



**US Army Corps
of Engineers**
Galveston District

**DRAFT
ENVIRONMENTAL ASSESSMENT**

**RESTORATION OF THE MOUTH OF THE SAN BERNARD RIVER
TO THE GULF OF MEXICO
BRAZORIA COUNTY, TEXAS**

June 2008

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**DRAFT
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**RESTORATION OF THE MOUTH OF THE SAN BERNARD RIVER
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1.0 PROPOSED PLAN

1.1 PROJECT DESCRIPTION AND AUTHORITY

The purpose of this U.S. Army Corps of Engineers (USACE) Draft Environmental Assessment (EA) is to describe the environmental impacts associated with the effort to restore the mouth of the San Bernard River to the Gulf of Mexico at its historic location prior to impacts resulting from the 1929 construction of the Brazos River Diversion Channel Project (Diversion Channel). The portion of the San Bernard River to be dredged is located immediately south of the Gulf Intracoastal Waterway (GIWW) in Brazoria County, Texas. The proposed restoration of the river's mouth to the Gulf is necessary for the safe operation and maintenance of the GIWW and Brazos River Floodgates.

The San Bernard River above the GIWW is an authorized 9-foot by 100-foot navigation channel that extends from the intersection with the GIWW upriver for approximately 31 miles. The channel is rarely dredged and has limited commercial navigation. The particular reach of the GIWW involved in this study was described in a report of the Chief of Engineers contained in House Document 230, 76th Congress, 1st Session, dated 23 March 1939. That report was adopted by Congress in Public Law 675 of the 77th Congress.

1.2 NEED FOR PROJECT

The purpose of the proposed project is to reconnect the San Bernard River with the Gulf of Mexico at its historic location. The mouth of the San Bernard River has migrated about two miles to the southwest since the 1929 construction of the Diversion Channel and the 1940's construction of the GIWW, and is now almost closed at the Gulf of Mexico due to sand accretion from the delta formed by the Diversion Channel. Accretion has accelerated over the last ten years due to a number of factors, including flooding on the Brazos River. At its current location, river discharge is not sufficient to flush the shoaling at the mouth of the river and keep it open to the Gulf. The blockage of the river's mouth has diverted flow into the GIWW, raising concerns for barge traffic along the GIWW (Kraus, 2002). The Galveston District, USACE, has received reports that barge tows traveling along the GIWW between the San Bernard and Brazos Rivers can experience an eastward flowing current that is sufficiently strong to pose a

potential navigation hazard. To allow for a more effective, safe, and efficient waterway, the proposed restoration of the mouth of the San Bernard River would reduce treacherous currents resulting from diverted flow into the GIWW and Brazos River Floodgates.

In 2002, a study by the U.S. Army Engineer Research and Development Center (ERDC) addressed how to improve navigation safety and efficiency on the GIWW in the vicinity of the San Bernard River. The conclusion of the study was that dredging a shorter, deeper channel to the Gulf would increase the hydraulic efficiency of the river sufficiently to keep the mouth open and flowing for perhaps 6 to 12 years, before longshore transport of sediment from the Brazos River would again overtake the channel. The proposed alignment, depicted in Figure 2, would re-establish sufficient flow while producing minimal environmental impacts.

1.3 WORK REQUIRED

The proposed project would consist of dredging the San Bernard River channel immediately south of the GIWW to the Gulf of Mexico (Station 0+00 to 96+23) through the existing and relatively recent sand spit (Figure 1). The entire reach, extending approximately two miles from the GIWW to the 10-foot contour line in the Gulf, would be dredged by hydraulic pipeline dredge to -10 mean low tide (MLT), with a bottom width of 100 feet and a top width of 160 feet. This effort would generate approximately 385,000 cubic yards (CY) of dredged material and 45,000 CY of vegetative debris that would be placed in three placement areas (PA; Figure 1).

Approximately 150,000 CY of material would be dredged from the existing river channel from the GIWW to the spit (Station 0+00 to 55+00) and placed in PA 90. PA 90 is a 119-acre, totally confined upland site previously coordinated for disposal of dredged material from the GIWW. This PA is located on the south side of the GIWW adjacent to the east bank of the San Bernard River, and is used about every five to six years for GIWW maintenance dredging.

An estimated 235,000 CY of sand would be dredged through the spit to the 10-foot contour line in the Gulf (Station 55+00 to 96+23) and deposited in the surf zone downdrift (southwest) of the new channel in the Surf PA, resulting in beach nourishment. Approximately 45,000 CY of vegetative debris, including large drift wood and other flotsam located on the spit in the proposed alignment, would be removed and deposited parallel to the Gulf shoreline above the beach vegetation line in the 9-acre Debris PA prior to dredging the new channel. The Debris PA is a temporary, one time use area for project construction. The debris would be wind-rowed parallel to the beach above the beach vegetative line (Figure 4). Vegetative debris found buried in the spit during dredging would also be removed and placed in the Debris PA. Non-vegetative debris including potentially hazardous material would be removed by the contractor and properly disposed of in a licensed disposal facility off site.

Excavation of the existing river channel would be accomplished by hydraulic pipeline dredge to the spit. At the spit, equipment would be barged in for vegetative debris removal and placement. It is anticipated that frontend loaders, backhoes, and trucks would be used for debris removal and placement. Once the vegetative debris is removed, the spit would also be excavated by hydraulic pipeline dredge, with the material pumped to the Surf PA for beach nourishment. Across the spit, channel construction impacts would be limited to a 200-foot wide corridor, which would accommodate construction of the new channel, equipment access, and staging areas. At the beach, a 100-foot pipeline corridor would provide access for surf placement of sand. This corridor would allow sufficient room to place the 24-inch dredge pipeline and for equipment access and maneuvering. The pipeline corridor would be placed above the beach swash zone to minimize impacts to piping plover critical habitat. After construction, it is estimated that 300,000 CY to 500,000 CY of maintenance material will be dredged from the channel every six to twelve years. No jetties or other hard structures would be constructed at the mouth of the river. Channel dimensions have been designed to provide sufficient velocity to keep the channel scoured and open between maintenance dredging cycles.

2.0 PROJECT ALTERNATIVES

Several alternatives were developed by ERDC during their study of the river (Kraus, 2002), and others were developed by the Galveston District team. The objective was to increase safe and efficient commercial navigation on the GIWW by addressing the hydrology of the lower San Bernard River, as described above. The following criteria were identified as important in the development and evaluation of possible project alternatives. The Recommended Plan should:

- Minimize environmental impacts;
- Minimize need for easements or land acquisition;
- Minimize the frequency of maintenance dredging; and
- Increase river velocity to maintain a restored channel

Four alternatives were identified for evaluation including No Action, a 4-foot deep by 400-foot wide channel, a 7.5-foot deep by 100-foot wide channel, and a 10-foot deep by 100-foot wide channel, which is the Recommended Plan. Each of these alternatives is described in detail below.

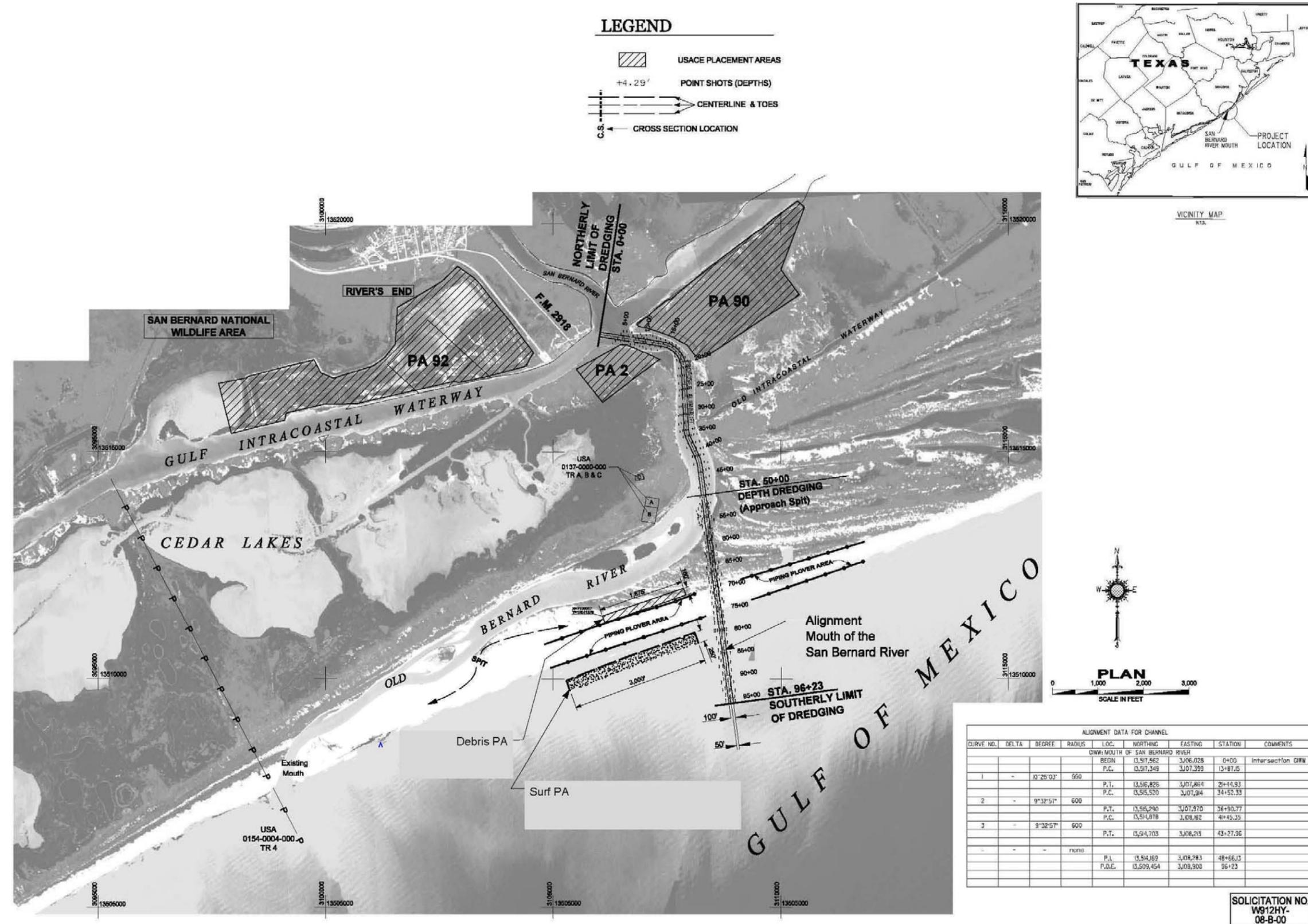


Figure 1: Plan for the Mouth of the San Bernard River Dredging .

Table 1: Alternatives Screening Matrix

Screening Criteria Alternatives	Minimize Environment al Impacts	Minimize Need for Easements	Minimize Maintenanc e Dredging	Increase river velocity to maintain channel
No Action	✓	✓		
4-ft x 400-ft Channel				✓
7.5-ft x 100-ft Channel	✓	✓		✓
10-ft x 100-ft Channel Recommended Plan	✓	✓	✓	✓

2.1 NO ACTION

Under the No Action Alternative the mouth of the San Bernard River would silt in entirely, closing off flow to the Gulf of Mexico. Inefficient and unsafe commercial navigation conditions on the GIWW would worsen. In addition, the hazardous increase in current velocities near the Brazos River Flood Gates would also worsen, increasing navigation hazards through the flood gates. Along with hazardous conditions on the GIWW, the continued migration of the river would result in the degradation of biological resources in and along the river as the mouth closes off entirely, losing Gulf exchange and tidal action in its lower reaches.

2.2 FOUR-FOOT DEEP CHANNEL

This alternative consists of dredging the river channel to a width of 400-feet from its intersection of the GIWW south to the 4-foot contour line in the Gulf of Mexico (Station 00+00 to 80+00), a distance of about two miles. This alternative would generate approximately 300,000 CY of material, with sand being placed the Surf PA

for beach nourishment, and material not compatible with the beach placement going to PA 90. This alternative would not produce sufficient current to keep the river flowing and the mouth open. In addition, the 400-foot width would impact the natural banks of the San Bernard River and require land acquisition or easements, increasing the cost and impacts of the project. Maintenance dredging of this alternative would occur every one to three years with an estimated 150,000 CY to 300,000 CY of material being placed in either PA 90 or the Surf PA for beach nourishment.

2.3 SEVEN AND A HALF FOOT DEEP CHANNEL

This alternative would consist of dredging the river channel from its intersection with the GIWW to the spit at a depth of – 7.5 feet MLT (Station 00+00 to 55+00) and to – 10 feet MLT through the spit to the 10-foot contour in the Gulf of Mexico (Station 55+00 to 96+23). The channel would have a bottom width of 100 feet and a top width of 350 feet. This alternative would generate approximately 500,000 CY of dredged material, with sand placed in the Surf PA for beach nourishment, and material not compatible with beach placement going to PA 90. This alternative would not sufficiently increase river velocity to keep the channel scoured, resulting in more frequent maintenance dredging. It is estimated that this alternative would require maintenance dredging every three to six years with an estimated 150,000 CY to 300,000 CY of material being placed in either PA 90 or the Surf PA for beach nourishment.

2.4 TEN FOOT DEEP CHANNEL (RECOMMENDED PLAN)

This alternative would dredge the river from the GIWW south to the 10-foot contour line in the Gulf of Mexico (Station 00+00 to 96+23). This two mile long restored channel would be dredged to -10 feet MLT with a bottom width of 100 feet and a top width of 160 feet. This alternative would generate an estimated 385,000 CY of dredged material, with sand placed in the Surf PA for beach nourishment and material not compatible with beach placement going to PA 90. This would restore the mouth of the river to its historic location and reestablish sufficient flow to keep the mouth open and the channel scoured. The restored river would result in improved conditions for commercial shipping on the GIWW and the Brazos River Flood Gates. The increased water velocity through the river channel would also reduce the frequency of maintenance dredging. This alternative would require maintenance dredging every six to twelve years with an estimated 300,000 CY to 500,000 CY of material placed in either PA 90 or the surf zone for beach nourishment.

3.0 AFFECTED ENVIRONMENT

3.1 DESCRIPTION OF THE PROJECT AREA

The proposed project is located on the upper Texas coast in Brazoria County, southwest of Freeport. Brazoria County is bordered by Matagorda, Fort Bend, Harris and Galveston Counties, and has experienced the urban sprawl of Houston and the

spread of suburban development along State Highway 288. Despite its location, the project area is located along a relatively remote and undeveloped portion of the Texas Gulf Coast (Figure 2).

The Texas Gulf Coast has low-lying, dynamic coastal landforms that include barrier islands, peninsulas, offshore sand bars, bays, mudflats, dunes, and shoals. These landforms are subject to the activities of waves, winds, storms, tides, climate, rising sea levels, and human activities, and are of direct concern to this project.

The San Bernard River rises one mile south of New Ulm in Austin County and flows 120 miles to the Gulf (Handbook of Texas Online, 2008). The river was dammed at the Wharton-Fort Bend county line in 1929, and was truncated by the GIWW in the 1940's. As described above, the river has been further impacted by the diversion of the Brazos River, approximately five miles to the northeast of the project area. Immediately west of the project area is the San Bernard Wildlife Refuge, significant for providing winter habitat for migratory waterfowl and birds on the Central Flyway, preserving rich coastal prairies and salt marshes in southern Matagorda and Brazoria Counties, and supporting a colonial water bird rookery. The project area is also located within the Columbia Bottomlands Conservation Area.



Figure 2: Project Area and Brazos River Floodgates

The proposed project area is located immediately south of the GIWW. This very active coastal area has undergone significant change over the last 80 years, due in large part to impacts to coastal sediment budget resulting from the development of the Port of Freeport and the dredging of the GIWW. The diversion of the Brazos River for port development resulted in a significant increase in the amount of sediment transported southward to the San Bernard River area, while the GIWW provides a channel available to “capture” flow from the impeded river, further reducing the current necessary to keep the mouth of the river open. Apparently unaware of the 2002 ERDC report (Kraus, 2002), TPWD’s Coastal Fisheries Division evaluated the blockage of the river’s mouth in 2004 in an attempt to determine the potential impact of the GIWW on the lower river (Chen and Buzan, 2004). Although their study was inconclusive as to the influence of the GIWW on the river, Chen and Buzan document that the mouth migrated from its 1974 location (the approximate location proposed for its restoration in this project), over 1.3 miles to the southwest by 2002. The 1974 location of the river’s mouth is now blanketed by a substantial sand spit that will be dredged through in this current restoration effort.

As is evident in Figures 2 and 3, a number of accretion ridges have developed, causing the river to migrate. Because of the small tidal range, the project area is classified as wave dominated, with development of successive beach ridges rather than stabilized dunes (Kraus, 2002). The older ridges, to the east of the current mouth, are more stable and support more vegetation. The area of the proposed channel cut is relatively recent, with limited scrub vegetation between the existing river channel and the beach, and no dune formation on the beach. The existing river channel in the project area supports fringing *Spartina* marsh, the distribution of which shifts with the migration of the channel.

3.2 PLACEMENT AREAS

Three placement areas have been identified for this project, including PA 90, a surf zone placement area, and a temporary placement area for driftwood and vegetative debris removed from the proposed channel alignment across the spit. Existing PA 90 is 119 acres in size. The PA is an active, leveed, totally confined PA that is currently used for maintenance dredging of the GIWW about every five to ten years. New construction material from the existing river channel will be placed in PA 90, which will also be used for maintenance dredging placement. PA 90 will be used for placement of silty material that cannot be used for beach placement.

The Surf Zone PA (Figure 3) extends approximately 3000 feet downdrift from the proposed channel parallel to the beach and in the active surf zone. Sediment placed in this PA will re-enter the littoral system and nourish the beach downdrift of the new channel. It is anticipated that this sand in combination with wind-blown sand will rapidly fill the migrated mouth of the river, creating both piping plover critical habitat and shallowing the abandoned river channel sufficiently to support the establishment of

Spartina marsh. This PA will be used for disposal of beach quality sand during both construction and maintenance of the channel.

