Draft Environmental Assessment

Harris County Flood Control District Greens Bayou Project HMGP-DR-1791-TX Project #67

Harris County, Texas

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FEMA

Federal Emergency Management Agency
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500 C Street, SW
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LIST OF ACRONYMS

AIRFA	American Indian Religious Freedom Act
APE	area of potential effect
ASTM	American Society for Testing and Materials
B/C	benefits/cost
BEG	University of Texas Bureau of Economic Geology
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practices
BTEX	benzene, toluene, ethylbenzene, and xylene
CAA	Clean Air Act
CFR	Code of Federal Regulations
CH4	methane
CO2	carbon dioxide
CRC	CRC International Archaeology & Ecology, LLC
CTA	Council of Texas Archeologists
EA	Environmental Assessment
EDR	Environmental Data Resources, Inc.
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
GIS	Global Information System
GLO	General Land Office
HCFCD	Harris County Flood Control District
HFC	hydrofluorocarbons
H-GAC	Houston-Galveston Area Council
HMGP	Hazard Mitigation Grant Program
IH	Interstate Highway
IP	Individual Permit
IPCC	Intergovernmental Panel on Climate Change
JTF	Joint Task Force
MBTA	Migratory Bird Treaty Act
MPO	Metropolitan Planning Organization
MS4	Municipal Separate Storm Sewer System
MSAT	mobile source air toxic
MSL	mean sea level
N20	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAGPRA	National American Grave Protection and Repatriation Act
NDD	Natural Diversity Database
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent

NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
PEM	palustrine emergent
PFC	per fluorocarbons
PFO	palustrine forested
ppm	parts per million
RCI	Reach Condition Indes
REC	recognized environmental condition
SAL	State Archeological Landmark
SF6	sulfur hexafluoride
SHPO	State Historic Preservation Officer
SW3P	Stormwater Pollution Prevention Plan
TAC	Texas Administrative Code
TARL	Texas Archaeological Research Laboratory
TCEQ	Texas Commission on Environmental Quality
TCMP	Texas Coastal Management Program
THC	Texas Historical Commission
TPDES	Texas Pollutant Discharge Elimination System
TPH	total petroleum hydrocarbons
TPWD	Texas Parks and Wildlife Department
TRRC	Texas Railroad Commission
TSS	total suspended solids
TXDOT	Texas Department of Transportation
TXLUST	Texas Leaking Underground Storage Tank
TXUST	Texas Underground Storage Tank
TXVCP	Texas Voluntary Cleanup Program
US	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
UT	University of Texas at Austin

1.0 INTRODUCTION

1.1 Project Authority

On September 13, 2008, President George W. Bush declared a major disaster as a result of damage due to Hurricane Ike (FEMA-1791-DR-TX). As a direct result of Hurricane Ike's heavy rainfall inundating many areas along Greens Bayou in Harris County, Texas, severe flooding caused damages to several structures located near Greens Bayou. The Harris County Flood Control District (HCFCD) has prepared and submitted an application for Federal Emergency Management Agency (FEMA) funding under the Hazard Mitigation Grant Program (HMGP). Under this application, FEMA is considering funding the construction of improvements to one stormwater detention basin and funding the construction of a new basin to reduce the likelihood of future flooding in this area. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, which is a funding source for cost-effective measures that would reduce or eliminate the threat of future similar damage to a facility during a disaster.

This Environmental Assessment (EA) has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, the President's Council on Environmental Quality regulations to implement NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508), and FEMA's regulations implementing NEPA (44 CFR Part 10). FEMA is required to consider potential environmental impacts before funding or approving actions and projects. The purpose of this EA is to analyze the potential environmental impacts associated with the proposed project. FEMA will use the findings in this EA to determine whether to prepare an Environmental Impact Statement (EIS) or issue a Finding of No Significant Impact (FONSI).

1.2 Project Location

The project area consists of the tracts of land of the two proposed stormwater detention basin locations, both located on the north side of Houston, Harris County, Texas, within the Greens Bayou watershed. The proposed P545-01-00-E005 (Kuykendahl) Stormwater Detention Basin is located north of W. Rankin Road and west of Kuykendahl Road, adjacent to the North Fork of Greens Bayou (HCFCD unit P145-00-00). The proposed P500-08-00-E001 (Glen Forest) Stormwater Detention Basin is located east of Interstate Highway (IH) 45 between Rankin Road and Greens Road, adjacent to Greens Bayou and can be found on the U.S. Geological Survey (USGS) Aldine, Texas (1995) 7.5-minute series quadrangle topographic Map. See Exhibit A, Figure 1 for a project location map and Exhibit B for site photographs. Topographic maps and 2012 aerial photography maps of the project area may be found in Exhibit A, Figures 2 and 3, respectively.

1.3 Project Site History

The proposed P545-01-00-E005 stormwater detention basin project site is a partially developed 300-acre tract of land currently owned by HCFCD. The majority of the site was previously used for agriculture purposes and has been partially excavated for stormwater detention purposes. Schiveley Field, home to the Houston Sport Flyers model airplane club, is located in the northeast corner of the property. The northwest corner of the site contains a hydrocarbon well pad site. Currently, a portion of the site has been excavated for detention. The remaining areas are undeveloped and dominated by woody vegetation. 2012 aerial photography maps of the project area may be found in Exhibit A, Figure 3.

The P500-08-00-E001 project site is an undeveloped 160-acre tract currently owned by HCFCD. Previous land uses of the P500-08-00-E001 project site include undeveloped, agriculture and ranching, oil and gas production and residential properties within the Glen Forest subdivision. The homes within the

Glen Forest subdivision were bought out in the early 2000's as part of a HCFCD Voluntary Home Buy-Out program. The homes have been demolished and removed; however, remnants of the associated roadways remain. Current uses include drainage improvements, undeveloped and wooded areas. Exhibit B includes site photographs that document the existing condition of the project area.

2.0 PURPOSE AND NEED

The HMGP provides grants to state and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property damage due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The Disaster Mitigation Act of 2000 requires a FEMA-approved local mitigation plan in order to apply for HMGP project funding. HCFCD has completed a FEMA-approved mitigation plan that consisted of an action item to include the pursuit of cost-effective mitigation projects. For flood mitigation projects, HCFCD focused on areas that are known to be in floodprone and repetitive loss areas. Data from Hurricane Ike and prior flooding events was used to calibrate models and evaluate cost-effective solutions to flooding.

The area of focus for the proposed project is a reach of Greens Bayou, approximately two miles along W. Greens Road from Ella Boulevard to Imperial Valley Drive, which experiences significant flood damages. The purpose of the proposed project is to lower flood water surface elevations and reduce structure flooding in this area. HCFCD has obtained two large tracts of land that are in the upstream limits of the project reach. Due to the size and optimal location of these tracts, the proposed stormwater detention basins are able to efficiently reduce the most severe and frequent flooding events in the project reach. The stormwater detention basins will allow for a total excavation of approximately 3,219 acre-feet of storage volume.

The proposed project is needed because there are currently over 1,130 homes, apartment complexes, and commercial buildings located in this reach of Greens Bayou that are subject to frequent flooding. These homes and businesses experience frequent and severe flooding during storm events, resulting in damage to residential and commercial structures. Studies conducted by the HCFCD indicate that the complete construction of two stormwater detention basins along Greens Bayou would significantly reduce the risk of flooding and would prevent future flood losses and damages to property in the focus area. The proposed project would provide flood water detention that would serve to detain stormwater volumes during excessive rainfall events. This project would benefit the residents and business of Harris County near and along Greens Bayou by reducing peak volumes during excessive rainfall events.

3.0 ALTERNATIVES

3.1 No-Action Alternative

The No-Action Alternative would entail no improvements to stormwater detention in the project area. The citizens of Harris County living adjacent to or in proximity of Greens Bayou and its associated tributaries would continue to experience the same potential for flood inundation that could result in property damage to surrounding homes and businesses and lead to unnecessary costs to the local community. This alternative does not achieve the stated project purpose of reducing flood volumes.

3.2 Proposed Action – Construction of Stormwater Detention Basins

Studies conducted by HCFCD indicate that expanding and improving the P545-01-00-E005 stormwater detention basin and constructing the proposed P500-08-00-E001 stormwater detention basin, would significantly lower surface flood water elevations and reduce structural flooding in the project area.

HCFCD proposes to create approximately 2,325 acre-feet of storage at the P545-01-00-E005 within 300 acres of property. The combined volume of flood water storage and the drop structures would reduce peak flows along the project reach. Excavated soil will be utilized on-site for fill material (e.g., maintenance berm structures, fill of existing channel) and the balance will be hauled off-site and placed in an area determined to not contain sensitive environmental resources or habitat. Historically, HCFCD, through the use of private contractors, has been successful in placing excavated soil at sites such as permitted landfills, sandpits, and urban development projects, such as road construction, residential subdivisions, and business parks. This practice reduces the total project cost and the amount of acreage required, which reduces the amount of potential impacts to habitat in and around Harris County. Contractors are required to submit all proposed disposal sites to HCFCD is advance for review. HCFCD completes a desktop review of the proposed site for potential wetlands, archeological resources, historic resources, threatened or endangered species, or impacts from hazardous materials using readily available data. During the review, if it is discovered that there is an impact to sensitive environmental resources or habitat, the disposal site would be rejected for project use.

Vegetation located within the footprints of the basin excavation will be removed during construction activities. The project area will be planted with grasses immediately following construction to provide stabilization and prevent erosion. Prior to completion of construction activities, HCFCD will develop a detailed planting plan that will include a variety of native tree, shrub, and wetland plantings.

Detailed descriptions of the proposed expansion and improvements to the P545-01-00-E005 (Kuykendahl) stormwater detention basin project are provided below:

- Stormwater Detention Basins – Construction of four detention basin cells within the complex, connected by pipe and/or culvert. Stormwater water quality treatment wetlands and wetlands to mitigate for proposed impacts to non-USACE jurisdictional wetlands will be constructed in the bottom of three of the detention basin cells to provide habitat and aid in the treat of stormwater runoff from an adjacent neighborhood.

- P145-00-00 – Approximately 1,400 linear feet (LF) of channel improvements, 1,530 LF of channel maintenance, and creation of a 75-foot-wide bench and weir adjacent to the channel. Channel improvements include replacement of an existing drop structure, 560 LF of concrete slope paving to armor stream banks, and 840 LF of 18-inch buried riprap along the channel. Channel maintenance includes cut and fill, where applicable, to create stable bank slopes and repair erosion. The bench and weir will be constructed with 18-inch buried riprap and replanted with grasses. This will carry bank overflow events into a detention basin cell.

- P245-00-00 – Realignment of approximately 475 LF at the southern end of the channel. The design was created to incorporate stream enhancements throughout the length of the channel to improve channel conditions. Stream enhancement activities would: (1) improve channel conditions by stabilizing eroding stream banks with plantings, creating access to the floodplain and placement of in-stream structures such as J-hooks and cross vanes; (2) establish grade control and stable channel dimensions by increasing channel roughness, dissipating energy and laying back the banks; (3) improve water quality and riparian corridor habitat with a 200-foot forested buffer re-establishment on each bank; and (4) enhance in-stream habitat with pools, overhanging vegetation, and coarse substrates. Once complete, P245-00-00 will include 3,691 LF of stream containing these enhancement features.

