

APPENDIX H

Environmental Mapping of the Conveyance Corridor and Scofield Island

TABLE OF CONTENTS

1.0	INTRODUCTION	H-1
2.0	PROJECT AREA AND LOCATION.....	H-1
3.0	ENVIRONMENTAL MAPPING.....	H-3
3.1	Surface Mapping.....	H-3
3.2	Permitting, Habitat Types, Ecologically Sensitive Areas, and Hazardous Materials.....	H-6
4.0	RESULTS BY REGION.....	H-6
4.1	Region 1 - Mississippi River Batture.....	H-6
4.2	Region 2 - Mississippi River Levee to Highway 11	H-7
4.3	Region 3 - Highway 11 to the Empire Canal Spoil Bank.....	H-8
4.4	Region 4 - Empire Canal Spoil Bank to Highway 23	H-8
4.5	Region 5 - Highway 23 to the Rock Breakwater	H-9
4.6	Region 6 - Rock Breakwater to Scofield Island.....	H-9
4.7	Region 7 - Scofield Island.....	H-10
5.0	CONCLUSION.....	H-13
6.0	REFERENCES	H-14

LIST OF FIGURES

Figure 1: Environmental Mapping Survey Location Map.....	H-2
Figure 2: Project Regions Map	H-4
Figure 3: Survey Segments from the Mississippi River to Empire Waterway	H-5
Figure 4: Oyster Leases	H-11
Figure 5: Scofield Island.....	H-12

LIST OF TABLES

Table 1: Regions	H-3
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ENVIRONMENTAL MAPPING OF THE CONVEYANCE CORRIDOR AND SCOFIELD ISLAND

1.0 INTRODUCTION

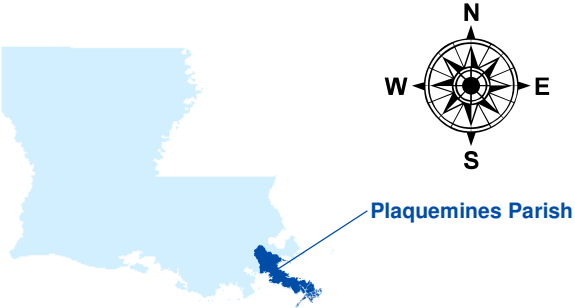
Environmental mapping of the Conveyance Corridor and Scofield Island was completed in support of the Feasibility Study and Preliminary Design Phases for the Riverine Sand Mining / Scofield Island Restoration Project (Project). The Project is sponsored by the Louisiana Department of Natural Resources (LDNR) Office of Coastal Protection and Restoration (OCPR) and NOAA Fisheries. The Project design is funded and authorized in accordance with the provisions of the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) (16 U.S.C.A., Sections 3951-3956) and has been approved by the Public Law 101-646 Task Force. The Project's CWPPRA designation is BA-40.

The purpose of the mapping was to collect environmental data specific to wetlands, ecologically sensitive areas, and hazardous materials; evaluate potential impacts to natural resources; and provide design data for the restoration plan for Scofield Island and the Conveyance Corridor, which shall serve as the corridor for the sediment pipeline to transport sand excavated from Mississippi River borrow areas to Scofield Island, as fully described in the Preliminary Design Main Report, Conveyance Corridor Design Analysis (Appendix I), and Scofield Island Restoration Area Design Analysis (Appendix M).

The scope of services included establishment of the survey control network, topographic surveys, infrastructure locations, and channel bottom elevation measurements within the canals from the Mississippi River batture to the Empire Waterway. The survey was conducted by SJB Group, LLC. (SJB) and C-K Associates, LLC (C-K), and reviewed by Coastal Engineering Consultants, Inc.

2.0 PROJECT AREA AND LOCATION

The Conveyance Corridor includes two segments. The Upland Segment is approximately 1,120 feet wide and extends approximately one mile from the western bank of the Mississippi River in Empire, Plaquemines Parish, southwest to the rock breakwater at the Empire Locks. The Over Water Segment is approximately 8.8 miles long, beginning at the Empire Locks and extending south through the Empire Waterway, crossing the eastern side of Caprien Bay, and entering the Gulf of Mexico through the jetties just west of Pelican Island. Scofield Island is a 2.4 mile long barrier island located east of Pelican Island between Scofield Bayou and the merger of Bay Coquette and the Gulf of Mexico. The Project area is shown in Figure 1.




