buffalo Bayou and Tributaries watershed in 1990. A third basin, Old Westheimer Basin, was also authorized. During acquisition of the proposed project areas, a substantial portion of the proposed Old Westheimer Basin project area was no longer available for purchase. HCFCD is therefore currently proposing to expand the Sam Houston Parkway Basin and Eldridge Basin to compensate for the loss in storage capacity at the Old Westheimer Basin. The authorized tracts and the additional tracts identified for construction of the additional storage, which are the focus of this EA, are denoted on Exhibits B and C.

PBS&J ecologists conducted a literature review of the TPWD Biological Conservation Database System (TxBCD) to identify known occurrences of threatened/endangered species within the vicinity of the project area in August 2002. Based on PBS&J's review, there are no documented occurrences of federally threatened or endangered species within the project area or within 1,000 feet of the project area. Further surveys completed by Larry E. Brown, Plant Taxonomist, did not identify any occurrences of threatened or endangered species.

On behalf of HCFCD, PBS&J is requesting written documentation regarding compliance with the Endangered Species Act of 1973. Based on your review of the project, if you determine that the proposed project will have no adverse impact on any threatened or endangered species, please sign the concurrence portion of this letter and return, indicating your approval.

Mr. Andy Sipocz
Page 2
June 2, 2005

We appreciate your timely review of this project. If you have any questions or need additional information, please contact Melinda Goelz or me.

Very truly yours,

PBS&J



Casey Kneupper
Environmental Scientist

CK:SC
Enclosures

c: Glenn Laird - HCFCD
Melinda Goelz - PBS&J

CONCURRENCE:

U.S. FISH AND WILDLIFE SERVICE

Authorized Signature

Title

Date



An employee-owned company

December 9, 2004

Mr. Carlos Mendoza
U.S. Fish and Wildlife Service
Ecological Services
17629 El Camino Real, Suite 211
Houston, Texas 77058-3051

PN 460927.07

Dear Mr. Mendoza:

Re: Proposed Expansion of Sam Houston Parkway Basin and Eldridge Basin
Upper Brays Bayou Watershed, Harris County, Texas

PBS&J has been retained by Harris County Flood Control District (HCFCD, also referred to as "the District") to prepare an Environmental Assessment (EA) document for the proposed expansion of the above-referenced regional detention basins located in the upper watershed of Brays Bayou, Harris County, Texas (Exhibit A). The Sam Houston Parkway Basin (HCFCD ID No. D500-06-00) is located west of Beltway 8 between Bellaire Boulevard and Beechnut Street (Exhibit B). The Eldridge Basin (HCFCD ID No. D500-04-00) facility is located east of Highway 6 at Westpark Drive (Exhibit C).

The Sam Houston Parkway Basin and Eldridge Basin were authorized as part of the comprehensive flood damage reduction plan for the Buffalo Bayou and Tributaries watershed in 1990. A third basin, Old Westheimer Basin, was also authorized. During acquisition of the proposed project areas, a substantial portion of proposed Old Westheimer Basin project area was no longer available for purchase. The District is therefore currently proposing to expand the Sam Houston Parkway Basin and Eldridge Basin to compensate for the loss in storage capacity at the Old Westheimer Basin. The authorized tracts and the additional tracts identified for construction of the additional storage, which are the focus of this EA, are denoted on Exhibits B and C.

PBS&J ecologists conducted a literature review of the TPWD Biological Conservation Database System (TxBCD) to identify known occurrences of threatened/endangered species within the vicinity of the project area in August 2002. Based on PBS&J's review, there are no documented occurrences of federally threatened or endangered species within the project area or within 1,000 feet of the project area.

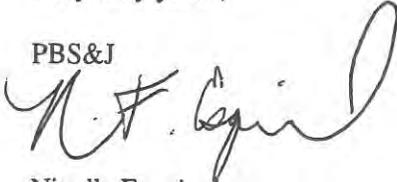
On behalf of HCFCD, PBS&J is requesting written documentation regarding compliance with the Endangered Species Act of 1973. Based on your review of the project, if you determine that the proposed project will have no adverse impact on any threatened or endangered species, please sign the concurrence portion of this letter and return, indicating your approval.

Mr. Carlos Mendoza
Page 2
December 9, 2004

We appreciate your timely review of this project. If you have any questions or need additional information, please contact Melinda Goelz or me.

Very truly yours,

PBS&J



Nicolle Esquivel
Project Biologist

NE:SC
Enclosure

c: Glenn Laird, HCFCD
Melinda Goelz, PBS&J

CONCURRENCE:

U.S. FISH AND WILDLIFE SERVICE

Authorized Signature

Title

Date



An employee-owned company

January 15, 2009

Ms. Donna Anderson
U.S. Fish and Wildlife Service
17629 El Camino Real, Suite 211
Houston, Texas 77058

PN 46145900

Dear Ms. Anderson:

Re: 2008 Updated ROW on the Detention Element
Upper Watershed of Brays Bayou
HCFCD Project ID D100-00-00-Y005
Harris County, Texas

PBS&J has been retained by Harris County Flood Control District (HCFCD) to prepare an Environmental Assessment (EA) document for the proposed expansion of the above-referenced project located in the upper watershed of Brays Bayou, Harris County, Texas. The U.S. Army Corps of Engineers (USACE) Galveston District (the lead federal agency) and HCFCD, the local sponsor, are evaluating additional stormwater storage locations within the Arthur Storey Park and Eldridge Detention Basin complexes within the upper watershed of Brays Bayou in accordance with Section 211(f) of the Water Resources Development Act of 1996 (WRDA 96). The additional storage areas are designed to be incorporated into an existing feasible and economically justified plan that effectively reduced damages due to flooding along the upper watershed of Brays Bayou. The Arthur Storey Park Basin (HCFCD ID D500-06-00) is located west of Beltway 8 between Bellaire Boulevard and Beechnut Street. The Eldridge Basin (HCFCD ID D500-04-00) facility is located east of State Highway 6 (SH 6) at Westpark Drive. Refer to Attachment A for the locations of the detention basins.

The Arthur Storey Park Basin and Eldridge Detention Basin were authorized as part of the comprehensive flood damage reduction plan for the Buffalo Bayou and Tributaries watershed in 1990. A third basin, Old Westheimer Basin, was also authorized (Attachment A). During acquisition of the proposed project areas, a substantial portion of the proposed Old Westheimer Basin project area was no longer available for purchase. Therefore, HCFCD purchased additional properties to construct additional stormwater storage within the upper watershed of Brays Bayou to compensate for this loss in storage capacity at the Old Westheimer Basin. The additional properties total approximately 188 acres, which includes approximately 153 acres at the Eldridge Detention Basin and approximately 35 acres at the Arthur Storey Park Detention Basin. Refer to Attachment B for the locations of the authorized and additional tracts.

The additional properties were assessed by a qualified biologist for the presence of threatened and endangered species and potential threatened and endangered species habitat. Based on field surveys conducted in 2002, 2004, 2005, and 2008, the vegetation types within the project area include upland forest, upland pasture, upland scrub-shrub, palustrine forested (PFO) wetlands, palustrine scrub-shrub

(PSS) wetlands, and disturbed or developed. Table 1 summarizes the vegetation types located within the project area. Vegetation maps are included in Attachment C.

Table 1
Vegetation Types within the Project Area

Vegetation Type	Area (Acres)
Arthur Storey Park Detention Basin	
Upland Scrub-Shrub	10.97
Upland Pasture	1.06
Scrub-Shrub Wetland	0.01
Disturbed	23.29
Basin Total	35.33
Eldridge Detention Basin	
Upland Pasture	48.47
Upland Scrub-Shrub	14.64
Upland Forest	9.15
Scrub-Shrub Wetland	3.24
Forested Wetland	1.89
Disturbed	75.53
Basin Total	152.92

Predominant vegetation observed within the upland pasture community included vasey grass (*Paspalum urvillei*), windmill grass (*Chloris canterai*), eastern false-willow (*Baccharis halimifolia*), Brazilian vervain (*Verbena brasiliensis*), dallisgrass (*Paspalum dilatatum*), frog fruit (*Phyla lanceolata*), western ragweed (*Ambrosia psilostachya*), southern dewberry (*Rubus trivialis*), and peppervine (*Ampelopsis arborea*).

Predominant vegetation observed within the upland scrub-shrub community included Chinese tallow-tree (*Sapium sebiferum*), eastern false-willow, southern dewberry, poison ivy (*Toxicodendron radicans*), giant ragweed (*Ambrosia trifida*), western ragweed, Brazilian vervain, Canada goldenrod (*Solidago canadensis*), curly dock (*Rumex crispus*), and powder puff mimosa (*Mimosa strigillosa*).

Predominant vegetation observed within the upland forested community included American elm (*Ulmus americana*), cedar elm (*Ulmus crassifolia*), common hackberry (*Celtis occidentalis*), willow oak (*Quercus phellos*), pecan (*Carya illinoensis*), roughleaf dogwood (*Cornus drummondii*), yaupon holly (*Ilex vomitoria*), Chinese privet (*Ligustrum sinense*), poison ivy, common greenbrier (*Smilax rotundifolia*), dwarf palmetto (*Sabal minor*), Cherokee sedge (*Carex cherokeensis*), inland sea-oats (*Chasmanthium latifolium*), and wild onion (*Allium drummondii*).

Ms. Anderson
Page 3
January 15, 2009

Predominant vegetation observed within the wetland scrub-shrub community included Chinese tallow (sapling), eastern false-willow, poison ivy, swamp smartweed (*Polygonum hydropiperoides*), green flatsedge (*Cyperus virens*), and small spikerush (*Eleocharis parvula*).

Predominant vegetation observed within the small area of forested wetland included Chinese tallow, willow oak, cedar elm, swamp smartweed, green flatsedge (*Cyperus virens*), and small spikerush.

The vegetation communities located within the project area do not provide suitable habitat for any threatened and endangered species. Presence/absence surveys for the Texas prairie dawn-flower (*Hymenoxys texana*) were conducted by Dr. Larry E. Brown in 2004 and 2005. Texas prairie dawn populations were not discovered during the field surveys (Attachment D). In addition, field surveys did not identify the presence of other threatened and endangered species. PBS&J ecologists conducted a literature review of the Texas Parks and Wildlife Department (TPWD) Texas Natural Diversity Database System (TxNDD) to identify known occurrences of threatened/endangered species within the vicinity of the project area in August 2002 and July 2008. No documented occurrences of federally threatened or endangered species were listed in the TxNDD within the project area or within 1,000 feet of the project area.

Based on the absence threatened and endangered species and potential threatened and endangered species habitat, a determination of “no effect” for the proposed activities was concluded. PBS&J is requesting your review of the proposed project and concurrence that the proposed project will have “no effect” on threatened and endangered species. If you have any questions or need additional information, please contact me at (281) 493-5100.

Very truly yours,

PBS&J

Courtney E. Cox

Courtney E. Cox
Senior Scientist II

CEG:
Enclosures

cc: Denise Todt, HCFC
Eddie George, HCFC
Casey Hall, PBS&J

----- Original Message -----

From: Donna_Anderson@fws.gov <Donna_Anderson@fws.gov>

To: Cox, Courtney E

Cc: Laird, Glenn (Flood Control) <Glenn.Laird@hcfcd.org>

Sent: Mon Jan 26 14:08:47 2009

Subject: Re: FW: 2008 Updated ROW on the Upper Brays Bayou Detention Element

Hello Courtney,

When a call of "no effect" is made on a project, it is not necessary for the Service to respond or provide concurrence. The responsibility of determining a "no effect" finding lies with the project proponent and should be well documented in your project files. In the event the project changes, threats to listed species should be assessed again and a determination made accordingly.

The Service appreciates the opportunity to review flood control projects such as the expansion of detention basins at Arthur Storey Park and Eldridge. Please feel free to contact me if you should have any questions.

Donna Anderson
Wildlife Biologist
USFWS Clear Lake Ecological Service Office
17629 El Camino Real, Suite 211
Houston, Texas 77058
Office: 281/286-8282
Fax: 281/488-5882

From: Cox, Courtney E
Sent: Thursday, January 15, 2009 12:39 PM
To: donna_anderson@fws.gov
Cc: Hall, Casey J
Subject: 2008 Updated ROW on the Upper Brays Bayou Detention Element

Donna,

Attached is the 2008 Updated ROW on the Upper Brays Bayou Detention Element threatened and endangered species review, as requested in our phone conversation earlier today. I have also attached the original letter that was sent to you guys in 2004.

Harris County Flood Control District will be submitting the Environmental Assessment (EA) to the Corps in a few weeks and we would like to include your response to the attached letter in the EA. I would really appreciate a concurrence letter from you as soon as you can to ensure that it gets included.

Please give me a call if you have any questions.

Thanks!

Courtney E. Cox
Senior Scientist II
PBS&J - Houston Ecology and Planning
1250 Wood Branch Park Drive, Suite 300
Houston, Texas 77079
Direct: 281-529-4137
Fax: 281-493-1047
cecox@pbsj.com
www.pbsj.com <<http://www.pbsj.com/>>

File(s) will be available for download until 22 January 2009:

Attachment: Updated ROW Brays Bayou Detention-USFWS Letter.pdf
<<https://sendit.pbsj.com/seos/1000/mpd/23012009c914643d2f88932653136ba2745d58f9>> , 22,406.14 KB

Attachment: 2004 USFWS Letter.pdf
<<https://sendit.pbsj.com/seos/1000/mpd/2301200933bd7c07ed77f54a6d08e4ddb477b213>> , 1,654.94 KB

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April 8, 2010

Mr. Brent Ortego
Texas Parks and Wildlife Department
Wildlife Division
Wildlife Habitat Assessment Program
4200 Smith School Road
Austin, Texas 78744-3291

PN 046145900

Dear Mr. Ortego:

Re: Fish and Wildlife Coordination Act Review Request
2008 Updated ROW on the Detention Element
Upper Watershed of Brays Bayou
HCFCD Project ID D100-00-00-Y005
Harris County, Texas

PBS&J has been retained by Harris County Flood Control District (HCFCD) to prepare an Environmental Assessment (EA) document for the proposed expansion of the above-referenced project located in the upper watershed of Brays Bayou, Harris County, Texas. The U.S. Army Corps of Engineers (USACE) Galveston District (the lead federal agency) and HCFCD, the local sponsor, are evaluating additional stormwater storage locations within the Arthur Storey Park and Eldridge Detention Basin complexes within the upper watershed of Brays Bayou. The additional storage areas are designed to be incorporated into an existing feasible and economically justified plan that effectively reduced damages due to flooding along the upper watershed of Brays Bayou. The Arthur Storey Park Basin (HCFCD ID D500-06-00) is located west of Beltway 8 between Bellaire Boulevard and Beechnut Street. The Eldridge Basin (HCFCD ID D500-04-00) facility is located east of State Highway 6 (SH 6) at Westpark Drive. Refer to Exhibits A, B, and C for the locations of the detention basins and additional tracts.

Under the Fish and Wildlife Coordination Act, the proposed project is required to consider potential impacts to fish and wildlife resources in planning civil works projects and coordinate with the Texas Parks and Wildlife Department (TPWD). Pursuant to the Act, PBS&J is requesting that TPWD review the proposed project and provide any comments your agency may have regarding the proposed action. We appreciate your continued cooperation in allowing us to fulfill our obligations under the Act.

If you have any questions or need additional information, please contact me at (281) 493-5100.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Jeremy Marshall'.

PBS&J

Jeremy Marshall
Project Scientist

JRM:
Enclosures

cc: Eddie George, HCFCD



An employee-owned company

April 8, 2010

Ms. Donna Anderson
U.S. Fish and Wildlife Service
17629 El Camino Real, Suite 211
Houston, Texas 77058

PN 046145900

Dear Ms. Anderson:

Re: Fish and Wildlife Coordination Act Review Request
2008 Updated ROW on the Detention Element
Upper Watershed of Brays Bayou
HCFCD Project ID D100-00-00-Y005
Harris County, Texas

PBS&J has been retained by Harris County Flood Control District (HCFCD) to prepare an Environmental Assessment (EA) document for the proposed expansion of the above-referenced project located in the upper watershed of Brays Bayou, Harris County, Texas. The U.S. Army Corps of Engineers (USACE) Galveston District (the lead federal agency) and HCFCD, the local sponsor, are evaluating additional stormwater storage locations within the Arthur Storey Park and Eldridge Detention Basin complexes within the upper watershed of Brays Bayou. The additional storage areas are designed to be incorporated into an existing feasible and economically justified plan that effectively reduced damages due to flooding along the upper watershed of Brays Bayou. The Arthur Storey Park Basin (HCFCD ID D500-06-00) is located west of Beltway 8 between Bellaire Boulevard and Beechnut Street. The Eldridge Basin (HCFCD ID D500-04-00) facility is located east of State Highway 6 (SH 6) at Westpark Drive. Refer to Exhibits A, B and C for the locations of the detention basins and proposed additional tracts.

Under the Fish and Wildlife Coordination Act, the proposed project is required to consider potential impacts to fish and wildlife resources in planning civil works projects and coordinate with the U.S. Fish and Wildlife Service (USFWS). Pursuant to the Act, PBS&J is requesting that USFWS review the proposed project and provide any comments your agency may have regarding the proposed action. We appreciate your continued cooperation in allowing us to fulfill our obligations under the Act.

If you have any questions or need additional information, please contact me at (281) 493-5100.

Very truly yours,

PBS&J

A handwritten signature in cursive script, appearing to read 'Jeremy Marshall'.

Jeremy Marshall
Project Scientist

JRM:
Enclosures

cc: Eddie George, HCFCD

From: [Donna Anderson@fws.gov](mailto:Donna_Anderson@fws.gov) [mailto:Donna_Anderson@fws.gov]

Sent: Tuesday, July 20, 2010 1:35 PM

To: George, Eddie (Flood Control)

Subject: Draft Biological Assessment 2008 Updates Right of Way on the Detention Element Upper Watershed of Brays Bayou

Dear Eddie,

Thank you for your recent submission of the Draft Biological Assessment 2008 Updates Right of Way on the Detention Element Upper Watershed of Brays Bayou. When a call of "no effect" is made on a project, it is not necessary for the Service to respond or provide concurrence. The responsibility of determining a "no effect" finding lies with the project proponent and should be well documented in your project files. In the event the scope of the project changes, threats to listed species should be assessed again and a determination made accordingly.

The Service appreciates the opportunity to review flood control projects such as the 2008 Updates Right of Way on the Detention Element Upper Watershed of Brays Bayou. Please feel free to contact me if you should have any questions.

Thanks,

Donna Anderson

Wildlife Biologist

USFWS Ecological Services Office

17629 El Camino Real, Suite 211

Houston, Texas 77058

Cell: 713-542-0389

Office: 281/286-8282

Fax: 281/488-5882

Appendix D
Draft Biological Assessment

**DRAFT BIOLOGICAL ASSESSMENT
2008 UPDATED RIGHT-OF-WAY ON THE
DETENTION ELEMENT
UPPER WATERSHED OF
BRAYS BAYOU

FEDERAL FLOOD CONTROL PROJECT**

Prepared for:

Harris County Flood Control District
9900 Northwest Freeway
Houston, Texas 77092

Prepared by:

PBS&J
1250 Wood Branch Park Drive, Suite 300
Houston, Texas 77079

*Texas Board of Professional Engineers
Certificate of Registration Number F-474*

April 2010

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Exhibits

The following exhibits are located in the Draft EA:

Exhibit A	Vicinity Map
Exhibit B	Arthur Storey Park Detention Basin (D500-06-00) Map
Exhibit C	Eldridge Detention Basin (D500-04-00) Map
Exhibit D	Old Westheimer Basin (D500-01-00) Map

Appendices

The following appendices are located in the Draft EA:

Appendix A	Habitat Assessment and Project Impact and Mitigation Alternatives Analysis
Appendix B	Cost Effectiveness/Incremental Cost Analysis
Appendix C	Agency Coordination

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Appendix D	General Conformity Determination
Appendix E	404(b) Analysis and 401 Water Quality Certification
Appendix F	Biological Assessment

Acronyms and Abbreviations

AAHU	average annual habitat units
BA	Biological Assessment
EA	Environmental Assessment
ESA	Endangered Species Act
GBWMB	Greens Bayou Wetland Mitigation Bank
HCFCDD	Harris County Flood Control District
HEP	habitat evaluation procedures
HSI	Habitat Suitability Index/Indices
HU	habitat units
NDD	Natural Diversity Database
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
PFO	palustrine forested
PSS	palustrine scrub-shrub
REC	Record of Environmental Consideration
SH	State Highway
SOC	species of concern
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey

1.0 INTRODUCTION

1.1 PURPOSE OF THE BIOLOGICAL ASSESSMENT

The purpose of this Biological Assessment (BA) is to fulfill the U.S. Army Corps of Engineers (USACE) obligations under Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended. The proposed federal action requiring the biological assessment is the USACE's evaluation of the 2008 Updated Right-of-Way on the Detention Element Upper Watershed of Brays Bayou.