- P145-03-00 – Channel improvements to southern 240 LF of channel, at confluence with P145-00-00. Channel improvements include replacement of existing drop structure. Extension of 18-inch buried riprap and concrete slope paving associated with the drop structure which will be in the same footprint as existing riprap and concrete. Remainder of channel was completely avoided during project design to minimize impacts.

- Old P245-00-00 – Permanent impacts to this channel were avoided. Temporary construction impacts will occur from installation of culvert under channel to connect two detention basin cells. Channel will be restored to pre-existing conditions once construction is complete.

HCFCD proposes to create approximately 894 acre-feet of storage at the P500-08-00-E001 stormwater detention basin within 160 acres of property. This detention volume will be adjacent to Greens Bayou (HCFCD P100-00-00). These proposed improvements will benefit the entire drainage area and are anticipated to reduce home flooding in the project reach by adding drainage improvements with no downstream impacts.

Detailed descriptions of the proposed new P500-08-00-E001 (Glen Forest) stormwater detention basin project are provided below:

- Stormwater Detention Basins – Construction of three detention basin cells within the complex, one of which will contain a stormwater quality treatment wetland complex to treat stormwater run-off from an adjacent property.

- P159-00-00 – Installation of two 8-foot by 5-foot concrete culverts under the channel in two locations to connect the three detention basin cells. The channel will be restored to pre-existing conditions once construction is complete.

- P100-00-00 – Proposed activities include the installation of three 30-inch corrugated metal pipes to carry bank overflow events from the detention basin cells into P100-00-00. Permanent impacts include placing stone riprap below the plane of the OHWM of the P100-00-00 at its intersection with the outfall pipes to provide bank stabilization and prevent erosion below the pipes. The remainder of the channel was completely avoided during project design to minimize impacts.

When built in combination, the two proposed stormwater detention basins will greatly reduce flooding and damages along the project reach. HCFCD is seeking funding assistance from FEMA for the most economical and efficient alternative to achieve a significant level of reduced flood damages for the Greens Bayou area of focus.

3.3 Alternatives Considered and Dismissed

HCFCD currently owns the land for both stormwater detention basins. To avoid additional land acquisition costs, alternate locations were not evaluated. Alternatives were evaluated for both detention basins to avoid and minimize impacts to historical riparian forest, wetlands, and streams. A summary of impacts associated with the proposed action is provided in Table 1. All alternatives are located within the same property boundaries; however, the design configurations of the basins vary. An environmental constraints analysis was performed to determine the environmental impacts associated with each alternative. The historical riparian forest was determined by mapping the riparian forest identified on aerial photographs from 1930. A major objective in evaluating the alternatives was to provide a maximum level of stormwater storage volume to help reduce rising water elevations while minimizing the

environmental impacts. Maps of alternatives for each basin are provided in Exhibit C. Results of the constraints analysis are provided in Tables 2 and 3.

Table 1: Impacts Associated with Proposed Project

Stormwater Detention Bain	Basin Size (acres)	Jurisdictional Wetlands (acres)	Non-Jurisdictional Wetlands (acres)	Waters (acres)	Historical Riparian Forest (acres)
P545-01-00-E005	300	2.55	14.04	1.45	5.24
P500-08-00-E001	160	8.96	0.00	0.02	45.92

1 Acreage based on Global Information System (GIS) shapefiles. The basin size estimated from the top of bank.

Table 2: Summary of Impacts by Alternative for the P545-01-00-E005 Stormwater Detention Basin Project

	Storage Detention Volume (acre-feet)[1]	Jurisdictional Wetlands (acres)	Non-Jurisdictional Wetlands (acres)	Waters (feet)	Historical Riparian Forest (acres)
Project Area Total	N/A	2.55	15.02	14,330	5.24
Alternative 1	2,015	0.14	14.43	8,125	1.88
Alternative 2	2,150	0.13	14.25	7,425	1.44
Alternative 3	2,046	2.53	14.58	7,939	5.07
Alternative 4 (Proposed Action)	2,325	2.55	14.04	2,115	5.24

1 Acre-feet provided from the Kuykendahl Stormwater Detention Basin PDR Report (LAN).

As noted in Table 2, some alternatives did have lower wetland impacts compared to the Proposed Action Alternative. However, the Proposed Action Alternative reduced impacts to waters of the United States (U.S.). Waters of the U.S. were considered valuable resources as they maintain the hydrologic flow throughout the project area. Four channels totaling 2,115 LF of jurisdictional waters and 2.55 acres of wetlands are located within the Proposed Action Alternative. After the U.S. Army Corps of Engineers (USACE) Galveston District Stream Condition Assessment Standard Operating Procedure was issued in July 2011, the project was redesigned to avoid streams and minimize stream impacts by incorporating stream enhancement features to improve stream conditions. Although Alternatives 1 through 3 have lower wetland and riparian forest impacts compared to the Proposed Alternative, the capacity sizes of Alternatives 1 through 3 are smaller than that of the Proposed Alternative and would not provide the targeted level of stormwater storage volume. Additionally, the Alternative 3 design included the elimination of 4,125 LF of P245-00-00 stream channel and the lowering and hardening of 3,814 LF along P245-00-00.

The Proposed Action Alternative design was proposed based on its ability to best fulfill the need for and purpose of the project while avoiding and minimizing the potential for environmental impacts. None of the Build Alternative design options achieved the project goals and satisfied the need of the project

without impacting surface waters in the state. The No-Build Alternative is the only alternative considered that does not impact waters; however, this alternative fails to meet the purpose and need of the project.

Table 3: Summary of Impacts by Alternative for the P500-08-00-E001 Stormwater Detention Project

	Storage Detention Volume (acre-feet)[1]	Wetlands[2] (acres)	Waters (feet)	Historical Riparian Forest (acres)
Project Area Total	N/A	11.98	4,947	71.54
Alternative 1	1,312	2.75	2,745	35.86
Alternative 2	1,357	4.61	2,432	33.68
Alternative 3	1,341	2.26	2,680	33.68
Alternative 4	1,341	2.25	2,680	42.16
Alternative 5 (Proposed Action)	894	8.96	53	45.92

1 Acre-feet provided from the Glen Forest Stormwater Detention Basin Alternative Analysis Report (Montgomery and Barnes, Inc.).
2 All wetlands identified within the P500-08-00-E001 project area are jurisdictional wetlands.

As noted in Table 3, for the P500-08-00-E001 stormwater detention basin, some alternatives did have lower wetland impacts compared to the Proposed Action Alternative, but were not carried forward due to higher amounts of impacts to waters of the U.S. compared to the Proposed Action Alternative. After the USACE Galveston District Stream Condition Assessment Standard Operating Procedure was issued in July 2011, the project was redesigned to avoid and minimize stream impacts. While the Proposed Action Alternative includes more linear feet of waters of the U.S. within the option boundary compared to the other alternatives, impacts to these waters were minimized to the greatest extent possible, and stream enhancement features were added to the design to improve stream conditions. The Proposed Action Alternative avoids approximately 1.34 acres of waters of the U.S. and 3.0 acres of wetlands. The avoided wetlands are predominantly located adjacent to the P159-00-00 channel (a historic meander of Greens Bayou). By avoiding these wetlands they will continue to act as a buffer for the channel and will continue to receive hydrology from the channel. Alternatives 1 through 4 all required the excavation of large portions of the P159-00-00 channel and its adjacent wetlands, which would have greatly disturbed the overall function of this system impacting the overall water quality and habitat surrounding the channel. The Proposed Action Alternative is the only alternative that avoids impacting this entire system.

The Proposed Action Alternative impacts a larger portion of the estimated historical riparian forest that was located along the P159-00-00 channel and Greens Bayou. Portions of this historical riparian forest were cleared starting in the 1970s for the Glen Forest Estates subdivision, which was bought out by the HCFCD in the early 2000s due to repetitive flooding. The Proposed Action Alternative is the only alternative that preserves the current riparian buffer along the continuous length of the P159-00-00 channel. Leaving the continuous riparian buffer along the P159-00-00 channel maintains the currently-established habitat that would be lost if one of the other alternatives were implemented.

4.0 AFFECTED ENVIRONMENT AND POTENTIAL IMPACTS

4.1 Physical Resources

4.1.1 Geology and Soils

The geology of the area and general soils within the Greens Bayou watershed are of the Quaternary Age and are of the Houston Group. The Houston Group is divided into two formations. The Lissie Formation is located at the base of the Houston Group, while the Beaumont Formation is located at the top. These formations both outcrop in Harris County.

The Geological Atlas of Texas-Houston Sheet indicated that the project area is located within the Lissie Formation. This formation consists of varying proportions of clays, silts, sands, and some minor amount of gravel. Concretions of calcium carbonate, iron oxide, and iron-manganese oxides are common in the weathered zone. The surface topography of the region tends to be very flat and featureless with pimple mounds and shallow rounded depressions (University of Texas Bureau of Economic Geology [BEG], 1992).

A review of the Geological Atlas of Texas-Houston Sheet indicated that there is a fault line located on or in proximity of the project area (BEG, 1992). Much seismic activity (earthquakes and subsidence) within the Coastal Plains has been attributed to well injections associated with oil and gas field operations and groundwater pumping (BEG, 1992). Since the proposed project would not result in any structures, such as buildings or dams that could be susceptible to damage from seismic activity, the Executive Order (EO) (12699) on consideration of the effects of seismic activity does not apply.

Based on the Natural Resources Conservation Service (NRCS) Soil Survey for Harris Counties, Texas (NRCS, 1976) , the project area contains four distinct soil units of Addicks loam, Clodine loam, Clodine-Urban land complex, and Gessner loam. Descriptions of the mapped soil types are provided below; the parenthetical abbreviation corresponds to the soil unit symbols provided on the aerial-based project maps in Exhibit A, Figure 4.

Addicks loam (Ad) is characterized as being nearly level and is slightly higher landscape. This soil type is poorly drained and is saturated with water for short periods during the year. Surface runoff is slow, internal drainage is slow, and permeability is moderate. This soil is used primarily for rice, improved pasture, and native pasture. A few small areas are used for corn, grain sorghum, and vegetables (NRCS, 1976).

Clodine loam (Cd) is characterized as being nearly level and is generally found on low landscapes. It is generally poorly drained and remains saturated for three to six months out of the year, generally during the winter and spring months. This soil type has moderate permeability, very slow surface runoff, high water capacity, and slow internal drainage. This soil is primarily used as cattle pastures and for rice production (NRCS, 1976).

Clodine – Urban land complex (Ce) is characterized as being nearly level complex. This soil type has been altered or covered by building and other urban structures making classification impractical. Typical structures are single- and multiple-unit dwellings, driveways, sidewalks, garages, patios, streets, schools, churches, parking lots, office buildings, and shopping centers. The main limitation is poor drainage (NRCS, 1976).