LEGEND

- CITY
- SURVEY SEGMENTS

NOTES



1.25 0 1.25 2.5
Miles



RIVERINE SAND MINING/
SCOFIELD ISLAND RESTORATION (BA-40)

**ENVIRONMENTAL MAPPING
SURVEY LOCATION MAP**

PLAQUEMINES PARISH, LOUISIANA



ENVIRONMENTAL & ENGINEERING
CONSULTANTS

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FIGURE 1

3.0 ENVIRONMENTAL MAPPING

The environmental mapping included the ecological field review of the Conveyance Corridor and Scofield Island. The investigation parameters were wetlands, ecologically sensitive areas, and hazardous materials. Data points were mapped utilizing a Trimble® GeoXH® differential global positioning system (DGPS) with real-time correction. The ecological field investigations were conducted on July 15, 16, and 17, 2008.

3.1 Surface Mapping

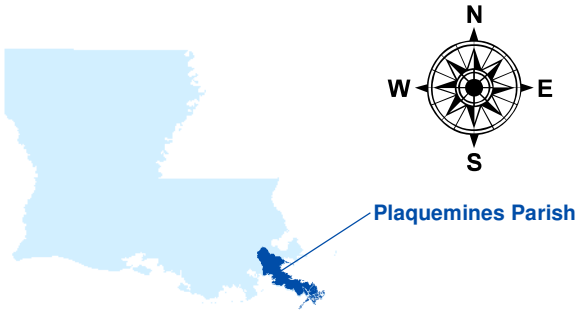
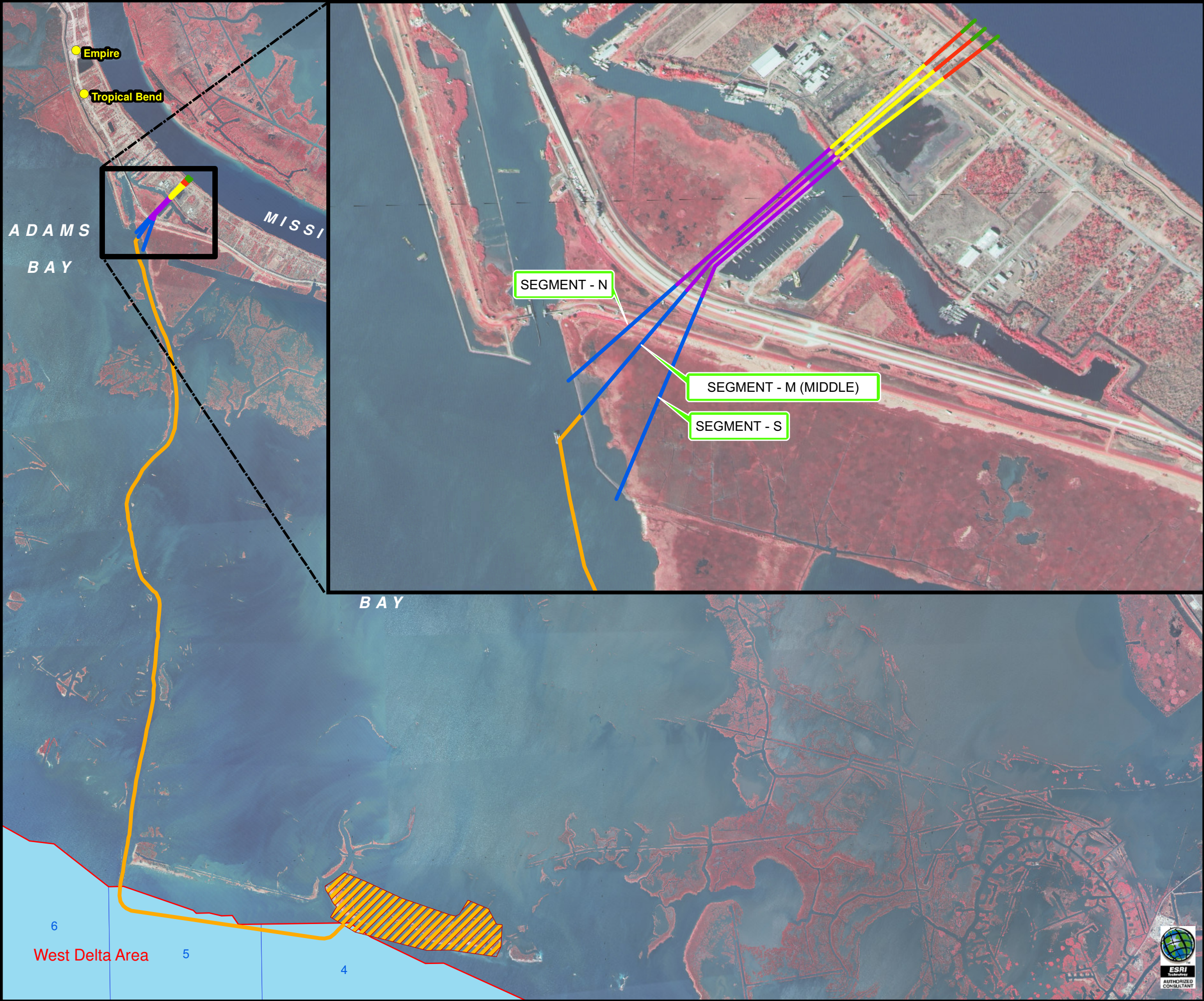
The Project area was composed of two areas: 1) Conveyance Corridor and 2) Scofield Island (Figure 2). The areas were separated into 7 regions, which are listed in the Table 1 and delineated on Figure 2.