A Draft Environmental Assessment (EA) has been completed for the proposed action. The Harris County Flood Control District (HCFCD, Local Sponsor) has prepared the Draft EA, which documents the environmental assessment of the No Action Alternative and the proposed action.

1.2 PURPOSE AND NEED OF THE PROJECT

1.2.1 Project Description

The USACE Galveston District (the lead federal agency) and HCFCD, the local sponsor, are evaluating additional stormwater storage locations within the Arthur Storey Park and Eldridge Detention Basin complexes within the upper watershed of Brays Bayou in Harris County, Texas. The additional storage areas are designed to replace detention that was originally identified to be located on land that has been developed since being originally identified in the Final Environmental Assessment, Brays Bayou at Houston, Texas, Flood Damage Prevention, Detention Element (USACE, 1998).

1.2.2 Purpose and Need of the Proposed Action

The Brays Bayou Federal Flood Control Project was authorized by the 1990 WRDA, Public Law 101-640, as part of the comprehensive flood damage reduction plan for the Buffalo Bayou and Tributaries watershed. The authorized flood control project on Brays Bayou is documented in the report entitled, *Buffalo Bayou and Tributaries, Texas Feasibility Report, Flood Damage Prevention, May 1988*. The HCFCD then requested a separable element analysis of the authorized Brays Bayou project, which was initiated in November 1991. Two separate elements were identified for the project, the detention element and the diversion element. During the separable element analysis, the diversion element was no longer found to be feasible due to technical feasibility and public opposition, and an alternative to the diversion element was later evaluated. An EA was prepared in March 1998 for the detention element. A Finding of No Significant Impacts (FONSI) was issued by the USACE in April 1998. The approved detention element plan consisted of the following: 3.7 miles of channel modifications, construction of the 2,500-acre-foot Arthur Storey Park Detention Basin (HCFCD Unit D500-06-00), construction of the 3,200-acre-foot Eldridge Detention Basin (HCFCD Unit D500-04-00), and construction of the 2,400-acre-foot Old Westheimer Detention Basin (HCFCD Unit D500-01-00). This plan would provide flood

damage reduction from the 2 percent chance flood event to urbanized areas of the basin and produce the maximum net economic benefits.

Following approval of the detention element plan, HCFCD began purchasing tracts within the proposed project areas of the authorized regional detention basins (Arthur Storey Park Detention Basin, Eldridge Detention Basin, and Old Westheimer Detention Basin). It was at this time that HCFCD learned that a substantial portion of the proposed Old Westheimer Detention Basin project area (approximately 70 acres) was no longer available for acquisition. Collectively, the regional detention basins were planned to contain approximately 8,100 acre-feet of storage. Reductions in the overall storage capacity of the basins would render the detention basin plan incapable of obtaining the documented level of performance for the authorized project. The loss of acreage at the Old Westheimer Detention Basin equates to 1,800 acre-feet of storage. Therefore, the purpose of the proposed action is to construct additional stormwater storage in a new location within the upper watershed of Brays Bayou to compensate for this loss in storage capacity at the Old Westheimer Detention Basin. See Exhibit A for locations of the approved detention basins.

1.3 DESCRIPTION OF THE PROPOSED PROJECT

1.3.1 Expansion of Two Existing Detention Basins

To ensure the detention element plan is still effective, HCFCD proposes to construct additional stormwater storage on approximately 188 acres of additional property adjacent to the project areas of the authorized Arthur Storey Park Detention Basin and Eldridge Detention Basin complexes to compensate for the loss in storage capacity at the Old Westheimer Detention Basin. The proposed action would adhere to the authorized plan's design criteria and construction methods (USACE, 1998).

Arthur Storey Park Detention Basin. The Arthur Storey Park Detention Basin (HCFCD Unit No. D500-06-00) is located west of Beltway 8 and south of Bellaire Boulevard. A total of four tracts, totaling an estimated 35 acres, were identified for proposed expansion of this regional detention facility (Exhibit B).

The authorized design storage capacity of the Arthur Storey Park Detention Basin is 2,500 acre-feet. HCFCD proposes to create an additional 1,000 acre-feet of storage by adding 35 acres of additional property and increasing the overall size of the authorized detention facility. Under the authorized plan, approximately 4.03 million cubic yards of earthen material would be excavated. The proposed action would require the excavation of approximately 1.07 million cubic yards of additional earthen materials. Construction began in 1995; therefore, the baseline date for evaluation of this detention basin is 1995.

Eldridge Detention Basin. The Eldridge Detention Basin (HCFC Unit D500-04-00) is located west of Eldridge Road and east of State Highway (SH) 6. A total of 21 tracts, totaling approximately 153 acres, were identified for the proposed expansion activities at this regional detention facility (Exhibit C).

The authorized design storage capacity of the Eldridge Detention Basin is 3,200 acre-feet. HCFCD proposes to create an additional 1,466 acre-feet of storage by increasing the overall size of the detention facility through the addition of 153 acres of property. Under the authorized plan, an estimated 5.16 million cubic yards of earthen material would be excavated. The proposed action requires the excavation of approximately 4.16 million cubic yards of additional earthen materials. Construction began in 1998; therefore, the baseline date for evaluation of this detention basin is 1998. Table 1 presents a summary of the project components. These components are identified in Exhibits B and C.

**Table 1
Proposed Action Summary**

Detention Basin	Location	Description
Arthur Storey Park Basin (D500-06-00)	Southwest of intersection of Beltway 8 and Bellaire Boulevard	Acquisition of 4 tracts of land totaling approximately 35 acres
Eldridge Basin (D500-04-00)	North of Westpark Tollway between SH 6 and Eldridge Parkway	Acquisition of 21 tracts of land totaling approximately 153 acres

1.3.2 Soil Placement

Approximately 5.23 million cubic yards of earthen material would be excavated as part of the proposed action. Based on extensive previous experience, HCFCD plans for the excavated materials to be sold by the contractor(s). The contractor(s) would be required to submit all proposed soil placement areas to HCFCD for evaluation and approval. Soil is anticipated to be disposed of within the community to develop roads and building pad sites. If use becomes necessary, Records of Environmental Consideration (REC) will be prepared to document evaluation of potential environmental impacts and coordination of the use of these disposal sites.

1.4 ALTERNATIVES CONSIDERED

1.4.1 No Action Alternative

The No Action Alternative was considered as an alternative. Adoption of this alternative plan implies acceptance of the existing situation, including the costs and the adverse effects of continued flooding in the Brays Bayou watershed. The No Action plan would forego the flood damage reduction benefits that would result from completing the authorized detention element plan and prevent federal funding for the construction of the other elements. The implementation of this alternative plan would result in continued flood damages, including losses to property owners and potential loss of lives. This plan would result in the deterioration of property values in the watershed and would not be acceptable to the local community

and local interests. Inhabitants of the watershed would continue to suffer the social and economic stresses associated with repetitive flooding. While the No Action Alternative fails to satisfy the goals and objectives of the proposed action, it is retained as a basis for comparison with the Action Alternatives carried forward for further study.

1.4.2 Alternative 2 – Relocation of Old Westheimer Detention Basin

Once it was determined that the tracts previously identified for construction of the authorized Old Westheimer Detention Basin were no longer available, the immediate area surrounding the existing detention basin (HCFCU Unit D500-01-00) was evaluated for other available tracts. The available tracts that were identified were smaller than the originally-proposed project area and were not contiguous. Hydrologic and hydraulic studies were performed to evaluate the feasibility and efficiency of constructing numerous smaller detention basins in lieu of a single, larger detention facility, and it was determined that the individual detention basins would be inefficient given their size and configuration (i.e., distance between each basin). Furthermore, it would be more costly to purchase the larger number of smaller tracts and construct the additional detention basins. For these reasons, this alternative plan was eliminated from further evaluation and no changes were proposed for the Old Westheimer Detention Basin.

1.4.3 Alternative 3 (Proposed Action)

In order to compensate for the loss in storage capacity at the Old Westheimer Detention Basin, HCFCU proposes to construct additional stormwater storage on approximately 188 acres of additional property adjacent to the Arthur Storey Park Detention Basin and Eldridge Detention Basin complexes. The proposed action would adhere to the authorized plan's design criteria and construction methods (USACE, 1998).

The proposed action is the alternative that best meets the planning goals and objectives. The proposed action provides substantial flood damage reduction, does not create adverse impacts downstream of the project, and has been favorably received by the public. The project provides opportunities to incorporate recreation elements into the flood damage reduction project. See Exhibits B and C for a map of the proposed action components.

1.5 PROJECT SETTING

The proposed additional tracts at the Arthur Storey Park Detention Basin and the Eldridge Detention Basin are currently undeveloped areas within a growing suburban community.

1.6 PHYSICAL SETTING

1.6.1 General Location

The Brays Bayou watershed consists of approximately 137 square miles and is located in central and southwestern Harris County. The Brays Bayou channel is approximately 31 miles long and generally flows west to east from its headwaters in Fort Bend County to its confluence with Buffalo Bayou at the Houston Ship Channel below the Turning Basin. The Arthur Storey Park Basin is located on the southwest corner of Bellaire Boulevard and Beltway 8, and the Eldridge Basin is located on the northeast corner of SH 6 and Alief-Clodine Road.

1.6.2 Climate

The Brays Bayou watershed is situated within a humid region of Texas that maintains subtropical weather during all parts of the year, especially the summer, primarily due to the proximity of the Gulf of Mexico. This area of Texas is subject to both intensive local thunderstorms of relatively short duration and thunderstorms that may stall and persist for several days. In addition, this region is subject to violent storms associated with tropical disturbances, including occasional hurricanes.

Annual rainfall in the Houston area is generally 45 inches per year. The distribution of rainfall throughout the year is somewhat bimodal with the months of June and September accounting for peak rainfall months. The mean relative humidity ranges from a minimum of approximately 60 percent at noon to a maximum of 91 percent at 6:00 a.m.

The average daily temperature is 70°F (21°C). There is an average of seven days per year in which the temperature falls below freezing and an average of 82 days per year in which the temperature reaches 90°F (32°C) or higher.

1.6.3 Geology

The Brays Bayou watershed lies within the Gulf Coastal Plain. This physiographic region consists of continental and marine sediments dating to the Cenozoic Era; these sediments are a result of the advance and retreat of the Gulf of Mexico. The regional geologic strata lie parallel to the coast, and the outcrops are progressively younger seaward. The entire project area lies within the Beaumont geologic formation. The Beaumont formation, dating from the Pleistocene age, has an almost featureless surface and is characterized by relict river channels shown by meander patterns and pimple mounds on meanderbelt ridges, separated by areas of low, relatively smooth, featureless, backswamp deposits without pimple mounds. This formation is comprised of silt, sand, and clay, and includes mainly stream channel, point-bar, natural levee, backswamp, and to a lesser extent, coastal and mud-flat deposits; concretions of calcium carbonate, iron oxide, and iron manganese oxides are found in the zone of weathering. This layer has a thickness of approximately 100 feet.

1.6.4 Soils

The soil mapping units within the project area include Bernard clay loam, Clodine loam, and Lake Charles clay, 0 to 1 percent (Natural Resources Conservation Service [NRCS], 1976). The Bernard Series consists of very deep, somewhat poorly drained, very slowly permeable soils. The Clodine Series consists of very deep, somewhat poorly drained, moderately permeable soils. The Lake Charles Series consists of very deep, moderately well drained, very slowly permeable soils.

1.7 BIOLOGICAL RESOURCES

1.7.1 Vegetation

Brays Bayou is located within the West Gulf Coastal Plain, which extends from the Mississippi Alluvial Plain southwest to the Republic of Mexico. The Brays Bayou watershed and tributaries are located in the vegetational zone of Texas known as the Gulf Prairies and Marshes (Texas Parks and Wildlife Department [TPWD], 2004). Formerly, the bottoms of this area of coastal rivers were covered in forests of sugar hackberry (*Celtis laevigata*), pecan (*Carya illinoensis*), elm (*Ulmus* spp.), and oak (*Quercus* spp.). Extensive open prairies dominated by little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), and various sedges (*Carex* spp.) were found on the uplands between rivers.

Today, few areas within this region exist in this natural state, and none exist within the project area. Urbanization has reduced most of the native habitat in the region to fragmented and isolated remnants. Adjacent to the project area, the primary land use is residential and commercial development. As a result, much of the native vegetation has been displaced through urban development. Vegetation within the project area is a mixture of invasive species, ornamental plants, and remnants of native vegetation.

Undeveloped areas that were noted within the project area during the field reconnaissance included 49.53 acres of upland pasture, 25.61 acres of upland scrub-shrub, 9.15 acres of upland forest, 3.25 acres of scrub-shrub wetland, and 1.89 acres of forested wetland. The breakout of these habitat communities per detention basin are provided in Table 2.

A habitat assessment based on the habitat evaluation procedure (HEP) was conducted in June 2008 for the project area. HEP, developed by the U.S. Fish and Wildlife Service (USFWS), was used to quantify the impacts of a proposed project by evaluating the ability of the habitat within the study area to provide key components necessary for specific wildlife species (USFWS, 1980a). HEP is a species-habitat approach to impact assessment that quantifies habitat quality for selected evaluation species through the use of a habitat suitability index (HSI). The HSI value is derived from an evaluation of the ability of key habitat components to provide the life requisites of selected species of wildlife (USFWS, 1980a). HEP is based on the assumption that habitat for selected species can be described by an HSI. The species HSI or the average HSI for multiple species is multiplied by the area of available habitat to determine the total

habitat units (HU) for the species for particular cover types in the study area. HU's are the index value derived from combining quality and quantity and a method to covert habitat data into dollar value.

The first step in the analysis is to identify the baseline habitat, which is based on 1995 conditions for the Arthur Storey Park Detention Basin and 1998 for the Eldridge Detention Basin. The baseline assessment describes the habitat conditions in terms of HU's for the project area. Analysis of the habitat types resulted in a total of 45.33 HU's (Table 2). A copy of the Habitat Assessment is included as Appendix A in the Draft EA.

Table 2
Habitat Communities and Habitat Units Within Project Area

Habitat Classification	Total Baseline Habitat Area (Acres)	Habitat Units
Arthur Storey Park Detention Basin		
Upland Scrub-Shrub	10.97	1.10
Upland Pasture	1.06	0.90
Scrub-Shrub Wetland	0.01	0.004
Basin Total	12.04	2.00
Eldridge Detention Basin		
Upland Pasture	48.47	38.77
Upland Scrub-Shrub	14.64	1.46
Upland Forest	9.15	1.60
Scrub-Shrub Wetland	3.24	1.17
Forested Wetland	1.89	0.33
Basin Total	77.39	43.33
Total	89.43	45.33

Predominant vegetation observed within the upland pasture community included vasey grass (*Paspalum urvillei*), fringed windmill grass (*Chloris ciliata*), eastern false-willow (*Baccharis halimifolia*), Brazilian vervain (*Verbena brasiliensis*), dallisgrass (*Paspalum dilatatum*), frog fruit (*Phyla lanceolata*), western ragweed (*Ambrosia psilostachya*), southern dewberry (*Rubus trivialis*), and peppervine (*Ampelopsis arborea*).

Predominant vegetation observed within the upland scrub-shrub community included Chinese tallow-tree (*Sapium sebiferum*), eastern false-willow, southern dewberry, poison ivy (*Toxicodendron radicans*), giant ragweed (*Ambrosia trifida*), western ragweed, Brazilian vervain, goldenrod (*Solidago* sp.), curly dock (*Rumex crispus*), and powder puff mimosa (*Mimosa strigillosa*).

Predominant vegetation observed within the upland forested community included American elm (*Ulmus americana*), cedar elm (*Ulmus crassifolia*), common hackberry (*Celtis occidentalis*), willow oak (*Quercus phellos*), pecan, roughleaf dogwood (*Cornus drummondii*), yaupon holly (*Ilex vomitoria*), Chinese privet (*Ligustrum sinense*), poison ivy, common greenbrier (*Smilax rotundifolia*), dwarf palmetto (*Sabal minor*), Cherokee sedge (*Carex cherokeensis*), inland sea-oats (*Chasmanthium latifolium*), and wild onion (*Allium drummondii*).

Predominant vegetation observed within the wetland scrub-shrub community included Chinese tallow (sapling), eastern false-willow, poison ivy, swamp smartweed (*Polygonum hydropiperoides*), green flatsedge (*Cyperus virens*), and small spikerush (*Eleocharis parvula*).

Predominant vegetation observed within the small area of forested wetland included Chinese tallow, willow oak, cedar elm, swamp smartweed, green flatsedge (*Cyperus virens*), and small spikerush.

1.7.2 Wetlands

Recent U.S. Geological Survey (USGS) topographic maps, National Wetland Inventory (NWI) maps, and aerial photography were reviewed and on-site delineations were conducted in order to identify and evaluate wetlands within the project area. Based on the results of the delineations, a total of 5.14 acres of wetlands were identified within the proposed additional tracts (Berg Oliver, 1995; Carter and Burgess, 1994; ENTRIX, 2004 and 2005; and PBS&J, 2004). Please refer to Exhibits B and C for tract numbers and locations of the wetlands.

As noted in Section 1.7.1, HEP modeling was conducted to determine the habitat quality and to help quantify any impacts to the wetlands within the project area. The baseline assessment describes the habitat conditions in terms of HU's for the project area. The next step involves projecting future habitat conditions in terms of Average Annual Habitat Units (AAHU) and comparing the future habitat conditions with the proposed action to the future habitat conditions without the proposed action. AAHU is defined as the total number of HU's gained or lost as a result of the proposed action, divided by the life of the action. The impact of the proposed action is equal to the difference between the future "without project" AAHU's and the future "with project" AAHU's. The quantitative project impact value is then used to determine the mitigation acreage required to compensate for the wetland habitat lost as a result of the proposed action. The results of the analysis are discussed below.

Arthur Storey Park Detention Basin. One palustrine scrub-shrub (PSS) wetland area totaling an estimated 0.01 acre was identified (ENTRIX, 2004). The dominant vegetation within this wetland area includes Brazilian verbena (*Verbena brasiliensis*), seaside goldenrod (*Solidago sempervirens*), bushy aster (*Aster dumosus*), sea myrtle (*Baccharis halimifolia*), southern dewberry, giant ragweed, and western ragweed. This wetland area (WB03) is shown on Exhibit B.

Over the period of the analysis, the scrub-shrub wetlands within the project area would provide 0.001 average AAHU of habitat (based on the species selected for the habitat modeling for scrub-shrub wetlands) with the proposed action and 0.005 AAHU of habitat without the proposed action. The proposed action would impact 0.01 acre (100 percent) and approximately 0.004 AAHU of the scrub-shrub wetlands within the proposed additional tracts.