Gessner loam (Ge) is characterized as being nearly level and containing small depressions throughout. It is poorly drained and remains saturated during wet periods throughout the year. This soil type has moderate permeability, high water capacity, and slow internal drainage. Surface runoff for this soil is

very slow and tends to pond water in areas. This soil is primarily used as native/improved cattle pastures and for rice production (NRCS, 1976).

The Farmland Protection Policy Act (FPPA), Subtitle I of Title XV of the Agricultural and Food Act of 1981 (Pub. L. 97-98), is in place 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. Clodine loam and Gessner loam are designated as Prime Farmland Soils by the NRCS (NRCS, 2013) and are considered potentially subject to the FPPA; therefore, a Farmland Conservation Impact Rating (Form AD-1006) was completed and forwarded to the NRCS in March 2010 to determine whether prime, unique, or otherwise important farmland would be impacted by the Build Alternative. A response was received by NRCS March 23, 2010, stating that the soils found in the project area are exempt from FPPA because the land is considered within an urban use area. A copy of this correspondence is included in Appendix A.

No-Action Alternative

The No-Action Alternative would have no impacts to soils, geology, or prime or unique farmland of the project area.

Proposed Action Alternative

The proposed project would cause disturbance to soils as part of the site preparation work. Soils would be excavated to construct the detention basin. Exposed soils could be subject to erosion. Silt fence and/or other sedimentation runoff and erosion best management practices (BMP) would be utilized during construction. Site-specific BMPs will be identified during development of the Stormwater Pollution Prevention Plan (SW3P). Effects to soils would be minor and temporary in nature. The proposed project is not anticipated to have any effects to the geology of the project area.

4.1.2 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 "moderate" non-attainment. The U.S. Environmental Protection Agency (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 NEPA process.

In addition to the criteria air pollutants for which there are NAAQS, the EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries). Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the CAA. The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

No-Action Alternative

The No-Action Alternative would have no impacts to air quality.

Proposed Action Alternative

No long-term changes in air quality are anticipated to be associated with the construction of the proposed project. Development trends or local traffic are not expected to change or increase due to the proposed project. No long-term air permitting issues have been identified as part of this project. Construction activities may temporarily degrade air quality through dust and exhaust gases associated with construction equipment and related vehicles. However, dust control techniques, such as covering or treating disturbed areas with dust suppression techniques, sprinkling, and other dust abatement controls, would be considered and incorporated into the BMP's construction specifications. The MSAT emissions will be minimized by measures to encourage use of EPA-required cleaner diesel fuels, limits on idling, increasing use of cleaner-burning diesel engines, and other emission limitation techniques, as appropriate. Construction equipment with EPA designated Tier 2 and Tier 3 engines would be utilized to minimize emissions. Construction activity is anticipated to have short-term impacts and will not have an overall impact on local air quality.

4.1.3 Climate Change

The climate in Harris County, Texas, can be classified as humid subtropical and characterized by hot, humid summers and cool winters. Harris County has an average annual temperature of 68.8°F and an average rainfall amount of 47.84 inches annually. Monthly average temperatures range from 51.8°F in January to 83.6°F in July. The highest temperature recorded was 109°F in September of 2000 and August 2011 and the lowest temperature recorded was 7°F in December of 1989. Monthly average rainfall amounts range from 2.98 inches in February to 5.35 inches in June. The highest monthly average rainfall recorded was 16.28 inches in June of 1989, and the lowest monthly average rainfall recorded was 0.04 inch in May of 1998. Snowfall is rare in Harris County with an average of 0.5 inch per year (National Oceanic and Atmospheric Administration) (NOAA, 2010).

Prevailing winds are from the southeast and south, except in January when frequent high pressure areas bring invasions of polar air and prevailing northerly winds. Temperatures are moderated by the influence of winds from the Gulf of Mexico, which results in mild winters and relatively cool summer nights. Another effect of the nearness of the Gulf of Mexico is abundant rainfall, except for rare extended dry periods. Monthly rainfall is evenly distributed throughout the year. Thundershowers are the main source of rainfall and precipitation may vary substantially in different sections of Harris County on a day-to-day basis. The project area is prone to flooding impacts from large tropical storms and hurricanes during late summer and early fall. Major named storms that have impacted the project area in the past few decades include Tropical Storm Claudette (July 1979), Tropical Storm Allison (June 2001), Hurricane Rita (September 2005), and Hurricane Ike (September 2008).

Most climate change scenarios project that greenhouse gas concentrations will increase through 2100 with a continued increase in average global temperatures. Many greenhouse gases, like water vapor and carbon dioxide (CO2), occur naturally. Fuel burning and other human activities are adding large amounts of CO2 and other gases to the natural mix at a faster rate than at any other time on record. Other important greenhouse gases produced by human activity include methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulfur hexafluoride (SF6). Due to uncertainties about future emissions and concentrations of greenhouse gases, their net warming effect in the atmosphere, and the response of the climate system, estimates of future temperature change are uncertain. Advancements in model simulations, combined with more data on observed changes in climate have led

to increased confidence in projections of future temperature changes. Recent climate change projections predict the average surface temperature of the earth is likely to increase by 2°F to 11.5°F by the end of the 21st century relative to 1980-1990, with a best estimate of between 3.2°F to 7.2°F. Although warming will not be evenly distributed around the globe, most of North America is likely to warm more than the global average (Intergovernmental Panel on Climate Change [IPCC], 2007).

According to the IPCC, an increase in the average global temperature is very likely to lead to changes in precipitation and atmospheric moisture because of changes in atmospheric circulation and increases in evaporation and water vapor. Tropical storms and hurricanes are likely to become more intense, produce stronger peak winds, and produce increased rainfall over some areas due to warming sea surface temperatures, which act to energize tropical storms.

No-Action Alternative

The No-Action Alternative would have no impacts on climate change.

Proposed Action Alternative

As described in Section 4.1.2, during the construction phase of this project there may be temporary increases in air pollutant emissions from construction activities, equipment, and related vehicles. Considering the temporary and transient nature of construction-related emissions, it is not anticipated that emissions from construction of this project will have any substantial effects on air quality in the area. Due to the small scale of the project, the proposed action would not measurably exacerbate climate change.

4.2 Water Resources

4.2.1 Water Quality

Within the project area, this segment of Greens Bayou has been established as stream segment 1016 by the Texas Commission on Environmental Quality (TCEQ). Segment 1016 is listed on the 2012 Texas Integrated Report of Surface Water Quality 303(d) list as an impaired water body. Segment 1016 data identifies no concern for Aquatic Life Use. General Use noted concerns for nutrient screening levels and Recreation Use is not supported due to bacteria levels (TCEQ, 2012).

Stream flow in Greens Bayou is supported year-round by the T. H. Wharton power plant discharges at the headwaters. There are 120 domestic and 23 industrial wastewater treatment plant outfall locations along this segment that contribute to large quantities of oxygen-demanding materials and nutriments that cause a depression of dissolved oxygen concentrations in the bayou (Houston-Galveston Area Council [H-GAC], 2010).

No-Action Alternative

Construction of the stormwater detention basins would not occur as part of the No-Action Alternative and storm events would continue to flood the urban areas adjacent to the project area. Water quality would continue to be affected through non-point source pollution generated from the surrounding watershed.

Proposed Action Alternative

The proposed detention basins were designed to have water quality treatment wetlands. These features would contribute long-term beneficial impacts to water quality within the project area more so than the existing conditions currently provide. These water quality treatment wetlands would aid in removing bacteria, total suspended solids (TSS), and other pollutants from the aquatic system, resulting in cleaner and clearer water within the watershed. Further, since the basins receive regular stormwater flows from

off-site drainage areas, the stormwater quality treatment wetlands would provide treatment and removal of pollutants before reaching Greens Bayou.

Since the proposed action does not involve the need for subsurface water, no effect on groundwater or the water table is anticipated. According to the Texas Water Development Board (2013), the central portion of the Gulf Coast Aquifer, which underlies the proposed project area, is considered deep. There are no known lenses in the proposed project area, and no seeps were found during the wetland surveys. Of several wells in the area of the proposed project, the minimum depth to water level measured in 1982/1983 was 221 feet (TWDB, 1988).

No adverse long-term water quality impacts are expected as a result of the proposed project. The stormwater quality wetlands being constructed as part of the proposed action will result in long-term beneficial impacts to water quality. The proposed project is not expected to contaminate or otherwise adversely affect the public water supply, water treatment facilities, or water distribution systems. The proposed action may result in minor, short-term adverse effects to water quality during the construction phase, but BMPs would be implemented throughout the duration of this phase to minimize effects to water quality. The project would disturb more than 5 acres and a notice of intent (NOI) submitted to TCEQ for Texas Pollutant Discharge Elimination System (TPDES) Construction General Permit coverage would be required. This permit would require posting a site notice and that a copy of the SW3P be kept on the construction site and that all sediment control measures identified in this plan are maintained.

HCFCD is co-permitted with the City of Houston, Harris County, and Texas Department of Transportation (TxDOT) on a Phase 1 Texas Pollution Discharge Elimination System (TPDES) Municipal Separate Storm Sewer System (MS4) Permit (TPDES Permit No. WQ0004685000). This permit obligates HCFCD to operate their MS4 in manner to minimize polluted discharges to Waters of the U.S. Impacts on receiving water quality are assessed for all proposed flood control projects. The MS4 permit requires that "where feasible, new flood control structures must be designed and constructed to provide pollutant removal from stormwater to the maximum extent practicable." The Proposed Action Alternatives with water quality treatment wetlands would comply with these MS4 permit requirements.

HCFCD will utilize the Joint Task Force (JTF) Stormwater Management Handbook for Construction Activities (2006 Edition) and the Design Guidelines for HCFCD Wet Bottom Detention Basins with Water Quality Features (HCFCD, 2013). From these guidelines, BMPs and an SW3P will be developed to reduce turbidity and TSS during construction. Erosion and sedimentation BMPs will be installed, monitored, and maintained during construction to minimize any detrimental effects to water quality during construction. HCFCD will obtain TPDES Construction General permit coverage from TCEQ before the start of construction and will comply with all permit conditions.

4.2.2 Waters of the U.S., Including Wetlands

The USACE regulates the discharge of dredged or fill material into waters of the U.S., including wetlands, pursuant to Section 404 of the Clean Water Act. Wetlands are identified as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. In addition, EO 11990, Protection of Wetlands, directs federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the values of wetlands on federal property.

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 35.97 acres of wetlands and waters were identified within the project area (Crouch, 2010a and 2010b). Please refer to Figure 4A and B for locations of the wetlands and waters. Impacts to wetlands and waters would be avoided to the maximum extent practical.