Table 1: Regions

Region	Description
1	Mississippi River Batture
2	Mississippi River Levee to Highway 11
3	Highway 11 to the Empire Canal Spoil Bank
4	Empire Canal Spoil Bank to Highway 23
5	Highway 23 to the Rock Breakwater
6	Rock Breakwater to Scofield Island
7	Scofield Island

The Upland Segment of the Conveyance Corridor included three alternate land segments (Figure 3). The segments were mapped as Segment - N (N), Segment - M (M), and Segment - S (S) from the Mississippi River batture to the Empire Waterway Flood Control Structure.

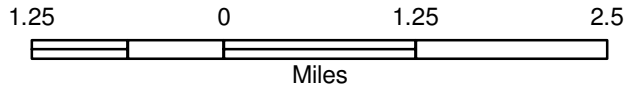
Scofield Island was mapped using six Gulf shoreline points to establish visual transects to describe the dominant plant species. Due to favorable weather conditions, Scofield Island was accessible from the Gulf of Mexico; however the inland side of Scofield Island was inaccessible due to shallow water, oyster reefs, and sand flats.



LEGEND

- CITY
- Region 1
- Region 2
- Region 3
- Region 4
- Region 5
- Region 6
- Region 7 (Scofield Island)

NOTES



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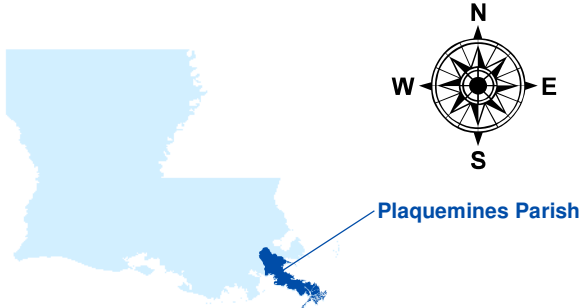
PROJECT REGIONS MAP

PLAQUEMINES PARISH, LOUISIANA



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FIGURE 2



LEGEND

- SAMPLE LOCATION
- ▬ SURVEY SEGMENTS

NOTES



SJB GROUP, LLC
QUALITY BY DESIGN

RIVERINE SAND MINING/
SCOFIELD ISLAND RESTORATION (BA-40)
**SURVEY SEGMENTS FROM MISSISSIPPI
RIVER TO EMPIRE WATERWAY**
PLAQUEMINES PARISH, LOUISIANA



CK ASSOCIATES, LLC
ENVIRONMENTAL & ENGINEERING
CONSULTANTS

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FIGURE 3

3.2 Permitting, Habitat Types, Ecologically Sensitive Areas, and Hazardous Materials

The Conveyance Corridor will require permitting under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. The corridor will cross the batture of the Mississippi River, Mississippi River Levee, inter-tidal saline marshes, waters of the United States, and other waters of the United States. In addition, the Plaquemines Parish Government maintains and has regulatory authority over the Hurricane Protection Levee, which involves a technical review by the Operations Division of the USACE and issuance of a letter of findings to the Plaquemines Parish Government who issues the levee-crossing permit (SJB and CEC, 2008).

Wetland assessments were completed to describe the wetlands within the project area and representative sampling points of habitat types were identified. Vegetative, hydrological, and soil data were collected by the methods described in the 1987 Delineation Manual (USACE, 1987). Plant community type was determined by visually estimating the dominant plant species. Hydrology was determined by the presence of primary and secondary field indicators. Hydric and non-hydric soils were determined by comparing horizon soil colors to a Munsell soil color chart. The plant community type was categorized by the habitat types described by Visser (et al. 1998).