Eldridge Detention Basin. Two palustrine forested (PFO) wetland areas totaling an estimated 1.56 acres were identified during field surveys within Tract 29-001.0 (PBS&J, 2004). Both of these areas have been disturbed. The dominant vegetation includes green ash (*Fraxinus pennsylvanica*) and Chinese tallow-tree. A PSS wetland totaling 1.59 acres is located within Tract 29-024.0. The dominant vegetation includes marsh elder (*Iva annua*), Maximilian sunflower (*Helianthus maximiliani*), Canada goldenrod (*Solidago canadensis*), and Bahia grass (*Paspalum spp.*). There is one 0.33-acre PFO wetland area within Tract 29-029.0 (PBS&J, 2004). This wetland area is a natural depression with dominant vegetation, including Chinese tallow-tree, American elm, common hackberry, broad-leaf witchgrass (*Dichanthelium latifolium*), southern dewberry, rough button-weed (*Diodia teres*), Japanese honeysuckle (*Lonicera japonica*), soft rush (*Juncus effusus*), poison ivy, and green flatsedge. Four PSS wetland areas were identified within Tract D001-24, totaling 0.07 acre (ENTRIX, 2005). One PSS wetland area totaling 1.58 acres was identified that extends into Tracts D001-19, D001-21, D001-22, D001-47, D001-48, D001-49, D001-54, and D001-55 (ENTRIX, 2005). These wetland areas are shown on Exhibit C.

Over the period of the analysis, the forested wetlands within the project area would provide 0.091 AAHU (based on the species selected for the habitat modeling for forested wetlands) with the proposed action and 0.800 AAHU of habitat without the proposed action. The proposed action would impact 1.89 acres (100 percent) and 0.709 AAHU of the forested wetlands within the proposed additional tracts.

Over the period of the analysis, the scrub-shrub wetlands within the project area would provide 0.222 AAHU of habitat (based on the species selected for the habitat modeling for scrub-shrub wetlands) with the proposed action and 0.852 AAHU of habitat without the proposed action. The proposed action would impact 3.24 acres (100 percent) and approximately 0.630 AAHU of the scrub-shrub wetlands within the proposed additional tracts.

Table 3 identifies the wetland habitat classification, total wetland habitat area, and the wetland HU's based on the habitat assessment.

Table 3
Wetland Habitat and Quality Within the Project Area

Habitat Classification	Evaluation Species	Total Wetlands (acres)	Baseline Wetland Habitat Units	"With Project" AAHU's	"Without Project" AAHU's
Arthur Storey Park Detention Basin					
Scrub-Shrub Wetland	Veery	0.01	0.004	0.001	0.005
Eldridge Detention Basin					
Forested Wetland	Veery and eastern gray squirrel	1.89	0.33	0.091	0.800
Scrub-Shrub Wetland	Veery	3.24	1.17	0.222	0.852
Total		5.14	1.504	0.314	1.657

1.7.2.1 Total Wetland Impact Summary

Of the approximate 188 acres required for detention basin construction, a total of 5.14 acres are considered wetlands and would be impacted by the proposed action. The net impact of the proposed action is 0.634 AAHU of PSS wetlands and 0.709 AAHU of PFO wetlands, for a total of 1.343 AAHU's (Table 4).

Table 4
Wetland Habitat and Impacts Within the Project Area

Habitat Classification	Evaluation Species	Total Wetlands (acres)	Net Impacts (AAHU's)
Arthur Storey Park Detention Basin			
Scrub-Shrub Wetland	Veery	0.01	0.004
Eldridge Detention Basin			
Forested Wetland	Veery and eastern gray squirrel	1.89	0.709
Scrub-Shrub Wetland	Veery	3.24	0.630
Total		5.14	1.343

1.7.2.2 Wetland Mitigation

Wetlands were identified as the only significant resource warranting compensatory mitigation. The acreage required for mitigation is based on the HSI scores for each alternative mitigation area and the AAHU's needed. The AAHU's were divided by the HSI scores to determine the mitigation acreage requirements for each habitat type (AAHU/HSI = acres). The Habitat Assessment Project Impact and Mitigation Alternatives Analysis report is included in Appendix A of the Draft EA.

The wetland mitigation plan would consist of purchasing 2.58 acres from the Greens Bayou Wetland Mitigation Bank (GBWMB) Subdivision B to mitigate for impacts to each wetland cover type. Current development consists of Subdivision B, totaling approximately 165 acres. Subdivision B was evaluated using habitat assessment procedures and was noted to consist of emergent and forested wetlands. Scrub-shrub wetland impacts would be mitigated through the purchase of forested wetland acres; however, no scrub-shrub wetland habitat would be provided by this alternative. Mitigation would require a total of 2.58 acres of forested wetland acres.

In addition to wetland mitigation occurring at the GBWMB, native emergent wetland vegetation species would be planted at the detention basins. Monitoring would occur for a minimum five-year period or until success criteria are met, whichever is longer. Replanting would continue to occur if survival rates are not met.

1.7.3 Wildlife

The Brays Bayou watershed lies within the Houston Metropolitan Area, which has been highly impacted by human activities. The degree and extent of the changes in habitat have directly influenced the numbers and species of wildlife found in the area. Indiscriminate hunting, predator control, use of pesticides, and various forms of air, water, and land pollution have been responsible for declines in wildlife resources. The wildlife that remains lives in a modified natural habitat within the immediate influence of an encroaching urban complex. The wildlife species found in the watershed are typical of those found in highly-urbanized areas. In residential areas adjacent to the project area, common wildlife species tolerant of man's activities include the following terrestrial and aquatic species identified below.

1.7.3.1 Terrestrial Species

Wildlife resources in the project area are limited due to extensive urban development and consist of species adapted to an urban setting where disturbance and adaptations to foraging, nesting, and loafing habitats can be made. Typical resident species of amphibians and reptiles within the project area would include the northern green treefrog (*Hyla cinerea*), green anole (*Anolis carolinensis*), ground skink (*Scincella lateralis*), red-eared slider (*Chrysemys scripta elegans*), Texas rat snake (*Elaphe obsoleta lindheimeri*), diamondback water snake (*Nerodia rhombifer rhombifer*), eastern hog-nosed snake (*Heterodon platyrhinos*), and Gulf Coast ribbon snake (*Thamnophis proximus*).

Bird species identified during site visits included great blue heron (*Ardea herodias*), mourning dove (*Zenaida macroura*), kill deer (*Charadrius vociferus*), common grackle (*Quiscalus quiscula*), American crow (*Corvus brachyrhynchos*), cattle egret (*Bubulcus ibis*), anhinga (*Anhinga anhinga*), rock dove (*Columba livia*), great egret (*Casmerodius albus*), double-crested cormorant (*Phalacrocorax auritus*), and pied-billed grebe (*Podilymbus podiceps*).

Mammals that are likely to occur in the project area include hispid cotton rat (*Sigmodon hispidus*), deer mouse (*Peromyscus maniculatus*), eastern fox squirrel (*Sciurus niger*), eastern gray squirrel (*Sciurus carolinensis*), common raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), eastern cottontail rabbit (*Sylvilagus floridanus*), and swamp rabbit (*Sylvilagus aquaticus*).

In a natural state—without urban development—the above species would likely occur along with white-tailed deer (*Odocoileus virginianus*), American beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), wood duck (*Aix sponsa*), canebrake rattlesnake (*Crotalus horridus*), and alligator snapping turtle (*Macrochelys temminckii*).

1.7.3.2 Aquatic Species

Flow within Brays Bayou is primarily derived from urban rainfall runoff and wastewater treatment plant effluent. As a result, Brays Bayou generally provides a poor aquatic habitat. This low habitat value can be attributed to the sources of stream flow, fluctuating water levels, high nutrient levels and algal growth, shallow water depths, and high water temperatures.

Based on a survey of Greens Bayou (City of Houston, 1999), another tributary of Buffalo Bayou, several fish species are also likely to occur in the earthen downstream reach of Brays Bayou. Dominant fish species included red shiner (*Cyprinella lutrensis*), western mosquitofish (*Gambusia affinis*), and sailfin molly (*Poecilia latipinna*). Other fishes collected included sheepshead minnow (*Cyprinodon variegatus*), bullhead minnow (*Pimephales vigilax*), and Rio Grande cichlid (*Cichlasoma cyanoguttatum*). Larger fish species collected included spotted gar (*Lepisosteus oculatus*), yellow bullhead (*Ameiurus natalis*), channel catfish (*Ictalurus punctatus*), bluegill (*Lepomis macrochirus*), longear sunfish (*Lepomis megalotis*), and striped mullet (*Mugil cephalus*).

The red-eared slider and various amphibians spend part of their time in the bayou as well. Invertebrates such as gastropods, insect larvae, and several species of crayfish also can tolerate the nutrient load and fluctuating water levels. These species are expected to occur within Upper Brays Bayou as well. A significant sport fishery does not exist in Upper Brays Bayou since species diversity and abundance of game fish are kept low by the fluctuating water levels and limited water quality.

2.0 THREATENED AND ENDANGERED SPECIES

There are two USFWS federally listed threatened and endangered species and an additional 45 TPWD state listed rare, threatened, and endangered species that have the potential to occur within Harris County (TPWD, 2010). These species, their preferred habitat, and the determination of whether this habitat is within the project area are listed in Table 5.

The vegetation communities located within the project area do not provide suitable habitat for any threatened and endangered species. No federal or state listed threatened or endangered species or species of concern (SOC) were observed within the project area.

Table 5
State and Federal Threatened and Endangered Species of Harris County, Texas

Species Scientific Name	Federal Status ¹	State Status ²	Habitat	Habitat Present Within Project Area
Amphibians				
Houston Toad <i>Anaxyrus houstonensis</i>		E	Endemic; sandy substrate, water in pools, ephemeral pools, stock tanks; breeds in spring, especially after rains; burrows in soil of adjacent uplands when inactive; breeds February-June; associated with soils of the Sparta, Carrizo, Goliad, Queen City, Recklaw, Weches, and Willis geologic formations.	No
Birds				
American Peregrine Falcon <i>Falco peregrinus anatum</i>		T	Year-round resident and local breeder in West Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in U.S. and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.	No
Arctic Peregrine Falcon <i>Falco peregrinus tundrius</i>			Migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.	No
Bald Eagle <i>Haliaeetus leucocephalus</i>	DM	T	Found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds.	No
Black Rail <i>Laterallus jamaicensis</i>			Salt, brackish, and freshwater marshes, pond borders, wet meadows, and grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia.	No
Brown Pelican <i>Pelecanus occidentalis</i>		E	Largely coastal and near-shore areas, where it roosts and nests on islands and spoil banks.	No
Henslow's Sparrow <i>Ammodramus henslowii</i>			Wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking.	No
Mountain Plover <i>Charadrius montanus</i>			Breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; non-breeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous.	No

Species Scientific Name	Federal Status ¹	State Status ²	Habitat	Habitat Present Within Project Area
Peregrine Falcon <i>Falco peregrinus</i>		T	Both subspecies migrate across the state from more northern breeding areas in U.S. and Canada to winter along coast and farther south; subspecies (<i>F. p. anatum</i>) is also a resident breeder in West Texas; the two subspecies' listing statuses differ, <i>F.p. tundrius</i> is no longer listed in Texas.	No
Red-Cockaded Woodpecker <i>Picoides borealis</i>		E	Cavity nests in older pine (60+ years); forages in younger pine (30+ years); prefers longleaf, shortleaf, and loblolly.	No
Snowy Plover <i>Charadrius alexandrinus</i>			Formerly an uncommon breeder in the Panhandle; potential migrant; winter along coast.	No
Southeastern Snowy Plover <i>Charadrius alexandrinus tenuirostris</i>			Wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats.	No
White-Faced Ibis <i>Plegadis chihi</i>		T	Prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats.	No
White-Tailed Hawk <i>Buteo albicaudatus</i>		T	Near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May.	No
Whooping Crane <i>Grus americana</i>		E	Potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio Counties.	No
Wood Stork <i>Mycteria americana</i>		T	Forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including saltwater; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e., active heronries); breeds in Mexico and birds move into Gulf states in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960.	No
Fishes				
American Eel <i>Anguilla rostrata</i>			Coastal waterways below reservoirs to Gulf; spawns January to February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; most aquatic habitats with access to ocean, muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries; diet varies widely, geographically, and seasonally.	No
Creek Chubsucker <i>Erimyzon oblongus</i>		T	Tributaries of the Red, Sabine, Neches, Trinity, and San Jacinto Rivers; small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in headwater rivulets or marshes; spawns in river mouths or pools, riffles, lake outlets, upstream creeks.	No

Species Scientific Name	Federal Status ¹	State Status ²	Habitat	Habitat Present Within Project Area
Smalltooth Sawfish <i>Pristis pectinata</i>		E	Different life history stages have different patterns of habitat use; young found very close to shore in muddy and sandy bottoms, seldom descending to depths greater than 32 ft. (10 m); in sheltered bays, on shallow banks, and in estuaries or river mouths; adult sawfish are encountered in various habitat types (mangrove, reef, seagrass, and coral), in varying salinity regimes and temperatures, and at various water depths, feed on a variety of fish species and crustaceans.	No
Mammals				
Louisiana Black Bear <i>Ursus americanus luteolus</i>		T	Possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas.	No
Plains Spotted Skunk <i>Spilogale putorius interrupta</i>			Catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie.	No
Rafinesque's Big-Eared Bat <i>Corynorhinus rafinesquii</i>		T	Roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures.	No
Red Wolf <i>Canis rufus</i>		E	Extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies.	No
Southeastern Myotis Bat <i>Myotis austroriparius</i>			Roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures.	No
Mollusks				
Little Spectaclecase <i>Villosa lienosa</i>			Creeks, rivers, and reservoirs, sandy substrates in slight to moderate current, usually along the banks in slower currents; East Texas, Cypress through San Jacinto River basins.	No
Louisiana Pigtoe <i>Pleurobema riddellii</i>		T	Streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins.	No
Pistolgrip <i>Tritogonia verrucosa</i>			Stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; East and Central Texas, Red through San Antonio River basins.	No
Rock Pocketbook <i>Arcidens confragosus</i>			Mud, sand, and gravel substrates of medium to large rivers in standing or slow-flowing water, may tolerate moderate currents and some reservoirs, East Texas, Red through Guadalupe River basins.	No
Sandbank Pocketbook <i>Lampsilis satura</i>		T	Small to large rivers with moderate flows and swift current on gravel, gravel-sand, and sand bottoms; East Texas, Sulfur south through San Jacinto River basins; Neches River.	No

Species Scientific Name	Federal Status ¹	State Status ²	Habitat	Habitat Present Within Project Area
Texas Pigtoe <i>Fusconaia askewi</i>		T	Rivers with mixed mud, sand, and fine gravel in protected areas associated with fallen trees or other structures; East Texas River basins, Sabine through Trinity Rivers as well as San Jacinto River.	No
Wabash Pigtoe <i>Fusconaia flava</i>			Creeks to large rivers on mud, sand, and gravel from all habitats except deep shifting sands; found in moderate to swift current velocities; East Texas River basins, Red through San Jacinto River basins; elsewhere occurs in reservoirs and lakes with no flow.	No
Reptiles				
Alligator Snapping Turtle <i>Macrochelys temmincki</i>		T	Perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March through October; breeds April through October.	No
Green Sea Turtle <i>Chelonia mydas</i>		T	Gulf and bay system; shallow water seagrass beds, open water between feeding and nesting areas, barrier island beaches; adults are herbivorous, feeding on sea grass and seaweed; juveniles are omnivorous, feeding initially on marine invertebrates, then increasingly on sea grasses and seaweeds; nesting behavior extends from March to October, with peak activity in May and June.	No
Gulf Saltmarsh Snake <i>Nerodia clarkii</i>			Saline flats, coastal bays, and brackish river mouths.	No
Kemp's Ridley Sea Turtle <i>Lepidochelys kempii</i>		E	Gulf and bay system, adults stay within the shallow waters of the Gulf of Mexico; feed primarily on crabs, but also snails, clams, other crustaceans and plants, juveniles feed on sargassum and its associated fauna; nests April through August.	No
Leatherback Sea Turtle <i>Dermochelys coriacea</i>		E	Gulf and bay systems, and widest-ranging open-water reptile; omnivorous, shows a preference for jellyfish; in the U.S. portion of their western Atlantic nesting territories, nesting season ranges from March to August.	No
Loggerhead Sea Turtle <i>Caretta caretta</i>		T	Gulf and bay system primarily for juveniles, adults are most pelagic of the sea turtles; omnivorous, shows a preference for mollusks, crustaceans, and coral; nests from April through November.	No
Smooth Green Snake <i>Liochlorophis vernalis</i>		T	Gulf Coastal Plain; mesic coastal shortgrass prairie vegetation; prefers dense vegetation.	No

Species Scientific Name	Federal Status ¹	State Status ²	Habitat	Habitat Present Within Project Area
Texas Horned Lizard <i>Phrynosoma cornutum</i>		T	Open, arid, and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush, or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive.	No
Timber/Canebrake Rattlesnake <i>Crotalus horridus</i>		T	Swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil, or black clay; prefers dense ground cover, i.e., grapevines or palmetto.	No
Plants				
Coastal Gay-Feather <i>Liatris bracteata</i>			Texas endemic; coastal prairie grasslands of various types, from salty prairie on low-lying, somewhat saline, clay loams to upland prairie on non-saline clayey to sandy loams; flowering in fall.	No
Giant Sharpstem Umbrella-Sedge <i>Cyperus cephalanthus</i>			In Texas, on saturated, fine sandy loam soils, along nearly-level fringes of deep prairie depressions; also in depressional area within coastal prairie remnant on heavy black clay; in Louisiana, most sites are coastal prairie on poorly drained sites, some on slightly elevated areas surrounded by standing shallow water, and on moderately drained sites; soils include very strongly acid to moderately alkaline silt loams and silty clay loams; flowering/fruitleting May through June, August through September, and possibly other times in response to rainfall.	No
Houston Daisy <i>Rayjacksonia aurea</i>			Texas endemic; on and around naturally-barren or sparsely-vegetated saline slick spots or pimple mounds on coastal prairies, usually on sandy to sandy loam soils, occasionally in pastures and on roadsides in similar soil types where mowing may mimic natural prairie disturbance regimes; flowering late September through November(-December).	No
Texas Meadow-Rue <i>Thalictrum texanum</i>			Texas endemic; mostly found in woodlands and woodland margins on soils with a surface layer of sandy loam, but it also occurs on prairie pimple mounds; both on uplands and creek terraces, but perhaps most common on claypan savannas; soils are very moist during its active growing season; flowering/fruitleting (January-)February through May, withering by midsummer, foliage reappears in late fall (November) and may persist through the winter.	No
Texas Prairie Dawn <i>Hymenoxys texana</i>	E	E	Texas endemic; in poorly drained, sparsely-vegetated areas (slick spots) at the base of mima mounds in open grassland or almost barren areas on slightly saline soils that are sticky when wet and powdery when dry; flowering late February through early April.	No

Species Scientific Name	Federal Status ¹	State Status ²	Habitat	Habitat Present Within Project Area
Texas Windmill-Grass <i>Chloris texensis</i>			Texas endemic; sandy to sandy loam soils in relatively bare areas in coastal prairie grassland remnants, often on roadsides where regular mowing may mimic natural prairie fire regimes; flowering in fall.	No
Threeflower Broomweed <i>Thurovia triflora</i>			Texas endemic; near coast in sparse, low vegetation on a veneer of light-colored silt or fine sand over saline clay along drier upper margins of ecotone between salty prairies and tidal flats; further inland associated with vegetated slick spots on prairie mima mounds; flowering September through November.	No

1 Status of federally-listed species was obtained from the USFWS Threatened and Endangered Species List for Harris County. Species designations are as follows: LE, LT-federally Listed Endangered/Threatened; DM – Delisted Taxon, Recover, Being Monitored First Five Years; "blank" - under federal status, not listed by USFWS in Harris County

2 Status of state-listed species was obtained from the TPWD Threatened and Endangered Species List for Harris County. Species designations are as follows: P/E, P/T - federally Proposed Endangered/Threatened; E/SA, T/SA - federally Endangered/Threatened by Similarity of Appearance; DL - De-Listed; C1 - federal Candidate, Category 1, information supports proposing to list as endangered/threatened; E,T - State Endangered/Threatened; N - no habitat present; "blank" - under state status, Rare, but with no regulatory listing status. *Species appearing on these lists do not all share the same probability of occurrence. Some species are migrants or wintering residents only, or may be historic or considered extirpated.*

2.1 STATUS OF FEDERALLY-LISTED THREATENED AND ENDANGERED SPECIES

2.1.1 Texas Prairie Dawn-flower

Status: Texas prairie dawn-flower (*Hymenoxys texana*) was federally listed as endangered on March 13, 1986, without critical habitat. It was listed in *51 Federal Register 8683*. According to TPWD's *Endangered, Threatened, or Protected Native Plants of Texas*, it was also state listed as endangered on January 23, 1987. The first specimen was collected near Hockley, Texas, in 1889 and it was rediscovered near Cypress, Texas, in 1981. The species was considered extinct by many as it had been almost 100 years since a specimen was collected. A Recovery Plan was approved in 1989. According to the Recovery Plan, 21 extant localities were known, all west of Houston in Harris and Fort Bend Counties, Texas. However, since that time, several more populations have been discovered and documented by the USFWS and TPWD.