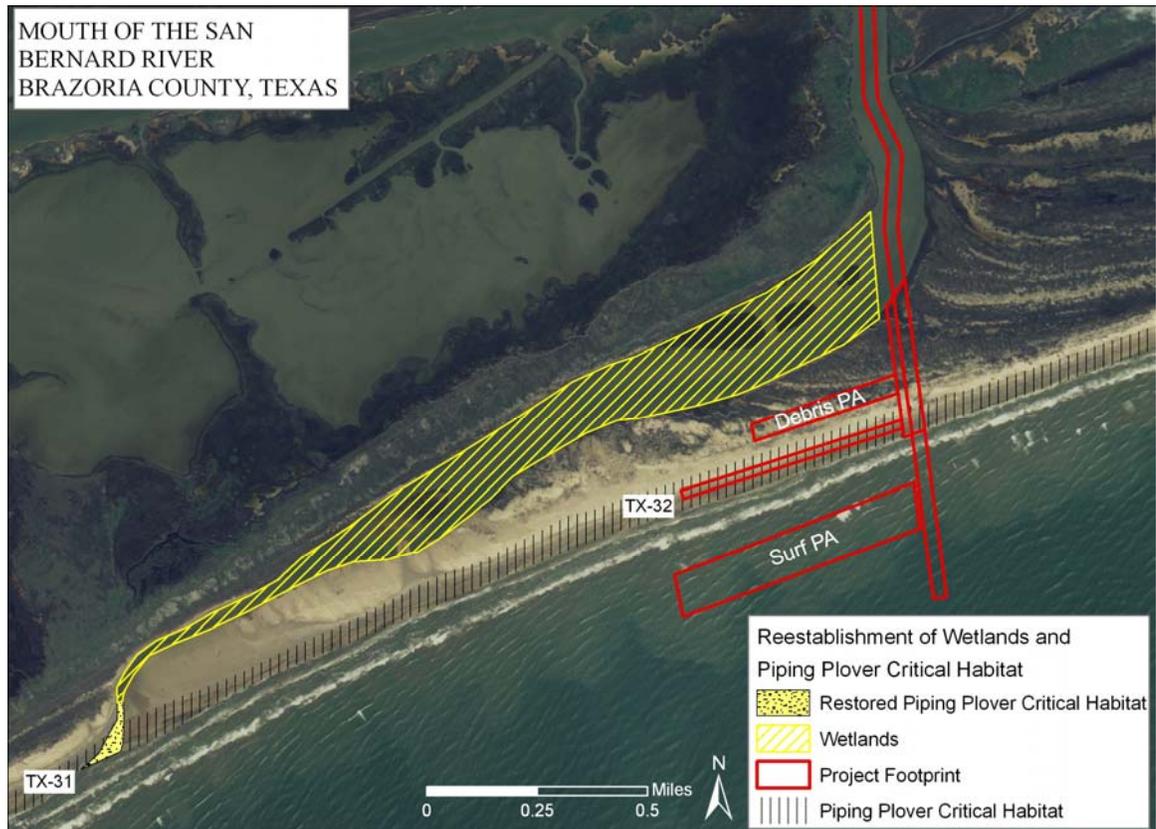


Figure 3. Anticipated Reestablishment of Wetlands and Piping Plover Critical Habitat.

A substantial quantity of driftwood and other water-deposited vegetative debris must be removed from the channel alignment across the spit. It is estimated that 45,000 CY of this material requires removal. In coordination with state and Federal resource agencies, a concurrence was reached that the best plan for removing this material was to windrow it parallel to the beach at the vegetation line in order to trap sediment and help stabilize the beach. A one-time use Debris PA approximately nine acres in size is proposed immediately adjacent to and downdrift of the new channel. Debris will be removed by front-end loaders or backhoes and placed parallel to the beach in the area identified on Figure 4. Existing vegetation in the Debris PA area consists of sparse scrub, grasses, and shore vegetation.

3.3 VEGETATION

The project area is located in the Gulf Coast Prairies and Marshes Region, that borders the Gulf of Mexico from the Sabine River to Corpus Christi Bay (Gould et al, 1960). The soils of the area range from acidic sands to sandy loams, with clays occurring in the river bottoms. While the project is located in an area of great

biological diversity, the immediate project area has undergone rapid transformation and is somewhat degraded. The vegetation of the immediate project area includes *Spartina* wetlands along the river, and sparse beach and sand ridge vegetation including *Spartina alterniflora*, *S. patens*, *S. spartinae*, *Scirpus sp.*, *Ipomoea pescapre*, *Croton punctatus*, *Heterotheca subaxillaris*, and *Machaeranthera philoxeroides*. The area has undergone such rapid accretion that vegetation has trouble establishing, and the distribution of species and habitats is transient.

3.4 WILDLIFE RESOURCES

The project area is located in the Texan Biotic Province (Blair, 1950), an area which supports a wide variety of animals. The San Bernard River area provides feeding and nesting habitat for a large number of species of waterfowl, shore, and migratory birds traversing the Mississippi or Central Flyways. Primary species of migratory waterfowl in the area include Canada goose (*Branta canadensis*), white-fronted goose (*Anser albifrons*), snow goose (*Chen hyperborea*), blue goose (*C. caerulescens*), pintail (*Anas acuta*), gadwall (*A. strepera*), blue and green-winged teal (*A. discors*, *A. carolinensis*), mallard (*A. platyrhynchos*), mottled ducks (*A. fulvigula*), shoveler (*A. clypeata*), lesser scaup (*Aythya affinis*), redhead (*A. americana*), and American wigeon (*Mareca americana*). The bays and marshes contain shore and wading birds including pelicans (*Pelecanus* spp.), black skimmer (*Rynchops niger*), white-faced ibis (*Plegadis chihi*), roseate spoonbill (*Ajaia ajaja*), plovers (*Charadrius* spp.), gulls and terns (*Laridae* family), sandpipers (*Scolopacidae* family), and herons and egrets (*Ardeidae* family) (USACE, 1977).

Marshes and pastureland in the vicinity of the project area provide food and cover for numerous other wildlife species including nutria (*Myocaster coupus*), otter (*Lutra canadensis*), muskrat (*Ondatra zibethicus*), skunk (family *Mustelidae*), rabbit (*Syvilagus spp.*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), and armadillo (*Dasyopus novemcinctus*).

The beaches in the project area provide habitat for nesting sea turtles and are designated as critical habitat for the threatened piping plover.

3.5 AQUATIC RESOURCES

3.5.1 San Bernard River

A recent water quality and biological study conducted by the United States Geological Survey (USGS; East and Hogan, 2003) on the San Bernard River found that fish diversity and numbers decreased as they sampled down river. The study reports only seven species including longnose gar (*Lepisosteus osseus*), channel catfish (*Ictalurus punctatus*), longear sunfish (*Lepomis megalotis*), freshwater drum (*Aplodinotus grunniens*), blackstripe topminnow (*Fundulus notatus*), blacktail shiner (*Cyprinella venusta*), and red shiner (*Cyprinella lutrensis*) from a collection station at West Columbia, approximately 25 miles from the project area, from a list of 32 fish

species found in the river at all sampling locations. With the near total closure of the mouth of the river and minimal flow or tidal exchange, it is assumed that the channel in the project area supports a depauperate fish population of more salt tolerant species.

3.5.2 Essential Fish Habitat

Essential Fish Habitat (EFH) consists of those habitats necessary for spawning, breeding, feeding, or growth to maturity of species managed by Regional Fishery Management Councils, as described in a series of Fishery Management Plan, pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). The Gulf of Mexico Fishery Management Council (GMFMC) has identified habitats in the project vicinity as EFH for juvenile and adult red drum (*Sciaenops ocellatus*), adult Spanish mackerel (*Scomberomorus maculatus*), juvenile and adult white shrimp (*Penaeus setiferus*) and brown shrimp (*Farfantepenaeus aztecus*), adult pink shrimp (*Farfantepenaeus duorarum*), and juvenile and adult Gulf stone crab (*Menippe adina*). EFH in the project area includes estuarine emergent marsh, estuarine mud, sand and shell substrate, and estuarine water column. This EA initiates EFH consultation under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA).

3.6 THREATENED AND ENDANGERED SPECIES

The U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) considered the threatened or endangered species in Table 1 as possibly occurring in Brazoria County. The bald eagle has been recently delisted but the protections provided by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act remain in effect.

A Biological Assessment (BA) has been prepared that addresses the proposed project's potential impact on federally listed threatened and endangered species and species of concern. This BA, which is included as Appendix B, includes information on the distribution and habitat requirements of these species. Of these species, the brown pelican, piping plover, and sea turtles are known to occur in the project area. All of the beach zone in the project area is designated as critical habitat (TX-31 and TX-32) for the piping plover, and this species is likely to occur as a winter migrant. Critical habitat unit TX-31 extends from south of Cedar Lakes to the mouth of the San Bernard River, while TX-32 extends from the mouth of the San Bernard River to the Brazos River.

Although the Kemp's Ridley sea turtle is the rarest of the sea turtles, in recent years there has been an increase in the reported nesting of this turtle along the Texas coast. It is possible that this species could occur in or near the project site during nesting season.

Table 2: Federally Listed Threatened and Endangered Species for Brazoria County

Common Name	Scientific Name	Listing Status	
		FWS	NMFS
Plants			
Texas Prairie-dawn Flower	<i>Hymenoxys texana</i>	Endangered	
Fish			
Smalltooth sawfish	<i>Pristis pectinata</i>		Endangered
Reptiles			
Green sea turtle	<i>Chelonia mydas</i>	Threatened	Threatened
Hawksbill sea turtle	<i>Eretmochelys imbricata</i>	Endangered	Endangered
Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>	Endangered	Endangered
Leatherback sea turtle	<i>Dermochelys coriacea</i>	Endangered	Endangered
Loggerhead sea turtle	<i>Caretta caretta</i>	Threatened	Threatened
Birds			
Brown pelican	<i>Pelecanus occidentalis</i>	Endangered	
Piping plover	<i>Charadrius melodus</i>	Threatened*	
Whooping crane	<i>Grus americana</i>	Endangered	
Mammals			
Blue whale	<i>Balaenoptera musculus</i>		Endangered
Finback whale	<i>Balaenoptera physalus</i>		Endangered
Humpback whale	<i>Megaptera novaengliae</i>		Endangered
Sei whale	<i>Balaenoptera borealis</i>		Endangered
Sperm whale	<i>Physeter macrocephalus</i>		Endangered

*Critical Habitat

Federally protected species are also listed by Texas Parks and Wildlife Department (TPWD), in addition to other species of state concern (Table 3, below). These additional species are not further addressed as they are not likely to occur in the study area or have minimal potential to be impacted by the proposed project.

Table 3: State Listed Species for Brazoria County, Texas

Common Name	Scientific Name	Listing Status
White-tailed hawk	<i>Buteo albicaudatus</i>	Threatened
Reddish egret	<i>Egretta rufescens</i>	Threatened
American Peregrine falcon	<i>Falco peregrinus anatum</i>	Endangered
Arctic Peregrine falcon	<i>Falco peregrinus tundrius</i>	Threatened
Wood stork	<i>Mycteria americana</i>	Threatened
Eskimo curlew	<i>Numenius borealis</i>	Endangered
White-faced ibis	<i>Plegadis chihi</i>	Threatened
Sooty tern	<i>Sterna fuscata</i>	Threatened
Red wolf	<i>Canis rufus</i>	Endangered
West Indian manatee	<i>Trichechus manatus</i>	Endangered
Louisiana black bear	<i>Ursus americanus luteolus</i>	Threatened
Alligator snapping turtle	<i>Macrochelys temminckii</i>	Threatened
Texas horned lizard	<i>Phrynosoma cornutum</i>	Threatened

3.7 HISTORIC RESOURCES

A site file and records review was conducted for the project area. The files at the Texas Archeological Research Laboratory and at the Texas Historical Commission (THC) were both examined for the location of recorded terrestrial archeological sites, listed National Register of Historic Places (NRHP) properties, State Archeological Landmark sites and Texas Historic Markers. The shipwreck files at the THC's State Marine Archeologist Office were also examined for the location of plotted shipwrecks.

There are seven recorded sites in the vicinity of the proposed project (Voellinger & Nash 1989). Six sites (41BO81-85 and 41BO205) were tested and were recommended as not eligible for the NRHP. The DuCroz Cemetery, 41BO170, as a cemetery is not normally considered eligible for the NRHP; however, cemeteries are protected by state law. The proposed project will not impact any historic properties eligible for inclusion in the NRHP or the DuCroz Cemetery.

Preliminary historical research has indicated that there is a high probability of shipwrecks at the mouth of the San Bernard River. The dynamic environment and ever-shifting bar guarding the river mouth has been a known hazard to coastal vessels since the mid-nineteenth century. Frequent hurricane and severe storm activity has also resulted in several reported vessel losses in the project vicinity. The channel extension to the 10-foot contour is within State Tract 406. State Tract 406 is on the Texas

Historical Commission's list of sensitive state tracts. No marine cultural resource investigations had previously been conducted in the project area; therefore, a cultural resource remote-sensing survey was conducted to assess for shipwrecks potentially eligible for inclusion on the NRHP.

The investigation included marine surveys of the river channel and offshore project areas, and a terrestrial magnetometer survey of upland portions within, and on either side of the proposed alignment. Following the completion of the remote-sensing survey at a transect spacing of 100 ft (30 m), the magnetometer data were contoured at a 5-gamma interval to determine possible locations of shipwrecks or other historic resources containing concentrations of ferrous materials. Where possible, selected magnetic targets were then subjected to close-order magnetometer survey at a transect spacing of 30 ft (10 m).

3.8 AIR QUALITY AND NOISE

3.8.1 Air

To comply with the 1970 Clean Air Act (CAA) and the 1990 Amendments, the U.S. Environmental Protection Agency (EPA) has promulgated National Ambient Air Quality Standards (NAAQS) for the protection of the public health and welfare with the allowance of an adequate margin of safety. The EPA has set NAAQS for six criteria pollutants- lead, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, and particulates.

The project area is located within Brazoria County, and is part of an area designated as the Houston-Galveston-Brazoria (HGB) Intrastate Air Control Region (EPA 2007d). The HGB is classified as a moderate nonattainment area, with a threshold level of 100 tons per year (tpy) for either NO_x or VOC.

3.8.2 Noise

Federal and local governments have established noise guidelines and regulations for the purpose of protecting citizens from potential hearing damage and from various other adverse physiological, psychological, and social effects associated with noise. The Federal Interagency Committee on Urban Noise developed land-use compatibility guidelines for noise in terms of day-night average sound level (DNL) (USDOT, 1980). It is recommended that no residential uses, such as homes, multifamily dwellings, dormitories, hotels, and mobile home parks, be located where the noise is expected to exceed a DNL of 65 decibels (dBA). The DNL is the energy average A-weighted acoustical level for a 24-hour period with a 10-decibel upward industrial uses area considered acceptable where the noise level exceeds DNL of 65 dBA. For outdoor activities, the EPA recommends DNL of 55 dBA as the sound level below which there is no reason to suspect that the general population will be at risk from any of the effects of noise (USEPA, 1974).

Noise-sensitive receptors are facilities or areas where excessive noise may disrupt normal activity, cause annoyance, or loss of business. Land uses such as residential, religious, educational, recreational, and medical facilities are more sensitive to increased noise levels than are commercial and industrial land uses. The project area is considered remote and undeveloped, with the closest residential neighborhood approximately one mile upstream of the GIWW.

The equipment required to dredge, transport and place the material in the designated PA's would be the primary source of noise from the proposed activities.

3.9 WATER AND SEDIMENT QUALITY

3.9.1 Water Quality

The San Bernard River is a water body connecting Segment 1301, San Bernard River Tidal with Segment 2501-05, Gulf of Mexico Area between Freeport and Port Aransas. Water body uses of these segments are: Aquatic Life Use (ALU); Recreation Use; General Use; and Fish Consumption Use. Based on the most recent data (TCEQ, 2008), the TCEQ determined that ALU in Segment 1301 is high while in Segment 2501-05 ALU is exceptional. There are no direct industrial or municipal discharges in the vicinity that could degrade water quality. However, Recreation Use is not supported in Segment 1301 because of bacteria impairment, while Fish Consumption Use is not supported in Segment 2501-05 because of mercury in fish tissue (TCEQ, 2008).

Water quality data were obtained on samples collected from the proposed dredging alignment on March 5, 2008. Chemical analyses were conducted for several metals, pesticides, polycyclic aromatic hydrocarbons, and other organic compounds. These data are located at Appendix D, and indicate that with respect to chemical contaminants, the water quality is good. The data presented represents the reach where the dredged material will be deposited into upland confined PA 90. Along with data on detected analytes, Appendix D also includes the complete list of contaminants analyzed, and data sheets containing field-collected data and sample locations. The data show that detected contaminant levels in all water samples were below applicable EPA Water Quality Criteria, and Texas Surface Water Quality Standards.

A review of the National Response Center (NRC) web page was also conducted (NRC, 2008). Records for the past three years did not reveal any reports of chemical or petroleum spills in the project vicinity.

Elutriate data are also included in Appendix D. The elutriate test was designed to simulate the process of hydraulic dredging and is used to predict any potential for resuspension of contaminants into the water column during dredging. The elutriate is prepared by creating a slurry which is then agitated to determine if contaminants associated with the sediment particles are resuspended into the water column. These data suggest that there is a potential for resuspension of several metals, namely, arsenic,

nickel, and zinc; but copper indicated a trend toward reduced levels in the elutriates. Ammonia also exhibited an increase in the elutriate samples. Despite slight increases in some chemicals in elutriate samples all concentrations remained below all applicable Texas Surface Water Quality Standards and EPA Water Quality Criteria.

3.9.2 Sediment Quality

Sediment quality data on channel sediments are also located at Appendix D. The sediment quality data are based on analyses of core samples that extended to the proposed depth of dredging. Each core was well-mixed to yield a single composite sample representing the entire dredging depth. There are no EPA quality criteria for sediments, so comparisons with sediment quality screening guidelines (Buchman, 1999) were made. Based on these comparisons, the channel sediment quality is considered to be good.

Grab samples were also collected at each core sample site. The physical characteristics of these sediments, however, are not considered to be compatible with adjacent beach material, therefore, the material represented by these samples will be deposited into upland confined PA. 90. The average sediment grain size distribution for the sediment samples is given in Table 3. The sediments in this reach are primarily clay and silt with a relatively small sand fraction. The D_{50} , which represents the median particle size, indicates an overall size characteristic of very fine silt. The sand composition ranges from 0.5% to 46.2%.

TABLE 4: Sediment and Grain Size Analysis

Project Segment	Average Composition (%)*			D_{50} (mm)
	Sand	Silt	Clay	
Proposed Dredging Area	22.3	18.6	59.1	0.005

The high ground, beach and dunes to be dredged are comprised of sand that accreted through littoral and aeolian processes. Chemical testing was not conducted on this material because this is ocean derived sand, and is considered to be noncontaminated and suitable for beneficial use. However, the cores collected upstream in the river channel suggest that it is possible that there may be some underlying silt and clay that will be excavated along with the sand, but no contaminant issues are anticipated.

3.10 PRIME AND UNIQUE FARMLANDS

The project area does not include land or soil suitable for farming activities.

3.11 SOCIOECONOMICS

Brazoria County is a blend of rural and urban areas, agricultural, manufacturing, and petrochemical companies and a diverse population (GEC, 2001). The Brazoria Metropolitan Statistical Area differs from most metropolitan areas in that there is no one primary city. Instead, it is a community of nine cities joined into one economic entity called Brazosport. These cities include Brazoria, Clute, Freeport, Jones Creek, Lake Jackson, Oyster Creek, Quintana, Richwood, and Surfside Beach.