Observations for ecologically sensitive areas (*e.g.* rookeries and plant communities) were completed. The Louisiana Department of Wildlife and Fisheries (LDWF) Threatened and Endangered website (<http://state.la.us/experience/threatened/>) was reviewed for threatened and endangered species that could potentially inhabit Scofield Island (*e.g.* shorebirds and sea turtles). The LDWF Louisiana Natural Heritage Program reviewed current information regarding colonial bird nesting on Scofield Island and reported no recent records of recent rookeries (personal communications, Carolyn Michon, LDWF).

Observations and mapping of municipal developments (*e.g.* fire hydrants), hazardous materials (*e.g.* chemical barrels), and water hazards (*e.g.* abandoned structures) were completed.

4.0 RESULTS BY REGION

4.1 Region 1 - Mississippi River Batture

The batture in Region 1 was inundated and inaccessible to soil sampling. The observation points were mapped on the Mississippi River Levee (Figure 3: S1, M1, and N1). The batture plant community was scrub/shrub/herbaceous with no particular dominant species. The plant species were black willow (*Salix nigra*), sugarberry (*Celtis laevigata*), rattlebox (*Sesbania drummondii*), common reed (*Phragmites communis*), giant cutgrass (*Zizaniopsis miliacea*), cattail (*Typha* sp.),

and water hyacinth (*Eichhornia crassipes*). Water hyacinth covered 100% of the water surface between the toe of the levee and the inner-edge of the scrub/shrub/herbaceous vegetative community. Due to complete inundation, soil hydrology and hydric soil data were not collected. The soil unit for the Mississippi River batture is Convent (CV), which includes three hydric soils types: Convent, Commerce, and Sharkey, which are frequently flooded, mineral, poorly drained soils (NRCS, 2008).

No visible hazards were observed. No ecologically sensitive sites were observed in Region 1. However, the batture between the Mississippi River and Mississippi Levee was assessed as potential wetlands.

4.2 Region 2 - Mississippi River Levee to Highway 11

Region 2 was accessible to soil sampling (Figure 3: DP1). Observation points were mapped between the Mississippi River Levee and Highway 11 (Figure 3: S2, M2, and N2). The plant community was dominated by coastal Bermudagrass (*Cynodon dactylon*), rattlebox, and common reed. One large live oak (*Quercus virginiana*) was centrally located on Segment N. Soil hydrology sampling indicated an absence of primary and secondary hydrologic indicators (>16 inches). Soil sampling for hydric soils was completed from 0.0 - 16.0 inches. From 0.0 to 10 inches, the soil chroma was non-hydric (10YR 5/3), and the soil texture was loamy. From 10.0 to 16.0 inches, the soil chroma was hydric (10YR 2/1), and the soil texture was clayey. Additionally, the degree of compaction and presence of oyster shell indicated that the materials overlaying the sampling point were potentially historic fill material. The mapped soil unit was Commerce (CM), which is hydric, level poorly drained, mineral soil in intermediate positions along the natural levees of the Mississippi River (NRCS, 2008)

Visible hazards were observed in Region 2. A natural gas line was parallel to the west side of Highway 11, which bisects Segments S, M, and N. A hurricane fence bisects Segments S2 and M2. Just east of Highway 11, a fire hydrant is located on Segment N. No ecologically sensitive sites were observed in Region 2 on Segments S, M, or N.

4.3 Region 3 - Highway 11 to the Empire Canal Spoil Bank

Region 3 was accessible to soil sampling (Figure 3: DP2). The observation points were mapped between Highway 11 and the Empire Canal Spoil Bank (Figure 3: S3, M3, and N3). The largest portion of Region 3 was a fenced landfill that was filled and capped. Located on the west side of the landfill was a shallow drainage canal, and on the north boundary of the landfill was a drainage ditch. The landfill plant community was dominated by coastal Bermudagrass (90%), and rattlebox (10%). Segments S and M were within the landfill. Segment N was within the east-west drainage ditch that bordered the landfill. Soil hydrology analysis indicated an absence of primary and secondary hydrologic indicators. Soil testing for hydric soils was completed. From 0.0 to 8 inches, the soil chroma was hydric (matrix 10YR 3/2; mottle 10YR 2/1) and the soil texture was loamy clay. From 8.0 to 16 inches, the soil chroma was hydric (matrix 10YR 3/2; mottle 7.5YR 4/6) and the soil texture was clayey. The mapped soil unit was Shriver (SK - Sharkey clay), which is hydric, level, poorly drained, mineral soil in low positions along the natural levees of the Mississippi River (NRCS, 2008).