Description: This member of the sunflower family (Asteraceae) is a small, single-stemmed or branching annual reaching a height of up to 6 inches. Leaves clustered at the plant base are spoon-shaped, with entire or toothed margins. Stem leaves are alternate, narrow with parallel sides, and no or few teeth on the margin. The small heads (a cluster of flowers) are 0.15 to 0.23 inch long with small yellowish disk flowers and minute ray flowers that appear to be missing. Seeds are cone-shaped, obscurely four-angled, and hairy. This species flowers from March to early April and seeds mature from April to May (TPWD, 1996).

Habitat: Preferred habitat for this species seems to be in micro-areas where the Texas prairie dawn-flower has a competitive advantage, probably due to its ability to tolerate soils high in salts (USFWS, 1989) or soil conditions not suitable or optimum for other plants. A typical Texas prairie dawn-flower location could be described as the edge of or the flats between naturally-occurring mima mounds on what used to be native prairie west and south of Houston. Much debate surrounds the formation of the mima mounds and the relict salt concentrations. Vegetation is typically sparse and bare soils are common (USFWS, 1989).

Texas prairie dawn-flower is also documented on nutrient-poor soils where subsoil has been sidecast and environmental conditions have established a scenario that offers a competitive advantage for the plant. One such location is in Addicks Reservoir west of Langham Creek and north of Clay Road, partially within the road right-of-way.

Although prairie dawn-flower is known to occur within roadway right-of-way, its occurrence seems dependent on two primary factors. Firstly, poor soil conditions seem to offer a competitive advantage for prairie dawn-flower; it is able to cope in areas that typically offer saline and bare ground site conditions. Secondly, a continuous disturbance regime is required in order to facilitate the poor soil conditions.

Disturbance regimes might include livestock [over-]grazing, compaction, and ponding of water (to float salts through the soil profile to the surface). Although Texas prairie dawn-flower might flourish in better soil conditions, other species typically out-compete the diminutive plant and it is eventually extirpated from the location.

Historic and Current Distribution: In 1989, 21 extant populations of this plant were known west of Houston in Harris and Fort Bend Counties, Texas (USFWS, 1989). The first known specimens of this plant were collected near the town of Hockley, Texas, in 1889 and 1890. No other records are known until James Kessler discovered a few small populations north of Cypress, Harris County, Texas, in 1981. Currently, several more populations have been found and documented by the USFWS and TPWD as evidenced in the TPWD's Natural Diversity Database (NDD). Several of these colonies have been identified in Addicks and Barker Reservoirs, owned and operated by the USACE.

Three new locations of Texas prairie dawn-flower have been recorded in Harris County since 1999. The new populations are:

1. East of Ellington Field in southern Harris County
2. 12 miles south of downtown Houston near South Main Street
3. The northeast corner of Beltway 8 near Lockwood Street

A fourth site, which has existed in Harris County for approximately 10 years, is located near Bear Creek Park.

Distribution in the Project Area: Presence/absence surveys for the Texas prairie dawn-flower were conducted by Dr. Larry E. Brown in 2004 and 2005. Neither Texas prairie dawn populations nor suitable habitat for Texas prairie dawn-flower were discovered during the field surveys. Copies of the Texas prairie dawn-flower surveys are on file at HCFCFCD offices.

2.2 BALD EAGLE

Status: In August 2007, the USFWS removed the bald eagle (*Haliaeetus leucocephalus*) from the federal list of threatened and endangered species. However, the bald eagle was originally protected under the Bald Eagle Protection Act (16 U.S.C. 668), which was passed in 1940 and later amended to include the golden eagle in 1962. In response to population declines following World War II, the Secretary of the Interior on March 11, 1967 (32 FR 4001), listed bald eagles south of the 40th parallel as endangered under the Endangered Species Preservation Act of 1966. The northern bald eagle was not included in that action primarily because the Alaskan and Canadian populations were not considered endangered in 1967. In 1978, the USFWS listed the bald eagle throughout the lower 48 states as endangered except in Washington, Oregon, Minnesota, Wisconsin, and Michigan, where it was designated as threatened (43 FR 6233, February 14, 1978). The bald eagle is also federally protected by the Migratory Bird Treaty Act (16 U.S.C. 703) and the Lacey Act (16 U.S.C. 3372 and 18 U.S.C. 42-44).

Description: The bald eagle is a bird of prey. Males generally measure 3 feet from head to tail, weigh 7 to 10 pounds, and have a wingspan of 6 to 7 feet. Females are larger, some reaching 14 pounds with a wingspan of up to 8 feet. Adults have a white head, neck, and tail, and a large yellow bill (Campbell, 1995).

Habitat: The bald eagle prefers nesting habitats of river systems, or within 1 to 2 miles of some other large body of water, such as a lake or a reservoir. Nests are often located in the ecotone (edge or boundary) between forest, marsh, and water. Large, tall 40- to 120-foot trees are generally needed, and nests are often constructed in the dominant or codominant trees within an area (taller than general forest canopy, providing unobstructed flight path to nest). A variety of tree species are utilized for nesting. In Texas, bald eagles have constructed nests in loblolly pine, bald cypress, oak, cottonwood, and sycamore trees, among others. Nearby open water or wetland areas are necessary for feeding. Fish is generally the primary food for bald eagles, but those in Texas also utilize waterfowl, turtles, small mammals, and carrion (Campbell, 1995).

The bald eagle nesting period in Texas is normally October to July, with peak egg-laying in December and hatching primarily in January. Young generally fledge in April after 10 to 12 weeks of growth, but parental care continues for another four to six weeks. Adults and young begin to migrate north in May, with a pair sometimes remaining within a territory all year. Adulthood is reached at four to six years of age (Campbell, 1995).

Historic and Current Distribution: The bald eagle historically ranged throughout North America from Alaska and Canada to northern Mexico. In the late 1700's, the country may have had as many as 100,000 nesting eagles. The first major decline in the bald eagle population probably began in the mid to late 1800's. This population decline coincides with declines in the numbers of waterfowl and shorebirds and other major prey species. Direct eagle killing was also prevalent, and coupled with the loss of nesting habitat, these factors reduced bald eagle numbers (USFWS, 2007).

In 1963, only 417 active nests were recorded in the lower 48 states. Thus, in 1967, the Secretary of Interior listed the bald eagle, south of the 40th parallel under the Endangered Species Preservation Act of 1966. Following the enactment of the Endangered Species Act of 1973, the bald eagle was listed as endangered in the lower 48 states in 1978. Bald eagle populations began to show signs of recovery following the ban of DDT in the United States in 1972. By July of 1995, the USFWS announced that bald eagles in the lower 48 states had recovered to the point where they could be reclassified from endangered to threatened. In July of 1999, the USFWS recommended removing the bald eagle from the list of threatened and endangered species. Current population estimates indicated that at least 9,789 nesting pairs of bald eagles occupy the lower 48 states. Thus, on June 28, 2007, the bald eagle was removed from the list of threatened and endangered species (USFWS, 2007).

Distribution in the Project Area: Preferred nesting habitat does not exist within the project area due to expansive urban development that limits the availability of preferred food sources for the bald eagle. There are no known sightings of this species within the project area and there were no sightings of the bald eagle during field investigations. In addition, no element occurrence records were documented during the review of the TPWD NDD conducted in August 2002 and July 2008 for the proposed project.

2.3 STATE-LISTED THREATENED AND ENDANGERED SPECIES

The TPWD list of state-listed threatened and endangered species for Harris County was reviewed. These species consist of species that do not have a record of occurrence within the project area based on the NDD review, were not identified within the project area during field evaluations, and habitat available within the urban setting is not likely to represent the preferred habitat for those species. Therefore, a discussion of state-listed threatened and endangered species is not included in this BA.

2.4 U.S. FISH AND WILDLIFE SERVICE COORDINATION

Coordination for the proposed project and a request for written documentation regarding compliance with the ESA were initiated with the USFWS in December 2004. The USFWS was notified of the proposed action and of the absence of federal or state listed threatened or endangered species within the project area. Copies of coordination letters with the USFWS are located in Appendix B of the Draft EA.

3.0 ANALYSIS OF EFFECTS

3.1 DIRECT EFFECTS

A literature review of the NDD was performed to identify known occurrences of threatened/endangered species within the vicinity of the project area in August 2002 and July 2008. Field surveys were conducted in 2002, 2004, 2005, and 2008. Based on the NDD and field surveys, there are no documented occurrences of federally threatened or endangered species within the project area or within 1,000 feet of the project area, vegetation communities located within the project area do not provide suitable habitat for any threatened and endangered species, and threatened and endangered species populations were not observed within the project area. Therefore, the proposed action would have "no effect" on threatened or endangered species or their habitat.

3.2 INDIRECT EFFECTS

"Indirect effects" are defined by ESA regulations as effects that are caused by a proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). In order to address the potential indirect effects of the proposed action, it is first necessary to identify events that would be reasonably certain to occur as a result of the proposed action (i.e., those events with a causal link to the proposed

action) and separate those from events that either are not reasonably certain to occur or that are reasonably certain to occur but would occur independent of activities performed by HCFCF.

Conceivable indirect effects with potential to result from the proposed project fall into two distinct categories: (1) those with potential to result from the direct impacts to soils, rock, and vegetation caused by performance of the proposed activities ("site-specific indirect effects"); and (2) those that could result from modification of the flooding regime within the watershed ("growth-related indirect effects"). For each category of possible indirect effects, ESA regulations require the analysis to include only those effects that are caused by the proposed action and which are reasonably certain to occur.

3.2.1 Causation and Reasonable Certainty

3.2.1.1 Causation

The ESA regulations provide that assessment of a federal proposed action must consider the effects caused by that action, but do not provide guidance on the nature of causal inquiry to be conducted. The ESA case law concerning indirect effects and causation is rare, and little guidance has been issued from the courts over the past 15 years. Older ESA cases that addressed causation did not directly address what the test of causation should be or how it should be (e.g., see *National Wildlife Federation v. Coleman*, 529 F.2d 359 (5th Circuit), cert. denied, 429 U.S. 979 (1976), and *Riverside Irrigation District v. Andrews*, 758 F.2d 508 [10th Circuit 1985]).

Regulatory language that defines indirect effects and incorporates the concept of causation under the ESA is the same framework used under the NEPA. In both cases, the causal test is established only by the phrase "indirect effects are caused by the action" (40 CFR 1508.8(b) and 50 CFR 402.02). The NEPA and the ESA thus adopt the same test for causation. Under NEPA, recently-issued judicial opinions have provided significant guidance on how to conduct causal analysis. The Ninth Circuit has held that an effect is caused by an action if the action is an "indispensable prerequisite" or an "essential catalyst" to the effects. *City of Davis v. Coleman*, 521 F.2d 661, 674 (9th Circuit 1975). However, it is not enough that the actions might be related or that each "might benefit from the other's presence." *Sylvester v. U.S. Army Corps of Engineers*, 884 F.2d 394 (9th Circuit 1989). Similarly, it is not enough if a proposed action "may induce limited additional development" when "the existing development necessitated the [action]." *City of Carmel by-the-Sea v. DOT*, 123 F.3d 1142 (9th Circuit 1997). The Ninth Circuit has also explained that, "the fact that [a project] might also facilitate further growth is insufficient to constitute a growth-inducing impact..." *Morongo Band of Mission Indians v. Federal Aviation Administration*, 161 F.3d 569 (9th Circuit 1998).

The tests embraced by the courts thus demonstrate a pragmatic approach that recognizes a stopping point must exist in any causal analysis. Based on this judicial guidance, therefore, the overriding factor in the causal analysis is whether the action is the prerequisite, but-for, "catalytic" cause of the impact. In the

site-specific effects analysis, this limits the scope to impacts that would not occur, either at all or in the experienced magnitude, in the absence of the habitat losses associated with the proposed action. In the growth-related effects analysis, this involves analysis of whether the action has a useful purpose other than serving new growth, whether the action is intended to induce growth or to address existing levels of demand, and whether growth is being regulated at the local level.

3.2.1.2 Reasonable Certainty

If it is determined that a proposed action has the potential to cause indirect effects, then an analysis must be conducted to determine whether any of the potential indirect effects are reasonably certain to occur. The term "reasonably certain to occur" was selected by USFWS to eliminate speculation concerning future actions – 51 FR 19926, 19933 (June 3, 1986). In order for an action to be reasonably certain to occur, "there must exist more than a mere possibility that the action may proceed." *Id.* Factors to be considered to determine whether a proposed action is reasonably certain to occur include the economic, administrative, and legal hurdles remaining, as evidenced by work plans, appropriations, and pending or issued permits (USFWS, 1998). According to the USFWS, "the more State, tribal or local administrative discretion remaining to be exercised before a proposed...action can proceed, the less there is reasonable certainty the project will be authorized." *Id.* at p. 4-30.

3.2.2 Indirect Site-Specific Effects

In general, the clearing of habitat, such as that which could occur during performance of the proposed activities, has the potential to result in minor indirect and localized effects to adjacent undisturbed habitat. Those potential impacts, if realized, then have the potential to affect individuals of some species. Impacts to habitat can be caused by increased availability of sunlight along newly-created edge and increased exposure to wind, which can lead to drying of microclimates, and alteration of drainage patterns and rates. Habitat clearing for construction of detention basin sites may also result in the increased development of shrubby vegetation along the margins of newly created edges. Impacts to individuals of some species could then result from consequent changes in habitat composition and structure. The degree to which these types of impacts manifest themselves depends on the structure of the local habitat and on what, if anything, is placed in the cleared area (e.g., a detention basin). Overall, however, such activity is not considered likely to substantially alter overall habitat structure or result in substantial changes to local microclimates because ultimately the properties will revert to a detention basin environment—grass bottom with wetlands, trees, shrubs, and other habitat enhancement features.

Because habitat changes will be somewhat temporary and offer increased value and diversity, these changes are not expected to cause substantial negative changes in overall wildlife habitat values or, as a result, substantial effects on the protected species under consideration. Adherence to the conservation measures included in the proposed action should minimize the potential for site-specific indirect effects.

3.2.3 Indirect Growth-Related Effects

Indirect effects are those effects caused by a proposed action that are later in time *and* are reasonably certain to occur. Although continued growth in the HCFCD service area is reasonably certain to occur, with many approved residential subdivisions and commercial developments under construction or in the final planning stages (see cumulative effects discussion below), it would not be reasonable to attribute causation of such growth to the proposed action. Additionally, the subject watershed—Brays Bayou—is already highly urbanized, and although areas may redevelop in the future, land uses are essentially residential, commercial, light industrial, public, or institutional. Wildlife species are relegated to urban guilds that tolerate disturbance and anthropogenic interactions to a larger degree than rural or natural environments.

The purpose of the proposed action is to construct additional stormwater storage in a new location within the upper watershed of Brays Bayou to compensate for the loss in storage capacity at the Old Westheimer Detention Basin. Large-scale government buyouts of structures are unrealistic. Remaining options require structural measures (i.e., something must be built). The proposed action identifies the best cost benefit plan and then provides for additional elements or features that optimize that plan. A complete project description is provided in Section 1.3.

Although past and expected growth in the upper Brays Bayou reaches has created the need for such a project as the proposed action, in no way does the proposed action cause such growth. The proposed action does, however, preserve and enhance the value of existing properties.

3.3 POTENTIAL EFFECTS

3.3.1 Direct Effects

Direct effects are immediate effects on the species or its habitat. The proposed action does not directly affect the bald eagle, as preferred nesting habitat is not present in the project area. Additionally, there are no known nesting pairs within the project area, and according to the TPWD NDD review, no element occurrence records for the bald eagle occur within the project area.

The proposed action does not directly affect the Texas prairie dawn, as preferred habitat is not present in the project area. In addition, TPWD NDD review revealed no known occurrence records for the Texas prairie dawn within the project area.

3.3.2 Interrelated and Interdependent Effects

Interrelated effects are effects created by actions that are part of the proposed action and depend on the proposed action for justification. Identified interrelated activities that are part of the proposed activity include the creation of ancillary features apart from the proposed action. There are no interrelated effects

or ancillary sites that have not been evaluated for impacts to protected species, and specifically to the Texas prairie dawn-flower and bald eagle.

Interdependent effects are effects created by the proposed action that have no independent utility apart from the proposed action. There are no known interdependent activities or effects as part of the proposed action. The overall effect of the proposed action is to compensate for the loss in stormwater storage capacity at the Old Westheimer Detention Basin. This effect will not impact Texas prairie dawn-flower or bald eagle populations, distribution, or continued survival in the project area.

3.3.3 Indirect Effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the area directly affected by the proposed action. Indirect effects can be difficult to predict. Indirect and secondary effects are more closely related to increased land values rather than changes in land use as the prairie dawn-flower does not typically tolerate urban land use practices (e.g., lawn enhancement by fertilizer and establishment of improved grasses). Urban land care practices typically strive to achieve a manicured look by providing soil conditions to maximize desired lawn species. While Texas prairie dawn-flower might thrive in these conditions in a mono-specific situation, other vegetation would establish and out-compete Texas prairie dawn-flower without the exclusion of such competing vegetation (i.e., lawn species). The proposed project is located within a highly-urbanized watershed. Impacts to bald eagle habitat have already occurred due to past development and may continue to occur with increased development and growth.

3.4 CUMULATIVE EFFECTS

Cumulative effects are those effects of future state, local, or private activities not involving federal activities that are reasonably certain to occur within the action area of the federal action subject to consultation. Future federal actions that are unrelated to the proposed action are not considered in the cumulative effects because they require separate consultation pursuant to Section 7 of the ESA. An undetermined number of unrelated future land use conversions (e.g., residential to commercial or vice versa) are not subject to federal authorization or funding but may alter the habitat or increase potential take of the listed species addressed in this BA. These effects would therefore be cumulative to the effects of the proposed action.

The Brays Bayou watershed is highly urbanized. There are limited opportunities for additional development. Redevelopment seems more likely as land values rise in response to lowering the 100-year floodplain water surface elevation. Portions of the watershed are being upgraded and maintained from an infrastructure perspective—roadways, traffic signals, water lines, sewer lines, storm sewers, and other utility distribution systems. The operation and maintenance activities associated with aging infrastructure

are not likely to have any cumulative effects on existing or future Texas prairie dawn-flower or bald eagle populations.

It is reasonably possible that other jurisdictions (e.g., City of Houston, Texas Department of Transportation) might provide other amenities along Brays Bayou easements and at the detention basin sites. Examples of amenities could include expansion of hike-and-bike trails, kiosks, gazebos, picnic facilities, playgrounds, habitat improvement projects, pedestrian bridges, and similar features. At such time as these types of facilities are proposed, HCFCD could provide threatened and endangered species information to the jurisdiction proposing the facility.

4.0 VOLUNTARY AVOIDANCE, MINIMIZATION, AND CONSERVATION MEASURES

The proposed action will have no effect on Texas prairie dawn-flower or bald eagle; therefore, voluntary avoidance, minimization, and conservation measures are not required.