P545-01-00-E005. Based on the results of the delineation, a total of 22.64 acres of wetlands and waters were identified within the proposed basin (Crouch, 2010a). Five palustrine forested (PFO) wetlands totaling an estimated 2.94 acres were identified (Crouch, 2010a). The dominant vegetation within these wetland areas is Chinese tallow (*Sapium sebiferum*). Six palustrine emergent (PEM) wetlands totaling an estimated 14.63 acres are located in the eastern portion of the basin. These are located within a man-made, routine-maintenance detention basin. A total of 5.07 acres (14,330 linear feet) of waters of the U.S. are located within the basin (Crouch, 2010a). Please refer to Figure 4A for the locations of the wetlands and waters. These wetlands and waters were verified by the USACE on December 22, 2010. Four PFO wetlands (2.55 acres) and five waters (5.07 acres), totaling 7.62 acres, were determined to be subject to USACE jurisdiction. Please refer to Appendix A for a copy of the verification letter.

P500-08-00-E001. Based on the results of the delineation, a total of 13.33 acres of wetlands and waters were identified within the proposed basin (Crouch, 2010b). Twelve PFO wetlands totaling an estimated 10.14 acres were identified. The dominant vegetation within these wetland areas is Chinese tallow, water oak (*Quercus nigra*), American elm (*Ulmus americana*), and green ash (*Fraxinus pennsylvanica*). Six PEM wetlands totaling an estimated 1.84 acres were identified. There is one intermittent stream (P159-00-00) totaling 1.35 acres (4,947 linear feet) of waters of the U.S. in the project area. This stream (a historic meander of Greens Bayou) is relatively permanent water located within the central portion of the project area and drains south to Greens Bayou, traditionally navigable water (Crouch, 2010b). All the above mentioned wetlands and waters were verified by the USACE on February 2, 2010, and all were determined to be subject to USACE jurisdiction. Please refer to Figure 4B for the locations of the wetlands and waters.

No-Action Alternative

The No-Action Alternative would have no impacts on wetlands in the project area.

Proposed Action Alternative

Of the 35.97 acres of wetlands and waters identified within the project area, the proposed project would impact approximately 25.55 acres of wetlands and 2,168 linear feet of waters. This includes impacts to USACE jurisdictional and non-jurisdictional wetlands and waters. The P545-01-00-E005 stormwater detention basin would impact a total of 16.59 acres of wetlands, including 2.55 acres of USACE-jurisdictional wetlands, and 2,115 linear feet of waters, and the P500-08-00-E001 detention basin would impact a total of 8.96 acres of jurisdictional wetlands (all wetlands located within P500-08-00E001 are USACE-jurisdictional wetlands) and 53 linear feet of waters. There are no navigable waters in the area; therefore, Section 10 of the Rivers and Harbors Act of 1899 does not apply. The P545-01-00-E005 detention basin avoids approximately 12,215 linear feet of waters of the U.S. and 0.98 acre of wetland, and the P500-08-00-E001 detention basin avoids approximately 1.34 acres of waters of the U.S. and 3.0 acres of wetlands. The avoided wetlands are predominantly located adjacent to the P159-00-00 channel (a historic meander of Greens Bayou).

An Individual Permit (IP) application was prepared and submitted to the USACE Galveston District on February 20, 2013, for P545-01-00-E005, and on April 1, 2013, for P500-08-00-E001. A permit to impact USACE-jurisdictional wetlands and construct the Kuykendahl Stormwater Detention Basin was issued to HCFCD on September 20, 2013 (SWG-2013-00172), by the USACE Galveston District. A

permit to impact USACE-jurisdictional wetlands and construct the Glen Forest Stormwater Detention Basin was issued to HCFCD on December 3, 2013 (SWG-2009-00691) by the USACE Galveston District. Copies of the USACE IP Authorizations are included in Appendix A.

Through the alternative analysis, the proposed project has avoided and minimized impacts to wetlands and waters to the greatest extent practicable. There is no practicable alternative to completely avoid impacts to wetlands and still meet the purpose and need of the proposed project. Mitigation to replace functions of impacted USACE jurisdictional wetlands is proposed to occur at the Greens Bayou Wetland Mitigation Bank. The P545-01-00-E005 stormwater detention basin will include three wet bottom detention basin cells that contain stormwater quality treatment wetlands and over wetlands to mitigate for unavoidable impacts of non-USACE jurisdictional wetlands. The P500-08-00-E001 stormwater detention basin will include a stormwater quality treatment wetland area within one of the detention basin cells.

These basins were designed and constructed to provide pollutant removal from stormwater to the maximum extent practicable, contribute long-term beneficial impacts to water quality within the project, and would aid in removing TSS from the aquatic system, resulting in cleaner and clearer water within the watershed. Further, the proposed detention basins would include a substantial amount of permanent water quality treatment wetlands since the basins receive regular stormwater flows from off-site drainage areas. The wet-bottom features would contribute beneficial impacts to water quality and provide suitable habitat for many species of wildlife, including birds, amphibians, fish, reptiles, and small mammals. The proposed project will include the creation of wetland areas within the basins that would mitigate for non-jurisdictional impacted wetlands.

After the USACE Galveston District *Interim SWG Stream Condition Assessment Standard Operating Procedure* (SOP) (USACE, 2011) was issued in July 2011, the P545-01-00-E005 stormwater detention basin was redesigned to avoid and minimize stream impacts. According to the SOP, the Reach Condition Index (RCI) is calculated for each stream segment, or reach, proposed for impact and/or improvement. Based on the *Streams Condition Assessment Report of Existing and Post-Project Conditions Report for the HCFCD P545-01-00-E005 (Atkins, 2013)*, after completion of the proposed project, the overall RCI for on-site streams is expected to be higher than existing conditions RCI. This is due to the stream enhancement features associated with the proposed project, as described in Section 3.2.

4.2.3 Floodplains

EO 11988 mandates that all federal agencies shall provide leadership and 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 in carrying out their responsibilities for (1) acquiring, managing, and disposing of federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

Before taking an action, each agency will determine whether the proposed action will occur in a floodplain. For major federal actions significantly affecting the quality of the human environment, the evaluation would be included in any statement prepared under Section 102(2)(C) of the NEPA. The agency will make a determination of the location of the floodplain based on the best available information.

To comply with EO 11988, FEMA is required to follow the procedure outlined in 44 CFR Part 9.11 to ensure that alternatives to the proposed action have been considered. This process, also known as the 8-step planning process, has been applied to the proposed action and is included below.

Step 1 of the 8-step planning process is to determine whether the project is located in the floodplain. The FEMA effective floodplain boundaries were used to determine the existing 100-year floodplain within the P545-01-00-E005 and P500-08-00-E001 stormwater detention basins. Approximately 84 acres, or 28 percent, of P545-01-00-E005 is located within the 100-year floodplain (FEMA Map Item ID: 48201C0455L. 6/18/2007) and approximately 160 acres, or 100 percent, of P500-08-00-E001 (FEMA Map Item ID: 48201C0460M, 10/16/2013) is located within the 100-year floodplain with portions located within the regulatory floodway.

Step 2 is to notify and involve the public in the decision-making process, which will be incorporated into the notice of availability for this EA that will be published in the Houston Chronicle and on-line at http://www.fema.gov/media-library/assets/documents.

Step 3 is to identify and evaluate practicable alternatives to locating the proposed project in the floodplain, including alternative sites and actions outside of the floodplain. Various size alternatives for the detention basin were considered; however, these alternatives would have also been located within the 100-year floodplain. Elevation of structures and roadways to mitigate flood impacts would also have been located in the 100-year floodplain. No alternative action or project site location exists outside of the 100-year floodplain that would meet the stated purpose and need of this project.

Step 4 is to identify impacts associated with occupancy and modification of the floodplain and support of floodplain development that could result from pursuing the proposed action alternative. Beneficial impacts would occur to the floodplain due to the reduction of flooding events in the Houston area. The previous flooding experienced within the project area is anticipated to be reduced as a result of the proposed project. Adverse impacts to structures, infrastructure, and public safety from flooding would be significantly reduced. The proposed detention basin would reduce the water surface elevations in the affected area by approximately 0.20 to 0.40 feet, with an average reduction of about 0.25 feet. The proposed project meets the "no rise" requirement of not resulting in any increase in flood levels within the community during the occurrence of the base flood discharge. The proposed project would add capacity to the 100-year floodplain. The proposed project is located within a developed area of Houston and it is not anticipated to encourage occupancy of the floodplain. The intent is to protect existing structures from flood risk.

Step 5 is to develop measures to minimize the impacts and restore and preserve the floodplain. Under the proposed action, impacts as a result of the project are beneficial and the proposed action will minimize the impact of floods on human health, safety, and welfare. HCFCD would coordinate with the local floodplain administrator and obtain required permits prior to initiating work. All coordination pertaining to these activities and applicant compliance with any conditions would be documented and copies forwarded to the state and FEMA for inclusion in the permanent project files.

Step 6 is to determine whether the proposed action is practicable and to reevaluate alternatives. FEMA has determined that there is no practicable alternative action or location outside of the floodplain that will address the purpose and need. Pursuing the no action alternative will result in structures and residents remaining at risk for flood hazards. Construction of the P545-01-00-E005 and P500-08-00-E001 stormwater detention basins would result in a reduction of flooding in the area. Pursuing the proposed action in the floodplain clearly outweighs the requirement of EO 11988.

Step 7 requires that the public be provided with an explanation of any final decision that the floodplain is the only practicable alternative. HCFCD must prepare and provide a Public Notice issued 15 days prior to the start of construction of any final decision where a proposed floodplain or wetland project is the only practicable alternative. Documentation of the final public notice is to be forwarded to FEMA for inclusion in the permanent project files.

Step 8 requires the review of the implementation and post-implementation phases of the proposed action to ensure that the requirements stated are fully implemented. The grant conditions require the review of implementation and post-implementation phases to ensure compliance with EO 11988 and floodplain development requirements.

The proposed project meets the requirements of 44 CFR 9.11 as it is functionally dependent, facilitates open space use, and is the only practicable alternative. The proposed project is one of several ongoing projects HCFCD has planned for the Greens Bayou watershed. A Letter of Map Revision (LOMR) would eventually be submitted reflecting the construction of these projects.

No-Action Alternative

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

Proposed Action Alternative

Beneficial impacts would occur to the floodplain due to the reduction of flooding events in the project reach. The flooding risk experienced near the project area is anticipated to be reduced as a result of the proposed project. Adverse impacts to structures, infrastructure, and public safety from flooding would be significantly reduced. There would be no adverse impacts on floodplain areas within the project area as a result of implementation of the proposed action. As required by EO 11988, floodplain impacts have been identified, minimized, and would be mitigated by construction of the detention basin. The detention basin would add 100-year floodplain capacity, thus compensating for impacts to the 100-year floodplain as a result of construction of the proposed project.

4.3 Coastal Resources

The Coastal Zone Management Act of 1972 establishes requirements for review of federally-funded projects in the Coastal Zone. The Texas Coastal Management Program (TCMP) is administered by Texas General Land Office (GLO). The Texas GLO designated coastal zone boundary runs through the southeast portion of Harris County (GLO, 2011). Both the P545-01-00-E005 and P500-08-00-E001 stormwater detention basins are located outside the TCMP boundary.