Although the project area is remote, there is great local interest and support for re-opening the mouth of the San Bernard River. The San Bernard River is a popular recreational river, and before the mouth closed off, it supported a small fleet of off-shore commercial shrimping and crabbing vessels that have since had to move their operations elsewhere (Smith, 2005). Recreational anglers would like to see river access to the Gulf restored, and local residents are concerned that the blockage of the river's mouth exacerbates flooding by impeding movement of flood waters down the river.

3.12 ENVIRONMENTAL JUSTICE

In compliance with Executive Order (EO) 12898, Federal Action to Address Environmental Justice in Minority and Low-Income Populations, an analysis was performed to determine whether the proposed project will have a disproportionately adverse impact on minority or low-income population groups in the vicinity of the project area. This analysis consisted of determining characteristics of residential populations in the project area.

Brazoria County has a population of 241,767 living in 81,954 households, based on the 2000 Census (USCB, 2000). The racial makeup of the county is 77.09% White, 8.50% African American, 0.53% Native American, 2.00% Asian, 0.03% Pacific Islander, 9.63% from other race, and 2.22% from two or more races (USCB, 2000). The closest population center to the project area is the small community of River's End, about one mile north of the GIWW on the west bank of the river.

3.13 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

A hazardous, toxic and radioactive waste (HTRW) survey was conducted in 1999 for the GIWW from the Brazos River to Port O'Conner, including the lower section of the San Bernard River. The purpose of the HTRW investigation was to identify potential hazardous materials or waste that might affect or be affected by the project. The assessment was conducted in accordance with procedures described in the USACE document ER1165-2-132, "Water Resource Policies and Authorities – Hazardous, Toxic and Radioactive Waste Guidance for Civil Works Projects. The 1999 baseline assessment was updated for this project with database available information and a review of aerial photographs from 1956 to 2004. Regulatory agency records don't identify any sites of concern in the project area. A review of the historical aerial photos

shows that the project area has remained undeveloped, with the exception of the construction of PA 90 in the 1980's.

4.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

Construction of the channel would occur within the existing San Bernard River channel, and across a large sand spit into the Gulf, a distance of about two miles, resulting in both temporary and permanent impacts to existing habitats. Habitats that would be impacted by the project include the riverine benthic in the natural channel of the San Bernard River, *Spartina* wetlands, uplands, piping plover critical habitat, and Gulf benthic (Figures 3 and 4). Habitat impacts are described below, and summarized in Table 5.

All impacts from construction within the existing river channel would be confined to the channel. There would be no impacts to the natural banks of the river from the GIWW south to the sand spit, a distance of about one mile. All construction in this reach would be accomplished by hydraulic pipeline dredge, with 150,000 CY of material placed in PA 90. Approximately 20 acres of river channel benthic habitat would be temporarily impacted by the project. The current depth of the river in this location ranges from about eight feet near the GIWW to about two feet near the spit. Deepening the river to 10 feet is anticipated to be a positive impact that would increase river flow and improve natural river habitats and function. The riverine benthic populations are expected to recover rapidly from the dredging.

Construction of the new channel across the sand spit to the Gulf, a distance of about 2,000 feet, would result in both permanent and temporary habitat impacts. Construction of the new channel would permanently impact approximately 2.1 acres of *Spartina* wetlands on the north side of the spit adjacent to the river, and 3 acres of uplands. The channel through the spit would also destroy 1.1 acres of piping plover critical habitat where the channel crosses the beach and enters the Gulf. A 100-foot wide construction corridor immediately west of the new channel would temporarily impact 2.1 acres of uplands, which are anticipated to fully recover after construction. The Debris PA, immediately adjacent to the channel corridor, would temporarily impact an additional 9 acres of upland scrub and grass vegetation immediately north of the beach. The placement of the drift wood and vegetative debris from the channel construction corridor parallel to and immediately north of the beach would serve to trap sand and help stabilize the beach and upland habitats downdrift of the channel. In addition, a 100-foot wide by approximately 2,700-foot long pipeline corridor is necessary to pump beach quality sand from the new channel to the Surf PA for beach nourishment. The pipeline corridor would run on firm beach sand above the swash zone to minimize impacts to piping plover critical habitat, and would temporarily impact approximately 6.3 acres of piping plover critical habitat. Approximately 235,000 CY of new work beach quality sand would be placed in the Surf PA for beach nourishment and creation of, conservatively, 2.5 acres of piping plover critical habitat resulting from the total closure of the existing mouth of the river, and beach nourishment.

The new channel would extend approximately 2,500 feet into the Gulf, temporarily impacting about 7 acres of marine benthic habitat. The Surf PA would temporarily impact an additional 36.5 acres of benthic habitat, for a total of 43.5 acres of temporary impact. In the high energy environment of Texas beaches, benthic organisms suffer frequent natural disturbances and recover quickly. Future temporary impacts would result from maintenance dredging of 300,000 CY to 500,000 CY of material, which is anticipated every 6 to 12 years. It is assumed that much of this material will be beach quality sand and will be placed in the Surf PA for continued beach nourishment. Surf PA and channel benthics are expected to fully and rapidly recover between construction and maintenance dredging events.

Table: 5 San Bernard River Habitat Impacts

Habitats	Construction Features										
	Temporary Impacts (Acres)						Permanent Impacts (Acres)				
	River Ch	Spit Const Corridor	Beach Pipeline Corridor	Gulf Ch	Debris PA	Surf PA	River Ch	Spit Ch	Spit Const Corridor	Beach Nourishment	
River Benthic	20.0						+ 6.0				
Wetlands							+ 140.0	- 2.1	- 0.8		
Uplands	2.1		9.0				- 3.0				
Gulf Benthic				7.0		36.5					
Piping Plover Critical Habitat	0.8		6.3						- 1.1		+ 2.5

4.1 IMPACTS ON VEGETATION

Approximately 2.1 acres of *Spartina* marsh located on the north side of the spit along the San Bernard River channel would be destroyed by construction of the new channel. This loss would be offset, however, by the anticipated natural establishment of extensive marsh habitat in the abandoned San Bernard River channel, from the current mouth of the river at the Gulf, to the new channel. The re-routing of the river and beach nourishment would result in total closure of the current mouth of the river. Aeolian and overwash sand is expected to quickly begin filling the abandoned river channel. As the abandoned channel shallows, *Spartina* would naturally invade and establish, as it is already doing in the shallow, low energy portion of the channel that

approaches the current mouth. It is estimated that as much as 140 acres of marsh could become established in the abandoned river channel once the shoreline is stabilized by the re-routing of the river and beach nourishment (Figure 3).

There would be a permanent loss of 3 acres of upland habitat from channel construction through the spit, and 11.1 acres of temporary impacts from the construction corridor and Debris PA. These impacts are considered minor and transitory in nature. The filling of the current mouth of the river would result in creation of both piping plover critical habitat and new upland habitat in the abandoned channel immediately adjacent to the beach; new upland habitat equivalent to the habitat that would be lost.

4.2 IMPACTS ON WILDLIFE

The proposed project would not have significant negative impacts on wildlife in the project area. There would be temporary, minor disturbance during construction, but species that do not tolerate disturbance could avoid the area during this time. The habitat in the project area is similar to the habitat found extensively along the Texas coast in the immediate vicinity of the project area. Temporarily displaced wildlife will have suitable habitat immediately available to them. In addition, restoring and stabilizing the mouth of the river will ultimately produce positive impacts on both project area habitats and wildlife.

4.3 IMPACTS ON FISHERIES

Approximately 20 acres of riverine benthic habitat and 43.5 acres of Gulf benthic habitat would be temporarily impacted by the project. Benthic organisms survive periodic disruptions related to natural events such as storms, erosion, and accretion cycles (Nelson and Pullen, 1988). Allen and Hardy (1980) report that the smothering of benthic organisms appears to be a minor, short-term impact. The recovery rates for beach nourishment projects to pre-project benthic abundance and diversity vary by location and are reported to occur within five weeks to two years. The ability of most macrofauna to recover rapidly is due to their short life cycle, their high reproductive potential, and the rapid recruitment from nearby unaffected areas (Nelson and Pullen, 1988). No permanent effects to invertebrates and benthos will occur as a result of the project.

Minimal adverse impacts to fish populations may result from turbidity due to suspension of sediments in the water column and burial of prey by beach nourishment material. Fish tolerance of suspended solids varies from species to species and by age (Boehmer and Sleight, 1975; O'Connor et al., 1976). No long term impacts to fish populations would occur as a result of depositing the sandy dredged material into the surf zone. Positive benefits to fisheries will entail from restoring river channel velocity and opening and stabilizing the mouth of the river through channel excavation, maintenance dredging, and beach nourishment.



Figure 4: Habitat Impacts.

4.3.1 Impacts on Essential Fish Habitat

The proposed project would result in minimal, temporary impacts to Essential Fish Habitat (EFH). Increased water column turbidity would be localized and short term. Although 2.1 acres of *Spartina* tidal marsh would be destroyed by the project, substantially more marsh would naturally establish once the river's mouth is stabilized by the project, which would also result in a more stable Gulf outlet for nursery stock. Approximately 36.5 acres of bare, sandy-bottom substrate in the surf zone would be covered by dredged material for beach nourishment, and 7 acres of Gulf substrate would be dredged to -10-foot MSL for the channel. Impacts to benthics by these actions are discussed above and are anticipated to be temporary, with very rapid recovery. Stabilization of the shoreline by restoring the mouth of the river and beach nourishment would offer protection for the existing and new wetlands that would establish in the abandoned river channel. EFH impacts are therefore expected to be minor and temporary in nature, and will not require mitigation.

4.4 IMPACTS ON THREATENED AND ENDANGERED SPECIES

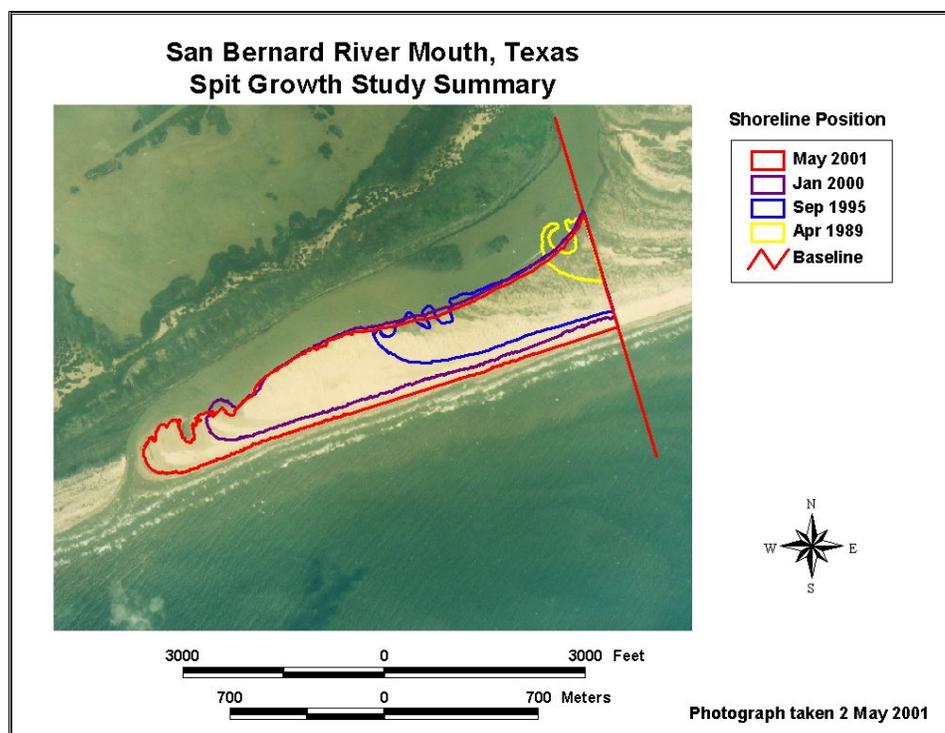
The District assessed the proposed project's potential to affect federally listed threatened and endangered species, species of concern, and critical habitat in a Biological Assessment (BA; Appendix B). Of the 15 threatened and endangered species identified by USFWS and NMFS as occurring in Brazoria County, five may be affected by the proposed project.

Threatened and endangered species and critical habitat that may be affected by the proposed project include the piping plover, piping plover Critical Habitat Unit TX-32, brown pelican, and three species of sea turtles. The BA concludes that the proposed project is not likely to adversely affect any listed species. Proposed conservation measures are included in the BA.

4.4.1 Piping Plover (*Charadrius melodus*).

The project is located in Critical Habitat Unit TX-32 for the wintering population of piping plovers. Critical Habitat Unit TX-31 occurs immediately southwest of the project area. Construction is proposed to take place in the fall of the year. The proposed channel alignment would destroy approximately 1.1 acres of piping plover critical habitat on the beach where the channel crosses the spit to the Gulf. An additional 7.1 acres of piping plover critical habitat will be temporarily impacted by the channel construction corridor (0.8 acres) and by the pipeline corridor to the Surf PA (6.3 acres). The pipeline corridor would be located as high up on the beach as possible to void the critical swash zone, while still allowing the pipe to be placed on hard sand for maneuverability. The impact of the construction and pipeline corridors is expected to be limited and temporary in nature. With no other development in the project area, there is substantial other plover habitat immediately available in Critical Habitat Units TX-31 and TX-32 for the birds to use during the temporary disturbance of construction.

Although the project would destroy 1.1 acres of critical habitat, closure of the existing mouth of the river and beach nourishment is conservatively estimated to generate 2.5 acres of critical habitat, as described above, for an overall gain of 1.4 acres of critical habitat for the project. As is demonstrated in Figure 5, below, the rapid accretion of the sand spit continues to impact and also generate critical habitat in this highly dynamic area. Closing the existing mouth of the river and stabilizing the beach by periodic beach nourishment would both create and protect critical habitat in the project area, resulting in an overall beneficial effect on the species. The loss of 1.1 acres of critical habitat is discountable because of the creation of at least 2.5 acres of critical habitat, resulting in a net gain of 1.4 acres of critical habitat for Critical Habitat Unit TX-32. As a result, we conclude that the project will effect, but is not likely to adversely affect, the continued existence of the piping plover.



(Kraus, 2002)

Figure 5: San Bernard River Spit Growth Summary

4.4.2 Brown Pelican (*Pelecanus occidentalis*).

The brown pelican is a common resident of the project area, and forages along the beach. The birds are acclimated to ship traffic and turbidity, and should not be disturbed by the proposed construction activity. Any disturbance would be localized and temporary. The closest nesting colony is Dressing Point Island in East Matagorda Bay, about 25 miles to the southwest of the project area. We conclude that the project is not likely to adversely affect the brown pelican.

4.4.3 Sea Turtles.

Of the five sea turtles on the Services' lists, only the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), and Kemp's ridley (*Lepidochelys kempii*) are considered to be potentially present in the project area. The most current turtle nesting data from the National Park Service (NPS, 2008a, 2008b) indicates that the closest sea turtle nests are two Kemp's ridley nests at Surfside, approximately 10 miles northeast of the project area. Impacts to nesting turtles will be avoided because construction will take place after the March 15 to September 15 nesting window. Dredging impacts will be avoided to foraging turtles by use of a hydraulic pipeline dredge. Only about 2,500 feet of new channel will be dredged into the Gulf, minimizing exposure to swimming turtles. We conclude that the project is not likely to adversely affect sea turtles.

4.5 IMPACTS ON HISTORIC RESOURCES

Six magnetic anomalies (A1-A6) were located during the remote-sensing survey and were selected as potential shipwreck locations. Additionally, a cluster of small magnetic anomalies (C1) was identified as possibly associated with a historic hotel formerly located along the river's eastern bank. In order to minimize the adverse effects, the channel alignment was shifted approximately 150 ft to the west to avoid all anomalies.

Changes to the original alignment have successfully avoided all of the anomalies by a sufficient margin, as coordinated with the Texas State Historic Preservation Officer (SHPO); therefore, the proposed project will have no adverse effect to historic properties eligible for inclusion in the National Register of Historic Places (NRHP).

4.6 IMPACTS ON AIR QUALITY AND NOISE

4.6.1 Air

The HGB is currently designated by the EPA as a nonattainment area for the National Ambient Air Quality Standards (NAAQS) for 1-hour ozone and has until 2007 to attain the NAAQS for ozone. TCEQ developed a State Implementation Plan (SIP) for attaining the air quality standard in the HGB, which was submitted to and subsequently approved by the EPA. Therefore, in accordance with regulatory requirements, Section 176 of the Federal Clean Air Act (CAA), known as the General Conformity Rule and Texas Rule, 30 TAC 101.30 respectively, that establishes criteria for air quality preservation that apply to federal actions in areas that are designated as being in non-attainment for any of the criteria pollutants, an air conformity analysis was undertaken for this project.

It has been estimated that emissions from dredging and material placement activities will produce minimal, short-term impacts to air quality in the immediate vicinity of the project. The duration of construction activities, which includes dredging and placement of material, will not exceed three months.

Since the project is within an area classified as a moderate non-attainment area for ozone, an analysis was conducted based on the established criteria to determine if a formal air conformity analysis would be required. The analysis focused on short-term direct construction impacts, as well as emission impacts that would result from the project. The results indicate that short-term construction emissions of both ozone precursors VOC and NO_x would amount to 0.03 and 25.39 tons per year, respectively, and would be below the applicable *de minimis* threshold levels to require a General Conformity determination. Therefore, further conformity analysis is not required.

4.6.2 Noise

One small community, River's End, is located approximately one mile upstream of the intersection of the GIWW and the San Bernard River. Water traffic on the GIWW and limited highway use north of the project area contribute to project ambient noise levels, which are low. Noise resulting from the proposed project is not anticipated to adversely affect surrounding land uses in the project area or the populace of River's End.

4.7 IMPACTS ON WATER AND SEDIMENT QUALITY

4.7.1 Water Quality

The material to be dredged from the intersection with the GIWW to Station 96+23 will be discharged into upland PA 90. The effluent will be controlled to minimize introduction of Total Suspended Solids (TSS) into the receiving water. Elutriate data, which can be found at Appendix D, indicates that little or no resuspension of chemical contaminants would occur during hydraulic dredging of this project.

The remainder of the material will be discharged into the surf zone. The end of the discharge pipe will have an energy dissipater to slow the discharge velocity and prevent scour immediately beneath the discharge point. No containment will be used, so any fine-grained material will remain in suspension until it is dissipated through natural coastal processes. This TSS will be rapidly dissipated by wave action once discharge operations are concluded. This resuspension is expected to be very localized and will probably be similar to natural levels during periods of heavy wave action.

Except for an increase in TSS at the beach nourishment site, the proposed dredged material discharges should have no adverse impacts on water quality. Adverse impacts, if any, are expected to be minor and temporary, occurring only during the dredging period, which is expected to be approximately one month.

