Using Landform and Hydraulic Modifications to Increase the Benefit of Fresh Water Inflows to Nueces Bay and Nueces Delta -- Phase II: Verification and Feasibility Assessment for Landform Modifications in the Nueces Delta

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PURSUANT TO HOUSE BILL 1 AS APPROVED BY THE 84TH TEXAS LEGISLATURE, THIS STUDY REPORT WAS FUNDED FOR THE PURPOSE OF STUDYING ENVIRONMENTAL FLOW NEEDS FOR TEXAS RIVERS AND ESTUARIES AS PART OF THE ADAPTIVE MANAGEMENT PHASE OF THE SENATE BILL 3 PROCESS FOR ENVIRONMENTAL FLOWS ESTABLISHED BY THE 80TH TEXAS LEGISLATURE. THE VIEWS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE AUTHOR(S) AND DO NOT NECESSARILY REFLECT THE VIEWS OF THE TEXAS WATER DEVELOPMENT BOARD.

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Table of Contents

List of Figures

List of Tables

List of Acronyms

ACOT	Antiquities Code of Texas
BBASC	Basin and Bay Area Stakeholder Committee
BBEST	Basin and Bay Area Expert Science Team
BEG	Bureau of Economic Geology
BMP	best management practice
BU	Beneficial Use
CBBEP	Coastal Bend Bays and Estuaries Program
CEI	Coastal Environments, Inc.
CGP	Construction General Permit
CMP	Coastal Management Program
CNRA	Coastal Natural Resource Area
DMPA	dredged material placement area
ECOS	Environmental Conservation On-line System
EFH	essential fish habitat
EMST	Ecological Mapping Systems of Texas
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FEMA	Federal Emergency Management Agency
GIS	geographic information system
GPS	Global Positioning System
IP	Individual Permit
IPaC	Information Planning and Conservation
JEM	Joint Evaluation Meeting
LiDAR	light detection and ranging
MAC	Moore Archeological Consulting, Inc.
MBTA	Migratory Bird Treaty Act
MHW	mean high water
MS4	Municipal Separate Storm Sewer System
MSFCMA	Magnuson–Stevens Fishery Conservation and Management Act
MSL	mean sea level
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NDHM	Nueces Delta Hydrodynamic Model
NEI	Naismith Engineering, Inc.
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
NWP	Nationwide Permit
ROW	right-of-way
RRC	Railroad Commission
SB3	Senate Bill 3

SW3P	Stormwater Pollution Prevention Plan
TAC	Texas Administrative Code
TARL	Texas Archaeological Research Laboratory
TCEQ	Texas Commission on Environmental Quality
TGLO	Texas General Land Office
THC	Texas Historical Commission
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
TSHA	Texas State Historical Association
TSS	total suspended solids
TWDB	Texas Water Development Board
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Service
UTMSI	University of Texas Marine Science Institute
VRS	Virtual Reference Station
WSS	Web Soil Survey

Executive Summary

The Nueces River supports the southernmost deltaic marsh, the Nueces Delta/Estuary complex, of any appreciable size in the Gulf of Mexico. The Nueces Delta (Delta) is composed of approximately 14,000 acres of salt marsh, mud flats, tidal channels, and open water habitats and is part of the Nueces Estuary (Estuary). Classified as semi-arid, the Estuary is the second driest in Texas. Additionally, the Estuary is also classified as a negative estuary because salinities are higher in the Delta than in the adjacent Nueces Bay due to the encroachment of hypersaline waters from the bay, the shortage of freshwater inflow from the Nueces River, and evaporation rates exceeding the freshwater inflow rates. The balanced influx of both fresh and saline waters serves an important role in maintaining a healthy estuarine ecosystem.

Channel banks and interior marsh areas are subject to highly irregular flooding patterns that are driven more by on-site meteorological conditions than by freshwater inflow from the Nueces River. In the absence of regular freshwater inundation, health of the estuarine ecosystem suffers due to the loss of ecosystem functions, diversity, habitat, food sources, and fresh (drinking) water. Health of the Estuary has been adversely affected by installation of upstream water control structures, such as dams, reservoirs, and channels, which redirect the essential freshwater inflows away from the Delta.

In 2007, declining river and estuary health was given statewide attention during the 80th Texas Legislature. It was recognized that increasing demand being exerted on our water supply due to population increase is having adverse impacts on our rivers and estuaries which are ecologically, economically, and socially important. The need for a statewide process that could determine environmental flows necessary to keep our rivers and estuaries healthy as well as determine studies needed to establish adaptive management strategies was addressed by establishing the Senate Bill 3 (SB3) Environmental Flows rulemaking process (SB3, 2007).

The intent of the SB3 process was to address three predominant questions (TWDB, 2017):

1. How much water is needed to sustain a sound ecological environment in the state's rivers and estuaries?
2. How can this water be protected?
3. What is the appropriate balance between water needed to sustain a sound ecological environment and water needed for human or other uses?

Pursuant to SB3, two groups were appointed for the Nueces River and Corpus Christi and Baffin Bays Area: the Basin and Bay Area Expert Science Team (Nueces BBEST) and the Basin and Bay Area Stakeholder Committee (Nueces BBASC). The Nueces BBEST was responsible for developing environmental flow analyses and a recommended environmental flow regime to support a sound ecological environment for all streams, bays and estuaries in the Nueces River Basin, the Nueces-Rio Grande Coastal Basin and the Corpus Christi and Baffin Bays Area (TCEQ, 2017). The Nueces BBASC was responsible for developing environmental flows recommendations for this same area based on the Nueces BBEST recommendations and other factors, including present and future needs of water for other uses (TCEQ, 2017).

In 2011, the Nueces BBEST concluded its extensive review and analysis of data sets that exist for the Estuary and determined that while other rivers and bays within the Nueces River Basin were "sound ecological environments," the "Nueces Bay and Delta region is an unsound ecological environment" (BBEST, 2011). The Nueces Bay and Delta region were deemed unsound ecological environments due to the "substantial alterations in freshwater reaching the bay and delta which have led to a failure to sustain a healthy complement of native species and its associated beneficial physical processes… [and that] a modification of flow regime will be required to rebuild these species and processes to sound levels" (BBEST, 2011).

In 2012, the Nueces BBASC developed and submitted a Work Plan for Adaptive Management (Work Plan) to the SB3 Environmental Flows Advisory Group and the TCEQ. This work plan included "Landform Modifications to Nueces Bay and Nueces Delta" as a strategy option for achieving the environmental flow standards for the Estuary and in 2013, the Texas Legislature appropriated funding to implement studies from adaptive management work plans developed during the SB3 environmental flows process.

On February 12, 2014, with due consideration and balancing of all relevant information available, including Nueces BBEST and BBASC recommendations, the Texas Commission on Environmental Quality (TCEQ), through an established, public rule-making process, adopted environmental flow standards for the Nueces River, its associated tributaries, the Nueces-Rio Grande Coastal Basin, and Corpus Christi and Baffin Bays (30 Tex. Admin. Code 298.430).

Later in 2014, based on recommendations of the Nueces BBASC, the Texas Water Development Board (TWDB) awarded a contract to Naismith Engineering Inc. (NEI), and a diverse team of scientists with extensive experience and expertise in the Nueces Delta, for a study to evaluate this strategy option (NEI, 2016). The study area was largely located in the Nueces Delta Preserve, owned by the Coastal Bend Bays and Estuaries Program (CBBEP), within San Patricio County and included the Nueces River from the Calallen Saltwater Barrier Dam to Nueces Bay, the Nueces Delta, and Nueces Bay.

Results from the Phase I study (NEI, 2016) identified two potential water diversion channel projects that, based on evaluations using the Nueces Delta Hydrodynamic Model (NDHM) (NEI, 2016), would be expected to improve the ecological benefits resulting from the freshwater inflow volumes delivered into the Rincon Bayou from the Calallen Pool via the City of Corpus Christi's Nueces Delta Pipeline. These benefits would be achieved by increasing the area of inundated acreage around South Lake, an area of concern that previously received limited freshwater from pumping events. Those two proposed projects are the Middle Rincon Bayou Diversion Channel to South Lake Area (Project #4) and the North Lake Diversion Channel to South Lake System (Project #5).

The Phase I Study also addressed permitting, construction, and funding issues associated with the two proposed diversion channels from Rincon Bayou into the South Lake system. However, this analysis was based on existing information about hydrological and ecological conditions within the proposed project area; it did not include field studies or generate any new, site-specific information. Recognizing that this kind of information would be required to move the project(s) into the design and permitting phases, the Phase I Study recommended that a second phase of the

project be conducted to include additional desk-top and field studies specifically designed to support further refinement and development of the two proposed diversion channels.

In 2016, the TWDB awarded a second contract to Naismith Engineering Inc., (now Hanson Professional Services Inc. (Hanson)) for a follow-up study (the Phase II Study) to address the issues and recommendations from the Phase I study, which included: 1) determining how to provide legal and physical access to the proposed diversion channel project sites, 2) collecting data and information to be used to satisfy requirements of future permitting and regulatory efforts, 3) collecting elevation data to help validate the NDHM modeling conducted in Phase I, and 4) developing recommendations for construction techniques applicable to wetland areas. The current Phase II Study is intended to accomplish those objectives.

A thorough environmental desktop investigation was conducted to assess topography, geology, soils, floodplains, oil and gas development, railroads, historic aerial imagery, wetlands, ecological mapping, threatened and endangered species, habitats, and historic and cultural resources in regard to the Phase II Study area. Once the desktop investigation data was compiled and reviewed, a field plan was prepared. The field plan involved an access plan and methodologies for wetland delineations, habitat characterizations, and collection of survey data.

Field reconnaissance efforts assessed access, delineated wetlands, characterized habitats, collected elevation data points using the Global Positioning System (GPS), evaluated habitats for the potential occurrence of threatened and endangered species, evaluated habitats for potential nesting bird habitat, and evaluated a candidate dredged material placement area (DMPA) site. Elevation and location data for various features collected during the field reconnaissance helped to verify or supplement data used in the NDHM to evaluate hydrologic suitability.

Data collected during Tasks 1 through 4 were compiled and interpreted relative to logistical and regulatory planning. Data collected in the field was used to create maps for the wetland delineations, habitat characterizations, and project access routes. Elevation data collected in the field was used to create engineering drawings of the channel cross sections and profiles. Logistical issues related to accessing the sites during construction were also evaluated based on landowner and regulatory restrictions. A Joint Evaluation Meeting (JEM) was held at the U.S. Army Corps of Engineers (USACE) Regulatory Field Office in Corpus Christi on May 2, 2017 to present the project alternatives and ascertain which local, state, and federal permits will likely be required for each project. Project team members provided background on the project and discussed various permitting requirements, issues and options based on the information collected through both the desktop evaluations and the field data collection. Lastly, the cost estimate provided in the Phase I Study was revised and updated to reflect the new findings from the Phase II Study and account for cost inflation.

While no previously-recorded prehistoric archeological sites have been documented within the project area, there were significant cultural and historical findings made during the archeological desktop assessment. A review of the Texas Historical Commission (THC) Site Atlas indicated that there are four previously recorded sites within one mile of the project area (MAC, 2016). A number of previous archeological surveys have been conducted on nearby tracts and most produced positive results for cultural and historic findings (MAC, 2016). In addition, reviewing

environmental factors that combine to make a location attractive for prehistoric settlement revealed that the project area does exhibit two of the five factors: located within the floodplain and proximity to sources of potable water. Due to the long history of prehistoric land use and exploitation by a number of indigenous groups (MAC, 2016) and the fact that no previous survey of the project areas have been conducted, it is recommended that an intensive pedestrian survey with shovel testing (MAC, 2016) be conducted. As part of the USACE permitting process and the interagency review, coordination with the THC will be required and a shovel test survey within the project site is probable.

Permitting efforts for the projects are expected to be substantial and involve, or potentially involve, USACE permitting, TCEQ Water Rights and Stormwater permitting, coordination with the City of Corpus Christi to ensure compliance with its Texas Pollutant Discharge Elimination System (TPDES) Municipal Separate Storm Sewer System (MS4) permit, coordination with the Texas General Land Office (TGLO) to ensure compliance with the Texas Coastal Management Program (CMP) and to obtain a coastal lease for submerged lands owned by the State, and San Patricio County floodplain permitting if the dredged material will be placed onsite within the project vicinity which is entirely within the floodplain. The project areas that are submerged, which is defined as any land lying below mean high water or mean higher high water, as applicable, and within the tidewater limits, are owned by the State of Texas (31 Tex. Admin. Code 7.7.2).

Because the Delta provides many diverse and important habitats, there are a significant number of federal and state-listed threatened or endangered species which could potentially occur within or near the project site. The diverse habitats also provide nesting habitats for many species of birds and it is recommended that construction take place in December and January when the number of potential nesting birds within the Delta are at a minimum. As part of the USACE permitting process, which will more than likely involve an interagency review, an endangered species survey and a nesting bird survey could potentially be required as well as monitoring before, during, and after construction. The utilization of best management practices (BMPs) will also be required.

Although the permitting efforts under an Individual Permit (IP) could be extensive, during the JEM it was widely accepted that the project could potentially be permitted under Nationwide Permits (NWP) 27 and 16 which is a much more desirable path than pursuing an IP. Because the project objective is to help restore functionality to the Delta ecosystem, the agencies may be more willing to work with the permittee regarding impacts caused by the project.

Access to the Project #4 site is attainable utilizing the Nueces Delta Preserve's access roads, some of which have been improved with caliche. The access roads also provide reasonable access to the candidate DMPA site.

However, access to Project #5 is much less attainable as the access road ends at the railroad crossing, which would result in equipment having to travel off-road approximately one mile through potentially sensitive habitat. This would also require crossing the railroad, which may result in the need for access permits, especially if the crossing needs to be reinforced with caliche for the equipment to cross safely. Another issue with Project #5 is that the candidate DMPA site

is located on the opposite side of the railroad, the same side as Project #4, which would result in more traffic through the potentially sensitive habitats and over the railroad. Water access to Project #5 is not recommended for heavy equipment or dredged material due to the historically shallow water depths within the Rincon Bayou. Because of the difficult access to Project #5, and the amount of wetlands it would impact, the project team does not recommend further investigation or development for this site.

Although the candidate DMPA location is within uplands, JEM attendees expressed concern regarding the disposal of dredged material (25,000 cubic yards) within the pristine habitat of the Nueces Delta. Another concern is that placement of the dredged material within the floodplain may result in material being washed downstream during flooding and storm events. The only area of the Nueces Delta Preserve that is not within the floodplain is near the entrance gate, approximately five miles from Project #4. However, if the candidate DMPA site were properly prepared and material properly placed, it may be that ecological benefits of the diversion channel outweigh negative impacts of the DMPA. In addition, CBBEP expressed interest in possibly stock piling the dredged material for use, presumably closer to the entrance, within the Nueces Delta Preserve. Potential uses may include road reinforcement if the material is suitable or creating/restoring shallow wetland habitat.

Finally, costs may present another impediment to pursuing recommended Project #4 due to remote access and extensive permitting requirements. Costs for construction, access roadway improvements, bladder dam installation, board mat roadways, and water monitoring instruments are estimated to be $1,375,000. Additional costs including surveying, engineering, permitting, and project management are estimated to be $375,000 for a total cost of $1,750,000. Annual costs associated with the operation and maintenance of the bladder dams and channels as well as ecological monitoring which would likely be required as a USACE permit condition are estimated to be $74,000.

1. Introduction to Study

Many landform and hydraulic modifications have been made within the Nueces Bay/Delta system, generally for purposes unrelated to enhancing ecosystem functions such as drainage, access, pipeline and powerline installation, highway and railroad construction, and navigation. However, beginning in the late 1970s, scientists and resource managers began recognizing that these historical landform and hydraulic modifications had significantly diminished the ability of natural processes to introduce freshwater into the wetland complexes of the interior of the Nueces Delta. Diminished freshwater inflow to the wetland complexes altered seasonally-critical salinity and nutrient regimes in the upper Delta, which in turn negatively affected water column primary productivity, benthic community abundance and diversity, and vegetative community structure and productivity (BOR, 2000).

Because of those findings, efforts were made in the 1990s to identify and implement hydraulic modifications and water diversions primarily based on their potential for providing additional freshwater inflows to enhance wetland ecosystems and ecosystem functions within the interior Nueces Delta. Some of these projects were designed to operate on an experimental basis, while others have been constructed as permanent projects which continue to function and provide desired benefits. These successful projects have provided a hydrologic and hydrodynamic framework for construction and operation of new projects designed to further enhance the ecosystem functions in the Nueces Delta.

The Senate Bill 3 (SB3) Nueces Basin and Bay Area Stakeholder Committee's (Nueces BBASC) 2012 Work Plan for Adaptive Management, submitted to the SB3 Environmental Flows Advisory Group and the Texas Commission on Environmental Quality (TCEQ), included "Landform Modifications to Nueces Bay and Nueces Delta" as a strategy option for achieving the environmental flow standards for the Nueces Estuary. In 2014, based on recommendations of the Nueces BBASC, the Texas Water Development Board (TWDB) awarded a contract to Naismith Engineering Inc. (NEI), and a diverse team of scientists with extensive experience and expertise in the Nueces Delta, for a study to evaluate this strategy option (NEI, 2016). The study area was within San Patricio County and included the Nueces River from the Calallen Saltwater Barrier Dam to Nueces Bay, the Nueces Delta, and Nueces Bay (see Figure 1-1).

Results from the Phase I study (NEI, 2016) identified two potential water diversion projects that, based on evaluations using the Nueces Delta Hydrodynamic Model (NDHM) (NEI, 2016), would be expected to improve the ecological results from the freshwater inflow volumes delivered into the Rincon Bayou from the Calallen Pool via the City of Corpus Christi's Nueces Delta Pipeline. The two potential water diversion projects would improve ecological benefits by increasing the area of inundated acreage around South Lake, an area of concern that previously received limited freshwater from pumping events. Those two proposed projects are the Middle Rincon Bayou Diversion to South Lake Area (Project #4) and the North Lake Diversion to South Lake System (Project #5) (see Figure 1-2).

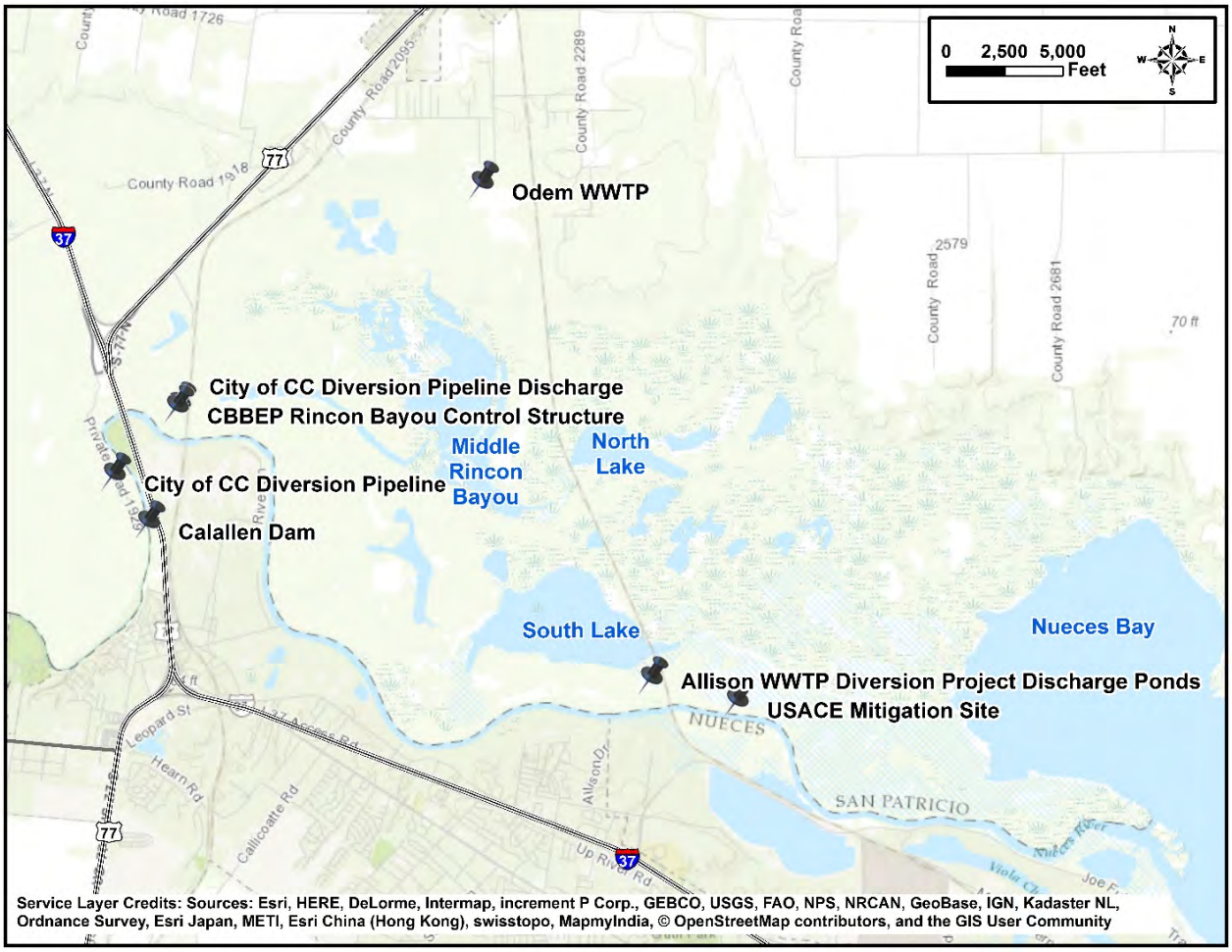

Figure 1-1. Nueces Delta Landform Modifications Project Phase I study area.

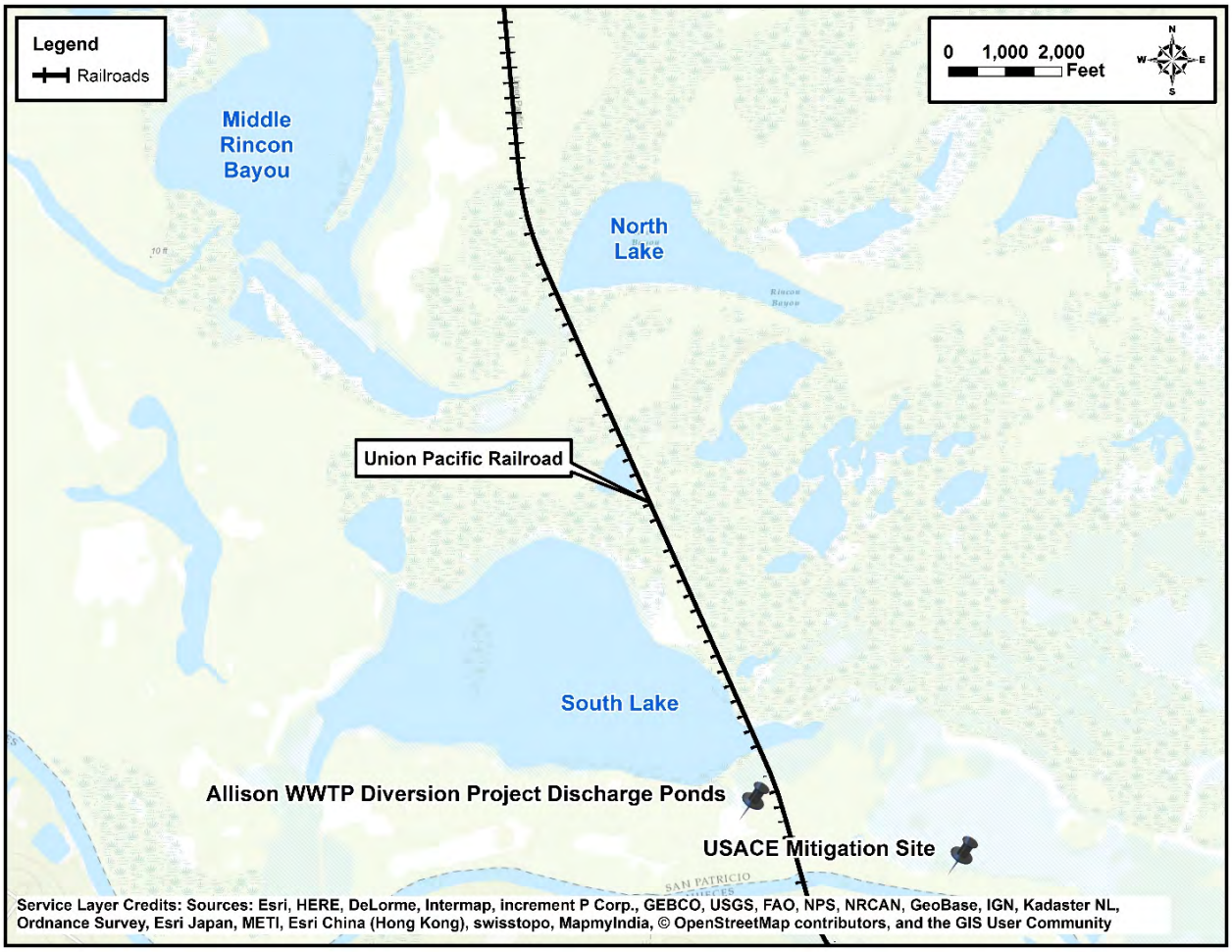

Figure 1-2. Nueces Delta Landform Modifications Project Phase II study area.

2. Phase I Study Results, Findings, and Recommendations

2.1 Rationale

The Bureau of Reclamation's final project report on the temporary opening of the Nueces River Overflow Channel succinctly captures the purpose of continuing studies on potential landform and hydraulic modifications in the Nueces Delta:

> *(T)he main purpose of any proposed modification would be to increase the benefit of the often-limited quantities of freshwater inflows by redirecting and delivering those flows into areas of the Nueces Delta where they would help to restore some level of pre-development ecosystem function. (BOR, 2000)*

Existing modifications within the Rincon Bayou/Nueces Delta area, all designed with this purpose in mind, include several overflow channels in the upper Rincon Bayou area (1997), the permanent opening of the Nueces River Overflow Channel (2001), construction of the Rincon Bayou Pipeline (2007) to deliver water directly from the Calallen Pool into the upper Rincon Bayou, and installation of the "check dam" in the upper Rincon Bayou (2013). These facilities set the stage for a new era of freshwater inflow management and expanded the range of possibilities for enhancing ecosystem functions within Rincon Bayou and wetland systems in the surrounding Nueces Delta.

Recognizing these possibilities, the Nueces BBASC Recommendations Report included, as one of the "Strategy Options for Achieving Environmental Flow Standards," a recommendation to "Explore Landform Modifications to Nueces Bay and Nueces Delta" (Nueces BBASC, 2012a). Evaluation of this potential strategy option also appears as a Tier One Priority in the Nueces BBASC Work Plan for Adaptive Management (Nueces BBASC, 2012b) and was one of the projects recommended by the Nueces BBASC when, in 2013, the 83rd Texas Legislature appropriated funds for continued studies of environmental flows and instream flows for Texas river basins. The recommended study was one of four projects to be funded in that funding cycle, and the contract for the study was awarded to Naismith Engineering, Inc., in conjunction with other consultants. The final project report, "Using Landform and Hydraulic Modifications to Increase the Benefit of Fresh Water Inflows to Nueces Bay and Nueces Delta," (NEI, 2016) was published in February 2016.

2.2 Nueces Delta Hydraulic Model

The Nueces BBASC's description of the potential strategy options, and the scope of this "Phase I Study," included the assessment of strategies such as the construction of earthen structures and landform modifications as well as hydrologic modifications. The analysis of these potential options relied both on expert opinion and on runs of the NDHM (Ryan and Hodges, 2011) to screen a preliminary list of eight potential projects and to quantify the impacts of projects recommended for further evaluation.

As a result of the preliminary screening of all potential strategy options, the projects which appeared to be most effective and feasible were primarily hydrologic modifications, as opposed to landform modifications. These projects were designed to take the freshwater, pumped into

Rincon Bayou via the City of Corpus Christi's Rincon Bayou Pipeline, and move it through diversion channels out of Rincon Bayou and into wetlands adjacent to Rincon Bayou.

In the evaluation of these options, output from the NDHM runs was used to generate and display data on inundation period and spatial extent, water depth and water column salinity, which was then compared to baseline conditions (i.e., no new projects) to determine the relative ecological effects these changes could have on areas within the Nueces Delta system. Using the criteria that the diversion project would need to create a minimum flooded depth of one centimeter for a duration of more than 6.2 hours, the model runs were able to calculate the number of acres which would be affected by the diversions, including either "new" acres (not previously flooded), "lost" acres (areas that are flooded in the existing system, but are lost with addition of the diversions), and "common areas" (areas flooded both in the existing system and with the diversions.) The number of "Net Additional Acres" could then be calculated and used as a basis for comparison between project alternatives.

Based on results of the NDHM screening analysis, the Phase I project team recommended two water diversion projects for further definition and analysis; one from the Middle Rincon Bayou into South Lake (Project #4), and the other from the North Lake portion of Rincon Bayou into the South Lake area (Project #5).

These two proposed diversion channels were incorporated into the NDHM, which was then run to simulate two different flow rate scenarios (1,200 acre-feet per month and 3,000 acre-feet per month) based on the quantity of freshwater which could be pumped into Rincon Bayou via the City of Corpus Christi's Rincon Bayou Diversion Pipeline within a 30-day period.

2.3 Feasibility of Proposed Diversions

The Phase I Study also addressed permitting, construction and funding issues associated with the two proposed diversions (Projects #4 & #5) from Rincon Bayou into the South Lake system. However, this analysis was based on existing information about hydrological and ecological conditions within the proposed project area; it did not include field studies or generate any new, site-specific information. Recognizing that this kind of information would be required to move the project(s) into the design and permitting phases, the Phase I Study recommended that a second phase of the project be conducted to include additional desk-top and field studies specifically designed to support further refinement and development of the two proposed diversions. The current Phase II Study is intended to accomplish those objectives.

3. Phase II Study Components

3.1 Rationale

Results from the Phase I Study determined that further investigation of the two proposed diversion projects (Projects #4 and #5) was needed to verify the hydrological modeling results from Phase 1 and to assess the topographical, ecological, archeological, regulatory, access, design, and construction issues associated with the recommended installation of water control/diversion facilities at the proposed sites.

3.2 Location and Setting of Proposed Projects

The two diversion projects proposed in the Phase I Study would move water from the lower end of Middle Rincon Bayou and the North Lake segment of Rincon Bayou into a wetlands complex bordering the north-east side of the South Lake system, an area of tidal flats and wetlands located south of Rincon Bayou, on both sides the railroad tracks crossing the mid-Delta area (see Figure 3-1).

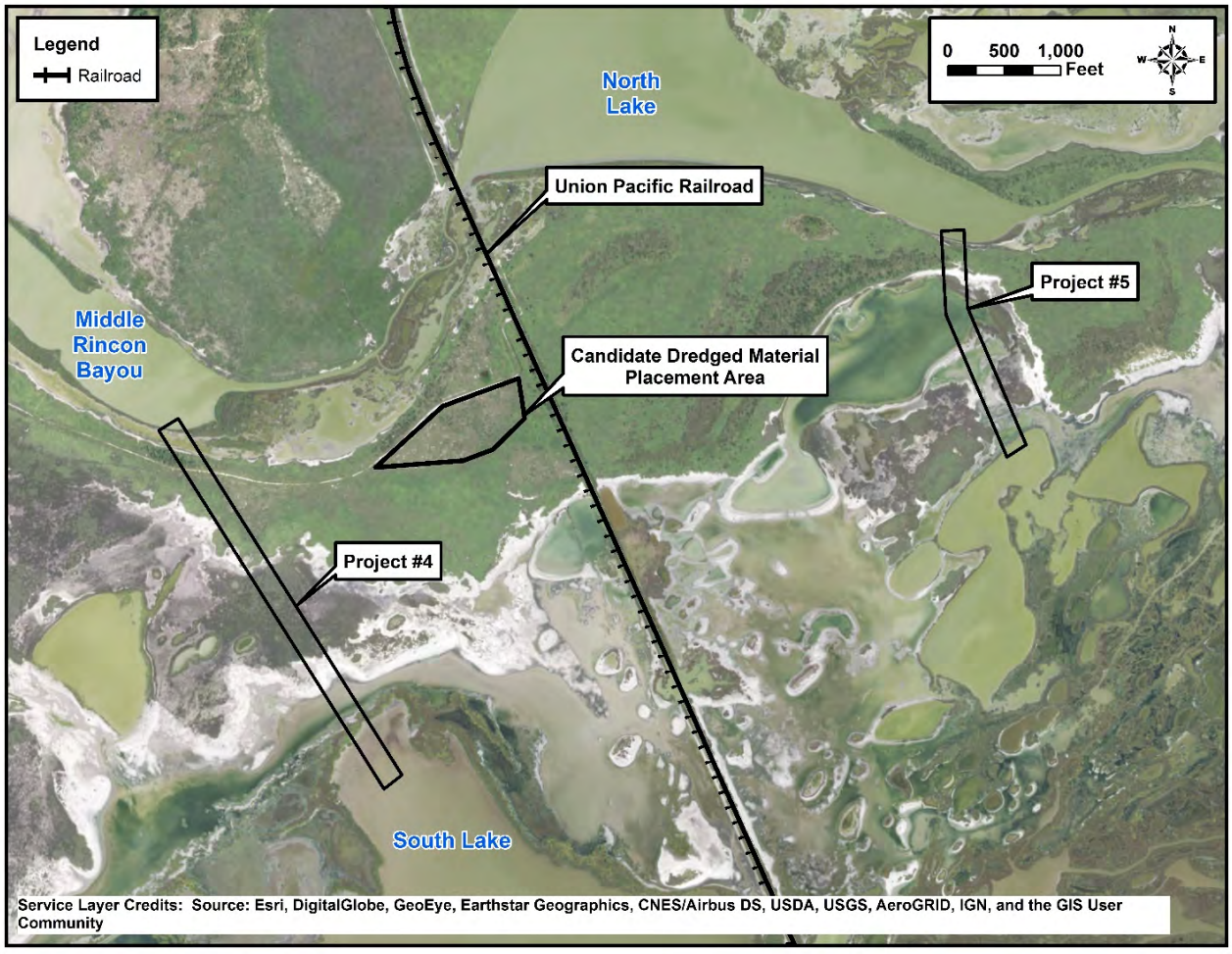

Figure 3-1. Location of Project #4, Project #5, and the candidate dredged material placement area.

3.3 Descriptions of Proposed Diversion Projects

The proposed diversions would consist of excavated channels, each approximately 100-feet wide, with sloped sides and a flat channel bottom. Spanning the upper end of each channel would be an inflatable bladder dam, or similar water control structure, which could be adjusted in height so as to provide for a managed control of water levels to facilitate release of water from the two sections of Rincon Bayou into the diversion channels for delivery to the South Lake system.

3.4 Study Tasks, Objectives, and Deliverables

In 2016, the TWDB awarded a second contract to NEI (now Hanson Professional Services Inc. (Hanson)) for a follow-up study (the Phase II Study) to address issues and recommendations from the Phase I study, which included: 1) determining how to provide legal and physical access to the proposed diversion sites, 2) collecting data and information to be used to satisfy requirements of future permitting and regulatory efforts, 3) collecting elevation data to help validate the NDHM modeling conducted in Phase I, and 4) developing recommendations for construction techniques applicable to wetland areas.

Task 1 of the Phase II Study included a desktop review of environmental issues and constraints and field plan preparation. The project team compiled and reviewed available data including Light Detection and Ranging (LiDAR), U.S. Geological Service (USGS) topography, U.S. Department of Agriculture (USDA) soils, Federal Emergency Management Agency (FEMA), Railroad Commission (RRC) oil, gas, and railway locations, historic aerial imagery, National Wetlands Inventory (NWI), Ecological Mapping Systems of Texas (EMST), and essential fish habitat (EFH). A desktop review of federal and state-listed threatened and endangered species that could potentially occur at the project site was performed. Also included in the desktop review was consideration for Birds of Conservation Concern, the Migratory Bird Treaty Act (MBTA), and nesting birds.

The field plan preparation involved an access plan and methodologies for wetland delineation, habitat characterization, and surveying. The project team consulted with the project area landowner, the Coastal Bend Bays and Estuaries Program (CBBEP), on possible site access routes and obstructions, potential sites for placement of excavated materials, and other construction-related issues. This information was used to develop a field investigation plan which guided activities during the field work.

An archeological desktop assessment of the project area was performed by Moore Archeological Consulting, Inc. (MAC), a branch of Coastal Environments, Inc. (CEI), for Task 2.

Task 3 included development of data collection procedures for the field investigations (part 1) so that the suitability of the project sites could be evaluated in the NDHM (part 2).

Field investigations were conducted for Task 4 in mid-November 2016 and included ground-truthing the environmental desktop review, collecting topographic and hydrologic data, performing wetland delineations and habitat characterizations within proposed construction locations, evaluating habitats for the potential occurrence of federal and state-listed species,

assessing the project site for potential nesting bird habitat, photographing site features, and collecting/confirming information related to site access and other construction-related issues.

Information obtained during field work was compiled and correlated with existing information developed during the desktop assessments. Elevation and location data for various features collected during the field work helped to verify or supplement data used in the NDHM to evaluate hydrologic suitability (Task 3).

Task 5 involved data compilation, planning, preliminary engineering, and agency coordination on permitting issues. Data collected during Tasks 1 through 4 were compiled and interpreted relative to logistical and regulatory planning. Data collected in the field was used to create maps for the wetland delineations, habitat characterizations, and project access routes. Elevation data collected in the field was used to create engineering drawings of the channel cross sections and profiles. Logistical issues related to accessing the sites during construction were also evaluated based on landowner and regulatory restrictions. A Joint Evaluation Meeting (JEM) was held at the U.S. Army Corps of Engineers (USACE) Regulatory Field Office in Corpus Christi on May 2, 2017 to present the project alternatives and ascertain which local, state, and federal permits will likely be required for each project. Project team members provided background on the project and discussed various permitting requirements, issues and options based on the information collected through both the desktop evaluations and the field data collection. Lastly, the cost estimate provided in the Phase I Study was revised and updated to reflect the new findings from the Phase II Study and account for cost inflation.

Task 6 was the preparation of the report. Included in the report are text, figures, tables, and appendices documenting the results of data collected during the desktop review and field investigation, as well as discussion of the site assessment, regulatory and permitting requirements, a dredged material placement plan, and recommendations for best management practices (BMPs) to avoid or minimize impacts to protected resources. The report addresses each project's feasibility for ensuring the maximum usage of freshwater delivered into the Rincon Bayou with little or no negative impacts to natural resources or hydrological flow.

4. Desktop Investigation

4.1 Purpose and Methods

The purpose of the desktop review is to identify, describe, and document the physical setting, various habitat types, and potential historic and cultural resources occurring within the proposed channel diversion project sites (Project #4 and Project #5) and to identify plant communities and wildlife that are associated with these habitat types. Special attention has been placed on documenting habitats and species that are significant on a local, national, and global level.

Several methods were used to develop a general ecological characterization for the project site. A desktop review was conducted utilizing online resources to acquire existing environmental data for the project site. A literature review was conducted and relevant technical reports, biological inventories, and other reports that address the area's natural resources were utilized. Critical information was also obtained from several natural resource managers and resource experts regarding historic and recent wildlife use.

4.2 Physical setting

4.2.1 Topography

The project area is located entirely within the Nueces Estuary/Delta complex (Estuary, Delta respectively) which is supported by the Nueces River. The Delta is a part of the Estuary and is the southernmost deltaic marsh of any appreciable size in the Gulf of Mexico (NEI, 2016). The distinguishing feature between estuaries and deltas is the origin of sediment; deltaic sediment is derived from a river while estuarine sediment is derived from marine waterbodies (Bhattacharya, 2003). The Delta is classified as a semi-arid ecosystem and it is an approximately 14,000-acre complex of salt marsh, mud flats, tidal channels, and open water (NEI, 2016).

The Estuary is the second driest in Texas and is often characterized as being a negative estuary, where, rather than having a salinity gradient of fresher water in the Delta and Upper Nueces Bay transitioning to the more saline waters of Corpus Christi Bay, the salinities in the Delta are much higher (hypersaline) than salinities in Upper Nueces Bay and Corpus Christi Bay. This occurs during periods of limited freshwater inflows from the Nueces River into the Delta via the Rincon Bayou channel (NEI, 2016).

A map depicting the (LiDAR data can be found in Figure 4-1. Surveyed elevations within the Project #4 area range from 0.8 feet to 6.4 feet and within the Project #5 area, elevations range from 0.1 feet to 5.8 feet North American Vertical Datum of 1988 (NAVD88). Generally, the northern end of both project areas gradually slopes towards the southern end. The primary topographic feature of both project areas is floodplain. Secondary topographic features within the project areas include open water, tidal flats, marsh, prairie, and prairie shrubland with the highest elevation points located within prairie shrublands and the lowest elevation points located within open water areas (see Figure 4-1).

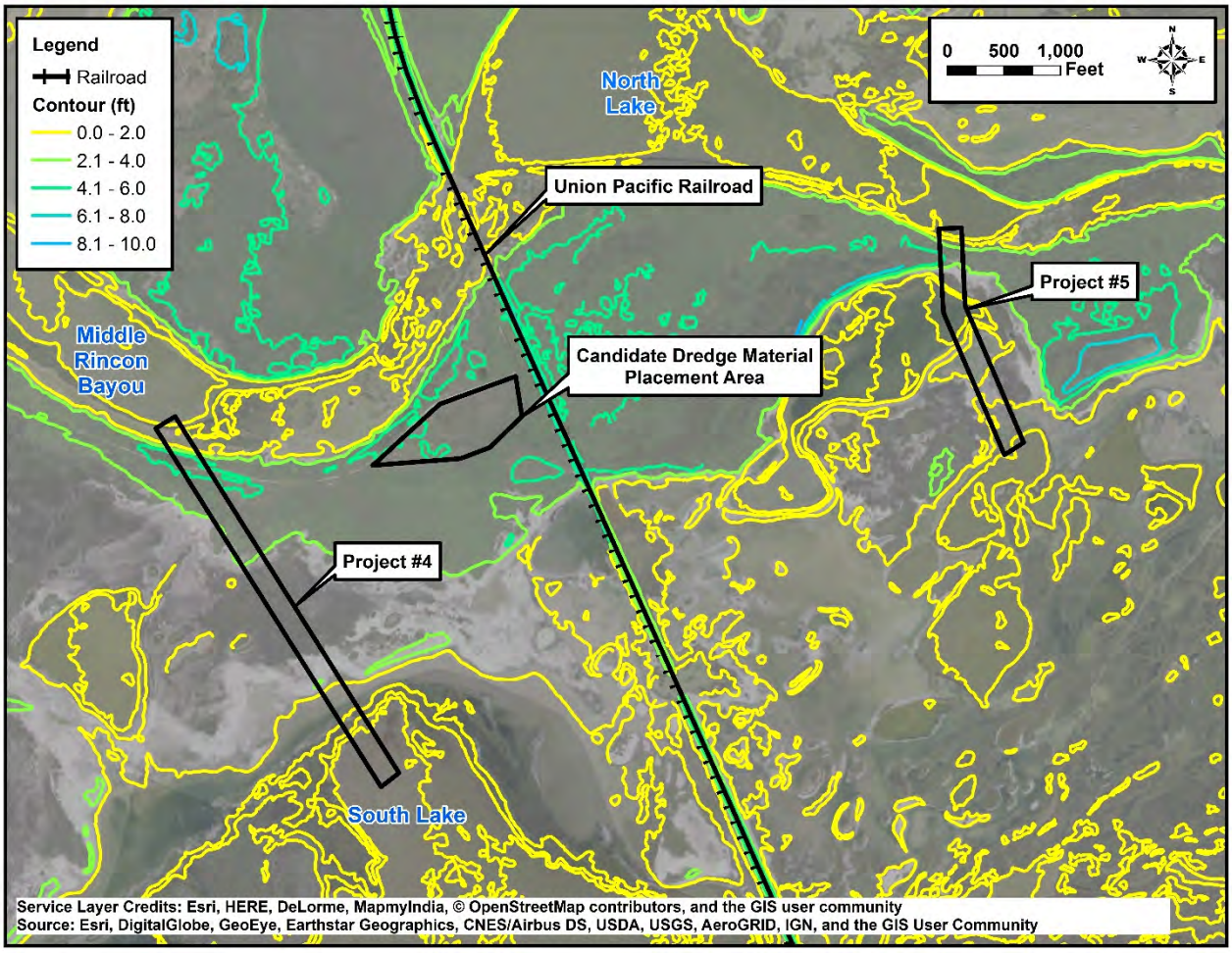

Figure 4-1. San Patricio County light detection and ranging data map of project area.

4.2.2 Geology and Soils

According to the Bureau of Economic Geology's (BEG) Geology of Texas maps (BEG, 1992), the primary geologic formation exposed at the project sites surface are Cenozoic Era. The geologic formation (the Alluvium) occurring at the project sites includes point bar, natural levee, stream channel, back-swamp, coastal marsh, mud flat, clay dune, sand dune, and other reef deposits from the Quaternary Period.

The Web Soil Survey (WSS), developed by the USDA Natural Resources Conservation Service (NRCS) (USDA, 2017b), provides soil data (such as hydric soils status) and other information produced by the National Cooperative Soil Survey (see Figure 4-2). The WSS maps are composed of one or more map unit component or soil type, each of which is rated as hydric soil or not hydric. Each map unit is rated based on its respective components and the percentage of each component within the map unit. The soil series at the project sites include Aransas clay, typical of floodplains, Barrada-Tatton association, typical of wind-tidal flats, and Narta loam, typical of flats. The hydric rating, which is expressed as a percent, represents the percent of hydric soil components occurring in a particular map unit (see Figure 4-2).

The National Technical Committee for Hydric Soils has defined hydric soils as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper portion (USDA, 2017a). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

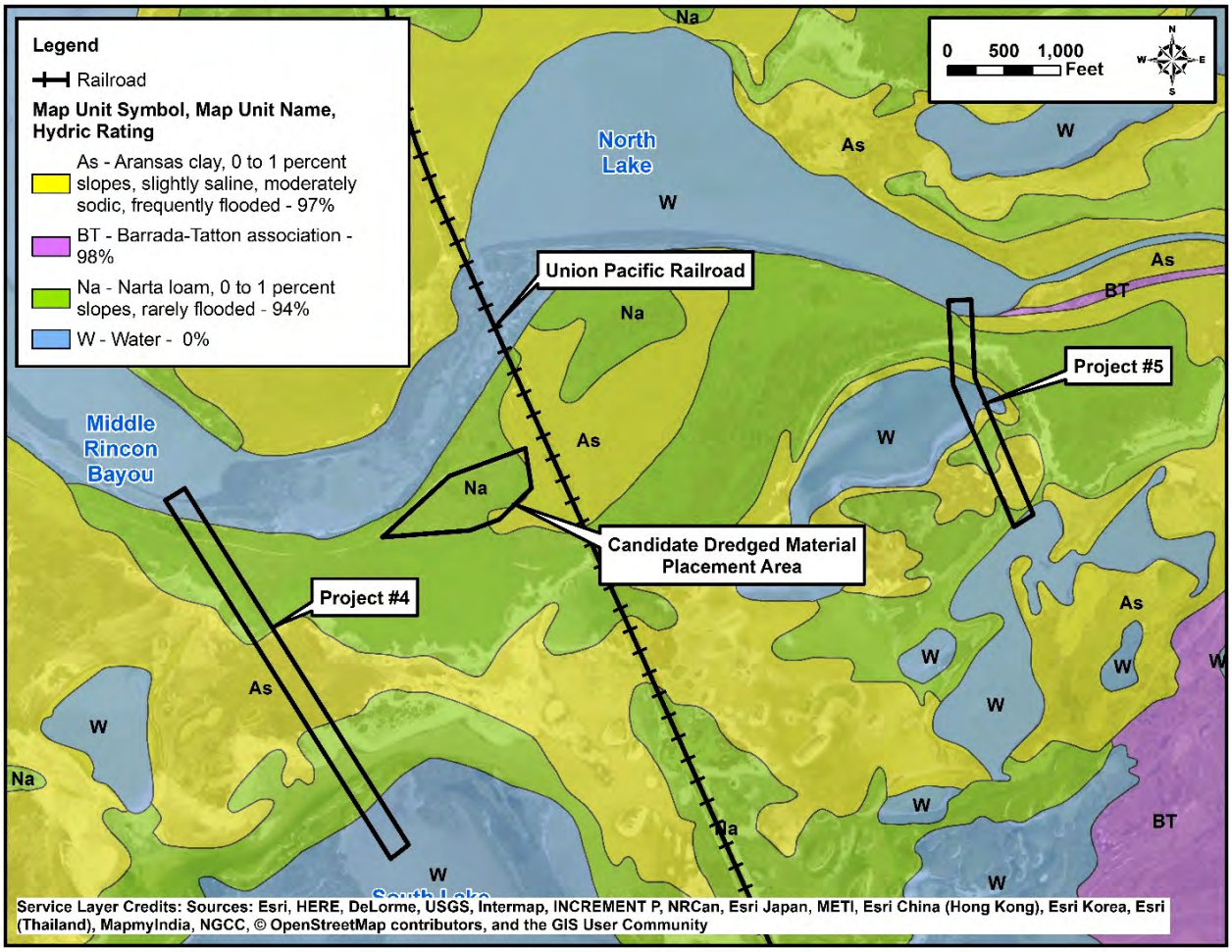

Figure 4-2. Natural Resources Conservation Service soil series and hydric rating map (USDA, 2017b).

4.2.3 Floodplains

Natural ground elevations within the project area range from 0.1 feet to 6.4 feet above mean sea level (MSL) (0.0 feet NAVD88).

The Special Flood Hazard Areas, which were developed by FEMA, depict areas that are subject to inundation by the 1% annual chance flood. According to the current FEMA maps (FEMA, 2017), the project site is located within the 100-year flood zone.

4.2.4 Oil and Gas Development

The RRC of Texas' Public GIS Viewer Map (RRC, 2017) was consulted regarding historic and current oil and gas wells and pipelines that occur within the project site. Figure 4-3, below, depicts several oil and gas wells, plugged wells, dry holes, well pads, and gas pipelines located within the project vicinity but none located directly within the project footprint.

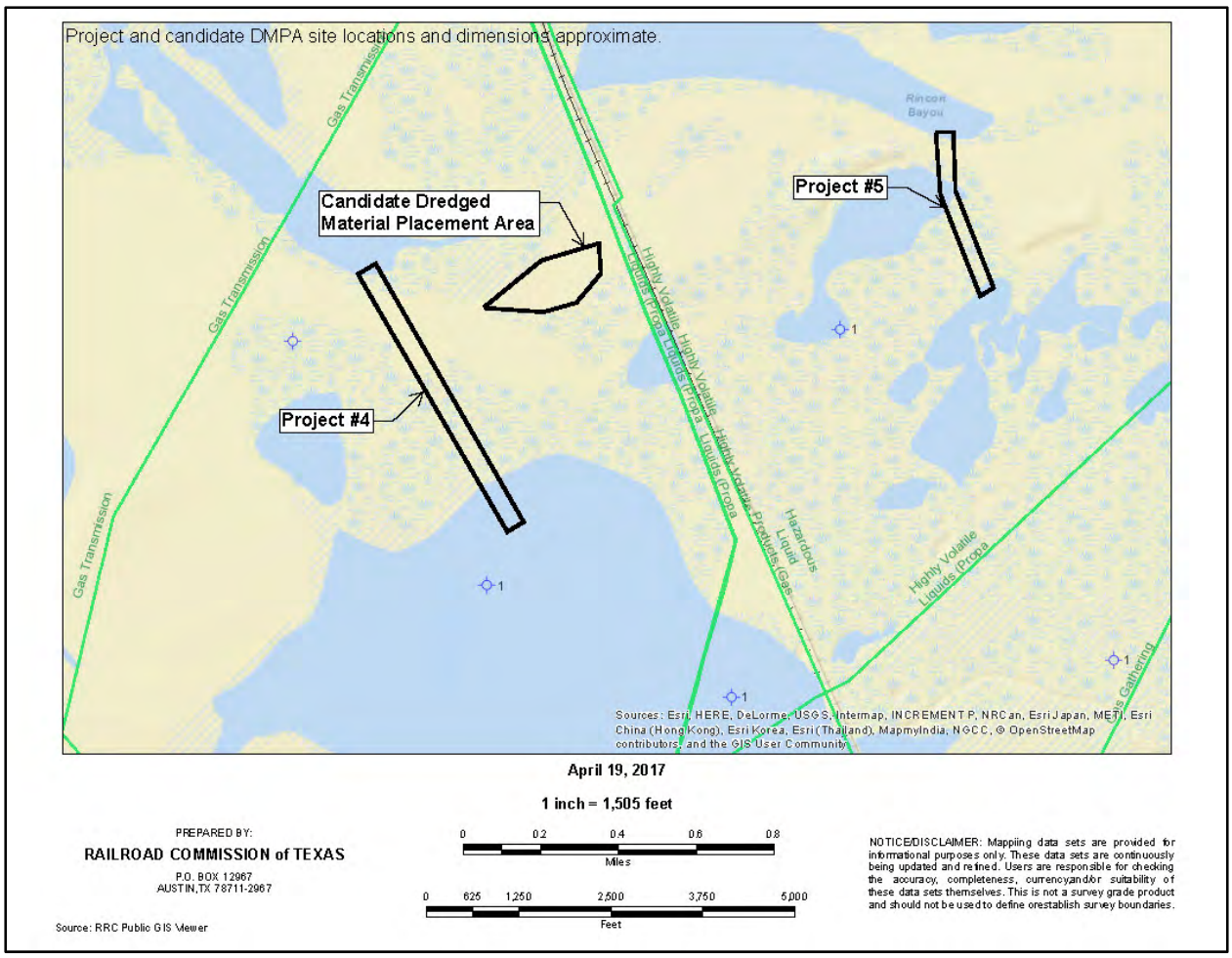

Figure 4-3. Railroad Commission of Texas oil, gas, and pipeline map (RRC, 2017).

4.2.5 Historic Aerial Imagery Review

Reviewing historic aerial imagery is a standard practice for many environmental projects. Historic aerial imagery can reveal past land uses, site access, and habitat conditions, such as vegetative communities and hydrology, throughout different seasons and climatic conditions. Past land uses can have an effect on the natural habitat as well as reveal potential permitting requirements. Historic habitat conditions are also crucial to observe, especially in a hydrological context. For example, if an area historically had channels that were not naturally maintained as functional channels, then it may not be prudent to construct new, man-made channels in locations where natural channels failed. In addition, if an area, such as the candidate dredged material placement area (DMPA) location, was frequently inundated with tidal or fresh water due to high tides or storm events, then that placement area location may not be suitable for a variety of reasons.

Numerous alterations to the Delta's landscape and natural habitats are known to have occurred over an observable time frame including caliche roadways to oil/gas production well sites, wells, pipelines, railroads, power lines, drainage easements, detention ponds, and cattle grazing (see Appendix A). The railway route which bisects the project area along the north-south axis was installed prior to the earliest Google Earth aerial imagery which is dated December 31, 1949.