No-Action Alternative

Under the No-Action Alternative, there would be no impacts to resources in the coastal zone.

Proposed Action Alternative

The project area is located outside the coastal zone management area boundary and is therefore not subject to review. No impacts to resources in the coastal zone would occur.

4.4 Biological Resources

4.4.1 Vegetation

The project area is located in the Gulf Coast Prairies and Marshes natural region of Texas, which includes approximately 20,312 square miles (University of Texas at Austin [UT], 1978). Gulf coast prairies are nearly level with slow surface drainage and elevations ranging from sea level to approximately 250 feet

above mean sea level (MSL). In addition to wildlife habitat, the prairies are used for crops, livestock grazing, and urban and industrial centers. It is estimated that as much as 99 percent of the coastal prairies in Texas have been converted to agricultural land (McMahan, et. al, 1984).

According to The Vegetation Types of Texas, the project area is within the Crops (Number 44) vegetation type (McMahan, et.al., 1984). Commonly associated plants within this region are cultivated row or cover crops that provide food and fiber for man and livestock. Grasslands associated with crop rotation may be present as well. The vegetation type present within the study area does not exhibit the vegetation typically found in the Crops vegetation type and would be better described as the Urban vegetation type.

P545-01-00-E005. Four primary vegetation communities were identified within the proposed P545-01-00-E005 stormwater detention basin, which consist of upland pine-hardwood forest, upland pasture/grassland, forested wetland, and herbaceous wetland. For representative photos of the vegetation communities observed within the P545-01-00-E005 stormwater detention basin, please refer to Exhibit B.

Dominant species identified within the pine-hardwood forest community include Chinese tallow, Chinese privet (*Ligustrum sinense*), loblolly pine (*Pinus taeda*), sweetgum (*Liquidambar styraciflua*), yaupon (*Ilex vomitoria*), and southern dewberry (*Rubus trivialis*).

Dominant species identified within the upland pasture/grassland community include Vasey's grass (*Paspalum urvillei*), whiteroot rush (*Juncus brachycarpus*), swamp sunflower (*Helianthus angustifolius*), and eastern gammagrass (*Tripsacum dactyloides*).

Dominant species identified within the forested wetland communities include Chinese tallow, Chinese privet, water oak, willow oak (*Quercus phellos*), yaupon, peppervine (*Ampelopsis arborea*), and southern dewberry.

Dominant species identified within the herbaceous wetland communities include Chinese tallow, sand spikerush (*Eleocharis montevidensis*), green flatsedge (*Cyperus virens*), Cattail (*Typha latifolia*), and soft rush (*Juncus effusus*).

P500-08-00-E001. Three primary vegetation communities were identified within the proposed P500-08-00-E001 stormwater detention basin, which consist of upland pine-hardwood forest, forested wetland, and herbaceous wetland. For representative photos of the vegetation communities observed within the P500-08-00-E001 stormwater detention basin, please refer to Exhibit B.

Dominant species identified within the pine-hardwood forest community include Chinese tallow, Chinese privet, Japanese privet (*Ligustrum japonicum*), loblolly pine, sweetgum, yaupon, and southern dewberry.

Dominant species identified within the forested wetland communities include Chinese tallow, Chinese privet, water oak, willow oak, yaupon, peppervine, dwarf palmetto (*Sabal minor*), and southern dewberry.

Dominant species identified within the herbaceous wetland communities include poisonbean (*Sesbania drummondii*), sand spikerush, green flatsedge, and soft rush.

No-Action Alternative

Under the No-Action Alternative, there would be no impacts to vegetation on the project site.

Proposed Action Alternative

Under the Proposed Action Alternative, there would be impacts to vegetation on the project site. Vegetation located within the footprints of the basin excavation will be removed or cleared during construction activities.

Following construction activities, exposed side slopes would be manually vegetated using BMPs upon completion to minimize soil erosion impacts. In addition to the vegetation of side slopes, the P245-00-00 channel will be planted with a 200-foot riparian corridor habitat (native forested buffer re-establishment) on each bank, stream bank plantings will be planted at various locations along P245-00-00, live stakes will be planted over the pipe crossings under P159-00-00, and stormwater quality treatment wetland areas will be planted with native wetland species.

Prior to completion of construction activities, HCFCD will develop a detailed planting plan for each basin that will include a variety of native tree, shrub, and wetland plantings. Native trees and shrubs will be monitored for two years to ensure at least 80 percent survival. Wetland plantings will be monitored quarterly for the first year to ensure at least 80 percent survival is achieved. After the first year, the wetland areas will be monitored biannually.

The planting sites will be managed to control the proliferation of noxious species. During the plant establishment period, the planting sites will be managed to control predation from carp, nutria, beaver, feral hogs, and other predators as identified by HCFCD.

4.4.2 Threatened and Endangered Species and Critical Habitat

4.4.2.1 Federal Regulations

The Endangered Species Act of 1973 provides for the protection of all listed threatened and endangered species from take as defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." Under the provisions of the Endangered Species Act, all federal agencies are required to undertake programs for conservation of threatened and endangered species and are prohibited from authorizing, funding, or carrying out any action that would jeopardize a listed species or destroy or alter its critical habitat. As shown in Table 4, the U.S. Fish and Wildlife Service (USFWS) lists two federally listed threatened and endangered species that have the potential to occur within Harris County (TPWD, 2013a).

The vegetation communities located within the project area do not provide suitable habitat for any threatened and endangered species. In addition, field surveys in February 2010 did not identify the presence of any threatened and endangered species. Presence/absence surveys for the Texas prairie dawn-flower (*Hymenoxys texana*) were conducted by Dr. Larry E. Brown in April 2001 at the proposed P545-01-00-E005 stormwater detention basin. Neither Texas prairie dawn populations nor suitable habitat for Texas prairie dawn-flower were discovered during the field surveys. The USFWS concurred with these findings on May 25, 2004. A copy of the Texas prairie dawn-flower survey and USFWS correspondence is included in Appendix A.

Table 4: Federal Threatened and Endangered Species of Harris County, Texas

Species ***Scientific Name***	**Federal Status**	**Habitat**	**Habitat Present Within Project Area**
Texas prairie dawn-flower *Hymenoxys texana*	LE	Endemic; in poorly drained depressions or base of mima mounds in open grasslands or almost barren areas on slightly saline soils; flowering March through early April.	No
West Indian manatee *Trichechus manatus*	LE	Potential marine or estuarine environments.	No

LE - Federally Listed Endangered/Threatened

4.4.2.2 Listed Species Occurrence

A literature review of the TPWD Texas Natural Diversity Database (NDD) for existing records was conducted (dated August 21, 2013) to identify known occurrences of threatened and endangered species, sensitive natural communities, and other features of concern known or suspected to occur in the proposed project area.. No documented occurrences of federally threatened or endangered species were listed in the NDD within the project area or within 1,000 feet of the project area (TPWD, 2013b).

No-Action Alternative

The No-Action Alternative would not impact any threatened or endangered species or their preferred habitat.

Proposed Action Alternative

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, FEMA has determined that the proposed action will have "no effect" on threatened and endangered species. Critical habitat will not be impacted as there is none present in the project area.

4.4.3 Wildlife and Fish

The Greens 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 remaining wildlife 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. Common wildlife species that may be located within the project area include the following terrestrial and aquatic species identified below.

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 that are likely to occur in the project area 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*).

Based on a survey of Greens Bayou (City of Houston, 1999), 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. A significant sport fishery does not exist in Greens Bayou since species diversity and abundance of game fish are kept low by the fluctuating water levels and poor water quality.

While not afforded the same protections as federal- and state-listed species, common wildlife species are protected under several federal regulations. The Migratory Bird Treaty Act (MBTA), prohibits anyone from taking, possessing, importing, exporting, transporting, selling, purchasing, bartering, or offering for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit. Nearly all native North American bird species are protected by the act.

The Bald and Golden Eagle Protection Act (BGEPA) requires measures to prevent the harassment and take of bald eagles resulting from human activities. The BGEPA provides for the protection of the bald eagle and the golden eagle by prohibiting the take, possession, sale, purchase, barter, transport, export, or import of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit. Take means to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb, and applies to both active and inactive nests.

No-Action Alternative

The No-Action Alternative would not impact any terrestrial or aquatic habitat.

Proposed Action Alternative

The loss of marginal habitat in the project area 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 stormwater detention basins will be cleared and graded during construction, most of these areas would be planted with grasses following construction. A variety of native tree, shrub, and wetland plantings in parts of the basins are included in the design features of the detention basins. Additionally, once complete, P245-00-00 will include a riparian corridor habitat with a 200-foot forested buffer re-establishment. The Proposed Alternative will preserve the current riparian buffer along the continuous length of the P159-00-00 channel.

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.

To comply with the MBTA, HCFCD will limit vegetation management work during the peak migratory bird nesting period of March through August as much as possible to avoid destruction of individuals,

nests, or eggs. If vegetation clearing must occur during the nesting season, HCFCD will deploy a qualified biological monitor with experience conducting breeding bird surveys to survey the project area for nests prior to conducting work. The biologist will determine the appropriate timing of surveys in advance of work activities. If an occupied migratory bird nest is found, work within a buffer zone around the nest will be postponed until the nest is vacated and juveniles have fledged. The biological monitor will determine an appropriate buffering radius based on species present, real-time site conditions, and proposed impacts to vegetation. If avoidance of the nests is not possible, a professional with ornithological experience will monitor the nests during construction and/or coordinate the relocation of the bird and nest. Relocation activities will be coordinated with the USFWS. FEMA does not anticipate a taking of migratory birds based on the habitat that is available at the project site.

Golden eagles inhabit a variety of open and semi-open rural areas within a large geographic range. On the upper Texas coast, golden eagles are rare migrants and winter residents. Golden eagles are not anticipated within the project area. Bald eagles are often associated with aquatic habitats as their primary prey includes fish, waterfowl, reptiles, and other aquatic fauna. As a result, birds throughout their life history are strongly dependent on diverse aquatic habitats. The project is interdispersed with suburban areas and lacks open water and large trees. The project area does not contain suitable nesting or roosting trees or preferred foraging habitat (i.e., open water that would support prey items). Therefore, the bald eagle is not anticipated to be affected as a result of the construction or operation of the proposed project. If the project activities occur adjacent to any occupied or unoccupied bald or golden eagle nest, HCFCD must contact FEMA and consult with USFWS before work begins.

4.5 Cultural Resources

Section 106 of the National Historic Preservation Act of 1966, as amended, requires federal agencies "to take into account" the "effect" that an undertaking would have on "historic properties." Historic properties are those included in or eligible for inclusion in the National Register of Historic Places (NRHP) and may include archeological sites, buildings, structures, sites, objects, and districts. In accordance with the Advisory Council on Historic Places regulations pertaining to the protection of historic properties (36 CFR 800.4), federal agencies are required to identify and evaluate historic-age resources for NRHP eligibility and assess the effects that the undertaking would have on historic properties.

