APPENDIX B

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PHOTO 13
Overview of project area, facing west

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APPENDIX C

BIOLOGICAL ASSESSMENT

APPENDIX C

BIOLOGICAL ASSESSMENT

CONSTRUCTION OF A NEW PUMP STATION
ALLIGATOR BAYOU PUMP STATION NO. 16,
PORT ARTHUR AND VICINITY, TEXAS
HURRICANE FLOOD PROTECTION PROJECT
PORT ARTHUR, JEFFERSON COUNTY, TEXAS

JEFFERSON COUNTY DRAINAGE DISTRICT NO. 7

AND

U.S. ARMY CORPS OF ENGINEERS
GALVESTON DISTRICT

NOVEMBER 2012

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1.0 INTRODUCTION

The Proposed Project, the construction of a new pump station at Alligator Bayou Pump Station No. 16 (PS 16) (the project), sponsored by Jefferson County Drainage District No. 7 (DD7), will require Section 408 authorization from the U.S. Army Corps of Engineers (USACE) for modification of a Federal structure, the Port Arthur and Vicinity, Texas Hurricane Flood Protection Project (Hurricane Flood Protection Project) and issuance of Department of the Army Permit Application No. SWG-2007-00850 Amendment. The purpose of this Biological Assessment (BA) is to fulfill the U.S. Army Corps of Engineers' (USACE) requirements as outlined under Section 7(a) of the Endangered Species Act (ESA) of 1973 as amended and further described in 50 CFR 402.12 and Engineering Regulation (ER) 1105-2-100.

2.0 PROPOSED PROJECT AND PROJECT AREA DESCRIPTION

The Proposed Project and project area are described in detail in the Environmental Assessment of which this BA is an appendix. The Proposed Project would achieve 25-year storm pumping capacity at PS 16. With the loss of function of the gravity drain structure, PS 16 is only capable of handling an 11.5-year event, yet based on the hydrological models developed for the *2002 COMPREHENSIVE STUDY AND DRAINAGE PLAN OF THE JEFFERSON COUNTY DRAINAGE DISTRICT NO. 7 SYSTEM AND SERVICE AREA*, more flow is now generated within the main outfall system during a 25-year storm event than the system was originally designed to accommodate, making restoration of capacity at PS 16 critical. The Proposed Project would include retaining the existing pump station on the west bank of Alligator Bayou and the gravity drain structure across Alligator Bayou, with construction of a second pump station on the east bank of Alligator Bayou. The new pump station would take over the continuous low-flow pumping, and, in concert with the existing pump station, would provide overall pumping capacity to handle a 25-year storm event at PS 16. The addition of more efficient pumps at the new pump station would replace the capacity provided by the now non-functional gravity drain structure. Maintaining two pumping stations at this location also provides redundancy in the event of a pump failure. The new pump station would add 1.5 million gallons per minute (gpm) of pumping capacity to the existing 2.25 million gpm capacity at PS 16, for a total 3.75 million gpm capacity for PS 16. As modeled, this increased capacity would mean that flood waters from a 25-year storm event would be removed from the system about 18 hours faster than is currently possible with the existing pumps.

The new pump station on the east bank of Alligator Bayou (Figure 1) would consist of a 4-level concrete structure designed to withstand 200 mph winds (a Category 5 hurricane) housing six 250,000-gallon diesel pumps, with office space, a bunk room, showers, potable water, generators, and fuel storage. Construction access would be from the immediately adjacent 57th Street, a non-public road, which is constructed on top of the Hurricane Flood Protection Levee in the project area. The construction site on the east bank of Alligator Bayou is currently mowed and maintained. The footprint of the new pump station and ancillary parking would cover 2.9 acres. Construction would require two temporary coffer dams (one on Taylors Bayou and one on Alligator Bayou), to allow construction in the dry; temporary staging areas; a temporary construction access road originating at Highway 82 with a temporary floating bridge across

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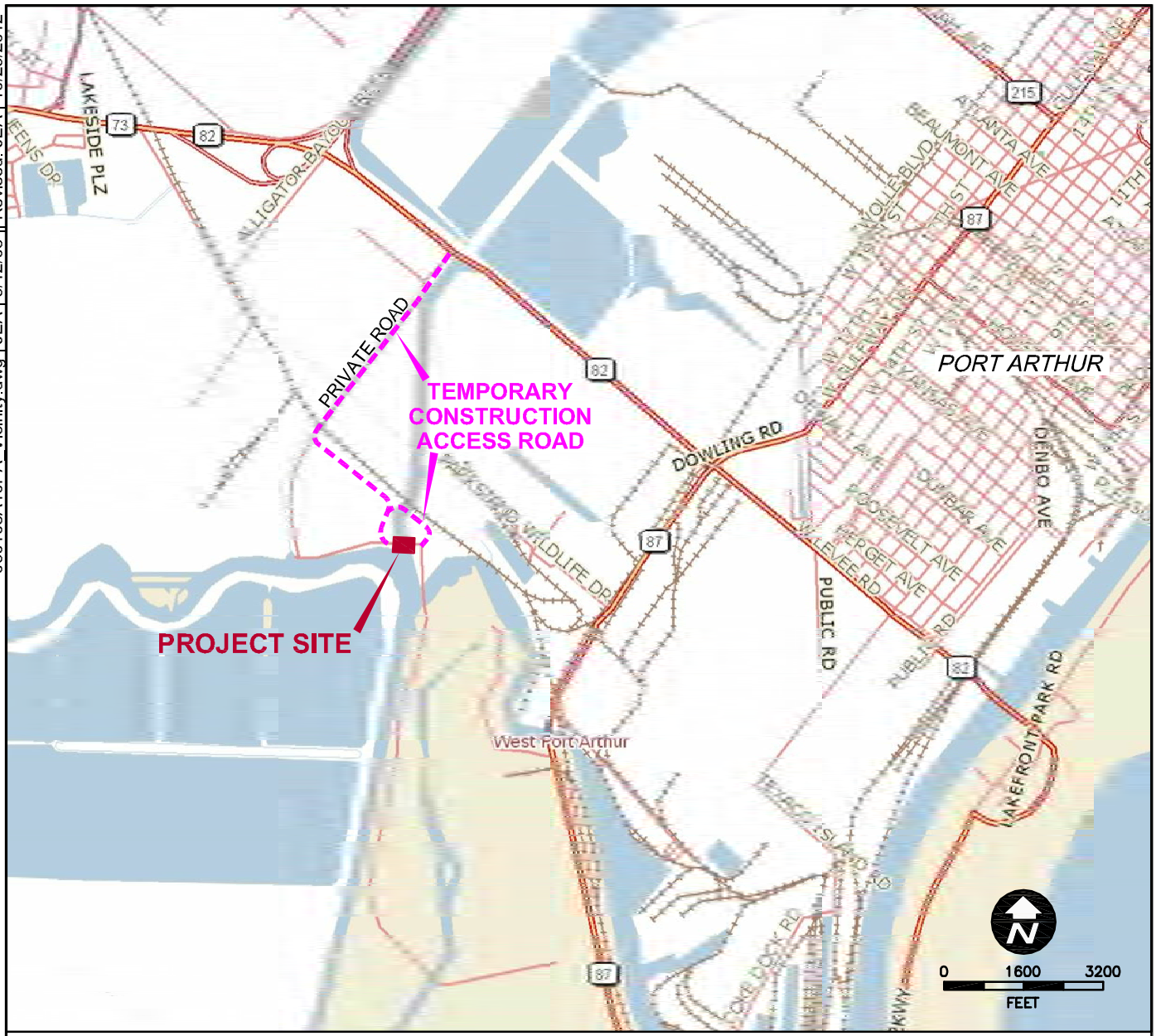
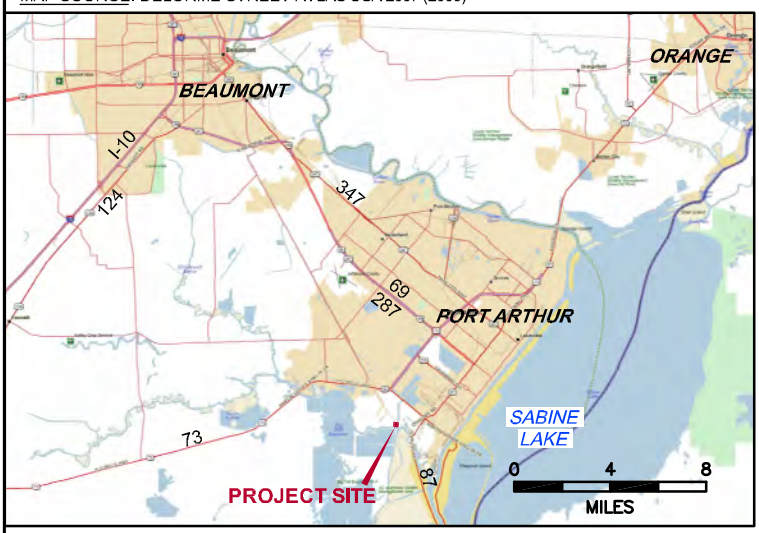


MAP SOURCE: DELORME STREET ATLAS USA 2007 (2006)



MAP SOURCE: DELORME STREET ATLAS USA 2007 (2006)

FIGURE 1

VICINITY MAP
PROPOSED PUMP STATION
CONSTRUCTION OF A NEW PUMP STATION
ALLIGATOR BAYOU PUMP STATION #16
CONFLUENCE OF ALLIGATOR BAYOU
AND TAYLORS BAYOU
PORT ARTHUR, JEFFERSON COUNTY, TEXAS

Horizon Environmental Services, Inc.

"Do Not Scale This Drawing"

Alligator Bayou; permanent excavated material placement areas with a capacity of 124,000 cu yds with concrete retainers and silt fencing to prevent sloughing or erosion of material into adjacent wetlands or waters of the US; and excavation (in the dry) on both the Alligator Bayou side and Taylors Bayou side to allow proper depth for pump operation. The excavated material would be stored for an indeterminate time for possible future use in levee repairs or improvements. The coffer dams would be constructed with two sheet pile walls 30 feet apart and filled with clean soil. Material for the coffer dams would be obtained from a commercial dirt source, possibly Halbouty Detention Pond owned by DD7, a sand and clay pit that has been in operation for 40 years and which is also used for floodwater detention. Construction is anticipated to take 24 to 30 months to complete, with project completion anticipated in late 2014.

Direct construction impacts of the Proposed Plan are summarized as follows:

Wetlands permanently filled	0.10 ac
Wetlands permanently excavated	0.67 ac
Wetlands temporarily disturbed and restored	0.21 ac
Open water (Taylors Bayou) Excavated	1.07 ac
Open water (Taylors Bayou) temporarily disturbed and restored	0.11 ac
Open water (Alligator Bayou) temporarily filled (coffer dam)	0.37 ac
Existing upland used for excavated material placement	7.79 ac
Existing upland (levee) excavated to open water	2.32 ac
Existing upland (levee) converted to pump building and parking	2.90 ac
Existing upland (levee) used for temporary construction staging	1.51 ac
Total Project Footprint Impact	17.05 ac

The temporary construction access road would follow existing roads that require no modification and is not expected to have any material impact. The temporary floating bridge for construction access to the east side of Alligator Bayou would be located adjacent to the existing railroad bridge crossing of the bayou in an area with existing fill and graded banks on both sides of Alligator Bayou. No material impacts from the floating bridge are anticipated.

The project construction footprint would impact 1.3 acres of fringe wetlands and shallow open water in the construction area on Taylors and Alligator Bayous. Proposed construction would occur on and immediately adjacent to the Hurricane Flood Protection Project levee separating Alligator Bayou from Taylors Bayou. Dominant plant species on the levee include bermudagrass (*Cynodon dactylon*), common reed (*Phragmites australis*), St. Augustine grass (*Stenotaphrum secundatum*), bedstraw (*Gallium uncinulatum*), curly dock (*Rumex crispus*), and dewberry (*Rubus trivialis*). Scattered sugarberry (*Celtis laevigata*) and baccharis (*Baccharis* sp.) are also present. A fringe of wetland vegetation is present along portions of Alligator Bayou and Taylors Bayou that includes spikerush (*Eleocharis* sp.), primrose willow (*Ludwigia decurrens*), common reed, sedge (*Carex* sp.), and marshhay cordgrass (*Spartina patens*).

Aquatic habitat is restricted to Alligator Bayou and Taylors Bayou. Fish samples were not collected from Alligator Bayou or Taylors Bayou during Horizon's reconnaissance survey of the area.

Common fish species that could occur in Alligator Bayou include the western mosquitofish (*Gambusia affinis*), black bullhead (*Ameiurus melas*), variegated pupfish (*Cyprindon variegatus*), largemouth bass (*Micropterus salmoides*), alligator gar (*Lepisosteus spafula*), blacktail redhorse (*Moxostoma poecilurum*), rainwater killifish (*Lucania parva*), inland silversides (*Menidia beryllina*), several sunfish species (*Lepomis* spp.), and possibly 1 or 2 species of minnows (Cyprinidae). In addition to the fish species, the area could support frogs, turtles, snakes, crayfish, and numerous insect species. Estuarine or marine species that potentially inhabit Taylors Bayou downstream of the proposed structure include species such as the blue crab (*Callinectes sapidus*), brown shrimp (*Farfantepenaeus aztecus*), white shrimp (*Litopenaeus setiferus*), red drum (*Sciaenops ocellatus*), spotted seatrout (*Cynoscion nebulosus*), croaker (*Micropogonias undulatus*), menhaden (*Brevoortia patronus*), and bay anchovy (*Anchoa mitchelli*).

3.0 THREATENED OR ENDANGERED SPECIES AND HABITAT DESCRIPTIONS

The following species and designated Critical Habitats (CH) listed by the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) were reviewed for potential impacts from the Proposed Project. The NMFS list also includes five species of whales, which will not be addressed in this BA.

TABLE 1: FEDERALLY-LISTED T/E SPECIES OF POTENTIAL OCCURRENCE IN JEFFERSON COUNTY, TEXAS

SPECIES	USFWS STATUS	NMFS STATUS	DETERMINATION
Piping Plover (*Charadrius melodus*)	Threatened	N/A	No effect; critical habitat in Texas, but not in Jefferson County; species unlikely in project area.
Atlantic hawksbill sea turtle (*Eretmochelys imbricate*)	Endangered	Endangered	No effect; critical habitat designated outside of Texas; species unlikely in project area.
Green sea turtle (*Chelonia mydas*)	Threatened	Threatened	No effect; critical habitat designated outside of Texas; species unlikely in project area.
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered	Endangered	No effect; species unlikely in project area.
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	Endangered	No effect; critical habitat designated outside Texas; species unlikely in project area.
Loggerhead sea turtle (*Caretta caretta*)	Threatened	Threatened	No effect; species unlikely in project area.
Smalltooth sawfish (*Pristis pectinata*)	N/A	Endangered	No effect; species unlikely in project area.
West Indian Manatee (*Trichechus manatus*)	Endangered	N/A	No effect; species unlikely in project area.

(USFWS, NMFS 2012; Attachment A)

Additionally, the USFWS lists the following migratory bird species as being of potential transitory occurrence in many or all Texas counties during migration: Eskimo curlew (*Numenius borealis*), interior least tern (*Sterna antillarum athalossos*), and whooping crane (*Grus americana*). The Texas Parks and Wildlife Department (TPWD, 2012; Attachment A) lists a number of additional species for Jefferson County.

No listed T/E species or potential habitats have been observed on the proposed construction site or within the immediate vicinity of the project area. Any potential utilization of the site by migratory T/E species would be limited to brief transitory occurrences or fly-overs. A lack of suitable habitat for listed species makes their occurrence highly unlikely.

3.1 PIPING PLOVER

The piping plover *(Charadrius melodus)* was Federally listed as endangered on December 11, 1985, for the Great Lakes watershed and was listed as threatened throughout the remainder of its range from the Great Lakes area to Texas (50 FR 50726). Piping plovers typically inhabit shorelines of oceans, rivers, and inland lakes. Summer nest sites include sandy beaches, especially where scattered tufts of grass are present; sandbars; causeways; bare areas on emergent dredged material placement areas; as well as natural alluvial islands in rivers; gravel pits along rivers; silty flats; and salt-encrusted bare areas of sand, gravel, or pebbly mud on interior alkali lakes and ponds. On the wintering grounds which include the Texas Gulf Coast, these birds utilize beaches, mud and sand flats, and offshore dredged material islands (AOU, 1998; USFWS, 1995). No CH has been designated for this species in the project area.

Along the Texas coast, a correlation appears to exist between tidal height and habitat selection, with piping plovers actively feeding on tidal flats during periods of low tides, and on the Gulf beaches during high tides (Eubanks, 1991; Zonick, et al., 1998; Drake et al., 2000). Winter distribution studies along the Atlantic and Gulf coasts found piping plovers usually occurring in small, unevenly distributed groups along the coast; however, the sites with largest concentrations of plovers consisted of expansive sand flats or mud flats with sandy beach in close proximity (Nicholls and Baldassarre, 1990). Piping plover concentrations in Texas occur in Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kleberg, Matagorda, Nueces, San Patricio and Willacy counties (USFWS, 1988). USFWS (1995) estimates that approximately 1,900 piping plovers, or approximately 35% of the known population, wintered along the Texas Gulf coast. CH for the wintering grounds has been designated in Texas by the FWS (66 FR 36074—36078). There are no areas of CH in project area. The closest critical habitat area (TX-37) is located 40 miles to the southwest at Rollover Bay, Chambers County, Texas. An October 2006 field survey by Lee Sherrod of Horizon Environmental Services, Inc. observed no piping plovers or habitat in and around the project area, which is located approximately 12 miles from the Gulf shoreline. It is concluded that neither the construction nor operation of the Proposed Project will impact piping plovers or their CH.

3.2 KEMP'S RIDLEY SEA TURTLE

Kemp's ridley sea turtle *(Lepidochelys kempii)* was listed as endangered throughout its range on December 2, 1970 (35 FR 18320). Populations of this species have declined since 1947, when an estimated 42,000 females nested in one day, to a total nesting population of approximately 1,000 in the mid-1980s, with 10,000 nests in 2005 and 12,000 in 2006 (Shaver, 2007). The recovery likely can be attributed to full protection of nesting females and their nests in Mexico and the requirement to use TEDs in shrimp trawlers both in the U.S. and in Mexico (NMFS, 2000).

Kemp's ridleys inhabit shallow coastal and estuarine waters, although rarely in bays, usually over sand or mud bottoms. Adults are primarily shallow-water benthic feeders that specialize on crabs, especially portunid crabs, while juveniles feed on sargassum and associated infauna, and other epipelagic species of the Gulf of Mexico (USFWS and NMFS, 1992). In some regions the blue crab *(Callinectes sapidus)* is the most common food item of adults and juveniles. Other food items include shrimp, snails, bivalves, sea urchins, jellyfish, sea stars, fish, and occasional marine plants (Pritchard and Marquez, 1973; Shaver, 1991; Campbell, 1995).

Adults are primarily restricted to the Gulf of Mexico, although juveniles may range throughout the Atlantic Ocean since they have been observed as far north as Nova Scotia (Musick, 1979) and in coastal waters of Europe (Brongersma, 1972). Important foraging areas include Campeche Bay, Mexico, and Louisiana coastal waters. Nesting has been documented from approximately 134 miles of the Tamaulipas coastline, and sporadic nesting has been reported from Bolivar Peninsula, Texas, southward to Isla Aquada, Campeche. There have been isolated nesting attempts scattered from North Carolina to Colombia. An intensive recovery program in Texas includes a hatchery on Padre Island National Seashore (PAIS) with release of hatchlings in Texas and Florida. Despite these efforts, Kemp's ridley turtles occur in Texas in small numbers and in many cases may well be in transit between crustacean-rich feeding areas in the northern Gulf of Mexico and breeding grounds in Mexico. They have nested sporadically in Texas in the last 50 years; however the number of nests has dramatically increased in recent years. In 1999, 16 Kemp's ridley nests were recorded in Texas, with 199 nests confirmed for 2011 (PAIS data),

Kemp's ridley turtles have been recorded as close as Boliver Peninsula, Chambers County, Texas. While nests have increased annually on Texas' beaches, it is very unlikely that this species will occur on beaches near the project area, where erosion has removed most sand from most beaches. In addition, the project area is connected to the Gulf of Mexico by 19 miles of man-made and man-modified waterways. It is highly unlikely that this species would occur in Taylors Bayou or the project area and it is concluded that the construction and operation of the Proposed Project will have no effect on this species.

3.3 ATLANTIC HAWKSBILL SEA TURTLE

The Atlantic hawksbill sea turtle (Hawksbill) *(Eretmochelys imbricata)* was federally listed as endangered on June 2, 1970 (35 FR 8495), with critical habitat designated in Puerto Rico on May 24, 1978 (43 FR 22224). The greatest threat to this species is harvest to supply the market for tortoiseshell and

stuffed turtle curios (Meylan and Donnelly, 1999). Hawksbills generally inhabit coastal reefs, bays, rocky areas, passes, estuaries, and lagoons, where they are typically found at depths of less than 70 feet. Like some other sea turtle species, hatchlings are sometimes found floating in masses of marine plants (e.g., sargassum rafts) in the open ocean (NFWL, 1980). Hawksbills reenter coastal waters when they reach a carapace length of approximately 8 to 10 inches. Coral reefs are widely recognized as the resident foraging habitat of juveniles, subadults, and adults. This habitat association is undoubtedly related to their diet of sponges, which need solid substrate for attachment. Hawksbills are also found around rocky outcrops and high energy shoals, which are also optimum sites for sponge growth. In Texas, juvenile hawksbills are associated with stone jetties (NMFS, 2000). They nest on undisturbed, deep-sand beaches, from high-energy ocean beaches to tiny pocket beaches several meters wide bounded by crevices of cliff walls. Typically, these sand beaches are low energy with woody vegetation, such as sea grape *(Coccoloba uvifera)*, near the waterline (NRC, 1990). The hawksbill is typically a solitary nester, which makes it harder to monitor nesting activity and success (NMFS, 2000).

