TE-0117 BORROW AREA AND ACCESS CORRIDOR DELIVERABLE

SUBMITTED SETPEMBER 2018 BY C. H. FENSTERMAKER & ASSOCIATES, LLC

TE-0117 BORROW AREA AND ACCESS CORRIDOR DELIVERABLE

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1.0) Coverletter

Client Focused. Technology Driven.

September 5, 2018

Brad Miller
Project Manager
Coastal Protection and Restoration Authority
150 Terrace Ave
Baton Rouge, LA 70802

RE: C.H. Fenstermaker & Associates, L.L.C Final Submittal
CPRA's Island Road Marsh Creation (TE-117) Marsh Creation Project – Borrow Area and Access Corridor Design

Phase I
CPRA Contract No. 4400005546
Purchase Order No. 2000242620
Task Order 2 – Island Road (TE-117) Borrow Area Survey & Design

Phase II
CPRA Contract No. 4400012415
Purchase Order No. 2000303178
Task Order 1 – Island Road Marsh Creation (TE-117) Project

Dear Mr. Miller:

C.H. Fenstermaker & Associates, L.L.C. was awarded a professional services indefinite delivery, indefinite quantity contract (4400005546) on September 30, 2014. Task Order #2 for this contract was issued December 6, 2016. This contract and task order expired on August 31, 2017, at which time, only about half of the scope of services was complete. On September 1, 2017, CPRA awarded a new indefinite delivery, indefinite quantity contract (4400012415) and Task Order 1, Island Road Marsh Creation, was issued.

Fenstermaker is pleased to submit this two (2) volume set constitutes the final deliverables for this effort.

Included in these two volumes are:

Volume I

1.1 TE-117 Island Road Borrow Area Option 1

1.2 TE-117 Island Road Borrow Area Option 2

1.3 TE-117 Island Road Conveyance Access Corridor Recommendations

1.4 TE-117 Borrow Area Hydrodynamic Study Report

1.5 TE-117 Island Road Geotechnical Recommendations

1.6 TE-117 Cultural Resources Report of Negative Findings

Volume II

2.1 TE-117 Final Survey Report – Phase I and II

2.2 TE-117 Phase 1 South Access and Borrow Area Maps

2.3 TE-117 Phase 2 Conveyance Corridor and North Access Maps

Should you have any questions, please contact me at (225) 229 - 3569.

Sincerely,

FENSTERMAKER

Garvin D Pittman
Director, Environmental Specialist

cc: Dr. John Foret, PhD
Ricardo Johnson, PLS

1.1) TE-117 Island Road Borrow Area Option 1

Line Table			
Line #	Beginning Northing & Easting	Ending Northing & Easting	Distance
L1	301,532.31 3,546,407.10	301,532.31 3,548,405.92	1,998.82
L2	301,532.31 3,548,405.92	300,275.63 3,548,405.92	1,256.68
L3	300,275.63 3,548,405.92	298,966.59 3,549,093.31	1,478.54
L4	298,966.59 3,549,093.31	298,704.53 3,549,957.52	903.07
L5	298,704.53 3,549,957.52	298,835.94 3,552,077.78	2,124.32
L6	298,835.94 3,552,077.78	298,278.53 3,552,058.33	557.75
L7	298,278.53 3,552,058.33	297,587.31 3,552,138.10	695.80
L8	297,587.31 3,552,138.10	296,220.11 3,551,734.41	1,425.56
L9	296,220.11 3,551,734.41	295,458.90 3,551,124.80	975.23
L10	295,458.90 3,551,124.80	295,535.64 3,548,379.07	2,746.80
L11	295,535.64 3,548,379.07	296,400.19 3,548,379.07	864.55
L12	296,400.19 3,548,379.07	297,453.56 3,547,540.82	1,346.20
L13	297,453.56 3,547,540.82	297,887.36 3,547,540.82	433.80
L14	297,887.36 3,547,540.82	297,887.36 3,546,407.10	1,133.72
L15	297,887.36 3,546,407.10	301,532.31 3,546,407.10	3,644.95