Visible hazards were observed in Region 3. At the west end of the landfill on Segment M, there was exposed debris (outside of the fence) that was not covered by the landfill cap. Most of this debris consisted of household materials and commercial fishing net. Along Segment N, there appears to be an underground waterline, which services fire hydrants and an adjoining trailer park in Region 3. No ecologically sensitive areas were observed in Region 3 on Segments S, M, or N. However, the utilization of Segment S will minimize wetland and human impacts.

4.4 Region 4 - Empire Canal Spoil Bank to Highway 23

Region 4 was not soil sampled. The observation points were mapped between the Empire Canal spoil bank and Highway 23 (Figure 3: S4, M4, and N4). The marsh was identified as an undisturbed, inter-tidal saltwater marsh. The Empire Boat Harbor soil surface was compacted and improved with parking lots, boat docks, and municipal facilities (water and electricity). Segments S and M passed through the northern edge of the Empire Boat Harbor. Segment N passed through the inter-tidal saltwater marsh. The saltwater marsh plant community was dominated by smooth cordgrass (*Spartina alterniflora*), leafy three-square (*Scirpus robustus*), and black needle rush (*Juncus roemerianus*). The Empire Boat Harbor plant community was dominated by coastal Bermudagrass. Soil testing for hydric soils was not collected due to tidal inundation in the saltwater marsh and soil compaction in the Empire Boat harbor. The mapped soil unit was dredged Aquents (AN), which are hydric, hydraulically dredged; poorly drained soils (NRCS, 2008).

Visible hazards were observed in Region 4. Between Segments S and M, a waterline and fire

hydrant system are located. Three fire hydrants were observed on the Segment M (Figure 3: MH1, MH2, and MH3). The saltwater marsh was the ecologically sensitive area that was observed in Region 4 on Segment S.

4.5 Region 5 - Highway 23 to the Rock Breakwater

Region 5 was accessible to soil sampling (Figure 3: DP3). The observation points were mapped between Highway 23 and the rock breakwater (Figure 3: S5, M5, and N5). The soil sample was collected in the high saltwater marsh between the Hurricane Protection Levee and the access road. The inter-tidal saltwater marsh was not soil sampled due to inundation at the time of sampling. The high saltwater marsh plant community was dominated by saltgrass (*Distichlis spicata*), annual glasswort (*Salicornia bigelovii*), sea-ox-eye daisy (*Borrchia frutescens*), marshhay cordgrass (*Spartina patens*), leafy three-square, black needle rush, and smooth cordgrass. The inter-tidal saltwater marsh plant community was dominated by smooth cordgrass, black needle rush, and leafy three-square. Soil water in the high saltwater marsh was at the soil surface level. The inter-tidal saltwater marsh soil hydrology was inundated and tidally dynamic. Soil testing for hydric soils was completed in the high saltwater marsh. From 0.0 to 6.0 inches, the soil chroma was hydric (matrix 10YR 4/2; mottle 10YR 3/6) and the soil texture was a sandy clay. From 6.0 to 16.0 inches; the soil chroma was hydric (matrix 10YR 5/1; mottle 10YR 4/4) and the soil texture was sandy. The high saltwater marsh soils were mapped as dredged Aquents, which was described in Section 4.4. The inter-tidal saltwater marsh soils were mapped as dredged, frequently flooded Aquent soils (AT), which are hydric, hydraulically dredged, poorly drained soils (NRCS, 2008).

Visible hazards were observed in Region 5. Segments S, M, and N cross the rock levee on the outside of the Empire Waterway Flood Control Structure. The high saltwater marsh and inter-tidal in saltwater marsh are ecologically sensitive areas that were observed in Region 5 on Segments S, M, and N. A more direct path (e.g. Segment M) would minimize wetland impacts.

4.6 Region 6 - Rock Breakwater to Scofield Island

Region 6 had two basic habitat components (open water and remnant inter-tidal saltwater marsh islands). Saltwater marsh remnants were not soil sampled, and the open water is dominated by oyster leases. The fragmented saltwater marsh plant community was dominated by smooth cordgrass and black needle rush. Soil hydrology and hydric soil data was not collected on the fragmented saltwater marsh islands. The mapped soil units included Belle Passe (BE), Scatlake muck (SC), and Timbalier Muck (TM), which are hydric soils (NRCS, 2008). Belle Passe soils are level, organic, poorly drained soils in tidal saltwater marshes. Scatlake muck soils are level, mineral, poorly drained soils in tidal saltwater marshes. Timbalier muck soils are level, organic, and very poorly drained soils in saltwater marshes.