Ground disturbances occurring west of the Project #4 site are depicted in the 1961 Google Earth aerial imagery. These disturbances are likely due to installation of the gas transmission line mapped by the RRC as well as the construction of aerial electrical transmission lines. In the 1990 Google Earth aerial, additional access roads appear at the northern end of Project #4 and appears to be the same access road still utilized today. In the 2002 aerial, it appears that a detention pond was excavated adjacent to the access road approximately 250-feet west of the railway. In the 2005 aerial, a makeshift access road beginning at the railway route and traveling east toward the Project #5 area was established; however, this feature appears to have revegetated and may be untraveled in the most recent aerial imagery.

4.3 Ecological Characterization: Habitat Types

4.3.1 NWI-Mapped Wetlands

NWI maps (USFWS, 2017b), which are developed and maintained by the U.S. Fish and Wildlife Service (USFWS), provide geospatially referenced information on the status, extent, characteristics, and functions of wetland, riparian, deep water, and related aquatic habitats. It should be noted that NWI maps are not intended to be used to determine whether wetland areas are jurisdictional under USACE authority; only that a wetland may occur in a particular area. Also, NWI maps do not accommodate temporal variation that may occur in the dynamic delta environment; some wetland areas may have developed since the maps were created.

NWI-mapped wetlands within the Project #4 channel diversion corridor (see Figure 4-4, below) include freshwater emergent wetlands (PEM1J) and estuarine and marine wetlands (E2EM1P, E2EM1N, E2USP, E2USN, and E2USM). The PEM1J designation represents non-tidal palustrine (P) (freshwater) wetlands that contain emergent (EM) persistent (1) vegetation and are intermittently flooded (J). The estuarine intertidal (E2) habitats mapped within Project #4 include two subclasses: emergent (EM) and unconsolidated shore (US). The estuarine intertidal emergent habitats contain emergent vegetation and exhibit two different water regimes: irregularly flooded (P) which means that tides flood substrate less often than daily and regularly flooded (N) which means that tides alternately flood and expose the substrate at least once daily. The estuarine intertidal unconsolidated shore designation includes landforms such as beaches, bars, and flats. These unconsolidated shore landforms are characterized as having less than 75 percent aerial cover of stones, boulders, or bedrock and less than 30 percent aerial cover of vegetation. Within the estuarine intertidal unconsolidated shore habitats, three water regimes are present: irregularly flooded (P), regularly flooded (N), and irregularly exposed (M). The irregularly and regularly flooded water regimes are defined the same as above and the irregularly exposed regime is defined as when tides expose the substrate less often than daily.

NWI-mapped wetlands within the Project #5 channel diversion corridor (see Figure 4-4, below) include freshwater emergent wetlands (PEM1J) and estuarine and marine wetlands (E2EM1P, E2EM1N, E2USP, and E2USM).

The candidate DMPA location does not contain any NWI-mapped wetlands (see Figure 4-4, below).

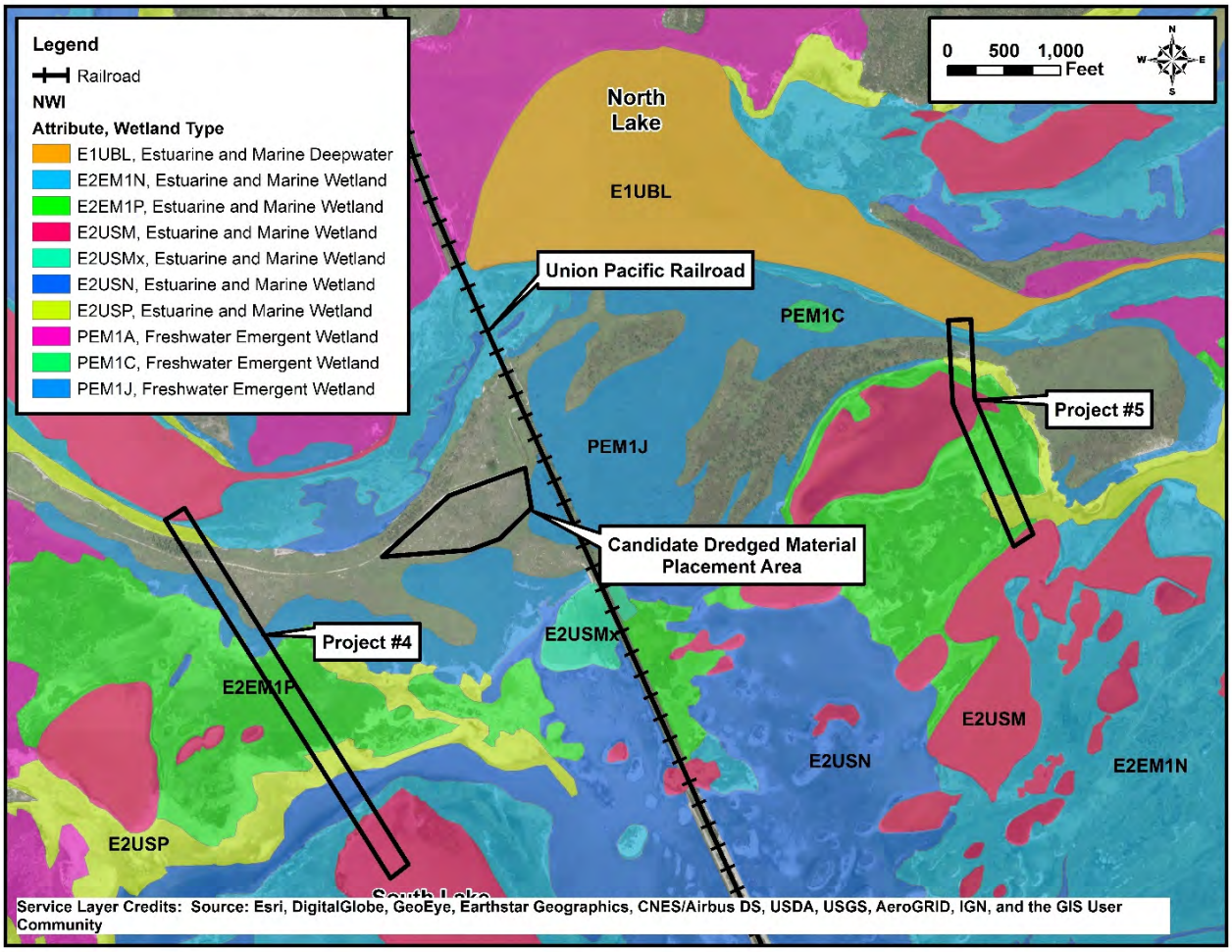

Figure 4-4. U.S. Fish and Wildlife Service National Wetland Inventory map (USFWS, 2017b).

4.3.2 TPWD Ecological Mapping

The EMST, which was developed and is maintained by the Texas Parks and Wildlife Department (TPWD), is an interactive geographic information system (GIS) mapping tool (TPWD, 2017a). This mapping system was developed to allow users to access ecological data relating to soils, hydrology, ecoregion layers, and vegetative communities. The EMST allows land managers and resource planners to acquire and integrate relevant data during the early planning stages. The EMST data utilized for this project is separated into habitat types with correlating vegetation descriptions and ecological interpretations provided in the TPWD Texas Vegetation Classification Project: Interpretive Booklet for Phase 3 (Ludeke, German, and Scott, 2010). Phase 3 is the phase covering the Texas coast (Ludeke, German, and Scott, 2010).

The project corridor for Project #4 contains the following EMST-mapped habitat types: Coastal: Salt and Brackish High Tidal Marsh, Coastal: Salt and Brackish High Tidal Shrub Wetland, Coastal: Salt and Brackish Low Tidal Marsh, Coastal: Sea ox-eye Daisy Flats, Coastal: Tidal Flat, Gulf Coast: Salty Prairie, and Open Water (Figure 4-5).

The project corridor for Project #5 contains the following EMST-mapped habitat types: Coastal: Salt and Brackish High Tidal Marsh, Coastal: Salt and Brackish High Tidal Shrub Wetland, Coastal: Salt and Brackish Low Tidal Marsh, Gulf Coast: Salty Prairie, Gulf Coast: Salty Prairie Shrubland, Open Water, and Urban Low Intensity (Figure 4-6).

Within the candidate DMPA location, the following EMST habitat types were mapped: Gulf Coast: Salty Prairie and Coastal: Salt and Brackish High Tidal Marsh (Figure 4-5).

The following are habitat descriptions from the Phase 3 Interpretive Booklet for each of the different habitat types present within the project area (Ludeke, German, and Scott, 2010).

Coastal: Salt and Brackish High Tidal Marsh

This mapped type includes a variety of tidal-influenced marsh types that may vary from year to year based primarily on storm events and precipitation, and across small areas due to small variations in elevation. Important species may include marshhay cordgrass, saltgrass, three-square bulrush, and seashore paspalum.

Coastal: Salt and Brackish High Tidal Shrub Wetland

This type is mapped in limited areas and may include shrub species such as baccharis or shrubby sumpweed together with herbaceous species such as marshhay cordgrass, bulrush species, and seashore paspalum.

Coastal: Salt and Brackish Low Tidal Marsh

This mapped type includes a variety of tidal-influenced marsh types that may vary from year to year based primarily on storm events and precipitation, and across small areas due to small variations in elevation. Smooth cordgrass is a common species, along with other salt-tolerant species such as three-square bulrush, marshhay cordgrass, seashore paspalum, saltgrass, and blackrush.

Coastal: Sea Ox-eye Daisy Flats

Sparse, low shrublands with salt-tolerant species such as sea ox-eye daisy, Carolina wolfberry, saltwort, gutta-percha, and tornillo characterize this type. Mesquite may be scattered and species such as annual seepweed, marshhay cordgrass, Gulf cordgrass, saltgrass, seashore grass, and glasswort may be present. Some areas at higher elevation, especially loams, are mapped within this type.

Coastal: Tidal Flat

This type is largely unvegetated because it is inundated frequently and for extended periods by tidal fluctuations.

Gulf Coast: Salty Prairie

Gulf cordgrass may form nearly pure stands within this mapped type, or may form mosaics with marshhay cordgrass or saltgrass at slightly lower elevations or species such as Bermudagrass and little bluestem at slightly higher elevations. Other common grasses include Gulf muhly,

shoregrass, switchgrass, and bushy bluestem, and shrubs such as baccharis, mesquite, or shrubby sumpweed may also occur.

Gulf Coast: Salty Prairie Shrubland

This type is dominated by a mix of shrubs such as baccharis, mesquite, huisache, Chinese tallow, and shrubby sumpweed together with grasses such as Gulf cordgrass, Gulf muhly, and rat-tail smutgrass. Spiny aster may also be a conspicuous dominant.

Open Water

In addition to large lakes, rivers, and marine waters, ephemeral ponds may be mapped as open water in Phase 3 Interpretive Booklet, and some may support vegetation with pioneering species such as black willow, cottonwood, Chinese tallow, seepweed, sea ox-eye daisy, saltwort, rushes, sedges, cattails, and spikerushes.

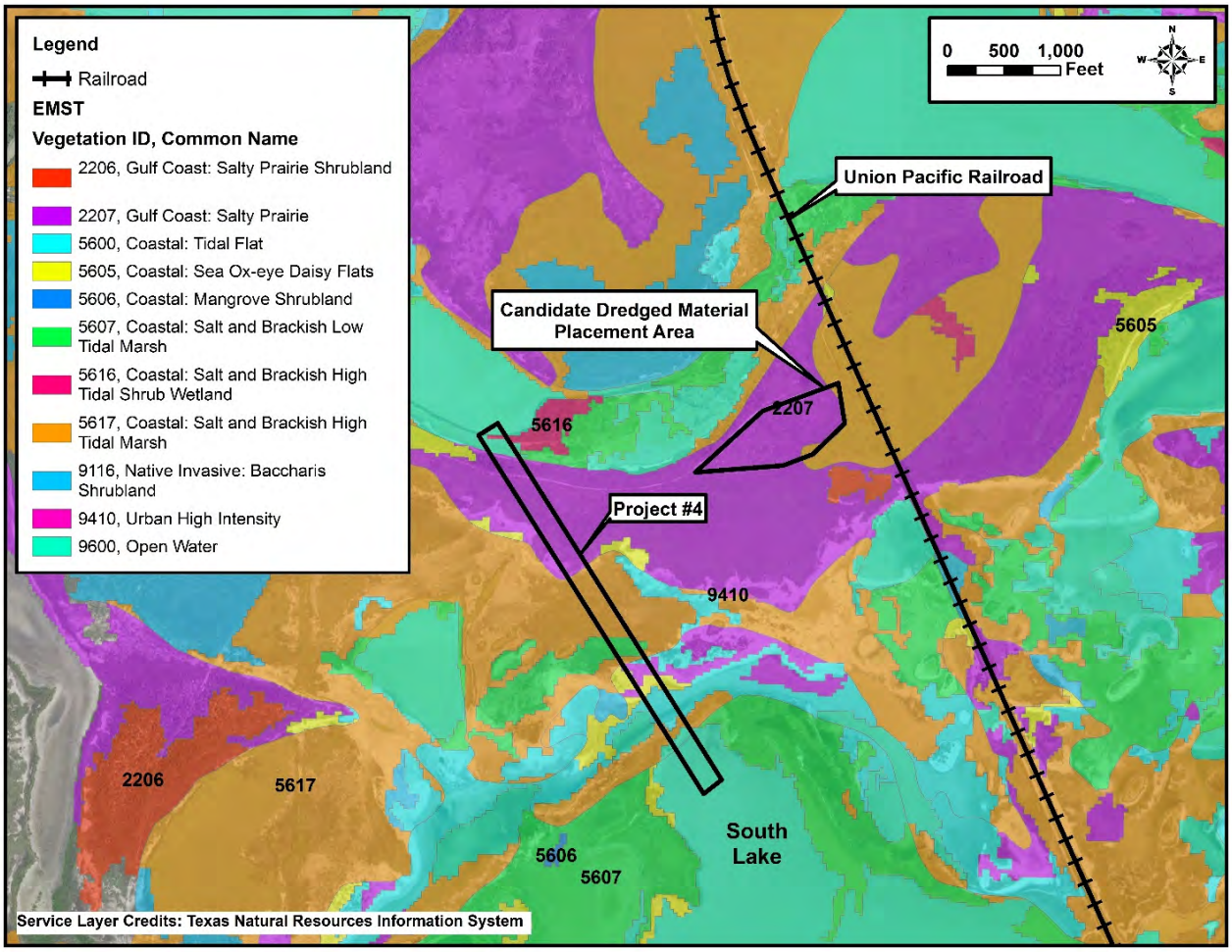

Figure 4-5. Texas Parks and Wildlife Department Ecological Mapping Systems of Texas map for Project #4 and the candidate dredged material placement area (TPWD, 2017a).

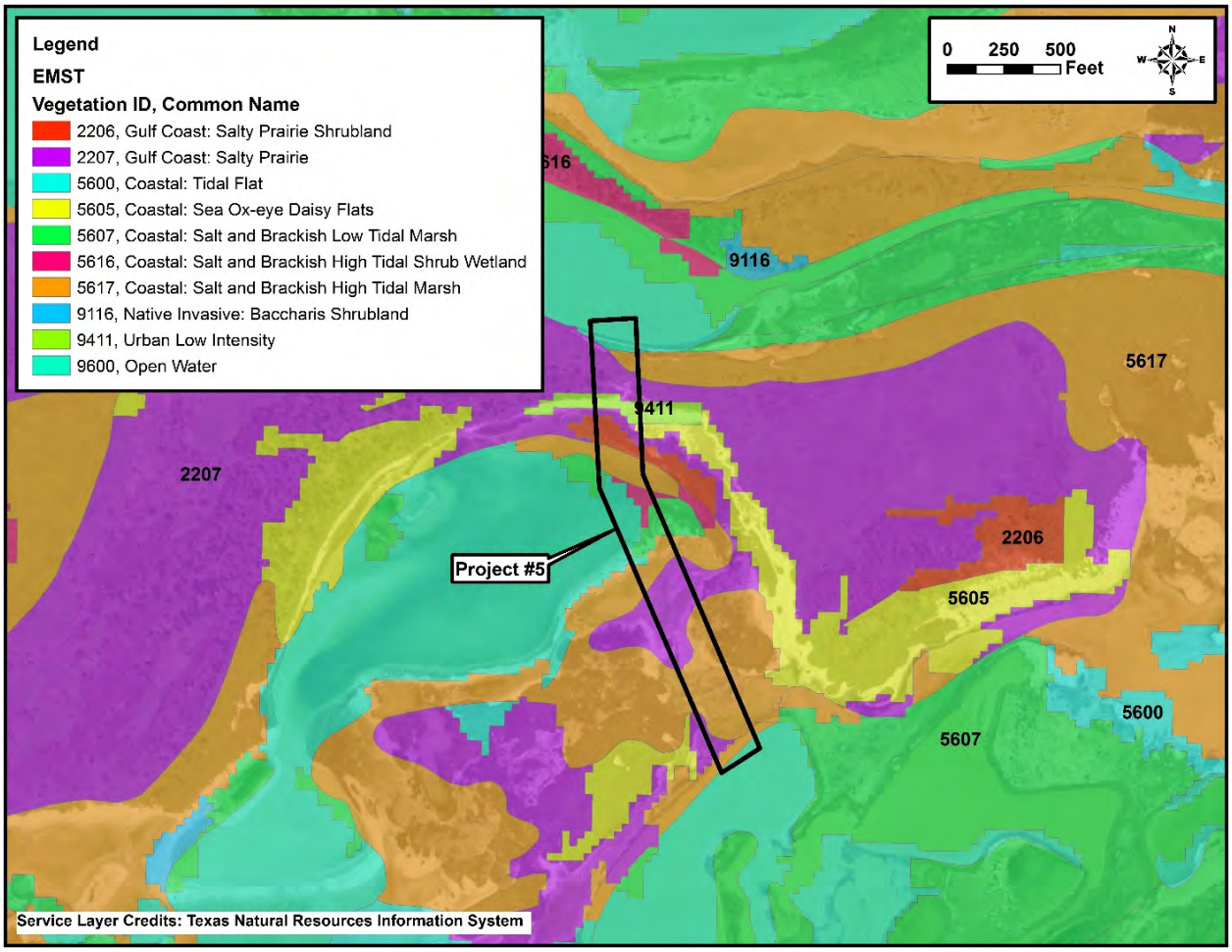

Figure 4-6. Texas Parks and Wildlife Department Ecological Mapping Systems of Texas map for Project #5 (TPWD, 2017a).

4.4 Ecological Characterization: Flora and Fauna

4.4.1 Federal and State-Listed Species and Species of Concern

The project sites were evaluated for the potential occurrence of federal and state-listed species that have a regulatory listing and, as such, are protected by law. The federal list of threatened and endangered species was obtained by providing site-specific information to the USFWS Environmental Conservation On-line System (ECOS) using the Information Planning and Conservation (IPaC) project planning tool (see Appendix B). The IPaC tool also provides a resource list containing designated critical habitats, birds of conservation concern, wetlands, and other natural resources which may occur in the general project area. According to IPaC, the project site does not contain critical habitat, however, a number of Birds of Conservation Concern are known to occur, or may potentially occur in the project area (see Section 4.4.3).

The state list, which is generated through the TPWD Nongame and Rare Species Program website (TPWD, 2017b) contains state-listed threatened and endangered species, species of concern but with no regulatory listing, and globally-ranked species (see Appendix C). Globally-ranked species are assigned a conservation status at the global level by Nature Serve and its

member Natural Heritage Programs. Rigorous, consistent, and transparent methods are used to assess the conservation status (extinction or extirpation risk) of species of plants, animals, and fungi, as well as the elimination or extirpation risks of individual ecosystems (ecological communities and systems).

There are 67 federal and/or state-listed threatened, endangered and/or globally-ranked species found within San Patricio County. All 67 listed and globally-ranked species contained within the most recent federal and state lists have been evaluated relative to their potential to occur at or near the project site (see Appendix D). Determinations were made based on existing literature and other documentation, personal communications, the presence or lack of appropriate habitat types, existing plant communities and associate assemblages, soil types and geologic formations, each animal's mobility range, migratory movements, and breeding and nesting behavior.

Special attention has been placed on several species that would likely occur at or near the project sites due to the presence of suitable habitat and known historic and/or recent occurrences (see Section 4.4.2). The endangered northern aplomado falcon (*Falco femoralis septentrionalis*) is the only federally-listed species that would likely occur in the project area. The federally-listed least tern (*Sterna antillarum*) is included in the federal list for San Patricio County, however, the listing for this endangered bird only involves the interior population. The least tern that is listed for San Patricio County is the interior least tern and it is found 50 miles and more inland. Therefore, this federally-listed tern is not technically listed for the Nueces Delta area (Gardiner, 2017).

Other species that may likely occur in the project area are listed as state-threatened, species of concern but with no regulatory listing, and globally-ranked species. These species include the state-listed threatened reddish egret (*Egretta rufescens*), white-faced ibis (*Plegadis chihi*), white-tailed hawk (*Buteo albicaudatus*), and wood stork (*Mycteria americana*); state-listed species of concern including the snowy plover (*Charadrius alexandrinus*), Sprague's pipit (*Anthus spragueii*), Texas diamondback terrapin (*Malaclemys terrapin littoralis*), coastal gayfeather (*Liatris bracteata*), and threeflower broomweed (*Thurovia triflora*); and the globally-ranked large selenia (*Selenia grandis*). Although the project site may not contain optimal habitat, a number of federal and state-listed species could potentially, occur in the project area particularly during migration (see Appendix D).

In addition, several state-listed and globally-ranked plants were identified as potentially occurring in the project area. Most of the available information concerning plant habitat requirements is very general and/or the information encompasses a wide range of habitat and soil types. There is also a general lack of available information regarding known plant populations, particularly as they relate to habitat requirements. Therefore, absence of several state-listed and globally-ranked plants in the project area could not be ruled out (see Appendix D).

4.4.2 Federal and State-Listed Species that are Likely to Occur in the Project Area

Northern Aplomado Falcon

The federal and state-listed endangered northern aplomado falcon currently has two self-sustained breeding populations in southern Texas; one in Cameron County and the other on Matagorda and San Jose Islands. Surveys conducted in 2013 documented 14 breeding pairs in

the Matagorda and San Jose Island population; since then, falcons have been observed feeding and/or attempting to nest on Mustang and North Padre Islands, indicating a potential population expansion (The Peregrine Fund, 2016).

Aplomado falcons live in large open habitats where there is an abundance of prey such as songbirds (particularly grassland birds), bats, and insects and where shrubs or trees are present, including the tree yuccas Spanish dagger and soap-tree yucca, which are utilized for nesting. Optimal habitats include open grasslands, savannas, pastures, and shrub-steppes. Aplomado falcons, which are not a migratory species, spend most of the year on their territory. More than 1,500 aplomado falcons have been released into the wilds of South Texas, and now, there is once again a wild breeding population in the United States. Today, there are 33 pairs of aplomado falcons occurring from Brownsville to Rockport, Texas and the population appears to be self-sustaining.

The USFWS indicated that the Nueces Delta appears to have suitable habitat for the northern aplomado falcon (Anderson, 2017). These falcons were sighted at Hazel Bazemore Park a few years ago during a Hawk Watch event. Hazel Bazemore Park is located approximately 3 miles southwest of the project site. The USFWS hopes to establish a few pairs of aplomado falcons at or near this park in the future.

Although optimal nesting habitat for the northern aplomado falcon does not appear to be present in the project area, construction sites, disposal areas, equipment staging areas, and access routes should be evaluated and found to be clear of nesting aplomado falcons prior to mobilizing equipment or initiating construction. The nesting period for these falcons is March through June.

Reddish Egret

The state-listed threatened reddish egret is a year-round resident along the Texas Gulf Coast. This long-legged wading bird, which is also a Bird of Conservation Concern, prefers brackish marshes, shallow salt ponds, and tidal flats for foraging. Reddish egrets nest on islands alongside other birds such as herons, egrets, cormorants, and spoonbills. These colonial nesting islands occur in Texas coastal bays such as Nueces Bay and the Laguna Madre. Although foraging reddish egrets would likely occur in marshes, ponds, and flats in the project area, the project is not expected to impact these mobile wading birds due to their ability to leave the site during construction.

Snowy Plover

The snowy plover, which is a state-listed species of concern as well as a Bird of Conservation Concern, winters locally and is known to nest in the Nueces Delta. This small shorebird utilizes beaches and bayside mud or salt flats for foraging and resting. They nest on bare upper Gulf beaches and sandy flats along the coast and along sandy shores of large alkaline, saline, or freshwater lakes. The snowy plover was formerly a fairly common nester in the Nueces Delta (Blacklock, 2017). The local breeding season extends from the last week of February through August. The proposed diversion projects could potentially impact nesting plovers during their nesting season. Therefore, it is recommended that the project be implemented during non-nesting season.

Sprague's Pipit

The Sprague's pipit, which is a state-listed species of concern and a Bird of Conservation Concern, is strongly tied to native upland prairies, and this bird can be locally common in coastal grasslands. This pipit has been observed in the Nueces Delta which contains suitable habitat for this passerine (Blacklock, 2017). Sprague's pipits, which are only in Texas during migration and winter, will leave the South Texas area by the first or second weeks of March. Although Sprague's pipits would likely occur in or near the project site, the project is not expected to impact these mobile birds due to their ability to leave the site during construction.

White-Faced Ibis

The state-listed threatened white-faced ibis prefers freshwater marshes (including rice fields) but will also use brackish and saltwater habitats, especially when they are flooded. This ibis nests in small to large colonies that are often associated with other nesting colonial waterbirds. The colonies are primarily situated on islands along the Texas Coast, however, they do occasionally nest in inland marshes and swamps among "islands" of emergent vegetation. The white-faced ibis is not expected to nest in the project area; however, it could be found foraging among the brackish and saltwater marshes. The project is not expected to impact these mobile birds due to their ability to leave the site during construction.

White-Tailed Hawk

The state-listed threatened white-tailed hawk only occurs in grassland habitats of South Texas. The white-tailed hawk, which is also a Bird of Conservation Concern, was once drastically reduced in this area probably due to environmental contaminants and from being hunted. This species has since recovered much of its former range and it now occurs on barrier islands as well as mainland ranches that contain appropriate native grassland habitats. The white-tailed hawk can be found on prairies and cordgrass flats such as those occurring at the project site. The project site contains both suitable foraging and nesting habitat for this state-listed hawk and has been observed nesting in the Delta area (Blacklock, 2017). The nesting season for this raptor extends from February through September. The proposed diversion projects could potentially impact nesting white-tailed hawks during their nesting season. Therefore, it is recommended that the project be implemented during non-nesting season.

Wood Stork

The state-listed threatened wood stork forages in prairie ponds and other shallow standing water, including salt water. These large birds occur from late May through mid-October. Wood storks appear in South Texas irregularly, and are uncommon. They were formerly abundant on the upper and central coasts and the Rio Grande Delta. These storks are known to wander widely inland from July to September. Wood storks have not been recorded as nesting in Texas since the 1960s. Although wood storks could potentially forage among the brackish and saltwater marshes at the project site, the project is not expected to impact these foraging birds due to their ability to leave the site during construction.

Texas Diamondback Terrapin

The Texas diamondback terrapin, which is a state-listed species of concern, occurs from Louisiana to Corpus Christi Bay. This terrapin, which can live up to 40 years, is solitary except

when breeding. The diamondback terrapin occurs in brackish and saltwater coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier island beaches. According to Aaron Baxter (pers. comm., 2017), habitats occurring in the Nueces Delta and Rincon Bayou are suitable for this species. In fact, the Nueces Delta was historically heavily utilized by nesting terrapins; however, elevated salinities have now driven the terrapins out into fresher bay waters.

An individual female terrapin breeds every four years or so. Mating season is in the spring. The female digs a tear-shaped nest in the sand above the high-tide line and lays four to 18 eggs. If the eggs do not hatch before winter sets in, then the hatchlings will spend the winter in the nest and will emerge when the weather warms.

The terrapins do not go through a true hibernation, rather, they dig down into the mud to sleep. They will begin to get very active once the water and air temperatures increase in spring. During the day, terrapins spend most of their time in the water or basking in the sun. At night, they bury themselves in the mud. Their diet consists primarily of crabs, shrimp, bivalves, fish, and insects.

Although the terrapins won't be in areas that have dried up, they could be present in wet years when the Delta marshes are flooded. An appropriate BMP for the diamondback terrapin would involve doing the construction work (in areas with water) when the water temperatures are above 59°F. This would prevent up-earthing and crushing the non-visible dormant terrapins (and possibly hatchlings) that are buried down in the mud. Projects involving the introduction and/or restoration of freshwater hydrologic regimes in the Delta would greatly benefit the Texas diamondback terrapin (Baxter, 2017).

Plants: Threeflower Broomweed, Coastal Gayfeather, and Large Selenia

Information associated with habitat requirements of plants is difficult to evaluate because plants often occur under a wide variety of landscape and environmental conditions. In addition, variables such as salinity tolerance ranges and associate plant species are often unknown. The project site contains a variety of habitat and soil types, flooding and drying regimes, disturbances, and other factors that also make it difficult to rule out the potential occurrence of state-listed plant species.

Although several state-listed and globally-ranked plants were identified as potentially occurring in the project area, the threeflower broomweed, coastal gayfeather, and large selenia appear to have the greatest likelihood of occurring in the project area, if at all. The threeflower broomweed and coastal gayfeather are state-listed species of concern but with no regulatory listing status. The large selenia is a state-listed plant that is globally ranked as G4. The G4 Nature Serve global conservation rank identifies this species as apparently secure.

The threeflower broomweed occurs in coastal prairie grasslands which contain sparsely vegetated spots with clayey to silty soils. The soils are occasionally somewhat saline. This broomweed also occurs on coastal flats and the upper margins of ecotone between salty prairies and tidal flats. The soils occurring at the project site appear to be conducive to the broomweed. The project site also contains salty prairies and tidal flats. Field reconnaissance efforts were conducted at the project site and candidate DMPA site a on November 15 and 17, 2017. The project site contains halophytes such as Gulf cordgrass (*Spartina spartinae*), sea ox-eye daisy

(*Borrichia frutescens*), wolfberry (*Lycium carolinianum*), glasswort (*Salicornia* spp.), and shoregrass (*Monanthochloe littoralis*). According to Poole et al. (2007), these particular plant species are known to be associate species of the threeflower broomweed.

The large selenia is associated with seasonally wet clayey soils in open areas. Although there is limited information for this selenia, it is known to occur in open floodplains along the Nueces River. The coastal gayfeather occurs in coastal prairie grasslands of various types, from salty prairies on low-lying somewhat saline clay loams to upland prairies on non-saline clayey to sandy loams. This gayfeather was identified as potentially occurring at or near the project site primarily due to its salinity tolerance.

A plant survey, particularly for the aforementioned state-listed plants, may be warranted as a BMP prior to construction.

4.4.3 Birds of Conservation Concern

Almost all of the resident, wintering, and migrating birds occurring in this geographic area are protected under the Migratory Bird Treaty Act. According to the USFWS IPaC resource list (USFWS, 2017a), the project site also provides habitat for 36 breeding, wintering, and year-round migratory birds that are designated as Birds of Conservation Concern (see Table 4-1). A 1988 amendment to the Fish and Wildlife Conservation Act mandates the USFWS to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973."

The overall goal of Birds of Conservation Concern is to accurately identify the migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the USFWS's highest conservation priorities. The USFWS stresses that although it is important to try to avoid and minimize impacts to all birds, special attention should be made to avoid and minimize impacts to birds of priority concern.

A number of species of birds included in the Birds of Conservation Concern resource list are known to occur in the Nueces Delta area and several, such as the least tern (*Sternula antillarum*) (non-interior population), Wilson's plover (*Charadrius wilsonia*), snowy plover (*Charadrius alexandrinus*), least bittern (*Ixobrychus exilis*), white-tailed hawk (*Geranoaetus albicaudatus*), loggerhead shrike (*Lanius ludovicianus*), and dickcissel (*Spiza americana*) are known to nest in the Delta as well (see Appendix E).

Common Name	Scientific Name	Seasonal Occurrence
American oystercatcher	*Haematopus palliatus*	Year-Round
Audubon's oriole	*Icterus graduacauda*	Year-Round
Bald eagle (vagrant)	*Haliaeetus leucocephalus*	Wintering
Black skimmer	*Rynchops niger*	Year-Round
Buff-bellied hummingbird	*Amazilia yucatanensis*	Year-Round
Burrowing owl	*Athene cunicularia*	Year-Round
Chestnut-collared longspur	*Calcarius ornatus*	Wintering
Dickcissel*	*Spiza americana*	Breeding
Gull-billed tern	*Gelochelidon nilotica*	Year-Round
Harris's sparrow	*Zonotrichia querula*	Wintering
Hudsonian godwit	*Limosa haemastica*	Migrating
Lark bunting	*Calamospiza melanocorys*	Wintering
Le Conte's sparrow	*Ammodramus leconteii*	Wintering
Least bittern*	*Ixobrychus exilis*	Breeding
Least tern*	*Sterna antillarum*	Breeding
Lesser yellowlegs	*Tringa flavipes*	Wintering
Loggerhead shrike*	*Lanius ludovicianus*	Year-Round
Long-billed curlew	*Numenius americanus*	Wintering
Marbled godwit	*Limosa fedoa*	Wintering
Mountain plover	*Charadrius montanus*	Wintering
Peregrine falcon	*Falco peregrinus*	Wintering
Red-headed woodpecker	*Melanerpes erythrocephalus*	Wintering
Reddish egret	*Egretta rufescens*	Year-Round
Sandwich tern	*Thalasseus sandvicensis*	Year-Round
Sedge wren	*Cistothorus platensis*	Wintering
Short-billed dowitcher	*Limnodromus griseus*	Wintering
Short-eared owl	*Asio flammeus*	Wintering
Snowy plover*	*Charadrius alexandrinus*	Breeding
Solitary sandpiper	*Tringa solitaria*	Wintering
Sprague's pipit	*Anthus spragueii*	Wintering
Swainson's warber	*Limnothlypis swainsonii*	Migrating
Whimbrel	*Numenius phaeopus*	Wintering
White-tailed hawk*	*Buteo albicaudatus*	Year-Round
Wilson's plover*	*Charadrius wilsonia*	Breeding
Worm eating warbler	*Helmitheros vermivorum*	Migrating
Yellow rail	*Coturnicops noveboracensis*	Wintering

Table 4-1. U.S. Fish and Wildlife Service Birds of Conservation concern that may potentially occur at or near the project site (USFWS, 2008).

4.4.4 Migratory Bird Treaty Act and Nesting Birds

The MBTA of 1918 is a federal law (16 U.S.C. 703-712) that is administered by USFWS (50 CFR Parts 10, 14, 20, and 21). This act currently protects 1,007 species of birds, making it unlawful to "take" migratory birds. Under the MBTA, "take" means to pursue, hunt, shoot, wound, kill, trap, capture, or collect any such bird covered by the MBTA, or to attempt those activities. "Migratory birds" include most native birds in the United States that migrate as well as those that do not migrate. If a project inadvertently destroys active nests or causes physical harm to birds, this constitutes a violation of the MBTA.

The Nueces Delta project site contains a variety of habitat types including shrublands and grasslands, accreting lomas, salty prairies, salt flats, mud flats, brackish marshes, open water areas, and estuarine high and low tidal marshes. Most of the soils are heavily saline and wet. Almost all of the resident, wintering, and migrating birds occurring in this geographic area are protected under the MBTA. The three species of birds that are commonly found within the area and are not protected by the MBTA are the house sparrow (*Passer domesticus*), European starling (*Sturnus vulgaris*), and the rock pigeon (*Columba livia*).

Several breeding bird surveys and evaluations have been conducted in the Nueces Delta, however, published information is lacking. Information regarding bird species that are known to nest in the Nueces Delta was subsequently obtained from experts in the field of ornithology. Gene Blacklock, who has personally studied the Delta area since the 1960s, has observed at least forty different species of birds nesting in the Delta (see Appendix E). Several of these nesting bird species are also included as Birds of Conservation Concern (see Table 4-1).

A systematic evaluation of Mr. Blacklock's information was performed which identifies the occurrence (common to rare) of a nesting species as well as their nesting season (see Appendix F). Although this information does not address how the proposed diversion projects may positively or negatively affect nesting bird habitats, the information does identify time periods when bird nesting activity should be at a minimum for construction purposes.

Some birds that have been observed nesting in the Nueces Delta can breed throughout the year outside of their primary nesting season. For example, the northern bobwhite and the mottle duck primarily breed from March through September, however, they are also known to breed throughout the year during wet periods. Birds that may breed throughout the year are marked with an asterisk in Appendix F.

The referenced appendices provide information relative to construction time frames that would avoid sensitive nesting periods, or require a limited out-of-season survey. These appendices also provide specific species and seasonal information to assist in scheduling construction events. As a BMP, it is recommended that construction be conducted during non-nesting season.

4.4.5 Essential Fish Habitat

The National Marine Fisheries Service (NMFS), a branch of the National Oceanic and Atmospheric Administration (NOAA), is the regulatory authority responsible for implementing the Magnuson–Stevens Fishery Conservation and Management Act (MSFCMA) of 1976. The MSFCMA is the primary law governing marine fisheries management in United States federal waters and its purpose is to prevent overfishing, rebuild overfished stocks, increase long-term economic and social benefits, and ensure a safe and sustainable supply of seafood (NMFS, 2017). In 1996, the MSFCMA was amended to include the designation and protection of EFH. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Federal agencies must consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (NMFS, 2004).

As part of the USACE permitting process, interagency coordination is required relative to EFH and if the proposed diversion projects were to receive federal funding, this would also elicit the requirement for interagency coordination. NMFS' responsibility is to provide recommendations to avoid, minimize, and mitigate for adverse effects on EFH in the form of an EFH Conservation Recommendation document (NMFS, 2004). Within 30 days of receiving these recommendations, the consulting action agencies/entities must provide a detailed response in writing to NMFS that includes measures proposed to avoid, minimize, or offset the impact of proposed activities on EFH.

Although the immediate project area does not include mapped EFH, EFH is mapped downstream (see Figure 4-7). The EFH mapped areas are designated for migratory pelagic species such as red drum (*Sciaenops ocellatus*), reef fish species, and shrimp species. These species could potentially be adversely affected during construction due to the disturbance of sediment and downstream migration of sediment. These species could also potentially be affected by the project since the channels are intended to increase and re-direct freshwater flow regimes but the effect would be expected to be a positive one.

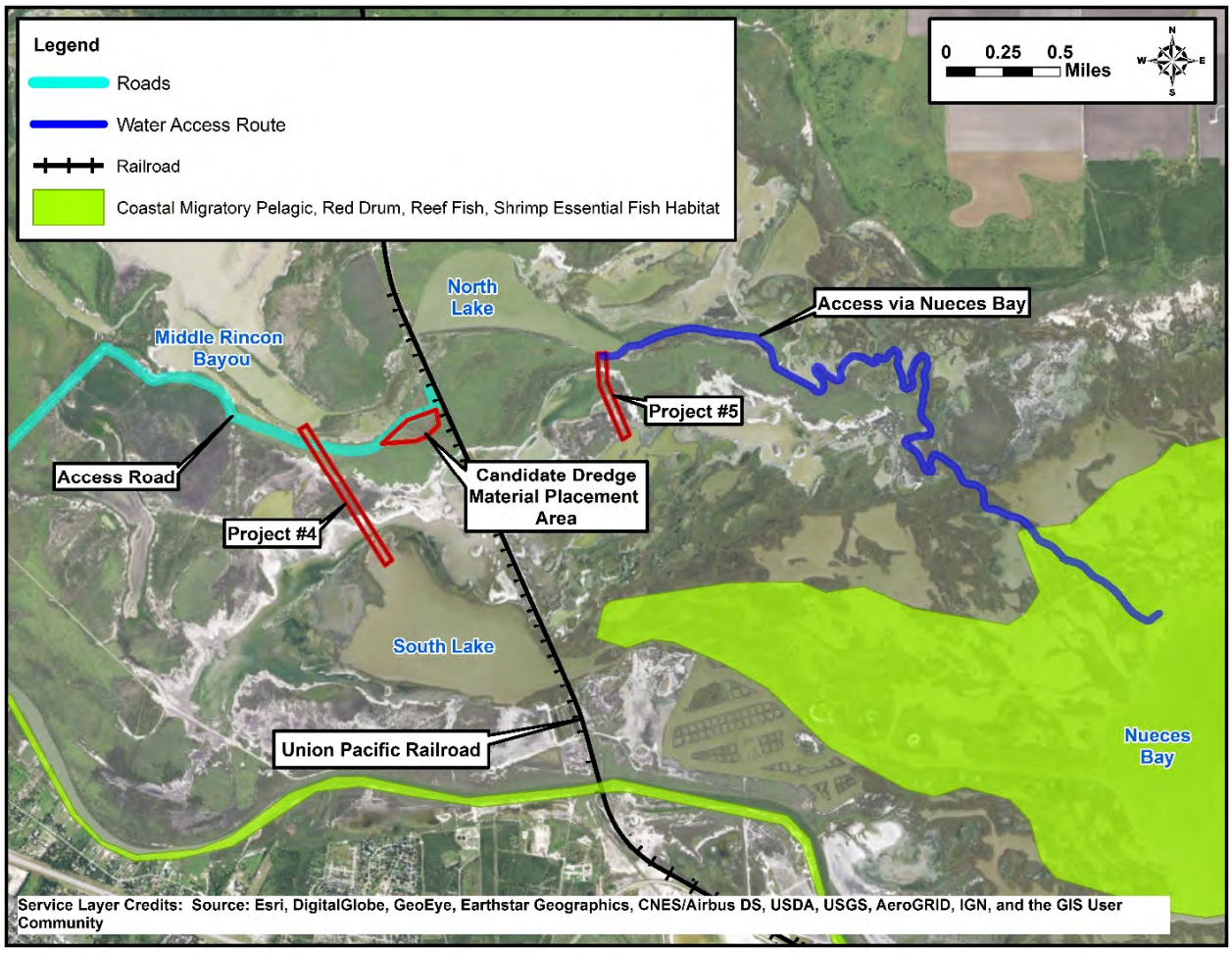

Figure 4-7. The National Marine Fisheries Service essential fish habitat map (NOAA, 2017).

4.5 Historic and Cultural Resources

Historic and cultural resources involve two primary laws, the National Historic Preservation Act (NHPA) and the Antiquities Code of Texas (ACOT). These laws address federal and state requirements for protection of historic and pre-historic cultural resources.

NHPA requires that any federal agency, such as the USACE, having licensing or permitting authority, must take into account the project's effects on historic or pre-historic cultural resources (54 U.S.C. 306108). Likewise, the ACOT requires that notification must be made to the Texas Historical Commission (THC) before breaking of ground for a project action on state or local public land (Section 191.0525).

A desktop assessment of cultural resources was performed by MAC in October of 2016 (see Appendix G). The assessment of cultural resources characterized the project area for the presence of previously recorded archeological sites and also for the likelihood that unrecorded sites may be present in reference to the State of Texas archeological site files, soil classifications, topography, and possible tract disturbances. These data were then compared to an existing site location predictive model (MAC, 2016) for prehistoric sites in the region.

A review of the THC Site Atlas indicated that there are four previously recorded sites (41SP6, 41SP7, 41SP9, 41SP187) within one mile of the project area (MAC, 2016). As indicated from the early trinomial numbers of three out of the four sites, it is likely that an amateur or avocational archaeologist first identified these sites (MAC, 2016). Subsequently, little is known about these sites and efforts to obtain more information from the Texas Archaeological Research Laboratory (TARL) were unsuccessful (Moore, 2016). Based on a number of sites that lie just outside the project boundaries to the south in Nueces County (e.g., 41NU154, 41NU259, 41NU240) and its proximity to Nueces Bay, it is highly probable that these are prehistoric campsites or shell midden sites (MAC, 2016). Shell middens are defined by the Texas State Historical Association (TSHA) as "archeological sites formed through the accumulation of domestic refuse consisting primarily of mollusk shells."

The project area was also assessed with respect to the following hierarchy of environmental factors that combine to make a locality attractive for prehistoric settlement within the region. The factors in combination constitute a set of settlement rules that define good locations for prehistoric campsites (MAC, 2016). While this criterion was designed for the Harris County area, this set of factors has been known to be predictive of prehistoric occupation in other parts of the state. These include preferences for the following:

1. Site locations in forested environments.
2. Site locations in the floodplain or on the floodplain/upland margin.
3. Site locations in proximity to sources of potable water.
4. Site locations on well-drained, loamy soils.
5. Site locations on topographic high points.

While the project area only meets two of the five preferences of environmental factors that combine to make a locality attractive for prehistoric settlement through predictive modeling (proximity to sources of potable water and on the floodplain), Nueces Bay, and the larger Nueces

River Delta system, has a long history of prehistoric land use and exploitation by a number of indigenous groups (MAC, 2016).

5. Site Assessment (Field Reconnaissance)

5.1 GIS Data

A geodetic survey was conducted during field work conducted on November 15 and 17, 2016 in order to collect GIS data. GIS data collected during the survey included wetland and habitat boundaries to be used for planning and permitting. Elevation points collected during the survey were to be used for planning, engineering drawings, permitting, and validating the NDHM.

5.1.1 Methodology

To define an area of field work concentration, 200-foot wide corridors were established around each of the 100-foot wide diversion channels. Within those corridors, survey points were collected along the boundaries of habitats as well as at wetland determination sample points for the wetland delineation. Within the Project #4 channel diversion corridor, survey points were collected from the top of vegetation and the ground directly underneath that vegetation. This survey point collection method was implemented so that it could be determined whether the LiDAR data was representative of ground elevations or top-of-vegetation elevations. Two wetland determination sample points were performed within the candidate DMPA boundary and consequently surveyed. Additional features surveyed included the centerline of the access road and checkpoints along the railway route.

Horizontal and vertical positions were obtained using Trimble Global Positioning System (GPS) technology within the Virtual Reference Station (VRS) Network and are based on the Texas State Plane Coordinate System, South Zone, North American Datum of 1983 (NAD83). The vertical datum used to obtain the elevations was NAVD88, Geoid09. Data points are measured to within less than ±0.3 feet (0.1 meter). The internal Trimble settings ensure that 98% of the GPS shots collected are within the sub-meter criteria.

5.1.2 Results

Data points collected for both project sites can be found in Figures 5-1 and 5-2. Within the Project #4 channel diversion site, elevations ranged from 0.8 feet to 6.4 feet above MSL. Below 3.4 feet, the predominant habitats included marsh, flats, and open water. Salty prairie was the predominant habitat between elevations of 3.4 feet and 4.8 feet. Elevations above 4.8 feet were predominantly prairie shrubland. Within the Project #5 channel diversion site, elevations ranged from 0.1 feet to 5.8 feet above MSL. Below 2.9 feet, predominant habitats included marsh, flats, and open water. Elevations above 2.9 feet were predominantly prairie shrubland. Elevation data points collected at the centerline of the access road within the immediate area of Project #4 and the candidate DMPA ranged from 4.9 feet to 6.4 feet. The two elevation points that were collected from within the candidate DMPA area had elevations of 5.4 feet and 4.7 feet. Elevations collected along the elevated railway route ranged from 9.8 feet to 10.8 feet.

This survey data was used to create profile and cross-section views of the proposed channel diversions before and after construction (see Figures 5-3 through 5-14) as well as to create wetland and habitat maps (see Sections 5.2 and 5.3). The survey data allowed for dredged material volume and potentially jurisdictional area calculations to be determined which is crucial to planning and permitting.

Projects #4 and #5 differ slightly from the hypothetical channels tested with the NDHM in Phase 1. In the case of Project #4, the proposed design is a direct connection to the upper end of South Lake, whereas the model connection was slightly longer and linked the western edge of South Lake. This change will not have any significant impact on the predicted results as the flux through the channel in both cases is driven by the difference between the Rincon and South Lake water surface elevations. In the case of Project #5, the hypothetical channel in NDHM was only about 30% of the length of the proposed channel, so it can be expected that the proposed channel will provide somewhat better connectivity and flushing than the modeled channel. As the intent is for the channel fluxes to be managed using inflatable dams, the differences between the model channels and the proposed channels are insignificant. It was determined that further model runs of the NDHM would not provide any greater insight into the proposed projects.

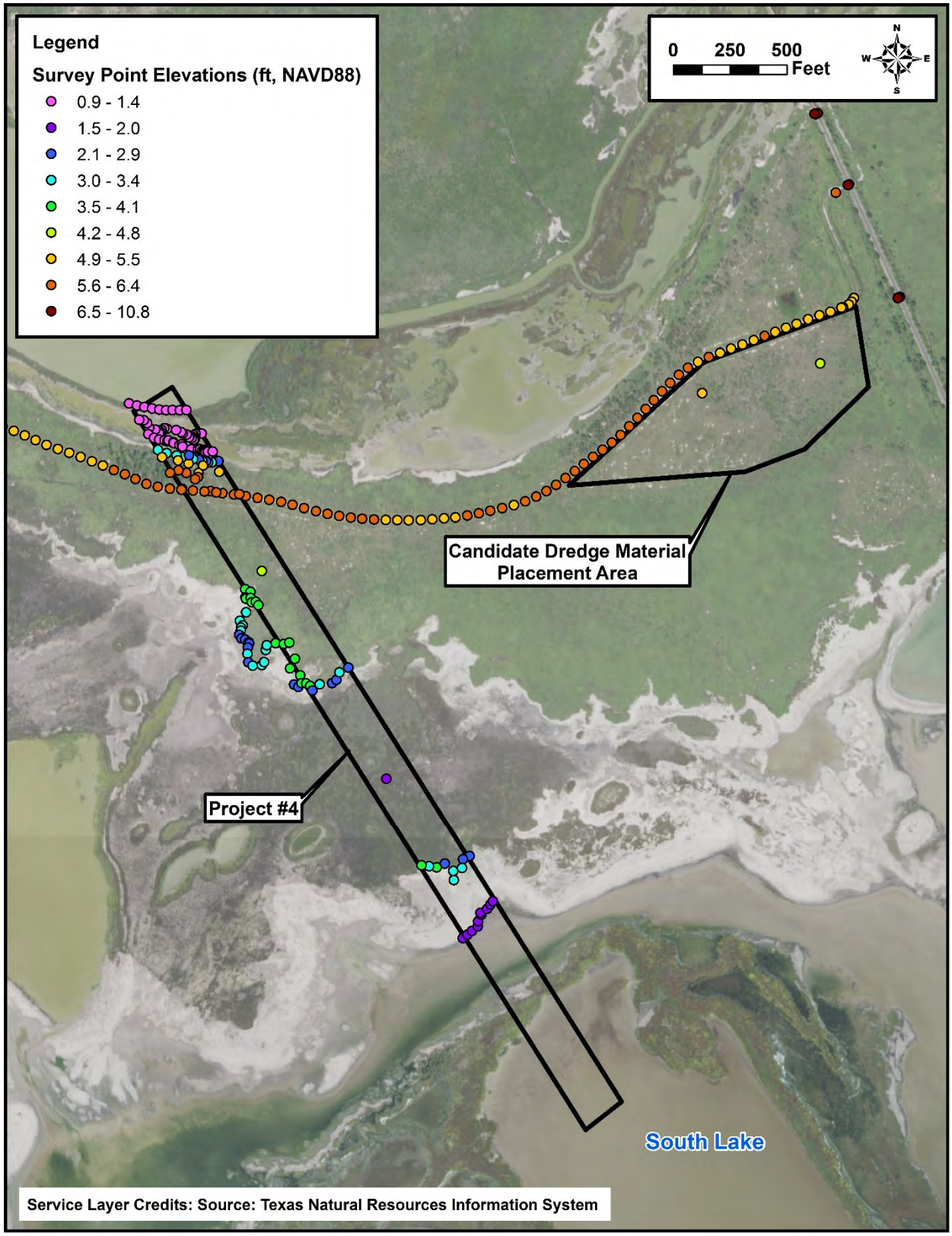

Figure 5-1. Survey data map for Project #4 and candidate dredged material placement area.

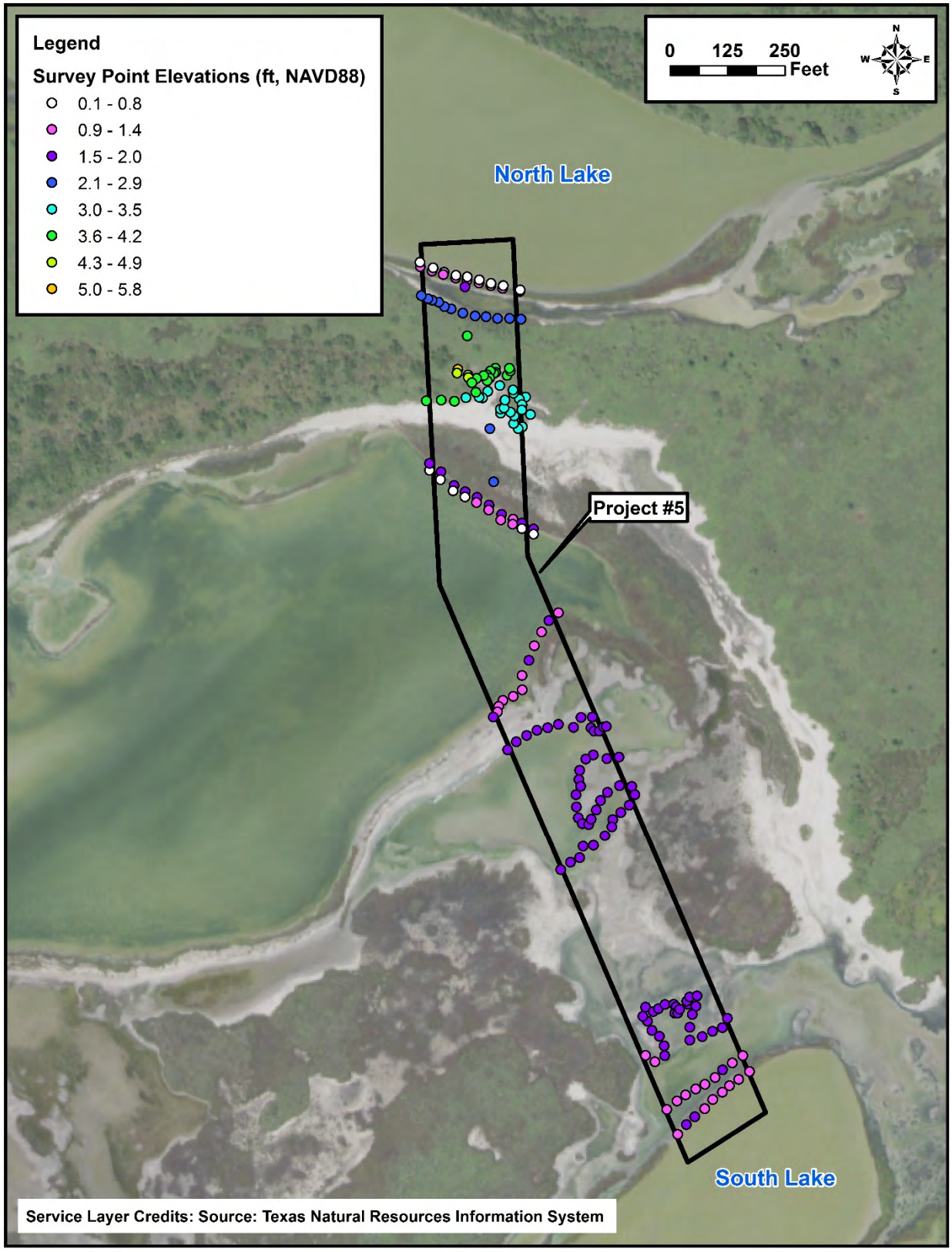

Figure 5-2. Survey data map for Project #5.