The hawksbill is circumtropical, occurring in tropical and subtropical seas of the Atlantic, Pacific, and Indian oceans (Witzell, 1983). This species is probably the most tropical of all marine turtles, although it does occur in many temperate regions. The hawksbill turtle is widely distributed in the Caribbean Sea and western Atlantic Ocean, with representatives of at least some life history stages regularly occurring in southern Florida and the northern Gulf of Mexico, especially Texas, south to Brazil (NMFS, 2000). In the continental U.S., the hawksbill nests only in Florida where it is sporadic at best (NFWL, 1980). Texas is the only state outside of Florida where hawksbills are sighted with any regularity. Most of these sightings involve post-hatchlings and juveniles, and are primarily associated with stone jetties. These small turtles are believed to originate from nesting beaches in Mexico (NMFS, 2000). As such, this species is not anticipated to be found in the project area, and it is concluded that there will be no effect to this species from the Proposed Project.

3.4 LEATHERBACK SEA TURTLE

The leatherback sea turtle *(Dermochelys coriacea)* was listed as endangered throughout its range on June 2, 1970 (35 FR 8495), with CH designated in the U.S. Virgin Islands on September 26, 1978 and March 23, 1979 (43 FR 43688—43689 and 44 FR 17710—17712, respectively). Current estimates are that 20,000 to 30,000 female leatherbacks exist worldwide.

The leatherback sea turtle is mainly pelagic, inhabiting the open ocean, and seldom approaches land except for nesting (Eckert, 1992). It is most often found in coastal waters when nesting or following concentrations of jellyfish (TPWD, 2000), during which it can be found in inshore waters, bays, and estuaries. It dives almost continuously, often to great depths. Leatherbacks nest only sporadically in some of the Atlantic and Gulf states of the continental U.S., with one nesting reported as far north as North Carolina (Schwartz, 1976). In the Atlantic and Caribbean, the largest nesting assemblages are found in the U.S. Virgin Islands, Puerto Rico, and Florida (NMFS, 2000).

Apart from occasional feeding aggregations such as a large occurrence of 100 turtles reported by Leary (1957) off Port Aransas in December 1956, or possible concentrations in the Brownsville Eddy in winter (Hildebrand, 1983), leatherbacks are rare along the Texas coast, tending to keep to deeper offshore waters where their primary food source, jellyfish, occurs. According to USFWS (1981), leatherbacks have never been common in Texas waters. No nests of this species have been recorded for over 60 years. The leatherback is unlikely to inhabit the project are due to a lack of habitat. As such, it is concluded that the Proposed Project will have no effect on this species.

3.5 GREEN SEA TURTLE

The green sea turtle *(Chelonia mydas)* was listed on July 28, 1978, as threatened except for Florida and the Pacific coast of Mexico (including the Gulf of California) where it was listed as endangered (43 FR 32808). The green sea turtle primarily utilizes shallow habitats such as lagoons, bays, inlets, shoals, estuaries, and other areas with an abundance of marine algae and submerged aquatic vegetation (SAV). Individuals observed in the open ocean are believed to be migrants en route to feeding grounds or nesting beaches (Meylan, 1982). Hatchlings often float in masses of sea plants (e.g., sargassum) in convergence zones. Coral reefs and rocky outcrops near feeding pastures often are used as resting areas. The adults are primarily herbivorous, while the juveniles consume more invertebrates. Foods consumed include SAV, macroalgae and other marine plants, mollusks, sponges, crustaceans, and jellyfish (Mortimer, 1982; Green, 1984). They prefer high energy beaches with deep sand, which may be coarse to fine, with little organic content.

The green sea turtle is a circumglobal species in tropical and sub-tropical waters. In U.S. Atlantic waters, it is found around the U.S. Virgin Islands, Puerto Rico, and continental U.S. from Massachusetts to Texas, where primarily small juveniles inhabit shallow bays and estuaries. Once they attain sexual maturity, they return to their natal beaches outside of Texas to nest. The green sea turtle is unlikely to be found in the project area due to lack of habitat and it is concluded that that there will be no effect to this species from the Proposed Project.

3.6 LOGGERHEAD SEA TURTLE

The loggerhead sea turtle *(Caretta caretta)* was listed as threatened throughout its range on July 28, 1978 (43 FR 32808). The loggerhead is found in the open seas as far as 500 miles from shore, but mainly over the continental shelf, and in bays, estuaries, lagoons, creeks, and mouths of rivers. It favors warm temperate and sub-tropical regions not far from shorelines. The adults occupy various habitats, from turbid bays to clear waters of reefs. Subadults occur mainly in nearshore and estuarine waters.

The loggerhead is widely distributed in tropical and subtropical seas, being found in the Atlantic Ocean from Nova Scotia to Argentina, Gulf of Mexico, Indian and Pacific oceans (although it is rare in the eastern and central Pacific), and the Mediterranean Sea (Rebel, 1974; Ross, 1982; Iverson, 1986). In the continental U.S., loggerheads nest along the Atlantic coast from Florida to as far north as New

Jersey (Musick, 1979) and sporadically along the Gulf coast. In recent years a few have nested on barrier islands along the Texas coast. The loggerhead is considered to be the most abundant turtle in Texas marine waters, preferring shallow inner continental shelf waters and occurring only very infrequently in the bays. Loggerheads are probably present year-round but are most noticeable in the spring when one of their food items, the Portuguese man-of-war, is abundant. Because of lack of habitat, this species is not expected to be found in the project area, and it is concluded there will be no effect to loggerhead sea turtles from the construction, operation, or maintenance of the Proposed Project.

3.7 WEST INDIAN MANATEE

The West Indian manatee (*Trichechus manatus*) was listed by USFWS as endangered on 11 March 1967 (32 FR 4001). Later it received protection under the ESA of 1973. The West Indian manatee inhabits shallow coastal waters, estuaries, bays, rivers, and lakes. Throughout most of its range, it appears to prefer rivers and estuaries to marine habitats, although manatees inhabit marine habitats in the Greater Antilles (Lefebvre et al., 1989). It is not averse to traveling through dredged canals or using quiet marinas. They prefer waters that are at least 1 to 2 meters (m) in depth; along coasts, they are often in water 3 to 5 m deep. Taylors Bayou in the vicinity of the project is about 18 inches deep. They usually avoid areas with strong currents. Manatees are primarily dependent upon submergent, emergent, and floating vegetation, with the diet varying according to plant availability. They range from the southeastern U.S. and coastal regions of the Gulf, through the West Indies and Caribbean, to northern South America. U.S. populations occur primarily in Florida, where they are effectively isolated from other populations by the cooler waters of the northern Gulf and the deeper waters of the Straits of Florida

The West Indian manatee historically inhabited the Laguna Madre, the Gulf, and tidally influenced portions of rivers. It is currently, however, extremely rare in Texas waters and the most recent sightings are likely individuals migrating or wandering from Mexican waters. Historical records from Texas waters include Cow Bayou, Sabine Lake, Copano Bay, the Bolivar Peninsula, and the mouth of the Rio Grande (Schmidly, 2004). In May 2005, a live manatee appeared in the Laguna Madre near Port Mansfield (Blankinship, 2005). Given the 19 miles of shallow, modified channels with control structures between the Gulf/Sabine Lake and the project area, it is extremely unlikely that a manatee would be found in the project vicinity, and it is concluded there will be no effect to manatees from the construction, operation, or maintenance of the Proposed Project.

3.8 SMALLTOOTH SAWFISH

The smalltooth sawfish was listed as endangered and critical habitat was designated by NMFS September 2, 2009 (74 FR 45353-45378). It is a tropical marine and estuarine species of circumtropical distribution. Its historic range in the U.S. was Texas to New York. It is most commonly found today in south and southwest Florida to the Dry Tortugas. Juveniles are associated with shallow water, red mangrove habitats. Since the 1990's, the distribution of smalltooth sawfish has been restricted to peninsular Florida, with extremely rare occurrences in other Gulf coast states. It is most often found in estuaries and the mouths of rivers. Given the distance from the Gulf of Mexico and Sabine Lake, it is

extremely unlikely that smalltooth sawfish would be found in the project area. As such, it is concluded there will be no effect to smalltooth sawfish from the construction, operation, or maintenance of the Proposed Project.

6.0 DETERMINATION OF EFFECT

It is concluded that proposed construction activities and operation and maintenance of the Proposed Project would have no effect on Critical Habitat or listed species in Jefferson County.

7.0 REFERENCES

American Ornithologists' Union (AOU). 1998. Check-list of North American Birds. Seventh edition. Allen Press, Inc., Lawrence, Kansas. 829 pp.

Brongersma, L.D. 1972. European Atlantic turtles. Zool. Verhl. 121. 318 pp.

Campbell, L. 1995. Endangered and threatened animals of Texas, their life history and management. Texas Parks and Wildlife Department, Resource Protection Division, Endangered Resources Branch. Austin, Texas. 130 pp.

Drake, K., K. Drake, and J. Thompson. 2000. The effects of dredge material on piping plovers and snowy plovers along the southern Laguna Madre of Texas. Final Report 1997—1999. Caesar Kleberg Wildlife Research Institute/Texas A&M University, Kingsville. 147 pp.

Eckert, S.A. 1992. Bound for deep water. Natural History, March 1992, pp. 28—35.

Eubanks, T.L., Jr. 1991. Piping Plover Recovery Team. Piping plover workshop. Presentation given at Corpus Christi State University, Corpus Christi, Texas. 30 May 1991.

Green, D. 1984. Long-distance movements of Galapagos green sea turtles. Journal of Herpetelogy 18:12 1—1 30.

Hildebrand, H. 1982. A historical review of the status of sea turtle populations in the western Gulf of Mexico. In: K. Bjorndal (editor), Biology and Conservation of Sea turtles. Pp. 447—453. Smithsonian Institution Press, Washington, D.C. 583 pp.

Hildebrand, H. 1983. Random notes on sea turtles in the western Gulf of Mexico. In: D. Owens et al. (editors) Proc. Western Gulf of Mexico Sea Turtle Workshop, Texas A&M University, College Station, Texas. Pp. 34—40. TAMU-SG-84-105. 74 pp.

Hildebrand, H. 1987. A reconnaissance of beaches and coastal waters from the border of Belize to the Mississippi River as habitats for marine turtles. Report prepared for National Marine Fisheries

Service, Southeast Fisheries Center, Panama City Laboratory, Panama City, Florida. Purchase Order No. NA-84-CF-A-134. 63 pp.

Iverson, J.B. 1986. A checklist with distribution maps of the turtles of the world. Paust Printing, Richmond, Indiana. 284 pp.

Leary, 1. 1957. A schooling of leatherback turtles, *Dermochelys coriacea coriacea,* on the Texas coast. Copela 3:232.

Meylan, A.B., B.W. Bowen, and J.C. Avise. 1990. A genetic test of the natal homing versus social facilitation models for green sea turtle migration. Science 248:724—727.

Meylan, A. 1982. Sea turtle migration — evidence from tag returns. In: K. Bjorndal (editor), Biology and Conservation of Sea Turtles. Pp. 91—100. Smithsonian Institution Press, Washington, D.C. 583 pp.

Meylan, A.B. and M. Donnelly. 1999. Status justification for listing the hawksbill turtle *(Eretmochelys imbricata)* as critically endangered on the 1996 IUCN red list of threatened animals. Chelonian Conservation and Biology 3(2):200—224.

Mortimer, J.A. 1982. Feeding ecology of sea turtles. In: K. Bjorndal (editor), Biology and Conservation of Sea Turtles. Pp. 103—109. Smithsonian Institution Press, Washington, D.C. 583 pp.

Musick, J. 1979. The marine turtles of Virginia with notes on identification and natural history. Educational Series No. 24. Sea Grant Program, Virginia Institute of Marine Science, Gloucester Point, Virginia. 18 pp.

(NFWL) National Fish and Wildlife Laboratory. 1980. Selected vertebrate endangered species of the seacoast of the United States. U.S. Fish and Wildlife Service, Biological Services Program, Washington, D.C. USFWS/OBS-80/01.

(NMFS) National Marine Fisheries Service. 2000. Information on sea turtles. Available on the Internet: <http://www.nmfs.noaa.govt/protres/species/turtles/kemps.html> 5 October 2000.

(NRC) National Research Council. 1990. Decline of the sea turtles: causes and prevention. National Academy Press. Washington, D.C. 259 pp.

Nicholls, J.L. and G.A. Baldassarre. 1990. Winter distribution of piping plovers along the Atlantic and Gulf coasts of the United States. Wilson Bulletin 102(3):400—412.

Pritchard, P.C.H. 1971. The leatherback or leathery turtle *Dermochelys coriacea*. IUCN Monograph No. 1. International Union for Conservation of Nature and Natural Resources, Morges, Switzerland. 39 pp.

Pritchard, P. C. H. 1977. Marine turtles of Micronesia. Chelonia Press, San Francisco, California. 83 pp.

Pritchard, P.C.H. and R. Marquez. 1973. Kemp's ridley turtle or Atlantic ridley, *Lepidochelys kempii*. IUCN Monograph 2, Morges, Switzerland. 30 pp.

Rebel, T.P. 1974. Sea turtles and the turtle industry of the West Indies, Florida, and the Gulf of Mexico. Rev. Ed. Univ. Miami Press, Coral Gables, Florida. 250 pp.

Ross, J.P. 1982. Historical decline of loggerhead, ridley, and leatherback sea turtles. In: K. Bjorndal (editor), Biology and Conservation of Sea Turtles. Pp. 189—195. Smithsonian Institution Press, Washington, D.C. 583 pp.

Schwartz, F. 1976. Status of sea Turtles, Cheloniidae and Dermochelidae, in North Carolina. Abstr. in Proceedings and abstracts from the 73rd meeting of the North Carolina Academy of Science, Inc., April 2—3, 1976, at the Univ. N. Carolina, Wilmington, N. Carolina. J. Elisha Mitchell Sci. Soc. 92(2):76—77.

Shaver, D. J. 1991. Feeding ecology of wild and head-started Kemp's ridley sea turtles in south Texas waters. Journal of Herpetology 25(3):327—334.

Shaver, D. J. 2000. Padre Island National Seashore, field station leader. Personal communication to Derek Green, PBS&J, 20 November 2000.

Shaver, D. J. 2002. Station leader, U.S. Geological Survey (USGS). Personal communication to K. Jecker, PBS&J. Corpus Christi, Texas. September 14, 2002.

Shaver, D. J. 2007. Personal communication to Matthew Kimmel, USACE Galveston District, Corpus Christi, Texas. July 23, 2007.

(TPWD) Texas Parks and Wildlife Department. Natural Diversity Database, T/E and Rare Species Elemental Occurrences. Wildlife Division, Habitat Assessment Program, Austin, Texas. Accessed 05 July 2011.

(TPWD). 2000. Nature; endangered and threatened species; leatherback sea turtle *(Dermochelys coriacea).* Available on the Internet: <http://www.tpwd.state.tx.us/. nature/endang/animals/leathback.html>

(USFWS). 1988. Great Lakes and Northern Great Plains piping plover recovery plan. U.S. Fish and Wildlife Service, Twin Cities, Minn. 160 pp.

(USFWS). 1995. Threatened and endangered species of Texas. Austin, Texas. June 1995.

(USFWS). 1998a. Sea turtles. June 1998. Available on the Internet: http://www.USFWS.gov

(USFWS) US Department of the Interior, Fish and Wildlife Service. National Wetlands Inventory maps, Port Arthur South, Texas, quadrangle. 1998b.

(USFWS). 2007. Mary Orms, Cons. #21410-2006-I-0265. April 2007. Response to letter requesting comments on the Public Notice for Corps of Engineers permit action 24192, and concurrence with the findings in the BE for threatened and endangered species.

(USFWS) Endangered Species Lists, <http://www.fws.gov/southwest/es/EndangeredSpecies/lists/default.cfm >. Accessed 05 July 2011.

(USFWS and NMFS). 1992. Recovery plan for the Kemp's ridley sea turtle *(Lepidochelys kempii).* National Marine Fisheries Service, St. Petersburg, Florida, 40 pp.

(USGS) US Geological Survey. 7.5-minute series topographic maps, Port Arthur South, Texas, quadrangle. 1993.

Witzell, W.N. 1983. Synopsis of biological data on the hawksbill turtle *Eretmochelys imbricata* (Linnaeus, 1766). FAO Fisheries Synopsis No. 137. FIR/5137, SAST — Hawksbill Turtle — 5.31 (07) 017.01. Food and Agriculture Organization (FAO) of the United Nations, Rome, Italy. 78 pp.

Zonick, C., K. Drake, K. Drake, L. Elliot, and J. Thompson. 1998. The effects of dredged material on piping plovers *(Charadrius melodus)* and snowy plovers *(C. alexandrinus)* in the lower Laguna Madre of Texas. Final Report for the 1997/1998 season.

ATTACHMENT A

Ecological Services

Southwest Region

Back to Start

List of species by county for Texas:

Counties Selected: Jefferson

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Jefferson County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critical Habitat	More Info
green sea turtle	*Chelonia mydas*	Reptiles	E, T				P
hawksbill sea turtle	*Eretmochelys imbricata*	Reptiles	E				P
Kemp's ridley sea turtle	*Lepidochelys kempii*	Reptiles	E				P
leatherback sea turtle	*Dermochelys coriacea*	Reptiles	E				P
loggerhead sea turtle	*Caretta caretta*	Reptiles	T				P
piping Plover	*Charadrius melodus*	Birds	E, T				P

Ecological Services
Endangered Species
Electronic Library
Environmental Contaminants
Energy
Partners Program
Texas Coastal Program
National Wetlands Inventory
Field Offices

Last Updated: September 20, 2012

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people.

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Southeast Region

Endangered and Threatened Species and Critical Habitats under the Jurisdiction of the NOAA Fisheries Service

Texas

Listed Species	Scientific Name	Status	Date Listed
Marine Mammals			
blue whale	*Balaenoptera musculus*	Endangered	12/02/70
finback whale	*Balaenoptera physalus*	Endangered	12/02/70
humpback whale	*Megaptera novaeangliae*	Endangered	12/02/70
sei whale	*Balaenoptera borealis*	Endangered	12/02/70
sperm whale	*Physeter macrocephalus*	Endangered	12/02/70
Turtles			
green sea turtle	*Chelonia mydas*	Threatened[1]	07/28/78
hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	06/02/70
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	12/02/70
leatherback sea turtle	*Dermochelys coriacea*	Endangered	06/02/70
loggerhead sea turtle	*Caretta caretta*	Threatened[2]	09/22/11
Fish			
None			

Candidate Species:

NMFS maintains a list of species that are undergoing an ESA status review that NMFS has announced in a Federal Register Notice. They are called "candidate" species as they are being considered for listing under the ESA, but are not yet subject to a proposed listing rule. To view the candidate species list, please visit: http://www.nmfs.noaa.gov/pr/species/esa/other.htm

Species of Concern:

NMFS maintains a list of species for which there are concerns regarding their status and threats. Federal agencies and the public are encouraged to consider these species during project planning. To view the Species of Concern list and receive more information please visit: http://sero.nmfs.noaa.gov/pr/SOC.htm

[1] Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered.

[2] Northwest Atlantic Ocean (NWA) Distinct Population Segment (DPS) was listed as threatened. NMFS and USFWS issued a final rule changing the listing of loggerhead sea turtles from a single, threatened species to nine DPSs listed as either threatened or endangered in 2012 (76 FR 58868).