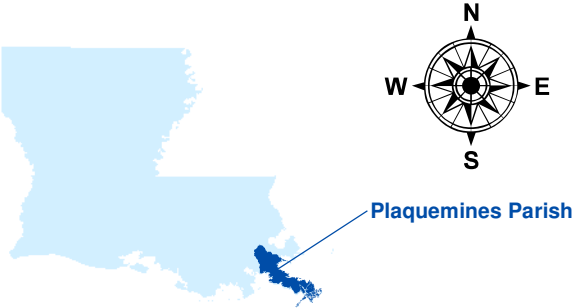
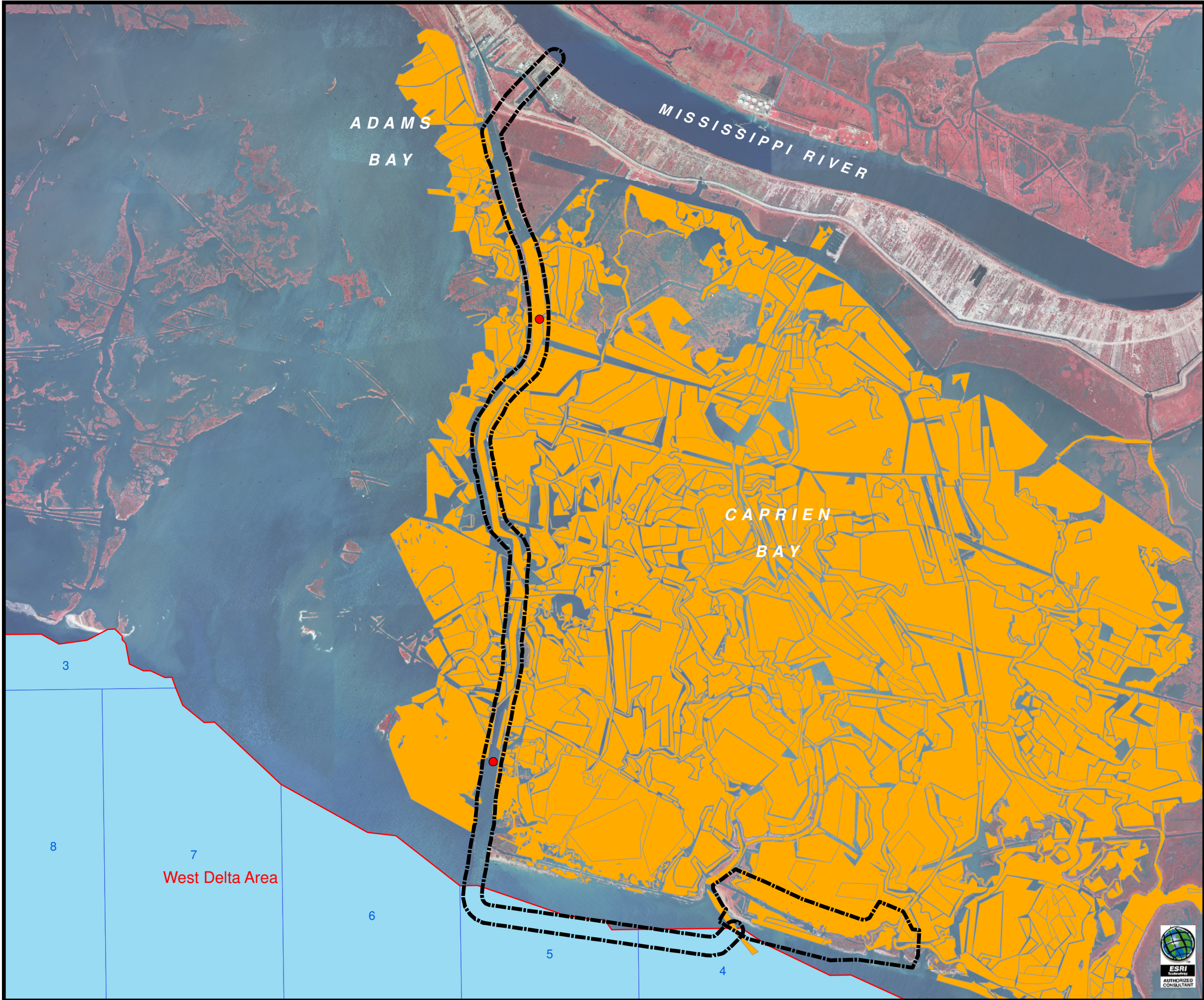
Visible hazards were observed in Region 6. The Empire Waterway was lined on both sides with 2 to 4 inch PVC pipe and hundreds of bamboo cane and sapling stem markers. Also, noted were pipeline bulkheads and riprap protection. The fragmented saltwater marsh islands and oyster beds were ecologically sensitive areas observed. Oyster lease boundaries overlap into the waterway (Figure 4).