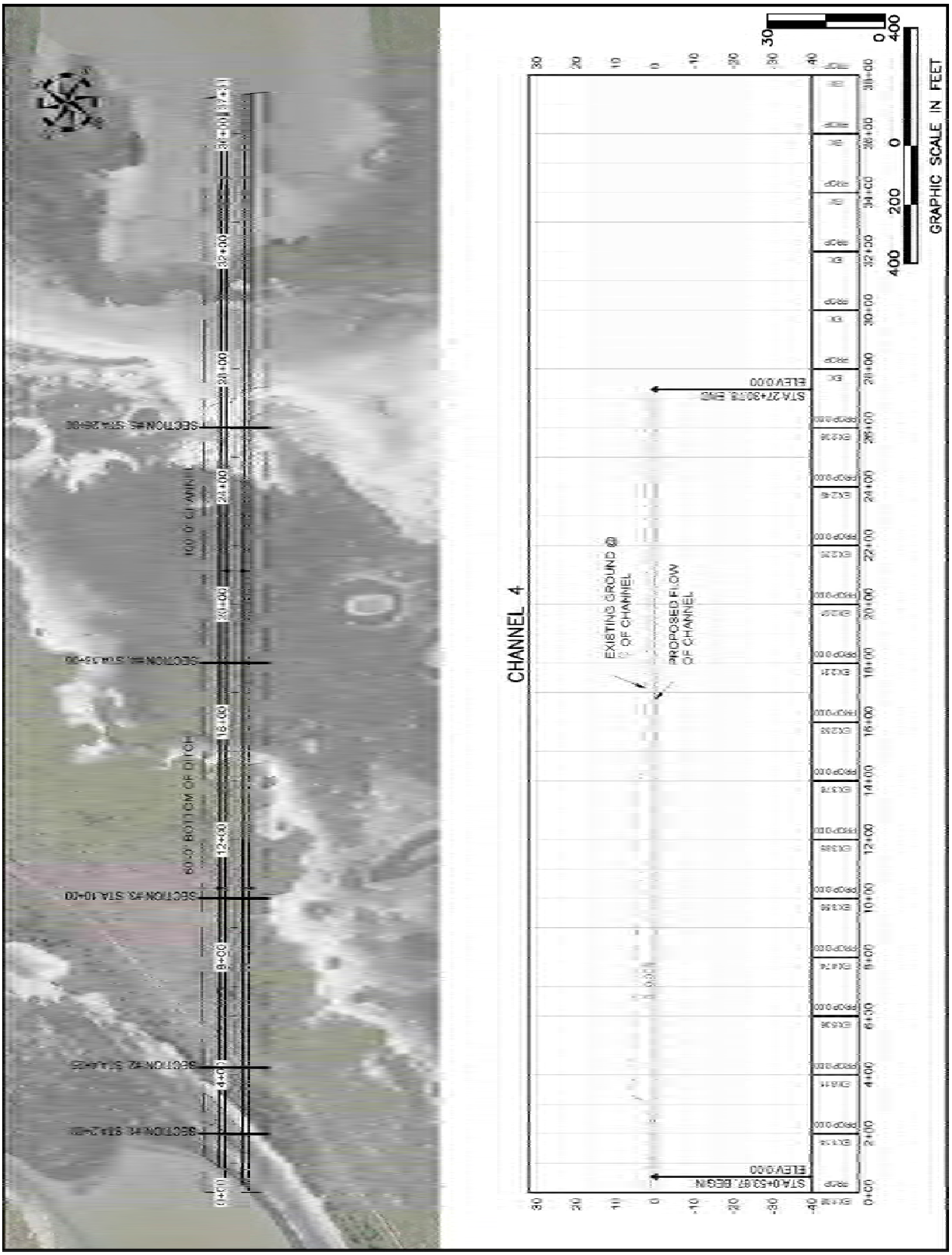

Figure 5-3. Overview of station locations for each of the cross-sections and profile views of Project #4.

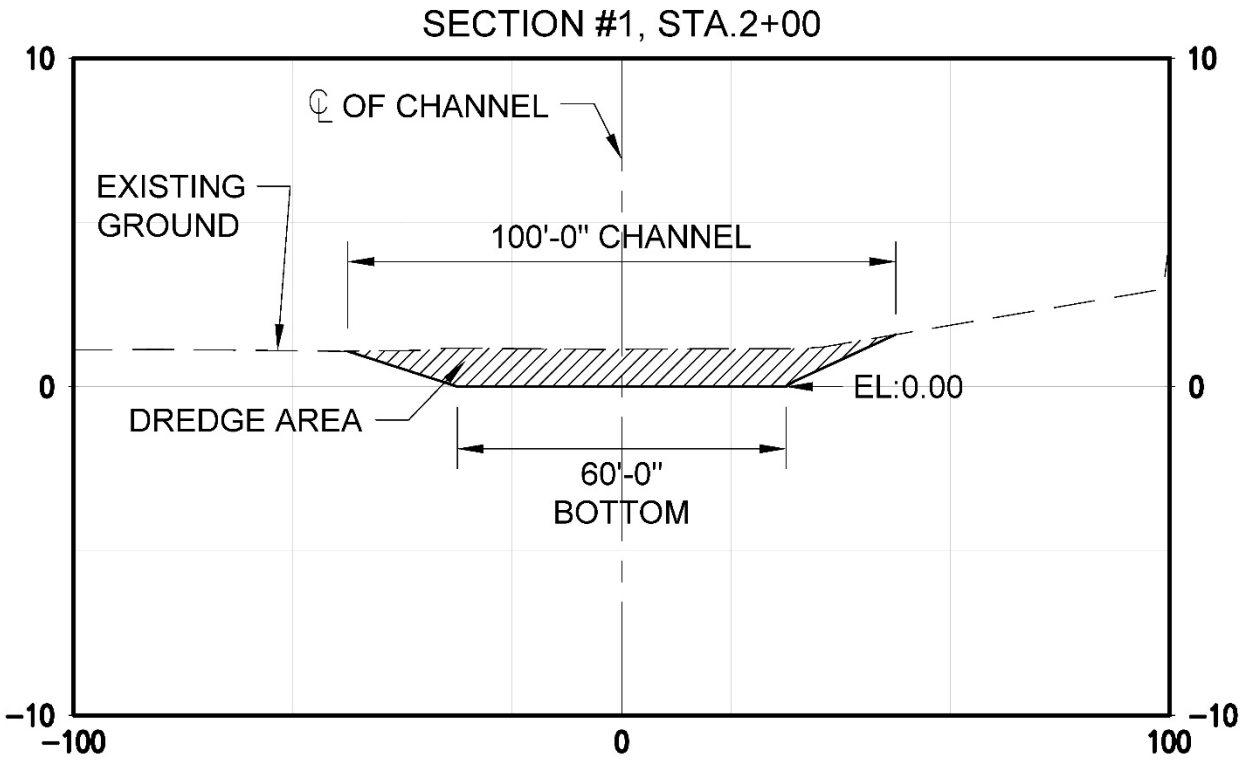

Figure 5-4. Station #1 cross-section of Project #4.

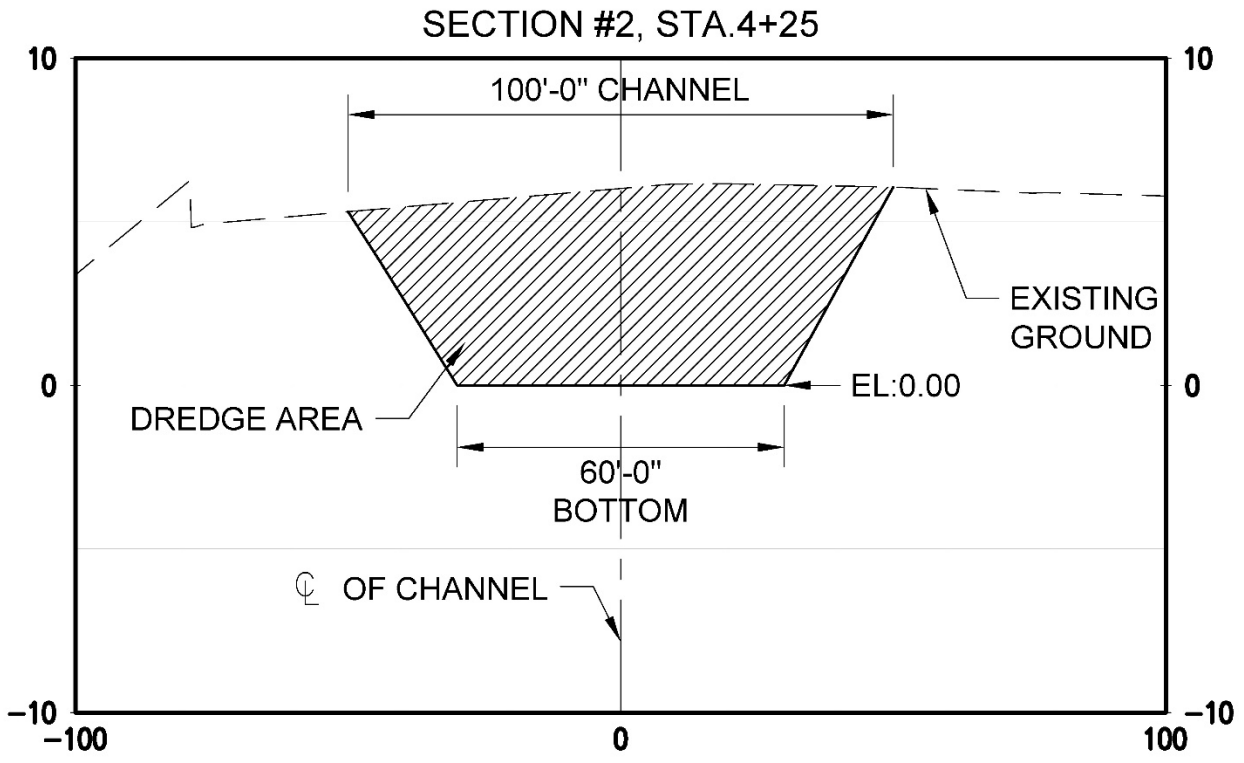

Figure 5-5. Station #2 cross-section of Project #4.

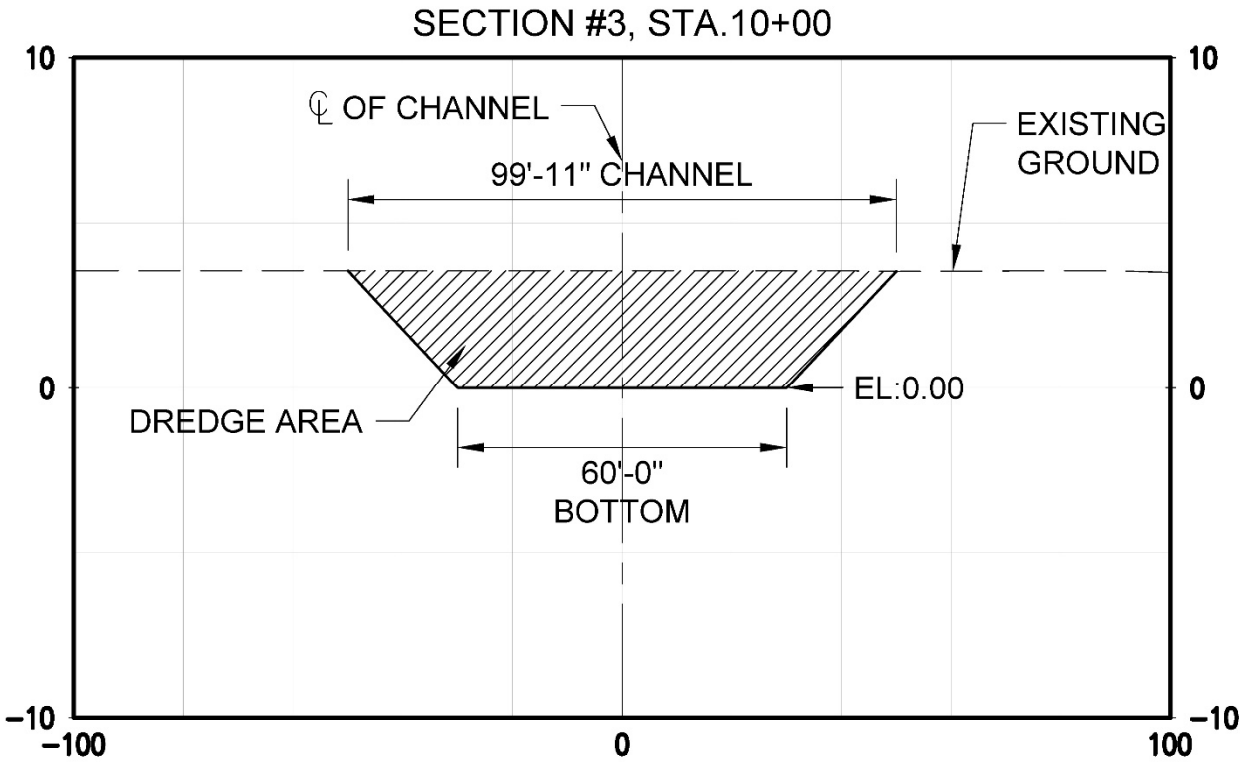

Figure 5-6. Station #3 cross-section of Project #4.

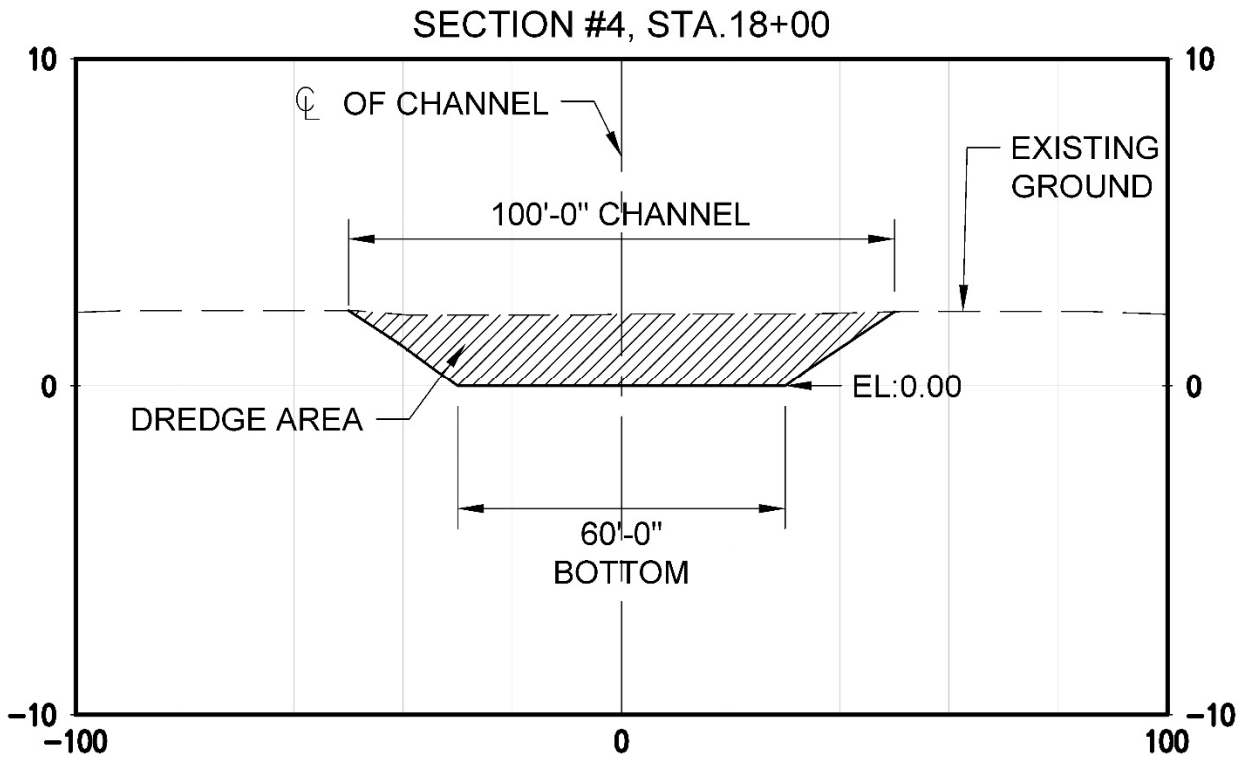

Figure 5-7. Station #4 cross-section of Project #4.

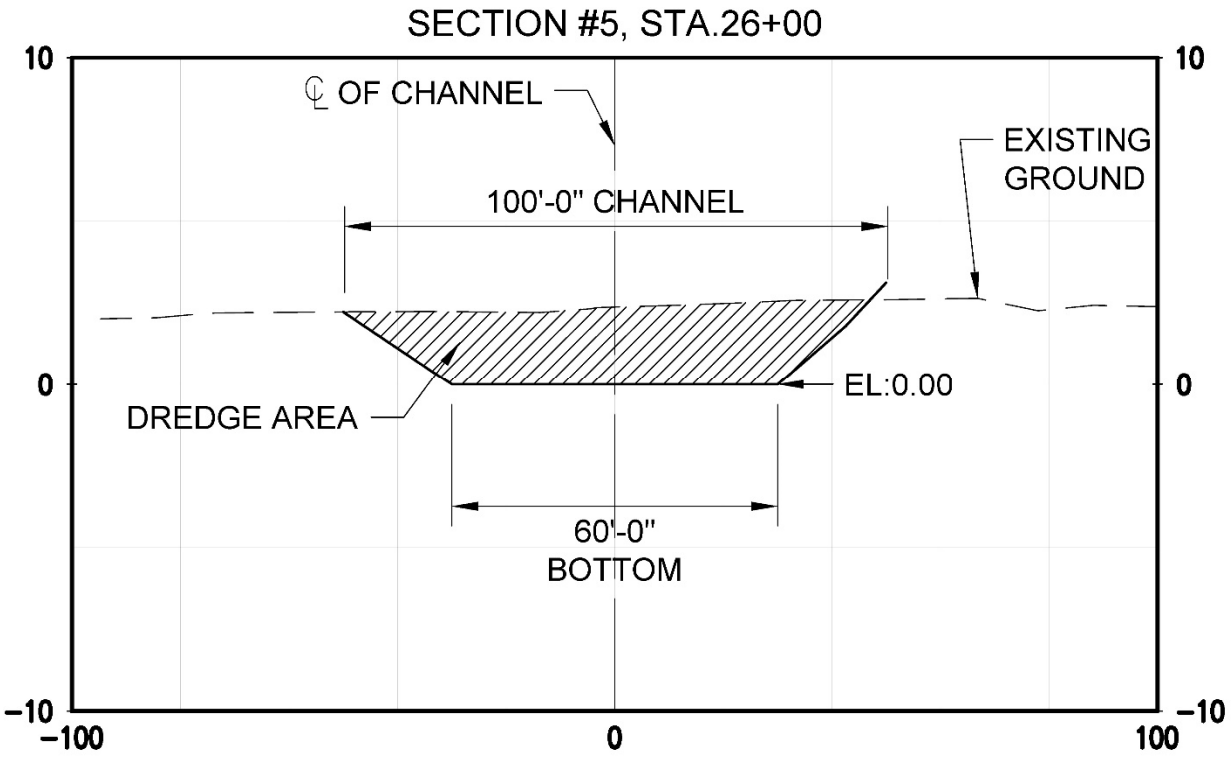

Figure 5-8. Station #5 cross-section of Project #4.

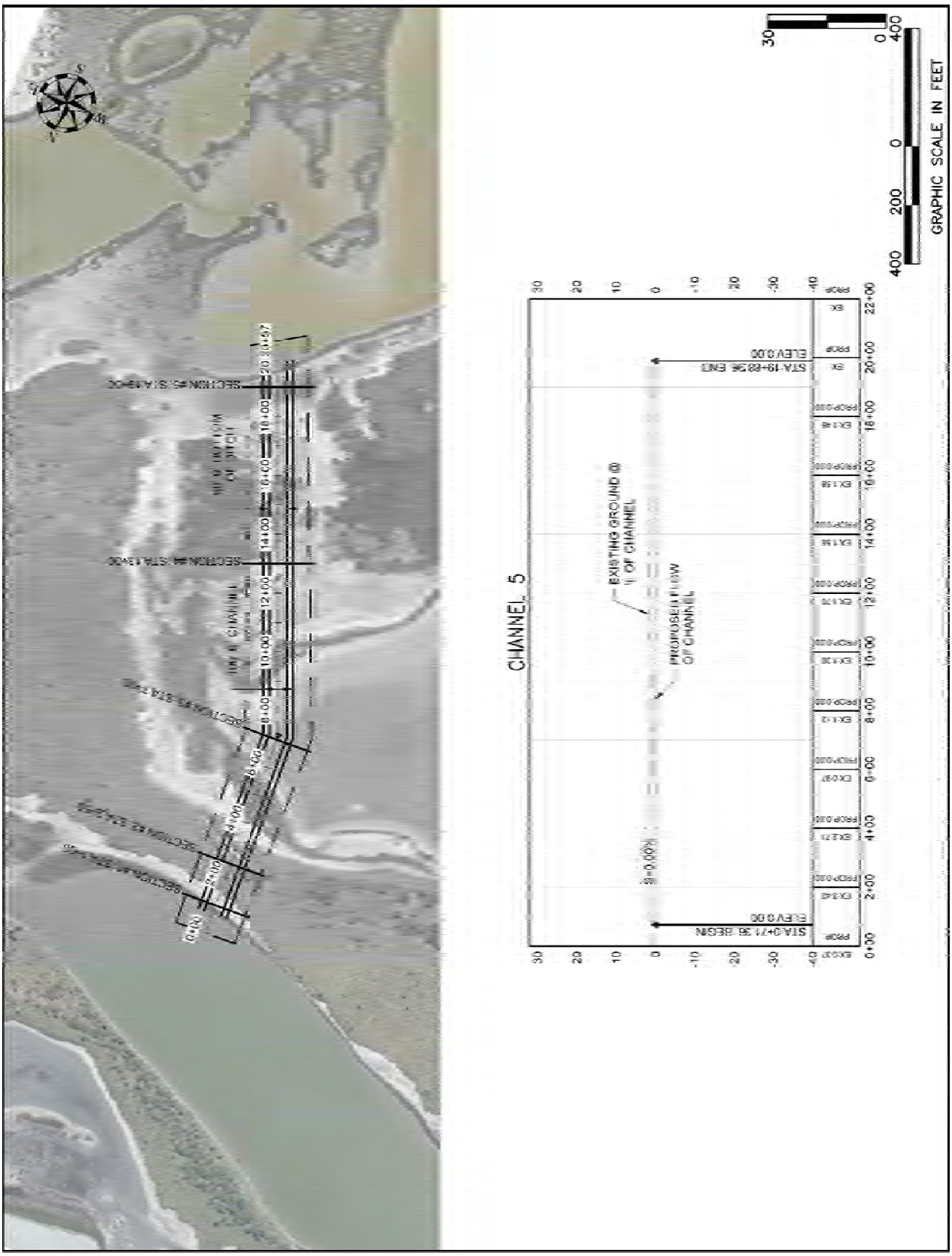

Figure 5-9. Overview of station locations for each of the cross-sections and profile views of Project #5.

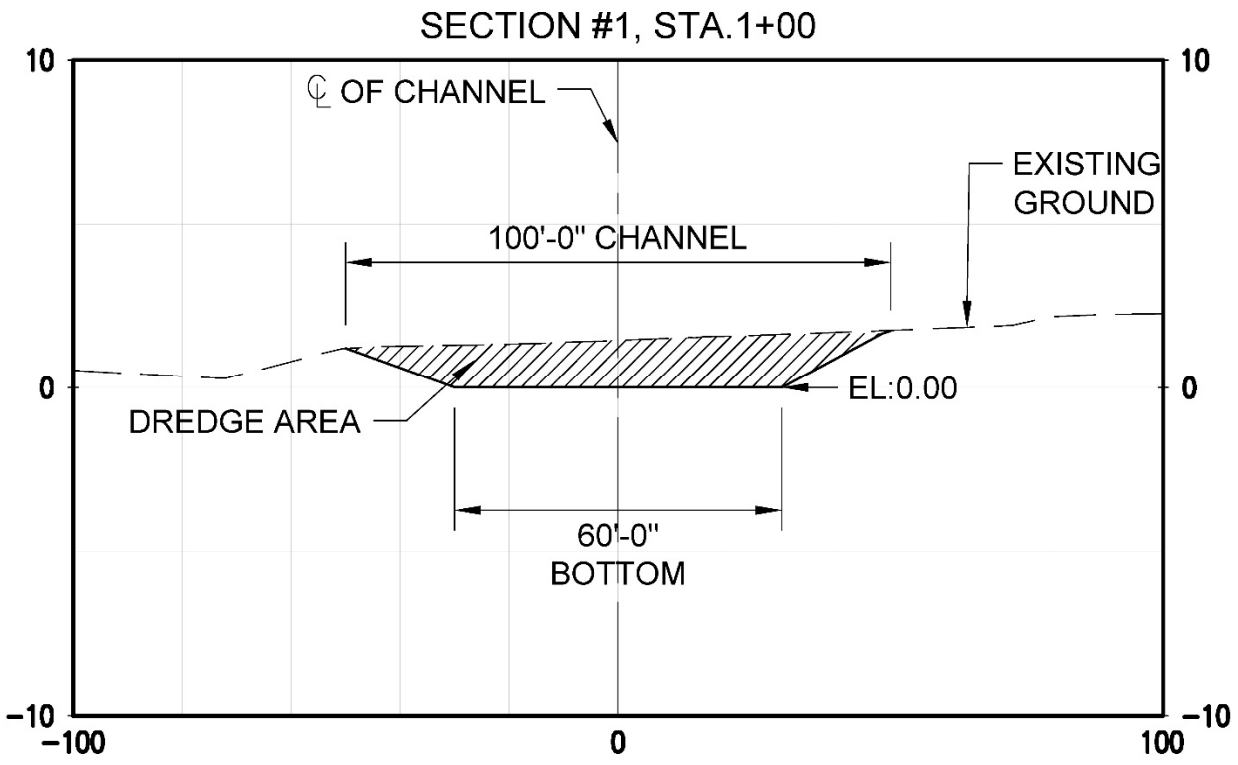

Figure 5-10. Station #1 cross-section of Project #5.

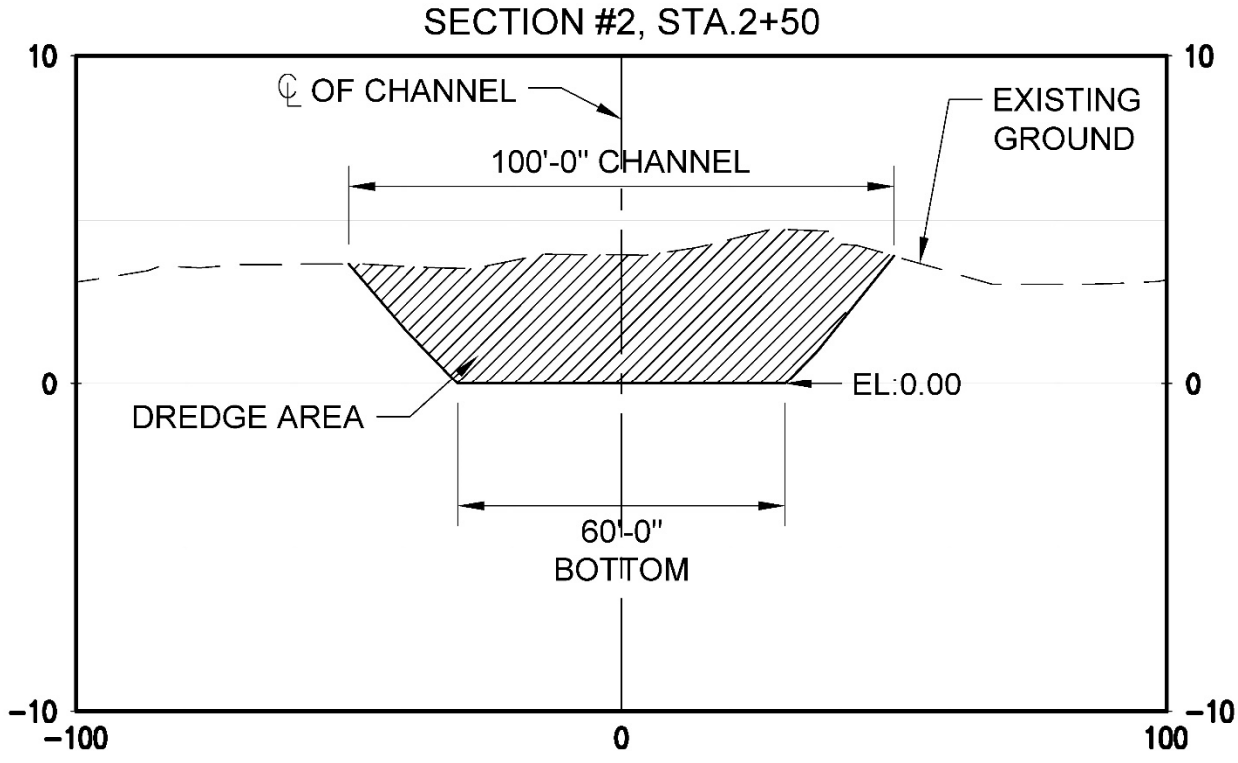

Figure 5-11. Station #2 cross-section of Project #5.

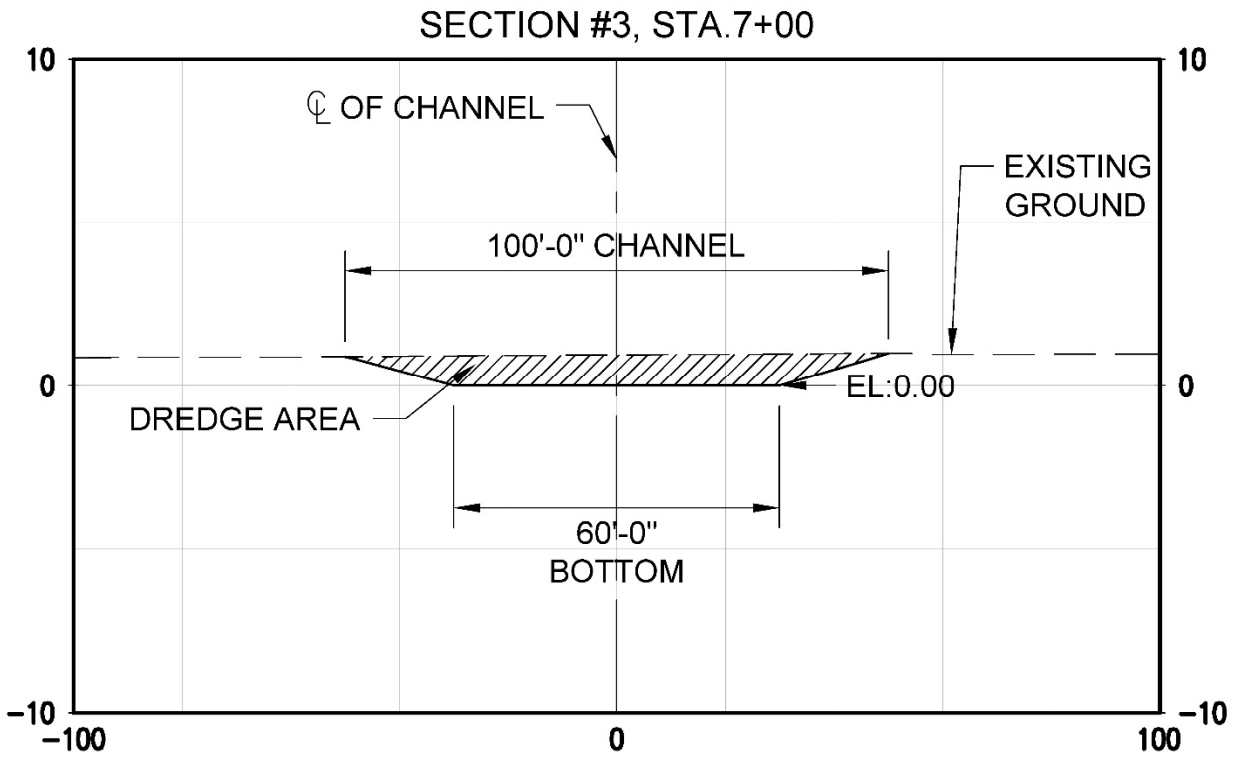

Figure 5-12. Station #3 cross-section of Project #5.

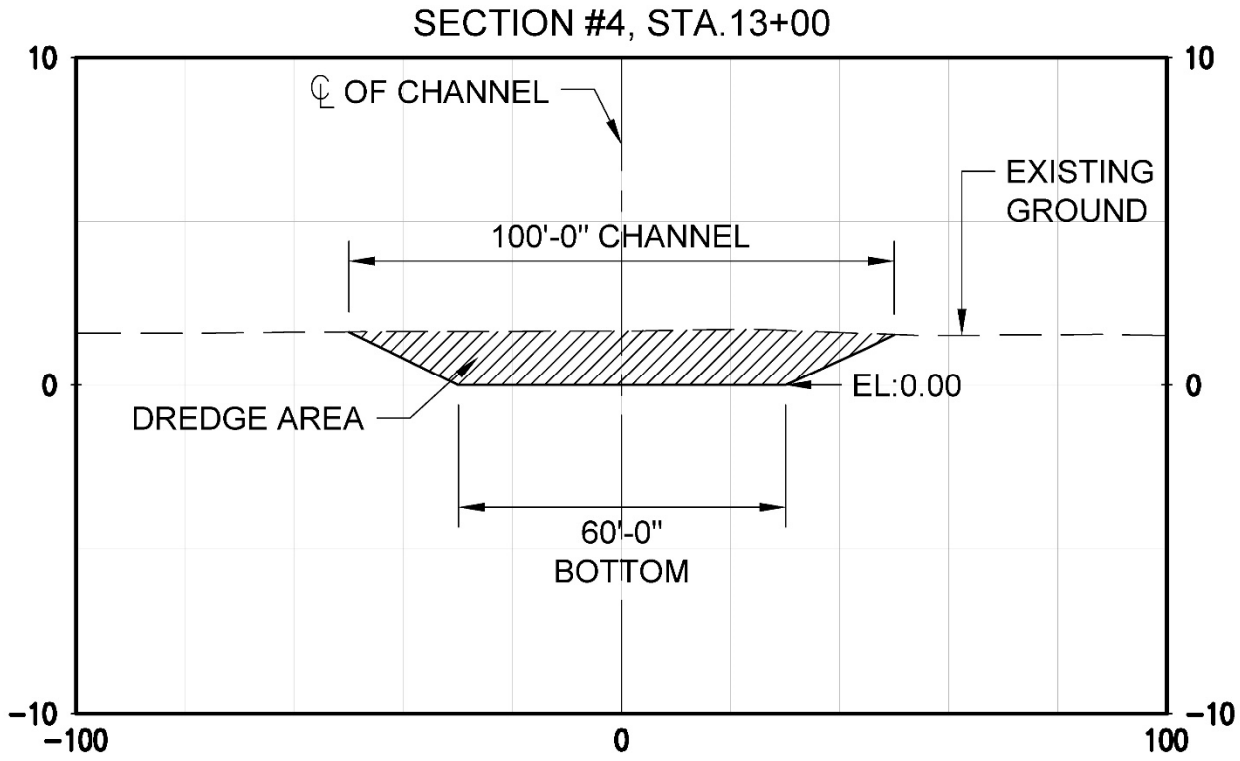

Figure 5-13. Station #4 cross-section of Project #5.

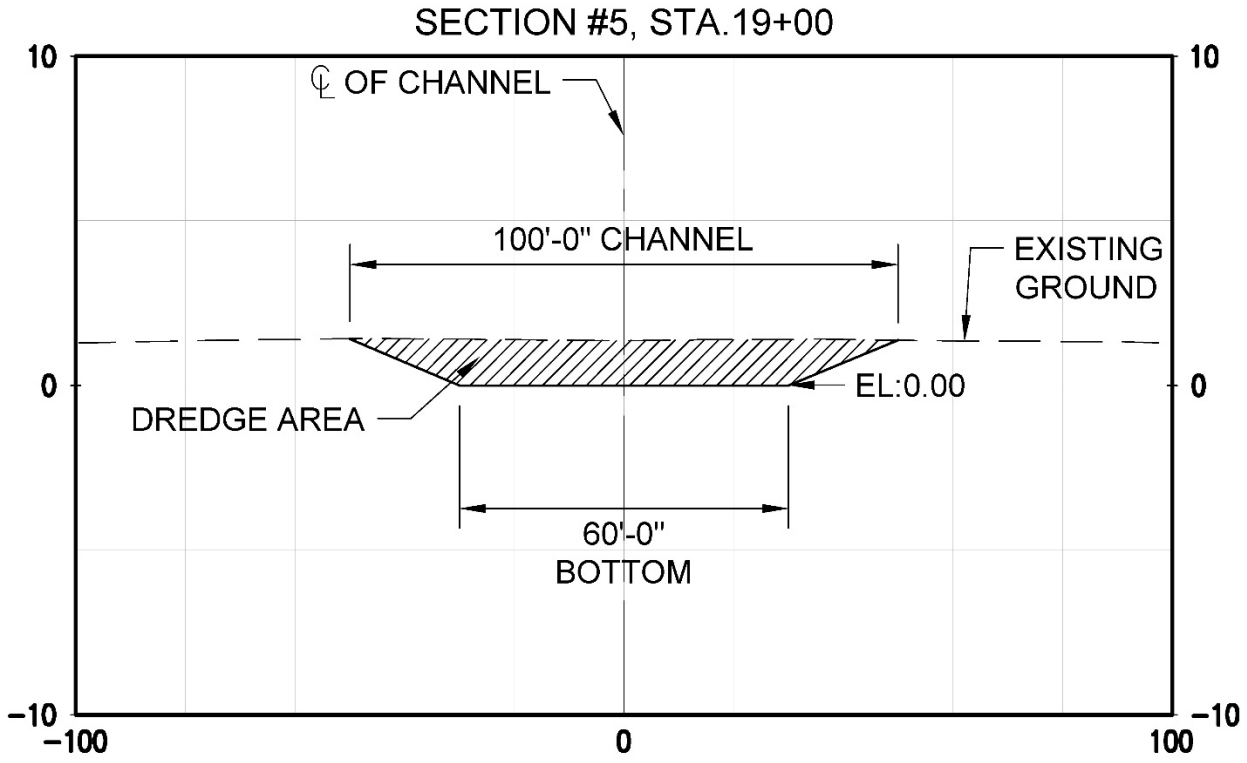

Figure 5-14. Station #5 cross-section of Project #5.

5.2 Wetland Delineation

A wetland delineation and habitat characterization was performed on November 15 and 17, 2016 at Projects #4 and #5, in accordance with the 1987 USACE Wetland Delineation Manual and Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plains Region (Version 2.0) (USACE 1987, 2010). During the desktop investigation, aerial photography, NWI maps, and an EMST map were used to determine the likelihood of occurrence and probable location of wetlands on site as well as probable habitat types present. Wetland delineations were performed within 200-foot corridors at each of the proposed channel diversions project sites. Sample points were taken within the different habitat types as the corridor was traversed on-foot, focusing on the more dominant habitats. Five sample points were taken within the Project #4 channel diversion corridor (see Figure 5-15) and four sample points were taken within the Project #5 channel diversion corridor (see Figure 5-16). Although the candidate DMPA was not included as part of the delineated area, two representative sample points were taken within its boundary to determine the presence/absence of wetlands.

At each sample point, a Wetland Determination form was completed (see Appendix H). For each point, the presence or absence of hydrology was determined and noted. The dominant plant species were then recorded and the 2016 National Wetland Plant List was used to determine the wetland indicator status for each species. Subsequently, a determination was made as to whether dominant hydrophytic vegetation was present or absent. Lastly, the Munsell Soil Color Charts, the Atlantic and Gulf Coast Plains Regional Supplement, and the NRCS Field Indicators of Hydric Soils in the United States were used to determine if hydric soils were present at each

sample point. After each point was fully analyzed and marked with a flagged lath, GPS coordinates for each sample point were recorded. These sample points also served as habitat characterization points and the habitat boundaries were also surveyed (addressed in Section 5.3). Coordinates were obtained using Trimble GPS technology and are in the Texas State Plane Coordinate System, South Zone, NAD83. The vertical datum used to obtain the elevations was NAVD88, Geoid09. Data points are measured to within less than ±0.10 meters. The internal Trimble settings ensure that 98% of the GPS shots collected are within the sub-meter criteria.

Within the Project #4 channel diversion corridor, it was determined that approximately 5.2 acres of upland/non-jurisdictional habitat and approximately 11.9 acres of wetland/potentially jurisdictional habitat were present (see Figure 5-15). Given that almost 91 percent of the area impacted by this proposed diversion channel is located in wetland/ potentially jurisdictional habitat, if Project #5 had been recommended for construction, consideration might be given to moving the proposed alignment of the channel slightly to the East, where the impacts would be almost entirely within upland/non-jurisdictional habitat. However, this would likely require another run of the NDHM to ascertain that the hydrologic outcomes at this new location would be at least equivalent to those resulting from the originally proposed alignment.

Within the Project #5 channel diversion corridor, it was determined that 0.81acres of upland/non-jurisdictional habitat and 8.5 acres of wetland/ potentially jurisdictional habitat were present (see Figure 5-16).

Within the candidate DMPA location, it was determined that the area was within uplands due to the lack of hydric soils (see Figure 5-15). The boundary of this area was not delineated via survey because the size of the habitat exceeded the boundary drawn in-office and also because the candidate DMPA location may change. The habitat characterization, which includes the Wetland Determination Forms, may be utilized to determine the best placement area for the dredged material.

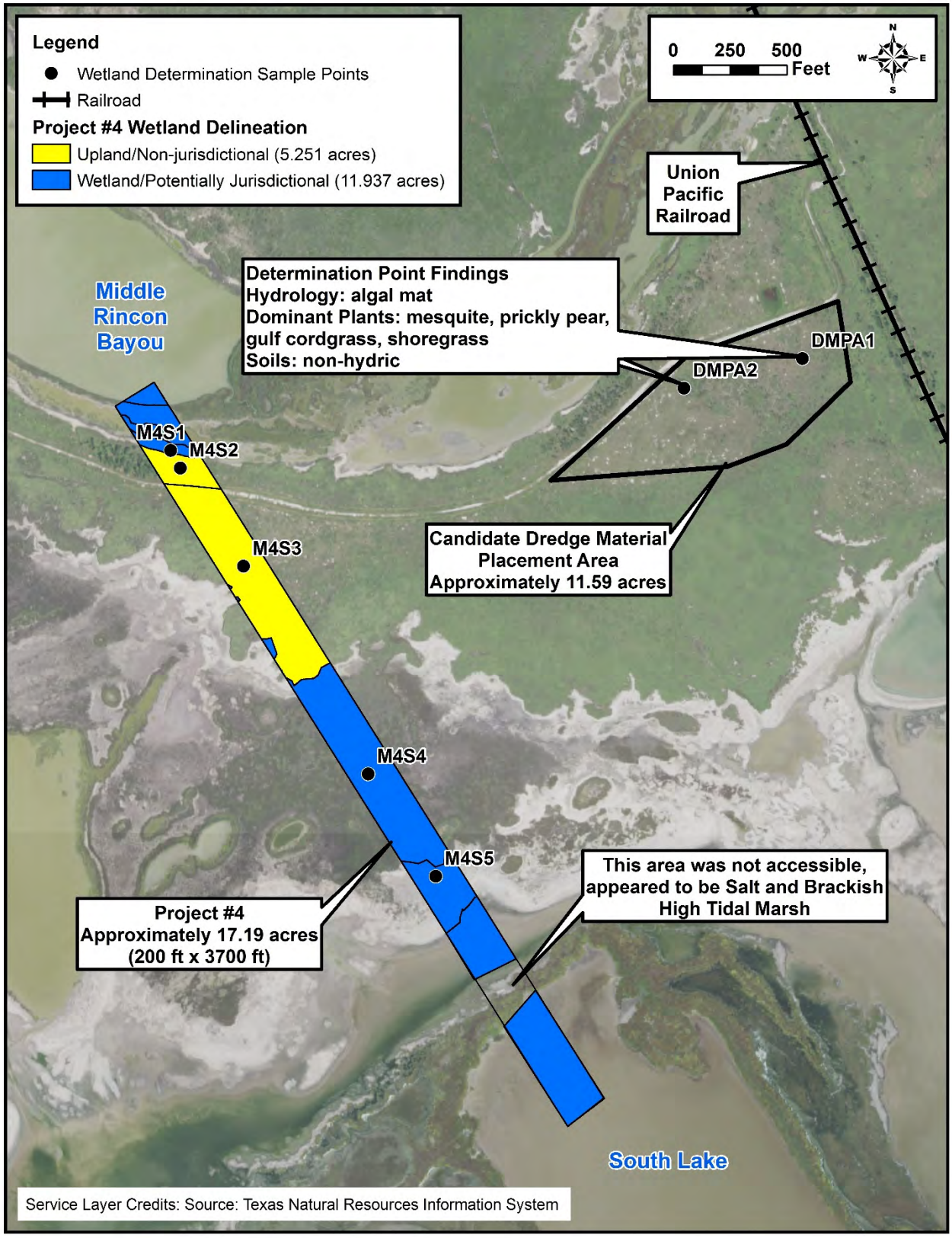

Figure 5-15. Project #4 wetland delineation and candidate dredged material placement area wetland determination sample points map.

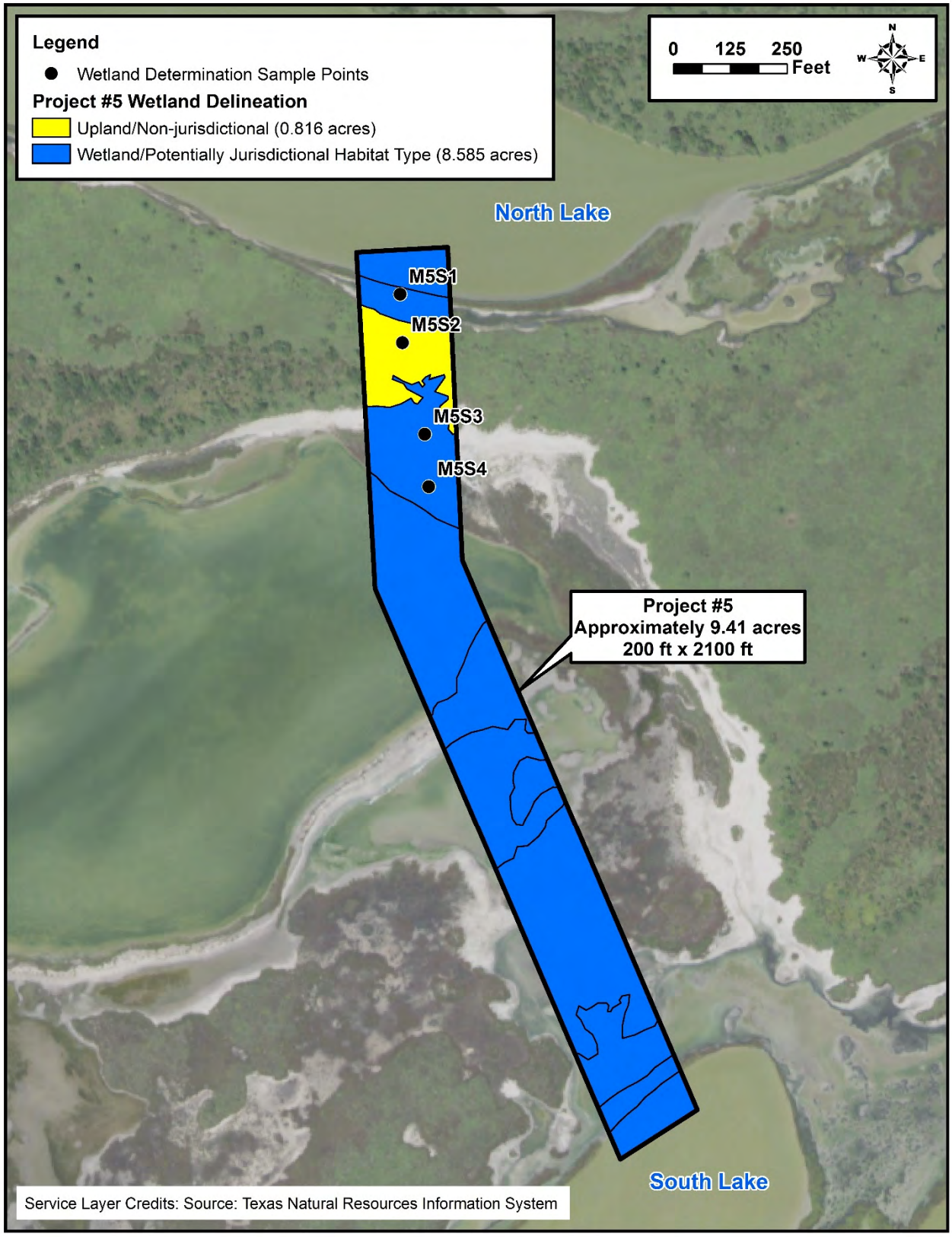

Figure 5-16. Project #5 wetland delineation map.

5.3 Habitat Characterization and Assessment

5.3.1 Plant Communities

The project areas contain a variety of terrestrial and wetland habitat types including shrublands, salty prairies, brackish and estuarine low and high marshes, coastal tidal flats, and open water. A habitat characterization was performed in which the general plant communities were identified during the November 2016 field reconnaissance efforts (see Figures 5-17 and 5-18). The salty prairie shrublands are dominated by shrubs and small trees such as honey mesquite (*Prosopis glandulosa*), cat claw acacia (*Senegalia greggii*), huisache (*Acacia farnesiana*), retama (*Parkinsonia aculeata*), baccharis (*Baccharis neglecta* and *B. halimifolia*) and spiny hackberry (*Celtis pallida*). The shrubland understory is comprised of grasses and forbs such as plains bristlegrass (*Setaria leucopilia*), rat-tail smutgrass (*Sporobolus indicus*), gaping panic grass (*Steinchisma hians*), western ragweed (*Ambrosia psilostachya*), silverleaf nightshade (*Solanum elaeagnifolium*), crotons (*Croton* spp.), and cacti such as prickly pear (*Opuntia* spp.). The non-native highly invasive guineagrass (*Urochloa maxima*) is also present.

The salty prairie grasslands are dominated primarily by Gulf cordgrass (*Spartina spartinae*) along with less dominant grasses and forbs such as Carolina wolfberry (*Lycium carolinianum*), croton, prickly pear, saltgrass (*Distichlis spicata*), sea ox-eye daisy (*Borrichia frutescens*), and shoregrass (*Monanthochloe littoralis*). Some of the salty prairie grasslands contain mottes of thornscrub such as honey mesquite and huisache.

The general project area is a mosaic of salt and brackish low and high marshes, vegetated flats, algal flats, and open water habitats. The vegetated flats and high marsh habitats are dominated by salt-tolerant plants such as sea ox-eye daisy, saltwort (*Batis maritima*), shoregrass, seepweed (*Suaeda linearis*), camphor daisy (*Rayjacksonia phyllocephala*), Carolina wolfberry, and saltgrass. The lower tidal marshes are dominated by glasswort (*Salicornia virginica* and *S. bigelovii*), and saltwort. Several Spanish daggers (*Yucca treculeana*) were observed in the salty prairie grasslands near the project site. Open sand flats occur throughout the mosaic and algal mats were associated with tidally-influenced water bodies. The referenced water bodies appear to be shallow throughout.

The candidate DMPA is primarily salty prairie habitat with some amount of shrublands. Dominant plants occurring within the candidate DMPA include Gulf cordgrass, plains bristlegrass, shoregrass, prickly pear, honey mesquite, and spiny hackberry.

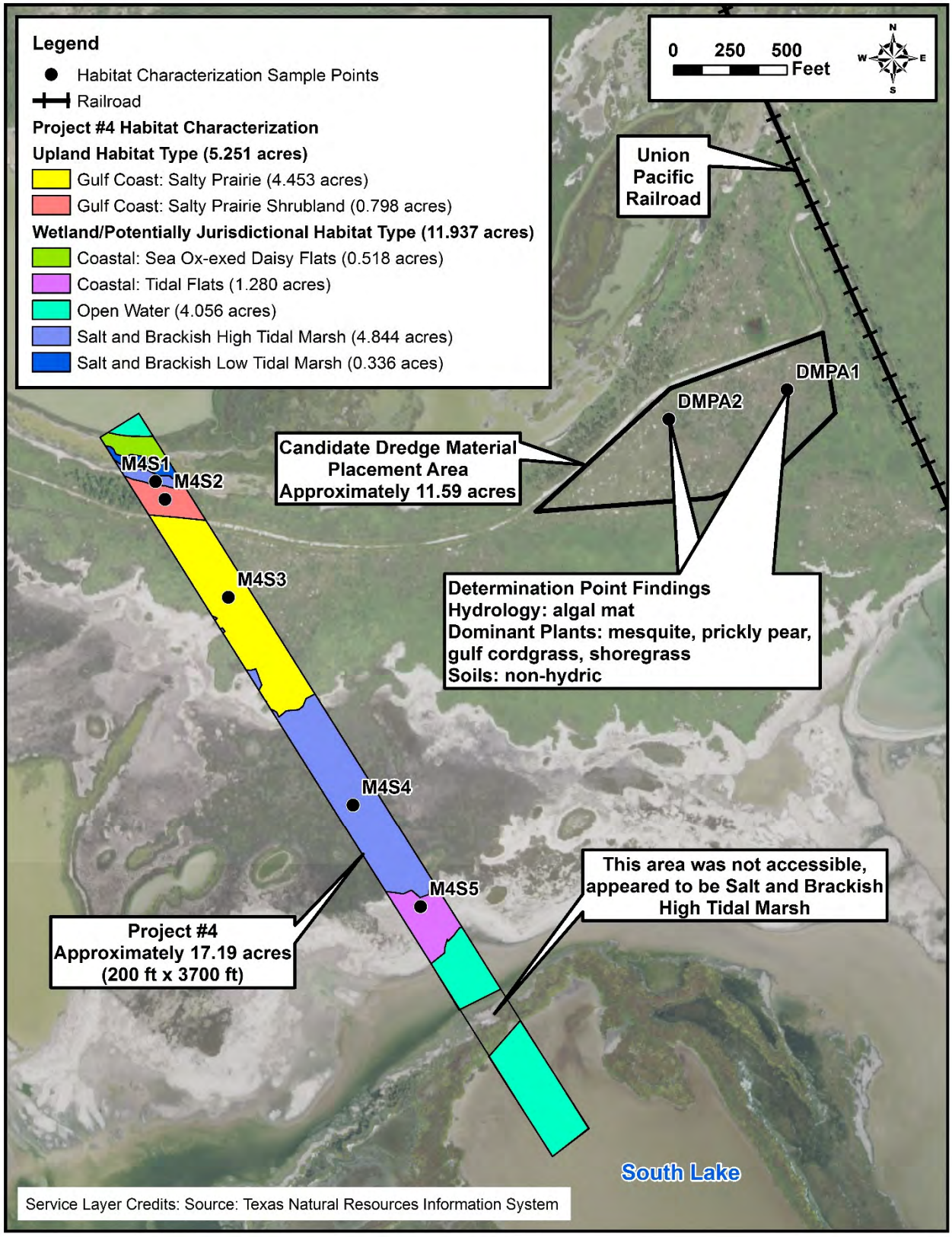

Figure 5-17. Habitat characterization results for Project #4.