TABLE 6: AIR ANALYSIS											
	Activity	Hours of Operation	Horse power	Load Factor	Emission Factor (g/hp-hr)		Emissions (tons/hr)		Emissions (tons/yr)		
					VOC	NO _x	VOC	NO _x	VOC	NO _x	
MARINE EQUIPMENT EMISSIONS			(HP)								
Dredging Cycle Duration = 1.7											
24" Dredge	Dredging	612	3400	0.80	0.00695112	7.92305622	0.00002084	0.02375572	0.01275504	14.53849987	
	Idle	306	1200	0.40	0.01966075	8.16219530	0.00001040	0.00431872	0.00318324	1.32152742	
Dredging Tugs (1 @ 500hp each)	Dredging	612	1500	0.80	0.00695112	7.92305622	0.00000919	0.01048046	0.00562722	6.41404406	
Spill Barge	Dredging	122.4	165	0.80	0.00695112	7.92305622	0.00000101	0.00115285	0.00012380	0.14110897	
Crewboat	Construction	122.4	400	0.40	0.01966075	8.16219530	0.00000347	0.00143957	0.00042443	0.17620366	
BUCKET, DRAGLINE, 7.5 CY, HEAVY WEIGHT	Construction	423	NA	0.00	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	
CRANES, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 65 TON, 180' BOOM, 4X4	Construction	423	500	0.80	0.00695112	7.92305622	0.00000306	0.00349349	0.00129647	1.47774545	
TRACTOR ATTACHMENT, POWER WINCH, 25.6 TON (23 MT) LINE PULL (ADD TO 76-100 HP (57-75 KW) DOZER, D-5)	Construction	406	NA	0.00	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	
TRACTOR, CRAWLER (DOZER), 136-180 HP (101-134 KW), POWERSHIFT, W/UNIVERSAL BLADE	Construction	812	200	0.59	0.01097519	7.99877138	0.00000143	0.00104043	0.00115920	0.84482713	
WORK BARGE, FLAT DECK, 2000 TON APPROX. 160'x 50'x 10', WOOD DECK	Construction	832	NA	0.00	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	
MARINE EQUIPMENT, BOATS & LAUNCHES, 26 FT, W/STEERING NOZZLE, INLAND TUG	Construction	446	250	0.40	0.01966075	8.16219530	0.00000217	0.00089973	0.00096659	0.40128079	
MARINE EQUIPMENT, BOATS & LAUNCHES, 18' (5.5 M) LONG, R-RUNNER V-HULL, 1,350 LBS (612 KG), NO CABIN, OUTBOARD ENGINE	Construction	426	50	0.40	0.01966075	8.16219530	0.00000043	0.00017995	0.00018465	0.07665723	
TOTAL MARINE EMISSIONS									0.02572063	25.39189457	
VEHICLE EMISSIONS											
	Activity	Hours of Operation	Daily Travel (miles)		Emission Factor (g/hp-hr)		Daily Travel		Emissions (tons/yr)		
					VOC	NO _x			VOC	NO _x	
TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	Construction	693	25		0.69880000	0.51760000	2165.63		0.00166814	0.00123559	
TRUCK, HIGHWAY, 30,000 LBS GVW, 2 AXLE, 4X4 (CHASSIS ONLY-ADD OPTIONS)	Construction	8	25		0.69880000	0.51760000	25.00		0.00001926	0.00001426	
TRUCK TRAILER, FLATBED, 40 TON, 2 AXLE (ADD TOWING TRUCK)	Construction	8	25		0.69880000	0.51760000	25.00		0.00001926	0.00001426	
TOTAL VEHICLE EMISSIONS									0.00170666	0.00126412	
TOTAL EMISSIONS									0.02742729	25.39315869	
Emission Factor (g/hp-hr) = (a*(Load Factor)-x +b) * 0.7457											
Where a = coefficient, b = intercept, x = exponent.											
For Nox = a = 0.1255, b=10.4496, x = 1.5											
For VOC (HC)- a= 0.0667, b=0, x = 1.5											
Emission Rate (tons/hr) = (Engine Horsepower x Engine Load Factor x Emission Factor (g/hp-hr))/453.59grams per pound/2,000 pounds per ton											
Emission Amount (tons/yr) = Emission Rate x Hours of Operations (hrs/year)											

4.7.2 Sediment Quality

A comparison of sediment quality data, found in Appendix D, with sediment quality screening guidelines indicate that the sediments in the region are suitable for beneficial use. The material to be discharged into the surf zone may contain some fine grain silts and clays, some of which may be cohesive enough to form clay balls. Whereas, the fines are expected to be winnowed by wave action leaving the sand, it is possible that some clay balls may remain after beach nourishment activities are concluded. Any clay balls remaining will be left to weather and disperse through natural processes. Therefore, unacceptable adverse impacts on sediment quality are not expected to result from dredging and discharge operations.

4.8 IMPACTS FROM HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

Based on the findings of the HTRW survey, the probability of increased project cost or lost time from discovery and remediation of any contaminated materials within the study area is considered low. Based upon information compiled for this project, no additional HTRW investigations are warranted at this time.

4.9 IMPACTS TO PRIME AND UNIQUE FARMLANDS

There are no prime or unique farmlands that will be impacted by the proposed re-opening of the San Bernard River to the Gulf of Mexico or the disposal of the dredged material.

4.10 IMPACTS ON SOCIOECONOMICS

The proposed restoration of the San Bernard River to the Gulf of Mexico is part of the continuing process of addressing inefficiencies and safety problems on the GIWW. The project will improve the efficiency and safety of shipping on the GIWW, and may perhaps allow the reestablishment of limited commercial fishing on the San Bernard River. A direct access to the Gulf will also stimulate local recreational fishing and tourism.

4.11 IMPACTS ON ENVIRONMENTAL JUSTICE

There are population statistics for the community of River's End near the project area, and no other residential areas in the immediate project vicinity. Given the remoteness of the project area, and overall minimal environmental impact of the project it is concluded that the proposed project will not create an adverse environmental impact on any person or group of people. Therefore there will be no disproportionate share of adverse environmental impacts on any minority, low income, disadvantaged, or Native American tribal population within the area of the proposed project.

5.0 MITIGATION

The proposed project will restore the course and outlet of the San Bernard River to its historic location. Although the project will destroy 2.1 acres of wetlands, it will also result in the natural restoration of up to 140 acres of wetlands in the abandoned river channel. Piping plover critical habitat will also be impacted. Approximately 1.1 acres of critical habitat will be destroyed by the new river channel as it enters the Gulf; however, closure of the existing mouth of the river and beach nourishment will create at least 2.5 acres, if not more, of critical habitat in its place. Other project impacts to upland vegetation and benthics are considered minimal and temporary. As such, no mitigation in addition to the restoration that will be accomplished by project construction is proposed.

6.0 CUMULATIVE IMPACTS

The President's Council on Environmental Quality (CEQ) defines cumulative impacts as those impacts "on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or persons undertake such actions." Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Impacts include both direct effects (caused by the action and occurring at the same time and place as the action), and indirect effects (caused by the action but removed in distance and later in time, and reasonable foreseeable). The following projects have been identified as potentially contributing to cumulative impacts in the general project vicinity.

6.1 PAST AND CURRENT ACTIONS

6.1.1 GIWW Maintenance Activities.

The GIWW, which is a coastal canal from Brownsville, Texas to the Okeechobee Waterway at Fort Myers, Florida, was constructed through the project area in the 1940's. Although construction impacted coastal wetlands in the project area, there is no way at this time to capture those impacts. After the passage of NEPA, a Galveston District 1975 Environmental Impact Statement was prepared that addressed potential impacts from the continued maintenance of the GIWW. Dredged material from the GIWW in the vicinity of the project area is placed in existing PAs designated for GIWW maintenance material (USACE, 1975). Any new construction required for maintenance of the GIWW would be fully coordinated under NEPA.

6.1.2 Freeport Hurricane Flood Protection Levees.

Galveston District studies in 1958 led to legislation in 1962 providing for a hurricane-flood protection project at Freeport (USACE, 1977, 2002). At Freeport, approximately 42 square miles of land including the Brazosport communities are protected by 56 miles of levees, wave barriers, flood walls, drainage structures, pumping plants, and a vertical-lift tide gate with a navigation opening 61 feet high and

75 feet wide (USACE, 1977) constructed in 1982. No impacts from this project were documented.

6.1.3 Bryan Mound Strategic Petroleum Reserve (SPR).

The Bryan Mound SPR facility occupies 500 acres close to the Port Freeport. The site was operational by 1979 and has been expanded twice (DOE, 2004). Twenty acres of wetlands were impacted by project construction and subsequently mitigated.

6.1.4 CenterPoint Energy, Inc.

Construction and operation of the Freeport LNG Project required that new, dedicated electrical service be brought to the LNG Terminal site (Federal Energy Regulatory Commission [FERC], 2004b). The project impacted an estimated eight acres of wetlands, which were mitigated. Construction of the facility ended in June 2007.

6.1.5 Freeport Harbor Channel 45-Foot Project (FH-45).

The FH-45 project was constructed in 1978. The Freeport Harbor Jetty and Entrance Channels are currently maintained by USACE to a depth of – 47 feet MLT at a width of 400 feet, and expansion of the navigation channel is currently proposed. During the course of construction of the FH-45 Project, Port Freeport acquired 400 acres of wetlands for current and future project mitigation.

6.1.6 Freeport Area Industrial Complexes.

The Freeport area and surrounding communities support a wide variety of private industrial uses. EPA tracks 528 facilities within Brazoria County. As construction and operational impact information is not uniformly available on all of these sites, impacts from industrial facilities cannot be presented.

6.1.7 Proposed Restoration of the Mouth of the San Bernard River to the Gulf of Mexico.

The restoration of the mouth of the San Bernard River to the Gulf of Mexico will result in safer and more efficient navigation of the federally maintained GIWW and is described in this document. If constructed, the project will result in the loss of 2.1 acres of wetlands and 1.1 acres of piping plover critical habitat. The restoration of the mouth will result, however, in the establishment of as much as 140 acres of wetlands in the abandoned river channel and at least 2.5 acres of piping plover critical habitat from closure of the current, displaced mouth of the river and beach nourishment.

6.2 FORESEEABLE FUTURE PROJECTS

6.2.1 Colorado River Navigation Channel, Southwest Cut, and the Diversion Dam Cut.

Foreseeable future projects in the vicinity of the proposed project area may include a proposed cut, or connection, between the Colorado River Navigation Channel and east Matagorda Bay known as the Southwest Cut, and a proposed cut in the Colorado River diversion dam (the Diversion Dam Cut). Both of these projects were subjects of Federal studies investigating alternatives to alleviate treacherous currents at the intersection of the GIWW and the Colorado River Navigation Channel. USACE determined that these alternatives would not meet the Federal objective of reducing currents to improve navigational safety; however, local interests are pursuing the implementation of these projects. The Southwest Cut project is expected to benefit fishery resources by providing additional access for aquatic species between East Bay and the Gulf of Mexico. The Diversion Dam Cut would provide access to Matagorda Bay for recreational vessels while enabling these vessels to avoid the Colorado River Locks. Specific project impacts have not been identified for these potential projects.

6.2.2 Freeport Harbor Channel Deepening and Widening.

It is proposed that Freeport Harbor Channel be widened by Port Freeport under Corps permit, and deepened to 55 feet as part of a cost-shared project with USACE. Approximately 300,000 CY of sandy material from the widening project would be used beneficially to nourish either the Quintana or Surfside Beach. The Federal project would impact 39 acres of wetlands and 21 acres of riparian forest, both of which will be mitigated.

6.2.3 Surfside Beach Shoreline Protection.

The Federal Emergency Management Agency (FEMA) is considering funding a 3,500-foot long revetment at Surfside, to protect public infrastructure. The project may entail removal of homes located on the beach and will evaluate additional erosion prevention alternatives. No adverse impacts are anticipated from this project.

6.3 CUMULATIVE IMPACTS CONCLUSIONS

Construction occurring before passage of NEPA resulted in loss of wetlands, changes to coastal sediment budget, and impacts to other sensitive resources in the general project area. Partially in response to these impacts, valuable coastal wetlands and other coastal resources have been preserved by the San Bernard National Wildlife Refuge and Columbia Bottomlands Conservation Area. After passage of NEPA, construction requiring Federal or state permits has generally required mitigation of impacts, although impacts resulting from on-going urbanization and industrialization continue in Brazoria County. Given the preservation of resources and regulatory mitigation of impacts to resources in the project area, it is concluded that cumulative

impacts due to past, existing, and reasonably foreseeable future projects, along with the proposed restoration of the river's mouth to the Gulf, are not expected to have significant adverse effects in the project area.

7.0 RELATIONSHIP OF PLAN TO ENVIRONMENTAL REQUIREMENTS

This assessment has been prepared to satisfy the requirements of all applicable environmental laws and regulations. This environmental assessment has been prepared using the Corps of Engineers regulations ER 200-2 (Environmental Quality: Policy and Procedures for Implementing NEPA) and Appendix C of ER 1105-2-100 (Planning Guidance Notebook), and the Council on Environmental Quality (CEQ) National Environmental Policy Act regulations (40 CFR Part 1500).

The following environment laws and regulations were considered in the planning of this project and the status of compliance with each is presented.

National Environmental Policy Act (NEPA) - This EA has been prepared in accordance with CEQ regulations for implementing NEPA. The environmental and social consequences of the recommended plan have been analyzed in accordance with the Act and presented in the assessment.

Fish and Wildlife Coordination Act of 1958, as amended - The proposed project has been coordinated with USFWS, NMFS, and TPWD. The USFWS expressed no interest in preparing a Planning Aid Letter or Coordination Act Report for the project.

National Historic Preservation Act of 1966, as amended - Coordination with the Texas SHPO has been conducted for the proposed project and formal coordination is ongoing.

Coastal Barrier Resources Act of 1982 (CBRA) – This Act established the John H. Chaffee Coastal Barrier Resources System to minimize the loss of human life, wasteful federal expenditures, and damage to fish, wildlife, and other natural resources associated with coastal barriers. The Act defines coastal barriers as “bay barriers, barrier islands, and other geological features composed of sediment that protect landward aquatic habitats from direct wind and waves.” As part of the program, the Federal government discourages development on designated, undeveloped coastal barriers by restricting certain federal financial assistance, including USACE development projects. It has been concluded that the proposed project is an exempt activity from the CBRA's prohibition of expenditures of federal funds within Coastal Barrier Resources System Unit T05/T05P, because the proposed project is being pursued under authority to maintain the safety of the GIWW for commercial navigation. In addition, the project would not encourage coastal barrier development and would only support previously existing development in areas outside of designated resource areas.

Endangered Species Act of 1973, as amended - Formal consultation under Section 7 of the Act has been initiated. USACE has determined that the proposed project is likely to adversely affect piping plover critical habitat. A BA has been prepared and is included as Appendix B. The BA concludes that the proposed project is not likely to jeopardize the continued existence of the species, and offers proposed conservation measures to avoid or minimize potential impacts to protected species.

Magnuson-Stevens Fishery Conservation and Management Act - Congress enacted amendments to the Magnuson-Stevens Fishery Conservation and Management Act in 1996 that established procedures for identifying EFH and required interagency coordination to further the conservation of federally-managed fisheries. Rules published by the NMFS (50 CFR 600.805 through 600.930) specify that any Federal agency that authorizes, funds or undertakes, or proposes to authorize, fund or undertake an activity that could adversely affect EFH be subject to the consultation provisions of the act. No permanent impacts to living marine resources or EFH would occur as a result of the project (Sections 3.5.1 and 4.4.1).

Clean Water Act of 1977 (CWA) - A section 404 (b) (1) evaluation was conducted and is enclosed in Appendix C. TCEQ will review the proposed project for compliance with the state water quality standards, pursuant to the provisions of Section 401 of the CWA.

Marine Protection, Research, and Sanctuaries Act of 1972 - This Act requires a determination that dredged material disposal in the ocean would not unreasonably degrade or endanger human health, welfare or amenities, or the marine environment, ecological system, or economic potentialities (shellfish beds, fisheries, or recreational areas). The disposal of dredged material into the surf zone during construction and maintenance activities would not result in unreasonable degradation of the marine environment or endangerment of human health, welfare or amenities and does not trigger this act.

Coastal Zone Management Act of 1972 - This Act requires that all land-use changes in the project area be conducted in accordance with approved state coastal zone management programs. Any project that is located in or that may affect land and water resources in the Texas coastal zone and that requires a Federal license or permit, or is a direct activity of a Federal agency, or is federally funded must be reviewed for consistency with the Texas Coastal Management Program (TCMP), which can be found in Appendix A. The project is in compliance with TCMP.

Clean Air Act of 1977 - The EPA established nationwide air quality standards to protect public health and welfare. Texas has adopted the NAAQS as the state's air quality criteria. The project is located in Brazoria County, which is a non-attainment area for air quality. The results of an air analysis conducted for the project indicated that short-term construction emissions of both ozone precursors VOC and NOx would amount to 0.03 and 25.39 tons per year, respectively, and would be below the

applicable *de minimis* threshold levels to require a General Conformity determination. Therefore, further conformity analysis is not required for the project.

Executive Order 11990, Protection of Wetlands - Consistent with the requirements of this order, it is Corps policy to avoid undertaking actions that affect wetlands identified as important based on wetland functions, unless there is no practicable alternative. The proposed project will result in an overall net increase in tidal marsh.

Executive Order 11988, Floodplain Management - The proposed project is located in a floodplain, but will not induce increased flooding in developed areas and will not contribute to increased future flood damages. In fact, by restoring a working outlet to the Gulf, the project may alleviate upstream flooding on the San Bernard River.

CEQ Memorandum dated August 11, 1980, Prime or Unique Farmlands - Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses. Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops. There are no lands designated as prime or unique farmlands in the project area.

Executive Order 12898, Environmental Justice - This Order directs Federal agencies to achieve environmental justice to the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review. Agencies are required to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The proposed project would not have a disproportionate adverse impact on minority or low-income population groups within the project area.

8.0 COORDINATION WITH OTHERS

Coordination with appropriate Federal, state, and local interests and citizens has occurred during development of the proposed project. The USFWS, NMFS and TPWD were the major resource agency contacts for fish and wildlife concerns. Information and suggestions received from these agencies has been considered in developing the project.

SHPO coordination has been initiated and a marine survey was performed. The channel alignment was moved to avoid anomalies that might represent historic shipwrecks or other remains.

The Draft EA will be circulated to interested Federal, state, and local agencies, organizations, and interested citizens. Comments on the Draft EA and responses to the comments will be included in the Final EA.