4.7 Region 7 - Scofield Island

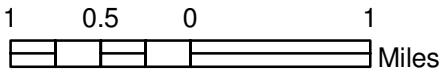
Region 7 is Scofield Island, which is a rapidly eroding barrier island (Figure 5). Six visual vegetative observation points (T1...T6) and three soil data points (DP4, DP5, and DP6) were established (Figure 5). Observation vegetative transects were established in a general north-south direction to bisect the island habitats. The soil data points were established at the southwest corner and southeast corner of Scofield Island.

There are four basic topographical features of Scofield Island: 1) sand dunes/high marsh, 2) low saltwater marshes, 3) black mangrove, and 4) sand/mud flat. The dune plant community is dominated by common reed, marshhay cordgrass, Eastern baccharis (*Baccharis halimifolia*), three square (*Schoenoplectus americanus*), annual glasswort, seaside golden rod (*Solidago sempervirens*), perennial iva (*Iva frutescens*) and deer pea (*Vigna luteola*). The saltwater marsh community is dominated by smooth cordgrass-with colonies of saltgrass, annual pickleweed, marshhay cordgrass, and black needle rush. The black mangrove (*Avicennia germinans*) colony was located on the eastern shoreline of Scofield Bayou.

Scofield Island soil hydrology was collected at three locations (Figure 5: DP4, DP5, and DP6). DP4 and DP5 were located on transect T1, and DP6 was located on transect T6. DP4 was located on a sand dune, DP5 was located in a smooth cordgrass saltwater marsh, and DP6 was located in a low lying/eroding sand dune/beach head. Data from DP4 indicated the absence of wetland hydrology features on the sand dune. Data from DP5 indicated wetland hydrology in the saltwater marsh (inundated, saturated, and raised water table at the soil surface). Data from DP6 (intermediate elevation between dune height and marsh level) indicated wetland hydrology (0.0 inundation, soil moisture \leq 6 inches below the soil surface, and water table \leq 2 inches).



- LEGEND**
- PROJECT AREA (550 FOOT BUFFER)
 - PRIMARY BOOSTER LOCATIONS
 - OYSTER LEASES



NOTES



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SCOFIELD ISLAND RESTORATION (BA-40)

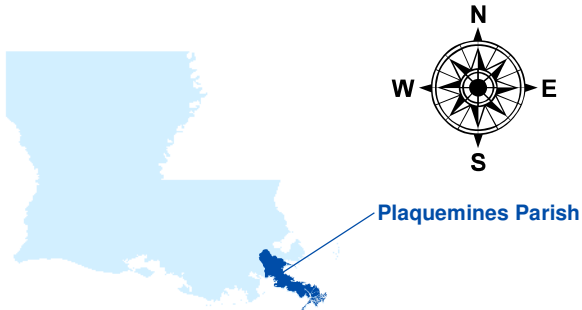
OYSTER LEASES

PLAQUEMINES PARISH, LOUISIANA

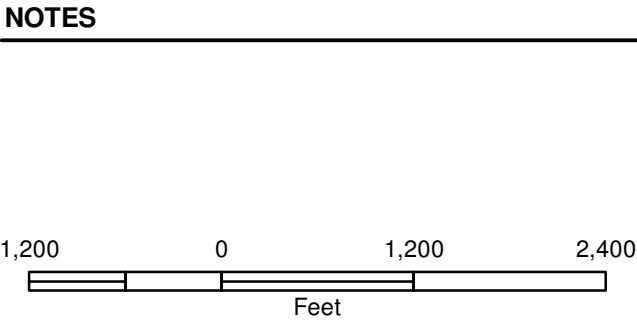


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FIGURE 4



- LEGEND**
- SAMPLE LOCATIONS
 - 1990 WADING BIRD COLONY
 - SCOFIELD ISLAND SURVEY LIMITS



QUALITY BY DESIGN

RIVERINE SAND MINING/
SCOFIELD ISLAND RESTORATION (BA-40)