Legend

Original Borrow Area Outline

Original Excavation Area Outline

NAD 83 LOUISIANA SOUTH ZONE

Scale: 1" = 1,000'

1,000' 0 500' 1,000'

BORROW AREA EXHIBIT DREDGE TO -15.0' (6,911179.81 Cu. Yds) Option 1

Sheet 1 of 2

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)

Borrow Area

Lake Tambour Area

Terrebonne Parish, Louisiana

FENSTERMAKER

C. H. Fenstermaker & Associates, L.L.C.
135 Regency Sq. Lafayette, LA 70508
Ph. 337-237-2200 Fax. 337-232-3299
www.fenstermaker.com

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DATE: 02/06/2018				

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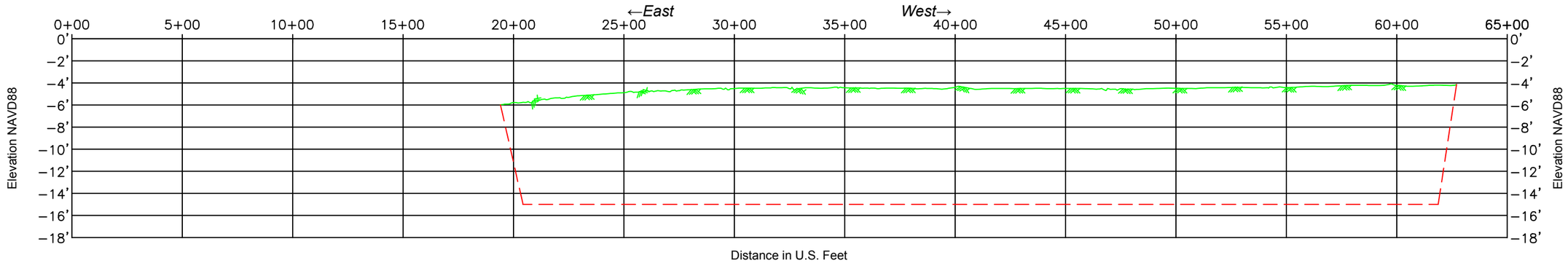

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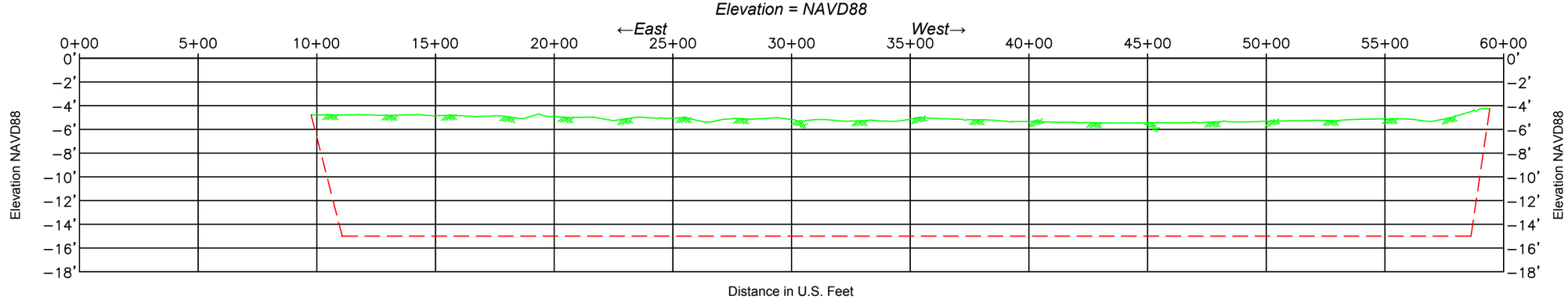

Legend
Existing Water Bottoms
Proposed Borrow Area

BORROW AREA EXHIBIT DREDGE TO -15.0' Option 1

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 2 of 2

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C. H. Fenstermaker & Associates, L.L.C.
135 Regency Sq. Lafayette, LA 70508
Ph. 337-237-2200 Fax. 337-232-3299
www.fenstermaker.com