9.0 CONCLUSIONS

The following conclusions summarize the findings of this EA, as detailed in the Environmental Impacts Section 4.0 of the EA:

- Aquatic habitat would be temporarily affected by dredging, but these impacts do not represent significant impacts to the environment. Benefits accrue through beach nourishment and shoreline protection.
- Terrestrial habitats would be affected including impacts to 2.1 acres of wetlands and 11.1 acres of vegetated uplands. All beach nourishment would be conducted seaward of the vegetation line and would result in the creation of 2.5 acres of piping plover critical habitat, stabilization of the shoreline, and establishment of as much as 140 acres of tidal wetlands.
- Fish and invertebrates may be temporarily affected, but the impacts do not represent significant or adverse impacts to these organisms. Benefits would result from restoration of riverine and estuarine functions in the lower San Bernard River.
- Approximately 1.1 acres of piping plover critical habitat would be lost as a result of project; however, 2.5 acres of critical habitat would be created as a result of beach nourishment.
- Emissions from construction are below the *de minimis* levels of 100 tons per year.
- Implementation of the proposed action would not exceed the Federal or local noise guidelines, and there are no sensitive receptors in the project vicinity.
- There would be no long-term impacts to water quality from the proposed project.
- There would be no HTRW impacts from the proposed project.
- The abandoned river channel would gradually fill with aeolian sand, creating as much as 140 acres of wetlands.
- No adverse cumulative impacts to environmental resources are expected as a result of the project.
- USACE finds that the proposed action is in compliance with the TCMP.
- It is recommended that a Finding of No Significant Impact (FONSI) be prepared and signed for this action.

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APPENDIX A

TEXAS COASTAL MANAGEMENT PROGRAM

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**COMPLIANCE WITH GOALS AND POLICIES - SECTION 501.25(a)-(f)
DREDGING AND DREDGED MATERIAL DISPOSAL AND PLACEMENT**

**RESTORATION OF THE MOUTH OF THE SAN BERNARD RIVER
TO THE GULF OF MEXICO, BRAZORIA COUNTY, TEXAS**

Section 501.25 Dredging and Dredged Material Disposal and Placement

Dredging and the disposal and placement of dredged material shall avoid and otherwise minimize adverse effects to coastal waters, submerged lands, critical areas, coastal shore areas, and Gulf beaches to the greatest extent practicable. The policies of this subsection are supplemental to any further restrictions or requirements relating to the beach access and use rights of the public. In implementing this subsection, cumulative and secondary adverse effects of dredging and the disposal and placement of dredged material and the unique characteristics of affected sites shall be considered.

Compliance: Material dredged from the San Bernard River channel will be pumped by pipeline and hydraulic pipeline dredge to PA 90, a confined, upland placement area. Sand excavated from the spit will be deposited in the Surf PA for beach nourishment, a beneficial use. In addition, restoration of the mouth of the San Bernard River to the Gulf of Mexico at its historic location will maintain the estuarine exchange which has been lost due to closure of the mouth at its current location.

Dredging and dredged material disposal and placement shall not cause or contribute, after consideration of dilution and dispersions, to violation of any applicable surface water quality standards established under subsection (f) of this section.

Compliance: No water quality standards will be violated by this project.

(B) Except as otherwise provided in subparagraph (D) of this paragraph, adverse effects on critical areas from dredging and dredged material disposal or placement shall be avoided and otherwise minimized, and appropriate and practicable compensatory mitigation shall be required, in accordance with subsection (h) of this section.

Compliance: The project will impact 2.1 acres of *Spartina* marsh on the north side of the spit, 1.1 acres of piping plover critical habitat where the new channel crosses the spit and enters the Gulf. Closure of the current, migrated mouth of the river, beach nourishment, and the natural filling of the abandoned channel of the river will result in the restoration of up to 140 acres of *Spartina* marsh, and the creation of 2.5 acres of piping plover critical habitat, offsetting all project impacts.

(C) Except as provided in subparagraph (D) of this paragraph, dredging and the disposal and placement of dredged material shall not be authorized if:

(I) there is a practicable alternative that would have fewer adverse effects on coastal waters, submerged lands, critical areas, coastal shore areas, and Gulf beaches, so long as that alternative does not have other significant adverse effects;

Compliance: Other alternatives considered would result in greater environmental impacts or would not accomplish the goal of restoring and maintaining the mouth to its historic location.

(ii) all appropriate and practicable steps have not been taken to minimize adverse effects on coastal waters, submerged lands, critical areas, coastal shore areas, and Gulf beaches; or

Compliance: All practicable steps have been taken to minimize adverse affects on these resources.

(iii) significant degradation of critical areas under subsection (h)(1)(G)(v) of this section would result.

Compliance: No significant degradation of critical areas will result from this project. Resource impacts are more than offset by the environmental benefits of the project, and maintaining the mouth of the river at its historic location will re-establish estuarine function.

(D) A dredging or dredged material disposal or placement project that would be prohibited solely by application of subparagraph (C) of this paragraph may be allowed if it is determined to be of overriding importance to the public and national interest in light of economic impacts on navigation and maintenance of commercially navigable waterways.

Compliance: The project has overriding importance to the public and national interest because it will reduce or eliminate inefficient and unsafe commercial navigation conditions on the GIWW and Brazos River Flood Gates.

(2) Adverse effects from dredging and dredged material disposal and placement shall be minimized as required in paragraph (1) of this subsection. Adverse effects can be minimized by employing the techniques in this paragraph where appropriate and practicable.

Compliance: Adverse effects of dredging as described in this EA have been minimized as described under "Compliance" for paragraph (1) of this subsection. The project has been cited and sized to optimize plan performance while minimizing environmental impacts and cost.

(A) Adverse effects from dredging and dredged material disposal and placement can be minimized by controlling the location and dimensions of the activity. Some of the ways to accomplish this include:

(I) locating and confining discharges to minimize smothering of organisms;
*(ii) locating and designing projects to avoid adverse disruption of water inundation patterns, water circulation, erosion and accretion processes, and other hydrodynamic processes;**(iii) using existing or natural channels and basins instead of dredging new channels or basins, and discharging materials in areas that have been previously disturbed or used for disposal or placement of dredged material;*
(iv) limiting the dimensions of channels, basins, and disposal and placement sites to the minimum reasonably required to serve the project purpose, including allowing for reasonable overdredging of channels and basins, and taking into account the need for capacity to accommodate future expansion without causing additional adverse effects;
(v) discharging materials at sites where the substrate is composed of material similar to that being discharged;
(vi) locating and designing discharges to minimize the extent of any plume and otherwise control dispersion of material; and
avoiding the impoundment or drainage of critical areas.

Compliance:

- (i) Discharge has been located to minimize impacts to benthics. Silty material will be pumped directly to a confined, upland PA. Beach quality sand will be disposed of in the surf zone for beach nourishment. Maintenance dredging is anticipated every six to twelve years, with beach quality sand continuing to be used for beach nourishment. Impacts to benthics will be minor and temporary.**
- (ii) The project will restore natural riverine and estuarine functions to the mouth of the San Bernard River.**
- (iii) The proposed channel extends about two miles from the intersection of the San Bernard River with the GIWW south to the 10-foot contour line in the Gulf. The first mile of the proposed channel will be dredged entirely within the existing channel of the San Bernard River. The extension of the new channel into the Gulf will follow the historic location of the natural channel across a recently accreted sandbar.**
- (iv) The proposed project has been sized to maximize channel velocity for maintenance of the channel and its opening to the Gulf, while minimizing environmental impacts.**
- (v) Material will be discharged at sites of comparable substrate. Silt from the natural river channel will be deposited in PA 90, while sand will be used for beach nourishment immediately down-drift of the new channel.**
- (vi) Disposal has been designed to minimize environmental impacts and beneficially use beach quality sand for beach nourishment.**
- (vii) There will be no impoundment or drainage of critical areas.**

(B) Dredging and disposal and placement of material to be dredged shall comply with applicable standards for sediment toxicity. Adverse effects from constituents contained in materials discharged can be minimized by treatment of or limitations on the material itself. Some ways to accomplish this include:

(I) disposal or placement of dredged material in a manner that maintains physicochemical conditions at discharge sites and limits or reduces the potency and availability of pollutants;

(ii) limiting the solid, liquid, and gaseous components of material discharged;

(iii) adding treatment substances to the discharged material; and (iv) adding chemical flocculants to enhance the deposition of suspended particulates in confined disposal areas,

Compliance: There are no contaminants in the project area. Sampling was performed for this project and the results are presented in Appendix D of the EA.

(C) Adverse effects from dredging and dredged material disposal or placement can be minimized through control of the materials discharged. Some ways of accomplishing this include:

(I) use of containment levees and sediment basins designed, constructed, and maintained to resist breaches, erosion, slumping, or leaching;

(ii) use of lined containment areas to reduce leaching where leaching of chemical constituents from the material is expected to be a problem;

(iii) capping in-place contaminated material or, selectively discharging the most contaminated material first and then capping it with the remaining material;

(iv) properly containing discharged material and maintaining discharge sites to prevent point and nonpoint pollution; and

(v) timing the discharge to minimize adverse effects from unusually high water flows, wind, wave, and tidal actions.

Compliance: Dredged material will be placed in a confined upland placement area (PA 90) with properly maintained levees, or in the surf zone for beach nourishment.

(D) Adverse effects from dredging and dredged material disposal or placement can be minimized by controlling the manner in which material is dispersed. Some ways of accomplishing this include:

(i) where environmentally desirable, distributing the material in a thin layer;

(ii) orienting material to minimize undesirable obstruction of the water current or circulation patterns;

(iii) using silt screens or other appropriate methods to confine suspended particulates or turbidity to a small area where settling or removal can occur;

(iv) using currents and circulation patterns to mix, disperse, dilute, or otherwise control the discharge;

(v) minimizing turbidity by using a diffuser system or releasing material near the bottom;

(vi) selecting sites or managing discharges to confine and minimize the release of suspended particulates and turbidity and maintain light penetration for organisms; and

(vii) setting limits on the amount of material to be discharged per unit of time or volume of receiving waters.

Compliance: Effluent from PA 90 will be controlled to minimize the introduction of Total Suspended Solids (TSS) into the receiving water.

(E) Adverse effects from dredging and dredged material disposal or placement operations can be minimized by adopting technology to the needs of each site. Some ways of accomplishing this include:

- (i) using appropriate equipment, machinery, and operating techniques for access to sites and transport of material, including those designed to reduce damage to critical areas;*
- (ii) having personnel on site adequately trained in avoidance and minimization techniques and requirements; and*
- (iii) designing temporary and permanent access roads and channel spanning structures using culverts, open channels, and diversions that will pass both low and high water flows, accommodate fluctuating water levels, and maintain circulation and faunal movement.*

Compliance: All dredging will be accomplished by a hydraulic pipeline dredge from the water. The dredge will begin at the GIWW and dredge south to the 10-foot contour in the Gulf. A 100-foot temporary construction corridor will be established on the spit immediately west of the new channel for project access and removal of driftwood and other debris from the channel dredging area, and for access to the Debris PA and pipeline corridor on the beach for placement of dredged material into the Surf PA. Frontend loaders, backhoes, trucks, and other vehicles may be used on the spit in these areas. All work and equipment access will be limited to the areas described above.

(F) Adverse effects on plant and animal populations from dredging and dredged material disposal or placement can be minimized by:

- (i) avoiding changes in water current and circulation patterns that would interfere with the movement of animals;*
- (ii) selecting sites or managing discharges to prevent or avoid creating habitat conducive to the development of undesirable predators or species that have a competitive edge ecologically over indigenous plants or animals;*
- (iii) avoiding sites having unique habitat or other values including habitat of endangered species;*
- (iv) using planning and construction practices to institute habitat development and restoration to produce a new or modified environmental state of higher ecological value by displacement of some or all of the existing environmental characteristics;*
- (v) using techniques that have been demonstrated to be effective in circumstances similar to those under consideration whenever possible and, when proposed development and restoration techniques have not yet advanced to the pilot demonstration stage, initiating their use on a small scale to allow corrective action if unanticipated adverse effects occur;*
- (vi) timing dredging and dredged material disposal or placement activities to avoid spawning or migration seasons and other biologically critical time periods; and*

(vii) avoiding the destruction of remnant natural sites within areas already affected by development.

Compliance:

- (i) The project will restore river current and estuarine function to the mouth of the San Bernard River.**
- (ii) The project will not create habitat that will endanger indigenous plants or animals.**
- (iii) The project will destroy 1.1 acres of piping plover critical habitat where the new channel crosses the spit to the Gulf. The project will result in the creation of at least 2.5 acres of piping plover critical through the total closure and filling of the current mouth of the river and by beach nourishment.**
- (iv) The restoration of the mouth of the San Bernard River to its historic location will benefit the project area. The estuarine function of the river will be re-established, piping plover critical habitat will be created, the beach will be nourished, and up to 140 acres of *Spartina* marsh will naturally establish in the abandoned river channel.**
- (v) It is anticipated that the restored channel will require maintenance dredging every six to twelve years, providing opportunity for further beach nourishment.**
- (vi) Construction is anticipated to occur in the fall of the year, which would avoid turtle nesting season, but might impact wintering piping plovers. Use of a hydraulic pipeline dredged should avoid impacts to foraging sea turtles. If construction occurs during a biologically critical time period, additional resource agency coordination of construction will be undertaken, especially to ensure compliance with the Endangered Species Act.**
- (vii) The project will restore a natural site.**

(G) Adverse effects on human use potential from dredging and dredged material disposal or placement can be minimized by:

- (i) selecting sites and following procedures to prevent or minimize any potential damage to the aesthetically pleasing features of the site, particularly with respect to water quality;*
- (ii) selecting sites which are not valuable as natural aquatic areas;*
- (iii) timing dredging and dredged material disposal or placement activities to avoid the seasons or periods when human recreational activity associated with the site is most important; and*
- (iv) selecting sites that will not increase incompatible human activity or require frequent dredge or fill maintenance activity in remote fish and wildlife areas.*

Compliance:

- (i) There will be no aesthetic impacts from the project.**
- (ii) The project will restore a valuable natural aquatic area.**
- (iii) Because of the remoteness of the project area, there is minimal use of the beach for public recreation.**
- (iv) The project will not increase incompatible human activity. The project area will remain remote, but maintaining Gulf access may increase use of the pass for**

recreational and possibly commercial fishing. It is estimated that maintenance dredging will be required every six to twelve years.

(H) Adverse effects from new channels and basins can be minimized by locating them at sites:

(I) that ensure adequate flushing and avoid stagnant pockets; or

(ii) that will create the fewest practicable adverse effects on CNRAs from additional infrastructure such as roads, bridges, causeways, piers, docks, wharves, transmission line crossings, and ancillary channels reasonably likely to be constructed as a result of the project; or

(iii) with the least practicable risk that increased vessel traffic could result in navigation hazards, spills, or other forms of contamination which could adversely affect CNRAs;

(iv) provided that, for any dredging of new channels or basins subject to the requirements of §501.15 of this title (relating to Policy for Major Actions), data and information on minimization of secondary adverse effects need not be produced or evaluated to comply with this subparagraph if such data and information is produced and evaluated in compliance with §501.15(b)(1) of this title (relating to Policy for Major Actions).

Compliance: Reopening the mouth of the San Bernard River to the Gulf of Mexico will restore the river to historic conditions and geographic location. The channel has been designed to ensure sufficient current to keep the river open to the Gulf, and to minimize environmental impacts. Restoration of the mouth of the river will alleviate adverse currents on the GIWW, reducing inefficient and unsafe commercial navigation conditions on the GIWW and at the Brazos River Floodgates. Improving navigational safety on the GIWW will reduce the potential for spills and other forms of contamination. Dredging of the channel does not constitute construction of a “new channel”; but rather restoration of historic river conditions.

(3) Disposal or placement of dredged material in existing contained dredge disposal sites identified and actively used as described in an environmental assessment or environmental impact statement issued prior to the effective date of this chapter shall be presumed to comply with the requirements of paragraph (1) of this subsection unless modified in design, size, use, or function.

Compliance: PA 90, which will receive dredged material from the river channel will not be modified in design, size, use, or function and, therefore, complies with the requirements of paragraph (1) of this subsection.

(4) Dredged material from dredging projects in commercially navigable waterways is a potentially reusable resource and must be used beneficially in accordance with this policy.

Compliance: All of the sand excavated from the spit will be deposited in the surf zone for beach nourishment.

(A) If the costs of the beneficial use of dredged material are reasonably comparable to the costs of disposal in a non-beneficial manner, the material shall be used beneficially.

(B) If the costs of the beneficial use of dredged material are significantly greater than the costs of disposal in a non-beneficial manner, the material shall be used beneficially unless it is demonstrated that the costs of using the material beneficially are not reasonably proportionate to the costs of the project and benefits that will result. Factors that shall be considered in determining whether the costs of the beneficial use are not reasonably proportionate to the benefits include, but are not limited to:

- (I) environmental benefits, recreational benefits, flood or storm protection benefits, erosion prevention benefits, and economic development benefits;*
- (ii) the proximity of the beneficial use site to the dredge site; and*
- (iii) the quantity and quality of the dredged material and its suitability for beneficial use.*

(C) Examples of the beneficial use of dredged material include, but are not limited to:

- (I) projects designed to reduce or minimize erosion or provide shoreline protection;*
- (ii) projects designed to create or enhance public beaches or recreational areas;*
- (iii) projects designed to benefit the sediment budget or littoral system;*
- (iv) projects designed to improve or maintain terrestrial or aquatic wildlife habitat;*
- (v) projects designed to create new terrestrial or aquatic wildlife habitat, including the construction of marshlands, coastal wetlands, or other critical areas;*
- (vi) projects designed and demonstrated to benefit benthic communities or aquatic vegetation;*
- (vii) projects designed to create wildlife management areas, parks, airports, or other public facilities;*
- (viii) projects designed to cap landfills or other waste disposal areas;*
- (ix) projects designed to fill private property or upgrade agricultural land, if cost-effective public beneficial uses are not available; and*
- (x) projects designed to remediate past adverse impacts on the coastal zone.*

Compliance: Total compliance with paragraph (4) is discussed above.

(5) If dredged material cannot be used beneficially as provided in paragraph (4) (B) of this subsection, to avoid and otherwise minimize adverse effects as required in paragraph (1) of this subsection, preference will be given to the greatest extent practicable to disposal in:

- (A) contained upland sites;*
- (B) other contained sites; and*
- (C) open water areas of relatively low productivity or low biological value.*

Compliance: PA 90 is fully confined and meets the requirements above.

(6) For new sites, dredged materials shall not be disposed of or placed directly on the boundaries of submerged lands or at such location so as to slump or migrate across the boundaries of submerged lands in the absence of an agreement between the affected public owner and the adjoining private owner or owners that defines the location of the boundary or boundaries affected by the deposition of the dredged material.

Compliance: This project will be constructed under Federal navigation servitude.

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APPENDIX B

BIOLOGICAL ASSESSMENT

FOR THE
RESTORATION OF THE MOUTH OF THE SAN BERNARD RIVER
TO THE GULF OF MEXICO

BRAZORIA COUNTY, TEXAS

June 2008

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BIOLOGICAL ASSESSMENT
FOR THE
RESTORATION OF THE MOUTH OF THE SAN BERNARD RIVER
TO THE GULF OF MEXICO
BRAZORIA COUNTY, TEXAS

1.0 INTRODUCTION

1.1 PURPOSE OF THE BIOLOGICAL ASSESSMENT

This Biological Assessment (BA) has been prepared for the purpose of fulfilling the U.S. Army Corps of Engineers (USACE) requirements as outlined under Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended. The proposed Federal action requiring the assessment is the restoration of the mouth of the San Bernard River to the Gulf of Mexico in Brazoria County, Texas. The proposed restoration of the river will alleviate inefficient and unsafe commercial navigation conditions on the Gulf Intracoastal Waterway (GIWW) and at the Brazos River Floodgates. This BA evaluates the potential impacts the proposed project may have on federally listed threatened and endangered species identified by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS).