5.0 COMPLIANCE WITH SECTION 7(d) OF THE ESA

Section 7(d) of the ESA provides that "after the initiation of consultation required [by Section 7(a)(2)], the federal agency and the permit or license applicant shall not make any irreversible or irretrievable commitment of resources with respect to the agency action which has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternatives which would not violate [the jeopardy prohibition in Section 7(a)(2)]."

Through past coordination with USFWS, HCFCD has commenced construction on portions of the proposed action prior to the conclusion of the ESA consultation on the proposed action. However, the following identifies why construction of certain portions of the proposed action during the pendency of the consultation is not prohibited by Section 7(d) of the ESA.

- According to USFWS guidance, the main purpose of Section 7(d) is to prevent resource commitments that completely foreclose the development of reasonable and prudent alternatives that may be necessary to avoid jeopardy and/or adverse modification of designated critical habitat. Based on analysis of the potential habitat for the listed species in Section 2.0 and the analysis of the potential impacts in Section 3.0, the proposed action will not impact the Texas prairie dawn-flower or bald eagle. The project lands that comprise the proposed action contain no designated critical habitat for any listed species. Therefore, given the likelihood that the proposed action will *not* result in a jeopardy determination as to any listed species, Section 7(d) would likely not be applicable.

- Construction of proposed detention basin complexes has been initiated to some degree under local project construction. Surveys for Texas prairie dawn-flower were conducted prior to construction as described in Section 2.1.1. No Texas prairie dawn-flower populations or suitable habitat were identified within the project area.
- As described in Section 2.0, no populations or suitable habitat for any federal or state listed threatened or endangered species, including the bald eagle, were identified within the project area.

6.0 CONCLUSION

The proposed action will have no effect on Texas prairie dawn-flower or bald eagle populations, distribution, or continued survival in the project area. In addition, no impacts to federal or state listed threatened or endangered species are anticipated. No critical habitat for any of these species occurs within the limits of the components of the proposed action; therefore, no critical habitat will be affected.

The USACE recommends a *no effect* determination for the proposed action.

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Appendix E
Air Quality Analysis

Appendix E

Air Analysis

An air analysis was completed for the proposed action to estimate annual emissions from construction activities (Tables 1 and 2). Based on the State Implementation Plan (SIP), a conformity determination is required for federal actions that result in total direct or indirect emissions equal to or exceeding 25 TPY of NO_x or VOC prior to June 15, 2004; 100 TPY of NO_x or VOC after June 15, 2004; and 25 TPY of NO_x or VOC after October 1, 2008 (40 CFR 51.853). Based on the findings, concentrations of NO_x and VOC are not expected to exceed national standards for any given period of time, and thus the proposed action conforms to the SIP (Table 3). Therefore, a general conformity determination is not required for the proposed action.

**Table 1: Volume of Material Excavated by Year for each Tract in the Eldridge Detention Basin
Unit # D500-04**

Tract Number	Cubic Yards	Year to be excavated
29-001	349713	2008 & 9
29-024	314481	2004, 5 & 6
29-025	8067	2004, 5 & 6
29-026	243352	2004, 5 & 6
29-027	191846	2004, 5 & 6
29-028	440156	2004, 5 & 6
29-029	191019	2004, 5 & 6
29-030	88499	2004, 5 & 6
29-035	63941	2004, 5 & 6
29-039	64030	2004, 5 & 6
29-041	1649895	2004, 5 & 6
D001-19	184445	2005 & 6
D001-21	23132	2005 & 6
D001-22	11882	2005 & 6
D001-24	57473	2005 & 6
D001-26	273850	2005 & 6
D001-47	888	2005 & 6
D001-48	313	2005 & 6
D001-49	576	2005 & 6
D001-54	4542	2005 & 6
D001-55	1006	2005 & 6
Total	4,163,106	

Appendix E

Air Analysis

Table 2: Volume of Material Excavated by Year for Each Tract in the Arthur Storey Park Detention Basin Unit # D500-06

Tract Number	Cubic Yards	Year to be excavated
22-004	338324	2002
22-005	141212	2004
22-008	209562	2005
22-009	360073	2005 & 2006
22-010	20980	2006
1,070,151		

Table 3: A Comparison of the Estimated Emissions for Each Year of Construction with the General Conformity Thresholds.

Year of Construction	Estimated Emissions (Tons)		General Conformity Threshold
	NOx	VOC	(Tons)
May - June 15, 2004	13.89	1.78	25
June 15 through Dec 31, 2004	60.17	7.71	100
2005	90.94	11.72	100
2006	90.94	11.72	100
2007	0.00	0.00	100
Jan 1 through Oct 1, 2008	12.35	1.53	100
Oct 1 through Dec 31, 2008	4.12	0.51	100
2009	16.46	2.04	25

Appendix F

Wetland Mitigation Alternatives Cost Effectiveness and Incremental Cost Analysis

**WETLAND MITIGATION ALTERNATIVES
COST EFFECTIVENESS AND INCREMENTAL
COST ANALYSIS**

**2008 UPDATED ROW ON THE
DETENTION ELEMENT
HCFCD PROJECT ID D100-00-00-Y005**

**UPPER WATERSHED OF BRAYS BAYOU
HARRIS COUNTY, TEXAS**

Prepared for:

Harris County Flood Control District
9900 Northwest Freeway
Houston, Texas 77092

Prepared by:

PBS&J
1250 Wood Branch Park Drive, Suite 300
Houston, Texas 77079

May 2010

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Appendices

Appendix A-1 Cost Effectiveness/Incremental Cost Analysis Results

Acronyms and Abbreviations

AAHU	average annual habitat unit(s)
CE/ICA	Cost Effectiveness/Incremental Cost Analysis
EPA	U.S. Environmental Protection Agency
GBWMB	Greens Bayou Wetlands Mitigation Bank
GLO	General Land Office
GSRC	Gulf South Research Corporation
HCFCDD	Harris County Flood Control District
HEP	habitat evaluation procedure
HSI	habitat suitability index
HU	habitat unit(s)
IWR	USACE Institute for Water Resources
MBRT	Mitigation Bank Review Team
MOA	Memorandum of Agreement
NMFS	National Marine Fisheries Service
PFO	palustrine forested
PSS	palustrine scrub-shrub
TCEQ	Texas Commission on Environmental Quality
TPWD	Texas Parks & Wildlife Department
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

1.0 BACKGROUND INFORMATION

1.1 PROJECT DESCRIPTION

The Harris County Flood Control District (HCFCD) 2008 Updated ROW on the Detention Element project for the upper watershed of Brays Bayou includes the construction of additional tracts of land within the Eldridge Detention Basin and Arthur Storey Park Detention Basin complexes (HCFCD Unit Nos. D500-04-00 and D500-06-00). HCFCD is the local sponsor of this federal project. The lead federal agency for the proposed project is the United States Army Corps of Engineers (USACE). Approximately 5.14 acres of wetlands were identified within the proposed additional tracts. Of these 5.14 acres, all will be impacted after project construction is complete. Wetlands were included in the analysis if they met the technical criteria for wetland classification per the USACE Wetlands Delineation Manual (Environmental Laboratory, 1987). Alternatives are being considered to mitigate for impacts to wetlands from construction of these additional tracts.

1.2 HABITAT ASSESSMENT OVERVIEW

The habitat assessment methodology is based on habitat evaluation procedures (HEP). HEP, developed by the U.S. Fish and Wildlife Service (USFWS), is a species-habitat approach to impact assessment that quantifies habitat quality for selected evaluation species through the use of a habitat suitability index (HSI). The HSI value is derived from an evaluation of the ability of key habitat components to provide the life requisites of selected species of wildlife (USFWS, 1980a). HEP is based on the assumption that habitat for selected species can be described by an HSI. The HSI is multiplied by the area of available habitat to determine the total habitat units (HU) for that species in the study area.

The wetland habitats identified within the additional tracts consisted of palustrine forested (PFO) wetlands and palustrine scrub-shrub (PSS) wetlands. Based on the wetland habitats present within the additional tracts, two HSI models were selected to evaluate the habitat quality: eastern gray squirrel (Allen, 1987) and veery (Sousa, 1982). The data collected were applied to individual HSI models to obtain an HSI score for individual evaluation species. The HSI score was multiplied by the patch size (acres) to determine HU's.

The project impact analysis projects future habitat conditions over the period of analysis in terms of average annual habitat units (AAHU) and determines the net impact of the proposed project in terms of AAHU's. AAHU's were calculated for the wetland habitat conditions within the additional tracts with and without the proposed project constructed to determine the net impact. The net impact is the difference between the AAHU's without the proposed project and the AAHU's with the proposed project. The net impact of the proposed project is 0.634 AAHU's of PSS wetlands and 0.709 AAHU's of PFO wetlands, for a total of 1.343 AAHU's.

The mitigation alternatives analysis evaluated the habitat associated with two general mitigation alternatives (on-site wetland creation and purchasing credits from the Greens Bayou Wetlands Mitigation Bank [GBWMB]) by predicting HSI scores over a 50-year period. The acreage for each alternative required to compensate for the net project impact was determined based on the mean HSI scores for each habitat type within the mitigation areas. The AAHU's associated with the net impact were divided by the mean HSI score to determine the final mitigation acreage requirements. Based on the mean HSI score, approximately 5.76 acres of on-site wetland creation would be required to mitigate for the 1.343 AAHU's. Based on the mean HSI score at the GBWMB, mitigation within the GBWMB would require a purchase of wetland credits equal to a total of 2.58 acres.

Refer to the Habitat Assessment Project Impact and Mitigation Alternatives Analysis report for further details regarding these analyses (PBS&J, 2010).

2.0 INTRODUCTION

This report presents a Cost Effectiveness/Incremental Cost Analysis (CE/ICA) to determine the most cost-effective mitigation alternative for the wetland impacts associated with the 2008 Updated ROW on the Detention Element project for the upper watershed of Brays Bayou. Any required mitigation for wetland losses would be either (1) incorporated into the design of either the Eldridge or Arthur Storey Park Detention Basins, which would include the creation of a variety of forested and/or emergent wetland habitats throughout portions of either basin; (2) purchased as mitigation credits at the GBWMB; or (3) created on-site at another property. Five viable alternatives for compensatory mitigation for the excavation or filling of wetlands within the proposed additional tracts were identified and evaluated, as documented in this report (see Chapter 4).

The 1,250-acre GBWMB became effective in 1995 based on the Memorandum of Agreement (MOA) between HCFCD and the Mitigation Bank Review Team (MBRT), comprised of the USACE, USFWS, Texas Parks and Wildlife Department (TPWD), Texas General Land Office (GLO), U.S. Environmental Protection Agency (EPA), the Texas Commission on Environmental Quality (TCEQ), and the National Marine and Fisheries Service (NMFS). Current development consists of two subdivisions, Subdivision A, Phase I, and Subdivision B, totaling approximately 165 acres. Per the MOA, both subdivisions are evaluated using a WET2 analysis to determine how many wetland credits are available within each subdivision. Currently, a direct cost comparison is not possible between WET2 evaluations and habitat evaluations; therefore, an approximate cost was derived comparing the total acreage of the GBWMB and WET2 credits available to the HSI scores for the study area and the GBWMB. Subdivision A, Phase I, had 31.66 credits deposited by the MBRT on June 28, 1999. This amount was reduced by 1.71 credits on October 27, 2005, for a total of 29.95 credits. Subdivision B had 100.76 credits deposited on July 19, 2005. Subdivision A is currently no longer selling credits; however, credits still remain available for purchase at Subdivision B.

Five mitigation alternatives were evaluated using the USACE Institute for Water Resources (IWR) Planning Suite software. Refer to Chapter 4 for a detailed description of each alternative.

A CE/ICA is required for all recommended mitigation alternatives associated with a federal project. The cost effectiveness analysis evaluates the relationship between the cost and environmental output (AAHU) associated with each mitigation alternative. The term cost effective means that for a particular level of output no other plan costs less. Furthermore, no plan yields more output for the same or less cost. The incremental cost analysis evaluates the relationship between the costs incurred to realize each unit of output (AAHU) associated with each alternative. In the incremental cost analysis, those cost effective alternatives that are most efficient in production are identified. These alternatives, known as "best buy"

alternatives, provide the greatest increase in output for the least increase in cost. The "best buy" alternative(s) represents the most cost-effective mitigation alternative(s) (USACE, 2000).

3.0 METHODS

The IWR Planning Suite software offers evaluations of cost effectiveness and incremental cost analysis in terms of environmental output. Data for the mitigation alternatives, including AAHU's gained, cost, and acres per mitigation alternative was input into IWR Planning Suite as the mitigation solutions. The acreage required for mitigation is based on the HSI scores for each alternative mitigation area and the AAHU's associated with the wetland impacts as described in Chapter 1.

A CE/ICA was then run on the mitigation alternatives. Each plan was determined to be cost effective, not cost effective, or a best buy plan. A plan that provided the same amount of AAHU's for a higher cost compared to another alternative was determined to be not cost effective. The recommended alternative will be selected from a best buy alternative.

4.0 WETLAND MITIGATION ALTERNATIVES

The mitigation alternatives analysis evaluates the potential output of AAHU's associated with two general mitigation alternatives (creation of wetlands on-site within either the Eldridge Detention Basin or Arthur Storey Park Detention Basin, and purchasing credits from the GBWMB Subdivision B). From these general mitigation alternatives, five viable detailed alternatives for compensation of wetland impacts were evaluated in further detail. These alternatives include the following:

- Alternative 1 Creation of wetlands on-site within the Eldridge Detention Basin (HCFCD Unit No. D500-04-00) equal to 3.917 AAHU's.
- Alternative 2 Creation of wetlands on-site within the Arthur Storey Park Detention Basin (HCFCD Unit No. D500-06-00) equal to 3.917 AAHU's.
- Alternative 3 Acreage in the GBWMB Subdivision B equal to 1.343 AAHU's.
- Alternative 4 Creation of wetlands on additionally purchased property equal to 3.917 AAHU's.
- Alternative 5 Creation of wetlands on-site within the Eldridge Detention Basin (HCFCD Unit No. D500-04-00) equal to 20 acres, or 14.056 AAHU's.

These alternatives are discussed in detail below.

4.1 **ALTERNATIVE 1: CREATION OF WETLANDS ON-SITE WITHIN THE ELDRIDGE DETENTION BASIN (HCFCD UNIT NO. D500-04-00) EQUAL TO 3.917 AAHU'S**

The on-site wetland creation mitigation alternative would consist of creating wetlands within the Eldridge Detention Basin (HCFCD Unit No. D500-04-00), per the habitat assessment results. This basin was selected because it is large enough to accommodate on-site creation of wetlands without compromising required detention capacity. The on-site wetland creation would include a forested wetland component. While scrub-shrub wetlands would be impacted from the proposed project, a scrub-shrub wetland component is not specifically included because the trees associated with the forested wetland component are planted as saplings. Based on the size and growth rate of the samplings, the forested wetland component would be considered a scrub-shrub wetland habitat for 10 years following construction. Therefore, scrub-shrub wetland impacts would be mitigated through the forested wetland component. Native species of forested wetland vegetation would be planted within the detention basin property. Based on the habitat assessment project impact analysis, approximately 5.76 acres of on-site wetland creation would be required at this site to mitigate for the 5.14 acres of wetland impacts resulting from the proposed project. The 5.76 acres of on-site wetland creation would result in 3.917 AAHU's (see Table 1).

Although only 1.343 AAHU's are required to compensate for the project impacts, 5.76 acres of on-site creation are required to compensate for the 0.634 AAHU's associated with the scrub-shrub wetland impacts. Since the forested wetland creation will compensate for both the scrub-shrub wetland impacts and the forested wetland impacts, 5.76 acres (3.917 AAHU's) of on-site creation is required. See Table 1 for the on-site wetland creation scenario.

Table 1
Creation of Wetlands On-site Within the HCFCD Unit No. D500-04-00 Equal to 3.917 AAHU's

Habitat Type*	Mean HSI Score	Mitigation Acreage	AAHU's Gained from Mitigation Alternative (acres x HSI)
Scrub-Shrub Wetland	0.11	5.76	0.634
Forested Wetland	0.57		3.283
Total		5.76	3.917

* At the time of planting (Year 2010), the created wetland would be considered a scrub-shrub wetland due to the size of the trees. The created wetland is anticipated to develop into a forested wetland, as defined by the veery and eastern gray squirrel HSI models, at Year 2020.

The costs to create on-site wetland mitigation were based on the following:

- No land costs are included in the price as land is already procured for the detention basin.
- Contouring habitat quality features (cut and haul) – Included in the detention basin construction cost.
- Design of transitional forested (trees and shrubs) wetland mitigation areas, planting, monitoring, and corrective measures – \$83,540 per acre (per estimate from HCFCD). This cost includes the planting of 300 trees and 680 shrubs per acre and monitoring the mitigation area for five years. The number of tree and shrub plantings is based on spacings suggested by the Texas Forest Service (Merritt, 2008). Costs for transitional forested species were based on acquiring species from the HCFCD nursery. The cost breakdown for the emergent wetland creation component is provided in Table 2.

Table 2
Forested Wetland Creation Costs

Task	Period	Size (gal)	Cost/Species (\$)	Species/Acre	Cost/Acre (\$)
Design	N/A	N/A	N/A	N/A	1,000
Tree Material	N/A	5 to 25	63	300	18,900
Shrub Material	N/A	5 to 25	63	680	42,840
Tree Maintenance	2 Years	5 to 25	56	300	16,800
Monitoring	5 Years	N/A	N/A	N/A	4,000
Total					83,540

- Hydroperiod monitoring equipment (purchase and installation) – \$800.

Total cost for creation of 5.76 acres = \$481,990 (\$481,190 for forested wetland creation [5.76 acres x \$83,540 per acre] and \$800 hydroperiod monitoring).

4.2 ALTERNATIVE 2: CREATION OF WETLANDS ON-SITE WITHIN THE ARTHUR STOREY PARK DETENTION BASIN (HCFCD UNIT NO. D500-06-00) EQUAL TO 3.917 AAHU'S

This on-site wetland creation mitigation alternative is similar to Alternative 1, except on-site wetland creation would take place at the Arthur Storey Park Detention Basin (HCFCD Unit No. D500-06-00). Costs associated with on-site wetland creation within this basin would be the same as Alternative 1 because there is no land acquisition cost associated with this alternative and planting assumptions are the same. However, this detention basin complex will also contain recreational facilities as part of a local initiative in cooperation with Harris County, Precinct 3. To avoid any impacts to mitigation areas due to recreational facilities, on-site creation of wetlands is preferred at the Eldridge Detention Basin. Therefore, since costs and the amount of AAHU's gained from the on-site creation of wetlands are the same at either detention basin, this alternative has been dropped from further evaluation.

4.3 ALTERNATIVE 3: ACREAGE IN THE GBWMB SUBDIVISION B EQUAL TO 1.343 AAHU'S

This alternative consists of purchasing credits from the GBWMB Subdivision B to mitigate for impacts to each wetland cover type. Subdivision B was evaluated using habitat assessment procedures and was noted to consist of emergent and forested wetlands. Scrub-shrub wetland impacts would be mitigated through the purchase of forested wetland acres; however, no scrub-shrub wetland habitat would be provided by this alternative. Mitigation would require a total of 2.58 acres of forested wetland acres. The cost of purchasing credits at the GBWMB is estimated to be \$24,100 per acre of wetland impacted. See Table 3 for the GBWMB Subdivision B scenario.

Table 3
Acreage in the GBWMB Subdivision B Equal to 1.343 AAHU's

Habitat Type	Mean HSI Score	Acres of Mitigation	AAHU's Gained from Mitigation Alternative
Forested Wetland*	0.52	2.58	1.343

* The forested wetland component would mitigate for both the forested and scrub-shrub wetland impacts.

Total cost of acquisition of acres at Subdivision B = \$62,178 (2.58 acres x \$24,100 per acre).