SCOFIELD ISLAND

PLAQUEMINES PARISH, LOUISIANA

CK
ASSOCIATES, LLC

ENVIRONMENTAL & ENGINEERING
CONSULTANTS

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FIGURE 5



Soil testing for hydric soils was completed. At DP4, from 0.0 to 16 inches, the soil chroma was non-hydric (matrix 2.5YR 4/4 without mottles), and the soil texture was sandy with shell fragments. At DP5, from 0.0 to 16 inches, the soil chroma was hydric (matrix gley-1, 2.5 N without mottles), and the soil texture was sandy with organics and silty-clay dispersed within the soil sample. At DP6, from 0.0 to 16 inches, the soil chroma was hydric (2.5Y 3/2 without mottles), and the soil texture was sandy with shell fragments. Soils on the higher dune elevations are non-hydric. Soils at the lower dune elevations and low saltwater marsh elevations are hydric.

The mapped soil units are Bellpass muck (BE), Felicity (FE); Scatlake muck (SC) (NRCS 2008). Bellpass muck and Scatlake muck were described in Section C2.2.6. Felicity is a frequently flooded, loamy fine sand on the gentle slopes and tops of barrier islands (sand dunes) (NRCS, 2008).

Visible hazards were observed in Region 7 (Figure 5). Marked, underground pipelines laterally bisect Scofield Island from southwest to northeast. For the following hazards, the UTM coordinates were plotted on Figure 5: three sunken boats (SB1, SB2, and SB3), one beached boat, one abandoned camp, one new camp, one transmission station, and one blue barrel on the beachhead.

The black mangrove colony was the only ecologically sensitive area observed in Region 7 (BMI and BM2). From shoreline and transect observations, ground nesting or scrub/shrub nesting bird species were not observed on Scofield Island at the time of the field reconnaissance. After reviewing the Louisiana Department of Wildlife and Fisheries Threatened and Endangered website, the only endangered species that may inhabit Scofield Island is the brown pelican (*Pelecanus occidentalis*). According to information posted on the website, the brown pelican nests from November to July. This survey was completed on July 15, 16, and 17, which is slightly outside of the nesting season. If fill material is to be placed on the Island during the brown pelican nesting season, then an over flight should be considered to investigate the potential of any nesting brown pelicans. Furthermore, the last active wading bird colony was mapped in 1990 at the following latitude and longitude +29.23861 -89.54917 (personal communications, Carolyn Michon, LDWF). The wading bird colony is indicated on Figure 5 by a wading bird symbol.

5.0 CONCLUSION

Scofield Island is visibly eroding, as indicated by Williams, *et al.* (1992), and is greatly in need of mineral sediment deposition and nourishment to restore the Island's historic boundaries. The ecologically significant habitats included a black mangrove colony that exists on the western edge of Scofield Island and a robust *Spartina alterniflora* marsh. As part of the restoration plan, consideration should be given to siting the western perimeter of the fill template along the eastern flank of the existing stable, black mangrove colony to protect this sensitive habitat and

minimize or avoid natural resource impacts. Furthermore, placing fill in Scofield Bayou will slough into the historic bayou channel. Consideration should also be given to avoiding direct placement of sediment on the existing *Spartina alterniflora* marsh. However, designing the restoration plan to take advantage of the existing island framework, thereby reducing the volume and corresponding cost required to construct the Project, along with creating and sustaining new marsh habitat in excess of the Project goal is a recommended alternative to avoidance. Further, this restoration plan is self mitigating by virtue of creating significantly more marsh habitat than what is being covered by the fill template.

From the Mississippi River to the Empire Waterway, the least invasive path is a combination of Routes S and M. The Conveyance Corridor should start at point S1 in the Mississippi River, be directed through the Empire Boat Harbor at point M4, and follow through points M5, M6, and M7. This Conveyance Corridor will reduce the interaction between the sediment pipeline, municipal appurtenances, and existing saltwater marshes. The open water segment of Conveyance Corridor did not appear to impinge upon any marsh islands. However, the corridor will traverse several oyster lease boundaries. In addition, there are physical hazards along the Empire Waterway (pipeline bulkheads, riprap, and channel markers). The open water segment of Conveyance Corridor should follow the east side of the Empire Waterway allowing for navigation access at pre-determined points along the access route.

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