Agency coordination (Appendix E of the EA) was initiated with NMFS and FWS to determine which species protected under the ESA should be included in this BA. From the Services' websites, the following species were identified as potentially occurring in Brazoria County. The NMFS website identified 11 species: smalltooth sawfish (*Pristis pectinata*), green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricate*), Kemp's ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), blue whale (*Balaenoptera musculus*), finback whale (*B. physalus*), humpback whale (*Megaptera novaengliae*), sei whale (*B. borealis*), and sperm whale (*Physeter macrocephalus*). The FWS website identified the sea turtles and brown pelican (*Pelecanus occidentalis*), piping plover (*Charadrius melodus*), whooping crane (*Grus Americana*), and Texas prairie-dawn flower (*Hymenoxys texana*).

The Texas Parks and Wildlife Department (TPWD) Annotated County List (Table 3 in the EA) includes a number of plants and animals in addition to the Federally recognized species, that are unlikely to occur in the project area and are not further addressed. Recently removed from the Federal list of threatened and endangered species, the peregrine falcons and bald eagle are protected under the Migratory Bird Treaty Act, and the bald eagle continues to receive additional protection under the Bald and Golden Eagle Protection Act. These birds are not addressed in this BA because they are unlikely to occur in the project area and are no longer covered by the ESA.

This BA describes the avoidance, minimization and conservation measures proposed for this project relative to the habitat and species covered in the BA, in order to assist FWS and NMFS in fulfilling their obligations under the ESA. The draft EA to which this BA is appended includes a detailed project description and discussion of alternatives considered.

1.2 DESCRIPTION OF THE PROPOSED PROJECT AND HABITAT IMPACTS

The proposed project is the dredging of the San Bernard River channel from its intersection with the Gulf Intracoastal Waterway (GIWW) to the Gulf of Mexico (Station 0+00 to 96+23) through an existing and relatively recent sand spit. The entire reach, extending approximately two miles from the GIWW to the 10-foot contour line in the Gulf, would be dredged by hydraulic pipeline dredge to -10 mean low tide (MLT), with a bottom width of 100 feet and a top width of 160 feet. This effort would generate approximately 385,000 cubic yards (CY) of dredged material and 45,000 CY of vegetative debris that would be placed in three placement areas (PA) as described in the EA. After construction, it is estimated that 300,000 CY to 500,000 CY of maintenance material would be dredged from the channel every six to twelve years.

The purpose of the proposed project is to reconnect the San Bernard River with the Gulf of Mexico at its historic location. The mouth of the San Bernard River has migrated about two miles to the southwest since the 1929 construction of the Diversion Channel and the 1940's construction of the GIWW, and is now almost closed at the Gulf of Mexico due to sand accretion from the delta formed by the Diversion Channel. Accretion has accelerated over the last ten years due to a number of factors, including flooding on the Brazos River. At its current location, river discharge is not sufficient to flush the shoaling at the mouth of the river and keep it open to the Gulf. The blockage of the river's mouth has diverted flow into the GIWW, raising concerns for barge traffic along the GIWW (Kraus, 2002). The Galveston District, USACE, has received reports that barge tows traveling along the GIWW between the San Bernard and Brazos Rivers can experience an eastward flowing current that is sufficiently strong to pose a potential navigation hazard. To allow for a more effective, safe, and efficient waterway, the proposed restoration of the mouth of the San Bernard River would reduce treacherous currents resulting from diverted flow into the GIWW and Brazos River Floodgates.

Construction of the channel would occur within the existing San Bernard River channel, and across a large sand spit into the Gulf, a distance of about two miles, resulting in both temporary and permanent impacts to existing habitats. Habitats that would be impacted by the project include the riverine benthic in the natural channel of the San Bernard River, *Spartina* wetlands, uplands, piping plover critical habitat, and Gulf benthic. A summary of habitat impacts is presented in Table 1, below.

Table 1: San Bernard River Habitat Impacts

Habitats	Construction Features									
	Temporary Impacts (Acres)						Permanent Impacts (Acres)			
	River Channel	Spit Const Corridor	Beach Pipeline Corridor	Gulf Channel	Debris PA	Surf PA	River Channel	Spit Channel	Spit Const Corridor	Beach Nourishment
River Benthic	20.0						+ 6.0			
Wetlands							+ 140.0	- 2.1	- 0.8	
Uplands	2.1		9.0				- 3.0			
Gulf Benthic				7.0		36.5				
Piping Plover Critical Habitat	0.8		6.3				- 1.1			+ 2.5

All impacts from construction within the existing river channel would be confined to the channel. There would be no impacts to the natural banks of the river from the GIWW south to the sand spit, a distance of about one mile. All construction in this reach would be accomplished by hydraulic pipeline dredge, with 150,000 CY of material placed in PA 90. Approximately 20 acres of river channel benthic habitat would be temporarily impacted by the project. The current depth of the river in this location ranges from about eight feet near the GIWW to about two feet near the spit. Deepening the river to 10 feet is anticipated to be a positive impact that would increase river flow and improve natural river habitats and function. The riverine benthic populations are expected to recover rapidly from the dredging.

Construction of the new channel across the sand spit to the Gulf, a distance of about 2,000 feet, would result in both permanent and temporary habitat impacts. Construction of the new channel would permanently impact approximately 2.1 acres of *Spartina* wetlands on the north side of the spit adjacent to the river, and 3 acres of uplands. The channel through the spit would also destroy 1.1 acres of piping plover critical habitat where the channel crosses the beach and enters the Gulf. A 100-foot wide construction corridor immediately west of the new channel would temporarily impact 2.1 acres of uplands, 0.8 acres of *Spartina* wetlands, and 0.8 acres of piping plover critical habitat, all of which are anticipated to fully recover after construction. The Debris PA, immediately adjacent to the channel corridor, would temporarily impact an additional 9 acres of upland scrub and grass vegetation immediately north of the beach. The placement of the

drift wood and vegetative debris from the channel construction corridor parallel to and immediately north of the beach would serve to trap sand and help stabilize the beach and upland habitats down-drift of the channel. In addition, a 100-foot wide by approximately 2,700-foot long beach pipeline corridor is necessary to pump beach quality sand from the new channel to the Surf PA for beach nourishment. The pipeline corridor would run on firm beach sand above the swash zone to minimize impacts to piping plover critical habitat, and would temporarily impact approximately 6.3 acres of piping plover critical habitat. Approximately 235,000 CY of new work beach quality sand would be placed in the Surf PA for beach nourishment and creation of, conservatively, 2.5 acres of piping plover critical habitat resulting from the total closure of the existing mouth of the river, and beach nourishment.

The new channel extends approximately 2,500 feet into the Gulf, temporarily impacting about 7 acres of marine benthic habitat. The Surf PA temporarily impacts an additional 36.5 acres of benthic habitat, for a total of 43.5 acres of temporary impact. In the high energy environment of Texas beaches, benthic organisms suffer frequent natural disturbances and recover quickly. Future temporary impacts would result from maintenance dredging of 300,000 CY to 500,000 CY of material, which is anticipated every 6 to 12 years. It is assumed that much of this material will be beach quality sand and will be placed in the Surf PA for continued beach nourishment. Surf PA and channel benthics are expected to fully and rapidly recover between construction and maintenance dredging events.

Approximately 2.1 acres of *Spartina* marsh located on the north side of the spit along the San Bernard River channel would be destroyed by construction of the new channel and 0.8 acres of *Spartina* would be temporarily impacted. This loss would be offset, however, by the anticipated natural establishment of extensive marsh habitat in the abandoned San Bernard River channel, from the current mouth of the river at the Gulf to the new channel. The re-routing of the river and beach nourishment would result in total closure of the current mouth of the river. Aeolian and overwash sand is expected to quickly begin filling the abandoned river channel. As the abandoned channel shallows, *Spartina* will naturally invade and establish, as it is already doing in the shallow, low energy portion of the channel that approaches the current mouth. It is estimated that as much as 140 acres of marsh could become established in the abandoned river channel once the shoreline is stabilized by the re-routing of the river and beach nourishment (Figure 1, below).

There would be a permanent loss of 3 acres of upland habitat from channel construction through the spit, and 11.1 acres of temporary impacts from the construction corridor and Debris PA. These impacts are considered minor and transitory in nature. The filling of the current mouth of the river will result in creation of both piping plover critical habitat and new upland habitat in the abandoned channel immediately adjacent to the beach; new upland habitat equivalent to the habitat that will be lost.

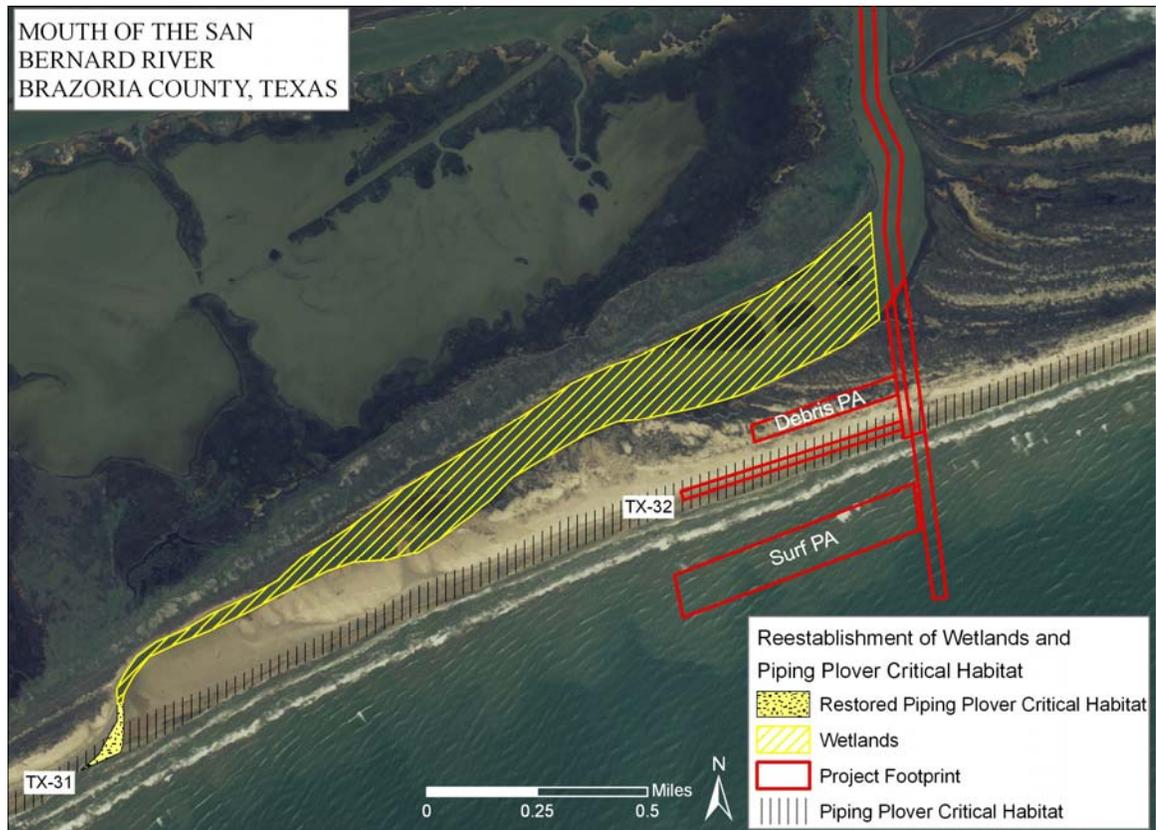


Figure 1. Anticipated Reestablishment of Wetlands and Piping Plover Critical Habitat.

Approximately 20 acres of riverine benthic habitat and 43.5 acres of Gulf benthic habitat would be temporarily impacted by the project. Benthic organisms survive periodic disruptions related to natural events such as storms, erosion, and accretion cycles (Nelson and Pullen, 1988). Allen and Hardy (1980) report that the smothering of benthic organisms appears to be a minor, short-term impact. The recovery rates for beach nourishment projects to pre-project benthic abundance and diversity vary by location and are reported to occur within five weeks to two years. The ability of most macrofauna to recover rapidly is due to their short life cycle, their high reproductive potential, and the rapid recruitment from nearby unaffected areas (Nelson and Pullen, 1988). No permanent effects to invertebrates and benthos would occur as a result of the project.

2.0 IMPACT ASSESSMENT FOR LISTED SPECIES

The species identified in Table 1 are listed by FWS and NMFS as possibly occurring in Brazoria County. Of the 15 listed species, six may be affected by the proposed project, including the piping plover, piping plover Critical Habitat Unit TX-32, and the five sea turtles. A description of each species, identification of potential project impacts, and identification of conservation measures, if appropriate, is provided below.

Table 2: Federally Listed Threatened and Endangered Species for Brazoria County

Common Name	Scientific Name	Listing Status	
		FWS	NMFS
Plants			
Texas Prairie-dawn Flower	<i>Hymenoxys texana</i>	Endangered	
Fish			
Smalltooth sawfish	<i>Pristis pectinata</i>		Endangered
Reptiles			
Green sea turtle	<i>Chelonia mydas</i>	Threatened	Threatened
Hawksbill sea turtle	<i>Eretmochelys imbricata</i>	Endangered	Endangered
Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>	Endangered	Endangered
Leatherback sea turtle	<i>Dermochelys coriacea</i>	Endangered	Endangered
Loggerhead sea turtle	<i>Caretta caretta</i>	Threatened	Threatened
Birds			
Brown pelican	<i>Pelecanus occidentalis</i>	Endangered	
Piping plover	<i>Charadrius melodus</i>	Threatened*	
Whooping crane	<i>Grus americana</i>	Endangered	
Mammals			
Blue whale	<i>Balaenoptera musculus</i>		Endangered
Finback whale	<i>Balaenoptera physalus</i>		Endangered
Humpback whale	<i>Megaptera novaengliae</i>		Endangered
Sei whale	<i>Balaenoptera borealis</i>		Endangered
Sperm whale	<i>Physeter macrocephalus</i>		Endangered

*Critical Habitat

2.1 TEXAS PRAIRIE DAWN-FLOWER

Texas prairie dawn-flower (*Hymenoxys texana*) is a delicate annual plant measuring from one to six inches tall. Its yellow flower heads, less than 1/2 inch in diameter, stand out brightly in the patches of dull gray barren silty sand in which the species is normally found. Suitable habitat is limited to a very small geographic area. It flowers from March to early April, disappearing by mid-summer. (TPWD, 2006).

This wildflower is found in Fort Bend and Harris Counties in southeast Texas. It is known to occur at about 50 sites, many within Addicks and Barker Reservoirs in western Harris County. It grows in sparsely vegetated areas ("slick spots") at the base of small mounds of dirt known as mima mounds (also called pimple mounds) or other nearly barren areas on slightly saline soils in coastal prairie grasslands. (TPWD, 2006). Suitable habitat for the Texas prairie dawn-flower is not found in project vicinity, and it is not expected to occur in the project area.

2.2 SMALLTOOTH SAWFISH

Smalltooth sawfish (*Pristis pectinata*) are generally slow growing, long lived (25-30 years), late-maturing fish. They produce a very small number of young, resulting in a very low rate of population growth for this species. Smalltooth sawfish species inhabit shallow coastal nearshore waters and estuaries throughout tropical regions of the world. They are often found in sheltered bays, on shallow banks, and in estuaries or river mouths.

The U.S. smalltooth sawfish population is found only in the Atlantic Ocean and Gulf of Mexico. Historically, the U.S. population was common throughout the Gulf of Mexico from Texas to Florida, and along the east coast from Florida to Cape Hatteras. Once common throughout its historic range, the smalltooth sawfish has declined dramatically in U.S. waters over the last century. Its current range has contracted to peninsular Florida, where they are relatively common only in the Everglades region of the extreme southern portion of the state (NMFS, 2006). Based on its present range, it is unlikely that this species occurs in the project vicinity or would be affected by the project.

2.3 GREEN SEA TURTLE

The green sea turtle (*Chelonia mydas*) inhabits shallow bays and estuaries in Texas where its principal foods, marine sea grasses, grow. Its population in Texas has suffered a decline similar to that of its world population. In the mid to late nineteenth century, Texas supported a green turtle fishery. Most of the turtles were caught in Galveston, Matagorda, and Aransas Bays, and the Laguna Madre, but by the early 1900's, this industry ceased because of the severe decline of the species. Green turtles still occur in these same bays today, but in much-reduced numbers. While green turtles prefer seagrass meadows, they may also be found in bays devoid of seagrasses. Green turtles in Texas bays are mainly small juveniles. Green turtle nests are rare in Texas, occurring primarily on Padre Island National Seashore (PINS). Green sea turtles have been taken at Freeport, approximately 10 miles from the project area (USACE 2008), an indication of the likelihood that these turtles may occur within the project area. It should be noted, however, that the project area is devoid of seagrasses, and does not possess an embayment, which may make it less attractive to this species.

2.4 HAWKSBILL SEA TURTLE

The hawksbill sea turtle (*Eretmochelys imbricate*), listed as endangered by the NMFS, is rare in Texas coastal waters. Hawksbills generally inhabit coastal reefs, bays, rocky areas, passes, estuaries, and lagoons. Along the Texas coast, this turtle may be attracted to stone jetties that provide foraging habitat. Adults are extremely rare, and Hildebrand (1983) believes that the hawksbills occurring in Texas waters are waifs, although Texas is the only state outside of Florida where hawksbills are sighted with any regularity. Most of the sightings involve posthatchlings and juveniles, and are primarily associated with stone jetties. In 1998 a hawksbill nest was recorded at PINS. No documented records of

hawksbills exist from Brazoria County, and it is unlikely that they will be found in this project area because of lack of foraging habitat.

2.5 KEMP'S RIDLEY SEA TURTLE

The Kemp's ridley sea turtle (*Lepidochelys kempii*) is the most critically endangered sea turtle. The primary range of the Kemp's ridley sea turtle is the Gulf of Mexico, but it also utilizes shallow water bays throughout its known distribution. Distribution appears closely related to the abundance of blue crabs, a favorite food item (Lutcavage and Musick, 1985). A favorite feeding ground is the crab-rich waters adjacent to the Mississippi Delta, east of Sabine Pass (Hildebrand, 1979). Adults are primarily restricted to the Gulf, although juveniles may range throughout the Atlantic Ocean. Although almost the entire population of Kemp's ridleys nests near Rancho Nuevo, Tamaulipas, Mexico, an increasing number of nests have been found along the Texas coast, with 128 nests recorded in 2007. The most current turtle nesting data from the National Park Service (NPS, 2008a, 2008b) indicates two Kemp's ridley nests at Surfside, approximately 10 miles northeast of the project area. In addition, there have been takes of Kemp's ridleys at Freeport in 2007 (USACE, 2008). The Kemp's ridley may be present in the project area.