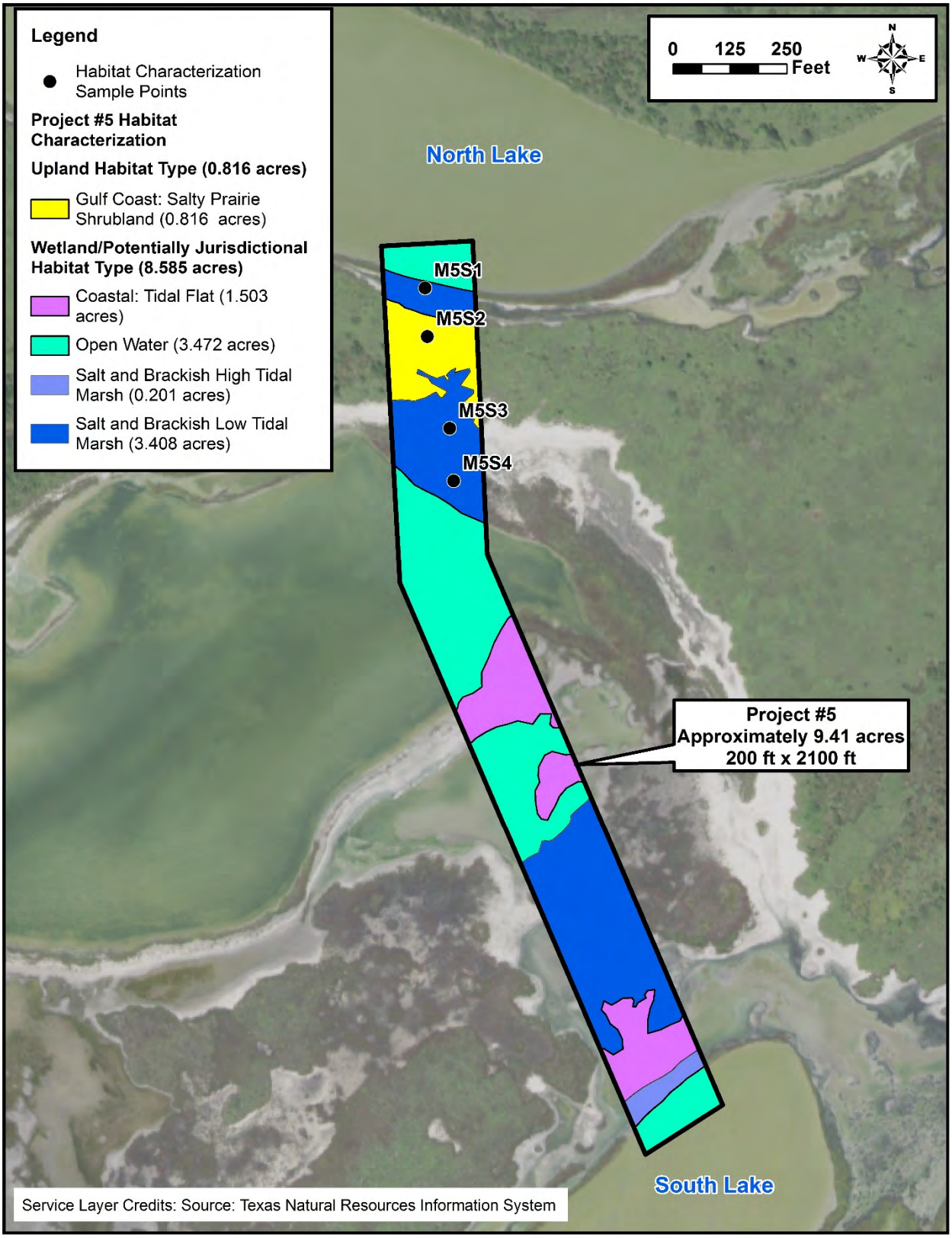

Figure 5-18. Habitat characterization results for Project #5.

5.3.2 Wildlife

The Nueces Delta is known to provide habitat for many species of wildlife ranging from invertebrates to mammals. Birds are a dominant and very visible form of wildlife in the Delta. The Delta's bird life is very diverse because of the wide range of habitat types. The Delta is an important area for many species of birds such as horned larks. Shorebirds are known to utilize the Delta by the thousands. A large number of birds are also known to nest in the Delta (see Appendix E).

Saline wet soils are often present because of the water table's close proximity to the surface of the ground. These wet conditions provide optimal conditions for flies and fly larvae that occur in algal and mud flats as well as wet saline soils. The Delta area contains habitats that provide high numbers of other invertebrates and small crustaceans. These organisms serve as an extremely important source of food for shorebirds.

A number of wildlife species were observed during the November 2016 site visits. Aquatic species, such as red drum (*Sciaenops ocellatus*) and blue crab (*Callinectes sapidus*) were observed in open water habitats and along lagoon shorelines. Various bird species were noted among the different estuarine habitat types including wading birds such as great blue heron (*Ardea herodias*) and great egret (*Ardea alba*), and shorebirds including willet (*Tringa semipalmata*), long-billed curlew (*Numenius americanus*), lesser yellowlegs (*Tringa flavipes*), and various species of terns.

Aquatic birds such as brown pelican (*Pelecanus occidentalis*), white pelican (*Pelecanus erythrorhynchos*), and Neotropic cormorant (*Phalacrocorax brasilianus*) were observed in the shallow lagoons. Birds of prey that were observed during the November 2016 site visits include crested caracara (*Caracara cheriway*) and osprey (*Pandion haliaetus*). Sandhill cranes (*Grus canadensis*) were observed flying over the site.

The only reptile observed during the November site visits was a western diamondback rattlesnake (*Crotalus atrox*). Monarch butterflies (*Danaus plexippus*) and great southern white butterflies (*Ascia monuste*) were also noted.

5.3.3 Potential Federal/State Listed Species

Federal and state-listed species were not observed during the November 2016 field reconnaissance efforts. Freshwater ponds and freshwater habitats with thick vegetation were not observed at the project site. The lack of freshwater ponds and non-saline soils excluded a number of amphibians and other state-listed species from potentially occurring at the project site. A number of listed aquatic species, such as fishes and sea turtles, were also ruled out due to the distance between the project site and the nearest marine waterbody (Nueces Bay), and the presence of the Calallen salt water dam which prevents bay organisms from migrating up the Nueces River.

The federal and state-listed endangered northern aplomado falcon was not observed during the site visits; however, several Spanish daggers were observed in the nearby salty prairie grasslands. Aplomado falcons live in large open habitats where there is an abundance of prey such as songbirds (particularly grassland species) and where shrubs or trees are present,

including the yuccas Spanish dagger and soap-tree yucca, which are utilized for nesting. Like most falcons, aplomado falcons do not build their own nests, rather, they use abandoned nests that were built by other birds such as ravens, jays, and kites. These suitable abandoned nests are often found in yuccas.

Suitable habitat was found to be present for several state-listed birds including wading birds such as the reddish egret and white-faced ibis, shorebirds such as the snowy plover, grassland birds, such as the Sprague's pipit, and raptors such as the white-tailed hawk. Although no Texas diamondback terrapins were observed during the site reconnaissance efforts, suitable habitat does exist for this species, particularly following flooding events. Additional state-listed species, such as the wood stork, would also be more likely to occur when the Delta floods.

A number of plant specimens were collected during the site visits in order to ensure proper identification. Although a number of the collected plants are known to be associated with certain state-listed plant species, no listed plant was found. Several state-listed plants could potentially occur in the project vicinity including the threeflower broomweed, coastal gayfeather, and large selenia.

5.3.4 Nesting Birds

Nesting birds were not observed during the November 2016 site visits. This is not unexpected because November is outside of the general nesting season for this geographic area, which extends from mid-February through September. A few birds such as the northern mockingbird (*Mimus polyglottos*) and common ground dove (*Columbina passerina*) are known to nest year-round. Some birds, such as the northern bobwhite (*Colinus virginanus*) and mottled duck (*Anas fulvigula*), will nest year-round when favorable wet conditions exist.

Although nesting birds were not observed during the November 2016 site visits, the general project area does contain a variety of habitats that are optimal for certain species of nesting birds. Approximately 40 different species of birds are known to nest in the Delta (see Appendix E). Some species of birds, such as the snowy plover (*Charadrius alexandrinus*) and least bittern (*Ixobrychus exilis*), still nest in the Delta but were historically much more common.

Birds, such as Wilson's plover (*Charadrius wilsonia*), usually nest in flats that are adjacent to or shaded by halophytes such as saltgrass within the high marsh areas. Some birds, such as the snowy plover, usually nests near the base of the foredunes of accreting lomas or in silt-sandy pebble substrates. The salty prairie grasslands provide habitat for nesting birds such as mourning dove (*Zenaida macroura*) and eastern meadowlark (*Sturnella magna*). Sparsely vegetated salty prairie areas are used by many different nesting birds including horned lark (*Eremophila alpestris*), seaside sparrow (*Ammodramus maritimus*), common nighthawk (*Chordeiles minor*), and lesser nighthawk (*Chordeiles acutipennis*).

Birds such as least tern (*Sternula antillarum*) nest in areas that are devoid of vegetation and are usually located adjacent to a bay shoreline. Some birds, such as killdeer (*Charadrius vociferous*) and nighthawks (*Chordeiles* spp.) are known to nest on man-made structures such as parking lots, caliche and shell pads, and other road surfaces. The barn owl (*Tyto alba*), which nests

throughout the Delta, will nest under railroad bridges and within dense stands of Gulf cordgrass. Birds such as northern mockingbird, Cassin's sparrow (*Peucaea cassinii*), and scissortail flycatcher (*Tyrannus forficatus*) nest in shrubs and trees within grasslands and savannahs. The project site also contains high brackish and estuarine marsh vegetation that is utilized by nesting birds such as least bittern and American avocet (*Recurvirostra americana*).

5.4 Site Access

For the November 2016 field work, site access was granted by the landowner, the CBBEP. The project site is located within the Nueces Delta Preserve (Preserve) which spans over 10,000 acres, all of which is owned by CBBEP. The entrance to the Preserve is located on the southeast side of State Highway 77 approximately three miles southwest of Odem, Texas (see Figure 5-19).

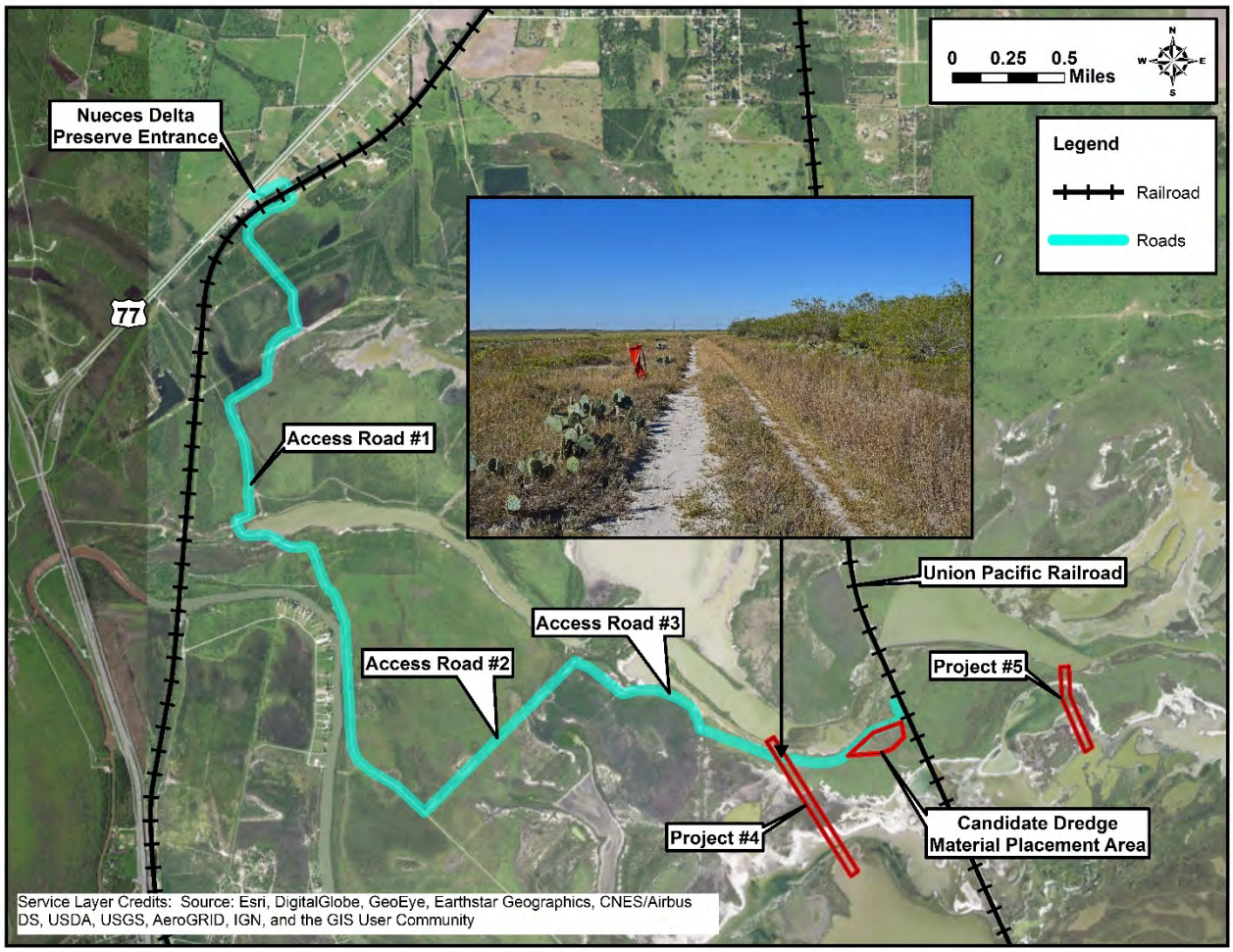

Figure 5-19. Project site access route via road.

5.4.1 Potential Landowner and Regulatory Constraints

CBBEP has offered full cooperation with the proposed diversion projects and will work alongside the involved entities and agencies to ensure a successful project is implemented.

The only portion of land that would require additional landowner coordination and permission, as well as permitting, is the Union Pacific Railroad Company (UP) railway right-of-way (ROW). Although there would not be any work done within the railway ROW, if proposed Project #5 were to be pursued, the railway and ROW will have to be crossed at one location, to access the project site and also to bring dredged material from the project site to the candidate DMPA or elsewhere. The railway and ROW is owned by Union Pacific Railroad Company and access would require a permit to grant right-of-entry for temporary use of their property.

5.4.2 Roadway Conditions

General roadway conditions are considered good for the first 3.6 miles (Access Road #1, see Figure 5-19) and are comprised of improved caliche roads maintained by the Preserve. Access Road #2 (see Figure 5-19) is an old access road which has not been improved with caliche but is considered fair and drivable. Access Road #3 (see Figure 5-19) is also an old access road which has not been improved with caliche. Towards the beginning of road three is an area that may not be passable with heavy equipment during wet periods but when it is dry, the road condition is fair and drivable. Some areas of the road are bounded by significant ditches or dense vegetation which may restrict over-sized loads but the majority of the road is located on level land without restricting features.

5.4.3 Alternate Access Options Investigated

Alternate access routes for heavy equipment are limited. The only potential alternate route for heavy equipment is from Nueces Bay (see Figure 5-20). The route to proposed Project #5 follows a very narrow and winding channel that is less than 40-feet wide in some areas. The most difficult element of this route, however, is the assumed shallow depth which is historically characteristic of channels within the Estuary/Delta complex. Considering the weight of heavy equipment and the damage a grounded barge could cause to habitat, this route is not recommended.

Access via airboat is feasible for light loads and sometimes preferable due to the extensive access it can offer but using an airboat to transport heavy equipment is not feasible.

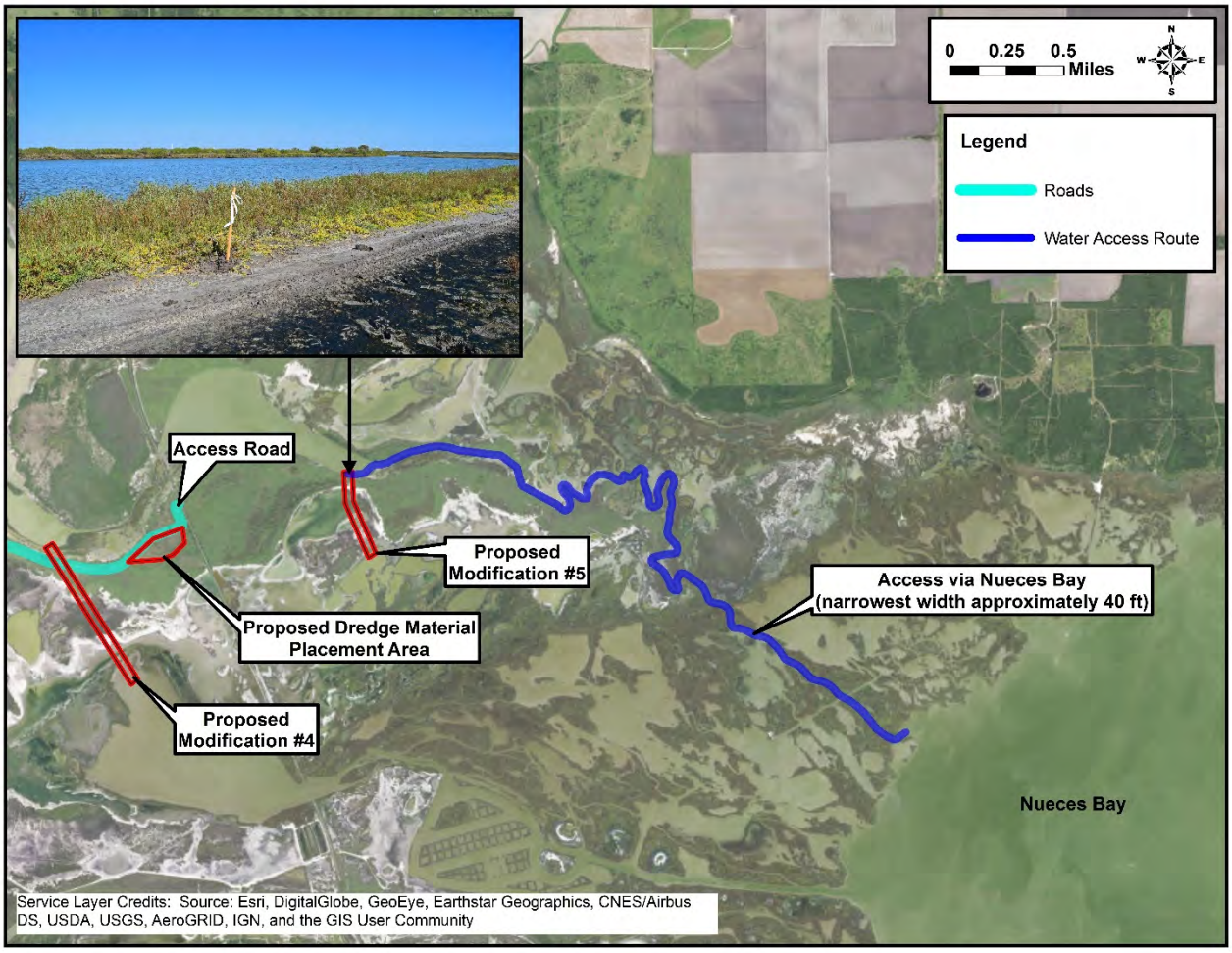

Figure 5-20. Project site access via water.

5.5 Potential Dredged Material Placement Area

The candidate DMPA was selected due to its upland characteristics, which avoids jurisdictional wetland impacts, and minimizes opportunities for erosion during high water events. However, it is understood that placement of dredged material within a scenic and healthy Delta is not highly desirable, even if the area is within uplands. CBBEP has expressed interest in finding an alternate use for the dredged material within the Preserve including improvement of roadways and/or a Beneficial Use (BU) including use of the material for marsh restoration opportunities within the Delta.

Recent discussions with CBBEP indicate several opportunities where dredged material could be used beneficially including: (1) as base material to stabilize proposed breakwaters associated with the Nueces Delta Shoreline Stabilization project, (2) as base material to stabilize proposed reef restoration in association with the Corpus Christi and Nueces Bay Oyster Reef Restoration project, and (3) within areas of historical Delta subsidence to raise elevations conducive to the re-establishment of smooth cordgrass (*Spartina alterniflora*). The Nueces Delta Shoreline Stabilization and Corpus Christi and Nueces Bay Oyster Reef Restoration projects are included as potential restoration projects within the Texas General Land Office Coastal Resiliency Master

Plan. According to CBBEP, areas of historical Delta subsidence could be pinpointed by reviewing historical aerial photography and then further vetted to select candidate sites for restoration.

In addition to the potential BU projects listed above, the dredged material could also be temporarily stockpiled within the candidate DMPA or at a location within uplands at the Preserve until a BU opportunity becomes available. Although there are several potential options for the beneficial use of dredged material, implementing these projects will be limited by distance of material transport, timing of projects, and cost.

6. Regulatory Analysis

6.1 U.S. Army Corps of Engineers Permitting

For both channel diversion projects (Project #4 and Project #5), the permitting scenario will involve development and submittal of a permit application to the USACE. The submittal will include a cover letter describing the proposed work, a USACE permit application form (ENG Form 4345), permit drawings, and a wetland delineation report of both the impacted area and the candidate DMPA. The projects will be submitted to USACE with a request for review and consideration under Nationwide Permit (NWP) 27 which authorizes aquatic habitat restoration, enhancement, and establishment activities.

In order for the projects to be authorized under NWP 27, the permit application must demonstrate that the projects will be planned, designed, and implemented so that they result in aquatic habitat that resembles a regional ecological reference and also provides a net gain in aquatic resource functions and values. An aquatic resource functions and values analysis will be developed and submitted along with the permit application request to demonstrate applicability of NWP 27. The analysis would include a history of fresh water inflows into the Nueces Delta, how those inflows changed over time, and how the proposed diversion projects will re-establish fresh water inflow into wetland complexes of the Delta.

It is likely that USACE will seek input from state and federal resource agencies during the permit process, including but not limited to, the Environmental Protection Agency (EPA), USFWS, NMFS, TPWD, TCEQ, the Texas General Land Office (TGLO), and the THC. This is typical protocol for projects for which resource agencies may have jurisdictional interest or can provide substantive recommendations. Coordination with resource agencies and a demonstration that their ideas and concerns are being incorporated could also assist in influencing authorization of the project under NWP 27.

Should USACE decide that NWP 27 is not applicable, authorization would require review under the more involved Individual Permit (IP) process. Obtaining an IP would require submittal of additional documentation including a TCEQ Tier I 401 Water Quality Certification checklist, Coastal Management Program (CMP) Consistency Review Form, and an Alternatives Analysis. In addition, the project would be placed on either a 15-day Interagency Coordination Notice or a 30-Day Public Notice, which could significantly influence the construction approach, timeline, and cost. The likelihood of an IP being triggered would be center on the issue of the proposed diversion projects being able to demonstrate “a net increase in aquatic resource functions and values”. Therefore, it is imperative that a comprehensive analysis of the anticipated improvements effect on aquatic resource functions and values be developed as well as pre-project coordination with USACE and resource agencies.

For either the NWP 27 or IP permitting scenario, a NWP 16 will also be necessary for return water resulting from the placement of dredged material into a confined upland disposal area. USACE will include a condition within the NWP or IP that requires the permittee to obtain an Individual 401 Water Quality Certification for return water. The permittee will be required to submit a letter to TCEQ stating that they agree to maintain total suspended solids (TSS) below

the threshold of 300 milligrams per liter. In return, the TCEQ will issue the water quality certification which will allow USACE to issue the NWP 16 for return water.

6.2 Texas Commission on Environmental Quality Permitting

6.2.1 Water Rights Permit

TCEQ regulates the diversion, impoundment, and use of state-owned surface waters under its water rights permitting program. A water right is required to impound, store, divert, convey, take or otherwise use state water and TCEQ requires that a water rights permit be obtained before using state-owned surface waters. Even temporary structures such as the proposed bladder dams could be considered "diversion dams" since they divert and convey water by gravity.

Various issues influence the applicability of water rights regulations and exemptions including design and operating conditions, aquatic resources, wildlife and endangered species, impoundment directions, and quantities (acre-feet of water).The City of Corpus Christi water rights permit for the Choke Canyon/Lake Corpus Christi reservoir system requires certain freshwater inflows to the Nueces Estuary that are to be measured at the Saltwater Barrier Dam and Rincon Bayou Diversion Pipeline. These locations are upstream of the recommended diversion channels and bladder dams and a water rights review associated with the City water rights permit could be applicable.

Since the Rincon Bayou project area includes relict river channels, most of which are under tidal influence, and water within those channels is considered unappropriated "state waters", it could be determined that the proposed diversion channels and associated bladder dams would "impound, divert, and convey" those waters and a State Water Rights permit review would be required. Preliminary coordination with TCEQ has further indicated a strong expectation that the proposed diversion channel projects would be subject to jurisdiction of the TCEQ Water Rights permitting program. Additional coordination with TCEQ is required to fully determine the applicability of these regulations with respect to installation of water control structures and whether this activity would require a new Water Rights permit for the diversion and "storage" of water in Rincon Bayou and how various design approaches, operating conditions, and landform modifications might trigger permitting or exemption. Existing water rights (i.e. City of Corpus Christi's permits) would not be subject to this review.

6.2.2 Construction Site Water Permit

A construction project must comply with TCEQ's Texas Pollutant Discharge Elimination System (TPDES) Construction General Permit (CGP) if an area greater than one acre is disturbed during construction. A Stormwater Pollution Prevention Plan (SW3P) would be required and implemented and a construction site notice would be posted on the construction site. A Notice of Intent (NOI) would also be required for submittal if the proposed diversion projects involve greater than five acres and would be expected to require an NOI and SW3P.

A SW3P would be prepared before construction and followed during construction. Pollution from stormwater would be minimized through adherence to measures outlined within the SW3P. Potential BMPs that might be implemented for the projects include temporary

vegetation/mats/mulch/sod, silt fences/hay bale dikes/rock berm, detention/retention ponds/booms/sediment traps.

If any portion of the proposed project area is located within the boundaries of the City of Corpus Christi, construction activities would require coordination with the City since they hold a TPDES Municipal Separate Storm Sewer System (MS4) permit. Under Section 401 of the Clean Water Act, the regulated entity holding an MS4 permit is responsible for assuring that construction activities within its jurisdictional area comply with local building code regulations and certain BMPs to assure storm water quality.

6.3 Texas General Land Office

The proposed channel diversion projects are located within the CMP area boundary. If located within the CMP boundary, projects requiring a USACE permit may be required to show consistency with CMP goals and policies and would not be allowed to have a direct or significant adverse effect on the Coastal Natural Resource Area (CNRA), as identified in 31 Texas Administrative Code (TAC) Chapter 501.31. The CMP is administered by TGLO.

Structures and work within submerged lands owned by the TGLO may require a coastal lease. A review of TGLO state-owned submerged lands and interviews with TGLO staff indicate the channel diversion projects are likely within areas owned by the state. These areas include submerged lands with a lease tract number and tidally submerged land below mean high water (MHW) without lease tract numbers. Further coordination with TGLO will be necessary once selection prior to either channel diversion project being implemented.

6.4 Floodplain Permitting

If the DMPA is located within the floodplain, then a Floodplain Permit from San Patricio County will have to be obtained.

6.5 Issues Identified in Field Survey and Implications for Permitting

A wetland delineation and habitat characterization were conducted at both proposed channel diversion sites (Project #4 and Project #5) on November 15 and 17, 2016. Issues identified during the field survey include:

1. Conversion of wetlands into tidal channels - Results of the November 15th and 17th survey indicate that excavation footprints of the channel diversion sites are located within potentially jurisdictional wetlands comprised of algal flats, high tidal marsh, low tidal marsh, and open water. Therefore, any work within these areas are subject to permitting with USACE. It is often challenging to permit the conversion of one type of wetland to another without the project being reviewed under USACE's IP process. Because the proposed diversion projects will convert potentially jurisdictional wetlands to tidal channels, a comprehensive analysis of the anticipated improvements effect on aquatic resource functions and values should be developed to demonstrate applicability of NWP 27. This will assist in avoiding the more complex IP process which could add significant time and cost to the project.
2. Identification of alternate DMPA locations – Prior to the November 15th and 17th survey, an initial DMPA location was identified via a review of aerial photography and

topographic maps. Results of the survey indicate this area to be comprised primarily of uplands. However, due to the DMPA's close proximity to highly valuable wetland complexes within the Delta, alternate off-site locations for excavated material should be explored.

3. Federally-listed species - A thorough review of potential federal and state-listed species was conducted. Although the endangered northern aplomado falcon is the only federally-listed species that may potentially occur in the project area, BMPs (ensuring that these falcons are not nesting in the area) should be employed to avoid impacts to this listed falcon.
4. State-listed species – Several state-listed species are either known to occur in the project area or are likely to occur there due to the presence of suitable habitat. Most of the state-listed species (birds) would not be affected by the project due to their ability to leave the area during construction. BMPs are provided for other state-listed species that are less mobile (the Texas diamondback terrapin) and non-mobile (several plants). Recommended BMPs for these species should be further coordinated with the USFWS and TPWD to ensure that they are adequate and appropriate.
5. Nesting birds – Approximately 40 different species of birds are known to nest in the Nueces Delta area. Several of these nesting bird species are also included as Birds of Conservation Concern. To avoid potential violations associated with nesting birds and the MBTA, it is recommended that construction be scheduled outside of the general nesting season. A less robust nesting bird survey may still be required for a small group of protected birds that are known to nest year-round under favorable conditions.
6. Access routes – Results of the November 15th and 17th survey indicate that Project #4 is accessible by an existing access road which will allow the ingress and egress of construction equipment during project construction. However, the field survey also revealed that access to Project 5 is difficult with no existing access road and no viable method to reach the site by boat or barge. If Project #5 had been recommended for construction, access would have required either board mats or marsh buggies, and construction would have required marsh excavators, all of which could have increased permitting issues, as well as construction time and cost. For costing purposes, it was assumed that access to this site would have required both road improvements (primarily at the railroad ROW), and board mats. The types and costs of specific materials and construction equipment included, but not limited to board mats, marsh excavators and marsh buggies, will not be known until the project is advertised for bid and a contractor selected. Each contractor will have a slightly different approach for project construction and therefore a cost estimate for materials is difficult to predict at this time. The selected contractor will coordinate with project stakeholders to decide the most feasible construction method for site access and appropriate materials and equipment needed for project construction.
7. Diversion channel design – In order to determine whether the combination of shorter, narrower channels might provide similar hydrologic efficiency as the proposed longer, wider channels (100-foot wide channel with 60 foot bottom width), further hydrologic modeling would be necessary. Current diversion channel design for Projects #4 and #5 was based off results of the NDHM, which show longer, wider channels would provide a sufficient hydrologic connection from Rincon Bayou to South Lake. Further analysis of

shorter, narrower channels utilizing the NDHM would need to be accomplished to see if this option is feasible to adequately transport water from Rincon Bayou into South Lake.

6.6 Joint Evaluation Meeting

A JEM was conducted at the USACE-Corpus Christi Field Office on May 2, 2017. In addition to USACE, resource agencies attending included USFWS, NMFS (on phone), TGLO, TCEQ, and TPWD (see Appendix J). Representatives from Hanson presented a history/background of fresh water inflow issues within the Nueces Delta and the purpose/goals of the proposed channel diversion projects to assist in restoring these flows. In addition, Hanson representatives discussed channel diversion project alternatives, an evaluation of each alternative, a summary of a desktop review and field work, a review of threatened and endangered species, and a review of regulatory permitting associated with each alternative. The JEM presentation packet can be found in Appendix K. The meeting was then opened up for discussion and feedback.

In regard to use of NWP 27, USACE stated that the project applicant needs to provide evidence to demonstrate that the project will have a net gain in aquatic resource functions and values. This should include a measurement of an identified success criteria such as salinity and a history of fresh water inflows into the Delta. This should include a summary of the historical flows and habitat within the Delta, how these flows and habitat have changed over time, what types of factors influenced these changes, and how the proposed channel diversion projects would re-establish fresh water inflows and have a positive impact on wetland complexes within the Delta. USACE also recommended that the project applicant use the word "restoration" within the permit application as opposed to "conversion" of wetland habitats.

Information regarding federal and state-listed species and nesting birds was provided to the group and certain relevant species, such as the Texas diamondback terrapin were discussed in more detail. The project area includes a variety of habitat types that provide opportunities for nesting birds. Hanson biologists also discussed historic and recent bird nesting activity as well as potential BMPs for both listed species and nesting birds. The resource agencies were supportive of the BMPs and indicated that they would appreciate future coordination relative to these topics.

In regard to location of the candidate DMPA, resource agencies recommended identification of a BU site for excavated material or finding at alternate placement location not located adjacent to high quality, high functioning wetland habitat. In addition, when identifying a new DMPA location, resource agencies stated that there are several mitigation sites within the Delta and caution should be taken not to place material within or near these sites.

TCEQ suggested that the project applicant review examples of other similar projects completed around the country and whether they have been successful. In addition, they requested a proposed timeline for construction. TPWD suggested that the project applicant review a similar project hydrological restoration completed at Bahia Grande in Brownsville, Texas.

USACE asked the benefit of constructing one large diversion channel as opposed to several small diversion channels. The general discussion was that one large channel would cause less direct wetland impacts and hydrologically one channel would be able to transfer more water flow

than several small channels. USACE also stated that the project applicant should make sure there are active control measures for channel construction such as no 90 degree angles and the construction of shallow side slopes.

TPWD suggested obtaining data on pore water salinities from Dr. Ken Dunton of University of Texas Marine Science Institute (UTMSI) who has conducted salinity studies in the Nueces Delta for many years. Agencies also asked that the locations of salinity measurements before and after construction of the channel diversion projects be identified within the proposed post-construction monitoring plan. Agencies also requested that a long-term plan for maintenance dredging of the channel and removal of invasive species such as cattails be provided within the post-construction monitoring plan.

6.7 Future Permitting Needs

The permitting path forward should include:

1. Development of a USACE permit application including a cover letter describing the proposed work, a USACE permit application form (ENG Form 4345), permit drawings, and a wetland delineation report of both the impacted area and the candidate DMPA. Coordination with TCEQ will also be necessary to obtain a 401 Water Quality Certification for return water from the upland DMPA.
2. In addition to the USACE permit application, a comprehensive analysis of the anticipated improvements effect on aquatic resource functions and values should be developed in order to qualify the project for authorization under NWP 27.
3. Continued identification of alternate DMPA locations and BU sites should be conducted for inclusion into the USACE permit application
4. Continued coordination with TCEQ regarding the potential for a Water Rights permit and development of this application, should it be necessary.
5. Continued coordination with TGLO regarding need for a Coastal Easement and development of the easement application, should it be necessary.
6. Continued coordination with San Patricio County regarding the floodplain permit for the DMPA, should it be necessary.
7. Continued coordination with resource agencies during project development to ensure agency comments/concerns are being incorporated into the project.

7. Findings and Recommendations

7.1 Listed Species, Nesting Birds, and Habitats

7.1.1 Federal and State-Listed Species

Northern Aplomado Falcon

The federal and state-listed endangered northern aplomado falcon has been observed at Hazel Bazemore Park which is located approximately 3 miles southwest of the project site. The USFWS hopes to establish a few pairs of breeding aplomado falcons at or near this park in the future. Therefore, the aplomado falcon could potentially occur at or near the project location. The nesting period for the aplomado falcon is March through June. As a BMP, it is recommended that the proposed construction sites, disposal areas, equipment staging areas, and especially the access routes be evaluated and found to be clear of nesting aplomado falcons prior to mobilizing equipment or initiating construction.

Reddish Egret, Sprague's Pipit, White-Faced Ibis, and Wood Stork

The state-listed reddish egret, Sprague's pipit, white-faced ibis, and wood stork are not expected to be affected by construction activities because these species would not be expected to nest in the area and they have the ability to temporarily leave the area during construction.

Snowy Plover and White-Tailed Hawk

The state-listed snowy plover and white-tailed hawk could be affected by the project during nesting season. The snowy plover was historically a fairly common nester in the Nueces Delta. The nesting season for the snowy plover extends from the last week of February through August. The nesting season for the white-tailed hawk extends from February through September. An appropriate BMP for these state-listed birds would be to conduct construction activities during non-nesting season.

Texas Diamondback Terrapin

The Nueces Delta was historically heavily utilized by nesting terrapins; however, elevated salinities have recently driven them out into fresher bay waters. These turtles do not go through a true hibernation, rather, they dig down into the mud to sleep. They will get very active in the early spring once the water and air temperatures increase. Although the terrapins won't be found in areas that are dried up, they could be present in wet years. An appropriate BMP for this species is to perform construction work (in areas with water and wet mud) when water temperatures are above 59°F. This will prevent crushing the terrapins (and possibly hatchlings) that are buried down in the mud and are in an inactive state.

Threeflower Broomweed, Coastal Gayfeather, and Large Selenia

Although other state-listed plants could potentially occur at or near the project site, the threeflower broomweed, coastal gayfeather, and large selenia appear to have the greatest likelihood of occurring in the project area. A plant survey, particularly for the three most likely species, may be warranted as a BMP prior to construction.

7.1.2 Nesting Birds and the Migratory Bird Treaty Act

The MBTA protects most native birds in the United States that migrate as well as those that do not migrate. If a project inadvertently destroys active nests or causes physical harm to birds, this constitutes a violation of the MBTA. Many species of birds, including Birds of Conservation Concern are known to occur in the vast area known as the Nueces Delta. Birds are mobile; therefore, they would be temporarily displaced during construction activities. Birds would, however, be impacted if they were actively nesting.

Species-specific information was gathered relative to birds that are known to nest in the Delta. Approximately 38 species of nesting birds were identified and their nesting seasons were determined. Appropriate BMPs would include avoiding nesting periods. A few protected birds, such as mottled duck and northern bobwhite, may nest year-round, particularly during wet years. A limited out-of-season survey may be warranted if climatic conditions dictate.

As a BMP, project supervisors should educate construction crews before mobilizing equipment and initiating work. Work crews should be advised to watch out for birds that are hovering around a site, calling, or acting injured as these behaviors are typical of a bird trying to protect its nest and/or young. If a nesting bird is found within a construction area, then project supervisors should be notified prior to mobilizing equipment or proceeding with work.

Disturbance of all forms of wildlife should be avoided to the extent possible. Care should be taken to allow wildlife (particularly slow-moving species such as lizards, snakes, and turtles) to safely escape the work area. Reptiles, which burrow underground much of their lives, are especially vulnerable during winter. During non-winter months, the Texas diamondback terrapin burrows in the mud at night and basks in the sun during the day. These turtles are fairly fast swimmers and should be able to escape during construction activities. As a BMP, a work crew member should be enlisted to watch for emerging reptiles when excavation is taking place in wet areas.

7.1.3 Essential Fish Habitat

Mapped EFH downstream of the Projects #4 and #5 have the potential to be adversely affected during construction activities. Potential adverse impacts include, but are not limited to, physical removal or disturbance of species, increased water column turbidity, removal of habitat, compaction by large equipment, and trampling or removal of submerged aquatic vegetation.

Proper planning is critical to avoid and minimize adverse impacts. The staging area should be in a stable, upland area, kept to a minimum size, and should avoid sensitive upland habitats. Construction access would need to be carefully planned so that all equipment, vehicles, and personnel can mobilize and demobilize with minimal impacts. Construction activities impacting EFH should be completed during low biological use periods which are generally the winter months (November, December, January, and February).

Monitoring should be conducted before, during, and after project implementation to ensure compliance with design and permitting conditions.

Prior to construction, project contractors should be provided proper training and education in order to minimize construction-related impacts and proper BMPs should be installed. To reduce water column turbidity and erosion, the following BMPs can be utilized: straw wattles, straw bales, silt fencing, turbidity curtains, and erosion mats. Erosion BMPs can also be used to establish buffer areas around sensitive resources on land while booms and silt curtains can be installed around sensitive aquatic resources. Board mats, which are generally installed to minimize impacts to vegetation, can also be used to prevent ruts and sediment runoff. During and after construction, the excavated channel banks need to be immediately stabilized with geotextile fabric, or a similar product, and a long-term stabilization plan, such a native vegetation seeding, needs to be implemented. Excavated material should only be placed within designated areas to decrease habitat impacts and downstream migration of sediment.

7.2 Historic and Cultural Resources

Due to the long history of prehistoric land use and exploitation by a number of indigenous groups (MAC, 2016) and the fact that no previous survey of the project areas have been conducted, it is recommended that an intensive pedestrian survey with shovel testing (MAC, 2016) be conducted. Based on the anticipated soil profile and the depth of impact, backhoe testing is not considered necessary; however, if the shovel testing program encounters deeply buried, intact deposits, additional deep testing by mechanical means may be needed (MAC, 2016).

It is recommended that the archeological assessment performed by Moore Archeological Consulting, Inc. (MAC) be forwarded to the Archeology Division of the Texas Historical Commission for their review. Any additional archeological investigations stipulated by that agency should be carried out prior to the beginning of any construction. Further, in the event that unanticipated archeological deposits are encountered during construction, work should be halted immediately and the Archeology Division of the Texas Historical Commission should be contacted.

7.3 Site Access

It is recommended that heavy machinery and personnel access the site via the access road. Depending on the weight of machinery and equipment and the amount of travel required for the project, it may be necessary that some areas of the road be stabilized.

Direct access to Project #4 and the DMPA site is achievable via the access road. Access to Project #5 site presents more complications since the elevated railway must be crossed and extensive wetlands must be traversed. Railway ROW access may need to be permitted with Union Pacific and strict procedures regarding safety and insurance may be required. The placement of board mats would be required for traversing wetland areas.

Even though water access via Nueces Bay is not practical for heavy machinery, it may be possible to transport small to medium loads of dredged material off-site.

Access would need to be carefully planned since the construction of Project #4 would, at least temporarily, cut-off access to the eastern part of the road. All machinery, vehicles, and

personnel would need to be able to demobilize from the site in a safe manner that causes the least amount of adverse effects to the habitat.

7.4 Permitting

As previously stated under Section 6.6 above, the permitting path forward should include:

1. Development of a USACE permit application including a cover letter describing the proposed work, a USACE permit application form (ENG Form 4345), permit drawings, and a wetland delineation report of both the impacted area and the candidate DMPA. Coordination with TCEQ will also be necessary to obtain a 401 Water Quality Certification for return water from the upland DMPA.
2. In addition to the USACE permit application, a comprehensive analysis of the anticipated improvements effect on aquatic resource functions and values should be developed in order to qualify the project for authorization under NWP 27.
3. Continued identification of alternate DMPA locations and BU sites should be conducted for inclusion into the USACE permit application.
4. As part of the USACE permitting process, due to the historic and cultural resource desktop assessment findings, it is likely that coordination with the THC will be necessary regarding a shovel test survey.
5. Continued coordination with TCEQ regarding the potential for a Water Rights permit and development of this application, should it be necessary.
6. Continued coordination with TGLO regarding need for a Coastal Easement and development of the easement application, should it be necessary.
7. Continued coordination with San Patricio County regarding the floodplain permit for the DMPA, should it be necessary.
8. Continued coordination with resource agencies during project development to ensure agency comments/concerns are being incorporated into the project.
9. Before construction, a SW3P should be developed and submitted to TCEQ for review.

7.5 Recommended Disposal Plan

Although a candidate DMPA location adjacent to Projects #4 and #5 has been identified and undergone preliminary review for the presence of wetlands, alternative DMPA locations and BU options should be identified and explored. Initial resource agency feedback obtained during the May 2nd JEM indicates that the adjacent DMPA is not the preferred placement location. Further coordination with CBBEP should be conducted to identify BU sites within the Nueces Bay watershed or other locations on CBBEP property where the material could be used to reinforce existing road beds or stockpiled for future use.

7.6 Cost

Permitting costs for this project could likely range from $50,000 to $100,000 depending upon whether the project is processed as a USACE NWP or an IP and the level of agency coordination necessary. Therefore, it is imperative to submit a comprehensive analysis of the proposed project's anticipated improvements in aquatic resource functions and values to USACE in order to avoid the more complex IP process. This will assist in reducing permitting costs associated with obtaining a USACE permit. Acquiring other permits, such as TGLO and TCEQ, associated with this project would likely range from $30,000 to $50,000, depending upon applicability of

these permits to the project. These are preliminary cost estimates and further refinement of scope and budget should be completed once a project site is selected and moves forward to construction.

Table 7.1, below, presents a summary of the estimated total project costs for proposed diversion projects #4 and #5. Note that one of the major cost factors is the rental of the board mats for project access. This estimate is a "worst case" scenario, and actual costs for this item may be considerably less, depending on site conditions at the time of construction.

Table 7-1. Cost estimates for Projects #4 and #5.

Capital Costs	Project #4		Project #5		Costs per Unit and Notes
	Costs	Units	Costs	Units	
Channel Excavation Construction	$ 625,000	25,000 cu yd	$ 250,000	10,000 cu yd	$25/cu yd; all inclusive (equipment, BMPs, mobilization, etc.)
Access Roadway Improvements			$ 10,000		Caliche stabilization
Bladder Dams	$ 90,000	2 dams	$ 90,000	2 dams	150 ft x 4 ft bladder size; includes installation
Board Mat Roadway	$ 600,000	40,000 sq ft	$ 456,000	30,400 sq ft	8 in board depth; $3/sq ft per month; rental for 5 months
Flow and water level measurement instruments	$ 60,000	4 instruments	$ 60,000	4 instruments	2 of each instrument; includes installation
Total Capital Costs	**$ 1,375,000**		**$ 866,000**		

Additional Costs	Project #4	Project #5	Notes
Surveying and Engineering	$ 206,250	$ 129,900	15% of Total Capital Costs
Permitting	$ 100,000	$ 150,000	
Project Management	$ 68,750	$ 43,300	5% of Total Capital Costs
Total Additional Costs	**$ 375,000**	**$ 323,200**	
Combined Total of Capital and Additional Costs	**$ 1,750,000**	**$ 1,189,200**	

Annual Costs	Project #4	Project #5	Notes
Amount Financed	$ 1,750,000	$ 1,189,200.00	
Annual Debt Service (4% for 20 years)	$ 128,768	$ 87,503	(http://agstar.com/loans/Pages/LoanAmortizationCalc.aspx)
Operation and Maintenance	$ 26,000	$ 26,000	Every other week inspection and maintenance visit
Ecological Monitoring	$ 48,000	$ 48,000	Monthly field sampling in affected areas of Delta
Total Annual Cost	**$ 202,768**	**$ 161,503**	

8. Acknowledgements

The Project Team would like to thank the members of the Nueces River and Corpus Christi and Baffin Bays Basin and Bay Expert Science Team (Nueces BBEST) and the Nueces River and Corpus Christi and Baffin Bays Basin and Bay Area Stakeholder Committee (Nueces BBASC), for all their time and energy spent in the development of recommendations for environmental flow standards for the Nueces River Basin and Corpus Christi and Baffin Bays and for the recommendations in the Nueces BBASC Adaptive Management Work Plan, including the recommendation to "Explore Landform Modifications to Nueces Bay and Nueces Delta."

The Project Team would also like to especially thank several individuals who freely provided their knowledge from years of experience working in, and for, the Nueces Delta/Bay system. Their personal knowledge of the history and outcomes of previous efforts to better manage freshwater inflows to the Nueces Estuary helped steer the project in the right direction at certain critical junctures. Those providing this "on the ground and in the field" expertise includes: Jake Herring (CBBEP), Jace Tunnell (formerly with CBBEP, now with the Mission-Aransas National Estuarine Research Reserve), Paul Carangelo (Port of Corpus Christi Authority), Rick Kalke (Harte Research Institute, TAMUCC), and Rocky Freund (Nueces River Authority).

Additionally, the Project Team would like to thank all the individuals who, working on behalf of the state and federal resource agencies, provided information and advice regarding the regulatory and permitting issues investigated in this study.

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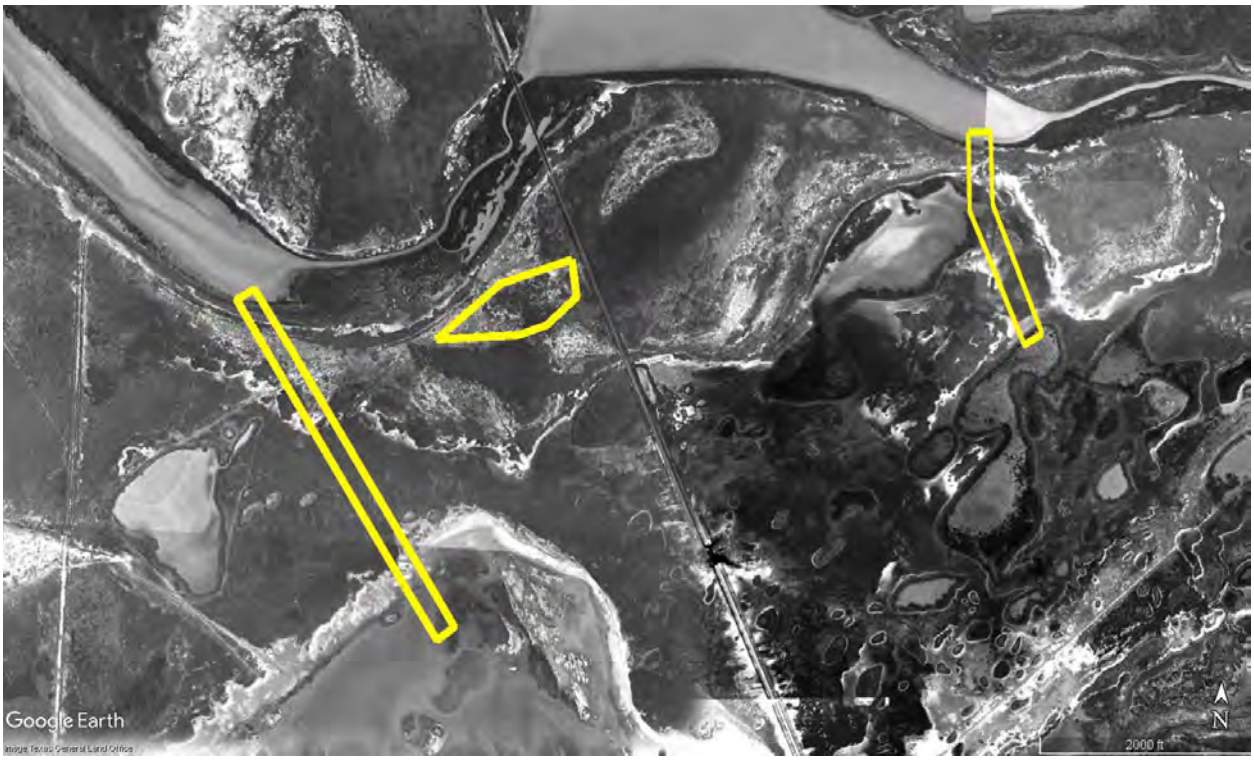
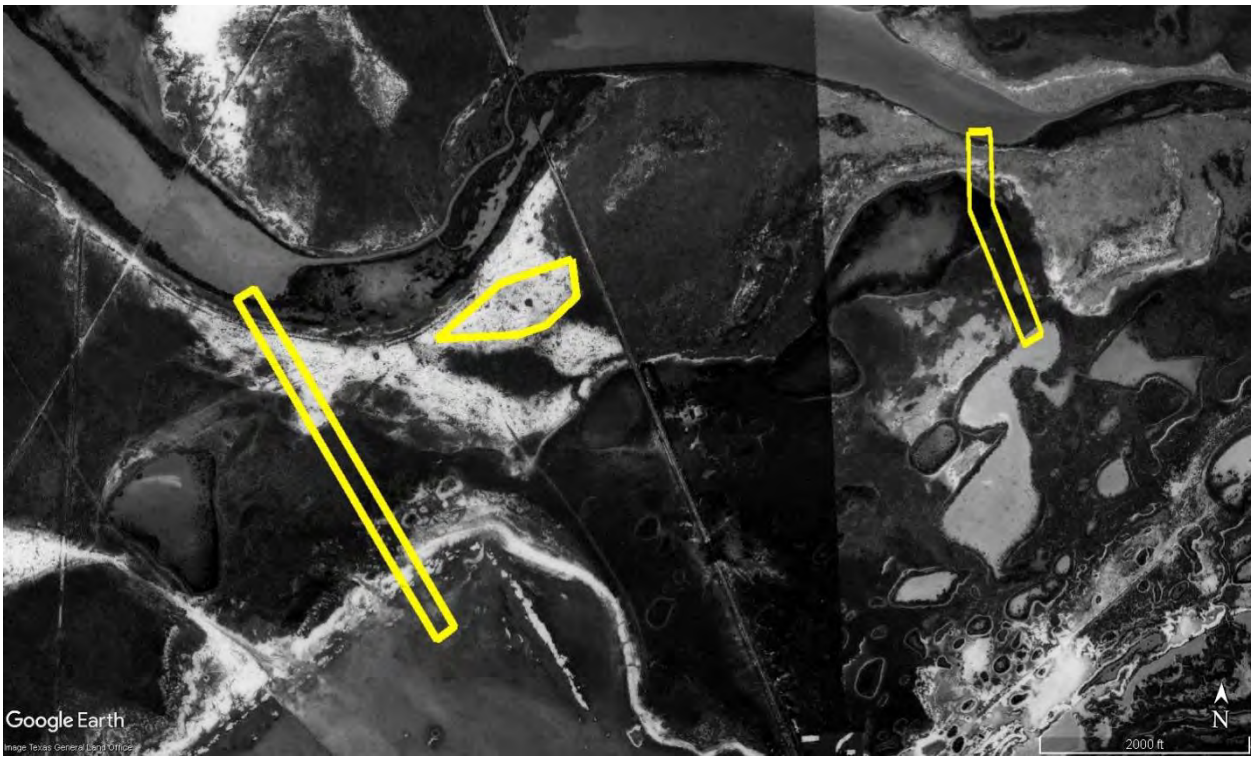
Appendix A. Historical aerial imagery obtained from Google Earth.