4.4 ALTERNATIVE 4: CREATION OF WETLANDS ON ADDITIONALLY PURCHASED PROPERTY EQUAL TO 3.917 AAHU'S

Alternative 4 consists of purchasing an additional tract of land and creating wetlands on this property. Based on the habitat assessment project impact analysis, approximately 5.76 acres of on-site wetland creation would be required at this site to mitigate for the 5.14 acres of wetland impacts resulting from the proposed project. The 5.76 acres of on-site wetland creation would result in 3.917 AAHU's. See Table 4 for details of on-site wetland creation. Based on 2008 data obtained by the Harris County Appraisal District (HCAD), a vacant tract of land on Eldridge Road (HCAD property ID 041-036-000-0487) that is large enough to accommodate the required on-site creation and is adjacent to the Eldridge Basin, was appraised at \$147,782. For this analysis, this appraised value will be used as a cost assumption if this land were to be purchased. The remaining cost estimates for the on-site wetland creation were prepared using the estimates prepared for Alternative 1.

Table 4
Creation of Wetlands on Additionally Purchased Property Equal to 3.917 AAHU's

Habitat Type*	Mean HSI Score	Mitigation Acreage	AAHU's Gained from Mitigation Alternative (acres x WHVI)
Scrub-Shrub Wetland	0.11	5.76	0.634
Forested Wetland	0.57		3.283
Total		5.76	3.917

* At the time of planting (Year 2010), the created wetland would be considered a scrub-shrub wetland due to the size of the trees. The created wetland is anticipated to develop into a forested wetland, as defined by the veery and eastern gray squirrel HSI models, at Year 2020.

Total cost = \$629,772 (\$147,782 for land acquisition + \$481,190 for forested wetland creation [5.76 acres x \$83,540 per acre] + \$800 hydroperiod monitoring).

4.5 ALTERNATIVE 5: CREATION OF WETLANDS ON-SITE WITHIN THE ELDRIDGE DETENTION BASIN (HCFCD UNIT NO. D500-04-00) EQUAL TO 20 ACRES, OR 14.056 AAHU'S

Alternative 5 would consist of creating wetlands within the Eldridge Detention Basin (HCFCD Unit No. D500-04-00); however, this alternative would go beyond the minimum acres identified in the habitat assessment. This alternative consists of creating 20.00 acres, or 14.056 AAHU's, on-site. This acreage was selected based on the conceptual design of the Eldridge Detention Basin complex. The acreage of the proposed additional tracts is approximately one-half of the total acreage of the detention basin. Therefore, 20 acres is approximately one-half of the total wetland plantings proposed in the conceptual design.

In this alternative, scrub-shrub wetland impacts would be mitigated through the creation of forested wetland acres. Based on cost estimates received from HCFCD, on-site emergent wetland creation costs less and provides more AAHU's when compared to on-site forested wetland creation. Therefore, it was determined that the addition of emergent wetland features in addition to forested wetland creation created more AAHU's for less cost. Since mitigation is required for at least 5.76 acres of forested wetlands, the AAHU's of forested wetlands to be created on-site equals 3.917 AAHU's (see Table 6). This alternative proposes to also create 14.28 acres of emergent wetland habitat, for a total of approximately 20.00 acres of wetland habitat. The 14.28 acres of emergent wetland habitat to be created equal 10.139 AAHU's (see Table 6). Costs of emergent wetland plantings are based on the following:

- Design of emergent wetland mitigation areas, planting, monitoring, and corrective measures – \$35,945 per acre (per estimate from HCFCD).
- This cost includes the planting of 4,840 plants per acre and monitoring the mitigation area for five years. Cost for emergent wetland species were based on market costs as of November 2007. The cost breakdown for the emergent wetland creation component is provided in Table 5.

**Table 5
Emergent Wetland Creation Costs**

Task	Period	Plants/Acre	Cost/Acre (\$)
Wetland Design, Planting	1 Year	4,840	26,000
Wetland Maintenance/Monitoring	5 Years	N/A	9,945
Total			35,945

The remaining cost estimates were prepared using the same estimates as in previous alternatives. See Table 6 for details of this mitigation alternative.

Table 6
Creation of Wetlands On-site Within the Eldridge Detention Basin (HCFCD Unit No. D500-04-00) Equal to 20 Acres, or 14.056 AAHU's

Habitat Type	Mean HSI Score	Acres of Mitigation	AAHU's Gained from Mitigation Alternative
On-Site Creation			
Emergent Wetland	0.71	14.28	10.139
Scrub-Shrub Wetland*	0.11	5.76	0.634
Forested Wetland*	0.57		3.283
Total		20.00	14.056

* At the time of planting (Year 2010), the created wetland would be considered a scrub-shrub wetland due to the size of the trees. The created wetland is anticipated to develop into a forested wetland, as defined by the veery and eastern gray squirrel HSI models, at Year 2020.

Total cost = \$991,944 (\$513,295 for on-site emergent wetland creation [14.28 acres x \$35,945 per acre] + \$477,849 for on-site forested wetland creation [5.76 acres x \$83,540 per acre] + \$800 hydroperiod monitoring).

4.6 SUMMARY OF ALTERNATIVES

Four wetland mitigation alternatives were determined to be feasible to carry forward to the cost effectiveness/incremental cost analysis. A comparison of these alternatives is provided in Table 7.

Table 7
Summary of Mitigation Alternatives

Mitigation Alternative	Acres of Mitigation	AAHU's Gained from Mitigation Alternative
1: Creation of wetlands on-site within the Eldridge Detention Basin	5.76	3.917
3: Acreage within the GBWMB Subdivision B	2.58	1.343
4: Creation of wetlands on additionally purchased property	5.76	3.917
5: Creation of wetlands on-site within the Eldridge Detention Basin	20.00	14.056

5.0 RESULTS

The CE/ICA was completed using the IWR Planning Suite software for the four proposed mitigation alternatives. Based on the results of the CE/ICA, two of the alternatives are best buy alternatives: Alternative 3, acreage in the GBWMB Subdivision B equal to 1.343 AAHU's; and Alternative 5, the on-site creation of wetlands equal to 20 acres, or 14.056 AAHU's. Figure 1 shows the costs and outputs for all mitigation alternatives differentiated by cost effectiveness.

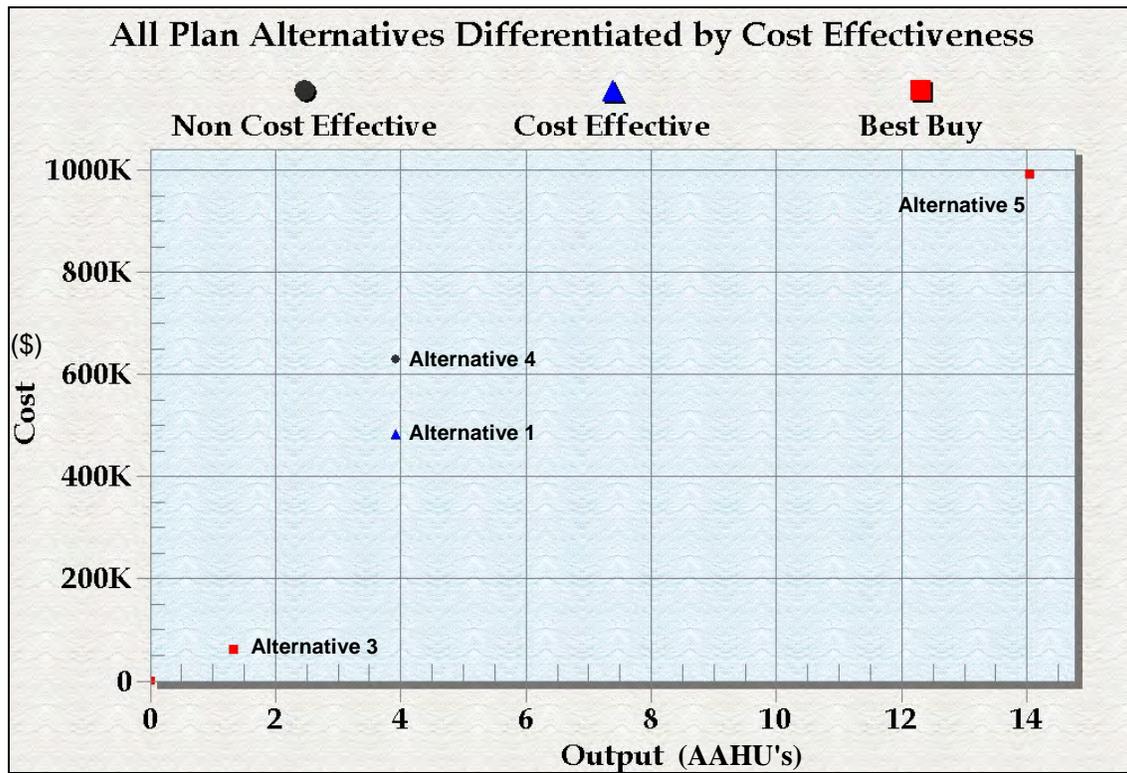


Figure 1
Cost and Output for All Mitigation Alternatives

Based on the cost effectiveness analysis, Alternative 4 produces the same amount of AAHU's as Alternative 1 for a higher cost and is therefore not cost effective. Alternative 3 has a lower cost than Alternative 5, but also produces much less AAHU's. See Figure 2 for the results of the cost effectiveness analysis in terms of costs and outputs (AAHU).

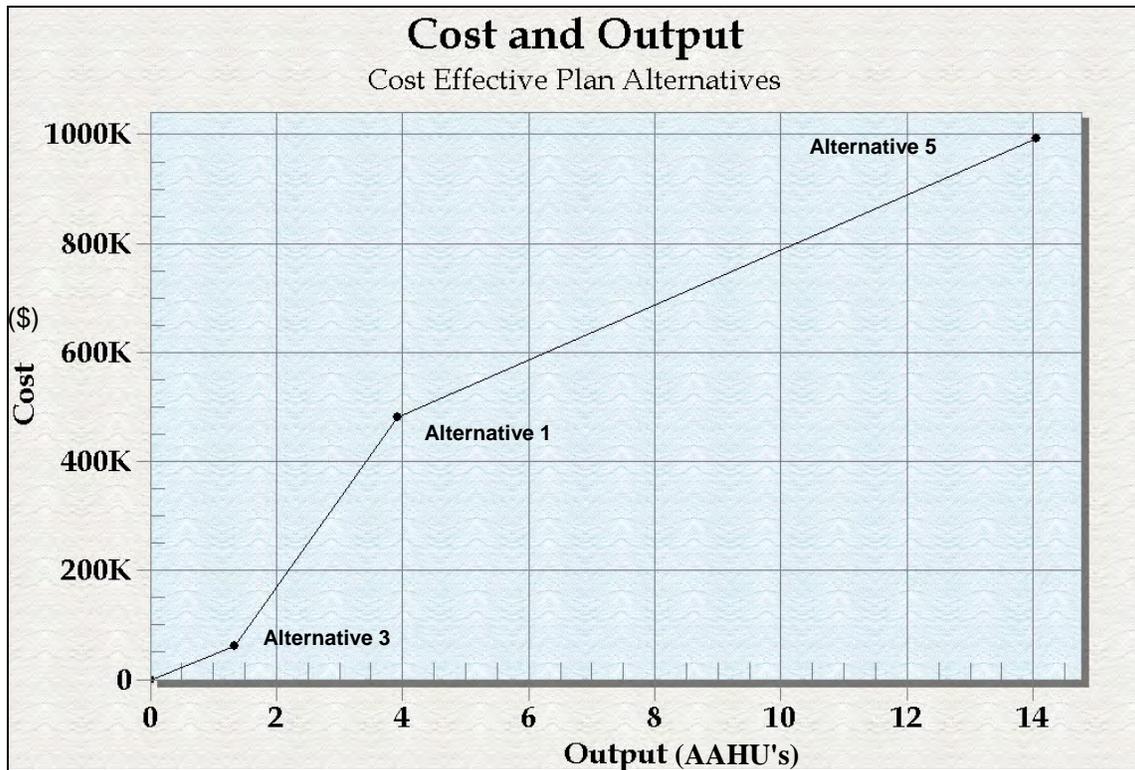


Figure 2
Cost Effectiveness Analysis Results

The average cost per AAHU was calculated for each mitigation alternative (Table 8). Of the two best buy alternatives, the average cost per AAHU for Alternative 3 is \$46,422 and the average cost per AAHU for Alternative 5 is \$70,571. Alternative 3 provides the lowest average cost per AAHU.

Table 8
Average Cost of Mitigation Alternative per AAHU

Mitigation Alternative	AAHU	Cost (\$)	Average Cost per AAHU (\$)
Alternative 1	3.917	481,990	123,051
Alternative 3	1.343	62,178	46,298
Alternative 4	3.917	629,772	160,779
Alternative 5	14.056	991,944	70,571

The incremental cost analysis shows that Alternative 3 provides the lowest incremental cost per unit of output (AAHU). Alternative 3 provides 1.343 AAHU's at a cost of \$62,178, resulting in approximately \$46,298 incremental cost per AAHU. Alternative 5 provides 12.713 additional AAHU's at an additional

cost of \$929,766 resulting in approximately \$70,571 incremental cost per AAHU. See Figure 3 for the results of the incremental cost analysis in terms of incremental cost per unit and output (AAHU).

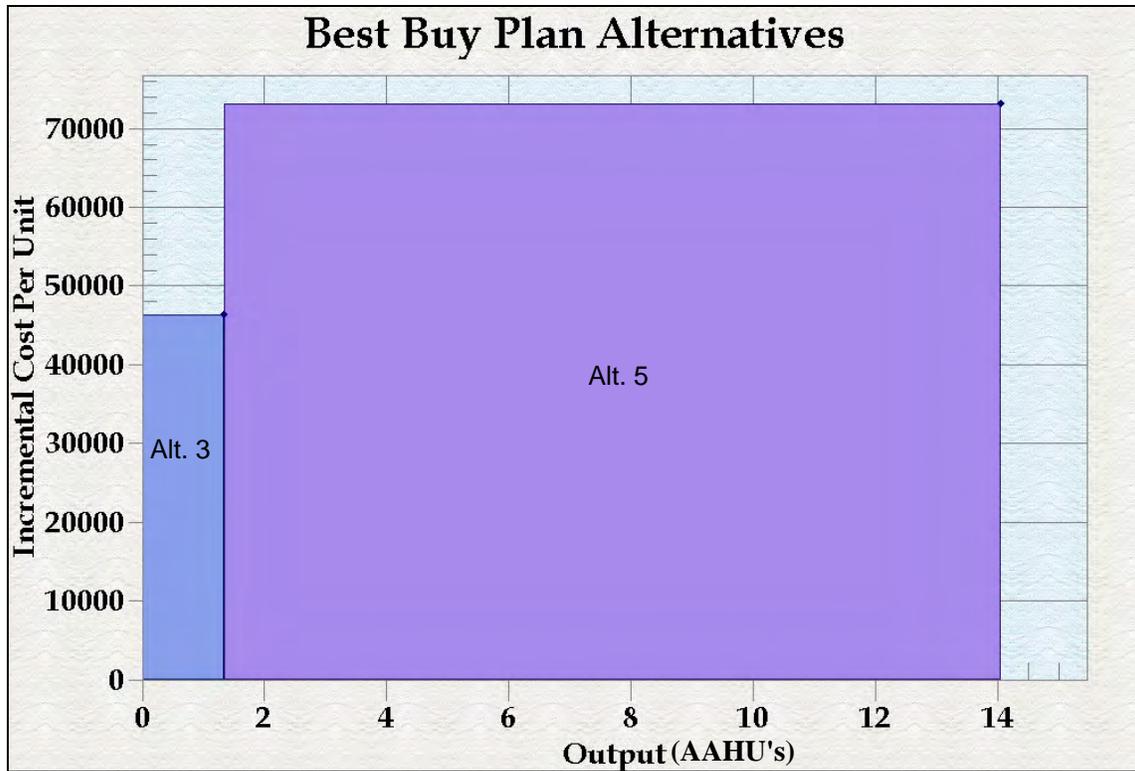


Figure 3
Incremental Cost Analysis Results

Based on the CE/ICA, Alternative 3 provides the lowest average cost per AAHU and the lowest incremental cost per unit of output (AAHU) while providing the 1.343 AAHU's required to mitigate for wetland impacts associated with the proposed project. Alternative 5 provides 12.713 additional AAHU's above those provided by Alternative 3 and increases the cost by \$929,766.

6.0 SUMMARY

The 2008 Updated ROW on the Detention Element project for the upper watershed of Brays Bayou includes the construction of additional tracts of land within the Eldridge Detention Basin and Arthur Storey Park Detention Basin complexes (HCFCD Unit No. D500-04-00 and D500-06-00). Five alternatives for compensatory mitigation for the excavation or filling of wetlands within the proposed additional tracts have been identified and are described below:

- Alternative 1 Creation of wetlands on-site within the Eldridge Detention Basin (HCFCD Unit No. D500-04-00) equal to 3.917 AAHU's.
- Alternative 2 Creation of wetlands on-site within the Arthur Storey Park Detention Basin (HCFCD Unit No. D500-06-00) equal to 3.917 AAHU's.
- Alternative 3 Acreage in the GBWMB Subdivision B equal to 1.343 AAHU's.
- Alternative 4 Creation of wetlands on additionally purchased property equal to 3.917 AAHU's.
- Alternative 5 Creation of wetlands on-site within the Eldridge Detention Basin (HCFCD Unit No. D500-04-00) equal to 20 acres, or 14.056 AAHU's.

A habitat assessment analysis was used to quantify the impacts of the proposed project by evaluating the ability of the wetland habitat within the study area to provide key components necessary for specific wildlife species. The project impact analysis projects future habitat conditions over the period of analysis in terms of AAHU's and determines the net impact of the proposed project in terms of AAHU's. AAHU's were calculated for the wetland habitat conditions within the additional tracts with and without the proposed project constructed to determine the net impact. The net impact is the difference between the AAHU's without the proposed project and the AAHU's with the proposed project. The acreage for each alternative required to compensate for the net project impact is determined based on the mean HSI scores for each habitat type within the mitigation areas. The AAHU's associated with the net impact were divided by the mean HSI score to determine the final mitigation acreage requirements.

A CE/ICA was completed using the IWR Planning Suite software for the purpose of evaluating the relationship between the costs and outputs associated with four mitigation alternatives. Based on the results of the CE/ICA, two of the alternatives are best buy alternatives: Alternative 3, acreage in the GBWMB Subdivision B equal to 1.343 AAHU's; and Alternative 5, the on-site creation of wetlands equal to 20 acres, or 14.056 AAHU's. Alternative 3 provides the lowest average cost per AAHU and the lowest incremental cost per unit of output (AAHU) while providing the 1.343 AAHU's required to mitigate for

wetland impacts associated with the proposed project. Alternative 5 provides 12.713 additional AAHU's above those provided by Alternative 3 and increases the cost by \$929,766.

7.0 REFERENCES

- Allen, A. W. 1987. Habitat Suitability Index Model: Eastern Gray Squirrel, revised. U.S. Fish Wildl. Serv. Biol. Rep. 82(10.135). 16 PP. [First printed as: FWS/OBS-82/10.19, July 1982.]
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- Merritt, Mickey. 2008. Texas Forest Service. Personal Interview conducted on August 25, 2008.
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- Sousa, P. J. 1982. Habitat suitability index models: Veery. U.S. Dept. Int., Fish Wildl. Serv. FWS/OBS-82/10.22. 12 pp.
- U.S. Army Corps of Engineers. 2000. ER 1105-2-100, Planning Guidance Notebook. Washington, DC.