2.6 LEATHERBACK SEA TURTLE

The leatherback sea turtle (*Dermochelys coriacea*) is rare along the Texas coast. This is not surprising because the leatherback is generally a pelagic species, tending to keep to deeper offshore waters, where it feeds primarily on jellyfish. Fritts *et al.* (1983), however, found this turtle more frequently in shallower waters in the Gulf than previously supposed. The last report of a leatherback nest in Texas was more than 70 years ago (NPS, 2007). There are no known aggregation sites or feeding areas in the project area. Therefore, this species is unlikely to occur in the project area.

2.7 LOGGERHEAD SEA TURTLE

The loggerhead sea turtle (*Caretta caretta*) frequents the temperate waters of the continental shelf along the Atlantic Ocean and Gulf of Mexico, where it forages around rocks, coral reefs, and shellfish beds. Sub-adults will also commonly enter bays, lagoons, and estuaries. The loggerhead is the most abundant turtle in Texas marine waters, preferring shallow inner continental shelf waters and occurring only very infrequently in the bays. Although nests have been confirmed along the Texas coast in recent years, none have been found in the project vicinity. Loggerheads have been taken at Freeport, and may occur in the project area.

2.2 BROWN PELICAN

The brown pelican (*Pelecanus occidentalis*) almost completely disappeared from the Texas coast by the 1960's, largely due to the use of agricultural pesticides that bio-accumulate in the marine food chain and cause reproductive failure (King et al. 1977;

Schreiber 1980). Since then, the use of chlorinated hydrocarbons for pest control has declined and the brown pelican has slowly recovered and spread through its original range. After years of unsuccessful nesting attempts, nesting activity has been on the increase since the late 1980's. This species is a common resident of the project area and forages along the beach. The closest nesting colony is Dressing Point Island in East Matagorda Bay, about 25 miles to the southwest of the project area.

2.3 PIPING PLOVER

The piping plover (*Charadrius melodus*) is threatened or endangered throughout its range. In Texas, the wintering piping plover is listed as threatened. An inhabitant of coastal beaches and tidal flats, the piping plover is a regular migrant along the Texas coast, where it overwinters (Oberholser 1974; Haig and Oring 1985, 1988; Haig et al. 1988). Piping plovers feed in moist sand along beaches and sand-mud flats around inlets and estuaries (Champman 1984). Two major populations winter along North and South Padre Island and Bolivar Flats in Texas (50 FR 50726 (1985); Haig and Oring 1985). The project is located in Critical Habitat Unit TX-32 for the wintering population of piping plovers. Critical Habitat Unit TX-31 occurs immediately southwest of the project area. Construction is proposed to take place in the fall of the year, and wintering piping plovers are of potential occurrence on the beach in the project area. Critical Habitat Unit TX-32 will be directly impacted by the project.

2.4 WHOOPING CRANE

Whooping cranes were originally found throughout most of North America. They now breed in isolated, marshy areas of the Wood Buffalo National Park, Northwest Territories, and Canada. The Aransas National Wildlife Refuge (ANWR) and vicinity serves as the sole wintering grounds for the only remaining breeding population of whooping cranes (*Grus americana*). Each fall, the cranes fly 2,600 miles from northern Canada to the oak savannas, salt flats and bays of the Texas coast, where they feed on crabs, clams, shrimp, frogs, small fish, crayfish, snails, roots and tubers of plants, acorns, sorghum, and other grains (Oberholser 1974). The cranes spend the winter at ANWR, Matagorda Island, Isla San Joe, portions of the Lamar Peninsula, and Welder Point on the east side of San Antonio Bay (NatureServe, 2006). The main stopover points in Texas for migrating birds are in the central and eastern panhandle. Whooping cranes do not normally stray from their traditional breeding and feeding grounds. Although Brazoria County is within the species' migration corridor, the cranes are unlikely to occur in the project area because of the absence of suitable habitat. Only unlikely transient individual cranes would occur in the project area, and it is extremely unlikely that they would be impacted by the proposed project.

2.6 WHALE SPECIES

None of the five whale species listed by NMFS are expected to occur in the project area; therefore, no effects to the five whale species are anticipated from the proposed project.

3.0 EFFECTS OF THE PROPOSED ACTION ON LISTED SPECIES

The following sections provide the findings of Galveston District and species-specific avoidance, minimization, and conservation measures that support the effect determinations presented. Effect determinations are presented using the language of the ESA:

- *No effect* – the proposed action will not affect a federally listed species or critical habitat;
- *May effect, but not likely to adversely affect* – the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial; or
- *Likely to adversely affect* – adverse effects to listed species and/or critical habitat may occur as a direct result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or completely beneficial. Under this determination, an additional determination is made whether the action is likely to jeopardize the continued survival and eventual recovery of the species.

3.1 EFFECTS ON TEXAS PRAIRIE-DAWN FLOWER

This species is highly unlikely to occur in the project area; therefore, no effect on this species is anticipated from the proposed action.

3.2 EFFECTS ON SMALLTOOTH SAWFISH

This species is highly unlikely to occur in the project area; therefore, no effect on this species is anticipated from the proposed action.

3.3 EFFECTS ON SEA TURTLES

It is unlikely that leatherback and hawksbill sea turtles would occur in the project area. Turtles that may occur in the project area include the green, Kemp's ridley, and loggerhead sea turtles. Project impacts could result from either channel dredging (to swimming or foraging turtles) or beach placement (nesting turtles).

3.3.2 Avoidance, Minimization, and Conservation Measures

A number of measures to avoid impacts to sea turtles were developed for the Gulf Regional Biological Opinion (GRBO; NMFS, 2003, 2007), negotiated between USACE and NMFS to address potential incidental take during maintenance and other dredging activities in the Gulf of Mexico. Most of the GRBO measures pertain to hopper dredges, which result in the greatest mortality to turtles. All work on the currently proposed project would be conducted by hydraulic pipeline dredge. Only about 2,500 feet of new

channel would be dredged into the Gulf, minimizing exposure to swimming or foraging turtles. It is anticipated that work would be performed during the fall of the year. Beach nourishment activities could interfere with nesting turtles, but no beach nourishment would be conducted during the peak sea turtle nesting season, from April 1 through July 15. The only beach areas available to the construction contractor will be the construction and pipeline corridors (Figure 4 in the EA). All work, vehicular access, and staging or storing of equipment would be limited to the designated corridors. In the event construction or maintenance should occur during the turtle nesting season, further coordination with the Services would be initiated prior initiation of work. We conclude that the proposed project is not likely to adversely affect sea turtles.

3.4 BROWN PELICAN

Foraging brown pelicans are common along the Texas Coast and may be found in the project area. However, no nesting sites are located in the project area. Although the beach in the project area may be used for loafing, pelicans are highly mobile and are able to relocate to avoid disturbance from construction activities. Although there may be disturbance of feeding and displacement during construction, these are localized activities that would not negatively affect this species' feeding, nesting, or resting activities overall. We conclude that the proposed project is not likely to adversely affect the brown pelican.

3.5 PIPING PLOVER

The proposed project is located adjacent to and within designated wintering piping plover Critical Habitat Units TX-31 and 32, respectively. The proposed channel alignment would destroy approximately 1.1 acres of piping plover critical habitat on the beach where the channel crosses the spit to the Gulf. An additional 7.1 acres of piping plover critical habitat would be temporarily impacted by the channel construction corridor (0.8 acres) and by the pipeline corridor to the Surf PA (6.3 acres). The impact of the construction and pipeline corridors is expected to be limited and temporary in nature. With no other development in the project area, there is substantial other plover habitat immediately available in Critical Habitat Units TX-31 and TX-32 for the birds to use during project construction.

3.5.1 Avoidance, Minimization, and Conservation Measures

Although the project will destroy 1.1 acres of critical habitat, closure of the existing mouth of the river and beach nourishment is conservatively estimated to generate at least 2.5 acres of critical habitat, as described above, for an overall gain of 1.4 acres of critical habitat for the project area, overall. Closing the existing mouth of the river and stabilizing the beach by periodic beach nourishment would both create and protect critical habitat in the project area, resulting in an overall beneficial effect on the species. Construction access to the beach would be limited to the construction and pipeline corridors indicated in Figure 4 of the EA. The pipeline corridor would be placed as high on the beach as possible (while still on firm sand) to avoid impacts to the swash zone of the beach. There will be no construction access outside these corridors in order to

minimize impacts to piping plovers and critical habitat. Although critical habitat is impacted by this project, we believe that the loss of 1.1 acres of critical habitat is discountable because of the overall gain of at least 1.4 acres of critical habitat resulting from project construction, and the overall positive benefits derived from restoring estuarine function to the river and beach nourishment, which will continue to support existing critical habitat. As a result, we conclude that the project may affect, but is not likely to adversely affect the piping plover and piping plover critical habitat.

3.6 WHOOPING CRANE

This species is not expected to occur in the project area; therefore, no effect is anticipated from the proposed action.

3.7 EFFECTS ON WHALES

None of the five whale species are expected to occur in the project area; therefore, no effects to the five whale species are anticipated from the proposed action.

4.0 CONCLUSIONS

The proposed project may affect, but is not likely to adversely affect any federally-listed threatened or endangered species. Conservation measures have been proposed to avoid or minimize impacts to sea turtles, piping plovers, and piping plover critical habitat. The impact of channel construction on 1.1 acres of piping plover Critical Habitat Unit TX-32 is discounted by the accrual of 2.5 acres of new piping plover habitat that will result from project construction, producing a net gain of at least 1.4 acres of habitat in Critical Habitat Unit TX-32. Beach nourishment would serve to protect and possibly increase critical habitat further during both construction and future maintenance dredging.

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APPENDIX C

SECTION 404(b)(1) ANALYSIS

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EVALUATION OF SECTION 404(b)(1) GUIDELINES (SHORT FORM)

PROPOSED PROJECT: GIWW: MOUTH OF THE SAN BERNARD RIVER RECONNECTION OF THE MOUTH OF THE SAN BERNARD RIVER TO THE GULF OF MEXICO, BRAZORIA COUNTY, TEXAS

	Yes	No*
1. Review of Compliance (230.10(a)-(d))		
A review of the proposed project indicates that:		
a. The placement represents the least environmentally damaging practicable alternative and, if in a special aquatic site, the activity associated with the placement must have direct access or proximity to, or be located in the aquatic ecosystem, to fulfill its basic purpose (if no, see section 2 and information gathered for EA alternative).	X	
b. The activity does not appear to:		
1) Violate applicable state water quality standards or effluent standards prohibited under Section 307 of the Clean Water Act;	X	
2) Jeopardize the existence of Federally-listed endangered or threatened species or their habitat; and	X	
3) Violate requirements of any Federally-designated marine sanctuary (if no, see section 2b and check responses from resource and water quality certifying agencies).	X	
c. The activity will not cause or contribute to significant degradation of waters of the U.S. including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic, an economic values (if no, see values, Section 2)	X	
d. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem (if no, see Section 5)	X	

	Not Applica ble	Not Significa nt	Significan t*
2. Technical Evaluation Factors (Subparts C-F) (where a 'Significant' category is checked, add explanation below.)			
a. Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C)			
1) Substrate impacts		X	
2) Suspended particulates/turbidity impacts		X	
3) Water column impacts		X	
4) Alteration of current patterns and water circulation		X	
5) Alteration of normal water fluctuation/hydroperiod	X		
6) Alteration of salinity gradients		X	
b. Biological Characteristics of the Aquatic Ecosystem (Subpart D)			

1) Effect on threatened/endangered species and their habitat * 1.1 acres of piping plover critical habitat will be impacted by the proposed project; however, beach nourishment will create at least 2.5 acres of new critical habitat.			X
2) Effect on the aquatic food web *The project will restore natural riverine and estuarine functions to the mouth of the San Bernard River.			X
3) Effect on other wildlife (mammals, birds, reptiles and amphibians)		X	
	Not Applicable	Not Significant	Significant*
2. Technical Evaluation Factors (Subparts C-F) (where a 'Significant' category is checked, add explanation below.)			
c. Special Aquatic Sites (Subpart E)			
1) Sanctuaries and refuges		X	
2) Wetlands/Tidal Marsh * 2.1 acres of <i>Spartina</i> tidal marsh will be impacted by the proposed alignment; however, natural filling of the abandoned river channel will result in the establishment of as much as 140 acres of tidal marsh.			X
3) Mud flats	X		
4) Vegetated shallows	X		
5) Coral reefs	X		
6) Riffle and pool complexes	X		
d. Human Use Characteristics (Subpart F)			
1) Effects on municipal and private water supplies	X		
2) Recreational and Commercial fisheries impacts *Restoration of the mouth of the San Bernard River will provide direct Gulf access for recreational and commercial fishing.			X
3) Effects on water-related recreation		X	
4) Aesthetic impacts	X		
5) Effects on parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar preserves *The project is located in the Columbia Bottomlands Conservation Area and immediately east of the Brazoria National Wildlife Refuge. The project will have a beneficial effect on these natural areas by restoring natural river and estuarine functions to the San Bernard River.			X

	Yes
3. Evaluation of Dredged or Fill Material (Subpart G)	
a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material (check only those appropriate)	

1) Physical characteristics	X
2) Hydrography in relation to known or anticipated sources of contaminants	X
3) Results from previous testing of the material or similar material in the vicinity of the project	X
4) Known, significant sources of persistent pesticides from land runoff or percolation	
5) Spill records for petroleum products or designated (Section 311 of Clean Water Act) hazardous substances	X
6) Other public records of significant introduction of contaminants from industries, municipalities or other sources	
7) Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities	

List appropriate references:

- 1) Unpublished Corps of Engineer data, Gulf Intracoastal Waterway, Galveston Causeway to Bastrop Bayou, 2002.

National Response Center – Public Report URL <http://www.nrc.uscg.mil/>

	Yes	No
b. An evaluation of the appropriate information in 3a above indicates that there is reason to believe the proposed dredged or fill material is not a carrier of contaminants, or that levels of contaminants are substantively similar at extraction and placement sites and not likely to degrade the placement sites, or the material meets the testing exclusion criteria.	X	

	Yes
4. Placement Site Delineation (230.11(f))	
a. The following factors as appropriate, have been considered in evaluating the placement site:	N/A
1) Depth of water at placement site	
2) Current velocity, direction, and variability at placement site	
3) Degree of turbulence	
4) Water column stratification	
5) Discharge vessel speed and direction	
6) Rate of discharge	
7) Fill material characteristics (constituents, amount, and type of material, settling velocities)	
8) Number of discharges per unit of time	
9) Other factors affecting rates and patterns of mixing (specify)	

List appropriate references:

	Yes	No
b. An evaluation of the appropriate factors in 4a above indicates that the placement site and/or size of mixing zone are acceptable.	N/A	

	Yes	No
5. Actions to Minimize Adverse Effects (Subpart H)		
All appropriate and practicable steps have been taken, through application of recommendations of 230.70-230.77 to ensure minimal adverse effects of the proposed discharge.	X	

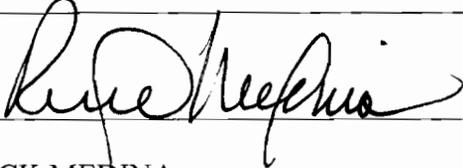
List actions taken:

- 1) Energy dissipaters will be used at the discharge to prevent scour at the placement areas.

	Yes	No*
6. Factual Determination (230.11)		
A review of appropriate information as identified in items 2-5 above indicates that there is minimal potential for short- or long-term environmental effects of the proposed discharge as related to:		
a. Physical substrate at the placement site (review Sections 2a, 3, 4, and 5 above)	X	
b. Water circulation, fluctuation and salinity (review Sections 2a, 3, 4, and 5)	X	
c. Suspended particulates/turbidity (review Sections 2a, 3, 4, and 5)	X	
d. Contaminant availability (review Sections 2a, 3, and 4)	X	
e. Aquatic ecosystem structure and function (review Sections 2b and c, 3, and 5)	X	
f. Placement site (review Sections 2, 4, and 5)	X	
g. Cumulative impacts on the aquatic ecosystem	X	
h. Secondary impacts on the aquatic ecosystem	X	

7. Evaluation Responsibility
a. This evaluation was prepared by: Natalie A. Rund Position: Environmental Specialist

8. Findings	Yes
a. The proposed placement site for discharge of or fill material complies with the Section 404(b)(1) Guidelines.	X
b. The proposed placement site for discharge of dredged or fill material complies with the Section 404(b)(1) Guidelines with the inclusion of the following conditions: List of conditions:	
c. The proposed placement site for discharge of dredged or fill material does not comply with the Section 404(b)(1) Guidelines for the following reason(s):	
1) There is a less damaging practicable alternative	
2) The proposed discharge will result in significant degradation of the aquatic ecosystem	
3) The proposed discharge does not include all practicable and appropriate measures to minimize potential harm to the aquatic ecosystem	

<p><i>16 June 2008</i> Date</p>	<p> RICK MEDINA Chief, Planning and Environmental Branch</p>
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NOTES:

* A negative, significant, or unknown response indicates that the permit application may not be in compliance with the Section 404(b)(1) Guidelines.

Negative responses to three or more of the compliance criteria at the preliminary stage indicate that the proposed projects may not be evaluated using this “short form” procedure. Care should be used in assessing pertinent portions of the technical information of items 2a-e before completing the final review of compliance.

Negative response to one of the compliance criteria at the final stage indicates that the proposed project does not comply with the Guidelines. If the economics of navigation and anchorage of Section 404(b)(2) are to be evaluated in the decision-making process, the “short form” evaluation process is inappropriate.