Google Earth, 1949

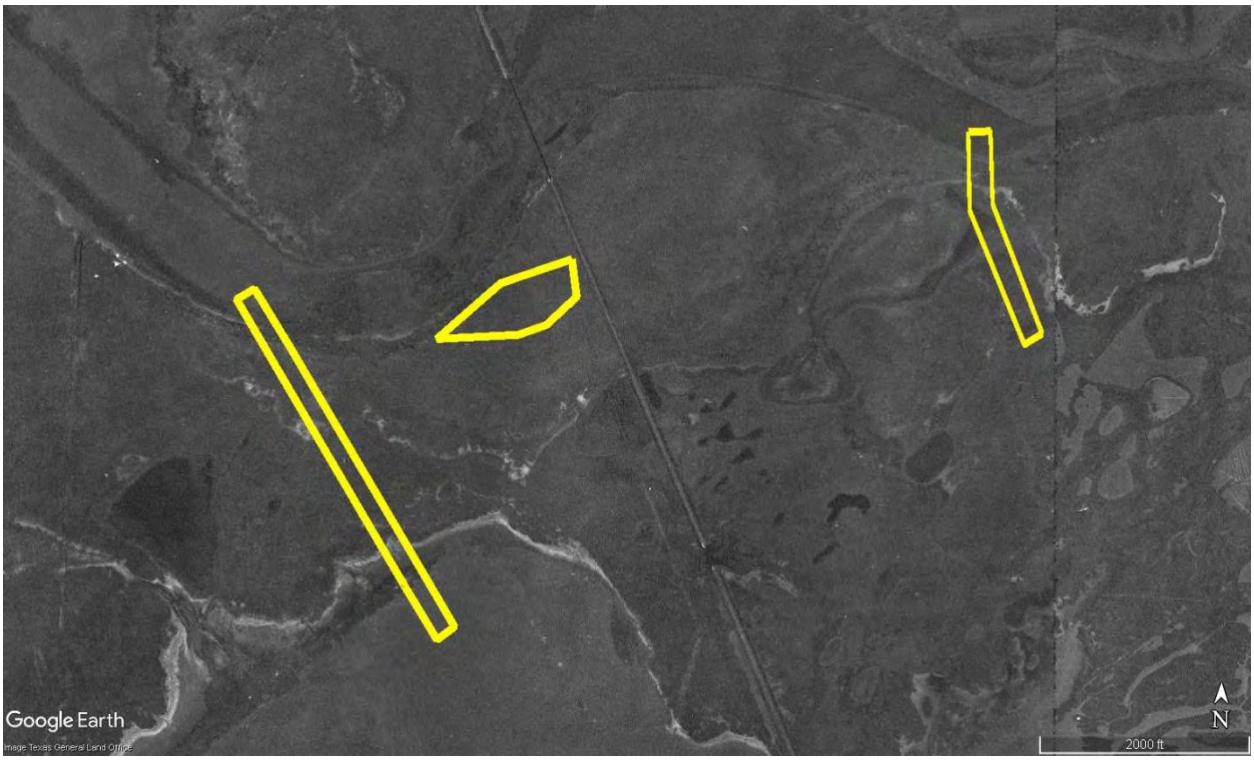


Google Earth, 1956

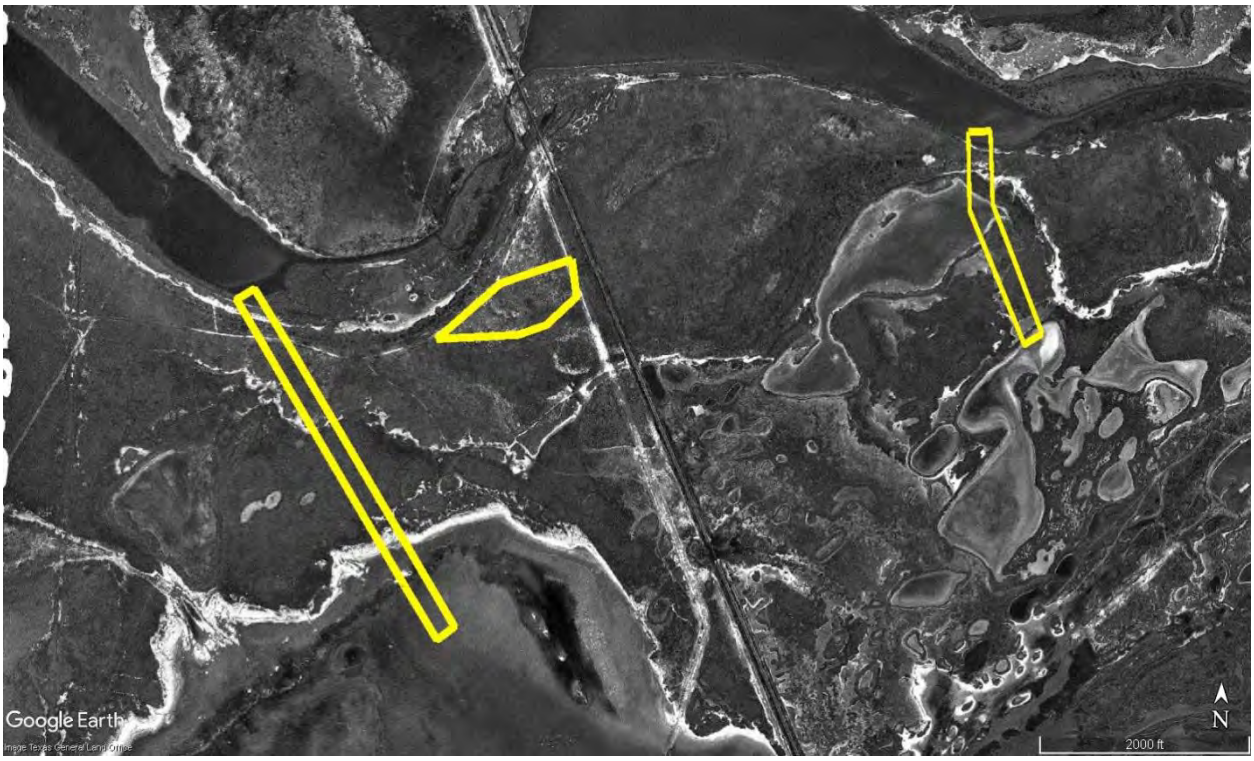


Google Earth, 1961

Google Earth, 1971



Google Earth, 1985



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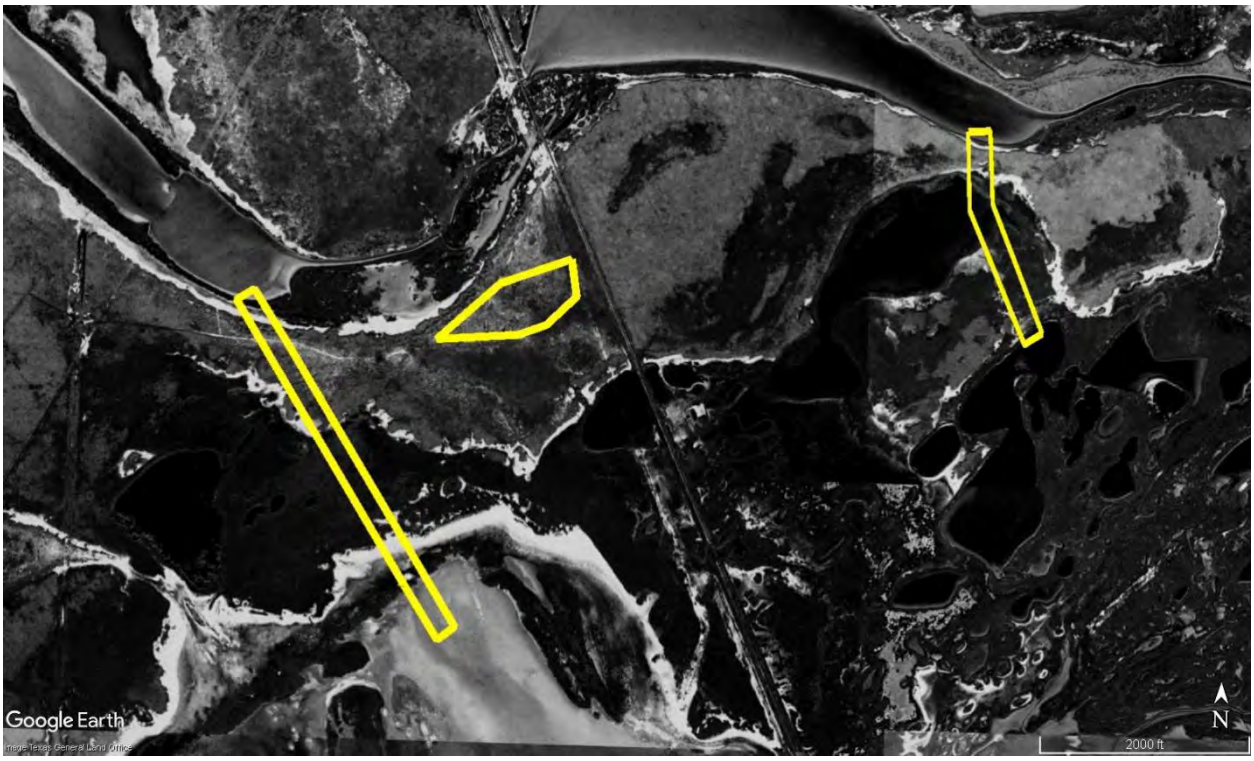
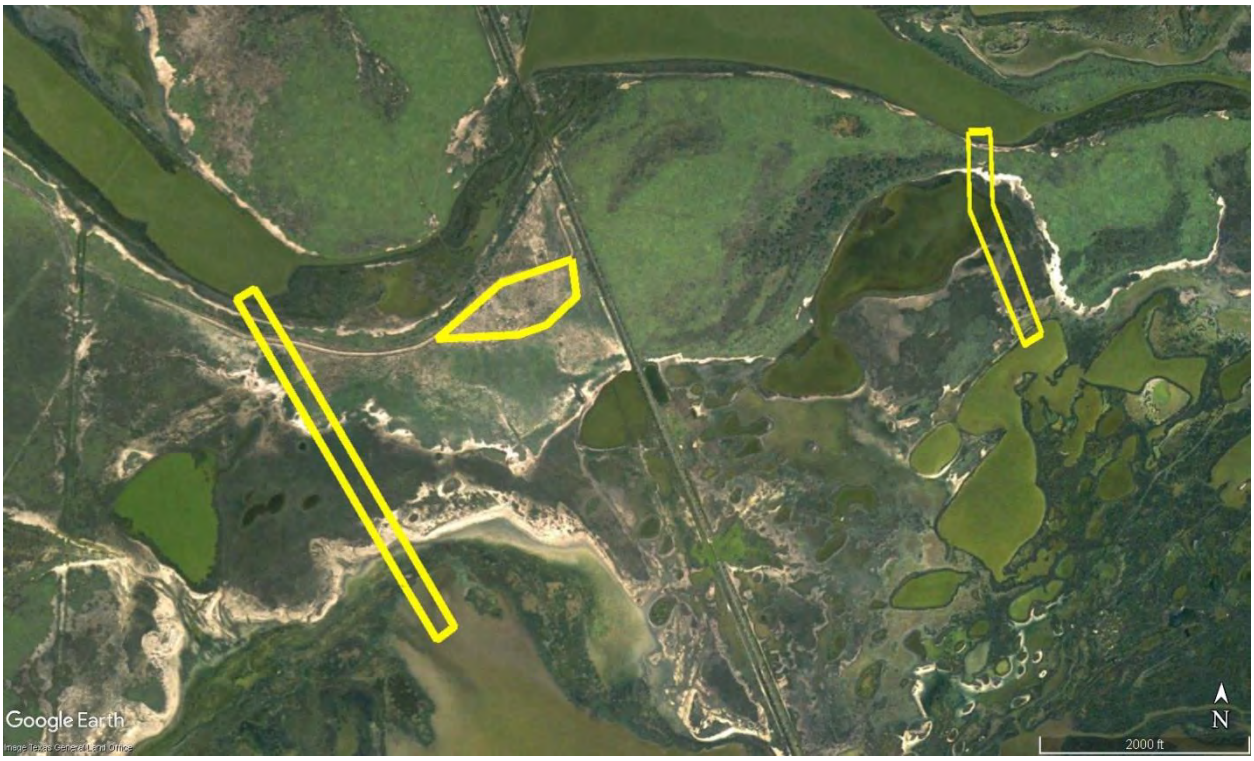


Google Earth, 1995

Google Earth, 2002

Google Earth, 2004



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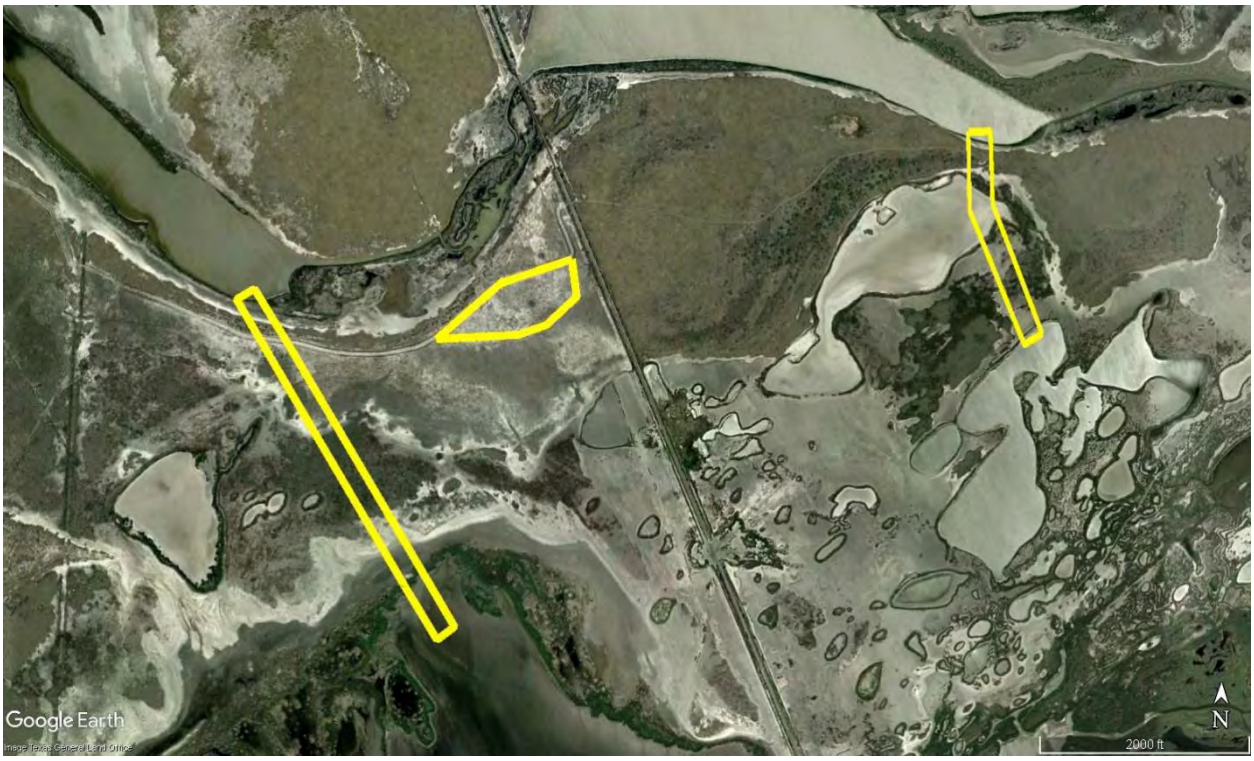
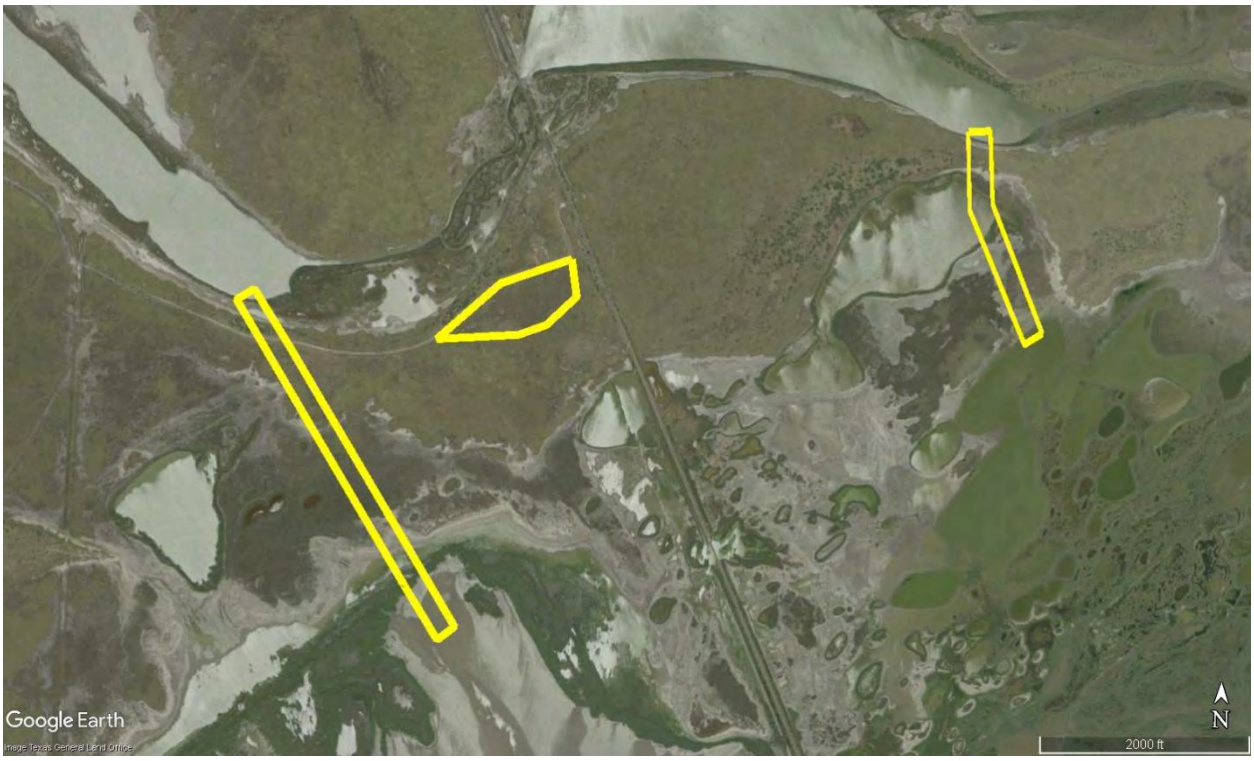
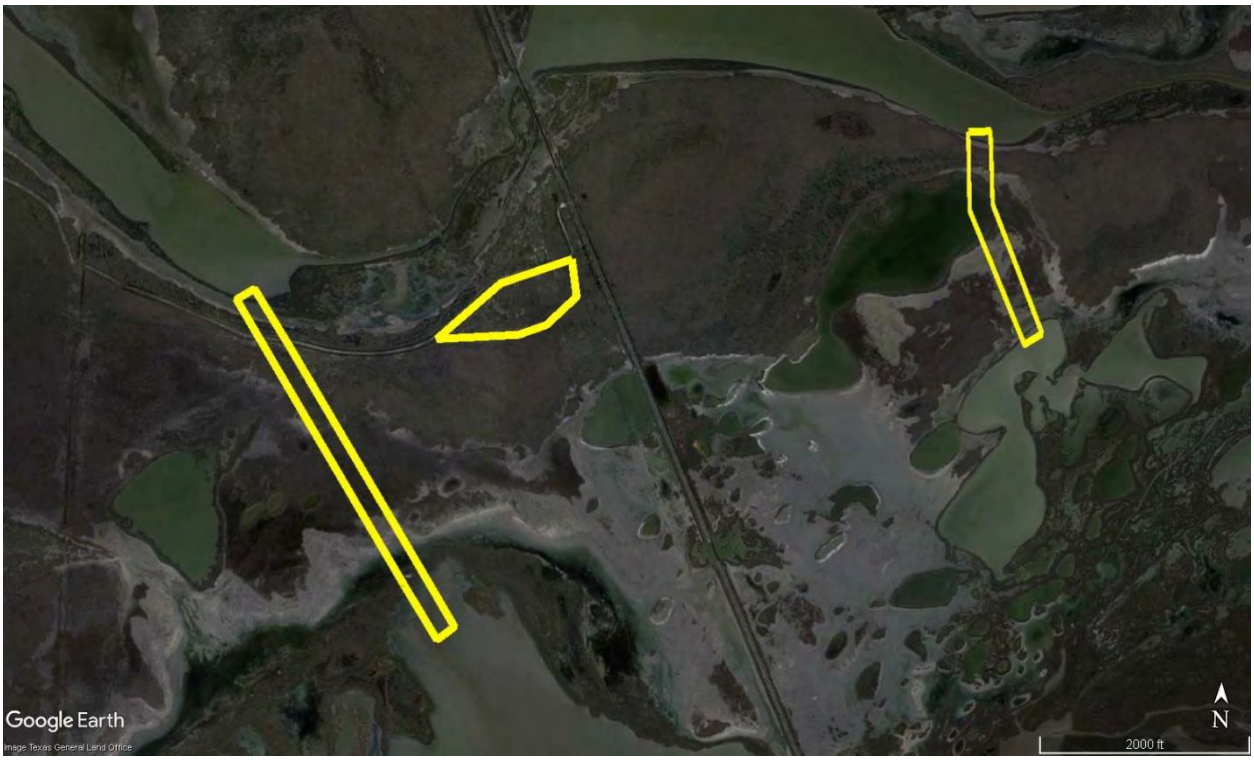


Google Earth, 2006



Google Earth, 2008



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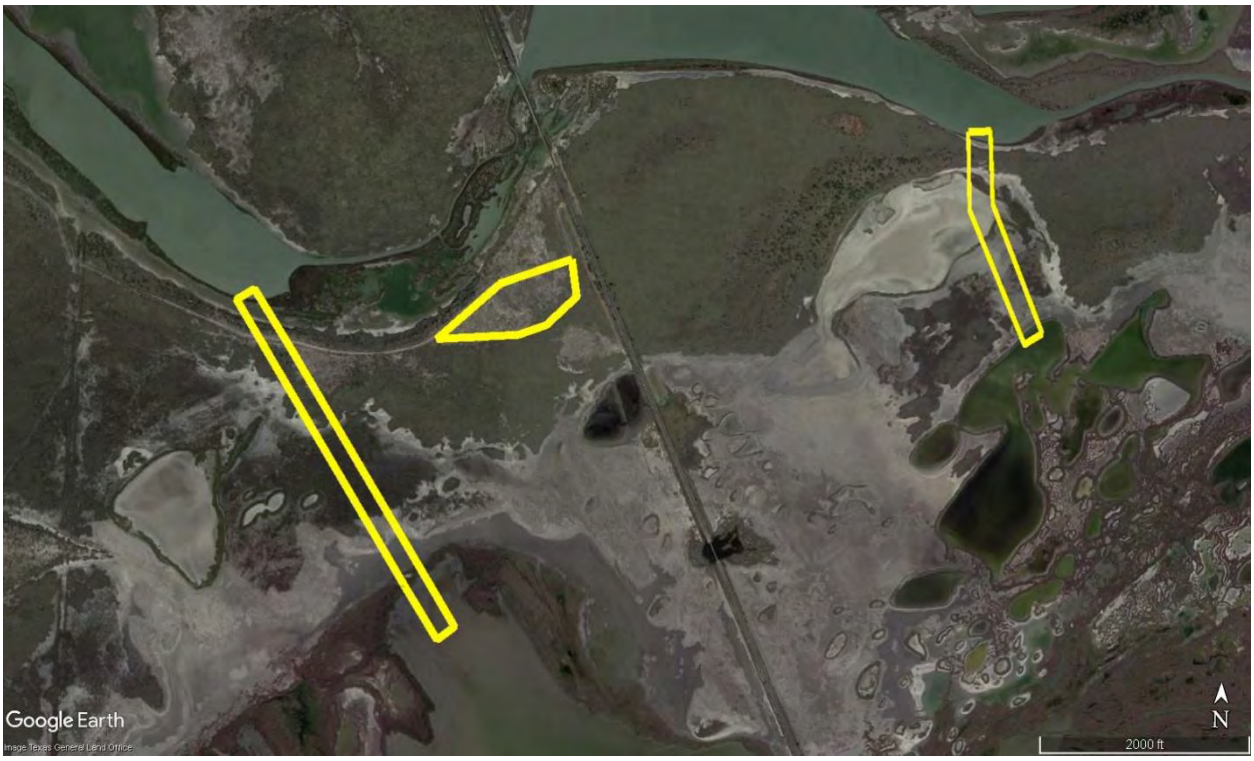
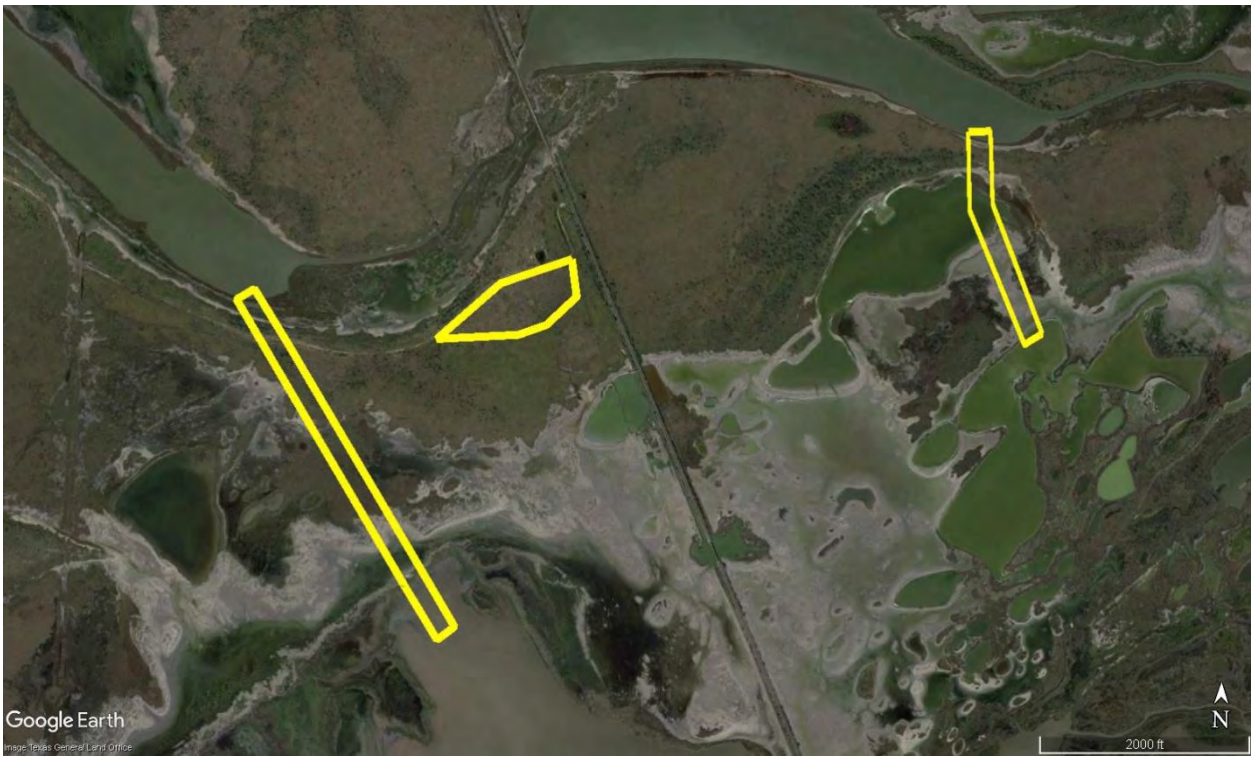
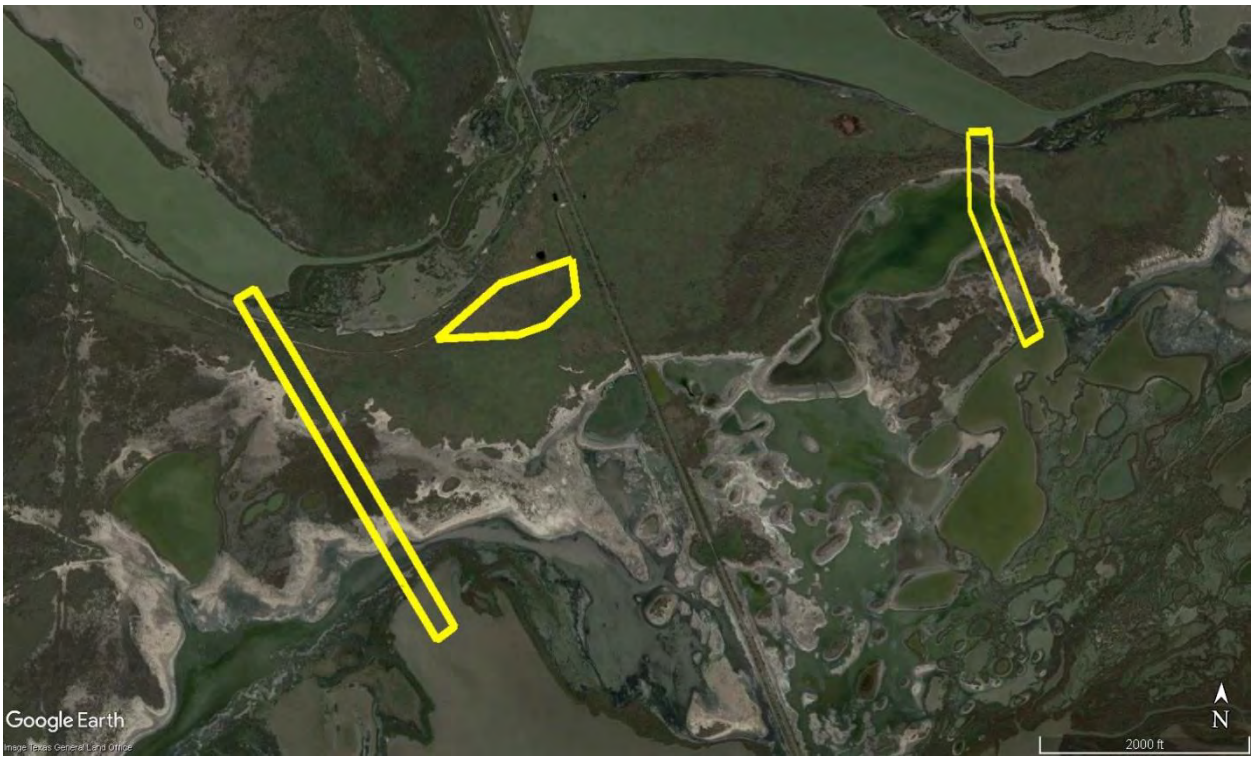


Google Earth, 2011



Google Earth, 2014



Google Earth, 2017

Appendix B. U.S. Fish and Wildlife Service Environmental Conservation Online System (ECOS) Information for Planning and Consultation (IPaC) resource list.

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

San Patricio County, Texas

Local office

Texas Coastal Ecological Services Field Office

(281) 286-8282
(281) 488-5882

17629 El Camino Real #211
Houston, TX 77058

http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.

3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

[1] are managed by the Endangered Species Program of the U.S. Fish and Wildlife Service.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS
Least Tern Sterna antillarum This species only needs to be considered if the following condition applies: • Wind Related Projects Within Migratory Route No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8505	Endangered
Piping Plover Charadrius melodus There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot Calidris canutus rufa No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane Grus americana There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. https://ecos.fws.gov/ecp/species/758	Endangered

Clams

NAME	STATUS
Golden Orb Quadrula aurea No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9042	Candidate

Mammals

NAME	STATUS
Gulf Coast Jaguarundi Herpailurus (=Felis) yagouaroundi cacomitli No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/3945	Endangered
Ocelot Leopardus (=Felis) pardalis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4474	Endangered
West Indian Manatee Trichechus manatus There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. https://ecos.fws.gov/ecp/species/4469	Threatened

Reptiles

NAME	STATUS
Hawksbill Sea Turtle Eretmochelys imbricata There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle Lepidochelys kempii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle Dermochelys coriacea There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. https://ecos.fws.gov/ecp/species/1493	Endangered

Loggerhead Sea Turtle Caretta caretta Threatened

There is a **final** critical habitat designated for this species.
Your location is outside the designated critical habitat.
https://ecos.fws.gov/ecp/species/1110

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act

[1] and the Bald and Golden Eagle Protection Act[2].

Any activity that results in the take (to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct) of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service

[3]. There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

Additional information can be found using the following links:

- Birds of Conservation Concern
  http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php

- Conservation measures for birds
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Year-round bird occurrence data
  http://www.birdscanada.org/birdmon/default/datasummaries.jsp

The migratory birds species listed below are species of particular conservation concern (e.g. Birds of Conservation Concern) that may be potentially affected by activities in this location. It is not a list of every bird species you may find in this location, nor a guarantee that all of the bird species on this list will be found on or near this location. Although it is important to try to avoid and minimize impacts to all birds, special attention should be made to avoid and minimize impacts to birds of priority concern. To view available data on other bird species that may occur in your project area, please visit the AKN Histogram Tools and Other Bird Data Resources. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

NAME	SEASON(S)
American Oystercatcher Haematopus palliatus https://ecos.fws.gov/ecp/species/8935	Year-round
Audubon's Oriole Icterus graduacauda	Year-round
Bald Eagle Haliaeetus leucocephalus https://ecos.fws.gov/ecp/species/1626	Wintering
Black Skimmer Rynchops niger https://ecos.fws.gov/ecp/species/5234	Year-round
Buff-bellied Hummingbird Amazilia yucatanensis	Year-round
Burrowing Owl Athene cunicularia https://ecos.fws.gov/ecp/species/9737	Wintering
Chestnut-collared Longspur Calcarius ornatus	Wintering
Dickcissel Spiza americana	Breeding

Gull-billed Tern Gelochelidon nilotica https://ecos.fws.gov/ecp/species/9501	Year-round
Harris's Sparrow Zonotrichia querula	Wintering
Hudsonian Godwit Limosa haemastica	Migrating
Lark Bunting Calamospiza melanocorys	Wintering
Le Conte's Sparrow Ammodramus leconteii	Wintering
Least Bittern Ixobrychus exilis https://ecos.fws.gov/ecp/species/6175	Breeding
Least Tern Sterna antillarum	Breeding
Lesser Yellowlegs Tringa flavipes https://ecos.fws.gov/ecp/species/9679	Wintering
Loggerhead Shrike Lanius ludovicianus https://ecos.fws.gov/ecp/species/8833	Year-round
Long-billed Curlew Numenius americanus https://ecos.fws.gov/ecp/species/5511	Wintering
Marbled Godwit Limosa fedoa https://ecos.fws.gov/ecp/species/9481	Wintering
Mountain Plover Charadrius montanus https://ecos.fws.gov/ecp/species/3638	Wintering
Peregrine Falcon Falco peregrinus https://ecos.fws.gov/ecp/species/8831	Wintering

Red-headed Woodpecker *Melanerpes erythrocephalus*	Wintering
Reddish Egret *Egretta rufescens* https://ecos.fws.gov/ecp/species/7617	Year-round
Sandwich Tern *Thalasseus sandvicensis*	Year-round
Sedge Wren *Cistothorus platensis*	Wintering
Short-billed Dowitcher *Limnodromus griseus* https://ecos.fws.gov/ecp/species/9480	Wintering
Short-eared Owl *Asio flammeus* https://ecos.fws.gov/ecp/species/9295	Wintering
Snowy Plover *Charadrius alexandrinus*	Breeding
Solitary Sandpiper *Tringa solitaria*	Wintering
Sprague's Pipit *Anthus spragueii* https://ecos.fws.gov/ecp/species/8964	Wintering
Swainson's Warbler *Limnothlypis swainsonii*	Migrating
Whimbrel *Numenius phaeopus* https://ecos.fws.gov/ecp/species/9483	Wintering
White-tailed Hawk *Buteo albicaudatus*	Year-round
Wilson's Plover *Charadrius wilsonia*	Breeding
Worm Eating Warbler *Helmitheros vermivorum*	Migrating

Yellow Rail Coturnicops noveboracensis Wintering
https://ecos.fws.gov/ecp/species/9476

What does IPaC use to generate the list of migratory bird species potentially occurring in my specified location?

Landbirds:

Migratory birds that are displayed on the IPaC species list are based on ranges in the latest edition of the National Geographic Guide, Birds of North America (6th Edition, 2011 by Jon L. Dunn, and Jonathan Alderfer). Although these ranges are coarse in nature, a number of U.S. Fish and Wildlife Service migratory bird biologists agree that these maps are some of the best range maps to date. These ranges were clipped to a specific Bird Conservation Region (BCR) or USFWS Region/Regions, if it was indicated in the 2008 list of Birds of Conservation Concern (BCC) that a species was a BCC species only in a particular Region/Regions. Additional modifications have been made to some ranges based on more local or refined range information and/or information provided by U.S. Fish and Wildlife Service biologists with species expertise. All migratory birds that show in areas on land in IPaC are those that appear in the 2008 Birds of Conservation Concern report.

Atlantic Seabirds:

Ranges in IPaC for birds off the Atlantic coast are derived from species distribution models developed by the National Oceanic and Atmospheric Association (NOAA) National Centers for Coastal Ocean Science (NCCOS) using the best available seabird survey data for the offshore Atlantic Coastal region to date. NOAANCCOS assisted USFWS in developing seasonal species ranges from their models for specific use in IPaC. Some of these birds are not BCC species but were of interest for inclusion because they may occur in high abundance off the coast at different times throughout the year, which potentially makes them more susceptible to certain types of development and activities taking place in that area. For more refined details about the abundance and richness of bird species within your project area off the Atlantic Coast, see the Northeast Ocean Data Portal. The Portal also offers data and information about other types of taxa that may be helpful in your project review.

About the NOAANCCOS models: the models were developed as part of the NOAANCCOS project: Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf. The models resulting from this project are being used in a number of decision-support/mapping products in order to help guide decision-making on activities off the Atlantic Coast with the goal of reducing impacts to migratory birds. One such product is the Northeast Ocean Data Portal, which can be used to explore details about the relative occurrence and abundance of bird species in a particular area off the Atlantic Coast.

All migratory bird range maps within IPaC are continuously being updated as new and better information becomes available.

Can I get additional information about the levels of occurrence in my project area of specific birds or groups of birds listed in IPaC?

Landbirds:

The Avian Knowledge Network (AKN) provides a tool currently called the "Histogram Tool", which draws from the data within the AKN (latest,survey, point count, citizen science datasets) to create a view of relative abundance of species within a particular location over the course of the year. The results of the tool depict the frequency of detection of a species in survey events, averaged between multiple datasets within AKN in a particular week of the year. You may access the histogram tools through the Migratory Bird Programs AKN Histogram Tools webpage.

The tool is currently available for 4 regions (California, Northeast U.S., Southeast U.S. and Midwest), which encompasses the following 32 states: Alabama, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, New York, North, Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia, and Wisconsin.

In the near future, there are plans to expand this tool nationwide within the AKN, and allow the graphs produced to appear with the list of trust resources generated by IPaC, providing you with an additional level of detail about the level of occurrence of the species of particular concern potentially occurring in your project area throughout the course of the year.

Atlantic Seabirds:

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAANCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Facilities

Wildlife refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGES AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

WETLAND INFORMATION IS NOT AVAILABLE AT THIS TIME
This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Appendix C. Texas Parks and Wildlife Department list of threatened, endangered, and rare species for San Patricio County.

SAN PATRICIO COUNTY

AMPHIBIANS		Federal Status	State Status
Black-spotted newt	*Notophthalmus meridionalis*		T

can be found in wet or sometimes wet areas, such as arroyos, canals, ditches, or even shallow depressions; aestivates in the ground during dry periods; Gulf Coastal Plain south of the San Antonio River

Sheep frog	*Hypopachus variolosus*		T

predominantly grassland and savanna; moist sites in arid areas

South Texas siren (large form)	*Siren sp 1*		T

wet or sometimes wet areas, such as arroyos, canals, ditches, or even shallow depressions; aestivates in the ground during dry periods, but does require some moisture to remain; southern Texas south of Balcones Escarpment; breeds February-June

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

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

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	

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

Brown Pelican	*Pelecanus occidentalis*	DL	

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

Eskimo Curlew	*Numenius borealis*	LE	E

historic; nonbreeding: grasslands, pastures, plowed fields, and less frequently, marshes and mudflats

Henslow's Sparrow	*Ammodramus henslowii*		

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

Mountain Plover	*Charadrius montanus*		

breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous

Northern Aplomado Falcon	*Falco femoralis septentrionalis*	LE	E

open country, especially savanna and open woodland, and sometimes in very barren areas; grassy plains and valleys with scattered mesquite, yucca, and cactus; nests in old stick nests of other bird species

SAN PATRICIO COUNTY

BIRDS

		Federal Status	State Status
Peregrine Falcon	*Falco peregrinus*	DL	T

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

Piping Plover	*Charadrius melodus*	LT	T

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

Red Knot	*Calidris canutus rufa*	T	

Red knots migrate long distances in flocks northward through the contiguous United States mainly April-June, southward July-October. A small plump-bodied, short-necked shorebird that in breeding plumage, typically held from May through August, is a distinctive and unique pottery orange color. Its bill is dark, straight and, relative to other shorebirds, short-to-medium in length. After molting in late summer, this species is in a drab gray-and-white non-breeding plumage, typically held from September through April. In the non-breeding plumage, the knot might be confused with the omnipresent Sanderling. During this plumage, look for the knot's prominent pale eyebrow and whitish flanks with dark barring. The Red Knot prefers the shoreline of coast and bays and also uses mudflats during rare inland encounters. Primary prey items include coquina clam (Donax spp.) on beaches and dwarf surf clam (Mulinia lateralis) in bays, at least in the Laguna Madre. Wintering Range includes- Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kennedy, Kleberg, Matagorda, Nueces, San Patricio, and Willacy. Habitat: Primarily seacoasts on tidal flats and beaches, herbaceous wetland, and Tidal flat/shore.

Reddish Egret	*Egretta rufescens*	T

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

Sennett's Hooded Oriole *Icterus cucullatus sennetti*

often builds nests in and of Spanish moss (Tillandsia unioides); feeds on invertebrates, fruit, and nectar; breeding March to August

Snowy Plover *Charadrius alexandrinus*

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

Sooty Tern	*Sterna fuscata*	T

predominately 'on the wing'; does not dive, but snatches small fish and squid with bill as it flies or hovers over water; breeding April-July

Sprague's Pipit *Anthus spragueii*

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

Western Burrowing Owl *Athene cunicularia hypugaea*

open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows

SAN PATRICIO COUNTY

BIRDS

		Federal Status	State Status
Western Snowy Plover	*Charadrius alexandrinus nivosus*		

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

White-faced Ibis	*Plegadis chihi*		T

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

White-tailed Hawk	*Buteo albicaudatus*		T

near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May

Whooping Crane	*Grus americana*	LE	E

potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties

Wood Stork	*Mycteria americana*		T

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

FISHES

		Federal Status	State Status
American eel	*Anguilla rostrata*		

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

Opossum pipefish	*Microphis brachyurus*		T

brooding adults found in fresh or low salinity waters and young move or are carried into more saline waters after birth; southern coastal areas

Smalltooth sawfish	*Pristis pectinata*	LE	E

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

Texas pipefish *Syngnathus affinis*

Corpus Christi Bay; seagrass beds

SAN PATRICIO COUNTY

INSECTS

		Federal Status	State Status
Manfreda giant-skipper	*Stallingsia maculosus*		

most skippers are small and stout-bodied; name derives from fast, erratic flight; at rest most skippers hold front and hind wings at different angles; skipper larvae are smooth, with the head and neck constricted; skipper larvae usually feed inside a leaf shelter and pupate in a cocoon made of leaves fastened together with silk

MAMMALS

		Federal Status	State Status
Jaguarundi	*Herpailurus yaguarondi*	LE	E

thick brushlands, near water favored; 60 to 75 day gestation, young born sometimes twice per year in March and August, elsewhere the beginning of the rainy season and end of the dry season

Ocelot	*Leopardus pardalis*	LE	E

dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November

Plains spotted skunk	*Spilogale putorius interrupta*		

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

Red wolf	*Canis rufus*	LE	E

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

Southern yellow bat	*Lasiurus ega*		T

associated with trees, such as palm trees (Sabal mexicana) in Brownsville, which provide them with daytime roosts; insectivorous; breeding in late winter

West Indian manatee	*Trichechus manatus*	LE	E

Gulf and bay system; opportunistic, aquatic herbivore

White-nosed coati	*Nasua narica*		T

woodlands, riparian corridors and canyons; most individuals in Texas probably transients from Mexico; diurnal and crepuscular; very sociable; forages on ground and in trees; omnivorous; may be susceptible to hunting, trapping, and pet trade

MOLLUSKS

		Federal Status	State Status
Golden orb	*Quadrula aurea*	C	T

sand and gravel in some locations and mud at others; found in lentic and lotic; Guadalupe, San Antonio, Lower San Marcos, and Nueces River basins

SAN PATRICIO COUNTY

REPTILES

		Federal Status	State Status
Atlantic hawksbill sea turtle	*Eretmochelys imbricata*	LE	E

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

Green sea turtle	*Chelonia mydas*	LT	T

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

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

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

Leatherback sea turtle	*Dermochelys coriacea*	LE	E

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

Loggerhead sea turtle	*Caretta caretta*	LT	T

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

Spot-tailed earless lizard *Holbrookia lacerata*

central and southern Texas and adjacent Mexico; moderately open prairie-brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas; eats small invertebrates; eggs laid underground

Texas diamondback terrapin *Malaclemys terrapin littoralis*

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

Texas horned lizard	*Phrynosoma cornutum*	T

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

Texas indigo snake	*Drymarchon melanurus erebennus*	T

Texas south of the Guadalupe River and Balcones Escarpment; thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands if not molested or indirectly poisoned; requires moist microhabitats, such as rodent burrows, for shelter

Texas scarlet snake	*Cemophora coccinea lineri*	T

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

SAN PATRICIO COUNTY

REPTILES

Federal Status State Status

Texas tortoise *Gopherus berlandieri* T

open brush with a grass understory is preferred; open grass and bare ground are avoided; when inactive occupies shallow depressions at base of bush or cactus, sometimes in underground burrows or under objects; longevity greater than 50 years; active March-November; breeds April-November

Timber rattlesnake *Crotalus horridus* T

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

PLANTS

Federal Status State Status

Arrowleaf milkvine *Matelea sagittifolia*

GLOBAL RANK: G3 ; Most consistently encountered in thornscrub in South Texas; Perennial; Flowering March-July; Fruiting April-July & Dec?

Coastal gay-feather *Liatris bracteata*

Texas endemic; coastal prairie grasslands of various types, from salty prairie on low- lying somewhat saline clay loams to upland prairie on nonsaline clayey to sandy loams; flowering in fall

Drummond's rushpea *Hoffmannseggia drummondii*

GLOBAL RANK: G4; Open areas on sandy clay; Perennial

Elmendorf's onion *Allium elmendorfii*

Texas endemic; grassland openings in oak woodlands on deep, loose, well-drained sands; in Coastal Bend, on Pleistocene barrier island ridges and Holocene Sand Sheet that support live oak woodlands; to the north it occurs in post oak-black hickory-live oak woodlands over Queen City and similar Eocene formations; one anomalous specimen found on Llano Uplift in wet pockets of granitic loam; Perennial; Flowering March-April, May

Indianola beakrush *Rhynchospora indianolensis*

GLOBAL RANK: G3Q; Locally abundant in cattle pastures in some areas (at least during wet years), possibly becoming a management problem in such sites; Perennial; Flowering/Fruiting April-Nov

Large selenia *Selenia grandis*

GLOBAL RANK: G4; Occurs in seasonally wet clayey soils in open areas; Annual; Flowering Jan-April; Fruiting Feb-April

Low spurge *Euphorbia peplidion*

GLOBAL RANK: G3; Occurs in a variety of vernally-moist situations in a number of natural regions; Annual; Flowering Feb-April; Fruiting March-April

Net-leaf bundleflower *Desmanthus reticulatus*

GLOBAL RANK: G3; Mostly on clay prairies of the coastal plain of central and south Texas; Perennial; Flowering April-July; Fruiting April-Oct

SAN PATRICIO COUNTY

PLANTS

Federal Status State Status

Plains gumweed *Grindelia oolepis*

coastal prairies on heavy clay (blackland) soils, often in depressional areas, sometimes persisting in areas where management (mowing) may maintain or mimic natural prairie disturbance regimes; 'crawfish lands'; on nearly level Victoria clay, Edroy clay, claypan, possibly Greta within Orelia fine sandy loam over the Beaumont Formation, and Harlingen clay; roadsides, railroad rights-of-ways, vacant lots in urban areas, cemeteries; flowering April-December

Refugio rain-lily *Zephyranthes refugiensis*

Occurs on deep heavy black clay soils or sandy loams in swales or drainages on herbaceous grasslands or shrublands on level to rolling landscapes underlain by the Lissie Formation.

Sand Brazos mint *Brazoria arenaria*

GLOBAL RANK: G3; Sandy areas in South Texas; Annual; Flowering/Fruiting March-April

South Texas spikesedge *Eleocharis austrotexana*

GLOBAL RANK: G3; Occurring in miscellaneous wetlands at scattered locations on the coastal plain; Perennial; Flowering/Fruiting Sept

Texas peachbush *Prunus texana*

GLOBAL RANK: G3; Occurs at scattered sites in various well drained sandy situations; deep sand, plains and sand hills, grasslands, oak woods, 0-200 m elevation; Perennial; Flowering Feb-Mar; Fruiting Apr-Jun

Texas stonecrop *Lenophyllum texanum*

GLOBAL RANK: G3; Found in shrublands on clay dunes (lomas) at the mouth of the Rio Grande and on xeric calcareous rock outcrops at scattered inland sites; Perennial; Flowering/Fruiting Nov-Feb

Threeflower broomweed *Thurovia triflora*

Texas endemic; near coast in sparse, low vegetation on a veneer of light colored silt or fine sand over saline clay along drier upper margins of ecotone between between salty prairies and tidal flats; further inland associated with vegetated slick spots on prairie mima mounds; flowering September-November

Tree dodder *Cuscuta exaltata*

GLOBAL RANK: G3; Parasitic on various Quercus, Juglans, Rhus, Vitis, Ulmus, and Diospyros species as well as Acacia berlandieri and other woody plants; Annual; Flowering May-Oct; Fruiting July-Oct

Velvet spurge *Euphorbia innocua*

GLOBAL RANK: G3; Open or brushy areas on coastal sands and the South Texas Sand Sheet; Perennial; Flowering Sept-April; Fruiting Nov-July

Welder machaeranthera *Psilactis heterocarpa*

Texas endemic; grasslands , varying from midgrass coastal prairies, and open mesquite-huisache woodlands on nearly level, gray to dark gray clayey to silty soils; known locations mapped on Victoria clay, Edroy clay, Dacosta sandy clay loam over Beaumont and Lissie formations; flowering September-November

Wright's trichocoronis *Trichocoronis wrightii var. wrightii*

SAN PATRICIO COUNTY

PLANTS	Federal Status	State Status

GLOBAL RANK: G4T3; Most records from Texas are historical, perhaps indicating a decline as a result of alteration of wetland habitats; Annual; Flowering Feb-Oct; Fruiting Feb-Sept

Appendix D. Federal, State, and Globally-Ranked species in San Patricio County, Texas that could potentially occur within or near the Nueces Delta Landform Modification project site.

Species	Federal Status	State Status	Global Rank	Description of Suitable Habitat	Occurrence Potential
AMPHIBIANS					
Black-spotted newt *Notophthalmus meridionalis*		T		Permanent and temporary ponds, roadside ditches, drainages, and shallow depressions in deep, poorly drained, clayey soils with slow permeability; not found in water bodies with predatory fish or high salinities; optimal habitat is intact Tamaulipan thorn forest in clayey soils with ephemeral wetlands.	Although optimal habitat is not present, could potentially (though not likely) occur within the prairie shrubland areas. These newts are limited to terrestrial and freshwater systems; therefore, the area's elevated soil and water salinities may preclude their occurrence in some area of the Nueces Delta.
Sheep Frog *Hypopachus variolosus*		T		Found in moist subterranean burrows (such as those of pack rats) in open coastal woodlands or pasturelands with abundant short-grass cover; utilize hollows under fallen trees and other woody debris. Mesic areas are unsuitable.	Could potentially (though not likely) occur in vegetative debris associated with prairie shrublands and in shortgrass prairie habitats.
South Texas Siren *Siren* sp. 1		T		Muddy, vegetated, freshwater; permanent and temporary wetlands including canals, ditches, and ponds; utilizes rocks, thick vegetation, and logs	Suitable habitat not present (primarily due to elevated salinities), therefore, not likely to occur in the project area.
BIRDS					
American Peregrine Falcon *Falco peregrinus*	DL	T		Winters along the Gulf coast and farther south; concentrations found along the coast and barrier islands; known to use power poles, towers, tanks and other tall structures as perch sites	This falcon prefers the coast with extensive concentrations occurring on the barrier islands. Although the peregrine falcon is closely associated with barrier islands, it could potentially occur in the project area during winter months.
Brown Pelican *Pelecanus occidentalis*	DL			Largely coastal; roosts and nests on islands and spoil banks	Suitable habitat is present, therefore, likely to occur in deeper open water habitats.
Eskimo Curlew *Numenius borealis*	LE	E		Historic; grasslands, pastures, plowed fields, and less frequently marshes and mudflats	Historic; not likely to occur.

Henslow's Sparrow *Ammodramus henslowii*				Wintering individuals found in weedy fields or cut-over areas containing a lot of bunch grasses, vines, and brambles. A key component is bare ground for running/walking.	Suitable habitat not present; therefore, not likely to occur in the project area
Least Tern (Interior Population) *Sterna antillarum*	LE			Nests on sparsely vegetated sand, shell, and gravel inland beaches along the Mississippi, Colorado, and other rivers; also nests along large inland reservoirs; winters along the coasts of Central and South America; in Texas, their historic range includes the entire state except for the coast and a 50-mile zone inland from the coast.	The federally-listed least tern is the interior least tern, which is different than the coastal least tern. The interior least tern occurs 50 miles and more inland. Due to the Delta's close proximity to the coast, the interior least tern is not technically listed for this area (USFWS, pers. comm. 2017).
Mountain Plover *Charadrius montanus*				Shortgrass plains and bare, dirt (plowed) fields, bermudagrass fields, heavily grazed annual grasslands, coastal prairies, alkaline flats, and even burned fields; winters in Texas	Although optimal habitat is not present, could potentially occur in the project area during winter.
Northern Aplomado Falcon *Falco femoralis septentrionalis*	LE	E		Year-round resident, large open unfragmented grasslands, savannas, pastures and shrub-steppes where there is an abundance of prey such as songbirds, bats, and insects. Self-sustained breeding populations currently exist at Laguna Atascosa and San Jose/Matagorda Islands. Individuals have recently been observed feeding and attempting to nest on Mustang and North Padre Islands.	According to the USFWS, the Nueces Delta appears to contain suitable habitat for the northern aplomado falcon. These falcons were sighted at Hazel Bazemore Park a few years ago during a Hawk Watch event. This park is located approximately 3 miles southwest of the project site. The USFWS hopes to establish a few pairs of aplomado falcons at or near Hazel Bazemore Park in the future.