Appendix A-1

Cost Effectiveness/Incremental Cost Analysis Results

Total and Average Cost

3/31/2010

5:16:56PM

All Plan Alternatives**Planning Set:** CEICA Analysis 4

Counter	Name	Output AAHU	Cost \$1000	Average Cost
1	No Action Plan	0.00	0.00	
2	Alternative 3 - GBWMB	1.34	62,178.00	46,297.84
3	Alternative 4 - Purchasing Property	3.92	629,772.00	160,779.17
4	Alternative 1 - Eldridge	3.92	481,990.00	123,050.80
5	Alternative 5 - 20ac; adding emergent	14.06	991,944.00	70,570.86

Incremental Cost of Best Buy Plan Combinations (Ordered By Output)

3/31/2010

5:18:11PM

Planning Set: CEICA Analysis 4

Counter	Plan Alternative	Output (AAHU)	Cost (\$1000)	Average Cost (\$1000 / AAHU)	Incremental Cost (\$1000)	Inc. Output (AAHU)	Inc. Cost Per Output
1	No Action Plan	0.00	0.00				
2	Alternative 3 - GBWMB	1.34	62,178.00	46,297.8407	62,178.0000	1.3430	46,297.8407
3	Alternative 5 - 20ac; adding emergent	14.06	991,944.00	70,570.8594	929,766.0000	12.7130	73,135.0586

"Is It Worth It?" - Questioning Process (Ordered By Output)

3/31/2010

5:18:33PM

Planning Set: CEICA Analysis 4

Best Buy Plan	Total Output (AAHU)	Total Cost (\$1000)	Incremental Cost (\$1000)	Incremental Output (AAHU)	Incremental Cost Per Unit of Output	Average Cost (\$1000 / AAHU)
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No Action Plan	0.00	0.00				
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Is it worth it? Yes No
Why?

Alternative 3 - GBWMB	1.34	62,178.00	62,178.0000	1.3430	46,297.8407	46,297.8407
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Is it worth it? Yes No
Why?

Alternative 5 - 20ac; adding emergent	14.06	91,944.00	929,766.0000	12.7130	73,135.0586	70,570.8594
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Is it worth it? Yes No
Why?

Appendix G

404(b)(1) Evaluation and 401 Certification Questionnaire

**EVALUATION OF THE EFFECTS OF THE
DISCHARGE OF DREDGED OR FILL MATERIAL INTO
WATERS OF THE U.S. USING SECTION 404(b) GUIDELINES
2008 UPDATED ROW ON THE DETENTION ELEMENT,
UPPER WATERSHED OF BRAYS BAYOU, HARRIS COUNTY, TEXAS**

I. PROJECT DESCRIPTION

- a. Location. The project is located in the southwestern portion of Harris County, Texas.
- b. General Description. Brays Bayou is located within the San Jacinto River Basin. The watershed of Brays Bayou and its tributaries includes a drainage area of approximately 137 square miles located in central and southwestern Harris County. The watershed is approximately 95 percent developed, consisting of a mixture of residential, commercial, industrial, and public land uses. The proposed action involves the construction of additional storm water storage locations at the Arthur Storey Park and Eldridge Detention Basins.
- c. Authority and Purpose. The Brays Bayou Federal Flood Control Project was authorized by the 1990 Water Resources Development Act of 1990, Public Law 101-640 as part of the comprehensive flood damage reduction plan for the Buffalo Bayou and Tributaries watershed. The authorized flood control project on Brays Bayou is documented in the report titled, *Buffalo Bayou and Tributaries, Texas Feasibility Report, Flood Damage Prevention, May 1988*. The Harris County Flood Control District (HCFCD) then requested a separable element analysis of the authorized Brays Bayou project, which was initiated in November 1991. Two separate elements were identified for the project, the detention element and the diversion element. The detention element was supported and an Environmental Assessment was prepared in March 1998. A Findings of No Significant Impacts (FONSI) was issued by the U.S. Army Corps of Engineers (USACE) in April 1998. The authorized detention element plan provides flood damage reduction from the 2% chance flood event for the urbanized area surrounding the basins.

Following approval of the detention element plan, HCFCD began purchasing tracts within the project areas of the authorized regional detention basins. It was at this time that HCFCD learned that a substantial portion of the proposed Old Westheimer Detention Basin project area (approximately 70 acres) was no longer available for acquisition. Any reductions in the overall storage capacity of the basins would effectively render the detention basin plan incapable of substantially reducing flood damages unless the lost storage was constructed at another location. HCFCD is therefore currently proposing to construct additional storm water storage in a new location within the upper watershed of Brays Bayou to compensate for this loss in storage capacity at the Old Westheimer Detention Basin.

- d. General Description of Dredged or Fill Material.
 - 1) General Characteristics of Material – According to the Houston sheet of the *Geologic Atlas of Texas (Bureau of Economic Geology, University of Texas; please refer to the reference list contained in the*

Environmental Assessment), the formation underlying the project area is Pleistocene in age and is identified as Beaumont geologic formation. The soils within the project area consist of Bernard clay loam, Clodine loam, and Lake Charles clay, 0–1 percent slopes. These soils are nearly level loams and clays. Section 4.1.4 of the EA describes the soils in further detail. The primary construction technique is excavation of existing soil to provide storage of floodwater.

- 2) Quantity of Material for Discharge – A total of 188 acres of land for the additional detention basin tracts would be utilized. Approximately 5.23 million cubic yards of earthen material would be excavated as part of the proposed action. The excavated materials would be sold by the contractor(s). The contractor(s) would be required to submit all proposed soil placement areas to HCFCD for evaluation and approval. District staff would identify all potential impacts to existing floodplains; wetlands; habitat; and hazardous, toxic and radioactive wastes (HTRW) sites. Unsuitable sites would be rejected. Suitable sites would be submitted to the USACE for coordination of preparation of a Record of Environmental Consideration (REC) prior to approval of these proposed sites. If the site is clear after the REC investigation, a REC for the disposal site would be kept on file at HCFCD.
- 3) Source of Material – The locations of all proposed excavations are shown in the Environmental Assessment on Exhibits B and C. Any fill required would consist of virgin material excavated from the detention basins. Concrete and other construction materials would be obtained from sources outside the project area.

e. Description of the Proposed Discharge Sites.

- 1) Location – The location of the additional tracts are listed in the EA and shown on Exhibits B and C in the Environmental Assessment.
- 2) Size – A total of 5.14 acres of wetlands would be impacted within the additional tracts.
- 3) Type of Site – The impacts to the wetlands would occur within the footprint of the additional tracts. The project area is mostly undeveloped land surrounded by urban land uses.
- 4) Type of Habitat – The fill would be placed within aquatic habitats, (i.e., wetlands). The fill would impact no aquatic species, as these wetland areas are ephemeral by nature. Local populations of small mammals, reptiles, amphibians and birds may use the wetlands. Due to HCFCDs local construction project, authorized under Section 211(f) of the Water Resources Development Act (WRDA), to alleviate flooding in the project area, the additional tracts have already been excavated to some degree. The majority of the land within the additional tracts is disturbed; however, in the remaining areas, habitats include upland pasture, upland scrub-shrub, upland forest, scrub-shrub wetlands, and forested wetlands.

5) Timing and Duration of Discharge – Excavation is 100% complete at the Arthur Storey Park Detention Basin and 40% complete at the Eldridge Detention Basin. Every attempt was made to avoid wetland areas through project design. All necessary permits were secured prior to construction. Maintenance activities would not involve discharge into waters of the U.S.

- f. Description of Disposal Method. Fill operations would be performed by land based equipment such as draglines, hydraulic shovels, motorized or towed scrapers or other similar earthmoving equipment.

II. FACTUAL DETERMINATIONS

a. Physical Substrate Determinations.

- (1) Substrate Elevation and Slope – The two detention basins would be approximately 13-18 feet deep and would have concrete weirs. The Arthur Storey Park Detention Basin would be designed as off-line flood storage facility with four compartments. The Eldridge Detention Basin would be designed as an in-line flood storage facility. Box culverts will convey flows uniformly throughout the adjacent compartments.
- (2) Sediment Type – The principal strata within the region are the Bernard, Clodine, and Lake Charles soil associations. These soils are clayey and loamy soils with very slow to moderate permeability.
- (3) Fill Material Movement – The foundation soils are generally strong and dense, and side slope stability should not present any problems in the areas where earthen fill material is used.
- (4) Physical Effects of Benthos – The existing wetlands within the project area are ephemeral in nature and do not support substantial communities of benthic organisms. Any small communities would be destroyed during the excavation and fill activities. Any impacts would be mitigated by the purchase of mitigation credits from the Greens Bayou Wetland Mitigation Bank (GBWMB) as part of a comprehensive mitigation package. A total of 5.14 acres of wetlands would be potentially impacted by the proposed action. The 5.14 acres of wetland impacts would be mitigated per required Average Annual Habitat Units (AAHUs), as determined by the wildlife habitat assessment modeling and subsequent Institute of Water Resources (IWR) Suite modeling conducted for the proposed action. All mitigation alternatives were required to gain at least 2.033 AAHU's of wetlands. A total of 2.033 AAHU's of mitigation would be provided through the purchase of 3.45 acres within the GBWMB Subdivision B.
- (5) Actions Taken to Minimize Impacts – The location of the additional tracts was based on available tracts of land within the project area and the ability to deliver sufficient flood flows with an accessible right-of-way while minimizing displacements. Any resulting impacts to wetlands are necessary to construct the proposed action.

b. Water Circulation, Fluctuation, and Salinity Determination.

(1) Water –

- (a) Salinity – Salinity levels would not be affected by excavation or fill activity.
- (b) Water chemistry – Water chemistry would not be substantially altered by excavation or fill activity.
- (c) Clarity – Clarity of the water in Brays Bayou may be temporarily impacted during the construction process. However, clarity of the project waters should return upon cessation of construction in each phase of the project.
- (d) Color – Color would not be substantially altered by excavation or fill activity.
- (e) Odor – Odor would not be substantially altered by excavation or fill activity.
- (f) Taste – Taste would not be substantially altered by excavation or fill activity.
- (g) Dissolved gas levels – Dissolved gas levels would not be substantially altered by excavation or fill activity.
- (h) Nutrients – Nutrient loads would not be substantially altered by excavation or fill activity.
- (i) Eutrophication – The process of eutrophication would not be substantially altered by excavation or fill activity.

(2) Current Patterns and Circulation –

- (a) Current patterns and flow – Typically, small wetlands do not exhibit current patterns and flow dynamics.
- (b) Velocity – Typically, small wetlands do not exhibit flow velocity.
- (c) Stratification – Typically, small wetlands do not exhibit stratification. Depths of the existing wetlands average 0.5 feet.
- (d) Hydrologic regime – The hydrologic regime of the existing wetlands is based on seasonal or temporary hydrology provided by precipitation. Any wetlands mitigated in the detention basin

would be designed to take advantage of smaller rain events while not substantially affecting the storage capacity of the basins.

- (3) Normal Water Level Fluctuation – The excavation and fill of the wetlands would not substantially alter the normal water levels in Brays Bayou.
- (4) Salinity Gradients – Salinity gradients are not an issue for this project, as no tidal reaches exist within the project area.
- (5) Actions Taken to Minimize Impacts – The excavation and fill activities would not substantially affect water circulation, fluctuation, or salinity; therefore, impacts are minimal. Where applicable, silt fencing would be placed along exposed slopes and excavated areas to prevent erosion and sedimentation of Brays Bayou. In addition, seeding and fertilization of the detention maintenance berms, side slopes, and basin bottoms would be performed following completion of the excavation, to establish ground cover and to prevent erosion of excavated areas and sedimentation of Brays Bayou.

c. Suspended Particulates / Turbidity Determinations.

- (1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Detention Basins – During construction, suspended particulates and turbidity levels may increase until the wetlands are either completely excavated or filled. Although these temporary increases are unavoidable in the construction area, in order to minimize unavoidable impacts, construction controls would be implemented during construction activities, and the impacted areas would be revegetated after the completion of construction.
- (2) Effect on Chemical and Physical Properties of the Water Column –
 - (a) Light penetration – Stormwater runoff during construction may cause an increase in turbidity in Brays Bayou. The increased turbidity could reduce light penetration and may negatively affect phytoplankton production in the vicinity of the construction. Turbidity increases are expected to be of short duration, normally dissipating within a few hours after a storm event. Turbidity in the 5.14 acres of wetlands would be insignificant as all wetlands would be excavated or filled. The construction of the additional tracts would actually help to reduce turbidity excursions by performing a settling function for sediment-laden stormwaters.
 - (b) Dissolved oxygen – Dissolved oxygen levels would not be affected during construction or operation.
 - (c) Toxic metals and organics – Toxic metals and organic levels would not be affected by the construction activities. The earthen fill and excavated soil is not considered high in pollutants.
 - (d) Pathogens – Pathogen levels would not be affected by excavation and fill activities.

- (e) Aesthetics – Increased turbidity in bayou water because of the construction activities would result in decreased clarity of the water during storm events. However, these conditions are not a substantial deviation from current storm conditions along Brays Bayou. These impacts would be temporary; water clarity would stabilize shortly after construction is completed.
- (3) Effects on Biota –
 - (a) Primary production, photosynthesis – During periods of turbidity (storm events during construction), the resultant decreased light penetration would inhibit photosynthesis. However, productivity in Brays Bayou is currently low due to poor water quality (see Section 4.5.3 of the Environmental Assessment).
 - (b) Suspension / filter feeders – It is not anticipated that there would be any substantial affect on these organisms as a result of the project construction or operation.
 - (c) Sight feeders – Line of sight for prey items may be reduced during turbidity excursions caused by storm events. However, these conditions would be temporary. In general, Brays Bayou is considered poor quality fisheries habitat due to screening levels of ammonia, nitrate, orthophosphorus, and total phosphorus.
 - (4) Actions Taken to Minimize Impacts – Turbidity impacts are unavoidable in excavation and fill areas. A stormwater pollution prevention plan (SW3P) would be prepared to manage stormwater runoff from the project during construction along the additional tracts. Impacts would be localized rather than regional because of a phased construction approach.
- d. Contaminant Determinations. The sediments to be excavated from the detention basins are considered to be virgin material. No substantial quantities of chemical contaminants would be released by excavation or excavation activities. A hazardous materials review was conducted for the excavation areas. One underground storage tank (UST) facility was identified within the Eldridge Detention Basin project area. This site was determined not to present a significant environmental concern based on the current regulatory status.
- e. Aquatic Ecosystem and Organism Determinations.
- (1) Effects on Plankton – No substantial impacts are anticipated to current plankton populations. Any impacts would be temporary in nature, as the aquatic ecosystem would reestablish itself upon completion of construction activities.
 - (2) Effects on Benthos – No substantial impacts are anticipated to current benthic populations. Any impacts would be temporary in nature, as the aquatic ecosystem would reestablish itself upon completion of construction activities.

- (3) Effects on Nekton – No substantial impacts are anticipated to current nekton populations. Any impacts would be temporary in nature, as the aquatic ecosystem would reestablish itself upon completion of construction activities.
- (4) Effects on Aquatic Food Web – No substantial impacts are anticipated to the aquatic food web. Any impacts would be temporary in nature, as the aquatic ecosystem would reestablish itself upon completion of construction activities.
- (5) Effects on Special Aquatic Sites –
 - (a) Wetlands – 5.14 acres of wetlands would be impacted at the additional tracts. The wetlands would be mitigated for through the purchase of credits from the GBWMB Subdivision B.
 - (b) Riffle and Pool Complexes – No effects to riffle or pool complexes are anticipated.
- (6) Threatened and Endangered Species – PBS&J ecologists conducted a literature review of the Texas Parks & Wildlife's (TPWD) Natural Diversity Database (NDD) to identify known occurrences of threatened/endangered species within the vicinity of the project area in July 2008. Field surveys were conducted in 2004 and 2005 (Brown, 2004 and 2005; please refer to the reference list contained in the EA). Based on PBS&J's review and field surveys, there are no documented occurrences of federally threatened or endangered species within the project area or within 1,000 feet of the project area; therefore, the proposed action would have no effect on threatened or endangered species or their habitat. The U.S. Fish & Wildlife Service (USFWS) and TPWD were notified of the proposed action on December 9, 2004, and June 2, 2005. USFWS concurred with this determination on January 16, 2009 (See Section 5.4 of the EA).
- (7) Other Wildlife – Impacts to local urban-type wildlife would be temporary. A net gain of habitats would result from the project, as habitat quality features are incorporated into the design of the detention basins (trees and shrubs would be planted within the two detention basins). The impacted wetlands would be mitigated through the purchase of 3.45 acres of forested wetlands at the GBWMB Subdivision B.
- (8) Actions to Minimize Impacts – As part of the proposed action, environmental (habitat) quality features would be added to the detention basins. Minimization measures include implementation of silt fencing during construction and seeding and fertilization of the detention maintenance berms, side slopes, and basin bottoms following construction. Not only would these measures establish ground cover, but they would also prevent erosion of excavated areas and sedimentation of Brays Bayou.

f. Proposed Disposal Site Determinations.

- (1) Mixing Zone Determination – Mixing was not considered because no discharges are proposed into Brays Bayou. A weir with a low flow outlet pipe would be installed for the detention basins.
- (2) Determination of Compliance with Applicable Water Quality Standards – A total of 5.14 acres of wetlands would be impacted by construction within the additional tracts. Brays Bayou Tidal and Above Tidal, Segments 1007_04 and 1007B respectively, are considered impaired waterbodies for contact recreation use because they do not meet pathogen water quality standards. Segment 1007_04 also does not support fish consumption. Comparisons of water quality to generally accepted criteria for a free-flowing stream indicate that fecal coliform and e-coli levels are excessive in Brays Bayou. As an effluent dominated stream, other nutrients are considered high: nitrite, orthophosphorus, total phosphorus, and ammonia.
- (3) Potential Effect on Human Use Characteristics –
 - (a) Municipal and private water supply – The proposed action would not have any affect on water supply.
 - (b) Recreational and commercial fisheries – The urbanized watershed is neither characterized as conducive to recreational fishing nor good fisheries habitat.
 - (c) Water related recreation – Although no known water recreation occurs within this portion of Brays Bayou, there might be a temporary and local disruption of the use of hike / bike trails in the vicinity of construction. Appropriate safety measures and traffic control plans would be implemented at these locations.
 - (d) Aesthetics – Temporary impacts to aesthetics can be expected during construction activities. These impacts would be relatively short in duration.
 - (e) Parks, national and historical monuments, national seashores, wilderness, research sites, and similar preserves – No impacts would occur to parks, national or historical monuments, national seashores, wilderness, research sites or other preserves.

- g. Determination of Cumulative Effects on the Aquatic Ecosystem. Adverse effects to the aquatic ecosystem as a result of the excavation and fill activities of the wetlands are minimal. The greatest effect would be the creation of 548 acres of wet-bottom detention basins from the entire footprint of the Arthur Storey Park and Eldridge Detention Basins and this is generally viewed as a positive effect by lowering flood damages to structures, residences, and infrastructure and by creating habitat.