The American Indian Religious Freedom Act of 1978 (AIRFA) (P.L. 95-341; 92 Stat. 469; 42 U.S.C. 1996) resolves that it shall be the policy of the United States to protect and preserve for the American Indian, Eskimo, Aleut, and Native Hawaiian the inherent right of freedom to believe, express, and exercise their traditional religions, including but not limited to access to religious sites, use and possession of sacred objects, and freedom to worship through ceremonials and traditional rites. Federal agencies are directed to evaluate their policies and procedures to determine if changes are needed to ensure that such rights and freedoms are not disrupted by agency practices. The Act, a specific expression of First Amendment guarantees of religious freedom, is not implemented by regulations.

The Native American Grave Protection and Repatriation Act (NAGPRA) (P.L. 101-601, 25 U.S.C. 3001, et seq.) requires federal agencies and museums receiving federal funds to locate, inventory, and determine the ultimate disposition of cultural items, including Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony (NAGPRA materials) under their possession or control. The Act also requires consultation with appropriate Native American tribes, Native Alaskan, and Native Hawaiian organizations regarding the identification and affiliation of these materials as well as those resulting from subsequent intentional excavations and inadvertent discoveries.

Between March 2 and 11, 1993, Moore Archeological Consulting conducted a cultural resources survey on the eastern portion of the proposed P545-01-00-E005 project area, consisting of a 126.68-acre site and a 5-acre addition near Greens Bayou, under the Texas Antiquities Committee Permit (TAC) No. 1233. For the remaining portion (western half) of the proposed P545-01-00-E005, between May 18 and July 13, 2001, CRC International Archaeology & Ecology, LLC (CRC) conducted an intensive cultural resources survey (D'Aigle, 2001), under TAC No. 2612.

Between June 8 and 11, 2009, personnel from Atkins conducted an intensive cultural resource survey for the proposed P500-08-00-E001 project site (Schubert, 2010), under TAC No. 5293.

The cultural resources investigations consisted of a background archival, literature, and record review, an intensive pedestrian survey of the APE, including the excavation of auger tests and/or backhoe tests, and the production of a report suitable for review by the State Historic Preservation Officer (SHPO) in accordance with the Texas Historical Commission's (THC) Rules of Practice and Procedure, Chapter 26, Section 27, and the Council of Texas Archeologists (CTA) Guidelines for Cultural Resources Management Reports. The purpose of the surveys was to determine if any cultural resources were located within the APE, and if so, to determine their eligibility for formal designation as State Archeological Landmarks (SAL) and for inclusion in the NRHP.

On June 19, 2014, consultation letters were sent to the Comanche Nation, Tonkawa Tribe of Oklahoma, and Kiowa Tribe of Oklahoma regarding the proposed project. On June 16, 2014, a consultation letter was sent to the SHPO on the proposed undertaking. Copies of the letters and any responses received are included in Appendix A.

P545-01-00-E005. The research conducted by Moore and CRC in local archives, at the THC, and at the Texas Archaeological Research Laboratory (TARL) indicates that there are no known historic structures or improvements on the APE (Moore, 1993 and D'Aigle, 2001). Further, the research indicated the absence of pre-recorded sites, NRHP-listed properties, or SALs within the APE. The nearest recorded historic sites are approximately 3.5 kilometers from the southwest corner of the APE (D'Aigle, 2001).

The intensive survey of the proposed detention site at Kuykendahl Road found no indications of significant cultural deposits. No historical structures or other historic cultural features were found. There was no evidence of hidden deposits, prehistoric structural features, or deposits (D'Aigle, 2001).

P500-08-00-E001. The review of the Texas Archeological Sites Atlas and records at the TARL found no previously recorded archeological sites, cultural resource surveys, NRHP or SAL properties, or Texas Historical Markers within the project area. Six cultural resource investigations have been conducted within 1 mile of the project area, only one of which resulted in the recordation of an archeological site (Schubert, 2010).

The investigations conducted within the project area did not result in the location of cultural materials. Although it has been shown that Greens Bayou attracted prehistoric peoples in the region, the combined effects of development and razing of the neighborhood within the project area, rechannelization of the bayou, and the generally low-lying, floodprone location of the project area may have decimated any landforms on which prehistoric habitation was most likely (Schubert, 2001).

Portions of the northern boundary of the project area abut the Resthaven Memorial Gardens Cemetery. This commercial cemetery first appears on the 1945 USGS quadrangle and was opened in 1928. Eighty-five gravesites were platted for sale along the shared property boundary in 1928, each able to contain two graves. The cemetery is located outside of the proposed project area (Schubert, 2010).

No-Action Alternative

The No-Action Alternative would not have any impacts on cultural resources.

Proposed Action Alternative

Based on the negative results of the cultural resources survey of the proposed P545-01-00-E005 stormwater detention basin, CRC concluded and recommended that no further archaeological investigations be required for the proposed APE. THC determined no historic properties would be affected by the proposed project on December 10, 2001 and again on July 11, 2014 concerning the entire FEMA proposed undertaking. The Comanche Nation concurred with FEMA's determination of no historic properties affected on June 20, 2014. The Tonkawa Tribe of Oklahoma and Kiowa Tribe of Oklahoma had not responded to FEMA on the undertaking at the time of the preparation of this EA.

Although the cemetery is outside of the proposed P500-08-00-E001 stormwater detention basin, the proximity of the cemetery to the project area is cause for concern. Thus, HCFCD in coordination with THC has proposed a minimum 75-foot buffer between the cemetery and any vegetation clearing or excavation. If human remains could are encountered during construction, steps should be taken to ensure that human remains and associated cultural materials encountered during construction are properly assessed and reported to the appropriate authorities. If an unmarked burial is encountered during construction, the Site Manager or archeologist, if present, will notify the HCFCD Project Manager, the law enforcement agency, and the THC immediately upon discovery. The Project Archeologist and a qualified physical anthropologist also will be contacted to assist with identifying the remains. THC concurred with the recommendation for the 75-foot buffer and other conditions on February 3, 2010. A copy of all correspondence letters is provided in Appendix A. Copies of the cultural resource surveys are on file at HCFCD offices.

4.6 Socioeconomic Resources

4.6.1 Environmental Justice

EO 12898, entitled "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," mandates that federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of programs on minority and low-income populations. This EO also tasks federal agencies with ensuring that public notifications regarding environmental issues are concise, understandable, and readily accessible. Socioeconomic and demographic data were studied to determine if a disproportionate number of minority or low-income persons have the potential to be adversely affected by the proposed project.

Although the 2010 census has been conducted, detailed census tract data for Harris County is not yet available. Therefore, data from the 2000 census was used for this analysis. The project area is located within two census tracts: the P545-01-00-E005 stormwater detention basin is located within Census Tract 5504; and the P500-08-00-E001 stormwater detention basin is located within Census Tract 2406. For the environmental justice analysis, the project area will consist of both census tracts and will be compared to the city of Houston and Harris County. The project area contains a population of 14,665, 78 percent of which are ethnic minorities. The city of Houston contains a population of 1,954,848, 69 percent of which are ethnic minorities. Finally, Harris County contains a population of 3,400,578, 58 percent of which are ethnic minorities.

Twelve percent of the population within the project area in 1999 were living below the poverty level, which is lower than that of the city of Houston (19 percent) and Harris County (15 percent). The average

median household income of the project area in 1999 ($32,479) was lower than that of the city of Houston ($36,616) and Harris County ($42,598).

No-Action Alternative

The No-Action Alternative would not disproportionately impact minority or low-income populations.

Proposed Project Alternative

The project area contains a higher minority population compared to the city of Houston or Harris County. The project area does not contain a significantly higher low-income population compared to the city of Houston or Harris County. Although the project area contains a higher minority population, the proposed project is not expected to have adverse or disproportionate impacts on minority or low-income populations. No displacements or relocations of minority populations are required. The flood damage reduction benefits of the proposed project are expected to be proportional to all residents in the area.

4.6.2 Noise

Noise is generally defined as unwanted sound. The proposed P545-01-00-E005 stormwater detention basin is surrounded on all sides by residential subdivisions. Hoyland Elementary is approximately 0.5 mile to the east of this basin. The closest noise receivers to the proposed P500-08-00-E001 stormwater detention basin are residential areas to the south and the Resthaven Memorial Gardens Cemetery to the north. Noise levels within and adjacent to the project area would increase during the proposed construction activities as a result of construction equipment and vehicular traffic. The noise levels generated would be limited to workday daylight hours for the duration of the construction work.

No-Action Alternative

The No-Action Alternative would result in no noise impacts.

Proposed Action Alternative

Following construction activities, there would be no significant noise-generating activities at the site. The only anticipated noises associated with the project would be short-term due to heavy equipment operation during the construction phase. Construction would be timed to occur during the daylight hours when increased noise levels are normally more tolerable.

4.6.3 Traffic

Major roadways in the immediate vicinity of the proposed project include IH 45 and Kuykendahl Road. Kuykendahl Road is adjacent to the northeast of the proposed P545-01-00-E005 stormwater detention basin project and is a four-lane roadway. IH 45 is an interstate highway located adjacent to the west of the proposed P500-08-00-E001 stormwater detention basin project that provides a north-sout route through Houston and access north to the Dallas metropolitan area and south to Galveston Island.

No-Action Alternative

The No-Action Alternative would have no impacts to traffic.

Proposed Action Alternative

Short-term temporary impacts to traffic flow on local residential and collector streets during construction are anticipated. There are no anticipated long-term impediments to traffic due to construction of the detention basins.

4.6.4 Public Services and Utilities

The project area is within the public service jurisdictions of the Harris County Sheriff's Department and Harris County Constable Precinct 4.

P545-01-00-E005. Two water treatment plants are located south of the proposed P545-01-00-E005 stormwater detention basin project. Four pipelines cross this proposed detention basin; one is located along the western property boundary (Kaiser-Francis Oil), two traverse the property from southeast to northwest (Copano Field Services and Explorer Pipeline), and one traverses the area from south to north through the middle of the property (EOG Resources). Natural gas wells are located in the northwest corner (Kaiser-Francis Oil) and central portions (EOG Resources) of the property. Kaiser-Francis Oil has a well remediation site, Busch Unit #2, located in association with its hydrocarbon well (for further details, see Section 4.7).

P500-08-00-E001. There is a petroleum pipeline owned and operated by Sunoco Pipeline, L.P., which traverses the northeast property boundary. Two monitoring wells (plastic pipes) were identified along the northeast and southwest property boundaries. There is an oil and gas well located adjacent to the proposed P500-08-00-E001 stormwater detention basin project in Resthaven Cemetery. A Regional Water Authority Meter Station and a fiber optic cable are located south of P500-08-00-E001 along the opposite bank of Greens Bayou.

No-Action Alternative

The No-Action Alternative would not impact any public services or utilities.

Proposed Action Alternative

The proposed project is not expected to change or impede the access of nearby residents to any public services. Coordination with the utility companies would be required prior to construction.