Last Revision: 8/7/2012 4:09:00 PM

JEFFERSON COUNTY

AMPHIBIANS		Federal Status	State Status
Pig frog	*Lithobates grylio*		

prefers permanent bodies of open water with emergent vegetation; active mainly at night; eats insects and crustaceans; mating and egg-laying March-September; male vocalization a pig-like grunt

BIRDS		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Bald Eagle	*Haliaeetus leucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Black Rail	*Laterallus jamaicensis*		

salt, brackish, and freshwater marshes, pond borders, wet meadows, and grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia

Brown Pelican	*Pelecanus occidentalis*	DL	

largely coastal and near shore areas, where it roosts and nests on islands and spoil banks

Henslow's Sparrow	*Ammodramus henslowii*		

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Peregrine Falcon	*Falco peregrinus*	DL	T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

Piping Plover	*Charadrius melodus*	LT	T

wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats

JEFFERSON COUNTY

BIRDS

		Federal Status	State Status
Reddish Egret	*Egretta rufescens*		T

resident of the Texas Gulf Coast; brackish marshes and shallow salt ponds and tidal flats; nests on ground or in trees or bushes, on dry coastal islands in brushy thickets of yucca and prickly pear

Snowy Plover	*Charadrius alexandrinus*		

formerly an uncommon breeder in the Panhandle; potential migrant; winter along coast

Southeastern Snowy Plover	*Charadrius alexandrinus tenuirostris*		

wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats

Sprague's Pipit	*Anthus spragueii*	C	

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

Swallow-tailed Kite	*Elanoides forficatus*		T

lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees

Western Snowy Plover	*Charadrius alexandrinus nivosus*		

uncommon breeder in the Panhandle; potential migrant; winter along coast

White-faced Ibis	*Plegadis chihi*		T

prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

Wood Stork	*Mycteria americana*		T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

FISHES

		Federal Status	State Status
American eel	*Anguilla rostrata*		

coastal waterways below reservoirs to gulf; spawns January to February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; most aquatic habitats with access to ocean, muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries; diet varies widely, geographically, and seasonally

Smalltooth sawfish	*Pristis pectinata*	LE	E

JEFFERSON COUNTY

FISHES		Federal Status	State Status

different life history stages have different patterns of habitat use; young found very close to shore in muddy and sandy bottoms, seldom descending to depths greater than 32 ft (10 m); in sheltered bays, on shallow banks, and in estuaries or river mouths; adult sawfish are encountered in various habitat types (mangrove, reef, seagrass, and coral), in varying salinity regimes and temperatures, and at various water depths, feed on a variety of fish species and crustaceans

INSECTS		Federal Status	State Status
Bay skipper	*Euphyes bayensis*		

apparently tidal sawgrass marsh only, probably covers same range of salinity as saw grass, nectarivore (butterfly), herbivore (caterpillar), larval foodplant is so far unconfirmed but is probably sawgrass, diurnal; two well separated broods apparently peaking in late May and in September which suggests the larvae may well aestivate in summer and the next brood hibernate

MAMMALS		Federal Status	State Status
Black bear	*Ursus americanus*	T/SA;NL	T

bottomland hardwoods and large tracts of inaccessible forested areas; due to field characteristics similar to Louisiana Black Bear (LT, T), treat all east Texas black bears as federal and state listed Threatened

Louisiana black bear	*Ursus americanus luteolus*	LT	T

possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas

Plains spotted skunk	*Spilogale putorius interrupta*		

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

Rafinesque's big-eared bat	*Corynorhinus rafinesquii*		T

roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

Red wolf	*Canis rufus*	LE	E

extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies

Southeastern myotis bat	*Myotis austroriparius*		

roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

MOLLUSKS		Federal Status	State Status
Creeper (squawfoot)	*Strophitus undulatus*		

small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins

JEFFERSON COUNTY

MOLLUSKS

		Federal Status	State Status
Fawnsfoot	*Truncilla donaciformis*		

small and large rivers especially on sand, mud, rocky mud, and sand and gravel, also silt and cobble bottoms in still to swiftly flowing waters; Red (historic), Cypress (historic), Sabine (historic), Neches, Trinity, and San Jacinto River basins.

Little spectaclecase	*Villosa lienosa*		

creeks, rivers, and reservoirs, sandy substrates in slight to moderate current, usually along the banks in slower currents; east Texas, Cypress through San Jacinto River basins

Louisiana pigtoe	*Pleurobema riddellii*		T

streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins

Sandbank pocketbook	*Lampsilis satura*		T

small to large rivers with moderate flows and swift current on gravel, gravel-sand, and sand bottoms; east Texas, Sulfur south through San Jacinto River basins; Neches River

Southern hickorynut	*Obovaria jacksoniana*		T

medium sized gravel substrates with low to moderate current; Neches, Sabine, and Cypress river basins

Texas heelsplitter	*Potamilus amphichaenus*		T

quiet waters in mud or sand and also in reservoirs. Sabine, Neches, and Trinity River basins

Texas pigtoe	*Fusconaia askewi*		T

rivers with mixed mud, sand, and fine gravel in protected areas associated with fallen trees or other structures; east Texas River basins, Sabine through Trinity rivers as well as San Jacinto River

Wabash pigtoe	*Fusconaia flava*		

creeks to large rivers on mud, sand, and gravel from all habitats except deep shifting sands; found in moderate to swift current velocities; east Texas River basins, Red through San Jacinto River basins; elsewhere occurs in reservoirs and lakes with no flow

Wartyback	*Quadrula nodulata*		

gravel and sand-gravel bottoms in medium to large rivers and on mud; Red, Sabine, Neches River basins

REPTILES

		Federal Status	State Status
Alligator snapping turtle	*Macrochelys temminckii*		T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Atlantic hawksbill sea turtle	*Eretmochelys imbricata*	LE	E

Gulf and bay system, warm shallow waters especially in rocky marine environments, such as coral reefs and jetties, juveniles found in floating mats of sea plants; feed on sponges, jellyfish, sea urchins, molluscs, and crustaceans, nests April through November

JEFFERSON COUNTY

REPTILES

		Federal Status	State Status
Green sea turtle	*Chelonia mydas*	LT	T

Gulf and bay system; shallow water seagrass beds, open water between feeding and nesting areas, barrier island beaches; adults are herbivorous feeding on sea grass and seaweed; juveniles are omnivorous feeding initially on marine invertebrates, then increasingly on sea grasses and seaweeds; nesting behavior extends from March to October, with peak activity in May and June

Gulf Saltmarsh snake *Nerodia clarkii*

saline flats, coastal bays, and brackish river mouthss

Kemp's Ridley sea turtle	*Lepidochelys kempii*	LE	E

Gulf and bay system, adults stay within the shallow waters of the Gulf of Mexico; feed primarily on crabs, but also snails, clams, other crustaceans and plants, juveniles feed on sargassum and its associated fauna; nests April through August

Leatherback sea turtle	*Dermochelys coriacea*	LE	E

Gulf and bay systems, and widest ranging open water reptile; omnivorous, shows a preference for jellyfish; in the US portion of their western Atlantic nesting territories, nesting season ranges from March to August

Loggerhead sea turtle	*Caretta caretta*	LT	T

Gulf and bay system primarily for juveniles, adults are most pelagic of the sea turtles; omnivorous, shows a preference for mollusks, crustaceans, and coral; nests from April through November

Northern scarlet snake	*Cemophora coccinea copei*		T

mixed hardwood scrub on sandy soils; feeds on reptile eggs; semi-fossorial; active April-September

Sabine map turtle *Graptemys ouachitensis sabinensis*

Sabine River system; rivers and related tributaries, ponds and reservoirs with abundant aquatic vegetation; basks on fallen logs and exposed roots; eats insects, crustaceans, mollusks, and aquatic plants; breeding and egg-laying March-May, with hatchlings appearing in early fall

Texas diamondback terrapin *Malaclemys terrapin littoralis*

coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier beaches; brackish and salt water; burrows into mud when inactive; may venture into lowlands at high tide

Texas horned lizard	*Phrynosoma cornutum*		T

open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September

Timber/Canebrake rattlesnake	*Crotalus horridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

JEFFERSON COUNTY

PLANTS

Federal Status State Status

Chapman's orchid *Platanthera chapmanii*

in Texas, appears restricted to wetland pine savannas and savanna swales in hillside seepage bogs, two very restricted and declining habitats in the State; flowering July-August

Florida ladies-tresses *Spiranthes brevilabris var. floridana*

Moist to wet, relatively open sites of pine-dominated landscapes, mesic pine uplands, open scrub pinelands with saw palmetto, Catahoula sandstone barrens, meadows, open grassy lawns, pitcher plant and seepage bogs, wet prairies, wet savannahs, and flatwoods. Delicate, nearly ephemeral, orchid with winter rosette. Flowers Apr-May.

APPENDIX D

PUBLIC COORDINATION

Public Notice

U.S. Army Corps Of Engineers Galveston District

Permit Application No: SWG-2007-00850
Date Issued: 5 December 2008
Comments Due: 6 January 2009

U.S. ARMY CORPS OF ENGINEERS, GALVESTON DISTRICT AND TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

PURPOSE OF PUBLIC NOTICE: To inform you of a proposal for work in which you might be interested. It is also to solicit your comments and information to better enable us to make a reasonable decision on factors affecting the public interest.

AUTHORITY: This application will be reviewed pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act.

APPLICANT: Jefferson County Drainage District No. 7
P.O. Box 3244
Port Arthur, Texas 77642-3244

AGENT: Horizon Environmental Services, Inc.
1507 South Interstate Highway 35
Austin, Texas 78741-2502
Telephone: 512-328-2430
POC: Mr. Lee Sherrod

LOCATION: The project is located at Alligator Bayou Pumping Station No. 16 (PS 16), at the confluence of Alligator Bayou and Taylors Bayou, approximately 2 miles southwest of Port Arthur, in Jefferson County, Texas. The project can be located on the U.S.G.S. quadrangle map entitled "Port Arthur South, Tex. – La." Approximate UTM Coordinates in NAD 27 (meters): Zone 15; Easting: 405150; Northing: 3303950. Directions to the site: from the intersection of Highway (Hwy) 73 and Hwy 82 in Port Arthur, proceed east on Hwy 82 for 1.36 miles to a private levee road. Proceed south on the private levee road for about 1 mile to the pump station.

PROJECT DESCRIPTION: The applicant proposes to add a low-flow pump station to the existing PS 16 in order to relieve shallow flooding within the 24,083-acre Jefferson County Drainage District No. 7 drainage area, and thereby prevent structure and road flooding. The project would allow PS 16 to pump water from the surrounding drainages within the contained drainage basin into Taylors Bayou more quickly and from a lower elevation. The proposed improvements to PS 16 would maintain continuous low flow, reduce flooding incidents, and provide backup capacity in the event that one or more of the existing pumps should become non-operational.

Approximately 970 linear feet of temporary steel sheet pile cofferdam would be installed around the Alligator Bayou and Taylors Bayou work area to allow for pump-out of water and work in the dry. Excavation of the site would be by bucket excavator, and all excavated material would be spread on uplands of the existing hurricane levee. Excavation of Taylors Bayou would permanently impact approximately 0.31 acre of existing open water. The adjacent herbaceous wetland (0.21 acre) lies above the ordinary high water mark of Taylors Bayou. Fill would be placed in 0.037 acre of Alligator Bayou open water to construct the northwest corner of the new concrete pump station. No other fill would occur in waters of the U.S. except for the short ends of the proposed wing walls where they extend into Alligator Bayou and Taylors Bayou. The new structure floor would be formed and poured concrete.

Alligator Bayou and the associated tributaries inside of the hurricane protection levees (upstream of the pumping station) are all maintained, trapezoidal drainage facilities that act as a linear detention basin for flood waters. These ditches have been deepened and leveed to add detention capacity for storm runoff. Due to the historic deepening and isolation by levees, these ditches do not support abutting or adjacent wetlands. The few remaining wetlands that exist within the hurricane levee protection area are depressions that derive hydrology from collection of precipitation. The lowering of the water level in Alligator Bayou or any of its tributaries would not affect any of these wetland areas.

The applicant has not proposed mitigation for regulated impacts in Taylors Bayou and Alligator Bayou, citing relatively low quality of the open water areas.

NOTES: This public notice is being issued based on information furnished by the applicant. The applicant's plans are enclosed in 4 sheets.

A preliminary review of this application indicates that an Environmental Impact Statement (EIS) is not required. Since permit assessment is a continuing process, this preliminary determination of EIS requirement will be changed if data or information brought forth in the coordination process is of a significant nature.

Our evaluation will also follow the guidelines published by the U.S. Environmental Protection Agency pursuant to Section 404 (b)(1) of the Clean Water Act (CWA).

OTHER AGENCY AUTHORIZATIONS: Texas Coastal Zone consistency certification is required. The applicant has stated that the project is consistent with the Texas Coastal Management Program goals and policies and will be conducted in a manner consistent with said program.

Although this project would result in a direct impact of three acres or less of waters of the state or 1,500 linear feet of streams (or a combination of the two is below the threshold), the best management practices (BMP's) available on the BMP checklist form are not applicable to this project. Therefore, Texas Commission on Environmental Quality (TCEQ) certification is required. Concurrent with processing of this application, the TCEQ is reviewing this application under Section 401 of the CWA and in accordance with Title 30, Texas Administrative Code Section 279.1-13 to determine if the work would comply with State water quality standards. By virtue of an agreement between the U.S. Army Corps of Engineers (Corps) and the TCEQ, this public notice is also issued for the purpose of advising all known interested persons that there is pending before the TCEQ a decision on water quality certification under such act. Any comments concerning this application may be submitted to the Texas Commission on Environmental Quality, 401 Coordinator, MSC-150, P.O. Box 13087, Austin, Texas 78711-3087. The public comment period extends 30 days from the date of publication of this notice. A copy of the public notice with a description of work is made available for review in the TCEQ's Austin office. The complete application may be reviewed in the Corps office listed in this public notice. The TCEQ may conduct a public meeting to consider all comments concerning water quality if requested in writing. A request for a public meeting must contain the following information: the name, mailing address, application number, or other recognizable reference to the application, a brief description of the interest of the requester, or of persons represented by the requester; and a brief description of how the application, if granted would adversely affect such interest.

NATIONAL REGISTER OF HISTORIC PLACES: The staff archaeologist has reviewed the latest published version of the National Register of Historic Places, lists of properties determined eligible, and other sources of information. The following is current knowledge of the presence or absence of historic properties and the effects of the undertaking upon these properties:

> The proposed work and/or structures are of such limited nature and scope that little likelihood exists for the proposed project to impinge upon a historic property, even if present within the affected area.

THREATENED AND ENDANGERED SPECIES: Preliminary indications are that no known threatened and/or endangered species or their critical habitat will be affected by the proposed work.

ESSENTIAL FISH HABITAT: This notice initiates the Essential Fish Habitat consultation requirements of the Magnuson-Stevens Fishery Conservation and Management Act. Our initial determination is that the proposed action would not have a substantial adverse impact on Essential Fish Habitat or federally managed fisheries in the Gulf of Mexico. Our final determination relative to project impacts and the need for mitigation measures is subject to review by and coordination with the National Marine Fisheries Service.

PUBLIC INTEREST REVIEW FACTORS: This application will be reviewed in accordance with 33 CFR 320-330, the Regulatory Programs of the Corps, and other pertinent laws, regulations and executive orders. The decision whether to issue a permit will be based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits, which reasonably may be expected to accrue from the proposal, must be balanced against its reasonably foreseeable detriments. All factors, which may be relevant to the proposal, will be considered: among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs and, in general, the needs and welfare of the people.

SOLICITATION OF COMMENTS: The Corps is soliciting comments from the public, Federal, State, and local agencies and officials, Indian tribes, and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Impact Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

This public notice is being distributed to all known interested persons in order to assist in developing facts upon which a decision by the Corps may be based. For accuracy and completeness of the record, all data in support of or in opposition to the proposed work should be submitted in writing setting forth sufficient detail to furnish a clear understanding of the reasons for support or opposition.

PUBLIC HEARING: Prior to the close of the comment period any person may make a written request for a public hearing setting forth the particular reasons for the request. The District Engineer will determine whether the issues are substantial and should be considered in the permit decision. If a public hearing is warranted, all known interested persons will be notified of the time, date, and location.

CLOSE OF COMMENT PERIOD: All comments pertaining to this Public Notice must reach this office on or before **6 January 2009**. Extensions of the comment period may be granted for valid reasons provided a written request is received by the limiting date. **If no comments are received by that date, it will be considered that there are no objections**. Comments and requests for additional information should be submitted to:

Denise Sloan
Regulatory Branch, CESWG-PE-RB
U.S. Army Corps of Engineers
P.O. Box 1229
Galveston, Texas 77553-1229
409-766-3962 Phone
409-766-6301 Fax

DISTRICT ENGINEER
GALVESTON DISTRICT
CORPS OF ENGINEERS

Federal Emergency Management Agency

PUBLIC NOTICE

Notice of Availability of the Draft Environmental Assessment for the Alligator Bayou Pump Station Expansion Project in Alligator Bayou Watershed
Port Arthur, Texas
Flood Mitigation Assistance Program

The Jefferson County Drainage District No. 7 (DD7) has applied to the Federal Emergency Management Agency (FEMA) for assistance with the construction of an additional low-flow pump station on the bank of Alligator Bayou opposite the existing Pump Station #16 at the outfall of Alligator Bayou into Taylors Bayou in Port Arthur, Texas in accordance with the National Environmental Policy Act of 1969 (NEPA), the Council for Environmental Quality (CEQ) regulations implementing regulations of NEPA (40 CFR Parts 1500 – 1508), the National Historic Preservation Act, and the implementing regulations of FEMA (44 CFR Parts 9 and 10). The drainage area flowing to PS 16 is estimated to be 24,083 acres, which includes Main A, Main B, Main C, West Port Arthur Road, Pear Ridge, Central, El Vista, Vista Village, and Montrose drainage areas contained within the hurricane protection levees for these communities. Pump Station #16 is one of the main components of the DD7 system, serving approximately 90,000 residents in the cities of Port Arthur, Port Neches, Groves, Nederland, and unincorporated areas of the county. This Notice of Availability also serves as the Initial Public Notice for work in the floodplain in accordance with 44 CFR Part 9.6. An Environmental Assessment (EA) is being prepared to assess the potential impacts of the proposed action on the human and natural environment.

The EA evaluates alternatives that provide for compliance with applicable environmental laws. The alternatives to be evaluated include (1) No Action; and, (2) The Proposed Action, the construction of an additional pump station.

The draft Environmental Assessment is available for review between March 9, 2008, and April 9, 2008, at the Beaumont Public Library located at 801 Pearl Street; at the Jefferson County Drainage District No. 7 Offices located at 4401 Ninth Avenue Port Arthur, Texas; and at the offices of Horizon Environmental Services, Inc., located at 1507 South IH 35, Austin, Texas.

Written comments regarding this proposed project can be mailed to C. Lee Sherrod, Horizon Environmental Services, Inc., 1507 South IH 35, Austin, Texas 78741. Electronic comments can also be submitted to lee_sherrod@horizon-esi.com. Comments should be received no later than 5 p.m. on April 9, 2008.

_____
Phil Kelly, General Manager

Federal Emergency Management Agency
PUBLIC NOTICE
Notice of Availability of the Final Environmental Assessment (EA)
and
Finding of No Significant Impact (FONSI)
Alligator Bayou Pump Station Expansion Project
Hazard Mitigation Grant Program
Port Arthur, Texas,

Interested persons are hereby notified that the Federal Emergency Management Agency (FEMA) is proposing to assist in funding the construction of an additional low-flow pump station on the bank of Alligator Bayou opposite the existing Pump Station #16 (PS 16) at the outfall of Alligator Bayou into Taylors Bayou in Port Arthur, Texas. In accordance with the National Environmental Policy Act (NEPA) of 1969, National Historic Preservation Act (NHPA), Executive Order 11988, Executive Order 11990, and the implementing regulations of FEMA, an environmental assessment (EA) was prepared to assess the potential impacts of the Proposed Action on the human and natural environment. This announcement also provides public notice for work within the regulated floodplain, in accordance with Executive Orders 11988 and 11990 and 44 CFR Part 9.12. The draft EA was released for public comment on March 9, 2008. No comments were received during the 30-day public comment period. The EA has been finalized and a Finding of No Significant Impact (FONSI) has been made.

The reasons for the decision not to prepare an Environmental Impact Statement (EIS) are as follows:

1. No significant adverse environmental impacts have been identified to existing land use, water resources (surface water, groundwater, waters of the United States, wetlands, and floodplains), air quality, noise, biological resources (vegetation, fish and wildlife, State- and Federally-listed threatened or endangered species and critical habitats), safety, hazardous materials and waste, or cultural resources; no disproportionately high or adverse effects on minority or low-income populations would occur, and;

2. The project is necessary to meet the needs of the citizens of the local community.

No further environmental review of this project is proposed to be conducted prior to the release of FEMA funds. Copies of the Final EA and FONSI can be obtained by contacting: Donald R. Fairley, REM, FEMA Regional Environmental Officer, 800 North Loop 288, Denton, TX 76201-3698, or at Donald.Fairley@dhs.gov. The FONSI is also available on the World Wide Web on the FEMA website at http://www.fema.gov/ehp/docs.shtm.

APPENDIX E

MITIGATION, INCREMENTAL ANALYSIS, MONITORING, AND ADAPTIVE MANAGEMENT PLANS

APPENDIX E

MITIGATION, INCREMENTAL ANALYSIS, MONITORING, AND ADAPTIVE MANAGEMENT PLANS

FOR

CONSTRUCTION OF A NEW PUMP STATION
ALLIGATOR BAYOU PUMP STATION NO. 16,
PORT ARTHUR AND VICINITY, TEXAS,
HURRICANE FLOOD PROTECTION PROJECT,
PORT ARTHUR, JEFFERSON COUNTY, TEXAS

PREPARED FOR:

JEFFERSON COUNTY DRAINAGE DISTRICT NO. 7

AND

U.S. ARMY CORPS OF ENGINEERS

NOVEMBER 2012

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1.0 INTRODUCTION AND PROPOSED PROJECT DESCRIPTION

The Proposed Project would provide for improvements to the existing Alligator Bayou pump station, Pump Station (PS) 16, located at the confluence of the Taylors and Alligator Bayous in Jefferson County, Texas. The existing pump station is operated and maintained by Jefferson County Drainage District No. 7 (DD7), and is part of the larger Port Arthur and Vicinity Hurricane Flood Protection Project (Hurricane Flood Protection Project), a levee system with pump stations that protect Port Arthur and surrounding communities and industry. The proposed improvement would add an additional pump station on the south bank of Alligator Bayou opposite PS16 (Attachment A). Project construction would impact 1.3 acres of fringe wetlands and shallow open water along Taylors and Alligator Bayous. Mitigation for unavoidable impacts resulting from the proposed improvements would be accomplished by creating 1.8 acres of tidal marsh dominated by *Spartina alterniflora* behind a recently constructed rock breakwater along the west shoreline of the Taylors Bayou Diversion Channel (Figure 1). A Habitat Evaluation Procedure (HEP) analysis was performed to support this mitigation plan.