Piping Plover *Charadrius melodus*	LT	T		Winter migrant along the Texas Gulf Coast; beaches and bayside mud and salt flats	Suitable habitat not present; therefore, not likely to occur in the project area. The piping plover is dependent upon the Gulf beach and bayside tidal flats for foraging and loafing. Close proximity to the Gulf beach is essential to this plover.
Red Knot *Calidris canutus rufa*	LT			Migrates southward July-October; primarily sea coasts on tidal flats and beaches, also utilizes herbaceous wetlands	Optimal habitat not present; therefore, not likely to occur in the project area. The red knot utilizes coastal beach and bay shorelines feeding primarily on small clams. This shorebird is, however, known to use mudflats during rare inland encounters.
Reddish Egret *Egretta rufescens*		T		Resident of the Texas Gulf Coast; brackish marshes and shallow salt ponds and tidal flats	Suitable habitat present, therefore, likely to occur in the project area.
Sennett's Hooded Oriole *Icterus cucullatus sennetti*				Woodlands; often builds nests in and of Spanish moss	Suitable habitat not present; therefore, not likely to occur in the project area. May occur as a pass-through migrant.
Snowy Plover *Charadrius alexandrinus*				Winters along the coast; beaches and bayside mud or salt flats	Suitable habitat present; likely to occur in the project area. Winters locally, known to nest in the general project area. The snowy plover was also formerly a fairly common nester in the Nueces Delta.
Sooty Tern *Sterna fuscata*		T		Forages by dipping down while in flight and snatching up small fish and squid from shallow waters; pelagic birds that only come ashore to breed/nest	Optimal habitat not present, however, could potentially occur in the project area.

Sprague's Pipit *Anthus spragueii*				Only in Texas during migration and winter; strongly tied to native upland prairies, can be locally common in coastal grasslands	Suitable habitat (coastal grasslands) present, therefore, likely to occur in the project area. This species has been observed within the Nueces Delta.
Western Burrowing Owl *Athene cunicularia hypugaea*				Open grasslands, especially prairies, plains, and savannas; sometimes in open areas such as bare fields, plowed fields, and vacant lots; depends upon daytime roosts for survival; roosts in abandoned burrows, road culverts, or crevices between rocks or other debris in open areas	Optimal habitat not present; however, could potentially occur in the project area if roost sites, such as road culverts and rubble piles are present and if predator perches (such as shrubs and trees) are absent.
Western Snowy Plover *Charadrius alexandrinus nivosus*				Potential migrant; beaches and bayside mud and salt flats; winters along the coast	Suitable habitat not present, therefore, not likely to occur in the project area.
White-Faced Ibis *Plegadis chihi*		T		Prefers freshwater marshes but also uses brackish and saltwater habitats; nests in marshes on the ground in bulrushes or reeds	Suitable habitat present, therefore, likely to occur in the project area particularly during wet years.
White-Tailed Hawk *Buteo albicaudatus*		T		Near the coast on prairies and cordgrass flats; nests in short trees and shrubs in disturbed grasslands	Suitable habitat present, therefore, likely to occur in the project area. This hawk has been observed nesting within the Nueces Delta.

Whooping Crane *Grus americana*	LE	E		Migrant via the plains throughout most of Texas south to the coast; wintering birds use brackish bays, marshes, and salt flats; forage on blue crabs, clams, and wolfberry plants	Optimal habitat not present; therefore, not likely to occur in the project area. This crane winters almost exclusively in the coastal areas of Aransas, Refugio, and Calhoun counties; however, it is possible that the project site could potentially be utilized during migration.
Wood Stork *Mycteria americana*		T		Forages in prairie ponds and other shallow standing water, including salt water	Suitable habitat is present, therefore, likely to occur in the project area year-round.
FISHES					
American Eel *Anguilla rostrata*				Spawns January to February in the ocean; larva move to coastal waters, then females move into freshwater; uses most aquatic habitats with access to the ocean including muddy bottoms, still waters, large streams; can travel overland in wet areas; males occur in brackish estuaries	Suitable habitat not present; the Calallen salt water barrier prevents coastal aquatic organisms from migrating further inland (upstream) via the Nueces River. The distance between the project site and the Gulf is too great to expect this eel to migrate inland via the Delta.
Opossum Pipefish *Microphis brachyurus*		T		Brooding adults found in fresh or low salinity waters; young move or are carried into more saline waters after birth; southern coastal areas	Suitable habitat not present.
Smalltooth Sawfish *Pristis pectinata*	LE	E		Young found very close to shore in muddy and sandy bottoms, in sheltered bays, on shallow banks, and in estuaries or river mouths; adults are encountered in mangrove, reef, seagrass, and coral habitats	Suitable habitat not present; the Calallen salt water barrier prevents coastal aquatic organisms from migrating further upstream (inland).
Texas Pipefish *Syngnathus affinis*				Estuarine seagrass beds.	Suitable habitat not present.
INSECTS					

Manfreda Giant-skipper *Stallingsia maculosus*				Subtropical thorn and pine forests of South Texas and Mexico.	Suitable habitat not present.
MAMMALS					
Jaguar *Panthera onca*	LE	E		Extirpated; dense chaparral, no reliable Texas sightings since 1952	Extirpated
Gulf Coast Jaguarundi *Herpailurus yagouaroundi cacomitti*	LE	E		Dense impenetrable thornscrub and brushlands in the lower Rio Grande Valley; near water favored	Suitable habitat not present; therefore, not likely to occur in the project area.
Ocelot *Leopardus pardalis*	LE	E		Dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; optimal woodland habitat contains a shrub canopy cover of at least 95%	Suitable habitat not present; therefore, not likely to occur in the project area
Plains Spotted Skunk *Spilogale putorius interrupta*				Prefers native woodland and tallgrass prairie habitats but will modify its habitat preferences (where there is an abundance of food) to include croplands, farmyards, barns, brush piles, etc.; will den under buildings, in attics, and in a variety of underground burrows	Suitable habitat not present; however, could potentially occur in the project area if habitat features such as brush and debris piles are present.
Red Wolf *Canis rufus*	LE	E		Extirpated; formerly known throughout the eastern half of Texas in brushy and forested areas as well as coastal prairies	Extirpated

Southern Yellow Bat *Lasiurus ega*		T		Roosts primarily beneath the hanging dead fronds of palm trees year-round; known from Cameron, Kleberg, and Nueces counties	Suitable habitat not present, therefore, not likely to occur in the project area.
West Indian Manatee *Trichechus manatus*	LE	E		Gulf and bay; opportunistic; aquatic herbivore	Suitable habitat not present.
White-Nosed Coati *Nasua narica*		T		Woodlands, riparian corridors and canyons; diurnal and crepuscular	Suitable habitat not present; therefore, not likely to occur in the project area
MOLLUSKS					
Golden Orb *Quadrula aurea*	C	T		Sand and gravel in some locations and mud in others; found in lentic and lotic areas of the Guadalupe, San Antonio, Lower San Marcos, and Nueces River basins.	Suitable habitat not present. Existing and historic golden orb populations are located significantly further inland within Live Oak County.
REPTILES					
Atlantic Hawksbill Sea Turtle *Eretmochelys imbricata*	LE	E		Gulf and bay waters; juveniles found in floating mats of sea plants; inhabits shallow coastal areas, lagoons, and coral reefs in tropical and subtropical seas.	Suitable habitat not present.
Green Sea Turtle *Chelonia mydas*	LT	T		Gulf and bay waters; shallow water seagrass beds, barrier island beaches	Suitable habitat not present.

Kemp's Ridley Sea Turtle *Lepidochelys kempii*	LE	E		Gulf and bay waters; adults stay within the shallow waters of the Gulf of Mexico	Suitable habitat not present.
Leatherback Sea Turtle *Dermochelys coriacea*	LE	E		Gulf and bay waters; pelagic, prefers open oceans and moves into coastal waters only during the reproductive season	Suitable habitat not present.
Loggerhead Sea Turtle *Caretta caretta*	LT	T		Gulf and bay waters primarily for juveniles; adults are the most pelagic of the sea turtles	Suitable habitat not present.
Spot-Tailed Earless Lizard *Holbrookia lacerata*				Prefers rocky desert flats and areas with sparse vegetation or open mesquite-prickly pear associations. Found on a variety of soil types, though never on pure sand. Needs open flat areas free of vegetation or other obstructions.	Suitable habitat, such as graded roads, open chaparral shrublands and prairie-brushlands may be present; therefore, could potentially occur in the project area.
Texas Diamondback Terrapin *Malaclemys terrapin littoralis*				Coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier island beaches; brackish and salt water; burrows in the mud when inactive.	Suitable habitat present; therefore, likely to occur in the project area. The Nueces Delta historically contained high numbers of terrapins; however, elevated salinities in the Delta have limited their occurrences. Would not occur in areas that are dried up, but could be present in wet years when the marshes are flooded.

Texas Horned Lizard *Phrynosoma cornutum*		T		Open, arid and semi-arid areas with sparse vegetation including grass, cacti, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into the soil, enters rodent burrows; hides under rocks when inactive.	Although optimal habitat is not present, these lizards are known to adapt to a wide range of conditions provided that there is an abundance of harvester ants. Therefore, could potentially (though not likely) occur in the project area.
Texas Indigo Snake *Drymarchon melanurus erebennus*		T		Thornbrush-chaparral woodlands of South Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands as well; requires moist microhabitats such as rodent burrows for shelter	Suitable habitat not present; not likely to occur within or near the project area
Texas Scarlet Snake *Cemophora coccinea lineri*		T		Mixed hardwood scrub on sandy soils	Suitable habitat not present.
Texas Tortoise *Gopherus berlandieri*		T		Open brush with a grass understory is preferred; open grass and bare ground are avoided; when inactive, occupies shallow depressions at the base of shrubs or cacti	Optimal habitat not present; however, could potentially occur in areas containing open scrub and brushlands.
Timber Rattlesnake *Crotalus horridus*		T		Prefer moist lowland forests and hilly woodlands or thickets near permanent water sources. Prefers dense ground cover such as grapevines or palmetto.	Suitable habitat not present.
PLANTS					
Arrowleaf Milkvine *Matelea sagittifolia*			G3	Most consistently encountered in South Texas thornscrub; found in brushy pastures on dry sand or caliche; clay soils on dry gravelly hills. Known from north and southwest of Mathis, and southeast of Ricardo.	Optimal habitat not present; therefore, not likely to occur in the project area

Coastal Gay-Feather *Liatris bracteata*				Coastal prairie grasslands of various types, from salty prairie on low-lying somewhat saline clay loams to upland prairie on non-saline clayey to sandy loams. Known from north of Tivoli, northwest of Austwell, and south of Gregory.	Suitable habitat may be present; therefore, could potentially occur in the project area.
Drummond's Rushpea *Hoffmannseggia drummondii*			G4	Open areas on sandy clay.	Suitable habitat may be present; therefore, could potentially occur in the project area.
Elmendorf's Onion *Allium elmendorfii*				Grassland openings in oak woodlands on deep, loose, well-drained sands. Known from around Mathis, south of Odem, west of Flour Bluff, Welder Refuge, and along the Aransas River in Refugio County.	Suitable habitat not present; therefore, not expected to occur in the project area
Indianola Beakrush *Rhynchospora indianolensis*			G3Q	Locally abundant in swales, ditches, and other low grounds on sand or clay. Occurs in wet areas of coastal prairies and marshes. Often occurs in disturbed sites such as roadside ditches. Known from south of Goliad, east of Refugio, Welder Refuge, northwest of Rockport, and northeast of Ingleside.	Suitable habitat may be present; therefore, could potentially occur in the project area.
Large Selenia *Selenia grandis*			G4	Occurs in seasonally wet clayey soil in open areas. Known from open floodplains along the Nueces River.	Suitable habitat may be present; therefore, could potentially occur in the project area.

Low Spurge *Euphorbia peplidion*			G3	Occurs in a variety of vernally-moist situations in a number of natural regions. Frequent in well-drained sandy prairies and openings.	Suitable habitat may be present; therefore, could potentially occur in the project area.
Net-Leaf Bundleflower *Desmanthus reticulatus*			G3	Mostly on clay prairies of the coastal plain of central and south Texas. Frequent on various soils in pasture openings.	Suitable habitat may be present; therefore, could potentially occur in the project area.
Plains Gumweed *Grindelia oolepis*				Coastal prairies on heavy clay (blackland) soils, often in depressional areas (crawfish lands); on sandy loam or clay, usually in swales and other low grounds. Also found within roadsides, railroad rights-of-ways, vacant lots in urban areas, and cemeteries.	Suitable habitat may be present; therefore, could potentially occur in the project area.
Refugio Rain-Lily *Zephyranthes refugiensis*				Occurs on deep heavy black clay soils or sandy loams in swales or drainages on herbaceous grasslands or shrublands on level to rolling landscapes. Occurring mostly in sandy swales around Refugio; also known from south of Goliad and east San Patricio County.	Optimal habitat not present; therefore, not likely to occur in the project area.
Sand Brazos Mint *Brazoria arenaria*			G3	Occurring on deep sand in openings or prairies; known from Aransas Refuge, south of Ingleside, west of Flour Bluff, King Ranch, and south and west of Riviera.	Suitable habitat not present; therefore, not expected to occur in the project area.

South Texas Spikesedge *Eleocharis austrotexana*			G3	Occurring in miscellaneous wetlands at scattered locations on the coastal plain; locally abundant on clay or heavier sands in swales and other poorly drained grounds. Known from King Ranch, west of Corpus Christi, south of Taft, southeast of Gregory, and the Welder Refuge.	Suitable habitat may be present; therefore, could potentially occur in the project area.
Texas Peachbush *Prunus texana*			G3	Shrub occurring in deep sands in openings in prairies, plains, sand hills, grasslands, and oak woodlands; known from Goose Island State Park, Welder Refuge, south of Odem, south of Edroy, west of Flour Bluff, along Cadena Creek in Goliad County, northwest of Woodsboro, and northeast of Refugio.	Optimal habitat not present; therefore, not likely to occur in the project area.
Texas Stonecrop *Lenophyllum texanum*			G3	Found in shrublands on clay dunes (lomas); clay or sandy loams in brushy pastures, usually in the shade; known from west of Corpus Christi and east of Calallen.	Suitable habitat not present; therefore, not expected to occur in the project area.
Threeflower Broomweed *Thurovia triflora*				Coastal prairie grasslands, in sparsely vegetated spots with clayey to silty, occasionally somewhat saline soils. Clay soils, less commonly sandy loams; coastal flats and shallow banks, upper margins of ecotone between salty prairies and tidal flats. Known to occur on the Greta Ranch in Refugio County.	Suitable habitat is present and many of the threeflower broomweed's associate species (Gulf cordgrass, sea ox-eye daisy, wolfberry, sea lavender, glasswort, shoregrass, and prickly pear) were observed at the project location. Therefore, the threeflower broomweed could potentially occur in the project area.

Tree Dodder *Cuscuta exaltata*			G3	Although tree dodder is a parasitic vine on various plants such as *Rhus* (dewberry), *Vitis* (grapevine), *Ulmus* (elm) and *Diospyros* (persimmon) it is primarily associated with southern live oak and red bay. Found in coastal woodlands from the Aransas Refuge to Flour Bluff.	Suitable habitat not present; therefore, not expected to occur in the project area.
Velvet Spurge *Euphorbia innocua*			G3	Open or brushy areas on coastal sands and the South Texas Sand Sheet; frequent on deep sands in openings, prairies, and island dunes.	Suitable habitat not present; therefore, not expected to occur in the project area.
Welder machaeranthera *Psilactis heterocarpa*				Varying from midgrass coastal prairies to open mesquite-huisache woodlands on nearly level clayey to silty soils.	Suitable habitat may be present; therefore, could potentially occur in the project area.
Wright's Trichocoronis *Trichocoronis wrightii* var. *wrightii*			G4 T3	Swales, marshes, ditches, and other low or moist places; most records from Texas are historical, perhaps indicating a decline as a result of alteration of wetland habitats.	Optimal habitat not present; therefore, not likely to occur in the project area.

Federal, State, and Globally-Ranked species in San Patricio County, Texas that could potentially occur within or near the Nueces Delta Landform Modification project site.

Federal and State Listing Status Descriptions:

LE = Federally-listed as endangered

LT = Federally-listed as threatened

C = Federally-listed as a candidate

DL = Federally de-listed or proposed for de-listing

E = State-listed as endangered

T = State-listed as threatened

"Blank" = State species of concern but with no regulatory listing

Nature Serve Conservation Status:

G3 = Nature Serve global conservation rank: globally vulnerable

G3Q = Nature Serve global conservation rank: globally vulnerable, but with questionable taxonomy

G4 = Nature Serve global conservation rank: globally ranked as apparently secure

G4T3 = Nature Serve global conservation rank for intraspecific taxon (subspecies): globally ranked as apparently secure; subspecies taxon as vulnerable

Appendix E. Nueces Delta Landform Modifications Project nesting birds within the Rincon Bayou/Nueces delta (project) area.

Species	Occurrence*	Nesting Season
Willet *Catoptrophorus semipalmatus*	Common	Last week of Feb - Last week of Sept
Common nighthawk *Chordeiles minor*	Common	Last week of Mar - First week of Oct
Mourning dove *Zenaida macroura*	Common	Could breed throughout the year Mainly Mar - Sept
Horned lark *Eremophila alpestris*	Common	Last week of Feb – First week of July
Cassin's sparrow *Peucaea cassinii*	Common but irregular (formerly)	Breeds throughout the year Mainly Feb - Sept
Eastern meadowlark *Sturnella magna*	Common	Last week of Feb – Last week of Sept
Red-winged blackbird *Agelaius phoeniceus*	Common	Last week of Feb – Last week of Sept
Least tern** *Sternula antillarum*		Last week of Apr – First week of Sept
Barn owl *Tyto alba*		Breeds throughout the year when food is abundant Mainly Nov - Aug
Black-necked stilt *Himantopus mexicanus*	Fairly common	Mar - Sept
Wilson's plover** *Charadrius wilsonia*	Fairly common	Last week of Mar - First week of Sept
Snowy plover** *Charadrius alexandrinus*	Fairly common (formerly)	Last week of Feb - Aug
Mottled duck *Anas fulvigula*	Fairly common	May breed throughout the year during wet periods Mainly Mar - Sept
Least bittern** *Ixobrychus exilis*	Fairly common (formerly)	Apr - Aug
Clapper rail *Rallus crepitans*	Fairly common	Feb - Sept
Lesser nighthawk *Chordeiles acutipennis*	Fairly common	April – Last week of July
Scissortail flycatcher *Tyrannus forficatus*	Fairly common	Middle of Mar – Last week of Aug
Seaside sparrow *Ammodramus maritimus*	Fairly common	Last week of Feb – First week of Sept
Great-tailed grackle *Quiscalus mexicanus*	Fairly common	Last week of Feb – Last week of Sept
Black-bellied whistling Duck *Dendrocygna autumnalis*	Uncommon	Apr - Nov
American avocet *Recurvirostra americana*	Uncommon	Mar-Aug
Killdeer *Charadrius vociferus*	Uncommon	Feb-Aug
Northern bobwhite *Colinus virginanus*	Uncommon	Breeds throughout the year during wet periods Mainly Mar – Sept

White-tailed hawk** *Geranoaetus albicaudatus*	Uncommon	Feb - Sept
Common ground dove *Columbina passerina*	Uncommon	Breeds throughout the year Mainly last week of Feb – First week of Nov
Greater roadrunner *Geococcyx californianus*	Uncommon	Mar – First week of Oct
Crested caracara *Caracara cheriway*	Uncommon	Last week of Feb – Last week of Sept
Loggerhead shrike** *Lanius ludovicianus*	Uncommon	Feb - Aug
Northern mockingbird *Mimus polyglottos*	Uncommon	Breeds throughout the year Mainly last week of Feb – First week of Sept
Lark sparrow *Chondestes grammacus*	Uncommon	Second week of Mar - Sept
Blue grosbeak *Passerina caerulea*	Uncommon	Middle of Apr – Last week of Aug
Painted bunting *Passerina ciris*	Uncommon	Middle of May – Last week of Aug
Fulvous whistling duck *Dendrocygna bicolor*	Irregular	May - Oct
Dickcissel** *Spiza americana*	Irregular	Second week of Apr – Last week of Sept
Blue-winged teal *Anas discors*	Rare	Apr - Aug
American coot *Fulica americana*	Rare	Throughout the year Mainly last week of Feb – First week of Sept
Curve-billed thrasher *Toxostoma curvirostre*	Rare	Rare; one nest discovered the last week of March 1963 on a loma adjacent to Crooked Lake
Northern cardinal *Cardinalis cardinalis*	Rare	Last week of Feb – First week of Sept

*Occurrence refers to overall habitat use (foraging, nesting, roosting, resting, cover, etc.) by the various bird species which have been observed nesting within the Nueces Delta/Rincon Bayou general project area

Common = Several individuals plus are expected within the appropriate habitats during a maximum 24-hour activity timeline; shorebird's actions are especially relative to tide timetables

Fairly Common = Usually more than six individuals within the appropriate habitats during a maximum 24-hour activity timeline

Uncommon = One or two individuals, not always seen in appropriate habitats during a maximum 24-hour activity timeline; only a few records each month

Irregular = A few individuals seen within appropriate habitats each season and during a maximum 24-hour activity timeline; not necessarily seen every year

Rare = Rare for this particular geographic area

Social Parasites (cowbirds) = Based on nesting passerines referenced in the table

**Birds of Conservation Concern

Appendix F. Nueces Delta Landform Modifications Project nesting bird species and seasons.

Species	Jan	Feb 1-15	Feb 15-28	Mar 1-15	Mar 15-31	Apr	May	Jun	Jul	Aug 1-15	Aug 15-31	Sept 1-15	Sept 15-31	Oct 1-15	Oct 15-31	Nov 1-15	Nov 15-30	Dec
Willet			X	X	X	X	X	X	X	X	X	X	X					
Common nighthawk					X	X	X	X	X	X	X	X	X	X				
Mourning dove*				X	X	X	X	X	X	X	X	X	X					
Horned lark			X	X	X	X	X	X	X									
Cassin's sparrow*		X	X	X	X	X	X	X	X	X	X	X	X					
Eastern meadowlark			X	X	X	X	X	X	X	X	X	X	X					
Red-winged Blackbird			X	X	X	X	X	X	X	X	X	X	X					
Least tern						X	X	X	X	X	X	X						
Barn owl*	X	X	X	X	X	X	X	X	X	X	X					X	X	X
Black-necked Stilt				X	X	X	X	X	X	X	X	X	X					
Wilson's plover					X	X	X	X	X	X	X	X						
Snowy plover			X	X	X	X	X	X	X	X	X							
Mottled duck*				X	X	X	X	X	X	X	X	X	X					
Least bittern						X	X	X	X	X	X							
Clapper rail		X	X	X	X	X	X	X	X	X	X	X	X					
Lesser nighthawk						X	X	X	X									
Scissortail flycatcher				X	X	X	X	X	X	X	X							
Seaside sparrow			X	X	X	X	X	X	X	X	X	X						
Great-tailed Grackle			X	X	X	X	X	X	X	X	X	X	X					
Black-bellied whistling duck						X	X	X	X	X	X	X	X	X	X	X	X	
American avocet				X	X	X	X	X	X	X	X							
Killdeer		X	X	X	X	X	X	X	X	X	x							
Northern bobwhite*				X	X	X	X	X	X	X	X	X	X					
White-tailed hawk		X	X	X	X	X	X	X	X	X	X	X	X					
Common ground dove*			X	X	X	X	X	X	X	X	X	X	X	X	X	X		

Species	Jan	Feb 1-15	Feb 15-28	Mar 1-15	Mar 15-31	Apr	May	Jun	Jul	Aug 1-15	Aug 15-31	Sept 1-15	Sept 15-31	Oct 1-15	Oct 15-31	Nov 1-15	Nov 15-30	Dec
Greater roadrunner				X	X	X	X	X	X	X	X	X	X	X				
Crested caracara			X	X	X	X	X	X	X	X	X	X	X					
Loggerhead shrike		X	X	X	X	X	X	X	X	X	X							
Northern mockingbird*			X	X	X	X	X	X	X	X	X	X						
Lark sparrow				X	X	X	X	X	X	X	X	X	X					
Blue grosbeak						X	X	X	X	X	X							
Painted bunting							X	X	X	X	X							
Fulvous whistling duck							X	X	X	X	X	X	X	X	X			
Dickcissel						X	X	X	X	X	X	X	X					
Blue-winged teal						X	X	X	X	X	X							
American coot*			X	X	X	X	X	X	X	X	X	X						
Curve-billed thrasher				X	X	X	X	X	X	X	X							
Northern cardinal			X	X	X	X	X	X	X	X	X	X						

*May breed throughout the year

Appendix G. Archeological Desktop Review

Moore Archeological Consulting, Inc.

2313 Brun Street
Houston, Texas 77019
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Office (713) 861-2323
Fax (713) 861-8627

October 19, 2016

Mary Kay Skoruppa
Naismith/Hanson
4501 Gollihar Road
Corpus Christi, Texas 78411

Re: Nueces Delta Landform Phase II project in San Patricio County, Texas (MAC 16-57; CEI 216078).

Dear Ms. Skoruppa,

We have examined the map plotting for the above referenced project per your request. The subject property has been reviewed with reference to the State of Texas archeological site files, soil classifications, topography, and possible tract disturbances. These data were then compared to an existing site location predictive model (Moore 1996) for prehistoric sites in the region.

Location

The project area is depicted on the Odem USGS quad map (2797-344), in southern San Patricio County, Texas (Figure 1). Three tracts were investigated as part of this assessment. The tracts lie to the south of Rincon Bayou (Figure 2). The first two proposed tracts would be excavated to create freshwater diversion channels. An excavation of approximately 1.5 to 4 feet (ft.) (0.5 to 1.2 meter [m]) of soil would be required. The excavation of these diversion channels is intended to address the problem that the Nueces River Delta is "fresh-water starved" and would help restore some level of pre-development ecosystem function within the Nueces Delta/Bay System. The *Middle Rincon Bayou to South Lake Diversion Channel* (also referred to as Project 4) would divert water out of the freshwater Middle Rincon Bayou via a channel directly into South Lake. This tract covers an area of approximately 16.94 acres, or 69,000 m² (738,000 ft^2). The *North Lake to South Lake System Diversion Channel* (also referred to as Project 5) would divert water from the North Lake area of Rincon Bayou into a wetlands complex bordering the north-east side of the South Lake "system," east of the railroad tracks crossing the mid-Delta area. This tract covers an area of approximately 10.03 acres, or 40,600 m² (437,000 ft^2). The third tract is one of the possible locations for the *Dredged Material Placement Area (DMPA)* that is being considered; a final location has not yet been selected. The tract of land covers an area of approximately 16.17 acres, or 65,500

m² (704,000 ft²). This project will be completed through Naismith Engineering, Inc. and the Texas Water Development Board.

Previously Identified Cultural Resources

A review of the Texas Historical Commission Site Atlas was conducted by Moore Archaeological Consulting Inc. (MAC) on October 24, 2016. The review indicated that there are four previously recorded sites (41SP6, 41SP7, 41SP9, 41SP187) within 1.6km (1 mile) of the project boundaries. As indicated from the early trinomial numbers of three out of the four sites, it is likely that an amateur or avocational archaeologist first identified these sites. Due to this, little is known about these sites and efforts to obtain more information from the Texas Archaeological Research Laboratory (TARL) were unsuccessful at this time. Based on a number of sites that lie just outside the project boundaries to the south in Nueces County (e.g., 41NU154, 41NU259, 41NU240) and its proximity to Nueces Bay, it is highly probable that these are prehistoric campsites or shell midden sites.

Potential for Cultural Resources

The project area was also assessed with respect to the following hierarchy of environmental factors that combine to make a locality attractive for prehistoric settlement within the region. The factors in combination constitute a set of settlement rules that define good locations for prehistoric campsites (Moore 1996). While this criterion was designed for the Harris County area, this set of factors has been known to be predictive of prehistoric occupation in other parts of the state. These include preferences for the following:

(1) Site locations in forested environments.

(2) Site locations in the floodplain or on the floodplain/upland margin.

(3) Site locations in proximity to sources of potable water.

(4) Site locations on well-drained, loamy soils.

(5) Site locations on topographic high points.

In terms of potential historic resources, a review of historic USGS topographic maps (1950, 1960, 1966, 1989), and aerial photographs (1950, 1956, 1961, 1979, 1985, 1990, 1995, 2002-2009) was carried out to determine if any disturbance had impacted the project area over time. Significantly, a railway line runs on a NW-SE orientation through the project area, in between Projects 4 and 5, and located approximately 25 meters (0.02 miles) to the east of DMPA Alternative 1 at its nearest point. This railroad was initially operated by San Antonio Uvalde & Gulf Railroad and the San Antonio Southern (formerly Asphalt Belt), both acquired by the Missouri Pacific Railroad in 1925 (Klein

1986). Topographic maps also indicated that some additional ground disturbance activities have occurred in the project area with the construction of various power lines and an underground pipeline located near the easternmost boundary of the project area. A detention basin is also visible on the western side of the railway line at the northern boundary of the project area. Although these are significant landscape modifications that are easily visible from topographic and aerial maps, it always remains possible that other modern superficial ground disturbance has occurred in the area that was not captured through these media.

The association with sources of water has been demonstrated to be a dominant factor affecting the probability of prehistoric sites in San Patricio and Nueces counties. Most sites within the region are found within 300 m (985 ft.) of a current or former source of natural potable water, and in this case, there exists a high concentration of prehistoric sites along the banks of Nueces Bay, particularly in the Whites Point region, which lies approximately 6.4 km (4 miles) from the eastern boundary of the project area. The project area proper is bounded to the north by Rincon Bayou, as part of the Nueces River delta, and to the south by South Lake, where Project 4 is proposed to divert water.

The soils within the project boundaries are primarily classified as Aransas clay (saline) and Narta loam, 0 to 1 percent slope (Figure 3; Soil Survey Staff 2016). Aransas clay (saline) and Narta loam are typically deep and poorly drained soils located on floodplains, flats, and coastal plains; indicative of the project areas location in the Nueces River delta and its proximity to Nueces Bay located approximately 4.8 km (3 miles) to the east. The Narta loam is taxonomically classified as fine, smectitic, hyperthermic Vertic Natraqualfs and was formed by loamy fluviomarine deposits derived from igneous, metamorphic, and sedimentary rock. The Aransas clay (saline) was formed as a clayey alluvium of the Holocene age and can be classified as fine, smectitic, calcareous, hyperthermic Vertic Haplaquolls. In summary, the soils within the project area were deposited during the Holocene and may contain stratified archeological material. The overall project area can be ecologically described as a salty bottomland/prairie. Native vegetation in this area is primarily comprised of coastal perennial grasses, including Gulf cordgrass, inland saltgrass, little bluestem, marshhay cordgrass, and other shrubs (Soil Survey Staff 2016).

Conclusions

In summary, no previously-recorded prehistoric archeological sites have been documented within the project areas. The review indicated there are four previously-recorded prehistoric sites within 1.6 km (1 mile) of the project boundaries. Additionally, a number of previous archeological surveys have been carried out on nearby tracts, most of which had positive results.

While the three tracts only meet two of the five preferences of environmental factors that combine to make a locality attractive for prehistoric settlement through predictive modeling (proximity to sources of potable water and on the floodplain),

Nueces Bay, and the larger Nueces River Delta system, has a long history of prehistoric land use and exploitation by a number of indigenous groups (Ricklis 1996, 2004). Due to this, and the fact that no previous survey of the project area has been conducted, we recommend an intensive pedestrian survey with shovel testing. Based on the anticipated soil profile and the depth of impact, backhoe testing is not considered necessary; however if the shovel testing program encounters deeply buried, intact deposits, additional deep testing by mechanical means may be needed.

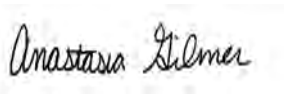
It is recommended that this archeological assessment be forwarded to the Archeology Division of the Texas Historical Commission for their review. Any additional archeological investigations stipulated by that agency should be carried out prior to the beginning of any construction. Further, in the event that unanticipated archeological deposits are encountered during construction, work should be halted immediately and the Archeology Division of the Texas Historical Commission should be contacted.

Thank you for the opportunity to evaluate this project location. If you have any questions or comments regarding this assessment, please do not hesitate to contact us.

Sincerely,

Catherine Jalbert, M.A., RPA

and



Anastasia Gilmer, M.A., RPA
Project Archeologist

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1986 *The Life and Legend of Jay Gould*. John Hopkins University Press, Baltimore.

Moore, Roger G.
1996 *An Empirical Analysis of Elements of Prehistoric Site Location and Formation in Harris County, Texas*. Report of Investigations No. 149. Moore Archeological Consulting, Inc., Houston.

Ricklis, Robert A.
1996 *The Karankawa Indians of Texas: An Ecological Study of Cultural Tradition and Change*. University of Texas Press, Austin.

2004 Prehistoric Occupation of the Central and Lower Texas Coast: A Regional Overview. In: *The Prehistory of Texas*, Timothy K. Perttula, editor. Texas A&M University Press, College Station.

Soil Survey Staff
2016 Web Soil Survey. Electronic document, http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm, accessed July 26, 2016.

Basemap Data: Odem (2797-344) 7.5' USGS Quadrangle

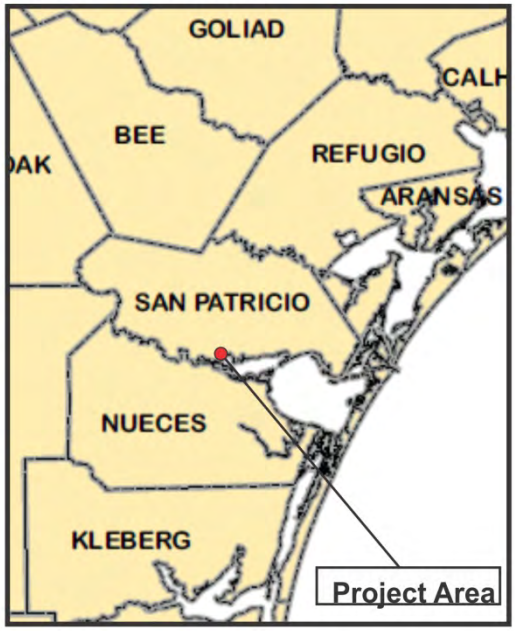


Figure 1. The three proposed tracts.

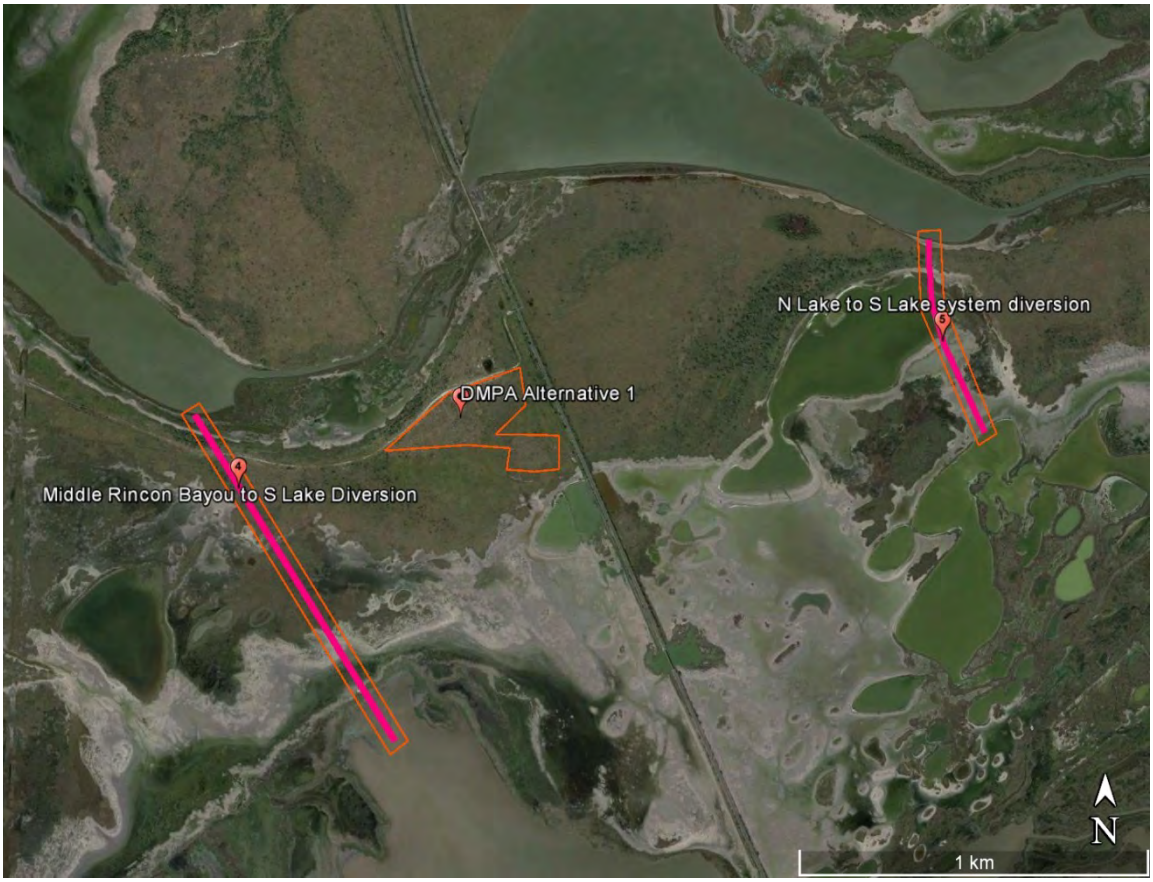


Figure 2. The three proposed tracts are shown. The two diversion channel tracts lie to the west and east, while the Dredge Material Placement Area (DMPA) is in the center. The proposed channels are shown in pink. An approximately 200' wide work corridor, to account for temporary impacts during construction of the channels, is outlined in orange (Google Earth 2016).

Figure 3. Outline of soils present within the proposed study area (Soil Survey Staff, accessed October 17, 2016).

Appendix H. Wetland determination forms.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: TWDB Phase II Nueces Delta Landform Mod City/County: San Patricio County Sampling Date: 11/17/2016

Applicant/Owner: Coastal Bend Bays and Estuaries Program State: TX Sampling Point: DMPA1

Investigator(s): KNT, HAM Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-1%

Subregion (LRR or MLRA): MLRA 150B Lat: 27.883295° Long: -97.570227° Datum: NAD83

Soil Map Unit Name: Narta loam, 0 to 1 percent slopes, rarely flooded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes X	No _____	

Remarks:

Although wetland hydrology and dominant hydrophytic vegetation were present, sample point DMPA1 was determined to not be within a wetland due to the absence of hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☑ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): none
Water Table Present?	Yes _____	No X	Depth (inches): none
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): none

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology was present at sample point DMPA1.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DMPA1

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: 20% of total cover:

Sapling/Shrub Stratum (Plot size: 30-ft r)			
1. Prosopis glandulosa	10	Y	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	10 = Total Cover		

50% of total cover: 5 20% of total cover: 2

Herb Stratum (Plot size: 30-ft r)			
1. Unknown grass	50	Y	N/A
2. Monanthochloe littoralis	10	N	OBL
3. Spartina spartinae	10	N	OBL
4. Opuntia spp.	10	N	UPL
5. Borrichia frutescens	5	N	OBL
6. Ambrosia psilostachya	5	N	FAC
7.			
8.			
9.			
10.			
11.			
12.			
	90 = Total Cover		

50% of total cover: 45 20% of total cover: 18

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: 20% of total cover:

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	25	x 1 =	25
FACW species	0	x 2 =	0
FAC species	5	x 3 =	15
FACU species	0	x 4 =	0
UPL species	20	x 5 =	100
Column Totals:	50 (A)		140 (B)

Prevalence Index = B/A = 2.8

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below).

The unknown grass is included in the herb stratum because it was the single dominant species within that stratum but it was not considered in the Dominance Test or the Prevalence Index calculations since its indicator status is unknown. Although the Dominance Test was less than 50%, the Prevalence Index, which is a more stringent method of assessment, was less than 3.0 which indicates that dominant hydrophytic vegetation was present at sample point DMPA1. The identity of the unknown grass could change this, but at the time of field work there were no viable seed heads needed for identifying the species.

SOIL

Sampling Point: DMPA1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 2/1	100%					sandy clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Hydric soils were not present at sample point DMPA1.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: TWDB Phase II Nueces Delta Landform Mod City/County: San Patricio County Sampling Date: 11/17/2016

Applicant/Owner: Coastal Bend Bays and Estuaries Program State: TX Sampling Point: DMPA2

Investigator(s): KNT, HAM Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-1%

Subregion (LRR or MLRA): MLRA 150B Lat: 27.883643° Long: -97.568612° Datum: NAD83

Soil Map Unit Name: Narta loam, 0 to 1 percent slopes, rarely flooded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes X	No _____	

Remarks:

Although wetland hydrology and dominant hydrophytic vegetation were present, sample point DMPA2 was determined to not be within a wetland due to the absence of hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☑ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): none
Water Table Present?	Yes _____	No X	Depth (inches): none
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): none

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology was present at sample point DMPA2.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DMPA2

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: 20% of total cover:

Sapling/Shrub Stratum (Plot size: 30-ft r)			
1. Prosopis glandulosa	40	Y	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	40 = Total Cover		

50% of total cover: 20 20% of total cover: 8

Herb Stratum (Plot size: 30-ft r)			
1. Monanthochloe littoralis	30	Y	OBL
2. Spartina spartinae	20	Y	OBL
3. Unknown grass (from DMPA1)	20	Y	N/A
4. Ambrosia psilostachya	10	N	FAC
5. Opuntia spp.	5	N	UPL
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	85 = Total Cover		

50% of total cover: 42.5 20% of total cover: 17

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: 20% of total cover:

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	50	x 1 =	50
FACW species	0	x 2 =	0
FAC species	10	x 3 =	30
FACU species	0	x 4 =	0
UPL species	45	x 5 =	225
Column Totals:	105 (A)		305 (B)

Prevalence Index = B/A = 2.9

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below).

The unknown grass is included in the herb stratum because it was a dominant species within that stratum but it was not considered in the Dominance Test or the Prevalence Index calculations since its indicator status is unknown. Dominant hydrophytic vegetation was present at sample point DMPA2.

SOIL

Sampling Point: DMPA2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 2/1	100%					sandy clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Hydric soils were not present at sample point DMPA2.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: TWDB Phase II Nueces Delta Landform Mod City/County: San Patricio County Sampling Date: 11/15/2016

Applicant/Owner: Coastal Bend Bays and Estuaries Program State: TX Sampling Point: M4S1

Investigator(s): KNT, HAM Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-1%

Subregion (LRR or MLRA): MLRA 150B Lat: 27.882587° Long: -97.577233° Datum: NAD83

Soil Map Unit Name: Narta loam, 0 to 1 percent slopes, rarely flooded NWI classification: E2USP

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes X	No _____	

Remarks:

Sample point M4S1 was determined to be within a wetland due to the presence of wetland hydrology, dominant hydrophytic vegetation, and hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☑ Drift Deposits (B3)
- ☑ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): none
Water Table Present?	Yes _____	No X	Depth (inches): none
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0-12"

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology was present at sample point M4S1.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: M4S1

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30-ft r)			
1. Batis maritima	20	Y	OBL
2. Salicornia depressa	10	Y	OBL
3. Monanthochloe littoralis	5	N	OBL
4. Distichlis spicata	5	N	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	40 = Total Cover		

50% of total cover: 20 20% of total cover: 8

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	40	x 1 =	40
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	40 (A)		7040 (B)

Prevalence Index = B/A = 1

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

x 2 - Dominance Test is >50%

x 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (If observed, list morphological adaptations below).

Dominant hydrophytic vegetation was present at sample point M4S1.

SOIL

Sampling Point: M4S1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 4/1	98%	7.5YR5/6	2%	C	M	sandy clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☑ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

Hydric soils were present at sample point M4S1.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: TWDB Phase II Nueces Delta Landform Mod City/County: San Patricio County Sampling Date: 11/15/2016

Applicant/Owner: Coastal Bend Bays and Estuaries Program State: TX Sampling Point: M4S2

Investigator(s): KNT, HAM Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-1%

Subregion (LRR or MLRA): MLRA 150B Lat: 27.882372° Long: -97.577104° Datum: NAD83

Soil Map Unit Name: Narta loam, 0 to 1 percent slopes, rarely flooded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Sample point M4S2 was determined to not be within a wetland due to the absence of wetland hydrology, dominant hydrophytic vegetation, and hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): none
Water Table Present?	Yes _____	No X	Depth (inches): none
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): none

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology was not present at sample point M4S2.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: M4S2

Tree Stratum (Plot size: 30-ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Prosopis glandulosa	50	Y	UPL
2. Celtis ehrenbergiana	10	N	UPL
3.			
4.			
5.			
6.			
7.			
8.			
	60	= Total Cover	
50% of total cover: 30	20% of total cover: 12		
Sapling/Shrub Stratum (Plot size: 30-ft r)			
1. Parkinsonia aculeata	5	Y	FAC
2. Prosopis glandulosa	2	Y	UPL
3.			
4.			
5.			
6.			
7.			
8.			
	7	= Total Cover	
50% of total cover: 3.5	20% of total cover: 1.4		
Herb Stratum (Plot size: 30-ft r)			
1. Urochloa maxima	40	Y	FAC
2. Spartina spartinae	40	Y	OBL
3. Opuntia spp.	5	N	UPL
4. Croton spp.	5	N	UPL
5. Rayjacksonia phyllocephala	5	N	FACU
6. Solanum elaeagnifolium	2	N	UPL
7. Ambrosia psilostachya	2	N	FAC
8. Setaria leucopila	2	N	UPL
9.			
10.			
11.			
12.			
	101	= Total Cover	
50% of total cover: 50.5	20% of total cover: 20.2		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	40	x 1 =	40
FACW species	0	x 2 =	0
FAC species	47	x 3 =	141
FACU species	5	x 4 =	20
UPL species	76	x 5 =	380
Column Totals:	160 (A)		581 (B)

Prevalence Index = B/A = 3.6

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (If observed, list morphological adaptations below).

Although the Dominance Test was more than 50%, the Prevalence Index, which is a more stringent method of assessment, was more than 3.0 which indicates that dominant hydrophytic vegetation was not present at sample point M4S2.

SOIL

Sampling Point: M4S2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 2/2	100%					clay	gravel fill material present

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Hydric soils were not present at sample point M4S2.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: TWDB Phase II Nueces Delta Landform Mod City/County: San Patricio County Sampling Date: 11/15/2016

Applicant/Owner: Coastal Bend Bays and Estuaries Program State: TX Sampling Point: M4S3

Investigator(s): KNT, HAM Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-1%

Subregion (LRR or MLRA): MLRA 150B Lat: 27.881180° Long: -97.576251° Datum: NAD83

Soil Map Unit Name: Narta loam, 0 to 1 percent slopes, rarely flooded NWI classification: PEM1J

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Although dominant hydrophytic vegetation was present, sample point M4S3 was determined to be within uplands due to the absence of wetland hydrology and hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): none
Water Table Present?	Yes _____	No X	Depth (inches): none
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): none

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology was not present at sample point M4S3.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: M4S3

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: 20% of total cover:

Sapling/Shrub Stratum (Plot size: 30-ft r)			
1. Prosopis glandulosa	2	Y	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	2 = Total Cover		

50% of total cover: 1 20% of total cover: 0.4

Herb Stratum (Plot size: 30-ft r)			
1. Spartina spartinae	70	Y	OBL
2. Borrichia frutescens	20	N	OBL
3. Monanthochloe littoralis	10	N	OBL
4. Steinchisma hians	5	N	OBL
5. Ambrosia psilostachya	5	N	FAC
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	110 = Total Cover		

50% of total cover: 55 20% of total cover: 22

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: 20% of total cover:

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	105	x 1 =	105
FACW species	0	x 2 =	0
FAC species	5	x 3 =	15
FACU species	0	x 4 =	0
UPL species	2	x 5 =	10
Column Totals:	112 (A)		130 (B)

Prevalence Index = B/A = 1.2

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below).

Dominant hydrophytic vegetation was present at sample point M4S3.

SOIL

Sampling Point: M4S3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 2/1						sandy clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Hydric soils were not present at sample point M4S3

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: TWDB Phase II Nueces Delta Landform Mod City/County: San Patricio County Sampling Date: 11/15/2016

Applicant/Owner: Coastal Bend Bays and Estuaries Program State: TX Sampling Point: M4S4

Investigator(s): KNT, HAM Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-1%

Subregion (LRR or MLRA): MLRA 150B Lat: 27.878654° Long: -97.574572° Datum: NAD83

Soil Map Unit Name: Aransas clay, 0 to 1 percent slopes, slightly saline, moderately sodic, frequently flooded NWI classification: E2EM1P

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes X	No _____	

Remarks:

Although wetland hydrology and dominant hydrophytic vegetation were both present, sample point M4S4 was determined to not be within a wetland due to the absence of hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☑ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X	No _____	Depth (inches): 0-12"
Water Table Present?	Yes _____	No X	Depth (inches): none
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): none

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology was present at sample point M4S4.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: M4S4

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 30-ft r)			
1. Monanthochloe littoralis	30	Y	OBL
2. Spartina spartinae	30	Y	OBL
3. Batis maritima	15	N	OBL
4. Salicornia depressa	15	N	OBL
5. Suaeda linearis	5	N	OBL
6. Borrichia frutescens	5	N	OBL
7. Lycium carolinianum	2	N	FACW
8.			
9.			
10.			
11.			
12.			
	102 = Total Cover		
50% of total cover: 51	20% of total cover: 20.4		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x 1 =	100
FACW species	2	x 2 =	4
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	102 (A)		104 (B)

Prevalence Index = B/A = 1.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below).

Dominany hydrophytic vegetation was present at sample point M4S4.

SOIL

Sampling Point: M4S4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 4/2	100%					clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Hydric soils were not present at sample point M4S4.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: TWDB Phase II Nueces Delta Landform Mod City/County: San Patricio County Sampling Date: 11/15/2016

Applicant/Owner: Coastal Bend Bays and Estuaries Program State: TX Sampling Point: M4S5

Investigator(s): KNT, HAM Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-1%

Subregion (LRR or MLRA): MLRA 150B Lat: 27.877411° Long: -97.573661° Datum: NAD83

Soil Map Unit Name: Narta loam, 0 to 1 percent slopes, rarely flooded NWI classification: E2USP

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes X	No _____	

Remarks:

Although wetland hydrology and dominant hydrophytic vegetation were both present, sample point M4S5 was determined to not be within a wetland due to the absence of hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☑ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☑ Surface Soil Cracks (B6)
- ☑ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): none
Water Table Present?	Yes _____	No X	Depth (inches): none
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): none

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology was present at sample point M4S5.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: M4S5

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			
50% of total cover: ____ 20% of total cover: ____			
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			
50% of total cover: ____ 20% of total cover: ____			
Herb Stratum (Plot size: 30-ft r)			
1. Batis maritima	4	Y	OBL
2. Salicornia depressa	2	Y	OBL
3. Monanthochloe littoralis	2	Y	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
8 = Total Cover			
50% of total cover: 4 20% of total cover: 1.6			
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
50% of total cover: ____ 20% of total cover: ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	8	x 1 =	8
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	8 (A)		8 (B)

Prevalence Index = B/A = 1.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: (If observed, list morphological adaptations below).

Dominant hydrophytic vegetation was present at sample point M4S5.

SOIL

Sampling Point: M4S5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 4/2	100%					sandy clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Hydric soils were not present at sample point M4S5.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: TWDB Phase II Nueces Delta Landform Mod City/County: San Patricio County Sampling Date: 11/15/2016

Applicant/Owner: Coastal Bend Bays and Estuaries Program State: TX Sampling Point: M5S1

Investigator(s): KNT, HAM Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-1%

Subregion (LRR or MLRA): MLRA 150B Lat: 27.887580° Long: -97.556212° Datum: NAD83

Soil Map Unit Name: Water NWI classification: E2EM1N

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes X	No _____	

Remarks:

Although wetland hydrology and dominant hydrophytic vegetation were both present, sample point M5S1 was determined to not be within a wetland due to the absence of hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☑ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): none
Water Table Present?	Yes _____	No X	Depth (inches): none
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0-12"

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology was present at sample point M5S1.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: M5S1

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30-ft r)			
1. Borrichia frutescens	2	Y	OBL
2. Monanthochloe littoralis	2	Y	OBL
3. Batis maritima	2	Y	OBL
4. Lycium carolinianum	2	Y	FACW
5. Salicornia depressa	2	Y	OBL
6. Distichlis spicata	2	Y	OBL
7. Suaeda linearis	2	Y	OBL
8.			
9.			
10.			
11.			
12.			
	14 = Total Cover		

50% of total cover: 7 20% of total cover: 2.8

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 7 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	12	x 1 =	12
FACW species	2	x 2 =	4
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	14 (A)		16 (B)

Prevalence Index = B/A = 1.1

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (If observed, list morphological adaptations below).

Dominant hydrophytic vegetation was present at sample point M5S1.

SOIL

Sampling Point: M5S1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 4/1	100%					clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Hydric soils were not present at sample point M5S1.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: TWDB Phase II Nueces Delta Landform Mod City/County: San Patricio County Sampling Date: 11/15/2016

Applicant/Owner: Coastal Bend Bays and Estuaries Program State: TX Sampling Point: M5S2

Investigator(s): KNT, HAM Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-1%

Subregion (LRR or MLRA): MLRA 150B Lat: 27.887287° Long: -97.556200° Datum: NAD83

Soil Map Unit Name: Narta loam, 0 to 1 percent slopes, rarely flooded NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Although dominant hydrophytic vegetation was present, sample point M5S2 was determined to not be within a wetland due to the absence of wetland hydrology and hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): none
Water Table Present?	Yes _____	No X	Depth (inches): none
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): none

Wetland Hydrology Present? **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology was not present at sample point M5S2.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: M5S2

Tree Stratum (Plot size: 30-ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Prosopis glandulosa	15	Y	UPL
2. Celtis pallida	2	N	UPL
3.			
4.			
5.			
6.			
7.			
8.			
	17	= Total Cover	
50% of total cover: 8.5	20% of total cover: 3.4		

Sapling/Shrub Stratum (Plot size: 30-ft r)			
1. Baccharis neglecta	25	Y	FAC
2. Prosopis glandulosa	10	Y	UPL
3. Parkinsonia aculeata	2	N	FAC
4. Senegalia greggii	2	N	UPL
5. Yucca treculeana	2	N	UPL
6.			
7.			
8.			
	41	= Total Cover	
50% of total cover: 20.5	20% of total cover: 8.2		

Herb Stratum (Plot size: 30-ft r)			
1. Spartina spartinae	70	Y	OBL
2. Rayjacksonia phyllocephala	15	N	FACU
3. Ambrosia psilostachya	2	N	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	87	= Total Cover	
50% of total cover: 43.5	20% of total cover: 17.4		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	70	x 1 =	70
FACW species	0	x 2 =	0
FAC species	29	x 3 =	87
FACU species	15	x 4 =	60
UPL species	31	x 5 =	155
Column Totals:	145 (A)		372 (B)

Prevalence Index = B/A = 2.6

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (If observed, list morphological adaptations below).

Dominant hydrophytic vegetation was present at sample point M5S2.