4.6.5 Public Health and Safety

Safety and security issues that were considered in this environmental assessment include the health and safety of area residents, the public at large, and the protection of personnel involved in activities related to the implementation of the proposed project.

No-Action Alternative

The No-Action Alternative could have a negative effect on the general safety of the residents within the proposed project area. The lack of an adequate stormwater drainage system could continue to flood some of the residential and commercial properties in the vicinity of the proposed project and affect downstream communities. The current stormwater drainage system caused the project area to experience flooding and associated property damage as a result of Hurricane Ike.

Proposed Action Alternative

Proposed improvements to the stormwater drainage system would provide the community with reduced flood volumes due to the proposed facilities' ability to detain water during above-peak volume storm events. Detention of flood waters as a result of construction of the proposed project would be crucial to preventing future loss of property and/or life in the vicinity of the proposed project.

No significant public health or safety issues are expected from construction or implementation of the proposed project.

4.6.6 Hazardous Materials

In March 2012 Environmental Data Resources, Inc. (EDR) provided an environmental database review of selected state and federal agency records. EDR conducted the database search for the project area to meet the requirements of the EPA's Standards and Practices for All Appropriate Inquiries (40 CFR, Part 312), the American Society for Testing and Materials (ASTM) Standards E-1527-05, or custom requirements developed for the evaluation of a project area (ASTM, 2006). The following tables show the number of known occurrences for each category as of March 2012 and the minimum search distance for each category for the proposed P545-01-00-E005 and P500-08-00-E001 stormwater detention basins, respectively. A map showing the locations of hazardous material sites adjacent to the project area is provided as Figure 5. Copies of the records reviews are available upon request from FEMA Region 6 per contact information provided in the public notice (see Appendix B).

Table 5: EDR Agency Database Report Findings
P545-01-00-E005 Stormwater Detention Basin

Database	Acronym	Minimum Search Distance in Miles	Findings
National Priority List	NPL	1.0	0
Comprehensive Environmental Response, Compensation, and Liability Information System	CERCLIS	0.5	0
No Further Remedial Action Planned	NFRAP	0.5	0
Resource Conservation and Recovery Act Information System - Treatment, Storage, or Disposal	RCRA-TSD	0.5	0
Corrective Action	CORRACT	1.0	0
Resource Conservation and Recovery Act Information System - Large Quantity Generators	RCRA-LQG	0.25	0
Resource Conservation and Recovery Act Information System - Small Quantity Generators	RCRA-SQG	0.25	0
Resource Conservation and Recovery Act Information System – Non Generator	RCRA-NonGen	0.25	1
Emergency Response Notification System	ERNS	On-site	0
Texas Voluntary Cleanup Program	TXVCP	0.5	0
Texas Innocent Owner/Operator Program	TXIOP	On-site	0
Texas State Superfund Database	SHWS	1.0	0
Permitted Solid Waste Facilities/Unauthorized and Unpermitted Landfill Sites	SWF/CLI	0.5	0
Texas Leaking Underground Storage Tanks	TXLPST	0.5	2
Texas Underground Storage Tanks	TXUST	0.25	1
Texas Aboveground Storage Tanks	TXAST	0.25	0
Texas Spills List	TXSPILL	On-site	0
Drycleaner Registration Database Listing	DRYC	0.25	0
Brownfields Site Assessments	BRNFD	0.5	0
Indian Reservation Underground Storage Tanks	IRUST	0.25	0

Table 6: EDR Agency Database Report Findings
P500-08-00-E001 Stormwater Detention Basin

Database	Acronym	Minimum Search Distance in Miles	Findings
National Priority List	NPL	1.0	0
Comprehensive Environmental Response, Compensation, and Liability Information System	CERCLIS	0.5	0
No Further Remedial Action Planned	NFRAP	0.5	0
Resource Conservation and Recovery Act Information System - Treatment, Storage, or Disposal	RCRA-TSD	0.5	0
Corrective Action	CORRACT	1.0	0
Resource Conservation and Recovery Act Information System - Large Quantity Generators	RCRA-LQG	0.25	0
Resource Conservation and Recovery Act Information System - Small Quantity Generators	RCRA-SQG	0.25	1
Resource Conservation and Recovery Act Information System – Non Generator	RCRA-NonGen	0.25	2
Emergency Response Notification System	ERNS	On-site	0
Texas Voluntary Cleanup Program	TXVCP	0.5	1
Texas Innocent Owner/Operator Program	TXIOP	On-site	0
Texas State Superfund Database	SHWS	1.0	0
Permitted Solid Waste Facilities/Unauthorized and Unpermitted Landfill Sites	SWF/CLI	0.5	0
Texas Leaking Underground Storage Tanks	TXLPST	0.5	5
Texas Underground Storage Tanks	TXUST	0.25	2
Texas Aboveground Storage Tanks	TXAST	0.25	1
Texas Spills List	TXSPILL	On-site	0
Drycleaner Registration Database Listing	DRYC	0.25	2
Brownfields Site Assessments	BRNFD	0.5	0
Indian Reservation Underground Storage Tanks	IRUST	0.25	0

P545-01-00-E005. One RCRA-NonGen facility (Chevron USA, Inc.) was found within 0.25-mile of the proposed P545-01-00-E005 stormwater detention basin at the intersection of Kuykendahl Road and Ella Boulevard. According to TCEQ records, there are two Texas Underground Storage Tanks (TXUST) within 0.25 mile of the proposed P545-01-00-E005 stormwater detention basin. Chevron USA, Inc. Number 175422 has two TXUSTs in use and one Texas Leaking Underground Storage Tank (TXLUST) at 13555 Kuykendahl Road. A Shell Station has four TXUST listings, all removed from the ground, and one TXLUST at 13550 Kuykendahl Road. All reported TXLUST cases have had final concurrence issued and are now closed.

A Phase I Environmental Site Assessment (ESA) was conducted for this property in November 2000. Based on the results of the Phase I ESA, the site revealed no evidence of "recognized environmental conditions" (REC) currently in connection with the property except for possible contamination associated with a hydrocarbon well and ancillary facility, Busch Unit #2, located in the northwest corner of the site (Crouch, 2000). This well and associated tanks and piping may represent either an historic or current recognized environmental condition (Crouch, 2000). Due to the potential presence of contaminated soil and groundwater, a Phase II ESA was recommended to be completed for the subject site.

A Phase II ESA for the Busch Unit #2 site was finalized June 30, 2004. The Phase II ESA, sampling revealed contaminant levels above Texas Railroad Commission (TRRC) reportable standards. Total petroleum hydrocarbons (TPH) were identified in the soil and groundwater at levels above TRRC reportable standards and benzene and toluene were also identified in the groundwater at levels above the TRRC reportable standards. The site is currently undergoing remediation under the TRRC Voluntary Clean-up Program (Operator Clean-up Program [OCP] 03-2342). To date, contaminants have been removed from soils and groundwater monitoring is now ongoing. Recent samples have indicated groundwater contamination is below regulatory limits and semi-annual monitoring will continue for the next two years.

P500-08-00-E001. One Texas Voluntary Cleanup Program (TXVCP) participant, Tip Top Cleaners (also a priority dry cleaner and RCRA-NonGen facility), located at 17553 Imperial Valley Drive, was identified within 0.5-mile of the proposed P500-08-00-E001 stormwater detention basin. One RCRA-Gen site, Anadarko Petroleum Corp, located at 17001 Northchase Drive, was located within 0.25 mile of the site. Five LPST facilities were identified within 0.5 mile of the site. All facilities have the final concurrence issued and the LPST cases are closed. Two TXUST facilities, Greens Shell and Super Food Mart, are located within 0.25 mile of the P500-08-00-E001 stormwater detention basin. An additional RCRA-NonGen site, Martel Laboratory Services Inc., is located within 0.25 mile of the detention basin. An additional dry cleaner, En Vogue Cleaners, is located at 389 Greens Road adjacent to the proposed P500-08-00-E001 detention basin. Based on a site inspection, the location of Tip Top Cleaners was verified to be 17571 Imperial Valley Drive.

A Phase I ESA was conducted for the P500-08-00-E001 stormwater detention basin in February 2006. Based on the results of the Phase I ESA, the proximity of the Green Briar North Center (Tip Top Cleaners) TXVCP site that is undergoing monitored natural attenuation to the subject property represents a high-risk REC for the subject property based on conversations with the TCEQ Project Manager (TCB/ AECOM, 2006). HCFCD has continued to coordinate with the TCEQ Project Manager, Uche Ikemba, for information regarding Tip Top Cleaners TXVCP (TCEQ Contract No. 582-5-49220, Site DRCP-0057). Recent sampling reports indicate that there are chlorinated volatile organic compounds (CVOCs) present in the shallow groundwater directly behind the buildings adjacent to the project area (approximately 150 feet from the nearest area to be excavation). CVOCs were also identified in the intermediate groundwater (approximately 30 to 40 feet below the surface); however, the contaminants

appear to be at a depth greater than the lowest point of the proposed basin (approximately 21 feet below the surface). The site will continue to be sampled quarterly to continue to monitor the rate of natural attenuation. Solid waste at the subject property was found in easily accessible areas and appeared to be abandoned and discarded household and related debris. The presence of this solid waste presents a low-risk REC to the development of the subject property (TCB/AECOM, 2006).

No-Action Alternative

The No-Action Alternative would not disturb any hazardous materials or create any potential hazard to human health.

Proposed Project Alternative

Remediation is currently ongoing at Busch Unit #2 and Tip Top Cleaners and is being monitored by TRRC and TCEQ. Due to the low concentration of contaminants and their location and depth; it is unlikely that construction activities will encounter hazardous materials in the project area. If additional hazardous constituents are encountered in the project area prior to or during the proposed construction operations, appropriate measures for the proper assessment, remediation, and management of the contamination would be initiated in accordance with applicable federal, state, and local regulations. The contractor would take appropriate measures to prevent, minimize, and control the spill of hazardous materials in the construction staging area.

4.7 Cumulative Impacts

Cumulative impacts are those effects on the environment that result from the incremental effect of the action when added to past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time and can be positive or negative in nature. At this time there are no known projects within the vicinity of the project area that when added to the proposed project would have a cumulative impact on the human or natural environment. Additionally, as stated in previous sections, the proposed project will have no significant impacts to environmental resources. Therefore, the project will not significantly contribute to area or regional cumulative impacts.

This project will reduce flood damage impacts to approximately 1,130 structures. Data was collected on these homes for the purpose of running a benefits/cost (B/C) analysis. The proposed project will avoid an estimated $206,489,630 in flood damages over the life of the project. The project would provide a positive economic benefit in terms of reduced liabilities.

5.0 MITIGATION

5.1 Mitigation Measures

The NEPA guidelines and regulations define mitigation as (1) avoiding adverse impacts by not taking an action, (2) minimizing impacts by limiting the degree of action, (3) rectifying by repairing, rehabilitating, or restoring the affected environment, (4) reducing or eliminating impacts over time through preservation and maintenance activities and (5) compensating for an impact by replacing or providing substitute resources or environments.