Recent guidance issued by the USACE requires monitoring for mitigation plans, updates previous requirements, and supplements regulatory guidelines. Mitigation guidance includes:

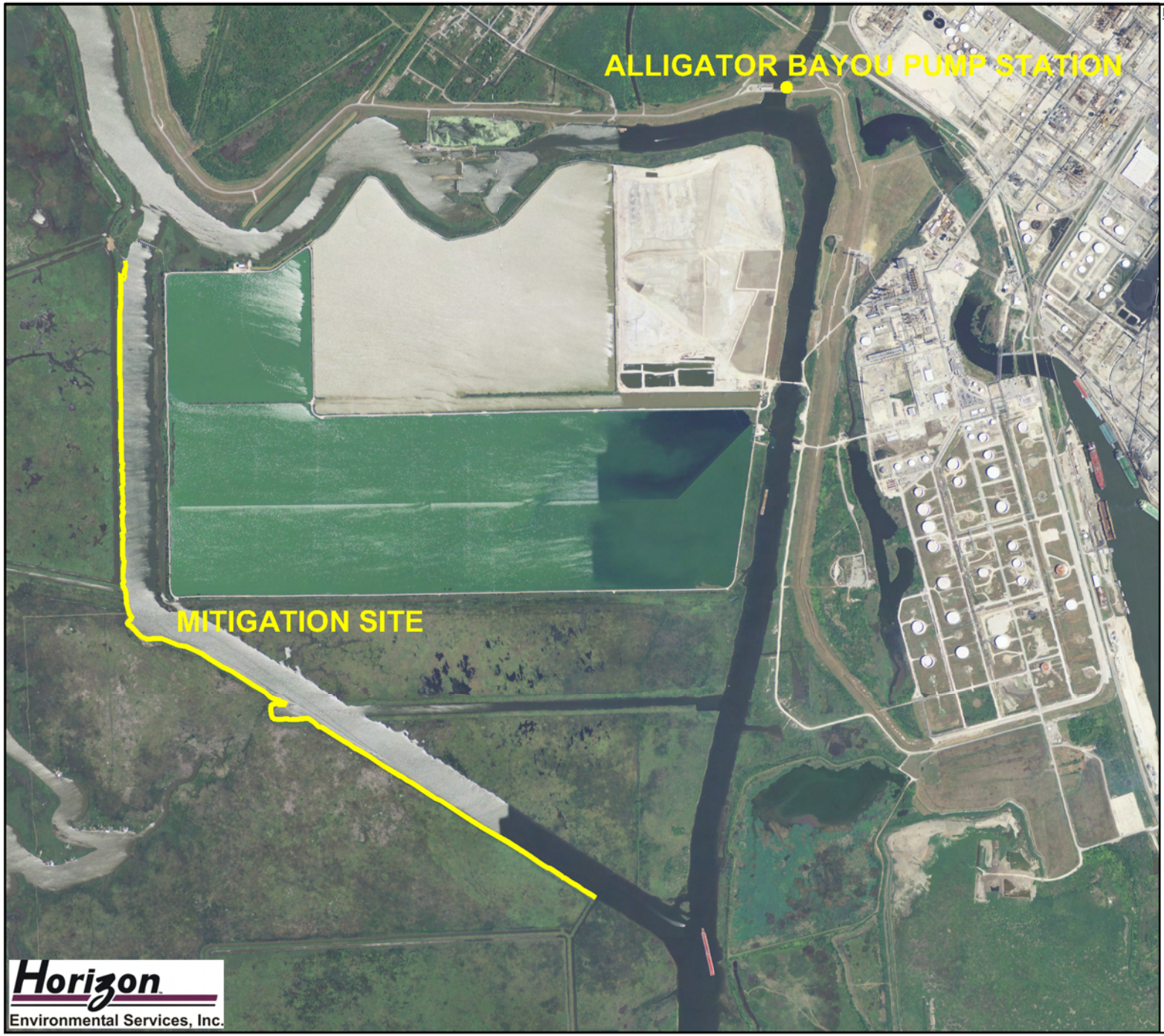
- Memorandum for Commanders, Major Subordinate Commands, Subject: implementation Guidance for Section 2036 (a) of the Water Resources Development Act of 2007 (WRDA 07) – Mitigation for Fish & Wildlife and Wetland Losses, CECW-PC, dated 31 August 2009.
- Section 906(d) of the Water Resources Development Act 1986 (33 USC 2283 (d)), as amended.
- ER 1105-2-100 dated 22 April 2000, Planning Guidance Notebook.
- Compensatory Mitigation for Losses of Aquatic Resources; Final Rule; Federal Register, Volume 73, No. 70, April 10, 2008.
- Conference Report to Accompany H.R. 14945, Report 110-280, dated July 31, 2007, Joint Explanatory Statement of the Committee of Conference.

2.0 PURPOSE

This document describes the monitoring and contingency/adaptive management plans as required by the Section 2036 guidance referenced above for mitigation proposed for alterations to the Alligator Bayou Pump Station. The monitoring plan described in this document is conceptual, and is based on the net functional costs of unavoidable resource impacts and the functional benefits of proposed in-kind mitigation as evaluated using species HEP modeling.

"Do Not Scale This Drawing"

060108A67PA_Breakwater.dwg | JEA | 10/19/2012



MAP SOURCE:
NATIONAL AGRICULTURAL IMAGERY PROGRAM (NAIP);
BIG HILL BAYOU, TEXAS QUADRANGLE (NE QUARTER; 2010)
PORT ARTHUR SOUTH, TEXAS QUADRANGLE (NW QUARTER; 2010)

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Horizon Environmental Services, Inc.

FIGURE 1

MITIGATION SITE
ALLIGATOR BAYOU
PUMP STATION
JEFFERSON COUNTY,
TEXAS

This document provides the mitigation, monitoring, and contingency/adaptive management plan to offset impacts associated with the construction of an additional pump station adjacent to Pump Station No. 16 at the confluence of Taylors Bayou and Alligator Bayou in Jefferson County. The existing pump station is operated and maintained by Jefferson County Drainage District No. 7 (DD7). The proposed alterations and mitigation plan have been previously approved under USACE Permit SWG-2007-00850.

3.0 MITIGATION PLAN

Section 2036 (a) guidance of WRDA 07, issued August 31, 2009, requires that the General Reevaluation Report and Preliminary Draft Supplemental Environmental Impact Statement contain a specific plan to mitigate unavoidable impacts to fish and wildlife resources. Adverse impacts to these resources must be avoided or minimized to the extent practicable, and the remaining unavoidable impacts must be compensated to the extent justified.

3.1 MITIGATION PLANNING OBJECTIVES

Paragraph C-3(e)(8)(a)(3) of ER 1105-2-100 requires the development of planning objectives to guide mitigation plan formation, to determine the appropriate mitigation management features, and to establish performance standards for evaluating each increment of mitigation management. The following mitigation planning objectives were established to evaluate restoration and mitigation measures considered for the project.

- Replace lost habitat quality at no less than a one-to-one basis as measured by Average Annualized Habitat Units (AAHUs) for a minimum of 0.02 AAHUs of wetlands.
- Replace habitat in-kind to the maximum extent practicable.
- Contribute to shoreline stabilization and restore habitat along the Taylors Bayou Diversion Channel shoreline, and reduce saltwater intrusion into the J.D. Murphree Wildlife Management Area.
- Meet goal of no net loss of wetlands.

3.2 COMPARISON OF THE MITIGATION PLAN WITH PLANNING OBJECTIVES

In-kind compensatory mitigation for unavoidable project impacts to 0.02 AAHUs of tidal wetlands would be accomplished by planting *Spartina alterniflora* within an approximate 1.8-acre site behind a recently constructed rock breakwater along the west shoreline of the Taylors Bayou Diversion Channel. The mitigation site is currently owned by Jefferson County Drainage District No. 6 (DD6). DD6 recently constructed the breakwater to reduce erosion of existing levees along the shoreline that was threatening saltwater intrusion into the J.D. Murphree Wildlife Management Area, owned and managed by Texas Parks and Wildlife Department (TPWD). Dense marsh development and maturation along this shoreline is desired by TPWD to further stabilize the eroded areas and to restore habitat conditions along an otherwise barren shoreline. The 1.8 acres of compensatory mitigation would provide for 0.16 AAUs over the 50-year period of analysis, providing overall benefits of 0.14 AAHUs in excess of the 0.02

AAHUs associated with the 1.3 acres of impacts, supporting the goal of no-net-loss of wetlands in terms of both function and acres.

3.3 COST EFFECTIVENESS AND INCREMENTAL COST ANALYSIS

Five alternative mitigation plans were considered. Purchase of credits from a coastal marsh ecosystem mitigation bank, the proposed mitigation plan, the previously approved mitigation plan, a Nueces River estuary mitigation plan, and the no-action alternative were evaluated.

Purchase Credits from a Mitigation Bank

There are currently no mitigation banks that service the project area that have coastal herbaceous wetland credits. This alternative was dropped from further consideration.

Proposed Mitigation Plan

The proposed mitigation plan will aid in stabilization and hasten the restoration of the eroding western shoreline of the Taylors Bayou Diversion Channel adjacent to the J.D. Murphree Wildlife Management Area. Planting will occur in the area behind a recently constructed breakwater that is currently sparsely vegetated (approximately 5%). Dense vegetation along this shoreline is desired by TPWD to further stabilize the eroded areas and to restore habitat conditions along an otherwise barren shoreline. The goal of the mitigation will be the restoration of 1.8 acres of estuarine marsh on the potentially erosive edges of the diversion channel. The planting of marsh vegetation will significantly aid stabilization of erosive channel edges and hasten marsh development and maturation with a resultant increase in the functional values of the entire area. The cost to implement this plan, including a 5-year monitoring period and invasive species controls was estimated at $23,000. HEP analysis of this mitigation scenario resulted in a gain of 9 HUs in the first year.

Previously Approved Mitigation Plan

The originally approved mitigation plan included the preservation of a 3-acre area containing forested wetlands and upland buffer areas adjacent to a 1955-acre dedicated preservation site upstream on Taylors Bayou. While this area has been considered very high value for preservation by the resource agencies, it is out-of-kind compensation for the project impacts. The only improvement that could be demonstrated for this mitigation site was invasive species control. The cost of the mitigation plan was $30,000 and a gain of only 1 HU was demonstrated for the first year due to management actions.

Nueces River Estuary Mitigation Plan

Mitigation opportunities are available in the lower Nueces River estuary on either private or public properties. The opportunities include planting of marsh grass on recently deposited dredged materials under beneficial use scenarios. The beneficial gains for this type of mitigation would be very

similar to the gains for the proposed mitigation (9 HU) in the first year. The cost for this scenario is estimated at $35,000 due to the added cost of land acquisition and/or environmental easement acquisition. This mitigation is in-kind, but is outside of the Taylors Bayou watershed.

No Action Alternative

The no-action alternative (no mitigation) is not acceptable because it does not achieve the goals of the proposed project and does not meet the guidelines in ER 1105-2-100.

Incremental Cost Analysis

An incremental cost analysis of the proposed mitigation plan, the previously-approved mitigation plan, and a third alternative (purchase of mitigation land in the Neches River estuary) was conducted using the USACE Institute for Water Resources Planning Suite (IWR Plan) guidance and software.

Of the plans analyzed in the IWR Plan, only the proposed plan and the no-action plan were indicated as Best-Buys (Table 1).

Table 1: Plan Analysis

Plan Name	Cost ($1000)	Output (HUs)	Cost Effective
No Action Plan	0	0	Best Buy
Proposed Mitigation Plan	23	9	Best Buy
Previously Approved Plan	30	1	No
Nueces River Estuary Plan	35	9	No

The total and average costs of the plans are shown in Table 2.

Table 2: Total and Average Cost

Plan Name	Cost ($1000)	Output (HUs)	Average Cost
No Action Plan	0	0	0
Proposed Mitigation Plan	23	9	2.56
Previously Approved Plan	30	1	30.0
Nueces River Estuary Plan	35	9	3.89

Table 3 shows the incremental cost of the two best buy plans.

Table 3: Incremental Cost of Best Buy Plans

Plan Name	Output (HU)	Cost ($1000)	Average Cost ($1000/HU)	Incremental Cost ($1000)	Inc. Output (HU)	Inc. Cost Per Output
No Action Plan	0.00	0.00				
Proposed Plan	9.00	23.00	2.5556	23.0000	9.0000	2.5556

Figure 2 indicates the Cost effectiveness of each of the plans. The previously approved plan and Nueces River Estuary plan are considered non cost effective. Figure 3 is a representation of the incremental cost and output for the only Best Buy plan, the proposed mitigation plan.

The results of the analysis indicate that the proposed mitigation plan is the best option to compensate for loss of aquatic resources.

Figure 2:

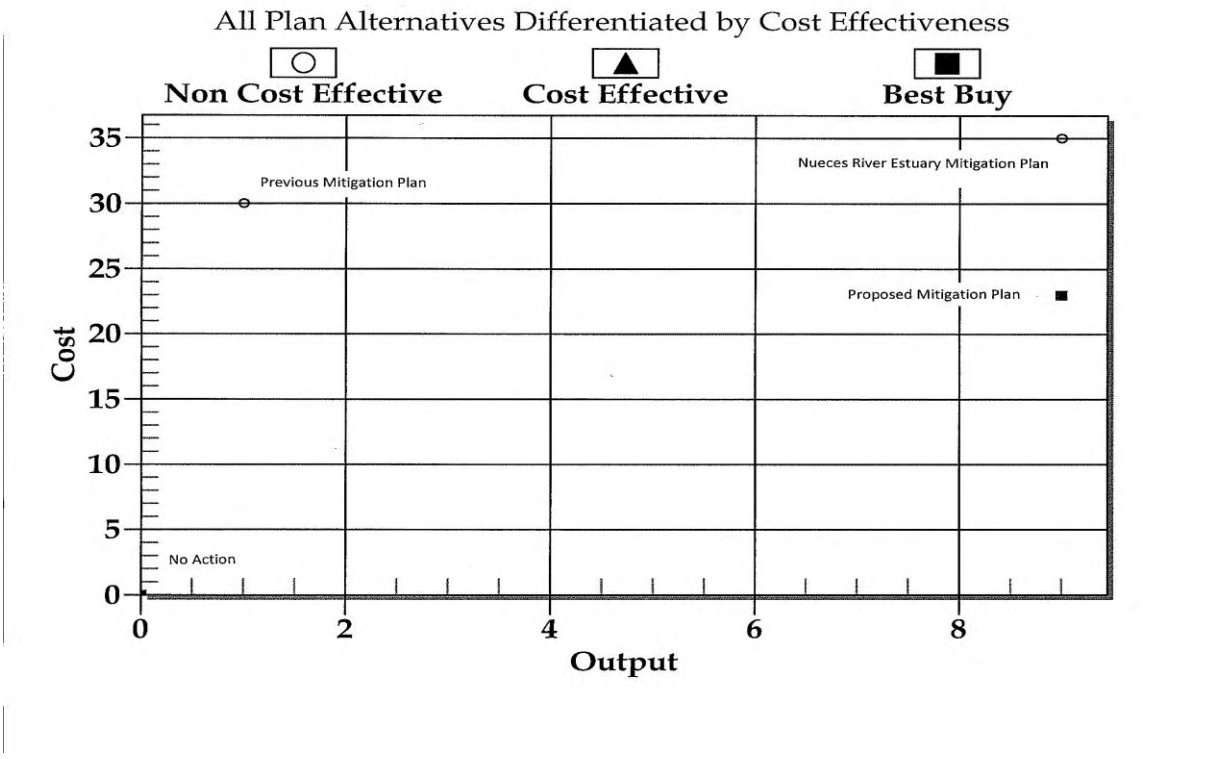
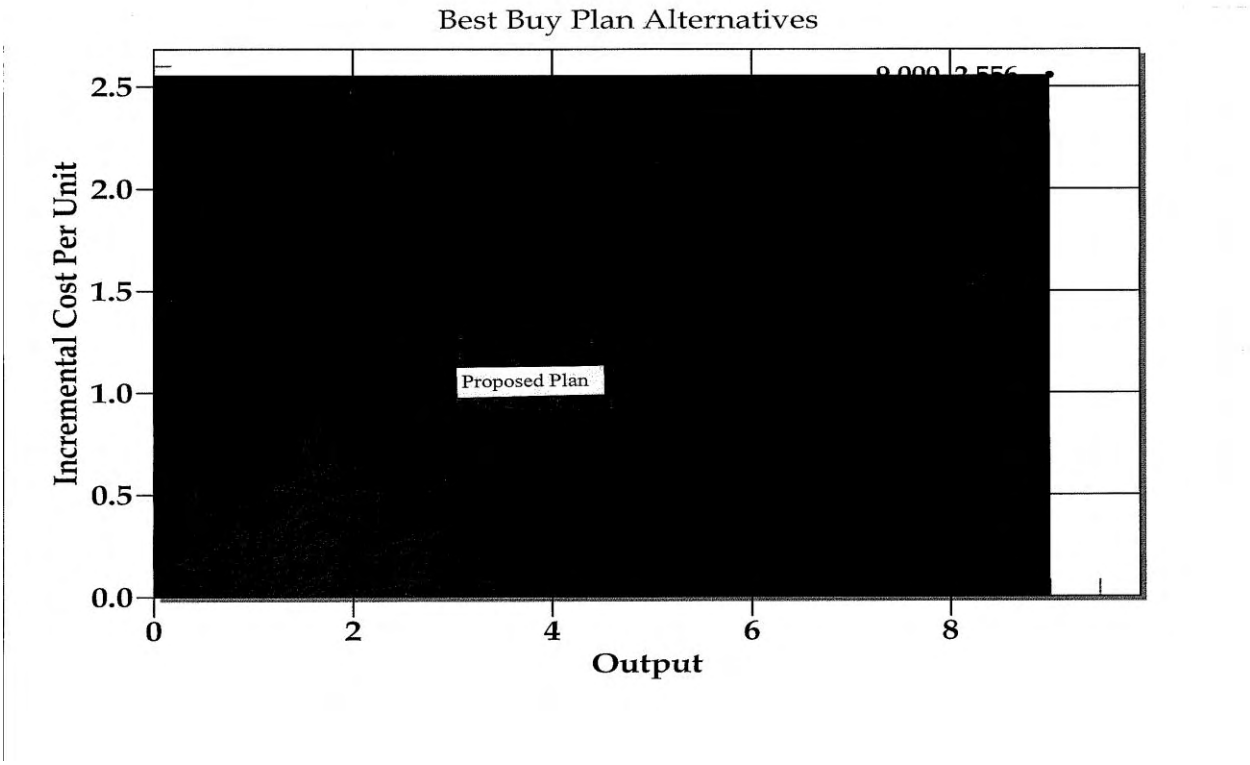


Figure 3:



4.0 IMPLEMENTATION

4.1 MITIGATION PLAN

The mitigation site is currently a shallow open water area approximately 6 feet wide located behind a recently constructed 2.5-mile-longrock breakwater (Figure 4). The proposed planting area is currently sparsely vegetated (approximately 5%) with smooth cordgrass (*Spartina alterniflora*), common reed (*Phragmites australis*), and saltmarsh bulrush (*Scirpus robustus*) (see photos in Attachment B). Restoration of 1.8 acres of intertidal herbaceous wetlands would be accomplished by planting 8,712 plants or sprigs of emergent tidal marsh plants, predominantly smooth cordgrass (Spartina alterniflora), on 3 ft-centers in the area behind the breakwater to provide enhanced stabilization of the shoreline and restore marsh habitat.

Smooth cordgrass was determined to be the best species for planting at this site due to its salt tolerance and rapid growth capabilities. Other species that could be planted may include saltmarsh bulrush (*Scirpus robustus*), bulltongue (*Sagittaria lancifolia*), black rush (*Juncus roemerianus*), and giant bulrush (*Schenoplectis californicus*). These plant species are also salinity tolerant and provide wildlife food and/or cover benefits. All plant species under consideration for planting are present in nearby marshes, which would facilitate transplantation. Plants would be transplanted from nearby donor areas as bare-root individual stems, or 2-inch or larger plugs.