SOIL

Sampling Point: M5S2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 4/1	100%					clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Hydric soils were not present at sample point M5S2.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: TWDB Phase II Nueces Delta Landform Mod City/County: San Patricio County Sampling Date: 11/15/2016

Applicant/Owner: Coastal Bend Bays and Estuaries Program State: TX Sampling Point: M5S3

Investigator(s): KNT, HAM Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-1%

Subregion (LRR or MLRA): MLRA 150B Lat: 27.886731° Long: -97.556052° Datum: NAD83

Soil Map Unit Name: Narta loam, 0 to 1 percent slopes, rarely flooded NWI classification: E2USP

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes X	No _____	

Remarks:

Sample point M5S3 was determined to be within a wetland due to the presence of wetland hydrology, dominant hydrophytic vegetation, and hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☑ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☑ Surface Soil Cracks (B6)
- ☑ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): none

Water Table Present? Yes _____ No X Depth (inches): none

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 0-12"

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology was present at sample point M5S3.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: M5S3

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30-ft r)			
1. Salicornia depressa	10	Y	OBL
2. Batis maritima	5	Y	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	15 = Total Cover		

50% of total cover: 7.5 20% of total cover: 3

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1 =	15
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	15 (A)		15 (B)

Prevalence Index = B/A = 1.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

_X_ 2 - Dominance Test is >50%

_X_ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (If observed, list morphological adaptations below).

Dominant hydrophytic vegetation was present at sample point M5S23.

SOIL

Sampling Point: M5S3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 4/2	98%	10YR 5/8	2$	C	M	sandy clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☑ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

Hydric soils were present at sample point M5S3.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: TWDB Phase II Nueces Delta Landform Mod City/County: San Patricio County Sampling Date: 11/15/2016

Applicant/Owner: Coastal Bend Bays and Estuaries Program State: TX Sampling Point: M5S4

Investigator(s): KNT, HAM Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-1%

Subregion (LRR or MLRA): MLRA 150B Lat: 27.886414° Long: -97.556028° Datum: NAD83

Soil Map Unit Name: Narta loam, 0 to 1 percent slopes, rarely flooded NWI classification: E2EM1P

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes X	No _____	

Remarks:

Although wetland hydrology and dominant hydrophytic vegetation were both present, sample point M5S4 was determined to not be within a wetland due to the absence of hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☑ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☑ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): none
Water Table Present?	Yes _____	No X	Depth (inches): none
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0-12"

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology was present at sample point M5S4.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: M5S4

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30-ft r)			
1. Monanthochloe littoralis	30	Y	OBL
2. Salicornia depressa	30	Y	OBL
3. Borrichia frutescens	20	Y	OBL
4. Spartina spartinae	5	N	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	85 = Total Cover		

50% of total cover: 42.5 20% of total cover: 17

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	85	x 1 =	85
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	85 (A)		85 (B)

Prevalence Index = B/A = 1.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (If observed, list morphological adaptations below).

Dominant hydrophytic vegetation was present at sample point M5S4.

SOIL

Sampling Point: M5S4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12"	10YR 4/1	100%					clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Hydric soils were not present at sample point M5S4.

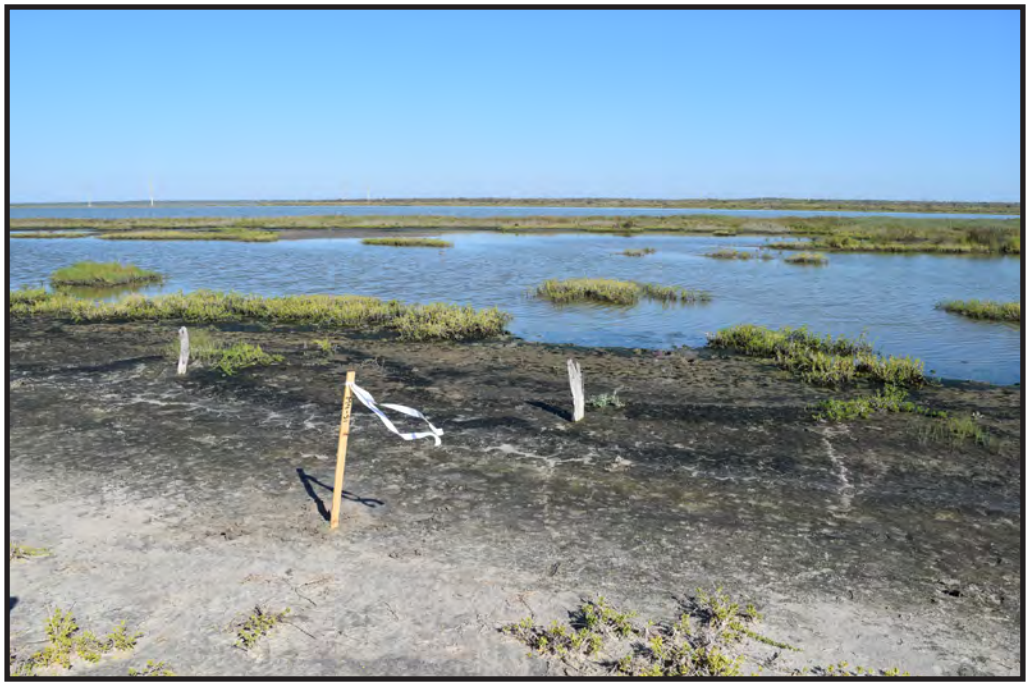
Appendix I. Photograph log.

Photograph 1. Bisecting the Project #4 corridor is Road #3 which has not been improved with caliche but the condition is still fair and driveable (looking west).

Photograph 2. Road #3 ends at the Union Pacific railroad track (looking east northeast).

Photograph 3. Looking north northwest along the Union Pacific railroad tracks.

Photograph 4. East of the Union Pacific railroad tracks, looking west southwest.



Photograph 5. Open water, high tidal marsh, low tidal marsh, and sea ox-eye daisy/ tidal flats located in the northern-most section of Project #4 corridor (looking north northwest). Wetland determination sample point M4S1 is pictured.

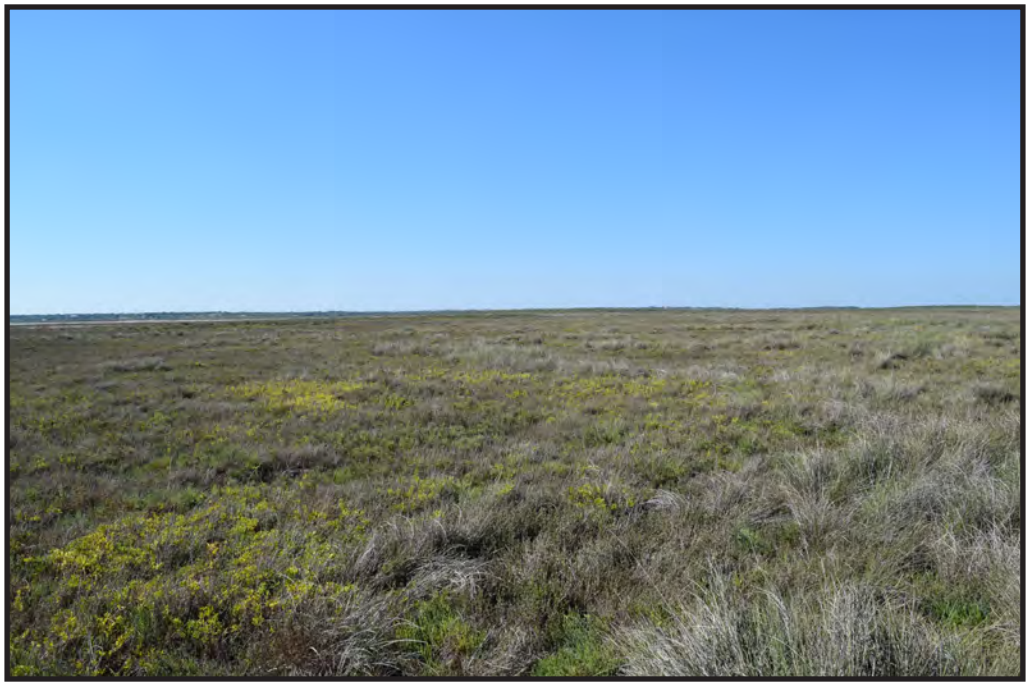
Photograph 6. Proceeding south from Photograph 5, within the Project #4 corridor, the habitat boundary between high tidal marsh and salty prairie shrubland. Wetland determination sample point M4S1 is pictured (looking south southeast).

Photograph 7. Proceeding south from Photograph 6, within the Project #4 corridor, the salty prairie shrubland habitat is dominanted by honey mesquite, retama, guinea grass, and gulf cordgrass (looking west southwest).

Photograph 8. Wetland determination sample point M4S2 taken in the Project #4 corridor was within the salty prairie shrubland habitat (looking north northwest).

Photograph 9. Proceeding south from Photographs 7 and 8, Road #3 delineates the habitat boundary between the salty prairie shrubland (right) and the salty prairie (left) within the Project #4 corridor (looking west).

Photograph 10. Proceeding south from Photograph 9, wetland determination sample point M4S3 taken in the Project #4 corridor was within the salty prairie habitat which includes sparse honey mesquite, gulf cordgrass, sea ox-eye daisy, shoregrass, gaping grass, and western ragweed (looking north northwest).



Photograph 11. Proceeding south from Photograph 10, wetland determination sample point M4S4 (not pictured) taken in the Project #4 corridor was within the high tidal marsh habitat which includes shoregrass, gulf cordgrass, saltwort, glasswort, annual seepweed, sea ox-eye daisy, and Carolina wolfberry (looking west).

Photograph 12. Proceeding south from Photograph 11, wetland determination sample point M4S5 taken in the Project #4 corrdior within tidal flats habitat which was sparsley vegetated and dominanted by saltwort, glassworth, and shoregrass (looking north northwest).

Photograph 13. Looking north northwest, boundary between the high tidal marsh habitat (background) and the tidal flats habitat (foreground) in the Project #4 corridor.

Photograph 14. Proceeding south from Photographs 12 and 13, the southern-most section of the Project #4 corridor includes tidal flats, open water, and high tidal marsh habitats (looking southeast).

Photograph 15. Wetland determination sample point M5S1 was taken in the northern-most section of the Project #5 corridor which includes open water and low tidal marsh habitats (looking east southeast).

Photograph 16. In the Project #5 corridor, looking southwest, the boundary between the low tidal marsh (foreground) and the salty prairie shrubland (background) habitats. Vegetation within the low tidal marsh included sea ox-eye daisy, shoregrass, saltwort, glasswort, Carolina wolfberry, saltgrass, and annual seepweed.

Photograph 17. Proceeding south from Photographs 15 and 16, wetland determination sample point M5S2 was taken in the Project #5 corridor within the salty prairie shrubland habitat (looking north northwest).

Photograph 18. The salty prairie shrubland habitat in the Project #5 corridor is dominated by honey mesquite, baccharis, and gulf cordgrass (looking south).

Photograph 19. Proceeding south from Photographs 17 and 18, looking north in the Project #5 corridor, the boundary between the low tidal marsh (foreground) and the salty prairie shrubland (background) habitats.

Photograph 20. Wetland determination sample points M5S3 and M5S4 (pictured in foreground) were taken within the low tidal marsh habitat. The dominant vegetation in this habitat type is saltwort, glasswort, shoregrass, and sea ox-eye daisy (looking north).

Photograph 21. Looking south in the Project #5 corridor, wetland determination sample point M5S4 is pictured within the low tidal marsh habitat and open water habitat is pictured in the background.

Photograph 22. Proceeding south from Photograph 21, sparsley vegetated tidal flats (foreground) and open water (background) habitats in the Project #5 corridor (looking north).

Photograph 23. Sparsley vegetated tidal flats (foreground) and open water (background) habitats in the Project #5 corridor (looking north).

Photograph 24. Looking southeast, the southern-most section of the Project #5 corridor ends with open water habitat bounded by high tidal marsh habitat (foreground).

Photograph 25. The proposed dredge material placement area is located within the salty prairie habitat which includes honey mesquite, shoregrass, gulf cordgrass, and prickly pear.

Photograph 26. The proposed dredge material placement area shown in relation to Road #3 (background), looking west northwest.

Photograph 27. An osprey was observed in-flight near the Project #5 corridor.

Photograph 28. A long-billed curlew was observed feeding in the Project #5 corridor.

Photograph 29. An emaciated western diamondback rattlesnake was observed at the southern-most end of the Project #5 corridor.

Photograph 30. American white pelicans were observed near the Project #4 corridor.

Photograph 31. A lesser yellowlegs was observed in the Project #4 corridor.

Photograph 32. A monarch butterfly was observed in the Project #4 corridor.

Photograph 33. Spanish dagger, located near the Project #5 corridor, could potentially serve as nesting habitat for the aplomado falcon, which is federal and state-listed endangered.

Photograph 34. American white pelicans, great blue heron, Neotropic cormorants, and various duck species were observed near the Project #4 corridor.

Photograph 35. A blue crab was observed in the Project #4 corridor.

Photograph 36. Coyote tracks were observed in the Project #4 corridor.

Appendix J. Joint Evaluation Meeting sign-in sheet.

Corpus Christi, Texas

Date: 2 May 2017

NAME	AGENCY	PHONE #
Robert Jones	USACE	361-814-5847 x1100
Mark Pattillo	USACE	361-814-5847 x1004
Jesse Solis	GLO	361.825.3050
Kristin Livingston	GLO	361.825.3030
Jason Zeplin	GLO	361.825.3030
Gretchen Nare HR	FWS	361-994-9005 x 242
Matthew Kimmel	USACE	361-814-5847 x1002
Jackie Robinson	TPWD	361-825-3241
Mary Ellen Vega	Vega Envir/Hanson	361-877-1543
James Dodson	Hanson	361-649-1518
Harrison McNeil	Hanson Professional Services	361-814-9900
Kara Thompson	Hanson	361-814-9900
Cremaine Koester	Hanson	361-814-9900
Lilian Murphy	TCEQ	

Appendix K. Joint Evaluation Meeting presentation packet.

Joint Evaluation Meeting
May 2, 2017

Nueces Delta Landform and Hydraulic Modifications: Phase II – Verification and Feasibility Assessment

Meeting Participants:

James Dodson, Project Manager
Mary Ellen Vega, Vega Environmental, Senior Biologist
Chemaine Koester, Hanson, Senior Biologist
Kara Thompson, Hanson, Biologist
Harrison McNeil, Hanson, Biologist

J. Dodson:

Introduction
Background
Strategic Purpose
Project Objectives
Evaluation of Alternatives

K. Thompson:

Desktop Review
Field Work

M.E. Vega:

Threatened and Endangered Species
Nesting Birds

C. Koester:

Permitting
DMPA

The Phase I report, *Using Landform and Hydraulic Modifications to Increase the Benefit of Fresh Water Inflows to Nueces Bay and Nueces Delta*, is available on the Texas Water Development Board's website: https://www.twdb.texas.gov/publications/reports/contracted_reports/doc/1400011717_Naismith_Nueces.pdf

Senate Bill 3 Environmental Flows Determinations and Standards Development Process -- Work Plan for Adaptive Management

Using Landform and Hydraulic Modifications to Increase the Benefit of Fresh Water Inflows to Nueces Delta and Nueces Bay

Nueces River and Corpus Christi and Baffin Bays
Basin and Bay Area Stakeholders Committee

Work Plan for Adaptive Management
Submission to the Environmental Flows Advisory Group
and the Texas Commission on Environmental Quality

November 2012

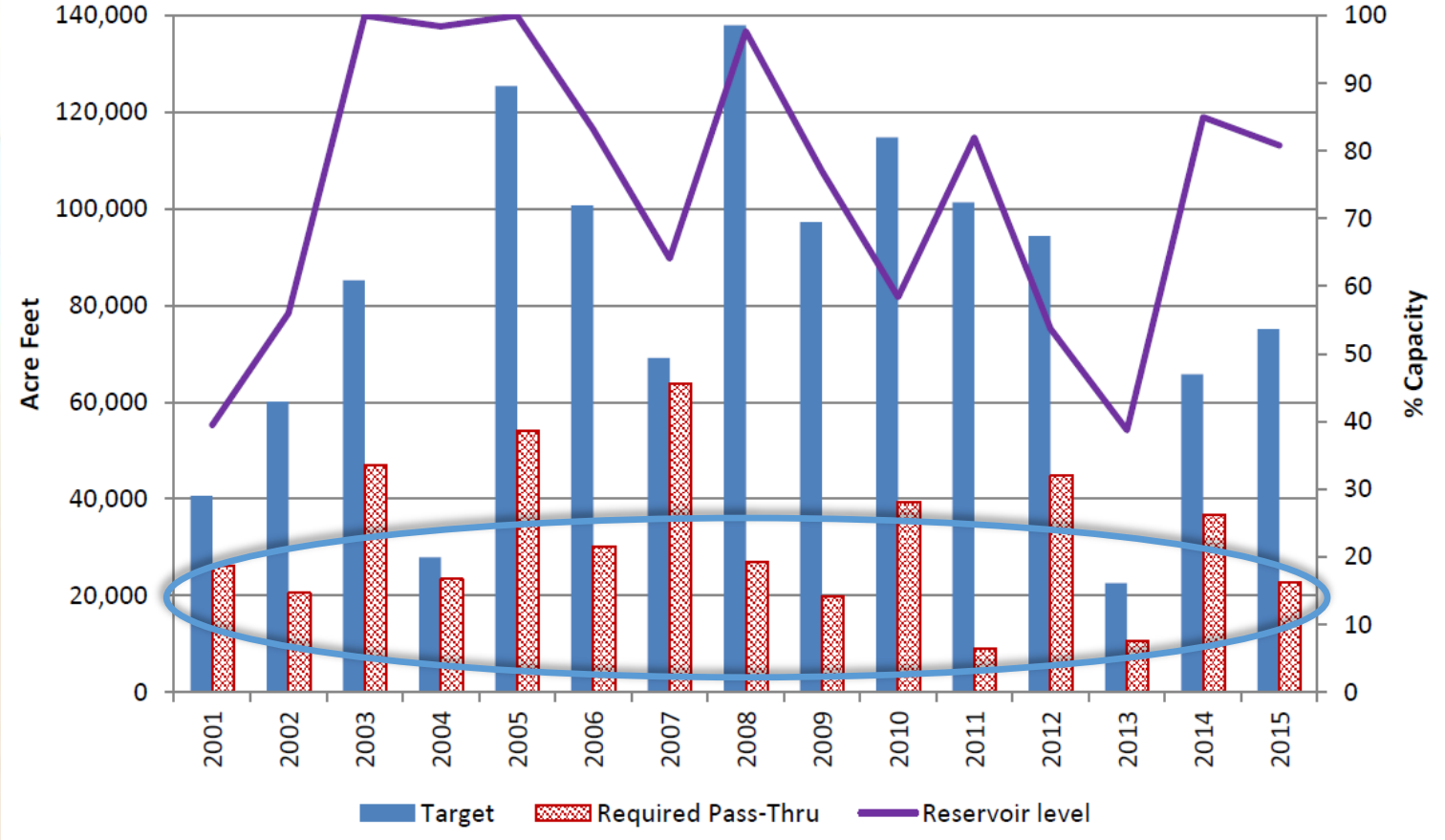
Project Background and Setting

Strategic Purpose

To evaluate potential landform and hydraulic modifications intended to **moderate the high salinities** experienced in the Nueces Delta and Nueces Bay during periods of limited freshwater inflows, with the expected benefit of **improving marsh habitat**.

Passthru Targets (AcFt)				
Month	Capacity >= 70%	40% <= Capacity < 70%	30% <= Capacity < 40%	Capacity < 30%
January	2,500	2,500	1,200	0
February	2,500	2,500	1,200	0
March	3,500	3,500	1,200	0
April	3,500	3,500	1,200	0
May	25,500	23,500	1,200	0
June	25,500	23,000	1,200	0
July	6,500	4,500	1,200	0
August	6,500	5,000	1,200	0
September	28,500	11,500	1,200	0
October	20,000	9,000	1,200	0
November	9,000	4,000	1,200	0
December	4,500	4,500	1,200	0

Strategic Purpose



Project Objectives

To evaluate specific landform and/or hydraulic modifications designed to **increase** the **area** and **duration** of freshwater inundation of wetland areas within the Nueces Delta.

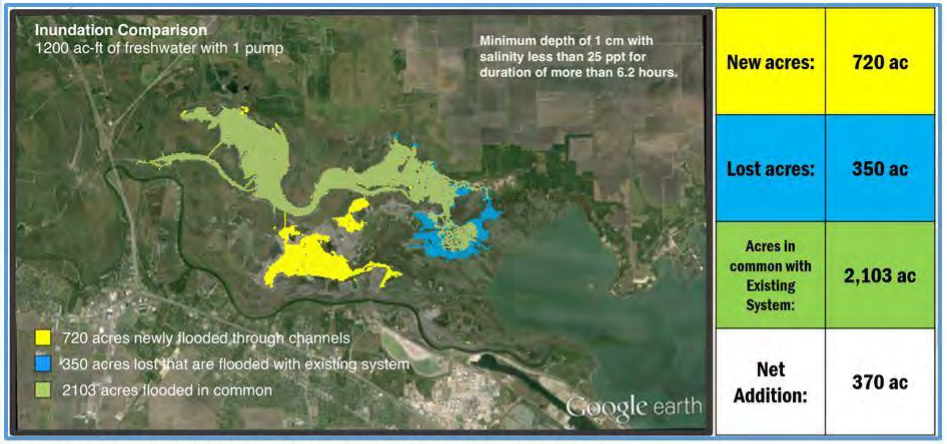


Figure 3.1.3-5: Modified System (Projects 4 & 5): 1,200 ac-ft. pumped Inundation Comparison with Baseline - for areas with salinity less than 25 ppt.

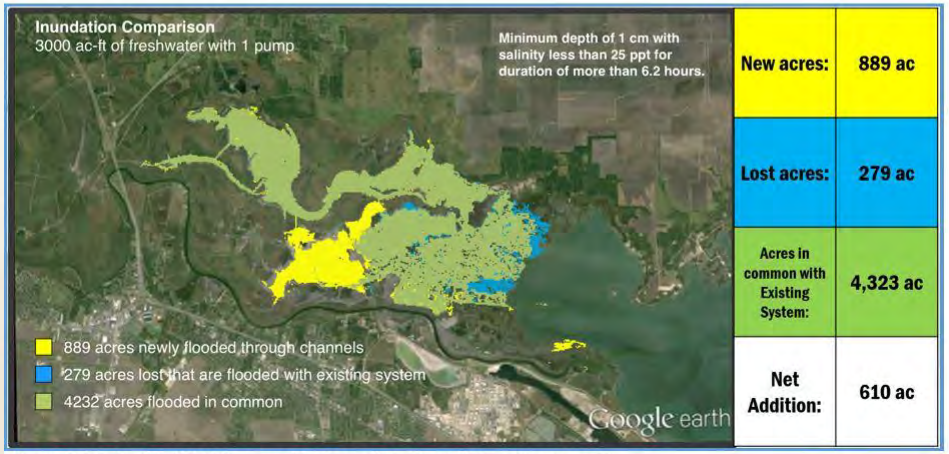
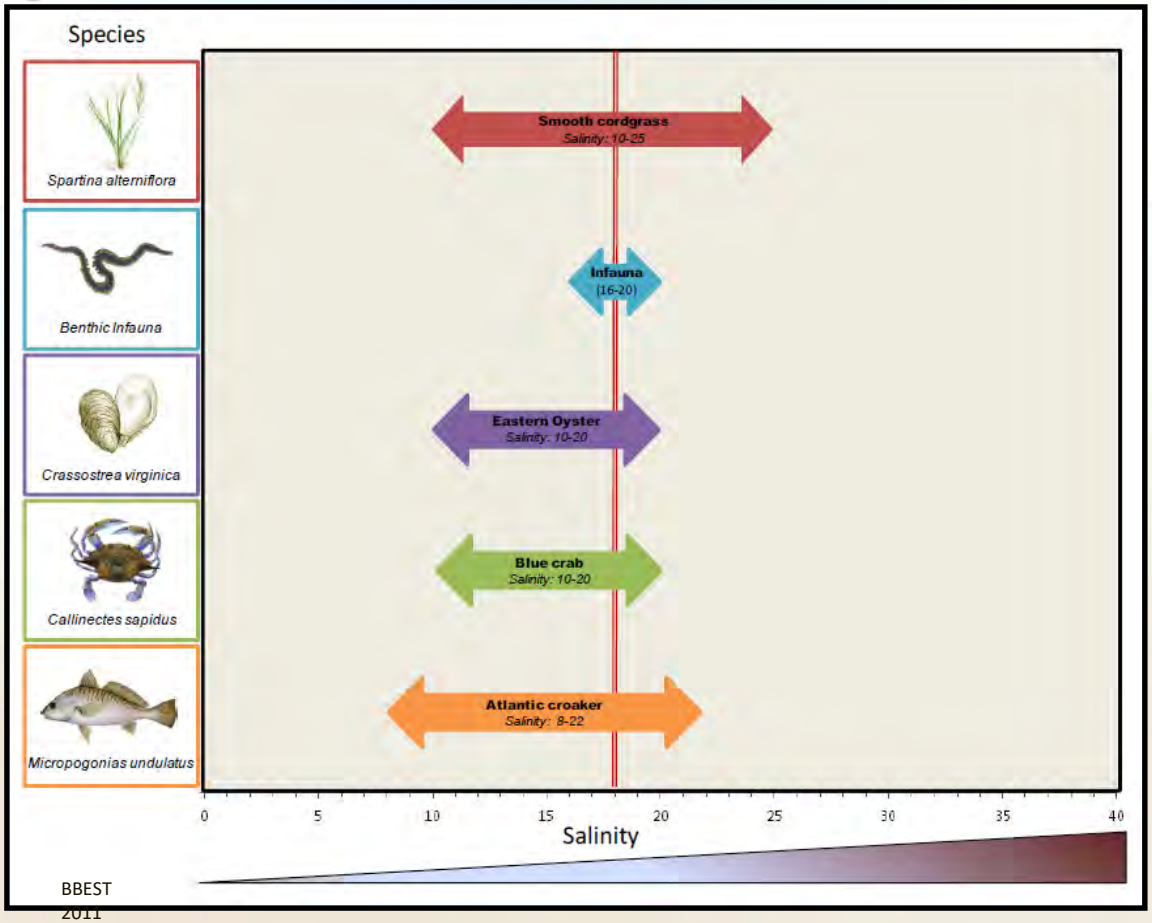


Figure 3.1.3-6: Modified System (Projects 4 & 5): 3,000 ac-ft. pumped Inundation Comparison with Baseline - for areas with salinity less than 25 ppt.

Salinity Tolerance of Various Estuarine Species



BBEST 2011

Salinity tolerance of *Spartina alterniflora* consistent with important faunal species

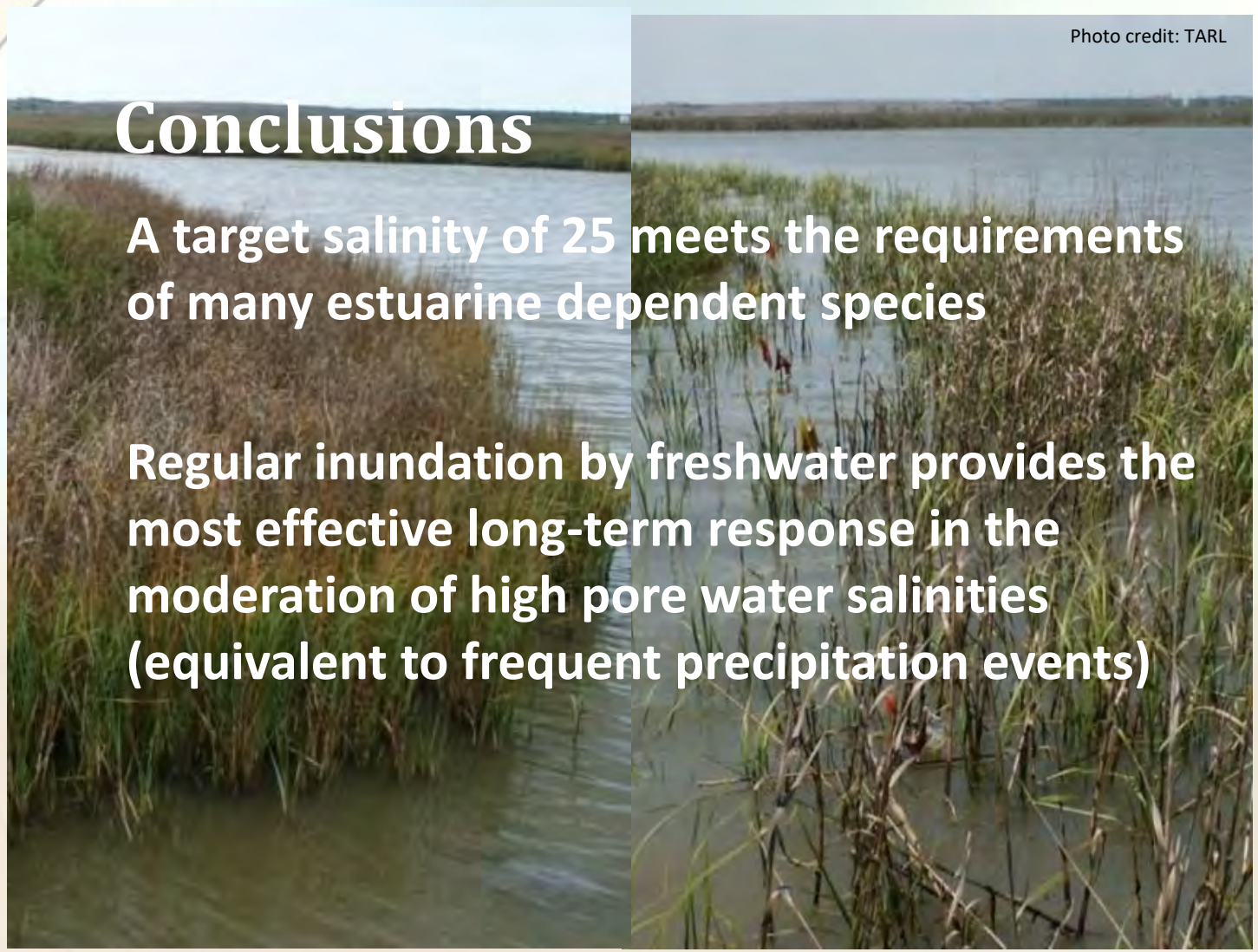


Photo credit: TARL

Conclusions

A target salinity of 25 meets the requirements of many estuarine dependent species

Regular inundation by freshwater provides the most effective long-term response in the moderation of high pore water salinities (equivalent to frequent precipitation events)

Project Alternative Modeling Using the Nueces Delta Hydrodynamic Model NDHM)

Criteria established to compare alternatives:

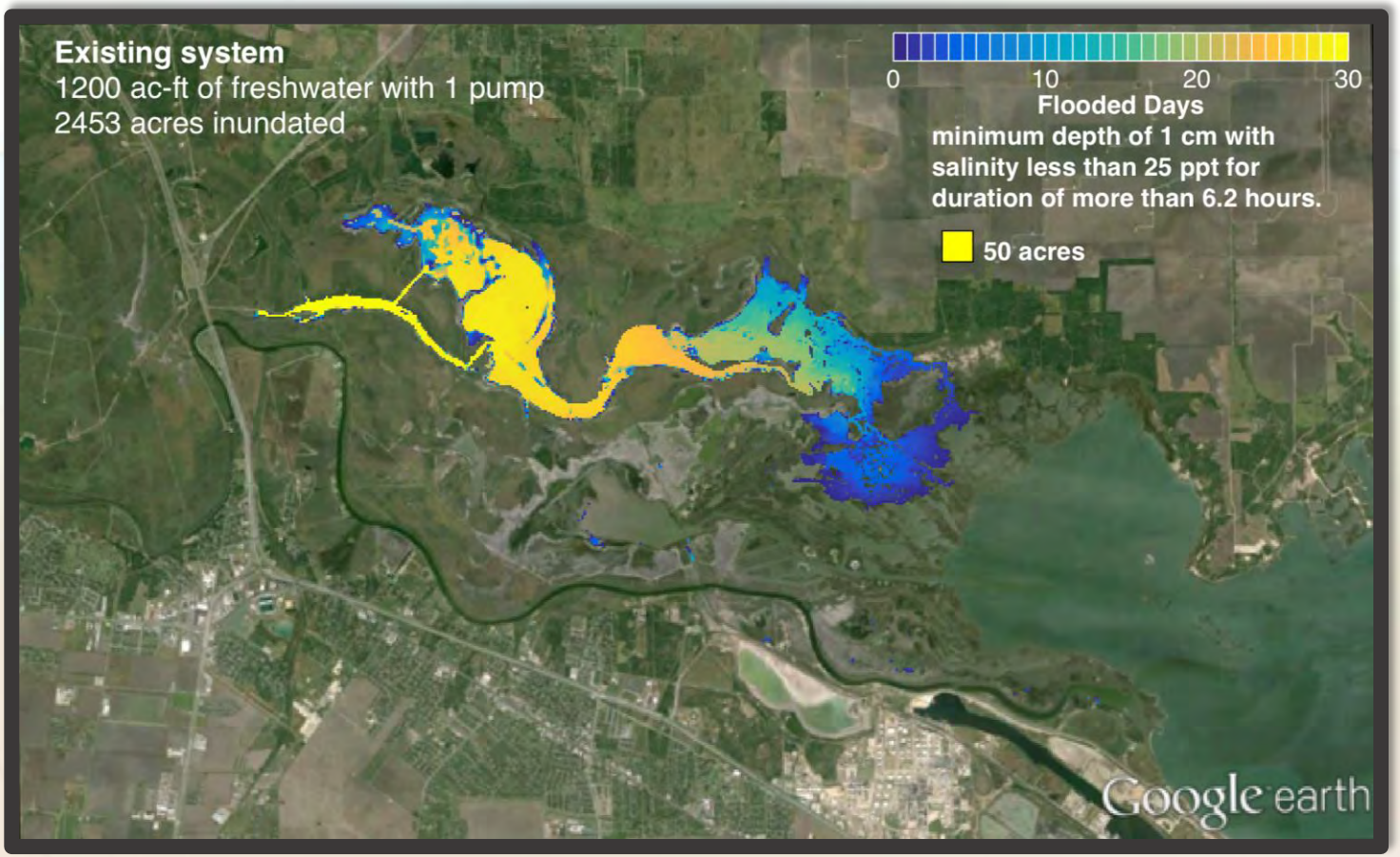
- Provided a water column depth of ≧1 cm
- Provided an inundation duration of > 6.2 hours
- Provided a salinity of < 25 ppt, < 20 ppt, < 15 ppt

Note: The depth and duration correspond to a typical tidal flooding period.

Project Options Included in Final Modeling

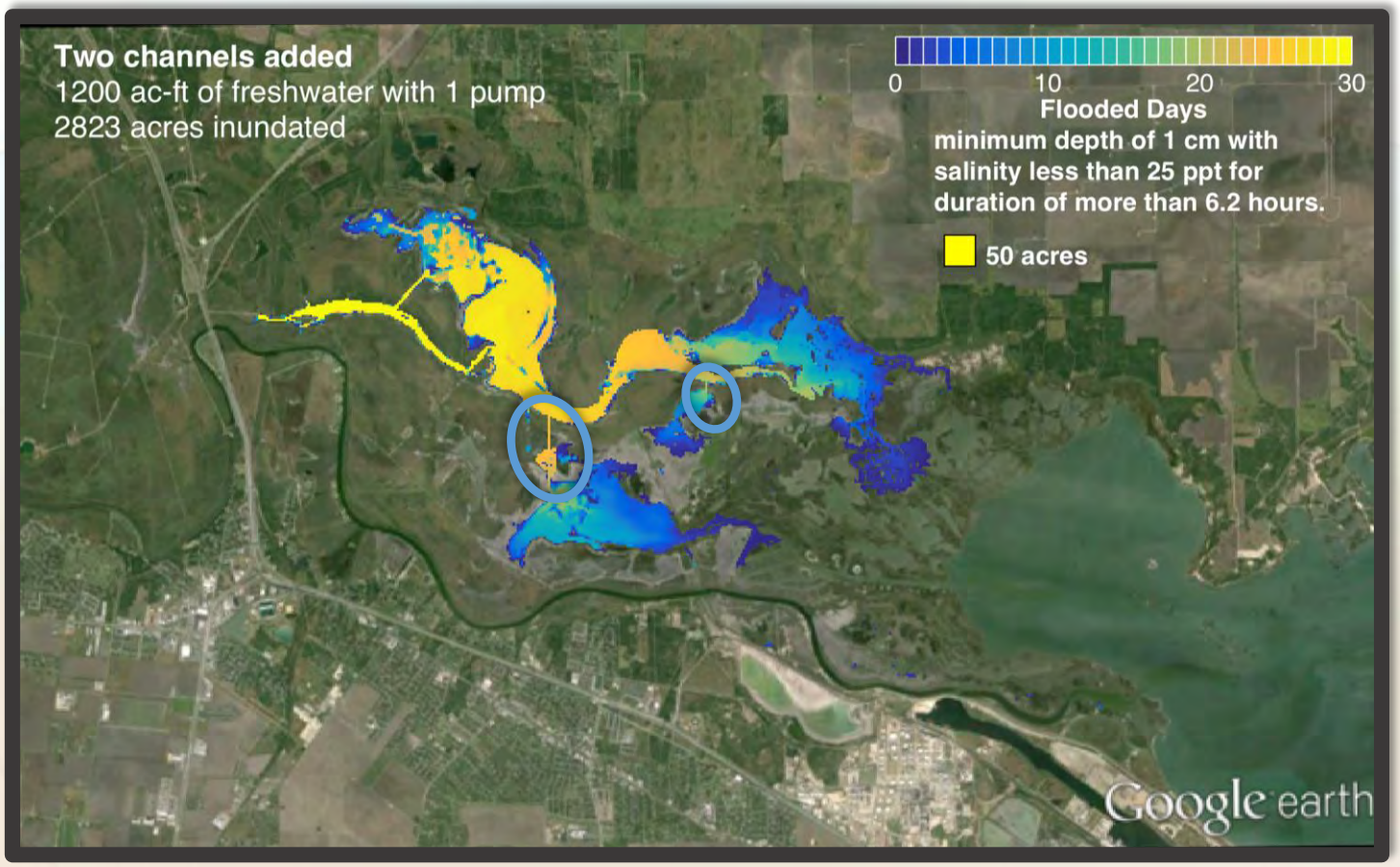
NDHM Used to Evaluate Inundation Duration and Salinity Changes Due to Pumping "Pass-Thru" Flows into the Rincon Bayou

1,200 ac-ft | 2,453 acres inundated



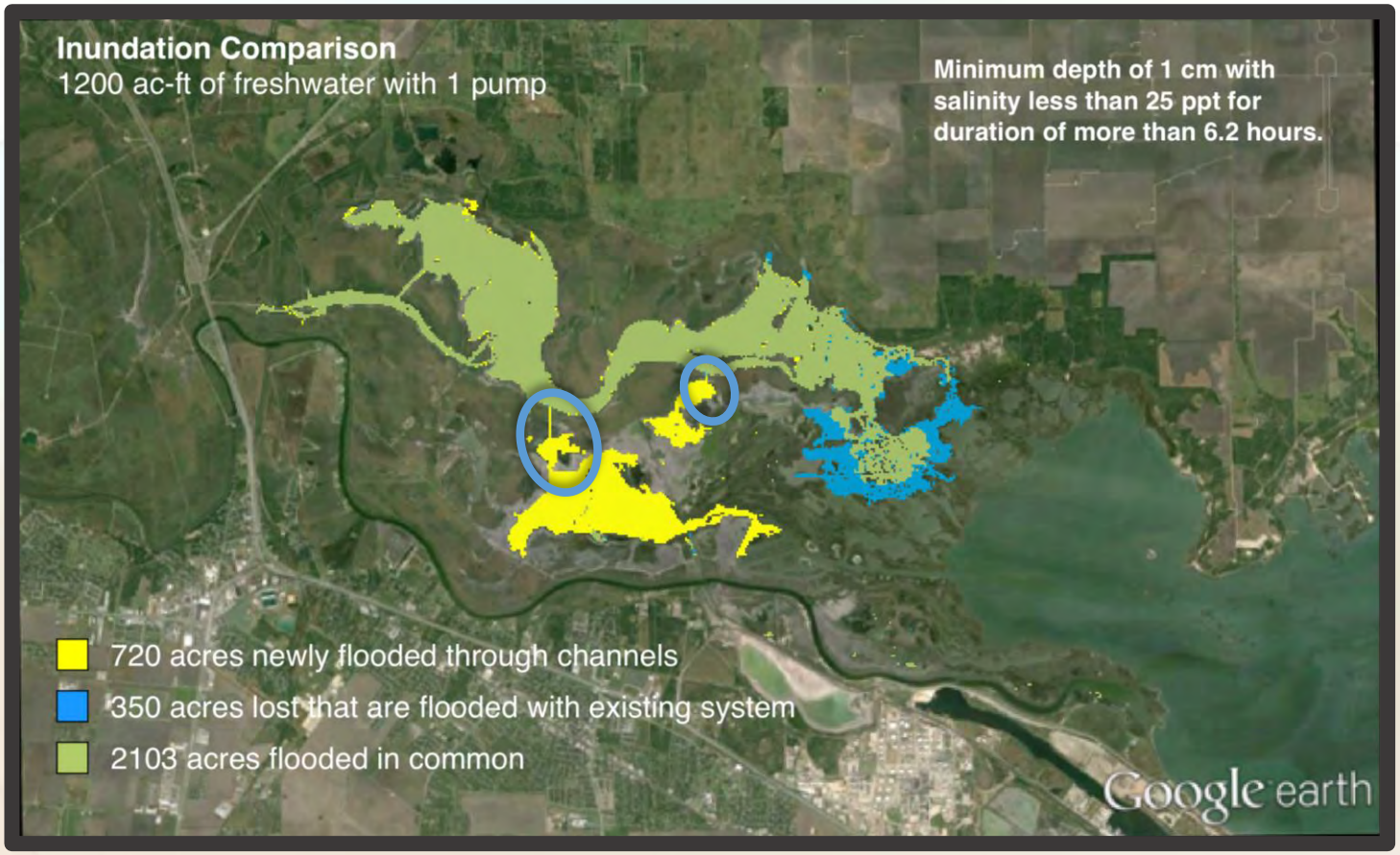
NDHM Used to Evaluate Inundation Duration and Salinity Changes Due to Pumping "Pass-Thru" Flows into the Rincon Bayou

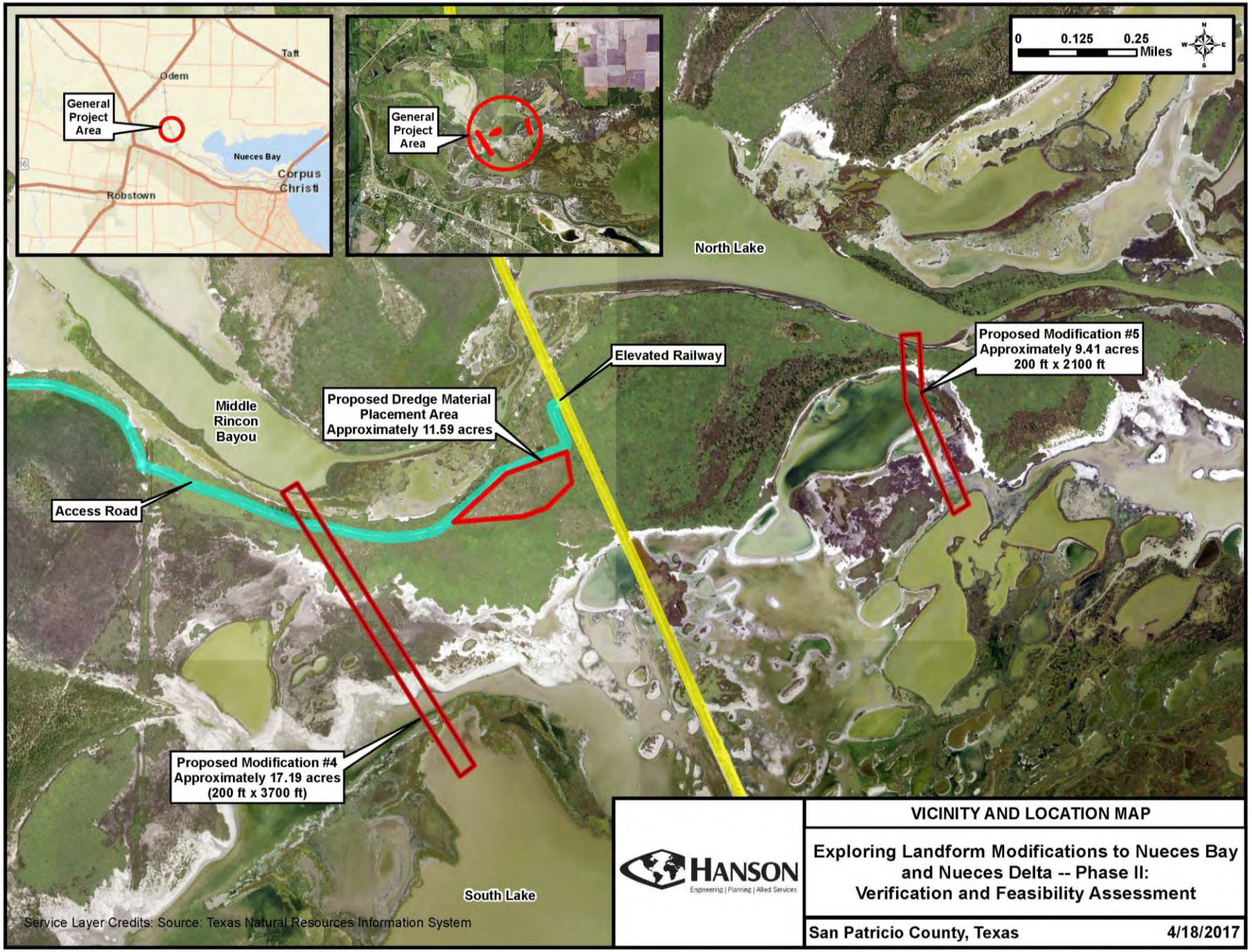
Modified System: Projects 4 & 5 | 1,200 ac-ft | 2,823 acres inundated

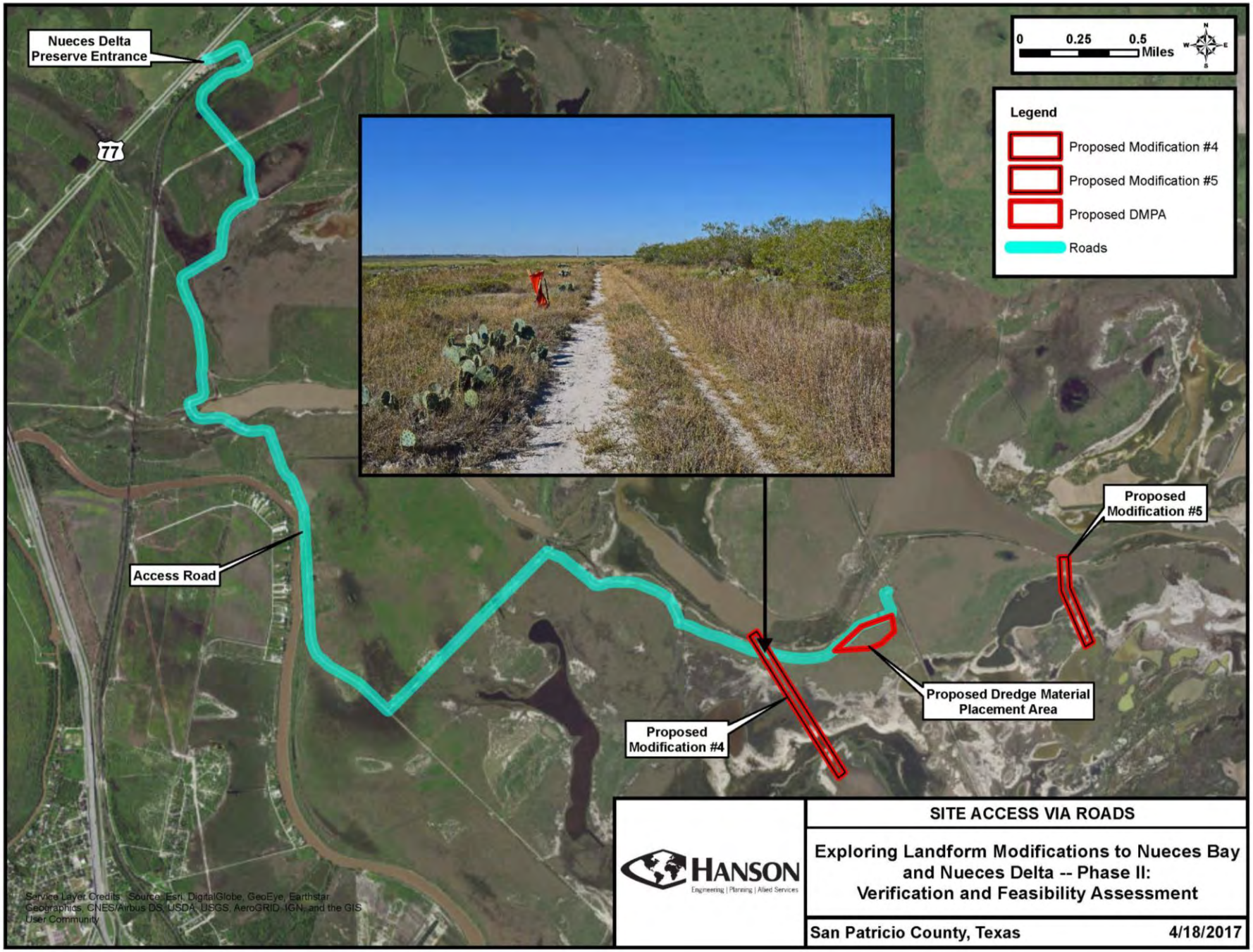


NDHM Used to Evaluate Inundation Duration and Salinity Changes Due to Pumping "Pass-Thru" Flows into the Rincon Bayou

Modified System: Projects 4 & 5 | 1,200 ac-ft | 2,823 acres inundated




Taft
Odem
General Project Area
Nueces Bay
Corpus Christi
Robstown
General Project Area
0 0.125 0.25 Miles
N
W
E
S
North Lake
Elevated Railway
Proposed Modification #5
Approximately 9.41 acres
200 ft x 2100 ft
Middle Rincon Bayou
Proposed Dredge Material Placement Area
Approximately 11.59 acres
Access Road
Proposed Modification #4
Approximately 17.19 acres
(200 ft x 3700 ft)
South Lake
Service Layer Credits: Source: Texas Natural Resources Information System
HANSON
Engineering | Planning | Allied Services
VICINITY AND LOCATION MAP
Exploring Landform Modifications to Nueces Bay and Nueces Delta -- Phase II:
Verification and Feasibility Assessment
San Patricio County, Texas
4/18/2017



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SITE ACCESS VIA ROADS

Exploring Landform Modifications to Nueces Bay and Nueces Delta -- Phase II: Verification and Feasibility Assessment

San Patricio County, Texas **4/18/2017**

0 0.25 0.5 Miles

N W E S

Legend

- Proposed Modification #4
- Proposed Modification #5
- Proposed DMPA
- Roads
- Water Access Route

Access Road

Proposed Modification #5

Access via Nueces Bay (narrowest width approximately 40 ft)

Proposed Dredge Material Placement Area

Proposed Modification #4

Nueces Bay

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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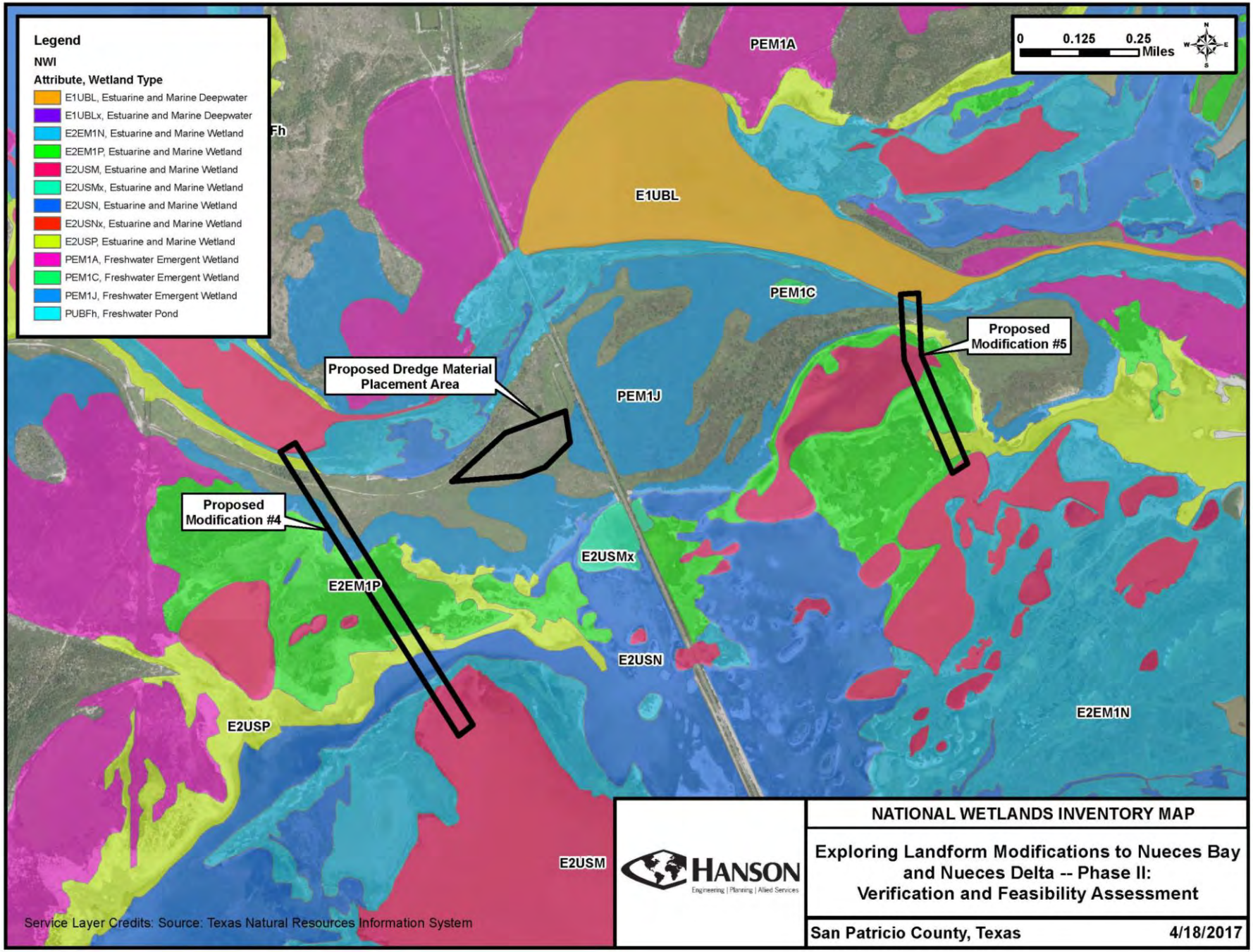
SITE ACCESS VIA WATER

Exploring Landform Modifications to Nueces Bay and Nueces Delta -- Phase II: Verification and Feasibility Assessment