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APPENDIX D

WATER & SEDIMENT QUALITY DATA

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**Target Detection Levels^a (TDLs)
for Analysis of Sediment, Water, and Elutriate**

Analyte	Sediment (Dry Wt.)	Water/Elutriate
Metals^c		
	mg/kg	µg/l
Antimony	2.5	3 (0.02) ^c
Arsenic	0.3 ^b	1 (0.005) ^c
Beryllium	1 ^b	0.2
Cadmium	0.1	1 (0.01) ^c
Chromium (total)	1 ^b	1
Chromium (3+)	1	1
Chromium (6+)	1	1
Copper	1 ^b	1 (0.1) ^c
Lead	0.3 ^b	1 (0.02) ^c
Mercury	0.2	0.2 (0.0002) ^c
Nickel	0.5 ^b	1 (0.1) ^c
Selenium	0.5 ^b	2
Silver	0.2	1 (0.1) ^c
Thallium	0.2	1 (0.02) ^c
Zinc	2 ^b	1 (0.5) ^c
Conventional/Ancillary Parameters		
	mg/kg	mg/l
Ammonia	0.1	0.03
Cyanides	2	0.1 ^d
Total Organic Carbon	0.1%	0.1%
Total Petroleum Hydrocarbons	5	0.1
Grain Size	1%	-
Total Solids/Dry Weight	0.1%	-
LPAH Compounds		
	µg/kg	µg/l
Naphthalene	20	0.8 ^b
Acenaphthylene	20	1.0 ^b
Acenaphthene	20	0.75 ^b
Fluorene	20	0.6 ^b
Phenanthrene	20	0.5 ^b
Anthracene	20	0.6 ^b

Analyte	Sediment (Dry Wt.)	Water/Elutriate
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PAH Compounds		
	$\mu\text{g/kg}$	$\mu\text{g/l}$
Fluoranthene	20	0.9 ^b
Pyrene	20	1.5 ^b
Benzo(a)anthracene	20	0.4 ^b
Chrysene	20	0.3 ^b
Benzo(b&k)fluoranthene	20	0.6 ^b
Benzo(a)pyrene	20	0.3 ^b
Indeno[1,2,3-c,d]pyrene	20	1.2 ^b
Dibenzo[a,h]anthracene	20	1.3 ^b
Benzo[g,h,i]perylene	20	1.2 ^b
Organonitrogen Compounds		
	$\mu\text{g/kg}$	$\mu\text{g/l}$
Benzidine	5	1
3,3-Dichlorobenzidine	300 ^b	3 ^b
2,4-Dinitrotoluene	200 ^b	2 ^b
2,6-Dinitrotoluene	200 ^b	2 ^b
1,2-Diphenylhydrazine	10	1
Nitrobenzene	160 ^b	0.9 ^b
N-Nitrosodimethylamine	-	3.1 ^b
N-Nitroso-di-n-propylamine	150 ^b	0.9 ^b
N-Nitrosodiphenylamine	20	2.1 ^b
Phthalate Esters		
	$\mu\text{g/kg}$	$\mu\text{g/l}$
Dimethyl Phthalate	50	1 ^b
Diethyl Phthalate	50	1 ^b
Di-n-butyl Phthalate	50	1 ^b
Butyl Benzyl Phthalate	50	4 ^b
Bis[2-ethylhexyl] Phthalate	50	2 ^b
Di-n-octyl Phthalate	50	3 ^b
Phenols/Substituted Phenols		
	$\mu\text{g/kg}$	$\mu\text{g/l}$
Phenol	100	10
2,4-Dimethylphenol	20	10

Analyte	Sediment (Dry Wt.)	Water/Elutriate
Pentachlorophenol	100	50
2,4,6-Trichlorophenol	140 ^b	0.9 ^b
4-Chloro-3-methylphenol	140 ^b	0.7 ^b
2-Nitrophenol	200 ^b	2 ^b
4-Nitrophenol	500 ^b	5 ^b
2,4-Dinitrophenol	500 ^b	5 ^b
2-Chlorophenol	110 ^b	0.9 ^b
2,4-Dichlorophenol	120 ^b	0.8 ^b
4,6-Dinitro-o-cresol	600	10
Polychlorinated Biphenyls		
	µg/kg	µg/l
Total PCB	1	0.01
Pesticides		
	µg/kg	µg/l
Aldrin	3 ^b	0.03 ^b
Chlordane and Derivatives	3 ^b	0.03 ^b
Dieldrin	5 ^b	0.02
4,4'-DDD	5 ^b	0.1
4,4'-DDE	5 ^b	0.1
4,4'-DDT	5 ^b	0.1
Endosulfan and Derivatives	5 ^b	0.1
Endrin and Derivatives	5 ^b	0.1
Heptachlor and Derivatives	3 ^b	0.1
Alpha-BHC	3 ^b	0.03
Beta-BHC	3 ^b	0.03
Delta-BHC	3 ^b	0.03
Gamma-BHC (Lindane)	3 ^b	0.1
Toxaphene	50	0.5
Chlorinated Hydrocarbons		
	µg/kg	µg/l
1,3-Dichlorobenzene	20	0.9 ^b
1,4-Dichlorobenzene	20	1 ^b
1,2-Dichlorobenzene	20	0.8 ^b
1,2,4-Trichlorobenzene	10	0.9 ^b
Hexachlorobenzene	10	0.4 ^b
2-Chloronapthalene	160 ^b	0.8 ^b
Hexachlorocyclopentadiene	300 ^b	3.0 ^b
Hexachloroethane	100	0.9 ^b
Hexachlorobutadiene	20	0.9 ^b

Analyte	Sediment (Dry Wt.)	Water/Elutriate
Halogenated Ethers		
	$\mu\text{g}/\text{kg}$	$\mu\text{g}/\text{l}$
Bis(2-chloroethyl)ether	130 ^b	0.9 ^b
4-Chlorophenyl phenyl ether	170 ^b	0.6 ^b
4-Bromophenyl phenyl ether	160 ^b	0.4 ^b
Bis(2-chloroisopropyl)ether	140 ^b	0.7 ^b
Bis(2-chloroethoxy)methane	130 ^b	1 ^b
Miscellaneous		
	$\mu\text{g}/\text{kg}$	$\mu\text{g}/\text{l}$
Isophorone	10	1

^aThe primary source of these TDLs was EPA 823-B-95-001, *QA/QC Guidance for Sampling and Analysis of Sediments, Water and Tissues for Dredged Material Evaluations*.

^bThese values are based on recommendations from the EPA Region 6 Laboratory in Houston; these values were based on data or other technical basis.

^cThe values in parentheses are based on EPA “clean techniques”, (EPA 1600 series methods) which are applicable in instances where other TDLs are inadequate to assess EPA water quality criteria.

^dThis value recommended by Houston Lab using colorimetric method.

^eMetals shall be expressed as Dissolved values in water samples, except for mercury and selenium, which shall be reported as Total Recoverable Concentrations.

TABLE 1
CONCENTRATIONS OF DETECTED COMPOUNDS (ug/L)
WATER
Mouth of the San Bernard River

Date Sampled: March 5, 2008

Parameter	WQS**		Detection Limit	GIN-SBR-08-								
	Acute	Chronic		B1	B2	B3	B3 Dup	B4	B5	B6	EB	Field Blank
			Antimony	N/A	N/A	3.00	0.35 J	0.43 J	0.40 J	0.28 J	0.36 J	0.31 J
Arsenic	149	78	1.00	1.58	2.06	2.05	2.10	2.11	2.25	2.13	BDL	BDL
Beryllium	N/A	N/A	0.20	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cadmium	45.4	10.0	1.00	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chromium, Total	N/A	N/A	1.00	0.83 J	0.97 J	1.01	0.61 J	0.67 J	0.93 J	0.75 J	BDL	BDL
Chromium, III	N/A	N/A	1.00	0.83 J	0.97 J	1.01	0.61 J	0.67 J	0.93 J	0.75 J	BDL	BDL
Copper	13.5	3.6	1.00	2.65	1.27	1.18	1.18	1.13	1.21	1.23	BDL	BDL
Lead	133	5.3	1.00	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nickel	118	13.1	1.00	1.25	1.30	1.27	1.07	1.25	1.10	1.47	BDL	BDL
Selenium	564	136	2.00	1.89 J	1.57 J	1.83 J	1.58 J	1.85 J	1.84 J	1.70 J	BDL	BDL
Silver	2	1.9	1.00	0.51 J	0.75 J	0.42 J	BDL	0.33 J	0.30 J	BDL	BDL	BDL
Thallium	N/A	N/A	1.00	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Zinc	92.7	84.2	1.00	2.00	1.14	0.82 J	0.43 J	1.00	0.95 J	2.03	BDL	BDL
Ammonia*	N/A	N/A	0.03	0.05	0.05	0.04	0.06	0.04	0.04	0.04	BDL	N/A
TOC*	N/A	N/A	0.10	8.06	8.63	8.64	7.45	7.83	8.89	8.30	BDL	N/A

Dup = Duplicate Sample

BDL = Below Detection Limits

* mg/L

** Texas Water Quality Standards for Saltwater

J = Analyte detected below Detection Limit



	Legend Sediment Cores and Water Sample Stations		Notes DOQQs d289513_1 d289513_2	
			PBS & J	
			San Bernard River Pre-Dredge Study	
			Sediment Core and Water Sample Stations	
				Project: coreb2o.mxd Date: 03/28/08 Figure 1

TABLE 2
CONCENTRATIONS OF DETECTED COMPOUNDS (ug/L)
ELUTRIATE
Mouth of the San Bernard River

Date Sampled: March 5, 2008

Parameter	WQS**		Detection Limit	GIN-SBR-08-						
	Acute	Chronic		B1	B2	B3	B3 Dup	B4	B5	B6
			Antimony	N/A	N/A	3.00	0.93 J	0.65 J	0.49 J	0.75 J
Arsenic	149	78	1.00	2.13	2.28	2.16	3.49	2.36	2.33	2.16
Beryllium	N/A	N/A	0.20	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cadmium	45.4	10.0	1.00	0.49 J	0.33 J	0.27 J	0.24 J	0.23 J	BDL	BDL
Chromium, Total	N/A	N/A	1.00	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chromium, III	N/A	N/A	1.00	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Copper	13.5	3.6	1.00	1.27	0.93 J	1.11	1.23	1.04	1.08	1.06
Lead	133	5.3	1.00	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nickel	118	13.1	1.00	3.21	2.70	2.98	2.58	2.57	2.45	2.57
Selenium	564	136	2.00	2.20	2.29	2.07	2.79	2.41	2.04	2.05
Silver	2	1.9	1.00	0.79 J	0.36 J	BDL	BDL	BDL	BDL	BDL
Thallium	N/A	N/A	1.00	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Zinc	92.7	84.2	1.00	2.60	2.10	1.73	2.12	2.26	1.87	2.78
Ammonia*	N/A	N/A	0.03	1.46	2.83	2.06	2.01	0.94	2.10	1.87
TOC*	N/A	N/A	0.10	11.6	10.5	8.99	9.86	11.1	9.27	11.1

Dup = Duplicate Sample

BDL = Below Detection Limits

* mg/L

** Texas Water Quality Standards for Saltwater

J = Analyte detected below Detection Limit

TABLE 3
CONCENTRATIONS OF DETECTED COMPOUNDS (dry weight)
SEDIMENT
Mouth of the San Bernard River

Date Sampled: March 5, 2008

Parameter	Units	Detection Limit	NOAA ERL	GIN-SBR-08-						
				B1	B2	B3	B3 Dup	B4	B5	B6
Arsenic	mg/kg	0.30	8.2	6.14	8.01	4.21	3.99	4.32	6.14	11.4
Beryllium	mg/kg	1.00	N/A	0.97 J	1.38	0.71 J	0.71 J	0.61 J	0.96 J	1.65
Cadmium	mg/kg	0.10	1.2	0.31	1.15	0.23	0.34	0.13	0.25	2.69
Chromium, Total	mg/kg	1.00	81.0	25.1	33.1	17.4	17.3	18.1	21.8	39.3
Chromium III	mg/kg	1.00	N/A	25.1	33.1	17.4	17.3	18.1	21.8	39.3
Copper	mg/kg	1.00	34.0	12.5	17.6	8.99	7.98	8.13	10.1	19.4
Lead	mg/kg	0.30	46.7	19.9	25.2	13.8	11.7	13.4	16.6	31.2
Nickel	mg/kg	0.50	20.9	11.8	19.1	8.76	8.25	7.16	11.7	21.4
Selenium	mg/kg	0.50	N/A	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Thallium	mg/kg	0.20	N/A	BDL	0.29	0.16 J	0.12 J	0.15 J	0.17 J	0.34
Zinc	mg/kg	2.00	150	56.0	74.9	40.4	38.6	39.4	48.7	87.5
Ammonia	mg/kg	0.10	N/A	229	366	204	199	178	297	415
TOC	%	0.10	N/A	0.57	0.58	0.86	0.50	0.54	0.63	0.48
Percent Solids	%	0.10	N/A	48.5	34.7	56.5	59.5	54.4	35.5	26.7
Gravel	%	N/A		0.0	0.9	0.0	0.0	0.0	0.0	0.0
Sand	%	N/A		0.5	17.9	44.3	40.9	46.2	2.7	2.7
Silt	%	N/A		36.6	7.9	12.4	21.0	9.3	22.4	20.6
Clay	%	N/A		62.9	73.3	43.3	38.1	44.5	74.9	76.7
D50	mm	N/A		0.002	0.002	0.010	0.002	0.019	0.000	0.000

Dup = Duplicate Sample

BDL = Below Detection Limit

J = Analyte detected below Detection Limit

APPENDIX E
PROJECT COORDINATION

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Environmental Section

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

January 30, 2008



Steve Parris
U.S. Fish and Wildlife Service
Field Supervisor Ecological Services
17629 El Camino Real, Ste. 211
Houston, TX 77058

Dear Mr. Parris:

The U.S. Army Corps of Engineers Galveston District has been tasked with re-opening the mouth of the San Bernard River in Brazoria County, Texas. The mouth of the San Bernard River has migrated almost five miles to the southwest since 1938 and is now almost closed at the Gulf of Mexico due to sand accretion. This blockage is diverting water flow from the river eastward through the Gulf Intracoastal Waterway (GIWW) to the Brazos River Locks, where increased velocities are impeding barge traffic. The GIWW intersects the San Bernard River a little over a mile inland of the mouth of the river. A map of the project area is attached (Attachment 1). The proposed project would relocate the mouth of the river to its historic location by excavation and dredging of sand across the accreted sand bar northeast of the current outlet. It is estimated that approximately 500,000 cubic yards of sand will be excavated. Disposal options under consideration for this material include placement southeast of the current river mouth in the surf zone for beach nourishment.

To ensure compliance with the requirements of Section 7 of the Endangered Species Act, a list is requested of any species that are listed or proposed to be listed as threatened or endangered within your jurisdiction of the mouth of the San Bernard River study area.

Your assistance with our coordination responsibilities is appreciated. If you have any questions, please contact Ms. Natalie Rund by phone at 409-766-6384 or by e-mail at Natalie.A.Rund@usacc.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Branch

Enclosure



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

JANUARY 30, 2008

Environmental Section

Mr. David Bernhart
Assistant RA for Protected Resources
Southeast Regional Office
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, Florida 33701

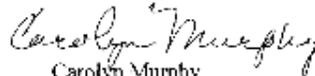
Dear Mr. Bernhart:

The U.S. Army Corps of Engineers Galveston District has been tasked with re-opening the mouth of the San Bernard River in Brazoria County, Texas. The mouth of the San Bernard River has migrated almost five miles to the southwest since 1938 and is now almost closed at the Gulf of Mexico due to sand accretion. This blockage is diverting water flow from the river eastward through the Gulf Intracoastal Waterway (GIWW) to the Brazos River Locks, where increased velocities are impeding barge traffic. The GIWW intersects the San Bernard River a little over a mile inland of the mouth of the river. A map of the project area is attached (Attachment 1). The proposed project would relocate the mouth of the river to its historic location by excavation and dredging of sand across the accreted sand bar northeast of the current outlet. It is estimated that approximately 500,000 cubic yards of sand will be excavated. Disposal options under consideration for this material include placement southeast of the current river mouth in the surf zone for beach nourishment.

To ensure compliance with the requirements of Section 7 of the Endangered Species Act, a list is requested of any species that are listed or proposed to be listed as threatened or endangered within your jurisdiction of the mouth of the San Bernard River project area.

Your assistance with our coordination responsibilities is appreciated. If you have any questions, please contact Ms. Natalie Rund by phone at 409-766-6384 or by e-mail at Natalie.A.Rund@usacc.army.mil.

Sincerely,


Carolyn Murphy
Chief, Environmental Branch

Enclosure



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

May 6, 2008

Steve Parris
U.S. Fish and Wildlife Service
Field Supervisor Ecological Services
17629 El Camino Real, Ste. 211
Houston, TX 77058

Dear Mr. Parris:

The purpose of this letter is to satisfy consultation with the U.S. Fish and Wildlife Service, pursuant to the Coastal Barrier Resources Act (CBRA), for the proposed re-opening of the mouth of the San Bernard River to the Gulf of Mexico in Brazoria County, Texas. The mouth of the San Bernard River has migrated almost five miles to the southwest since 1938 and is now almost closed at the Gulf of Mexico due to sand accretion. This blockage is diverting water flow from the river eastward through the Gulf Intracoastal Waterway (GIWW) to the Brazos River Locks, where increased velocities are impeding barge traffic. The GIWW intersects the San Bernard River a little over a mile inland of the mouth of the river. The proposed project would relocate the mouth of the river to its historic location by excavation and dredging of sand across the accreted sand bar northeast of the current outlet. It is estimated that approximately 350,000 cubic yards of sand will be excavated. Disposal options under consideration for this material include placement southeast of the current river mouth in the surf zone for beach nourishment and placement area 90, which is a previously coordinated upland area.

The U.S. Army Corps of Engineers, Galveston District has concluded that the proposed project is an exempt activity from the CBRA's prohibition of expenditures of federal funds within Coastal Barrier Resources System Unit 105/105P because the proposed project is being pursued under the authority to maintain safe waterway for commercial navigation, specifically the GIWW.

We are hereby requesting your written concurrence with the District's conclusion that the proposed project is an exempt activity under the CBRA. Your assistance with our coordination responsibilities is appreciated. If you have any questions, please contact Ms. Natalie Rund by phone at 409-766-6384 or by e-mail at Natalie.A.Rund@usacc.army.mil.

Sincerely,

A handwritten signature in cursive script that reads "Carolyn Murphy".

Carolyn Murphy
Chief, Environmental Branch



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Division of Ecological Services

17629 El Camino Real #211

Houston, Texas 77058-3051



February 2007

This responds to your request for threatened and endangered species information in the Clear Lake Ecological Services Field Office's area of responsibility. According to Section 7(a)(2) of the Endangered Species Act and the implementing regulations, it is the responsibility of each federal agency to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any federally listed species. Therefore, we are providing information to assist you in meeting your obligations under the Endangered Species Act.

A county by county listing of federally listed threatened and endangered species that occur within this office's work area can be found at <http://www.fws.gov/southwest/es/EndangeredSpecies/lists/lisrSpecies.cfm>. You should use the county by county listing and other current species information to determine whether suitable habitat for a listed species is present at your project site. If suitable habitat is present, a qualified individual should conduct surveys to determine whether a listed species is present.

After completing a habitat evaluation and/or any necessary surveys, you should evaluate the project for potential effects to listed species and make one of the following determinations:

No effect – the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No coordination or contact with the Service is necessary. However, if the project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Is not likely to adversely affect – the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. You should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation you used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect – adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires formal Section 7 consultation with this office.

Regardless of your determination, the Service recommends that you maintain a complete record of the evaluation, including steps leading to the determination of effect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles.

TAKE PRIDE
IN AMERICA 

Threatened and Endangered Species Information
Page 2

The Service's Consultation Handbook is available online to assist you with further information on definitions, process, and fulfilling Endangered Species Act requirements for your projects at <http://endangered.fws.gov/consultations/s7hndbk/s7hndbk.htm>.

If we can further assist you in understanding your obligations under the Endangered Species Act, please contact Kathy Nemec, Edith Erfling, or Catherine Yeagan at 281/286-8282.

Sincerely,



Stephen D. Parris
Field Supervisor, Clear Lake Field Office