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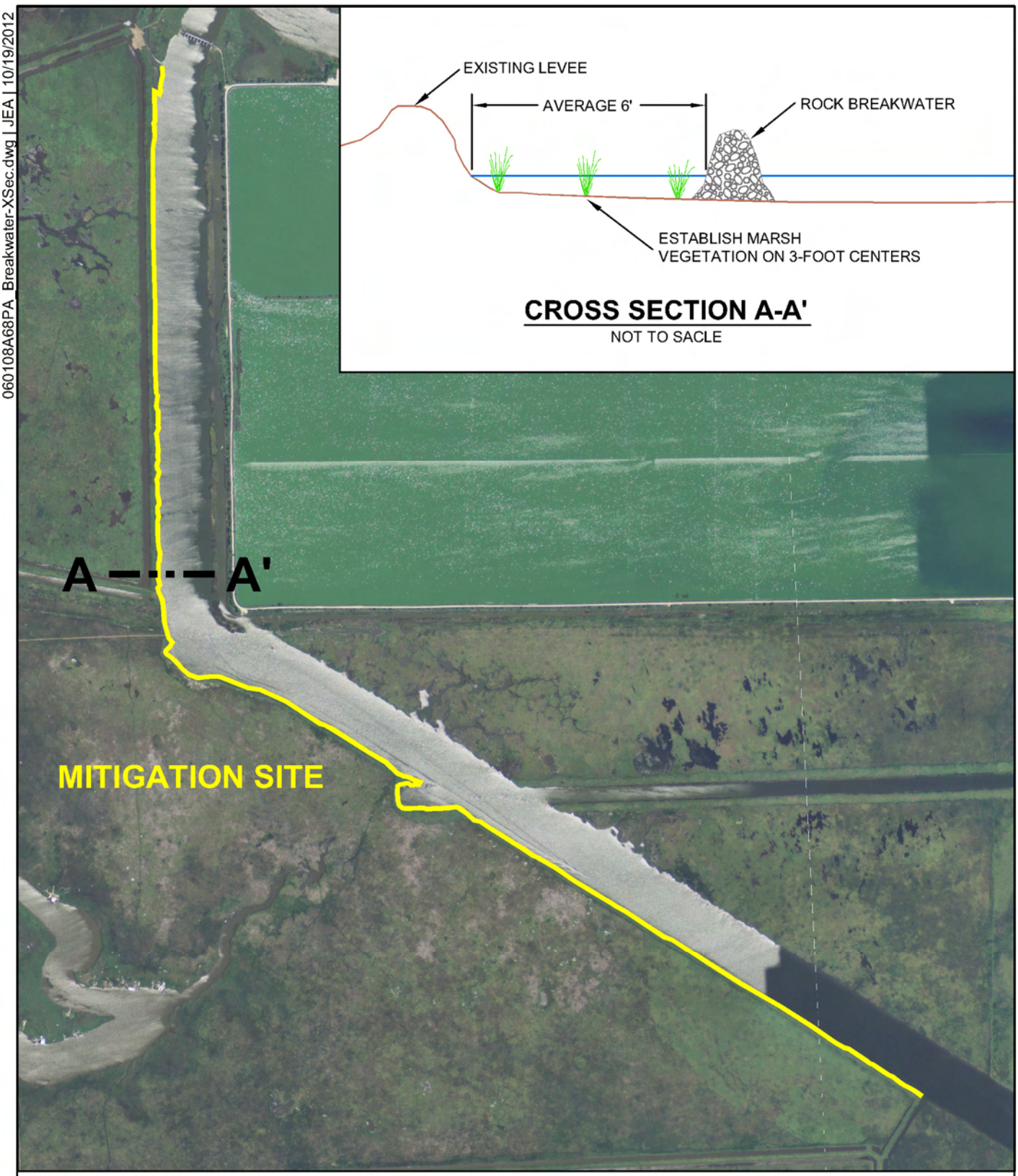

MAP SOURCE:
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PORT ARTHUR SOUTH, TEXAS QUADRANGLE (NW QUARTER; 2010)

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Horizon Environmental Services, Inc.

FIGURE 2

MITIGATION SITE AND CROSS SECTION
ALLIGATOR BAYOU PUMP STATION
JEFFERSON COUNTY, TEXAS

"Do Not Scale This Drawing"

A mitigation access agreement between DD6 and DD7 would be initiated concurrent with start of site construction activities that result in impacts to waters of the US. Mitigation planting would be anticipated to occur in the spring of 2013 (March to May) depending on schedule of permit approval and commencement of construction in jurisdictional areas. It is estimated that the planting effort would take approximately one week to complete.

4.2 MAINTENANCE PLAN

Due to the presence of Chinese tallow, cattails, and common reed (*Phragmites australis*), in adjacent areas, the restored marsh would be closely monitored for the presence of these species. Invading non-desirable species would be treated with careful annual herbicide application during the annual site inspections. Although not currently present in numbers that represent a problem, the following species are also deemed to be potential nuisance species within the mitigation site: black willow (*Salix nigra*), eastern false-willow (*Baccharis halimifolia*), giant salvinia (*Salvinia molesta*), and deep-rooted sedge (*Cyperus enterianus*). If annual monitoring determines that their populations represent a discernible percentage of the total vegetative cover, these species would also be controlled with herbicide application. Other than invasive species control, no other significant maintenance requirements are expected; the mitigation site should be a generally self-sustaining marsh protected by the rip rap breakwater.

A mitigation access agreement between DD6 and DD7 would be initiated concurrent with start of site construction activities that result in impacts to waters of the US. Mitigation planting would be anticipated to occur in the spring of 2013 (March to May) depending on schedule of permit approval and commencement of project construction. It is estimated that the planting effort would take approximately one week to complete.

4.3 MONITORING PLAN

Monitoring mitigation is a critical part of the mitigation process. The purpose of monitoring is to: obtain an objective assessment of project progress towards pre-determined project goals and success criteria; identify and correct problems through an adaptive management approach; and ensure that USACE Galveston District and the non-Federal sponsor meet their mitigation obligations.

4.3.1 Ecological Performance Standards

Performance standards establish the basis for determining the ecological success of mitigation measures. Success criteria are used to objectively evaluate the progress of mitigation plans in achieving predetermined objectives, and to determine whether corrective actions need to be implemented. Because habitat functions are difficult to measure directly, success criteria may be based on an assessment of the structural attributes of restored habitats and evaluated according to the best available scientific understanding of the relationship of these attributes with ecosystem functioning. In this way, structural attributes serve as surrogate measures of habitat function. Once site conditions have met or surpassed predetermined structural thresholds, it is assumed that the desired functions are either currently being provided or will be provided given time. Success criteria for the proposed mitigation would pertain to

percent survival of plantings, control of invasive, noxious, and/or exotic plant species, and vegetative cover requirements.

Field data would be collected to determine the percent survival of vegetation planted within 60 days and 5 and 10 years. Success criteria for plant survivorship target is a minimum survivorship of 75 percent of the original planting density at 60 days post planting and 50 percent of original planting density at 1 year after the initial planting. This criterion ensures that the mitigation areas will have the requisite acres of desired vegetation. Invasive, noxious, and/or exotic plant species shall comprise less than 5 percent areal coverage of mitigation sites and will be measured annually for 5 years after construction. This criterion ensures that the mitigation areas will not be overrun by invasive, noxious, and/or exotic plants before native vegetation has developed sufficient cover to prevent the establishment of these undesired plant species. To evaluate vegetative cover requirements, percent foliar cover will be measured annually for 5 years following construction. This criterion ensures that the mitigation sites will provide sufficient vegetative cover for the full period of analysis to produce the total benefits needed to mitigate for project impacts.

4.3.2 SUCCESS CRITERIA

1. Minimum plant survivorship shall be 75 percent of the original planting density at 60 days post planting and 50 percent of original planting density at 1 year after the initial planting.

2. Desirable species shall achieve a minimum aerial coverage of 80% within 5 growing seasons following the initial planting.

3. Invasive/Non-native species would not consist of more than 5 percent of the aerial coverage per acre. Invasive or non-native species are to be considered, but not limited to: common reed, Chinese tallow, cattail, eastern false-willow, giant salvinia, deep-rooted sedge, and black willow.

4.3.3 MONITORING REQUIREMENTS

Vegetation sampling procedures approved by the USACE to annually survey and document the percent survival of planted vegetation and the aerial coverage of noxious plant species will be used to survey, document, and report the survival of planted vegetation at the mitigation site. This monitoring information must be submitted to the USACE in an annual report, that would include, but not be limited to: percent aerial coverage per acre of desirable species, percent aerial coverage per acre of invasive/non-native plant species, and photos of the mitigation site. In addition to the initial survey report, monitoring reports would be submitted to the USACE District Engineer bi-annually for the first year following the initial transplanting effort and annually for the next four years. This would be a total of five years.

4.3.4 CONTINGENCY PLAN AND ADAPTIVE MANAGEMENT

The following contingency plan has been developed to guide corrective actions where monitoring demonstrates that mitigation is not achieving ecological success as measured by the success criteria. If monitoring determines that the vegetation survival, coverage, and composition do not meet ecological success criteria, planting would be employed to restore the requisite acres of to produce the total benefits needed to mitigate for project impacts as follows:

1. A transplant survival survey of the planted mitigation area would be performed within 60 calendar days following the conclusion of the initial planting effort. If at least 75% survival of transplants is not achieved within 60 calendar days of planting, a second planting effort would be completed within 60 calendar days of completing the initial survival survey. If optimal seasonal requirements for replanting desirable species are not suitable when replanting would be required, the USACE must approve all replanting schedules.

2. If, after one year from the initial planting effort (or subsequent planting efforts), the site does not have at least 50% aerial coverage of desirable species that are not considered invasive or non-native, an additional planting effort would be completed within 60 calendar days of completing the annual survey.

3. If the mitigation area has been determined to be unsuccessful by USACE, the sponsor would be required to take the necessary corrective measures, as approved by USACE, to correct the failed components of the mitigation plan within 6 months of this determination. Once the corrective measures were completed, the sponsor would notify USACE and the monitoring process would start over. This 5-year cycle would continue until the mitigation project is considered successful. The number, species, spacing, and location of vegetation to be re-planted would be determined after reviewing monitoring data. Additional or alternate methods for addressing the control of invasive, noxious, and/or exotic plant species would be developed if monitoring reveals that the proposed methods for control do not achieve the desired or target level specified in the success criteria, or if the methods prove to be highly successful and invasive species control could be performed less frequently using the same or different methods to save costs.

4. The sponsor may choose to cease monitoring of the mitigation area and provide an alternative mitigation plan. This alternative mitigation plan would consist of preservation, enhancement, and/or mitigation banking. The alternative mitigation plan would mitigate the failure of the 1.8 acre mitigation area, must be approved by USACE, and must be implemented within 6 months of approval.

Should the mitigation area be damaged as a result of catastrophic disturbance events (e.g., severe flooding associated with intense storms and hurricanes), an assessment of the nature and extent of the damage and recommend measures to correct or restore the mitigation areas to pre-damage or target conditions would be made.

4.3.5 PROJECT CLOSURE

Monitoring activities will cease and the project will be formally closed when it is determined that the desired mitigation site conditions have met the monitoring ecological success criteria as specified above. The contingency plan/adaptive management process described above is intended to allow periodic modifications in order to achieve the necessary functional mitigation for project impacts at the end of the period of analysis and ensure that the presence of undesirable vegetation is minimized. Evaluation of the data collected during the last scheduled annual report will determine if it is appropriate to close monitoring of the mitigation features. Monitoring would continue until it has been demonstrated that the mitigation has met the ecological success criteria as documented by the District Engineer and determined by the Division Commander.

ATTACHMENT A

ALLIGATOR BAYOU PUMP STATION PROJECT PLANS

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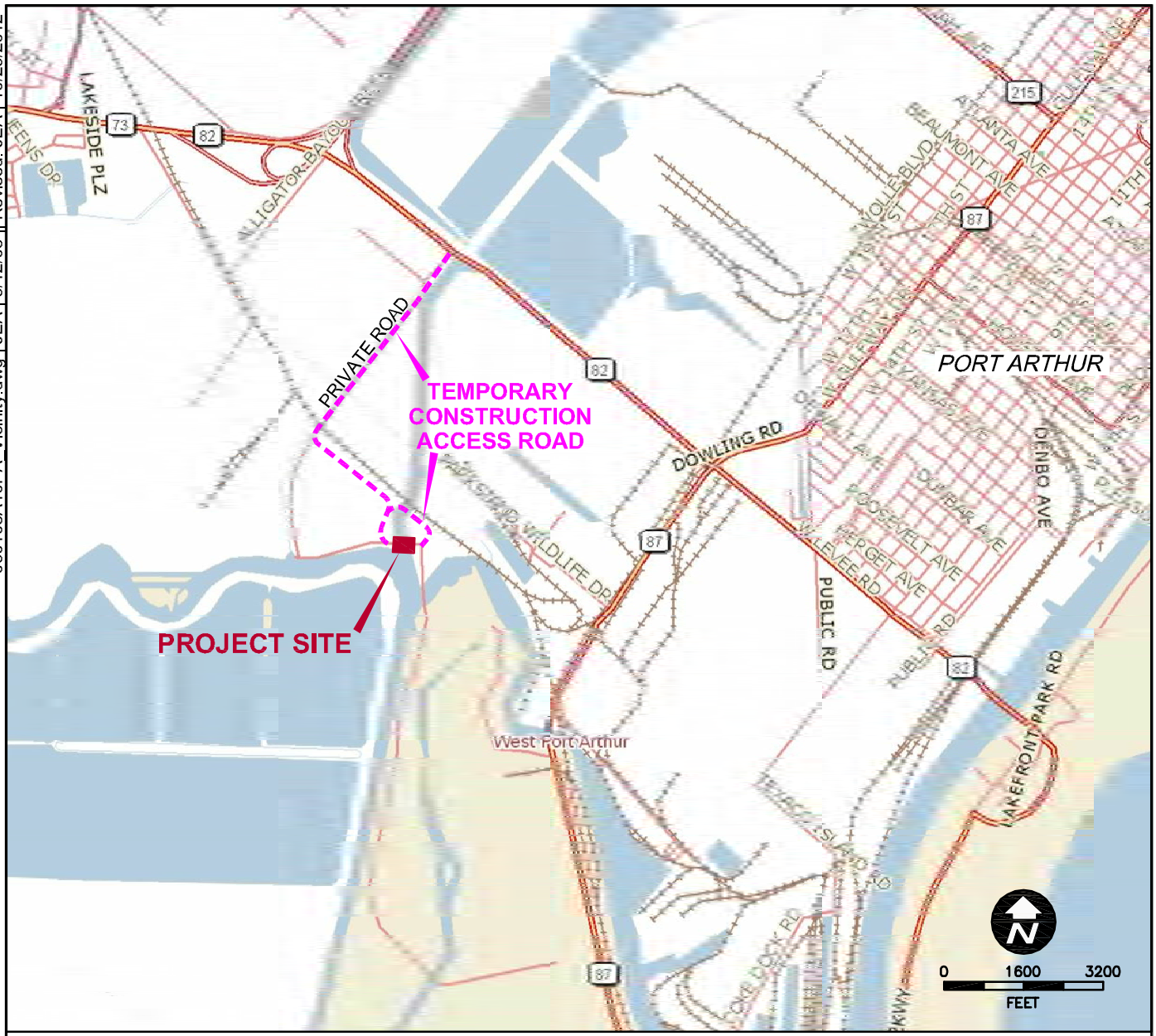
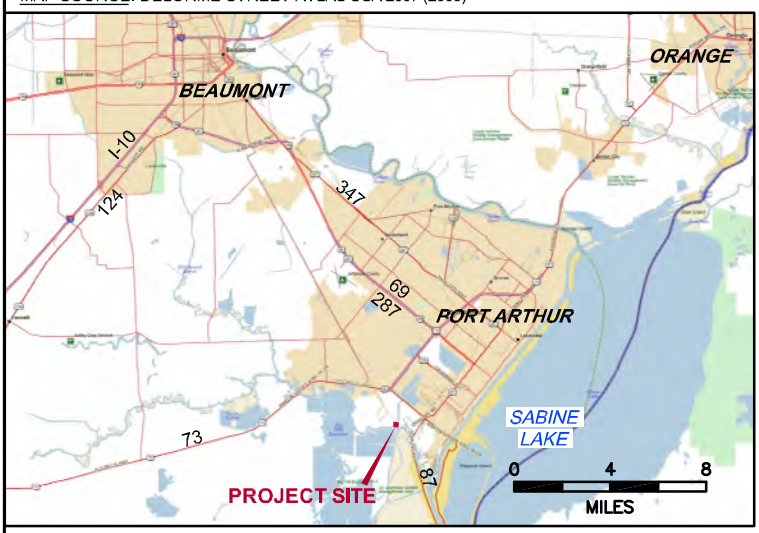


MAP SOURCE: DELORME STREET ATLAS USA 2007 (2006)



MAP SOURCE: DELORME STREET ATLAS USA 2007 (2006)

FIGURE 1

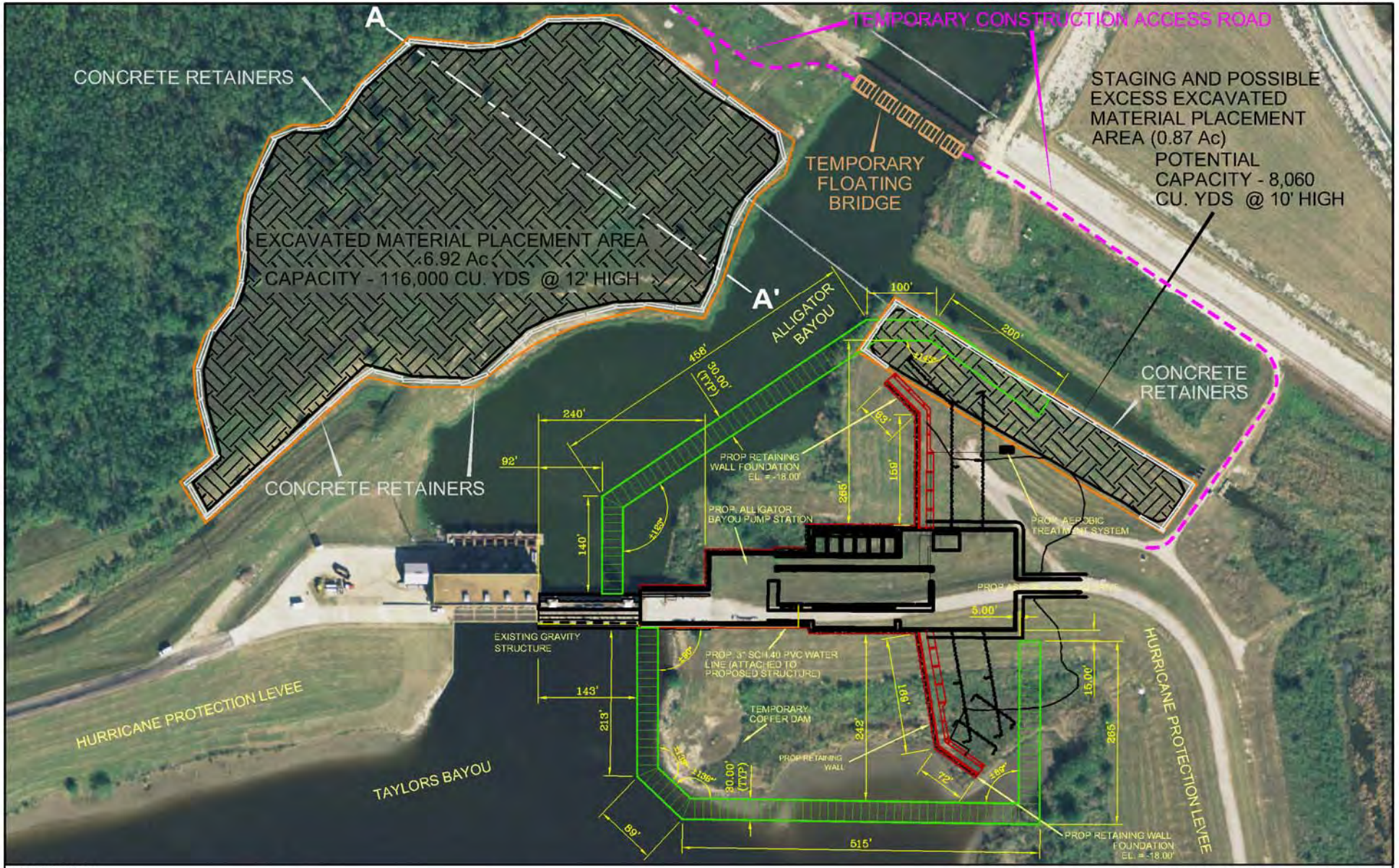
VICINITY MAP
PROPOSED PUMP STATION
CONSTRUCTION OF A NEW PUMP STATION
ALLIGATOR BAYOU PUMP STATION #16
CONFLUENCE OF ALLIGATOR BAYOU
AND TAYLORS BAYOU
PORT ARTHUR, JEFFERSON COUNTY, TEXAS

Horizon Environmental Services, Inc.

"Do Not Scale This Drawing"

"Do Not Scale This Drawing"

060108A21PA_Plan.dwg | JEA | 12/5/2011 || Revised: JEA | 10/31/2012



MAP SOURCE:

1. PROVIDED BY CARROLL & BLACKMAN, INC. (2008)
2. 2006 AERIAL: JEFFERSON COUNTY DRAINAGE DISTRICT (2008)

Horizon Environmental Services, Inc.