San Patricio County, Texas **4/27/2017**


Legend
NWI
Attribute, Wetland Type
E1UBL, Estuarine and Marine Deepwater
E1UBLx, Estuarine and Marine Deepwater
E2EM1N, Estuarine and Marine Wetland
E2EM1P, Estuarine and Marine Wetland
E2USM, Estuarine and Marine Wetland
E2USMx, Estuarine and Marine Wetland
E2USN, Estuarine and Marine Wetland
E2USNx, Estuarine and Marine Wetland
E2USP, Estuarine and Marine Wetland
PEM1A, Freshwater Emergent Wetland
PEM1C, Freshwater Emergent Wetland
PEM1J, Freshwater Emergent Wetland
PUBFh, Freshwater Pond
0 0.125 0.25 Miles
N
W
E
S
PEM1A
Fh
E1UBL
PEM1C
Proposed Modification #5
Proposed Dredge Material Placement Area
PEM1J
Proposed Modification #4
E2USMx
E2EM1P
E2USN
E2EM1N
E2USP
E2USM
Service Layer Credits: Source: Texas Natural Resources Information System
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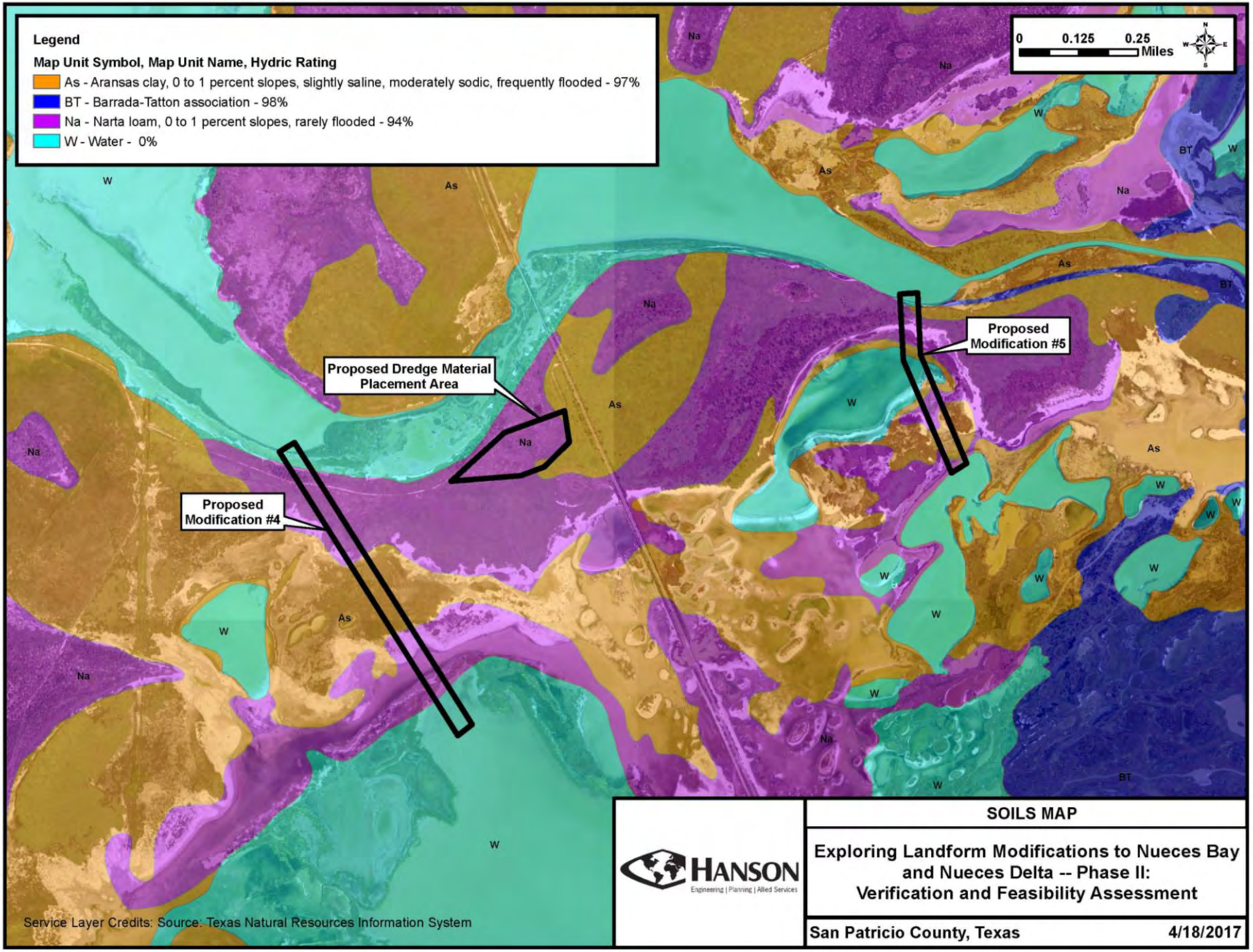
NATIONAL WETLANDS INVENTORY MAP
Exploring Landform Modifications to Nueces Bay and Nueces Delta -- Phase II: Verification and Feasibility Assessment
San Patricio County, Texas
4/18/2017


Legend
Map Unit Symbol, Map Unit Name, Hydric Rating
As - Aransas clay, 0 to 1 percent slopes, slightly saline, moderately sodic, frequently flooded - 97%
BT - Barrada-Tatton association - 98%
Na - Narta loam, 0 to 1 percent slopes, rarely flooded - 94%
W - Water - 0%
0 0.125 0.25 Miles
Proposed Dredge Material Placement Area
Proposed Modification #4
Proposed Modification #5
Service Layer Credits: Source: Texas Natural Resources Information System
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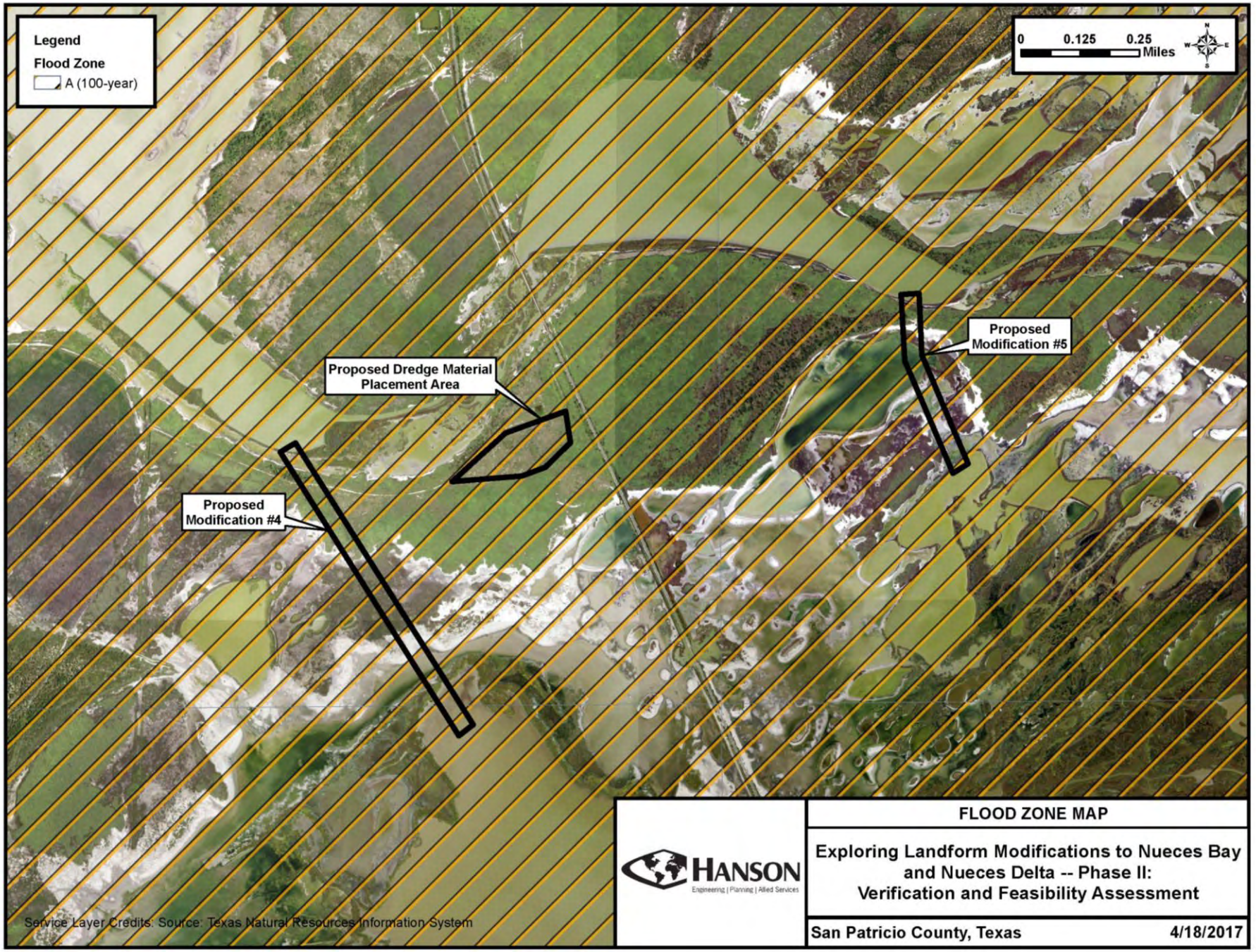
SOILS MAP
Exploring Landform Modifications to Nueces Bay and Nueces Delta -- Phase II: Verification and Feasibility Assessment
San Patricio County, Texas
4/18/2017



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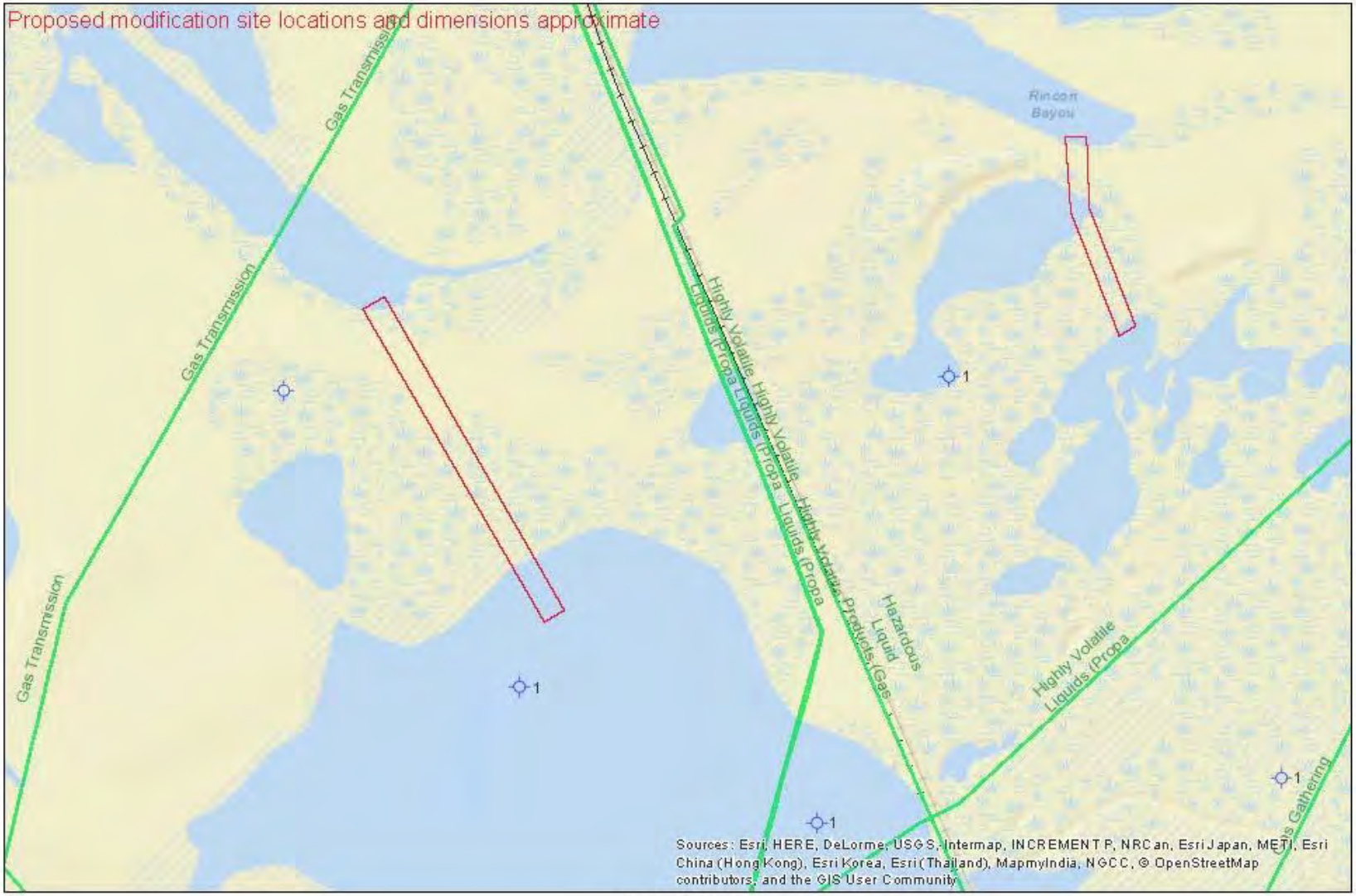
FLOOD ZONE MAP

Exploring Landform Modifications to Nueces Bay and Nueces Delta -- Phase II: Verification and Feasibility Assessment

San Patricio County, Texas **4/18/2017**



April 19, 2017

1 inch = 1,505 feet

PREPARED BY:

RAILROAD COMMISSION of TEXAS

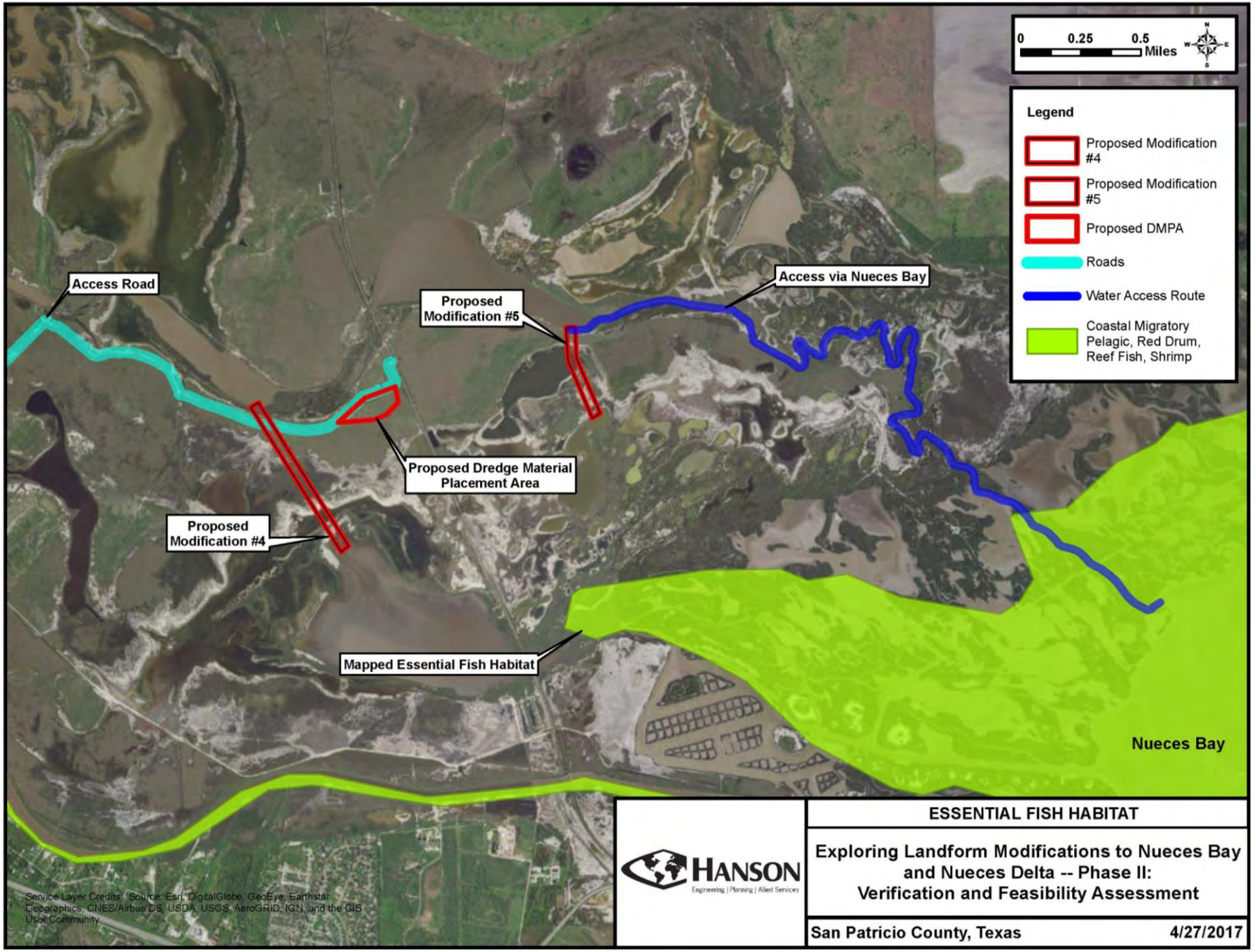
P.O. BOX 12967
AUSTIN, TX 78711-2967

Source: RRC Public GIS Viewer

0 0.2 0.4 0.6 0.8
Miles

0 625 1,250 2,500 3,750 5,000
Feet

NOTICE/DISCLAIMER: Mapping data sets are provided for informational purposes only. These data sets are continuously being updated and refined. Users are responsible for checking the accuracy, completeness, currency, and/or suitability of these data sets themselves. This is not a survey grade product and should not be used to define or establish survey boundaries.


0 0.25 0.5 Miles
N
W
E
S
Legend
Proposed Modification #4
Proposed Modification #5
Proposed DMPA
Roads
Water Access Route
Coastal Migratory Pelagic, Red Drum, Reef Fish, Shrimp
Access Road
Proposed Modification #5
Access via Nueces Bay
Proposed Dredge Material Placement Area
Proposed Modification #4
Mapped Essential Fish Habitat
Nueces Bay
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
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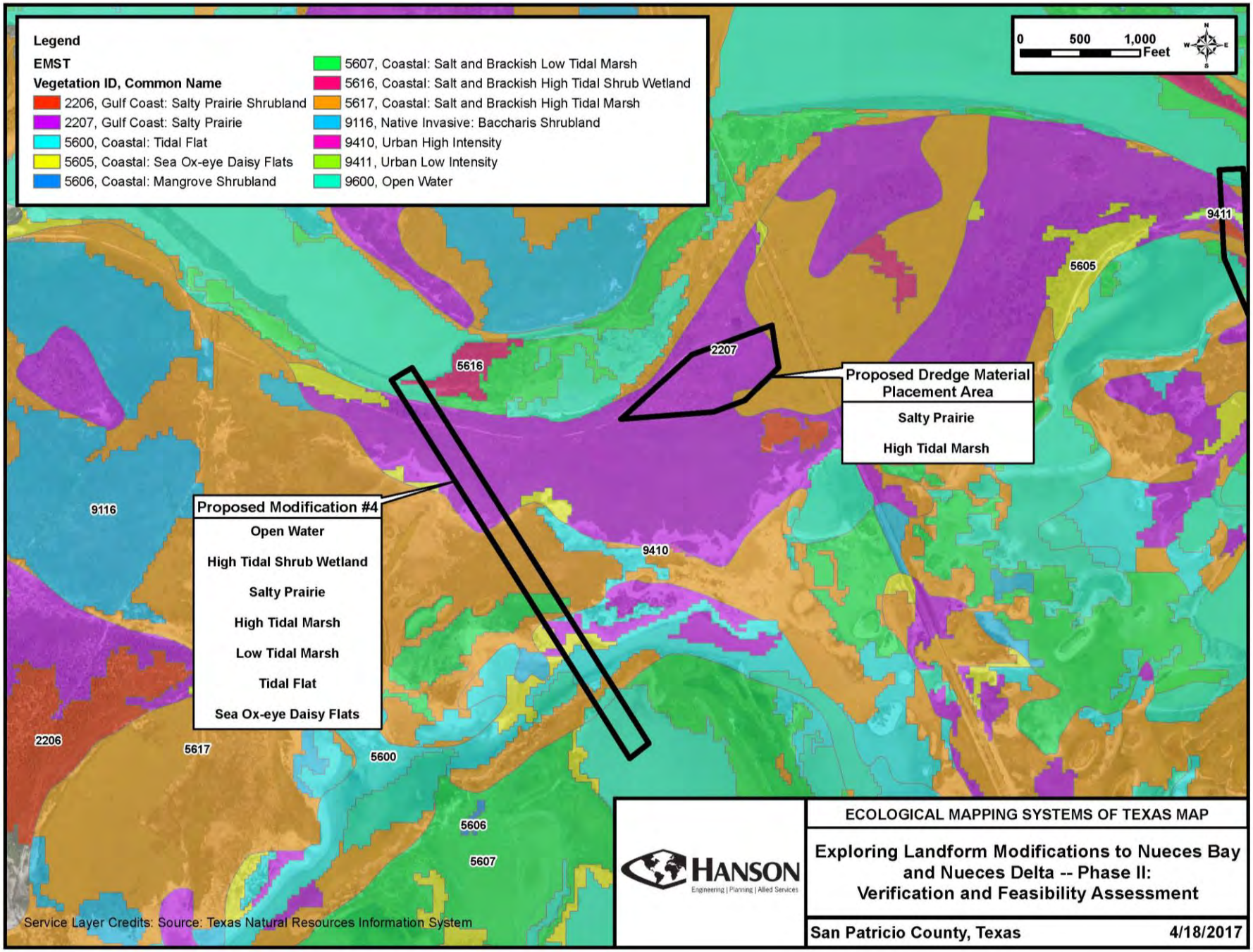
ESSENTIAL FISH HABITAT
Exploring Landform Modifications to Nueces Bay and Nueces Delta -- Phase II: Verification and Feasibility Assessment
San Patricio County, Texas
4/27/2017


Legend
EMST
Vegetation ID, Common Name
2206, Gulf Coast: Salty Prairie Shrubland
2207, Gulf Coast: Salty Prairie
5600, Coastal: Tidal Flat
5605, Coastal: Sea Ox-eye Daisy Flats
5606, Coastal: Mangrove Shrubland
5607, Coastal: Salt and Brackish Low Tidal Marsh
5616, Coastal: Salt and Brackish High Tidal Shrub Wetland
5617, Coastal: Salt and Brackish High Tidal Marsh
9116, Native Invasive: Baccharis Shrubland
9410, Urban High Intensity
9411, Urban Low Intensity
9600, Open Water
0 500 1,000 Feet
N
W E
S
9411
5605
2207
5616
Proposed Dredge Material Placement Area
Salty Prairie
High Tidal Marsh
9116
Proposed Modification #4
Open Water
High Tidal Shrub Wetland
Salty Prairie
High Tidal Marsh
Low Tidal Marsh
Tidal Flat
Sea Ox-eye Daisy Flats
9410
2206
5617
5600
5606
5607
Service Layer Credits: Source: Texas Natural Resources Information System
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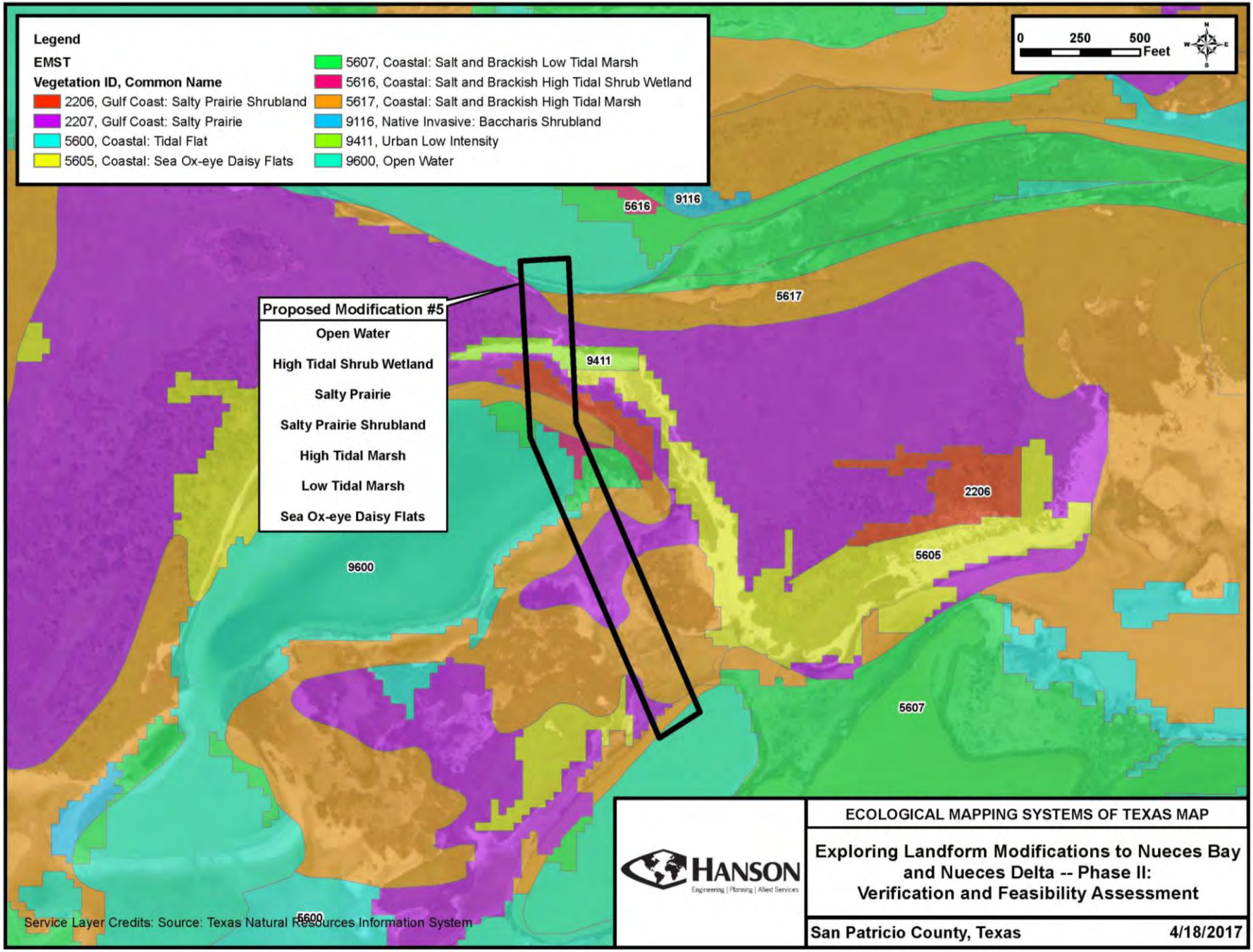
ECOLOGICAL MAPPING SYSTEMS OF TEXAS MAP
Exploring Landform Modifications to Nueces Bay and Nueces Delta -- Phase II: Verification and Feasibility Assessment
San Patricio County, Texas
4/18/2017


Legend
EMST
Vegetation ID, Common Name
2206, Gulf Coast: Salty Prairie Shrubland
2207, Gulf Coast: Salty Prairie
5600, Coastal: Tidal Flat
5605, Coastal: Sea Ox-eye Daisy Flats
5607, Coastal: Salt and Brackish Low Tidal Marsh
5616, Coastal: Salt and Brackish High Tidal Shrub Wetland
5617, Coastal: Salt and Brackish High Tidal Marsh
9116, Native Invasive: Baccharis Shrubland
9411, Urban Low Intensity
9600, Open Water
0 250 500 Feet
N
W
E
S
5616
9116
5617
Proposed Modification #5
Open Water
High Tidal Shrub Wetland
Salty Prairie
Salty Prairie Shrubland
High Tidal Marsh
Low Tidal Marsh
Sea Ox-eye Daisy Flats
9411
2206
5605
9600
5607
5600
Service Layer Credits: Source: Texas Natural Resources Information System
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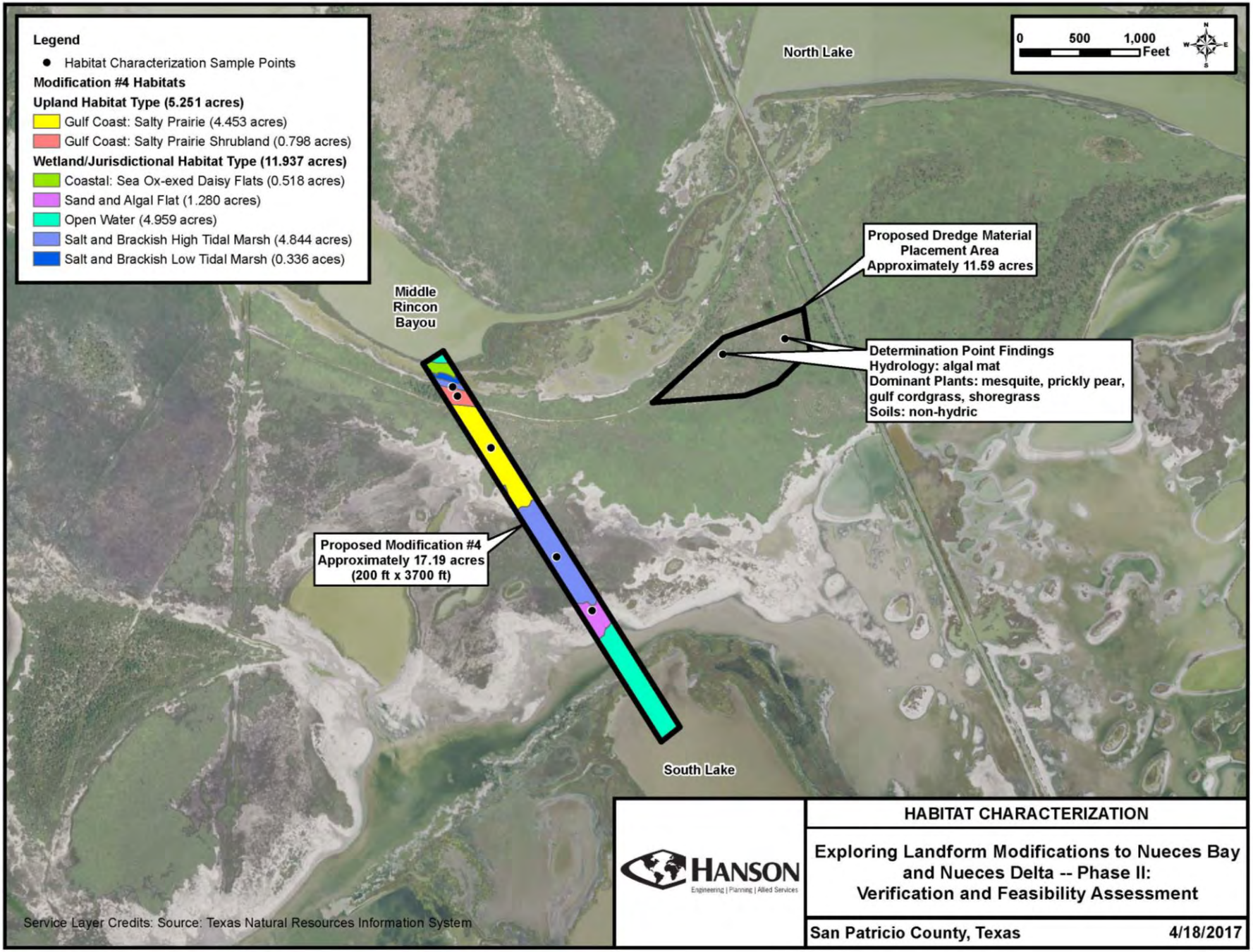
Engineering | Planning | Allied Services
ECOLOGICAL MAPPING SYSTEMS OF TEXAS MAP
Exploring Landform Modifications to Nueces Bay and Nueces Delta -- Phase II: Verification and Feasibility Assessment
San Patricio County, Texas
4/18/2017


Legend
Habitat Characterization Sample Points
Modification #4 Habitats
Upland Habitat Type (5.251 acres)
Gulf Coast: Salty Prairie (4.453 acres)
Gulf Coast: Salty Prairie Shrubland (0.798 acres)
Wetland/Jurisdictional Habitat Type (11.937 acres)
Coastal: Sea Ox-exed Daisy Flats (0.518 acres)
Sand and Algal Flat (1.280 acres)
Open Water (4.959 acres)
Salt and Brackish High Tidal Marsh (4.844 acres)
Salt and Brackish Low Tidal Marsh (0.336 aces)
0 500 1,000 Feet
N
S
E
W
North Lake
Proposed Dredge Material Placement Area Approximately 11.59 acres
Middle Rincon Bayou
Determination Point Findings
Hydrology: algal mat
Dominant Plants: mesquite, prickly pear, gulf cordgrass, shoregrass
Soils: non-hydric
Proposed Modification #4
Approximately 17.19 acres
(200 ft x 3700 ft)
South Lake
Service Layer Credits: Source: Texas Natural Resources Information System
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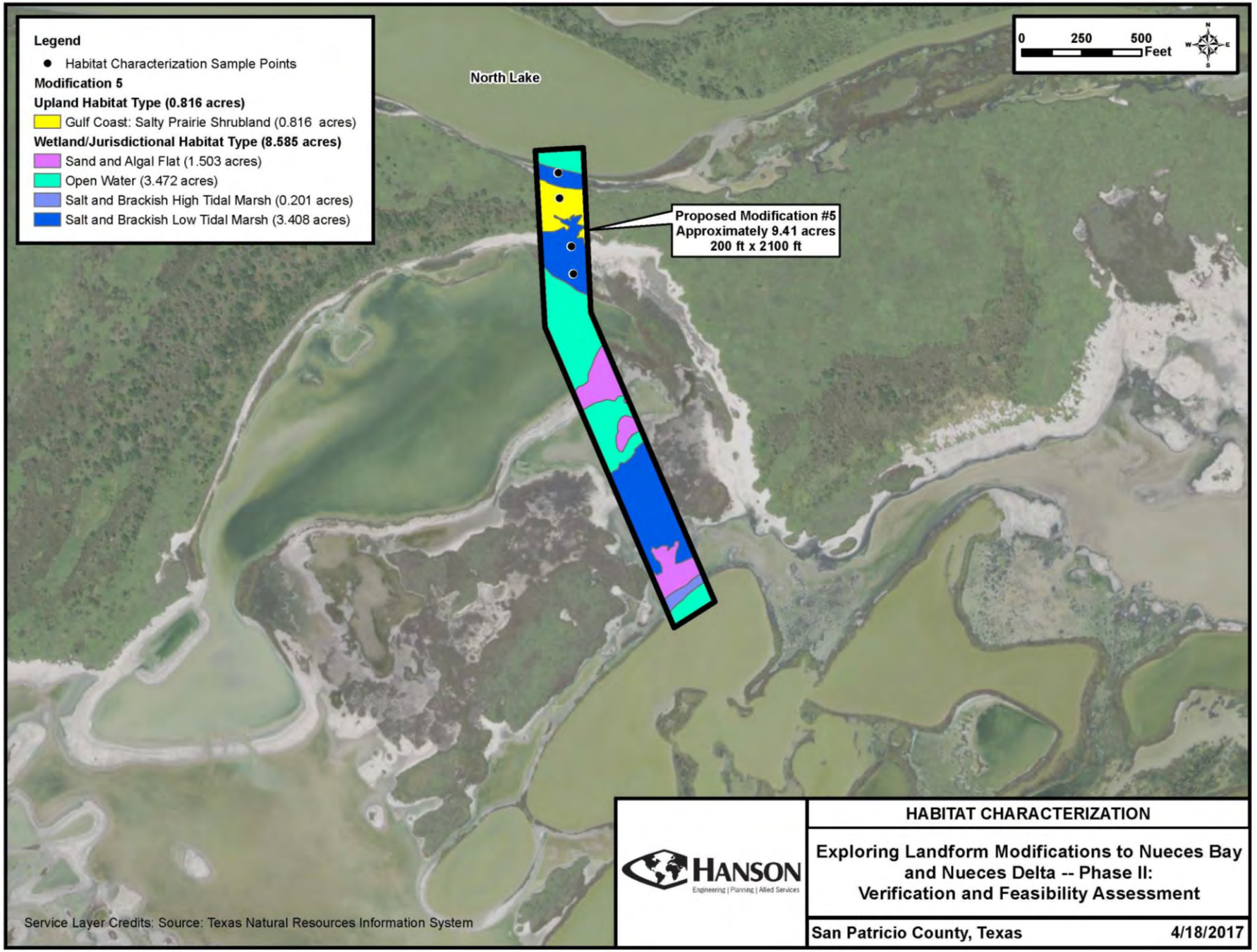
HABITAT CHARACTERIZATION
Exploring Landform Modifications to Nueces Bay and Nueces Delta -- Phase II:
Verification and Feasibility Assessment
San Patricio County, Texas
4/18/2017


Legend
Habitat Characterization Sample Points
Modification 5
Upland Habitat Type (0.816 acres)
Gulf Coast: Salty Prairie Shrubland (0.816 acres)
Wetland/Jurisdictional Habitat Type (8.585 acres)
Sand and Algal Flat (1.503 acres)
Open Water (3.472 acres)
Salt and Brackish High Tidal Marsh (0.201 acres)
Salt and Brackish Low Tidal Marsh (3.408 acres)
North Lake
Proposed Modification #5
Approximately 9.41 acres
200 ft x 2100 ft
0
250
500
Feet
N
W
E
S
Service Layer Credits: Source: Texas Natural Resources Information System
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HABITAT CHARACTERIZATION
Exploring Landform Modifications to Nueces Bay and Nueces Delta -- Phase II:
Verification and Feasibility Assessment
San Patricio County, Texas
4/18/2017

Modification Site #4 (north end)

Open Water, Coastal: Sea Ox-eyed Daisy Flats, Salt and Brackish Low Tidal Marsh, Salt and Brackish High Tidal

Modification Site #4

Gulf Coast Salty Prairie Shrubland

Modification Site #4

Gulf Coast Salty Prairie Shrubland (right) and Gulf Coast Salt Prairie (left)

Modification Site #4
Gulf Coast Salty Prairie

Modification Site #4

Coastal: Tidal Flats (foreground) and Salt and Brackish High Tidal Marsh (background)

Modification Site #4 (south end)

Coastal: Tidal Flats and Open Water

Modification Site #5 (north end)

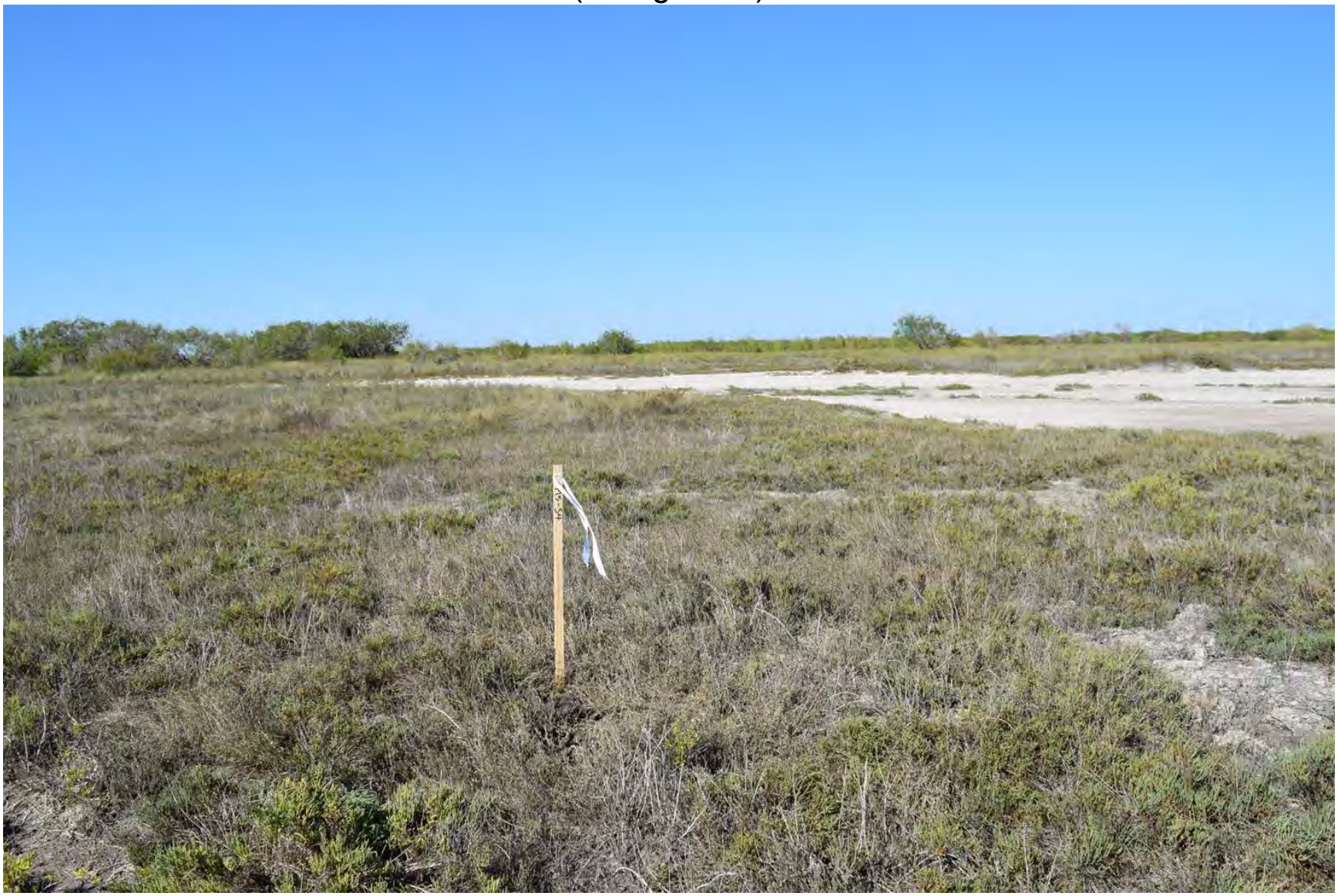
Open Water, Salt and Brackish Low Tidal Marsh, Gulf Coast Salty Prairie Shrubland

Modification Site #5

Gulf Coast Salty Prairie Shrubland

Modification Site #5

Salt and Brackish Low Tidal Marsh (foreground) and Gulf Coast Salty Prairie Shrubland (background)



Modification Site #5

Salt and Brackish Low Tidal Marsh, Open Water

Modification Site #5

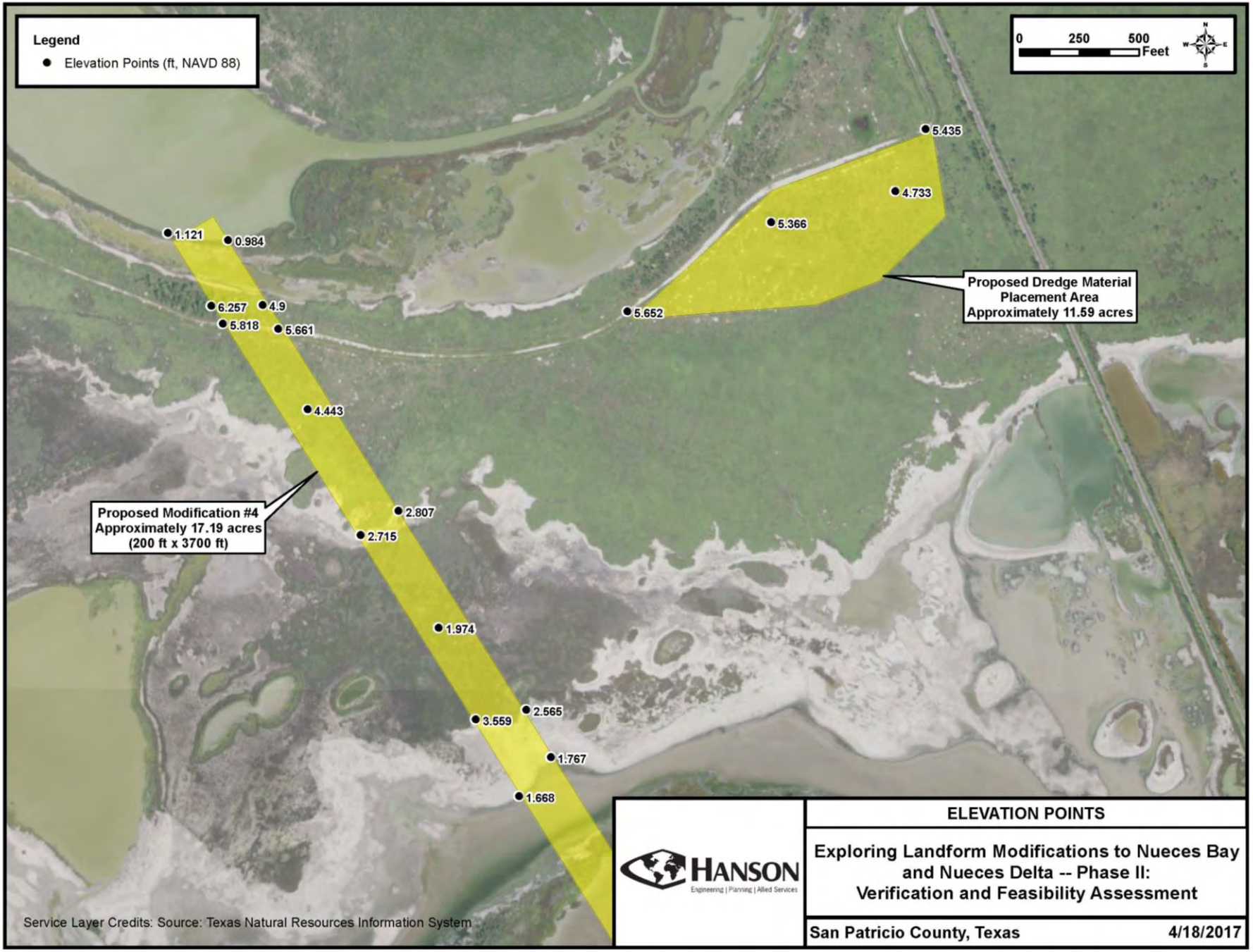
Coastal: Tidal Flats, Salt and Brackish High Tidal Marsh, Open Water

DMPA

Gulf Coast Salty Prairie Shrubland

DMPA

Gulf Coast Salty Prairie Shrubland



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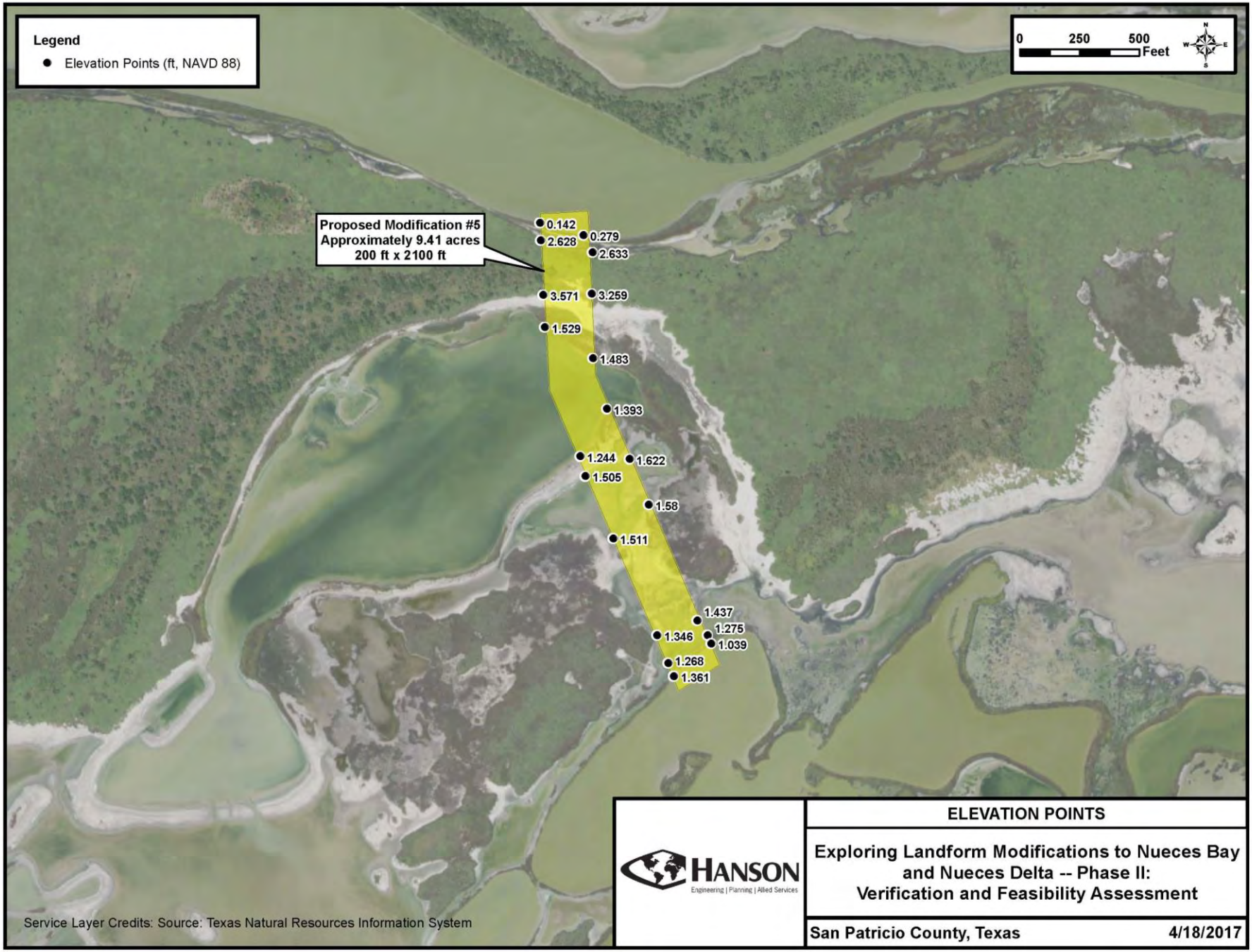
ELEVATION POINTS

Exploring Landform Modifications to Nueces Bay and Nueces Delta -- Phase II: Verification and Feasibility Assessment

San Patricio County, Texas **4/18/2017**


Legend
Elevation Points (ft, NAVD 88)
0
250
500
Feet
N
W
E
S
Proposed Modification #5
Approximately 9.41 acres
200 ft x 2100 ft
0.142
2.628
0.279
2.633
3.571
3.259
1.529
1.483
1.393
1.244
1.622
1.505
1.58
1.511
1.437
1.275
1.346
1.039
1.268
1.361
Service Layer Credits: Source: Texas Natural Resources Information System
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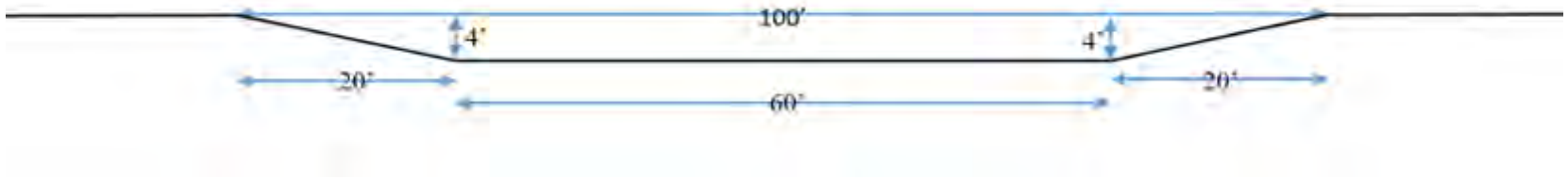
ELEVATION POINTS
Exploring Landform Modifications to Nueces Bay and Nueces Delta -- Phase II:
Verification and Feasibility Assessment
San Patricio County, Texas
4/18/2017

Conceptual Diversion Channel Cross-Section



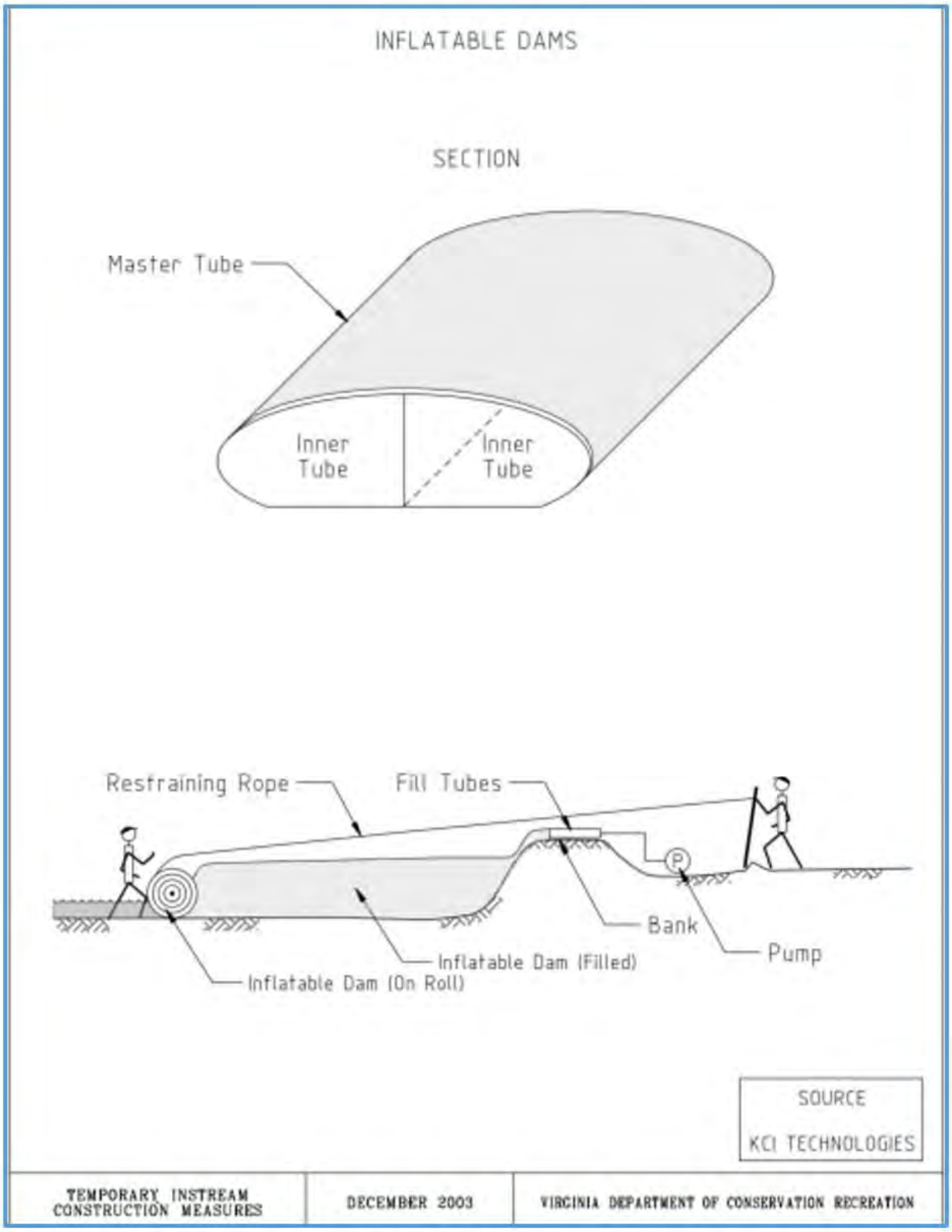


Figure 3.2.1-9 Example of deploying an inflatable barrier in the field

(Source: *http://www.deq.virginia.gov/Portals/0/DEQ/Water/Publications/BMPGuide.pdf*)