During the development of the proposed project, mitigation measures were incorporated and considered in an effort to avoid and minimize impacts to the greatest extent practicable, while meeting the project purpose and need. The following list summarizes other conditions or mitigation measures to offset those impacts.

Geology and Soils – Silt fence and/or other sedimentation and erosion BMPs will be utilized during construction.

Air Quality – Dust control techniques, such as covering or treating disturbed areas with dust suppression techniques, sprinkling, and other dust abatement controls, will be implemented during construction of the proposed project. Construction equipment with EPA designated Tier 2 and Tier 3 engines will be utilized during construction. The MSAT emissions will be minimized by measures to encourage use of EPA-required cleaner diesel fuels, limits on idling, increasing use of cleaner-burning diesel engines, and other emission limitation techniques, as appropriate.

Water Quality – HCFCD will utilize the Joint Task Force (JTF) Stormwater Management Handbook for Construction Activities (2006 Edition) and the Design Guidelines for HCFCD Wet Bottom Detention Basins with Water Quality Features (HCFCD, 2013). From these guidelines, BMPs and an SW3P will be developed to reduce turbidity and TSS during construction. Erosion and sedimentation BMPs will be installed, monitored, and maintained during construction to minimize any detrimental effects to water quality during construction. HCFCD will obtain TPDES Construction General permit coverage from TCEQ before the start of construction, and will comply with all permit conditions.

Waters of the U.S., Including Wetlands –On April 10, 2008, the EPA and the USACE published a Final Rule on Compensatory Mitigation for the Losses of Aquatic Resources (33 CFR 325 and 332 and 40 CFR 230). These rules are designed to improve the effectiveness of compensatory mitigation to replace lost aquatic resource functions and area, expand public participation in compensatory mitigation decision making, and increase the efficiency and predictability of the mitigation project review process. Since mitigation banks must have an approved mitigation plan and other assurances in place before any of its credits can be used to offset permitted impacts, this rule establishes a preference for the use of mitigation bank credits, which reduces some of the risks and uncertainties associated with compensatory mitigation.

The proposed project will mitigate for 11.51 acres of USACE-jurisdictional wetland impacts at the Greens Bayou Wetland Mitigation Bank. The purchase of credits at this mitigation bank will offset the functions and services of those wetland areas currently present on-site and provide an enhanced benefit to water quality and habitat diversity within the watershed. As required by their MOA, GBWMB will calculate a mitigation ratio based on WET 2.0 analysis. This analysis will determine the amount of credits that must be purchased to replace lost aquatic resource functions of wetlands impacted by this project.

The creation of over 14.04 acres of mitigation wetlands within the newly constructed basins will offset impacts to 14.04 acres of non-USACE jurisdictional wetlands within the project area. Construction fencing will be installed around all of the avoided wetlands to prevent accidental impacts during construction. Once construction is complete "No Maintenance Zones" signs will be instal1ed in these areas. Additionally, site-specific BMPs will be identified during development of the SW3P that will avoid/minimize adverse effects to existing wetlands that will remain intact.

After the USACE Galveston District *Interim SWG Stream Condition Assessment* SOP (USACE, 2011) was issued in July 2011, the P545-01-00-E005 stormwater detention basin was redesigned to avoid and minimize stream impacts. According to the SOP, the Reach Condition Index (RCI) is calculated for each stream segment, or reach, proposed for impact and/or improvement. Based on the *Streams Condition Assessment Report of Existing and Post-Project Conditions Report for the HCFCD P545-01-00-E005 (Atkins, 2013)*, after completion of the proposed project, the overall RCI for on-site streams is expected to be higher than existing conditions RCI. This is due to the inclusion of stream enhancement features such

as riffle construction (creation of pools), including the addition of coarse substrate and planting of native overhanging vegetation to create/enhance in-stream habitat, as described in Section 3.2.

The SW3P, including specific BMPs to be utilized, will be prepared during the final design of the proposed project. Hydrology to avoided wetlands will not be altered as these wetlands are located adjacent to the P159-00-00 channel (a historic meander of Greens Bayou) and will continue to receive hydrology via overflow events from the channel.

Vegetation – Native tree and shrub species will be planted within the project area once construction is complete. Exposed side slopes will be manually revegetated using BMPs upon completion of construction. Non-invasive and non-exotic herbaceous species will be utilized for revegetation of exposed side slopes. The P245-00-00 channel will be planted with a 200-foot riparian corridor habitat (forested buffer re-establishment) on each bank. The Proposed Alternative will preserve the current riparian buffer along the continuous length of the P159-00-00 channel.

Wildlife and Fish – To comply with the MBTA, HCFCD will limit vegetation management work during the peak migratory bird nesting period of March through August as much as possible to avoid destruction of individuals, nests, or eggs. If vegetation clearing must occur during the nesting season, HCFCD will deploy a qualified biological monitor with experience conducting breeding bird surveys to survey the project area for nests prior to conducting work. The biologist will determine the appropriate timing of surveys in advance of work activities. If an occupied migratory bird nest is found, work within a buffer zone around the nest will be postponed until the nest is vacated and juveniles have fledged. The biological monitor will determine an appropriate buffering radius based on species present, real-time site conditions, and proposed impacts to vegetation. If avoidance of the nests is not possible, a professional with ornithological experience will monitor the nests during construction and/or coordinate the relocation of the bird and nest. Relocation activities will be coordinated with the USFWS. FEMA does not anticipate a taking of migratory birds based on the habitat that is available at the project site.

Cultural Resources – A minimum 75-foot buffer will remain between the Resthaven Cemetery and the P500-08-00-E001 stormwater detention basin and any vegetation clearing or excavation. If an unmarked burial is encountered during construction, the Site Manager or archeologist, if present, will notify the HCFCD Project Manager, the law enforcement agency, FEMA, and the THC immediately upon discovery. The Project Archeologist and a qualified physical anthropologist will also be contacted to assist with identifying the remains.

Noise – Construction equipment will be timed to operate during the daylight hours when increased noise levels are normally more tolerable.

Hazardous Materials – Unusable equipment, debris, and material will be disposed of in an approved manner and location. In the event significant items (or evidence thereof) are discovered during implementation of the project, HCFCD will handle, manage, and dispose of petroleum products, hazardous materials, and toxic waste in accordance with the requirements and to the satisfaction of the governing local, state, and federal agencies. HCFCD will take appropriate measures to prevent, minimize, and control the spill of hazardous materials in the construction staging area.

6.0 AGENCY COORDINATION, PUBLIC INVOLVEMENT, AND PERMITS

6.1 Agency Coordination

Coordination letters were sent to the USFWS on February 24, 2004 (HCFCD Project ID P545-01-00-E005), and April 8, 2013 (HCFCD Project ID P500-08-00-E001). It has been determined

that the proposed action would have "no effect" on any threatened or endangered species. USFWS responded on May 25, 2004, and during March 2013, and stated that USFWS concurs with the "no effect" determination.

A coordination letter was sent to NRCS in March 2010 to determine whether prime, unique, or otherwise important farmland would be impacted by the Build Alternative. The NRCS responded that the project was exempt from the FPPA because it is already considered in an urban land use area.

No prehistoric or historic sites would be impacted by the proposed action. For the P545-01-00-E005, THC concurred with the findings of the reports and considered the permit requirements complete on January 21, 1994 (AP No. 1233) and January 15, 2002 (AP No. 2612). The concurrence for P545-01-00-E005 was received on February 3, 2010 (AP No. 5293). Copies of all correspondence are included in Appendix A.

An Individual Permit (IP) application was prepared and submitted to the USACE Galveston District on February 20, 2013, for HCFCD Project ID P545-01-00-E005 (Kuykendahl) and on April 1, 2013, for HCFCD Project ID P500-08-00-E001 (Glen Forest). A permit to construct the Kuykendahl Stormwater Detention Basin was issued to HCFCD on September 20, 2013 (SWG-2013-00172), by the USACE Galveston District. A permit to construct the Glen Forest Stormwater Detention Basin was issued to HCFCD on December 3, 2013 (SWG-2009-00691) by the USACE Galveston District. Copies of the USACE IP Authorizations are included in Appendix A.

As part of the IP application, TCEQ certified that there is reasonable assurance that the projects will be conducted in a way that will not violate water quality standards. Copies of the TCEQ Water Quality Certifications are included in Appendix A.

6.2 Public Involvement

A Notice of Availability of the Draft Environmental Assessment will be published that will request public comments on the proposed action and the document. The notice will be published in the Houston Chronicle and on FEMA's website (http://www.fema.gov/media-library/assets/documents). Additionally, the Draft EA will be made available for review for a period of 30 days at the Harris County Public Library Aldine Branch located at 11331 Airline Drive, Houston, Texas, 77037. The Draft EA will also be available upon request from FEMA. A copy of the draft public notice is attached in Appendix B.

Interested federal, state, and local agencies, as well as organized groups, individuals, and navigation districts, were invited by USACE to comment on the issuance of the Clean Water Act 404 permits for both detention basins during two 30-day public comment periods in the spring of 2013.

6.3 Permits

HCFCD is required to obtain and comply with all required local, state, and federal permits and approvals prior to implementation of the Proposed Action Alternative. Permits that may be required include:

- Grading and Erosion Control Permit.
- CWA Section 404 Permit prior to conducting any work in any jurisdictional waters of the U.S. – issued by the USACE.
- CWA Section 401 certification of federal issuance of the Section 404 Permit, if work in any waters of the U.S., including wetlands exceeds 0.5 acre in size – issued by TCEQ.

- TPDES - Submission of the NOI to obtain coverage under TCEQ's Construction General permit which requires posting a site notice card and that a copy of the SW3P be kept on the construction site.

- Floodplain Development Permit – issued by Harris County.

- In the event that historically or archaeologically significant materials or sites (or evidence thereof) are discovered during the implementation of the project, the project will be halted immediately and all reasonable measures taken to avoid or minimize harm to property. HCFCD would then be required to consult with FEMA and THC for further guidance.

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7.0 LIST OF PREPARERS

Government Contributors:

Kevin Jaynes, Regional Environmental Officer, FEMA, Denton, Texas
Dorothy Weir, Environmental Specialist, FEMA, Denton, Texas
Connie Dill, HMA Specialist, FEMA, Denton, Texas
Hildy Soper, Mitigation Grants Officer, Texas Division of Emergency Management, Austin, Texas

Local Sponsor Contributors:

Katie Wanka, Regulatory Coordinator, Harris County Flood Control District, Houston, Texas

Document Preparers:

Project Manager
Kevin Burkes, Atkins, Houston, Texas

Technical Writers
Paula Gutierrez, Associate Project Manager, Atkins, Houston, Texas
Rudolfo Salazar, Sr. Environmental Scientist, Atkins, Houston, Texas
Lane Martinez, Environmental Scientist, Atkins, Houston, Texas

Figures
Micah Gray, Geographic Information Systems Specialist, Atkins, Houston, Texas
Kenneth Lewis, Geographic Information Systems Specialist, Atkins, Houston, Texas