0 100 200 FEET

FIGURE 4

PLAN VIEW OF PROPOSED PUMP STATION
CONSTRUCTION OF A NEW PUMP STATION
ALLIGATOR BAYOU PUMP STATION #16
CONFLUENCE OF ALLIGATOR BAYOU
AND TAYLORS BAYOU
PORT ARTHUR, JEFFERSON COUNTY, TEXAS

"Do Not Scale This Drawing"

060108A26PA_Plan.dwg | JEA | 10/31/2012

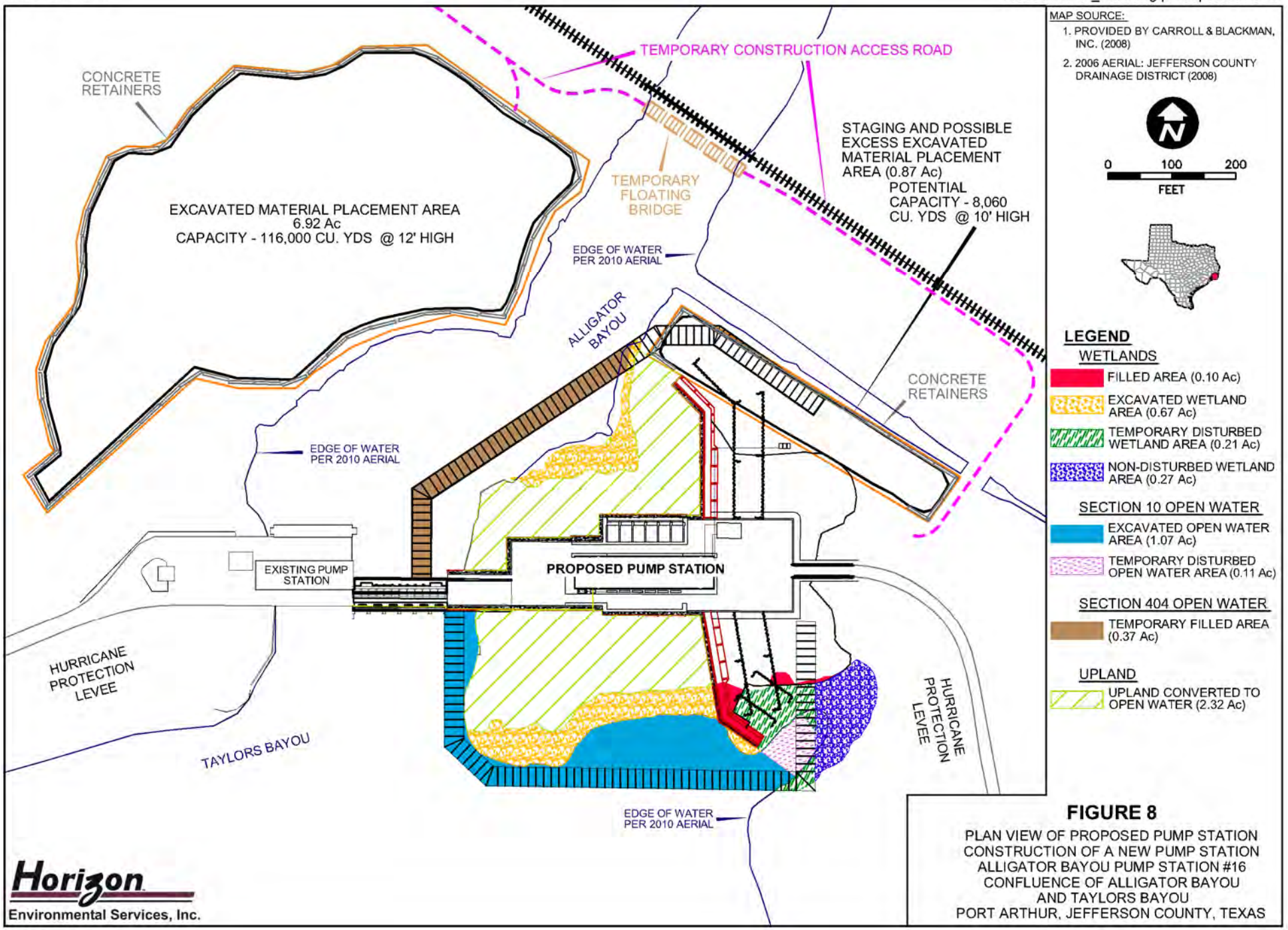


FIGURE 8

PLAN VIEW OF PROPOSED PUMP STATION
CONSTRUCTION OF A NEW PUMP STATION
ALLIGATOR BAYOU PUMP STATION #16
CONFLUENCE OF ALLIGATOR BAYOU
AND TAYLORS BAYOU
PORT ARTHUR, JEFFERSON COUNTY, TEXAS

Horizon
Environmental Services, Inc.

ATTACHMENT B

MITIGATION SITE PHOTOS

Photo 1: Bank of Taylors Bayou Diversion Channel

Photo 2: Bank of Taylors Bayou Diversion Channel

APPENDIX F

RELATIVE SEA LEVEL RISE CALCULATION

Relative Sea Level Rise Calculation

Recent climate research by the Intergovernmental Panel on Climate Change predicts continued or accelerated global warming through the 21st century. The USACE requires all phases of Civil Works programs to consider impacts from sea-level change (USACE, 2009).

Relative sea level rise (RSLR) rates were calculated for the project area through 2064. This project involves the construction of the additional pump station capacity at Alligator Bayou Pump Station #16. Construction of the new pump station is not expected to affect future RSLR therefore RSLR is expected to be the same with or without the project. Consequently, the future RSLR described below should satisfy the requirement to calculate the future RSLR "with" and "without" project conditions.

A low rate of RSLR is calculated as required (USACE, 2009) using the historical rate of sea-level change. Data from the Sabine Pass tide gage (CO-OPS station 8770570) in Sabine Pass were used since the gage is closest to Port Arthur. The gage also meets the requirements described in Appendix C (USACE, 2009) for use in calculating RSLR because it is the nearest tide station to the proposed project area with over 40 years of data. The period-of-record for the Sabine Pass tide gage extends from 1958 to present. The historic RSLR rate at the tide station is 5.88mm/yr (Mean Sea Level Trend, 8770570, Sabine Pass, Texas, NOAA, 2009). Use of the historic RSLR rate of 5.88 mm/yr indicates a RSLR of 0.153 m will occur over the period from 1986 to 2012 (Table 1). The sea level is estimated to rise 0.294 m over the project period from 2014 to 2064 at the historic RSLR rate (Table 1) (Figure 1).

Table 1. Calculated relative sea level rise in meters from 1986.

	2014 Project Construction	2064 End of Project
Low Rate, Historic Sea-Level Rise	0.153 m	0.294 m
Intermediate Rate, Modified NRC Curve I	0.182 m	0.642 m
High Rate, Modified NRC Curve III	0.234 m	1.11 m

The predicted intermediate or high sea level rise is calculated using the equation in USACE (2009).

$$\text{Intermediate or high sea level rise} = (0.0017 + 0.00469)(t_2 - t_1) + b(t_2^2 - t_1^2)$$

Where:

- t_1 = time in years between the project construction date and 1986
- t_2 = time in years between the relevant project date, 2064 and 1986
- 0.0017 = value assigned for eustatic sea level rise in mm (USACE, 2009)
- 0.00418 = relative sea level rise rate for Sabine Pass in mm (NOAA, 2009). Calculated by
- subtracting the eustatic sea level rise rate of 0.0017 mm from the measured mean sea level rise rate at Sabine Pass in Sabine Pass of 0.00588 mm.
- b = 0.0000236, value assigned to this coefficient for intermediate sea level rise for NRC Curve I or b = 0.0001005 assigned for high sea level rise for NRC Curve III provided in USACE (2009).

The intermediate RSLR calculated for the project area is estimated to be 0.642 m above the sea level in 1986 in 2064 when the project is complete (Table 1) (Figure 1). The predicted high sea level rise is calculated using the equation in USACE (2009) and is intended to accommodate sea level rise resulting from the possible rapid loss of ice from Antarctica and Greenland. The high RSLR calculated for the project area is estimated to be 1.11 m above the sea level in 1986 in 2064 when the project is complete (Table 1) (Figure 1).

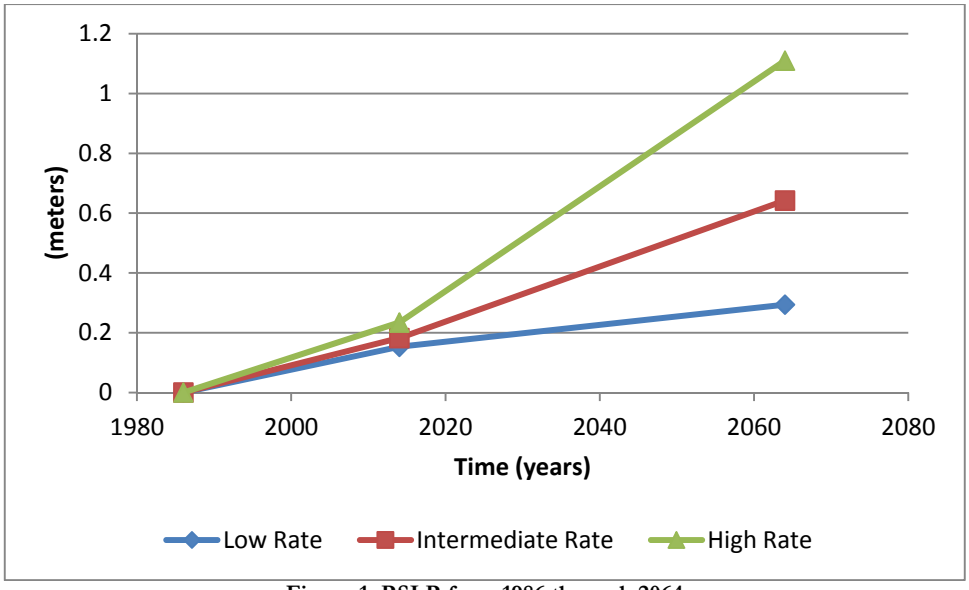


Figure 1: RSLR from 1986 through 2064

APPENDIX G

ENVIRONMENTAL ASSESSMENT NOTICE OF AVAILABILITY

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

NOVEMBER 9, 2012

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Notice of Availability for the Draft Environmental Assessment for Section 408 Evaluation, Construction of a New Pump Station, Alligator Bayou Pump Station No. 16, Port Arthur and Vicinity, Texas, Hurricane Flood Protection Project, Port Arthur, Jefferson County, Texas.

AGENCY: Department of the Army, U.S. Army Corps of Engineers

ACTION: Notice of Availability

SUMMARY: The U.S. Army Corps of Engineers (USACE), Galveston District (District) announces the release of the Draft Environmental Assessment (EA) for 33 U.S.C. 408 (Section 408) evaluation of modifications to the Federal Alligator Bayou Pump Station No. 16, Port Arthur and Vicinity, Texas, Hurricane Flood Protection Project, Port Arthur, Texas.

DATES: The USACE, Galveston District will provide the Draft EA for review November 9 through November 23, 2012.

FOR FURTHER INFORMATION CONTACT: Questions about the proposed action and the Draft EA should be addressed to Ms, Carolyn Murphy (409) 766-3044. Written inquiries and comments should be sent to the USACE, Galveston District, Attn: Ms. Carolyn Murphy, P.O. Box 1229, Galveston, TX 77553-1229 or emailed to carolyn.e.murphy@usace.army.mil.

PURPOSE: This public notice is to inform interested parties that the USACE, Galveston District has prepared a draft Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA), Public Law 91-190, regulations for implementing the Procedural Provisions of the NEPA, 40 Code of Federal Regulations (CFR) 1500-1508, USACE's regulation ER 200-2-2 (Environmental Quality: Policy and Procedures for Implementing NEPA, 33 CFR 230), and other pertinent laws, regulations, and executive orders. This notice is being distributed to interested state, Federal, and local agencies, private organizations and individuals in order to assist in collecting facts and recommendations concerning proposed modification by Jefferson County Drainage District No. 7 to the Federal Port Arthur and Vicinity, Texas, Hurricane Flood Protection Project. The decision to approve Section 408 modification of the existing Federal project will be based on an evaluation of the probable impacts, including cumulative impacts, of the proposed action on the public interest. This project has also undergone NEPA review under Department of the Army Permit No. SWG-2007-00850 and a subsequent application for amendment of that permit, as well as under a 2008 Federal Emergency Management Agency (FEMA) EA and Finding of No Significant Impact (FONSI) for Alligator Bayou Pump Station Expansion Project, Hazard Mitigation Grant Program, Port Arthur, Texas.

PROJECT LOCATION: The Port Arthur and Vicinity, Texas, Hurricane Flood Protection Project is located in southern Jefferson County in southeast Texas. The proposed project modification is located approximately two miles southwest of Port Arthur at the confluence of Alligator and Taylors Bayous, at Pump Station (PS) 16 on the flood protection levee.

PROJECT DESCRIPTION: The Proposed Project would restore 25-year storm pumping capacity at PS 16 through the construction of an additional pumping facility on Alligator Bayou at PS16. The new pump station on the east bank of Alligator Bayou would consist of a 4-level concrete structure designed to withstand 200 mph winds (a Category 5 hurricane) housing six 250,000-gallon diesel pumps, with office space, a bunk room, showers, potable water, generators, and fuel storage. The footprint of the new pump station and ancillary parking would cover 2.9 acres. Construction would require two temporary coffer dams, staging areas, and excavated material placement areas. The total construction impact footprint would be 17.2 acres. Mitigation of impacts to 1.3 acres of fringe wetlands would be accomplished by restoration of 1.8 acres of tidal marsh dominated by *Spartina alterniflora* behind a recently constructed rock breakwater on the west shoreline of the Taylors Bayou Diversion Channel near the project area. This EA has been prepared as part of a Section 408 evaluation of proposed modifications to the Federal Port Arthur and Vicinity, Texas, Hurricane Flood Protection Project.

NEED FOR WORK: The existing PS 16 is part of the Port Arthur and Vicinity, Texas, Hurricane Flood Protection Project, a system of levees, concrete and steel sheet pile floodwalls, and 12 pump stations constructed in the early 1980s to protect urban and industrial development at Port Arthur and surrounding communities from a 100-year event hurricane storm surge. The levee and floodwall system extends approximately 30 miles with levees ranging from 14 to 19 feet high. The system includes a series of 12 pump stations to drain the area behind the levees during high rainfall and flood events, and was authorized to provide protection within the levee system for a 50-year rainfall or flood event; however, the system was constructed to provide only 25-year event protection. Over the last 30 years, subsidence has compromised the functioning of the existing PS 16 to the point that it only provides protection for an 11.5-year storm event. The Proposed Project would provide additional pumping capacity such that 25-year event protection would be re-established.

PROPOSED WORK: The work would consist of the construction of a new pump station on the east bank of Alligator Bayou, as described above, that would work in concert with the existing PS16 facility on the west bank of the bayou to restore 25-year storm event capacity at this location.

COMPLIANCE WITH LAWS AND REGULATIONS: PS 16 is one of 12 pump stations authorized for the Federal Port Arthur and Vicinity, Texas, Hurricane Flood Protection Project. Approval for modification of PS 16 is being sought under Section 408. Jefferson County Drainage District No. 7 has also applied for an amendment to Department of the Army Permit No. SWG-2007-00850 for construction of this project.
The draft EA will be coordinated with the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and other Federal, state, and local agencies. Our initial determination is that the proposed action will not have any adverse impacts on threatened or endangered species or Essential Fish Habitat or federally-managed fisheries in the Gulf of Mexico.
The following is a list of Federal, State, and local agencies with which these activities are being coordinated:

U.S. Environmental Protection Agency, Region 6
U.S. Department of Commerce
U.S. Department of the Interior
U.S. Coast Guard
Budget and Planning Office, Office of the Governor of Texas
Texas Historical Commission
Texas Parks and Wildlife Department
Texas Commission on Environmental Quality
Texas General Land Office
The Texas Office of State-Federal Relations
Texas Department of Transportation
Texas Water Development Board

EVALUATION FACTORS: The decision whether to approve Section 408 modifications to PS 16 will be based on an evaluation of the probable impact of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources as well as public and environmental safety and economic concerns.

ENVIRONMENTAL DOCUMENTATION: A preliminary review of this proposed action indicates that an Environmental Impact Statement (EIS) is not required. This preliminary determination of an EIS requirement will be changed if information brought forth in the coordination process is of a significant nature. Based on this determination, a draft EA has been prepared. The EA assesses potential impacts to the human and natural environment that would result from the proposed action. The document is available online on both Jefferson County Drainage District No. 7 and Galveston District websites:

http://www.dd7.org

http://www.swg.usace.army.mil/BusinessWithUs/PlanningEnvironmentalBranch/DocumentsforPublicReview.aspx

CDs of the Draft EA can be requested from Jefferson County Drainage District No. 7's agent, Horizon Environmental Services, Inc., Attn: C. Lee Sherrod, 1507 South IH 35, Austin, TX 78741; or email at lee_sherrod@horizon-esi.com.

PUBLIC COMMENT: Persons desiring to express their views or provide information to be considered in evaluating the impact of approval of Section 408 modification of a Federal project are requested to mail or email their comments within 15 days of the date of this notice to:

District Engineer
U.S. Army Engineer District, Galveston
ATTN: Ms. Carolyn Murphy, CESWG-PE-PR
P.O. Box 1229
Galveston, Texas 77553-1229

All comments must be post-marked or received by November 23, 2012. Any person who has an interest that may be affected by this action may request a public hearing. The request must be submitted in writing within 15 days of the date of this notice and must clearly set forth the interest that may be affected and the manner in which the interest may be affected by this activity. Any questions concerning the proposed action may be directed to Ms. Carolyn Murphy at (409) 766-3044.

Dolan Dunn
Chief, Planning, Environmental
and Regulatory Division
Galveston District

APPENDIX H

RESPONSE TO COMMENTS

APPENDIX I

HABITAT EVALUATION PROCEDURE ANALYSIS

APPENDIX I

HABITAT EVALUATION PROCEDURE ANALYSIS FOR CONSTRUCTION OF A NEW PUMP STATION ALLIGATOR BAYOU PUMP STATION NO. 16, PORT ARTHUR AND VICINITY, TEXAS HURRICANE FLOOD PROTECTION PROJECT PORT ARTHUR, JEFFERSON COUNTY, TEXAS

PREPARED FOR:

JEFFERSON COUNTY DRAINAGE DISTRICT NO. 7

AND

U.S. ARMY CORPS OF ENGINEERS

NOVEMBER 2012

INTRODUCTION

USACE planning studies depend on non-monetary evaluation methodologies to quantify inherent ecological processes, structure, dynamics and the functions ecosystems carry out in nature. The Habitat Evaluation Procedure (HEP) methodology is an environmental accounting process developed to appraise habitat suitability for fish and wildlife species in response to potential change (USFWS 1980a-c).

In HEP, a Suitability Index (SI) is a mathematical relationship that reflects a species' or community's sensitivity to a change in a limiting factor (i.e., variable) within the habitat type. These suitability relationships are depicted using scatter plots and bar charts (i.e., suitability curves). The SI value (Y-axis) ranges from 0.0 to 1.0, where an SI = 0.0 represents a variable that is extremely limiting, and an SI = 1.0 represents a variable in abundance (not limiting) for the species or community. In HEP, a Habitat Suitability Index (HSI) model is a quantitative estimate of habitat conditions for an evaluation species or community. HSI models combine the SIs of measurable variables into a formula depicting the limiting characteristics of the site for the species/community on a scale of 0.0 (unsuitable) to 1.0 (optimal).

HEP is an objective, quantifiable, reliable and well-documented process used nationwide to generate environmental outputs for proposed projects and operations in the natural resources arena. HEP provides an impartial look at environmental effects, and delivers measurable products to the decision-maker for comparative analysis. The following sections provide the details of the application of the HEP techniques to the Alligator Bayou plan.

PROPOSED PROJECT

The Proposed Project is located approximately two miles southwest of Port Arthur at the confluence of Alligator and Taylors Bayous, and consists of an improvement to PS 16 that would be accomplished by the construction of an additional low-flow pump station at the existing PS 16 facility on the south bank of Alligator Bayou. As part of the extensively modified DD7 interior drainage system, Alligator Bayou flow into Taylors Bayou is entirely controlled by PS 16 through the Port Arthur and Vicinity, Texas, Hurricane Flood Protection Project (Hurricane Flood Protection Project) levee. Taylors Bayou ultimately flows into the Sabine-Neches Canal (tidal portion) below Port Arthur, approximately two miles south of PS 16. The Canal flows south through Sabine Pass, where it enters the Gulf of Mexico, approximately 12 miles south of PS 16; although the system of canals is about 19 miles long.

The drainage basin controlled by PS 16 is large, at approximately 28,643 acres, protecting a population of about 100,000 people and significant industrial infrastructure. This drainage basin has been substantially altered through the years, with many of the secondary drainages channelized. Portions of the channelized drainage system that flow into PS 16 include Main A, Main B, Main C, and West Port Arthur Road, Pear Ridge, Central, El Vista, Vista Village, and Montrose drainage areas. In addition to these conveyances, the system also includes 10 large detention basins with 8 large forebay detention areas

for the pump stations, and 2 large regional detention ponds (4,000 acre-feet and 1,100 acre-feet, respectively), plus numerous small detention areas for commercial and residential developments. As a result of these modifications to the internal drainage system and on-going urban and industrial development, the remaining natural wetlands in the area behind the Hurricane Flood Protection Project levee system consist of depressional areas that no longer have surface water connectivity, and survive by rainfall events and groundwater sources.