III. Findings of Compliance or Non-Compliance with the Restrictions on Discharge.

- a. Adaptation of the Section 404(b)(1) Guidelines to this Evaluation. An ecological evaluation has been made following the evaluation criteria in 40 CFR 230.4 and in conjunction with the evaluation considerations in 40 Code of Federal Regulations (CFR) 230.5. Appropriate measures have been identified and incorporated in the proposed action to minimize adverse effects on the aquatic environment as a result of excavation and fill operations. Consideration has been given to the need for the proposed excavation and fill, the availability of alternative sites, methods of filling that are the least damaging to the environment, and such water quality standards as are appropriate and applicable by law. Based on these determinations, the excavation and fill sites for the additional tracts have been specified through the application of the Section 404(b)(1) guidelines. It has been found that the proposed action, as described in the EA meets the requirements of Section 404(b) guidelines.
- b. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Sites Which Would Have Less Adverse Impact on the Aquatic Ecosystem. Other alternatives were investigated during the preliminary studies for the proposed action. Alternatives that were carried forward in the EA are discussed in Chapter 3 of the EA. Although the proposed action (Alternative 3 in the EA) is not the least environmentally damaging plan, it provides the approved recommended flood storage amount with minimal additional sacrifice of environmental resources. Despite its lack of impacts, the No Action Alternative does not meet the purpose and need for this project. The remaining reasonable alternative (Alternative 2 in the EA), if implemented, would have similar unavoidable impacts to wetlands because the amount of required additional land is the same. However, this alternative is not suitable based on the feasibility and cost.
- c. Compliance with Applicable State Water Quality Standards. The excavation and fill activities would not involve the release of harmful materials into the waterway. The earthen material used for fill activities is considered virgin material from a location away from sources of pollution. (See Section 5.5.3 of the EA for a detailed discussion of water quality.)
- d. Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 of the Clean Water Act. Toxic effluent would not be discharged into any waters of the U.S.
- e. Compliance with Endangered Species Act of 1973. Excavation or fill activities would have no effect to any endangered and / or threatened species. (See Chapter 5.4 of the EA).
- f. Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection Research and Sanctuaries Act of 1972. This law is not applicable to the proposed action.
- g. Evaluation of Extent of Degradation of the Waters of the United States.
 - (1) Significant Adverse Effects on Human Health and Welfare –

- (a) Municipal and private water supplies – This project would have no effect on water supply.
 - (b) Recreation and commercial fisheries – The project would have no effect on fisheries. Brays Bayou is not conducive to recreational fishing and no known commercial fisheries exist in the watershed. Due to water quality limitations, Brays Bayou is not considered good fisheries habitat.
 - (c) Plankton – No substantial impacts are anticipated to current plankton populations. Turbidity excursions are locally possible during storm events at construction locations; these conditions would be temporary and of relatively short duration.
 - (d) Fish – In general, the waterway provides poor fisheries habitat, and substantial impacts to fish are not likely.
 - (e) Shellfish – No substantial impacts are anticipated to current freshwater shellfish populations.
 - (f) Wildlife – The proposed action may have some locally adverse effects (temporary displacement) to wildlife. However, the proposed action would provide a net gain in more desirable wildlife habitat through the inclusion of habitat quality features at the detention basins.
 - (g) Special aquatic sites – As a result of the proposed action, there would be no net loss of wetlands, as mitigation would be provided for through the purchase of credits from the GBWMB Subdivision B.
- (2) Significant Adverse Effects on Life Stages of Aquatic Life and Other Wildlife Dependent on Aquatic Ecosystems – Construction activities would cause localized short-term excursions in turbidity. The inclusion of the tree and shrub plantings would benefit the species in the project area. Due to water quality limitations, the project area is not used extensively for feeding, spawning, breeding or nursery areas by aquatic species.
 - (3) Significant Adverse Effect on Aquatic Ecosystem Diversity, Productivity and Stability – Because of the current poor water quality of Brays Bayou, the temporary nature of construction activity, and the fact that the bayou is not being converted to some other use, any impacts from the construction activity would be insignificant to the aquatic ecosystem.
 - (4) Significant Adverse Effects on Recreational Aesthetics and Economic Values – The project would create no significant adverse effects to recreational aesthetics or economic values. Both of these values would receive a net benefit increase from the proposed action. The long-term gain in benefits for recreation and economic values are positive. Recreational aesthetics would be improved by widening the viewshed of Brays Bayou in the project area and creating additional greenspace.

- h. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem. The only adverse impact caused by the excavation and/or discharge of earthen material is a short-term increase in turbidity; this is unavoidable in construction area receiving waters. Appropriate measures would be taken to minimize sediment entrainment in stormwater as required by the current Federal Construction Storm Water Program. Utilizing a phased construction approach such that only smaller segments of the project would be under construction at any given time would further minimize impacts. The excavated or otherwise impacted areas would be re-vegetated after the completion of construction.

- i. On the Basis of the Guidelines, the Proposed Excavation and Disposal Sites for the Excavation and Discharge of the Earthen Material are Specified as Complying with the Requirements of These Guidelines.

The proposed excavation and fill sites for discharge of material would comply with the guideline requirements to minimize pollution or adverse effects to the affected aquatic ecosystem.

**FINDING OF COMPLIANCE FOR 2008 UPDATED ROW ON THE DETENTION ELEMENT,
UPPER WATERSHED OF BRAYS BAYOU,
HARRIS COUNTY, TEXAS PROJECT**

1. No substantial adaptation of the guidelines was made relative to this evaluation.
2. The planned disposal of fill material would not violate any applicable state water quality standards with the exception of minor turbidity excursions during substantial rain events. This temporary effect is unavoidable in construction areas. The excavation and disposal operation would not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.
3. No endangered species or their critical habitat would be harmed from disposal of excavated materials. USACE-approved, fully functioning, licensed vendors would be obtained to perform disposal operations.
4. The proposed excavation, fill and soil disposal activities would not result in substantial adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and other wildlife would not be adversely affected. Substantial adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, aesthetic and economic values would not occur.
5. Appropriate steps that would be taken to minimize potential adverse impacts of the discharge on aquatic systems include, construction controls, re-vegetation after completion of construction, and implementation of the environmental quality measures included in the proposed action at the detention basins.
6. On the basis of the guidelines, the proposed excavation and fill sites for discharge of material are specified as complying with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects to the affected aquatic ecosystem.

401 Certification Questionnaire

Harris County Flood Control District 2008 Updated ROW on the Detention Element Of the Upper Watershed of Brays Bayou

I. Impacts to Surface Water in the State, including Wetlands

- A. Implementation of the proposed action would result in impacts to wetlands, including excavation of 5.14 acres of wetlands. The 5.14 acres include approximately 0.01 acre of wetland impacts within the proposed Arthur Storey Park detention basin and 5.13 acres within the proposed Eldridge detention basin.
- B. The proposed action does not include any modifications to Brays Bayou. Best Management Practices (BMP) would be implemented during and after construction of the basin, including seeding and/or sodding, and silt fencing. These BMPs would assist in the reduction of construction impacts to Brays Bayou.

Based on the incremental cost analysis conducted for various mitigation alternatives (Appendix A of the Environmental Assessment), mitigation is proposed for the approximate 5.14 acres of wetland impacts at the Greens Bayou Wetland Mitigation Bank (GBWMB). The mitigation is based on the wildlife habitat assessment methodology that was conducted to determine the quality of the wetland habitat. The habitat quality is expressed in Habitat Units (HU). It was determined that all mitigation alternatives must gain at least 1.347 Average Annual HUs (AAHU) of forested wetlands and 0.686 AAHUs of scrub-shrub wetlands. The mitigation alternative achieves the required AAHUs.

The project proposes to purchase 3.45 acres of forested wetlands from the GBWMB Subdivision B. Subdivision B was evaluated using wildlife habitat assessment procedures and was noted to consist of emergent and forested wetlands. The purchase of forested wetlands would mitigate for impacts to the scrub-shrub wetlands. Mitigation equal to 2.033 AAHU's requires the purchase of 3.45 acres. The U.S. Army Corps of Engineers (USACE) has the final authority for approval of this mitigation proposal.

- C. The Alternatives Analysis Checklist is attached.

II. Disposal of Waste Materials

- A. Excavated soil from the proposed action would not be disposed of in a wetland or other significant habitat/resource. A total of 188 acres of land for the additional detention basin tracts would be utilized. Approximately 5.23 million cubic yards of earthen material would be excavated as part of the proposed action. The excavated materials would be sold by the contractor(s). The contractor(s) would be required to submit all proposed soil placement areas to the Harris County Flood Control District (HCFCD) for evaluation and approval. District staff would identify all potential impacts to existing floodplains; wetlands; habitat; and hazardous, toxic and radioactive wastes (HTRW) sites. Unsuitable sites would be rejected. Suitable sites would be submitted to the USACE for coordination of preparation of a Record of Environmental Consideration (REC) prior to approval

of these proposed sites. If the site is clear after the REC investigation, a REC for the disposal site would be kept on file at HCFCD.

- B. No known identified sanitary sewer lines would be used to dispose of sewage generated during construction. Portable toilets would be on site for workers during the construction phase. A solid waste management contractor would be responsible for compliance with local, state, and federal laws for sewage disposal.
- C. N/A

III. Water Quality Impacts

- A. The proposed action would include adding additional storage capacity to the Arthur Storey Park and Eldridge Detention Basins.

The construction practices for the proposed action as related to water quality would be documented in the Storm Water Quality Management Plan (SWQMP) and the Storm Water Pollution Prevention Plan (SW3P) in accordance with guidance provided by the City of Houston, Harris County, and HCFCD. The design guidelines include the *Storm Water Management Handbook for Construction Activities*, the *Storm Water Quality Management Guidance Manual*, and the *Minimum Design Criteria for Implementation of Certain Best Management Practices for Storm Water Runoff Treatment Options*. The SW3P/SWQMP would be prepared during the final design of the proposed action.

According to the Houston sheet of the *Geologic Atlas of Texas (Bureau of Economic Geology, University of Texas; please refer to the reference list contained in the Environmental Assessment)*, the sediments that would be removed generally consist of silt, sand, and clay of the Beaumont Formation.

- B. As stated above, the construction practices for the proposed action as related to water quality would be documented in the SWQMP and the SW3P in accordance with guidance provided by the City of Houston, Harris County, and HCFCD. The SW3P/SWQMP would be prepared during the final design of the proposed action.

The following BMPs would be implemented in order to avoid unnecessary impacts and to minimize unavoidable impacts to the bayou: seeding and sodding of the basin area would be implemented in a timely fashion and silt fencing would be used during construction. New trees and shrubs would be planted within the basins for visual, aesthetic, recreational, and environmental/habitat value. The trees and shrubs would also aid stabilizing the disturbed soil area.

The side slopes and perimeter of the detention basins would be seeded with grass after construction to establish ground cover and reduce erosion; thereby stabilizing disturbed soil areas and assisting in filtration of stormwater runoff. All of the detention basins would include construction of a low-flow channel in the center of the basins.

- C. Not applicable.

- D. If impacts to shallow groundwater through excavation of soil material are observed through sight and/or smell during construction activities, all work would be suspended immediately and a qualified environmental professional would be contacted to assess the situation and recommend sampling if necessary. All environmental concerns would be addressed by the HCFCD prior to construction activities proceeding.

Alternatives Analysis Checklist

Harris County Flood Control District 2008 Updated ROW on the Detention Element Of the Upper Watershed of Brays Bayou

I. Alternatives

A. How could you satisfy your needs in ways which do not affect surface water in the state?

The Brays Bayou Federal Flood Control Project was authorized by the 1990 Water Resources Development Act (WRDA), Public Law 101-640, as part of the comprehensive flood damage reduction plan for the Buffalo Bayou and Tributaries watershed. The authorized flood control project on Brays Bayou is documented in the report entitled, Buffalo Bayou and Tributaries, Texas Feasibility Report, Flood Damage Prevention, May 1988.

An Environmental Assessment (EA) for the detention element of the Brays Bayou Federal Flood Control Project was prepared in March 1998. A Finding of No Significant Impacts ("FONSI") was issued by the U.S. Army Corps of Engineers (USACE) in April 1998. The approved detention element plan evaluated various potential detention basin locations within the Brays Bayou watershed and determined that the following basin locations result in the least environmental impact while meeting the goal of the project: Arthur Storey Park Detention Basin (HCFCD Unit D500-06-00), Eldridge Detention Basin (HCFCD Unit D500-04-00), and Old Westheimer Detention Basin (HCFCD Unit D500-01-00).

Following approval of the detention element plan, Harris County Flood Control District (HCFCD) began purchasing tracts within the project areas of the authorized regional detention basins (Arthur Storey Park, Eldridge, and Old Westheimer Detention Basins). It was at this time that HCFCD learned that a substantial portion of the proposed Old Westheimer Detention Basin project area (approximately 70 acres) was no longer available for acquisition. The loss of acreage at the Old Westheimer Detention Basin equates to 1,800 acre-feet of storage, which means this amount is needed in an alternate location to ensure that the detention element plan would still be effective.

There are no feasible alternatives for the proposed action that avoid surface water impacts. Two alternatives to the proposed action were evaluated as solutions to the flood storage loss at the Old Westheimer Basin, which include relocation of the Old Westheimer Basin and "No Action." However, neither of these alternatives was determined to be feasible. The No Action Alternative does not involve impacts to streams and wetlands, but it does not reduce flood damages within the project area. The proposed action best meets the goal of reducing flood damages at an affordable cost.

B. How could the project be re-designed to fit the site without affecting surface water in the state?

Due to the loss of acreage at the Old Westheimer Basin, the combined amount of flood storage provided by the Arthur Storey Park and Eldridge Detention Basins needs to be increased by 1,800 acre-feet in order to reduce flood damage within the Brays Bayou watershed. The proposed action is the optimal layout and configuration of the expansion.

HCFCFCD proposes to create an additional 1,000 acre-feet of storage at the Arthur Storey Park Detention Basin complex through the addition of approximately 35 acres of property and an additional 1,466 acre-feet of storage at the Eldridge Detention Basin complex by increasing the overall size of the detention facility through the addition of 153 acres of property.

C. How could the project be made smaller and still meet your needs?

The proposed action has been designed to compensate for the loss of storage at the Old Westheimer Detention Basin by increasing the storage capacities of both the Arthur Storey Park and Eldridge Detention Basin complexes. Additional right-of-way ("ROW") in the amount of 188 acres is required to implement the proposed action. The ROW acquisition includes 35 acres adjacent to the Arthur Storey Park Detention Basin and 153 acres adjacent to the Eldridge Detention Basin. Any reductions in the proposed action would effectively render the detention basin plan incapable of substantially reducing flooding.

D. What other sites were considered?

1. What geographical area was searched for alternative sites?

A broad range of solutions to the flooding problems in the Brays Bayou watershed was evaluated during the preparation of the authorized Buffalo Bayou and Tributaries, Texas Feasibility Report, Flood Damage Prevention and the Final Environmental Assessment, Brays Bayou at Houston, Texas Flood Damage Prevention, Detention Element (USACE, 1988 and 1998; please refer to the reference list contained in the Environmental Assessment). Various potential detention basin locations within the Brays Bayou watershed were evaluated and the Arthur Story Park, Eldridge, and Old Westheimer Detention Basins were determined to provide the maximum net economic benefits. Therefore, potential additional tract locations were limited to the areas immediately surrounding these three authorized detention basins.

2. How did you determine whether other non-wetland sites are available for development in the area?

The additional tracts were selected based on availability and location adjacent to the authorized detention basins. The potential tracts available were constrained by residential and commercial development in the project area. The likelihood of encountering wetlands at additional tracts was the same at all potential available tracts.

Wetland delineations and wetland delineation reports were conducted for the additional tracts. These delineation reports were then submitted to the USACE, Galveston District.

A total of 5.14 acres of wetlands were identified within the project area, all of which would be impacted by the proposed action.

3. In recent years, have you sold or leased any lands located within the vicinity of the project? If so, why were they unsuitable for the project?

No.

E. What are the consequences of not building the project?

The proposed detention element plan was developed to reduce flood damages in the extensively developed urban area of southwest Houston. The authorized plan would provide flood damage reduction from the 2% chance flood event to the urbanized area within the basins. Without construction of the proposed action, the overall detention element plan would be ineffective. The loss of 1,800 acre-feet of storage from the Old Westheimer Basin would remain and the effective amount of flood damage reduction would not be achieved.

II. Comparison of alternatives

A. How do the costs compare for the alternatives considered above?

The additional acreage required for the proposed action is equal to the acreage lost at the Old Westheimer Basin; therefore, costs associated with the proposed action are similar to those associated with construction of the Old Westheimer Basin. There would be no costs associated with the No Action alternative.

B. Are there logistical (location, access, transportation, etc.) reasons that limit the alternatives considered?

Yes. The proposed additional tracts need to be located adjacent to the authorized detention basins to achieve the flood storage capacity required to reduce flood damages in the watershed. Individual tracts which are not located adjacent to the detention basins require larger surface areas to achieve the same storage capacity, which is not cost effective.

C. Are there technological limitations for the alternatives considered?

There are no technological limitations for the alternatives considered.

D. Are there other reasons certain alternatives are not feasible?

No.

III. If you have not chosen an alternative which would avoid impacts to surface water in the state, explain:

A. Why your alternative was selected?

Two alternatives to the proposed action were evaluated including relocation of the Old Westheimer Basin and the No Action Alternative. The relocation of the Old Westheimer Basin was determined to be not feasible, and the No Action Alternative would not meet the goals of the project. Therefore, the proposed action was selected.

The immediate area surrounding the Old Westheimer Basin was evaluated for other available tracts to relocate the original basin. The available tracts that were identified were smaller than the originally proposed project area and were not contiguous with one another. Hydrologic and hydraulic studies were performed to evaluate the feasibility and efficiency of constructing numerous, smaller detention basins in lieu of a single, larger detention facility, and it was determined that the individual detention basins would be inefficient given their size and configuration (i.e., distance between each basin). Furthermore, it would be more costly to purchase the larger number of smaller tracts and construct the additional detention

basins. For these reasons, relocation of the Old Westheimer Basin was eliminated from further evaluation.

The No Action Alternative does not involve impacts to streams and wetlands, but it does not reduce flood damages within the project area. Without the proposed action, the authorized detention basin plan would be incapable of providing the approved amount of flood storage in the Brays Bayou watershed, resulting in continued flood damages, including losses to property owners and potential loss of lives. Continued flood damages would result in the deterioration of property values in the watershed and would not be acceptable to the local community and local interests. Inhabitants of the watershed would continue to suffer the social and economic stresses associated with repetitive flooding.

- B. What do you plan to do to minimize adverse effects on the surface water in the state impacted?

Based on the incremental cost analysis conducted for various mitigation alternatives (Appendix A of the Environmental Assessment), mitigation is proposed for the approximate 5.14 acres of wetland impacts at the Greens Bayou Wetland Mitigation Bank (GBWMB). The mitigation is based on the wildlife habitat assessment methodology that was conducted to determine the quality of the wetland habitat. The habitat quality is expressed in Habitat Units (HU). It was determined that all mitigation alternatives must gain at least 1.347 Average Annual HUs (AAHU) of forested wetlands and 0.686 AAHUs of scrub-shrub wetlands, or 2.033 total AAHU's. The mitigation alternative achieves the required AAHUs.

The proposed action proposes to purchase 3.45 acres of forested wetlands from the GBWMB Subdivision B. Subdivision B was evaluated using wildlife habitat assessment procedures and was noted to consist of emergent and forested wetlands. The purchase of forested wetlands would also mitigate for impacts to the scrub-shrub wetlands. Mitigation equal to 2.033 AAHU's requires the purchase of 3.45 acres. The USACE has the final authority for approval of this mitigation proposal.

Best Management Practices (BMP) would be implemented during and after construction of the basin, including seeding and/or sodding, and silt fencing. These BMPs would assist in the reducing construction impacts to Brays Bayou.

- IV. Please provide a comparison of each criteria (from Part II) for each site evaluation in the alternatives analysis.

**Upper Watershed of Brays Bayou
 Alternatives Analysis Matrix**

Criteria	Alternative 1-No Action	Alternative 2 Relocation of Old Westheimer Basin	Alternative 3 Expansion of Eldridge and Arthur Storey Park Detention Basins
Size	0 acres	Approximately 188 acres	188 acres
Major Thoroughfare Access	Because no action is being taken, existing access points at the Old Westheimer, Arthur Storey Park, and Eldridge Detention Basins would remain the same.	Access to the Old Westheimer Detention Basin is at the northwest corner of West Houston Center Blvd and Westpark Tollway, or approximately 0.4 mile north of this intersection.	Access to Eldridge Detention Basin is on Eldridge Parkway, approximately 0.1 mile south of Westpark Dr. Access to Arthur Storey Park Detention Basin is approximately 0.4 mile south or west of the Bellaire Blvd and Beltway 8 intersection.
Threatened & Endangered Species	Because no action is being taken, no impacts to threatened or endangered species are expected.	Low potential for federally listed species and preferred habitat.	Low potential for federally-listed species and preferred habitat.
Amount of Adjacent, Jurisdictional Wetlands and Waters of the U.S.	0.0 Acres 0% of total property	0.0 Acres 0% of total property	0.0 Acres 0% of total property
Archeological Resources	Because no action is being taken, no impacts to archeological resources are expected.	Low potential for archeological resources. Alternative 2 is also located in the 100-yr floodplain.	Low potential for archeological resources. Alternative 3 is also located in the 100-yr floodplain.
Reason Purchased or Not purchased	Because no action is being taken, no property was purchased or not purchased.	Hydrologic and hydraulic studies determined inefficiencies. Additionally, cost was higher compared to Alternative 3.	Purchased. Attractive acquisition and project-development costs and location.