The Proposed Project would achieve 25-year storm pumping capacity at PS 16. With the loss of function of the gravity drain structure, PS 16 is only capable of handling an 11.5-year event, yet based on the hydrological models developed for the *2002 COMPREHENSIVE STUDY AND DRAINAGE PLAN OF THE JEFFERSON COUNTY DRAINAGE DISTRICT NO. 7 SYSTEM AND SERVICE AREA*, more flow is now generated within the main outfall system during a 25-year storm event than the system was originally designed to accommodate, making restoration of capacity at PS 16 critical. The Proposed Project would include retaining the existing pump station on the west bank of Alligator Bayou and the gravity drain structure across Alligator Bayou, with construction of a second pump station on the east bank of Alligator Bayou. The new pump station would take over the continuous low-flow pumping, and, in concert with the existing pump station, would provide overall pumping capacity to handle a 25-year storm event at PS 16. The addition of more efficient pumps at the new pump station would replace the capacity provided by the now non-functional gravity drain structure. Maintaining two pumping stations at this location also provides redundancy in the event of a pump failure. The new pump station would add 1.5 million gallons per minute (gpm) of pumping capacity to the existing 2.25 million gpm capacity at PS 16, for a total 3.75 million gpm capacity for PS 16. As modeled, this increased capacity would mean that flood waters from a 25-year storm event would be removed from the system about 18 hours faster than is currently possible with the existing pumps.

The new pump station on the east bank of Alligator Bayou would consist of a 4-level concrete structure designed to withstand 200 mph winds (a Category 5 hurricane) housing six 250,000-gallon diesel pumps, with office space, a bunk room, showers, potable water, generators, and fuel storage. Construction access would be from the immediately adjacent 57th Street, a non-public road, which is constructed on top of the Hurricane Flood Protection Levee in the project area. The construction site on the east bank of Alligator Bayou is currently mowed and maintained. The footprint of the new pump station and ancillary parking would cover 2.9 acres. Construction would require two temporary coffer dams (one on Taylors Bayou and one on Alligator Bayou), to allow construction in the dry; temporary staging areas; a temporary construction access road originating at Highway 82 with a temporary floating bridge across Alligator Bayou (see Figure 1); permanent excavated material placement areas with a capacity of 124,000 cu yds with concrete retainers and silt fencing to prevent sloughing or erosion of material into adjacent wetlands or waters of the US; and excavation (in the dry) on both the Alligator Bayou side and Taylors Bayou side to allow proper depth for pump operation. The excavated material would be stored for an indeterminate time for possible future use in levee repairs or improvements. A plan view of the proposed pump station is provided in Figure 4. A cross-section of the proposed pump station is provided in Figure 5. The coffer dams would be constructed with two sheet pile walls 30 feet apart and filled with clean soil. Material for the coffer dams would be obtained from a commercial dirt

source, possibly Halbouty Detention Pond owned by DD7, a sand and clay pit that has been in operation for 40 years and which is also used for floodwater detention. Construction is anticipated to take 24 to 30 months to complete, with project completion anticipated in late 2014.

Direct construction impacts of the Proposed Plan are summarized as follows:

Wetlands permanently filled	0.10 ac
Wetlands permanently excavated	0.67 ac
Wetlands temporarily disturbed and restored	0.21 ac
Open water (Taylors Bayou) Excavated	1.07 ac
Open water (Taylors Bayou) temporarily disturbed and restored	0.11 ac
Open water (Alligator Bayou) temporarily filled (coffer dam)	0.37 ac
Existing upland (previous fill area) used for excavated material placement	7.79 ac
Existing upland (levee) excavated to open water	2.32 ac
Existing upland (levee) converted to pump building and parking	2.90 ac
Existing upland (levee) used for temporary construction staging	1.51 ac
Total Project Footprint Impact	17.05 ac

The temporary construction access road would follow existing roads that require no modification and is not expected to have any material impact. The temporary floating bridge for construction access to the east side of Alligator Bayou would be located adjacent to the existing railroad bridge crossing of the bayou in an area with existing fill and graded banks on both sides of Alligator Bayou. No material impacts from the floating bridge are anticipated. See project plans in Attachment C.

While existing open water to be excavated totals 1.07 acre, only a zone of shallow (< 3 ft) open water adjacent to the wetland fringes along the shoreline is deemed to be impacted by conversion to deeper water. This zone is variable in width, but generally represents 20 to 30 feet from the shoreline. The acreage of this zone is 0.53 ac and is combined with the fringe marsh (0.77 ac) to represent 1.3 acres of estuarine emergent habitat in the HEP analysis. The balance of open water exceeding 3 ft in depth is not deemed to be materially impacted by additional deepening.

PROJECT SITE CHARACTERISTICS

The project area is described as a constructed hurricane protection levee separating Alligator Bayou from Taylors Bayou. Dominant plant species on the levee include bermudagrass (*Cynodon dactylon*), common reed (*Phragmites australis*), St. Augustine grass (*Stenotaphrum secundatum*), bedstraw (*Gallium uncinulatum*), curly dock (*Rumex crispus*), and dewberry (*Rubus trivialis*). Scattered sugarberry (*Celtis laevigata*) and baccharis (*Baccharis* sp.) are also present. A fringe of wetland vegetation is present along portions of Alligator Bayou and Taylors Bayou that includes spikerush (*Eleocharis* sp.), primrose willow (*Ludwigia decurrens*), common reed, sedge (*Carex* sp.), and occasional marshhay cordgrass (*Spartina patens*). Wetland shrub cover is characterized by marsh elder (*Iva*

frutescens). Aquatic habitat is restricted to the shallow open water of Alligator Bayou and Taylors Bayou ranging from 0 (MHT line) to 3 feet deep.

HABITAT SUITABILITY INDEX CALCULATIONS

The delineation of habitats within the project site and mitigation site were based on mapping efforts using aerial photography and physical site characteristies. One major habitat category (estuarine emergent / open water) was identified on both the project site and the mitigation site and four target species – brown and white shrimp, speckeled trout and marsh wren - that utilized this habitat type were identified and assessed for in the HEP analysis. The variables and their descriptions for the published HSI models for these target species are provided in Attachment A. All of these HSI models have been approved for use in USACE in planning studies.

Field data collection efforts were conducted in July 2011. Due to the small size of the project site and mitigation site, data measurements or estimates were made based on the entirety of the sites rather than subset sampling locations.

The field data collected for the habitat variables for each species were applied to the appropriate Suitability Index (SI) graphs in the published HSI models. Habitat Suitability Indices were then calculated using the published formulae. The resultant SI and HSI values are shown in Tables 1 through 3 (Attachment B).

HABITAT UNITS

HSI values were multiplied by the acreage of the respective habitats for each target species to arrive at the Habitat Units (HU) for each species. The period of analysis was 6 years with target years of TY0 (2011 or preconstruction), TY1 (2013 or completion of construction), TY2 (2014 or first full growing season after construction), TY4 (2016 or third full growing season after construction), and TY6 (2018 or fifth full growing season after construction). The proposed mitigation plan (planting of *Spartina alterniflora* for shoreline stabilization) was also analyzed for five full growing seasons past construction (to 2018) to be commensurate with the time period of the project impacts.

PROJECT IMPACTS

TABLE 1 – PERMANENT IMPACTS TO WATERS OF THE US

Type Impact		Waterbody	Cowardin Class	Acreage
Permanent Fill		Taylors Bayou (Sect 10/404)	Emergent Herb/shrub	0.10
Excavation		Taylors Bayou (Sect 10/404)	Shallow Open Water	0.53
Excavation		Taylors/Alligator Bayou (Sect 10/404)	Emergent Herb/shrub	0.67
Total	**--**	**--**	**Emergent Herb/shrub**	**0.77**
Total	**--**	**--**	**Open Water**	**0.53**
TOTAL				**1.30**

The attached exhibits (Attachment C) include maps depicting the locations of the existing pump station and proposed pump station, site plans, and detailed impacts to waters of the US.

Within the 24,000 acre benefit area of the project, no additional impacts to wetlands are anticipated.

PROPOSED MITIGATION

The western shoreline of the Taylors Bayou Diversion Channel was historically estuarine emergent marsh backed by a saltwater exclusion levee protecting the freshwater marshes of the J.D. Murphree Wildlife Management Area. This shoreline has suffered from erosion in recent decades that has caused almost total loss of marsh habitats and potential compromise of the protection levee that prevents saltwater intrusion into the thousands of acres of fresh marshes in the wildlife management area. Texas Parks and Wildlife Department has been pursuing stabilization and restoration efforts of this shoreline. Recently, DD6 agreed to construct a rip rap breakwater along the shoreline to reduce further erosion from high flood flows in the diversion channel.

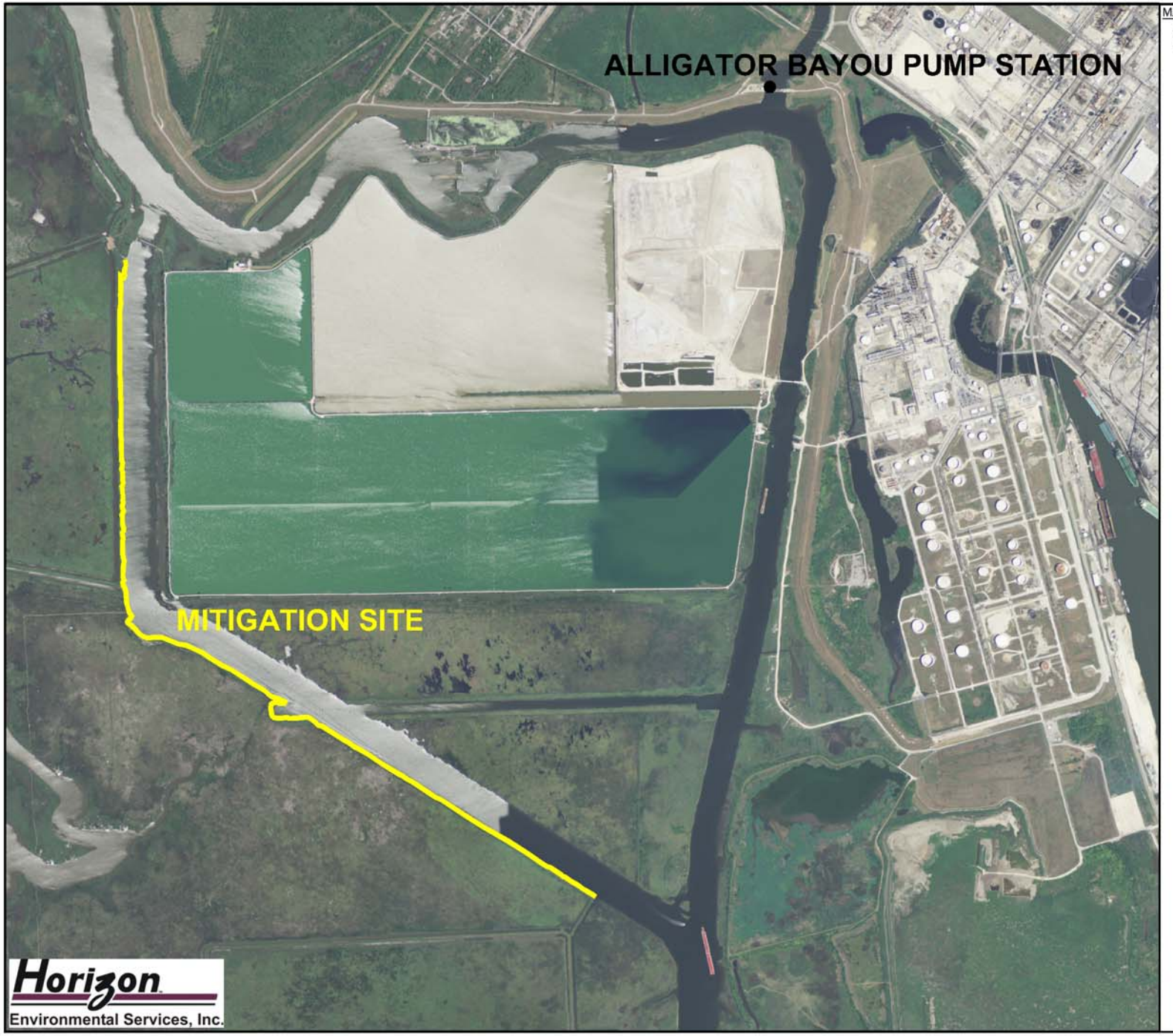
The proposed mitigation plan would include planting smooth cordgrass (*Spartina alterniflora*) behind this recently constructed rock breakwater along the west shoreline of the Taylors Bayou Diversion Channel (Figure 1). The area behind the breakwater averages 6 feet wide and is about 13,000 linear feet long (approximately 1.8 acres). The area behind the breakwater is currently sparsely vegetated (approximately 5%). Dense vegetation along this shoreline is desired by Texas Parks and Wildlife Department to further stabilize the eroded areas and to restore habitat conditions along an otherwise barren shoreline. Smooth cordgrass would be planted on 3 ft centers within the area behind the breakwater (1.8 acres) in the spring of 2013 (TY1, year of construction). It is expected that the planted area will achieve at least 50% coverage within the first growing season (2013) and 100% by the 3rd (2016) through 5th (2018) growing seasons.

WITH-PROJECT FUTURE ASSUMPTIONS

The Alligator Bayou Pump Station Expansion project is estimated to have a one year construction period and total environmental impacts from this project will be felt within that one year (TY1 - 2013). Attachment C (project plans) shows the anticipated construction plans and the acreage of impacts for the project area. To be conservative in the analysis it is assumed the HSI values for all wetland habitats within the project footprint will go to zero in the first year, even though some habitat value would actually remain for certain aquatic species. The mitigation site (1.8 acres of *Spartina* planting for shoreline stabilization along the Taylors Bayou Diversion Channel) will be planted concurrent with TY1 of construction. Five-year invasive species management of the mitigation area will help maintain HSI values over the 5 years of analysis post planting (TY1 to TY6). The following assumptions were made in the analysis for the project site and mitigation site:

"Do Not Scale This Drawing"

060108A20PA_Breakwater.dwg | JEA | 9/30/2011



MAP SOURCE:
NATIONAL AGRICULTURAL IMAGERY PROGRAM (NAIP);
BIG HILL BAYOU, TEXAS QUADRANGLE (NE QUARTER; 2010)
PORT ARTHUR SOUTH, TEXAS QUADRANGLE (NW QUARTER; 2010)

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Horizon Environmental Services, Inc.

FIGURE 1

MITIGATION SITE
ALLIGATOR BAYOU
PUMP STATION
JEFFERSON COUNTY,
TEXAS

TY0 - Project Site Baseline Conditions (2011)

TY1 – Project Site Completion of Construction (2013)

Estuarine emergent wetlands and existing shallow open water excavated to deep water or filled – 1.3 acres

HSI values for all wetlands are assumed to go to zero.

TY2 – Project Site – One Year Post-Construction (2014)

HSI values for all wetlands remain at zero.

TY4 – Project Site – Three Years Post-Construction (2016)

HSI values for all wetlands remain at zero.

TY6 – Project Site – Five Years Post-Construction (2018)

HSI values for all wetlands remain at zero.

TY0 - Mitigation Site Baseline Conditions (2011)

TY1 – Mitigation Site Completion of Planting (2013)

Planting of the area behind the rip-rap will be completed. HSIs are not expected to significantly increase.

TY2 – Project Site – One Year Post-Planting (2014)

The planted area behind the rip-rap is expected to result in approximately 50% aerial coverage of *Spartina alterniflora* after the first full growing season.

TY4 – Mitigation Site - Three Years Post-Planting (2016)

The planted area behind the rip-rap is expected to result in approximately 100% aerial coverage of *Spartina alterniflora* after the third full growing season.

TY6 – Mitigation Site – Five Years Post-Planting (2018)

The planted area behind the rip-rap is expected to remain at 100% aerial coverage of *Spartina alterniflora* after the fifth full growing season.

The calculation of HSIs and HUs for the various target species is shown in Tables 1-3 (Attachment B).

WITHOUT-PROJECT FUTURE ASSUMPTIONS

Impact site: Remains static, assume HSI values would not change, has remained relatively static for numerous years.

Mitigation site: It is likely that natural recruitment of *Spartina, Phragmites, Scirpus*, or other emergent species would increase to approximately 10% in TY2, 40% in TY4, and 80% in TY6 if planting did not occur.

RESULTS AND COMPARISON OF IMPACTS AND MITIGATION

The determination of net change of HUs is shown in Table 4 (Attachment B). Based on the described with- and without-project scenarios, the proposed project will result in the average loss of 0.02 AAHU over the 6 years of analysis (2011 to 2018). The described mitigation planting will result in a gain in AAHUs for the wetland habitats during the six year analysis period (2011 to 2018) of 0.16 AAHU for a net gain of 0.14 AAHU (1.8:1 ratio). Therefore, under these described assumptions for with and without project, no additional mitigation actions would be required beyond those described in the preferred project. The analysis demonstrates that the proposed plan adequately avoids, minimizes, and mitigates impacts to habitats in the project area.

REFERENCES:

U. S. Fish and Wildlife Service (USFWS). 1980a. Habitat as a Basis for Environmental Assessment, Ecological Services Manual 101. U.S. Fish and Wildlife Service, Department of the Interior, Washington, DC.

_____. 1980b. Habitat Evaluation Procedure (HEP), Ecological Services Manual 102. U.S. Fish and Wildlife Service, Department of the Interior, Washington, DC.

_____. 1980c. Standards for the Development of Habitat Suitability Index models, Ecological Services Manual 103. U.S. Fish and Wildlife Service, Department of the Interior, Washington, DC.

ATTACHMENT A

MODEL VARIABLES AND ASSUMPTIONS

HABITAT SUITABILITY INDEX MODEL VARIABLES AND ASSUMPTIONS
ALLIGATOR BAYOU PUMP STATION

WHITE AND BROWN SHRIMP (Estuarine Emergent)

V_1 – % of estuary covered by vegetation (emergent or seagrass)

- "estuary" is assumed to include aquatic and emergent portions of the site at or below mean high tide. For the project site, this would include open water areas and the narrow shoreline (0.54 ac). The onsite wetland area is situated above mean high tide and is rarely inundated, thus not contributing significantly to shrimp habitat. Only a very narrow fringe of vegetation exists along the immediate shoreline (~5% of the "estuary"). At the mitigation site, the "estuary" is the zone between the rock breakwater and the mean high tide line on the shore (1.8 ac). This area is presently sparsely vegetated (~5%).

V_2 – Substrate Composition (soft, muddy, or course)

- based on sediment sampling, sediments at the project site are muddy (silty clay). Sediments at the mitigation site are soft (silty). Substrate conditions are not expected to change at the project site or mitigation site.

V_3 – Mean salinity during the spring (ppt)

- Salinities were determined from quarterly water quality data from Taylors Bayou published by the TCEQ for 2010. Baseline spring data were derived by averaging values from February and May. It is estimated that the project will result in more continuous low-flow discharges of fresh water from Alligator Bayou into Taylors Bayou, thus reducing the mean salinity by 3 ppt. Salinities are not expected to significantly change at the mitigation site.

V_4 – Mean water temperature during the spring (°C)

- Water temperatures were determined from quarterly water quality data from Taylors Bayou published by the TCEQ for 2010. Spring data were derived by averaging values from February and May. Mean water temperatures are not expected to change significantly at the project site or mitigation site.

SPOTTED SEATROUT (Estuarine Emergent)

V_1 – Lowest monthly mean winter-spring salinity

- The lowest monthly mean water salinities were derived from quarterly water quality data from Taylors Bayou published by the TCEQ for 2010. The lowest winter-spring salinities occurred in February and the average was 1.45 ppt. It is estimated that the project will result in more continuous low-flow discharges of fresh water from Alligator Bayou into Taylors Bayou, thus reducing the mean lowest salinity below 1 ppt. Salinities are not expected to significantly change at the mitigation site.

V_2 – Highest monthly mean summer salinity

- Highest mean monthly water salinities were derived from quarterly water quality data from Taylors Bayou published by the TCEQ for 2010. The highest summer salinities occurred in May and the average was 13.23 ppt. It is estimated that the project will result in more continuous low-flow discharges of fresh water from Alligator Bayou into Taylors Bayou, thus

reducing the mean salinity by 3 ppt. Salinities are not expected to significantly change at the mitigation site.

V_3 – Lowest monthly mean winter temperature

- Lowest mean winter water temperatures were derived from quarterly water quality data from Taylors Bayou published by the TCEQ for 2010. The lowest winter temperatures occurred in February and the average was 11.28 °C. Mean water temperatures are not expected to change significantly at the project site or mitigation site.

V_4 – Highest monthly mean summer temperature

- Highest mean summer water temperatures were derived from quarterly water quality data from Taylors Bayou published by the TCEQ for 2010. The highest summer temperatures occurred in August and the average was 31.2 °C. Mean water temperatures are not expected to change significantly at the project site or mitigation site.

V_5 – % of the study area with submerged and emergent vegetation, submerged islands, and oyster reefs

- "Study area" is interpreted to include the open water and emergent marsh at the project site (total 1.3 ac) and at the mitigation site (total 1.8 ac). On the project site, approximately 60% of the emergent marsh area is vegetated and the open water area is void of vegetation or structure. The emergent marsh is 58 % of the total study area, thus the % of the total study area with vegetation or structure is 35%. At the mitigation site, 5% of the study area (between the breakwater and shoreline MHT) is vegetated. Planting of smooth cordgrass on 3 ft centers within the area behind the breakwater (1.8 acres) in the spring of 2012 is expected to achieve at least 50% coverage within the first growing season and 100% by the 3rd through 5th growing seasons. Under the without-project scenario, it is expected that natural recruitment of *Spartina, Phragmites, Scirpus*, or other emergent species would increase to approximately 40% in the 3rd year and 80% in year 5 if planting did not occur.

MARSH WREN (Estuarine Emergent)

V_1 – Growth form of emergent hydrophytes

- The project site is characterized by short herbaceous (*Eleocharis, Ludwigia,* and *Carex*) and shrub (*Iva frutescens*) cover. The mitigation site is characterized by cordgrass.

V_2 – percent canopy cover of emergent herbaceous vegetation

- Within the study area (1.3 ac), approximately 58% is emergent marsh with 60% vegetative cover, of which 50% is herbaceous. Thus, total herbaceous cover of the study area is 18%. At the mitigation site, 5% of the study area (between the breakwater and shoreline MHT) is vegetated with herbaceous species. Planting of smooth cordgrass on 3 ft centers within the area behind the breakwater (1.8 acres) in the spring of 2012 is expected to achieve at least 50% coverage within the first growing season and 100% by the 3rd through 5th growing seasons. Under the without-project scenario, it is expected that natural recruitment of *Spartina, Phragmites, Scirpus*, or other emergent herbaceous species would increase to approximately 40% in the 3rd year and 80% in year 5 if planting did not occur.

V_3 – Mean water depth (cm) in wetland

- The emergent wetland portion of the project site is above mean high tide, thus the mean water depth is 0. After construction, the mean water depth will be >20 cm. The mean water depth of the mitigation site is approximately 15 cm.

V_4 – percent canopy cover of woody vegetation

- Within the study area (1.3 ac), approximately 58% is emergent marsh with 60% vegetative cover, of which 50% is woody shrub. Thus total woody cover of the study area is 18%. The mitigation site does not contain woody species

ATTACHMENT B

DATA & CALCULATION TABLES

TABLE 1: White/Brown Shrimp Habitat Evaluation (Estuarine Emergent)

	Variable	Impact Site (Pre Con)	SI (Pre Con)	Impact Site (Years 1,3,5)	SI (Years 1,3,5)		Mitigation Site (Pre Con)	SI (Pre Con)	Mitigation Site With-Project(Y1)	SI With Project(Y1)	Mitigation Site With-Project(Y3)	SI With Project(Y3)	Mitigation Site With-Project(Y5)	SI With Project(Y5)		Mitigation Site WO-Project (Y1)	SI Without Project(Y1)	Mitigation Site WO-Project (Y3)	SI Without Project(Y3)	Mitigation Site WO-Project (Y5)	SI Without Project(Y5)
V_1	% of estuary covered by vegetation (%) (emergent or seagrass)	5	0.05	0	0		5	0.05	50	0.5	100	1	100	1		10	0.1	40	0.4	80	0.8
V_{2b}	Substrate Composition - Brown Shrimp (Soft=1, muddy=2, course=3	muddy	0.8	muddy	0.8		soft	1	soft	1	soft	1	soft	1		soft	1	soft	1	soft	1
V_{2w}	Substrate Composition - White Shrimp (Soft=1, muddy=2, course=3	muddy	0.6	muddy	0.6		soft	1	soft	1	soft	1	soft	1		soft	1	soft	1	soft	1
V_{3b}	Mean salinity during the spring (ppt) -Brown shrimp	7	0.65	4	0.4		7	0.65	7	0.65	7	0.65	7	0.65		7	0.65	7	0.65	7	0.65
V_{3w}	Mean salinity during the spring (ppt) - White shrimp	7	1	4	1		7	1	7	1	7	1	7	1		7	1	7	1	7	1
V_4	Mean water temperature during the spring (ºC)	25	1	25	1		25	1	25	1	25	1	25	1		25	1	25	1	25	1

HSI and HU CALCULATIONS

	IMPACT (pre)	IMPACT (yr 1, 3, 5)	MITIGATION With-Project (pre)	MITIGATION With-Project (YR1)	MITIGATION With-Project (YR3)	MITIGATION With-Project (YR5)	MITIGATION WO-Project (pre)	MITIGATION WO-Project (YR1)	MITIGATION WO-Project (YR3)	MITIGATION WO-Project (YR5)
Food/Cover Brown Shrimp (FCb) = $(SIV1^2 x SIV2brn)^{1/3}$	0.0007	0	0.0008	0.08	0.33	0.33	0.0008	0.003	0.05	0.21
Food/Cover White Shrimp (FCw) = $(SIV1^2 x SIV2wht)^{1/3}$	0.0005	0	0.0008	0.08	0.33	0.33	0.0008	0.003	0.05	0.21
Average FC Value	0.0006	0	0.0008	0.08	0.33	0.33	0.0008	0.003	0.05	0.21
Water Quality Brown Shrimp (WQb) = $(SIV3brn \times SIV4brn)^{1/2}$	0.81	0	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Water Quality White Shrimp (WQw) = $(SIV3wht \times SIV4wht)^{1/2}$	1	0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Average WQ Value	0.90	0	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
HSI = Smaller of FC or WQ										
HSI Brown Shrimp =	0.0007	0	0.0008	0.08	0.33	0.33	0.0008	0.003	0.053	0.213
HSI White Shrimp =	0.0005	0	0.0008	0.08	0.33	0.33	0.0008	0.003	0.053	0.213
Average HSI	0.0006	0	0.0008	0.08	0.33	0.33	0.0008	0.003	0.053	0.213
HU = HSI x Aces	**0.0008**	**0**	**0.00144**	**0.144**	**0.594**	**0.594**	**0.00144**	**0.006**	**0.096**	**0.384**

AVERAGE ANNUAL HABITAT UNIT CALCULATIONS

$(T_2 - T_1)$ $(((A_2 x HSI_2) + (A_1 x HSI_1))/3) + ((A_1 x HSI_2) + (A_2 x HSI_1))/6))$ = Habitat Units Between Target Years

T = Target Year, A = Acreage, HSI = Habitat Suitability Index

IMPACT SITE WITH PROJECT			IMPACT SITE WITHOUT PROJECT			MITIGATION SITE WITH PROJECT			MITIGATION SITE WITHOUT PROJECT		
TY0-TY1 =	0.0004	Habitat Units	TY0-TY1 =	0.0008	Habitat Units	TY0-TY1 =	0.07	Habitat Units	TY0-TY1 =	0.0037	Habitat Units
TY1-TY3 =	0.0000	Habitat Units	TY1-TY3 =	0.0013	Habitat Units	TY1-TY3 =	0.62	Habitat Units	TY1-TY3 =	0.0850	Habitat Units
TY3-TY5 =	0.0000	Habitat Units	TY3-TY5 =	0.0013	Habitat Units	TY3-TY5 =	0.99	Habitat Units	TY3-TY5 =	0.4000	Habitat Units
SUM	0.0004		SUM	0.0034		SUM	1.68		SUM	0.489	
AAHUs (5 years)=	0.0001	AAHU	AAHUs (5 yrs)=	0.0007	AAHU	AAHUs (5 yrs)=	0.34	AAHU	AAHUs (5 yrs):	0.098	

COMPENSATION CALCULATION

NET LOSS OF AAHU - IMPACT SITE	-0.0006	AAHU
NET GAIN OF AAHU - MITIGATION SITE	0.24	AAHU
TOTAL GAIN/LOSS	**0.24**	**AAHU**

TABLE 2: Spotted Seatrout Habitat Variables (Estuarine Emergent)

	Variable	Impact Site (Pre Con)	SI (Pre Con)	Impact Site (Years 1,3,5)	SI (Years 1,3,5)		Mitigation Site (Pre Con)	SI (Pre Con)	Mitigation Site With-Project(Y1)	SI With Project(Y1)	Mitigation Site With-Project(Y3)	SI With Project(Y3)	Mitigation Site With-Project(Y5)	SI With Project(Y5)		Mitigation Site WO-Project (Y1)	SI Without Project(Y1)	Mitigation Site WO-Project (Y3)	SI Without Project(Y3)	Mitigation Site WO-Project (Y5)	SI Without Project(Y5)
V_1	Lowest monthly mean winter-spring salinity	1.45	0	<1	0		1.45	0	1.45	0	1.45	0	1.45	0		1.45	0	1.45	0	1.45	0
V_2	Highest monthly mean summer salinity	13.23	0.7	10.23	0.4		13.23	0.7	13.23	0.7	13.23	0.7	13.23	0.7		13.23	0.7	13.23	0.7	13.23	0.7
V_3	Lowest monthly mean winter temperature	11.28	0.6	11.28	0.6		11.28	0.6	11.28	0.6	11.28	0.6	11.28	0.6		11.28	0.6	11.28	0.6	11.28	0.6
V_4	Highest monthly mean summer temperature	31.2	1.0	31.2	1.0		31.2	1.0	31.2	1.0	31.2	1.0	31.2	1.0		31.2	1.0	31.2	1.0	31.2	1.0
V_5	% study area with submerged and emergent vegetation, submerged islands, and oyster reefs	35	0.7	0	0		5	0.1	50	1.0	100	1	100	1		10	0.2	40	0.8	80	1

HSI and HU CALCULATIONS

	IMPACT (pre)	IMPACT (yr 1, 3, 5)	MITIGATION With-Project (pre)	MITIGATION With-Project (YR1)	MITIGATION With-Project (YR3)	MITIGATION With-Project (YR5)	MITIGATION WO-Project (pre)	MITIGATION WO-Project (YR1)	MITIGATION WO-Project (YR3)	MITIGATION WO-Project
Water Quality (WQ) = $(SIV_1 \times SIV_2)^{1/2}$ or $(SIV_3 \times SIV_4)^{1/2}$ whichever is lower	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Food / Cover (FC) = SIV_5	0.70	0.00	0.10	1.00	1.00	1.00	0.10	0.20	0.80	1.00
HSI = WQ or FC, whichever is lower	0.00	0.00	0.10	0.00	0.00	0.00	0.10	0.20	0.00	0.00
HU = HSI x Acres	0.00	0.00	0.18	0.00	0.00	0.00	0.18	0.36	0.00	0.00

AVERAGE ANNUAL HABITAT UNIT CALCULATIONS

$(T_2 - T_1)$ $(((A_2xHSI_2) + (A_1xHSI_1))/3) + ((A_1xHSI_2) + (A_2xHSI_1))/6))$ = Habitat Units Between Target Years

T = Target Year, A = Acreage, HSI = Habitat Suitability Index

IMPACT SITE WITH PROJECT			IMPACT SITE WITHOUT PROJECT			MITIGATION SITE WITH PROJECT			MITIGATION SITE WITHOUT PROJECT		
TY0-TY1 =	0.00	Habitat Units	TY0-TY1 =	0.00	Habitat Units	TY0-TY1 =	0.09	Habitat Units	TY0-TY1 =	0.27	Habitat Units
TY1-TY3 =	0.00	Habitat Units	TY1-TY3 =	0.00	Habitat Units	TY1-TY3 =	0.00	Habitat Units	TY1-TY3 =	0.30	Habitat Units
TY3-TY5 =	0.00	Habitat Units	TY3-TY5 =	0.00	Habitat Units	TY3-TY5 =	0.00	Habitat Units	TY3-TY5 =	0.00	Habitat Units
SUM	0.00		SUM	0.00		SUM	0.09		SUM	0.57	
AAHUs (5 years)=	0.00	AAHU	AAHUs (5 yrs)=	0.00	AAHU	AAHUs (5 yrs)=	0.02	AAHU	AAHUs (5 yrs)=	0.11	

COMPENSATION CALCULATION

NET LOSS OF AAHU - IMPACT SITE	0.00	AAHU
NET GAIN OF AAHU - MITIGATION SITE	-0.10	AAHU
TOTAL GAIN/LOSS	**-0.10**	**AAHU**

TABLE 3: Marsh Wren Habitat Variables (Estuarine Emergent)

	Variable	Impact Site (Pre Con)	SI (Pre Con)	Impact Site (Years 1,3,5)	SI (Years 1,3,5)		Mitigation Site (Pre Con)	SI (Pre Con)	Mitigation Site With-Project(Y1)	SI With Project(Y1)	Mitigation Site With-Project(Y3)	SI With Project(Y3)	Mitigation Site With-Project(Y5)	SI With Project(Y5)		Mitigation Site WO-Project (Y1)	SI Without Project(Y1)	Mitigation Site WO-Project (Y3)	SI Without Project(Y3)	Mitigation Site WO-Project (Y5)	SI Without Project(Y5)
V_1	Growth form of emergent hydrophytes	short herb and shrubs (3)	0.1	open water	0		cordgrass	1.0	cordgrass	1.0	cordgrass	1.0	cordgrass	1.0		cordgrass	1.0	cordgrass	1.0	cordgrass	1.0
V_2	% canopy cover of emergent herbaceous vegetation	18	0.03	0	0		5	0.01	50	0.1	100	1.0	100	1.0		10	0.01	40	0.08	80	1.0
V_3	Mean water depth (cm) in wetland	0	0	>20	1.0		15	1.0	15	1.0	15	1.0	15	1.0		15	1.0	15	1.0	15	1.0
V_4	% canopy cover of woody vegetation	18	0.8	0	1.0		0	1.0	0	1.0	0	1.0	0	1.0		0	1.0	0	1.0	0	1.0

HSI and HU CALCULATIONS

	IMPACT (pre)	IMPACT (yr 1, 3, 5)	MITIGATION With-Project (pre)	MITIGATION With-Project (YR1)	MITIGATION With-Project (YR3)	MITIGATION With-Project (YR5)	MITIGATION WO-Project (pre)	MITIGATION WO-Project (YR1)	MITIGATION WO-Project (YR3)	MITIGATION WO-Project (YR5)
HSI = $(SIV_1 \times SIV_2 \times SIV_3)^{1/3} \times SIV_4$	0	0	0.003	0.033	0.333	0.333	0.003	0.003	0.027	0.333
HU = HSI x Acres	0	0	0.006	0.060	0.600	0.600	0.006	0.006	0.048	0.600

AVERAGE ANNUAL HABITAT UNIT CALCULATIONS

$(T_2 - T_1)$ $(((A_2 x HSI_2) + (A_1 x HSI_1))/3) + ((A_1 x HSI_2) + (A_2 x HSI_1))/6))$ = Habitat Units Between Target Years

T = Target Year, A = Acreage, HSI = Habitat Suitability Index

IMPACT SITE WITH PROJECT			IMPACT SITE WITHOUT PROJECT			MITIGATION SITE WITH PROJECT			MITIGATION SITE WITHOUT PROJECT		
TY0-TY1 =	0.00	Habitat Units	TY0-TY1 =	0.02	Habitat Units	TY0-TY1 =	0.03	Habitat Units	TY0-TY1 =	0.01	Habitat Units
TY1-TY3 =	0.00	Habitat Units	TY1-TY3 =	0.40	Habitat Units	TY1-TY3 =	0.55	Habitat Units	TY1-TY3 =	0.05	Habitat Units
TY3-TY5 =	0.00	Habitat Units	TY3-TY5 =	0.72	Habitat Units	TY3-TY5 =	1.00	Habitat Units	TY3-TY5 =	0.54	Habitat Units
SUM	0.00		SUM	1.14		SUM	1.58		SUM	0.59	
AAHUs (5 years)=	0.00	AAHU	AAHUs (5 yrs	0.23	AAHU	AAHUs (5 yrs)=	0.32	AAHU	AAHUs (5 yrs)=	0.12	

COMPENSATION CALCULATION

NET LOSS OF AAHU - IMPACT SITE	-0.23	AAHU
NET GAIN OF AAHU - MITIGATION SITE	0.20	AAHU
TOTAL GAIN/LOSS	**-0.03**	**AAHU**

TABLE 4: Summary of Habitat Units for Impact Site and Mitigation Site

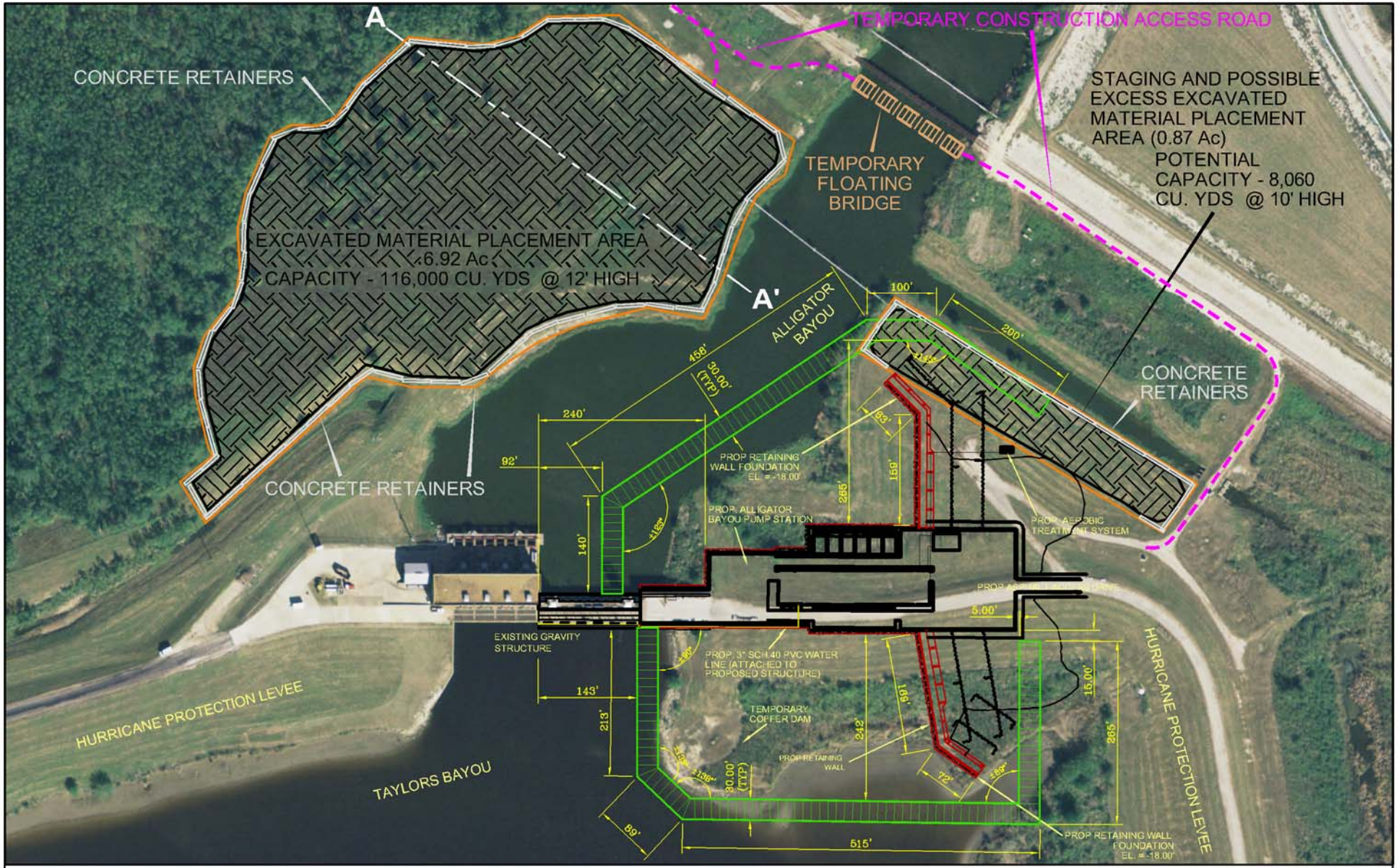
	IMPACT HU	MITIGATION HU	HU Gain-Loss		
Shrimp	-0.0006	0.24	0.24		
Spotted Seatrout	0.00	-0.10	-0.10		
Marsh Wren	-0.23	0.20	-0.03		
AVERAGE HU LOSS OR GAIN	-0.06	0.09	0.03	Ratio of Gain =	0.2

ATTACHMENT C

PROJECT PLANS

"Do Not Scale This Drawing"

060108A21PA_Plan.dwg | JEA | 12/5/2011 || Revised: JEA | 10/31/2012



MAP SOURCE:

1. PROVIDED BY CARROLL & BLACKMAN, INC. (2008)
2. 2006 AERIAL: JEFFERSON COUNTY DRAINAGE DISTRICT (2008)

Horizon Environmental Services, Inc.

0 100 200 FEET

FIGURE 4

PLAN VIEW OF PROPOSED PUMP STATION
CONSTRUCTION OF A NEW PUMP STATION
ALLIGATOR BAYOU PUMP STATION #16
CONFLUENCE OF ALLIGATOR BAYOU
AND TAYLORS BAYOU
PORT ARTHUR, JEFFERSON COUNTY, TEXAS