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* Value adjusted by cut or fill factor other than 1.0

1.2) TE-117 Island Road Borrow Area Option 2

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L2	301,532.31 3,548,405.92	300,275.63 3,548,405.92	1,256.68
L3	300,275.63 3,548,405.92	298,966.59 3,549,093.31	1,478.54
L4	298,966.59 3,549,093.31	298,704.53 3,549,957.52	903.07
L5	298,704.53 3,549,957.52	298,835.94 3,552,077.78	2,124.32
L6	298,835.94 3,552,077.78	298,278.53 3,552,058.33	557.75
L7	298,278.53 3,552,058.33	297,587.31 3,552,138.10	695.80
L8	297,587.31 3,552,138.10	296,560.05 3,551,834.79	1,071.10
L9	296,560.05 3,551,834.79	295,660.29 3,548,379.07	3,570.93
L10	295,660.29 3,548,379.07	296,400.19 3,548,379.07	739.90
L11	296,400.19 3,548,379.07	297,453.56 3,547,540.82	1,346.20
L12	297,453.56 3,547,540.82	297,887.36 3,547,540.82	433.80
L13	297,887.36 3,547,540.82	297,887.36 3,546,407.10	1,133.72
L14	297,887.36 3,546,407.10	301,532.31 3,546,407.10	3,644.95

Legend

- Old Borrow Area Outline
- Old Excavation Area Outline
- New Borrow Area Outline
- New Excavation Area Outline

NAD 83 LOUISIANA SOUTH ZONE

Scale: 1" = 1,000'

1,000' 0 500' 1,000'

BORROW AREA EXHIBIT DREDGE TO -15.0' (6,102,057 Cu. Yds) Option 2

Sheet 1 of 2

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
Terrebonne Parish, Louisiana

FENSTERMAKER
C. H. Fenstermaker & Associates, L.L.C.
135 Regency Sq. Lafayette, LA 70508
Ph. 337-237-2200 Fax. 337-232-3299
www.fenstermaker.com

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DATE: 02/06/2018				

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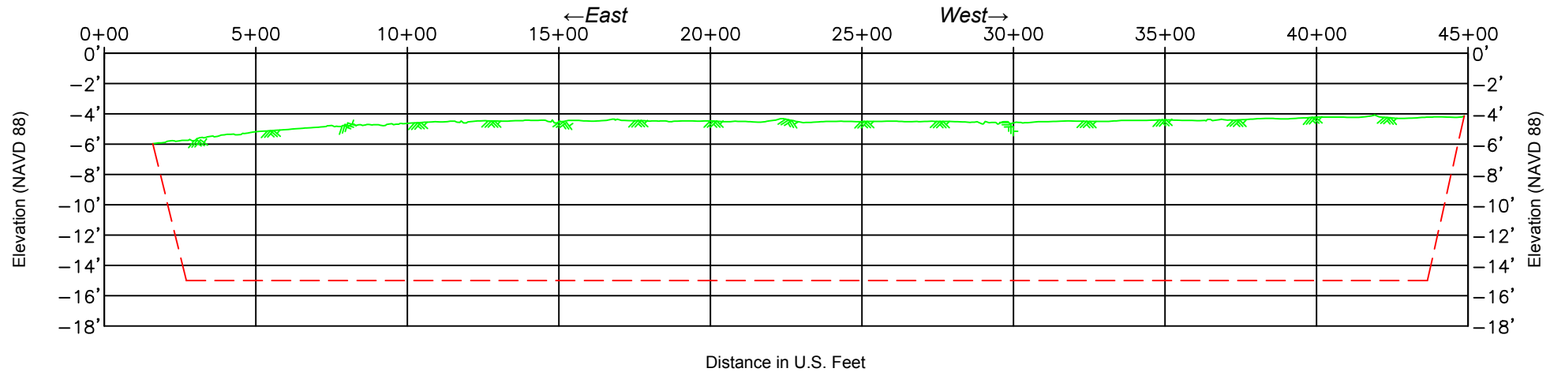

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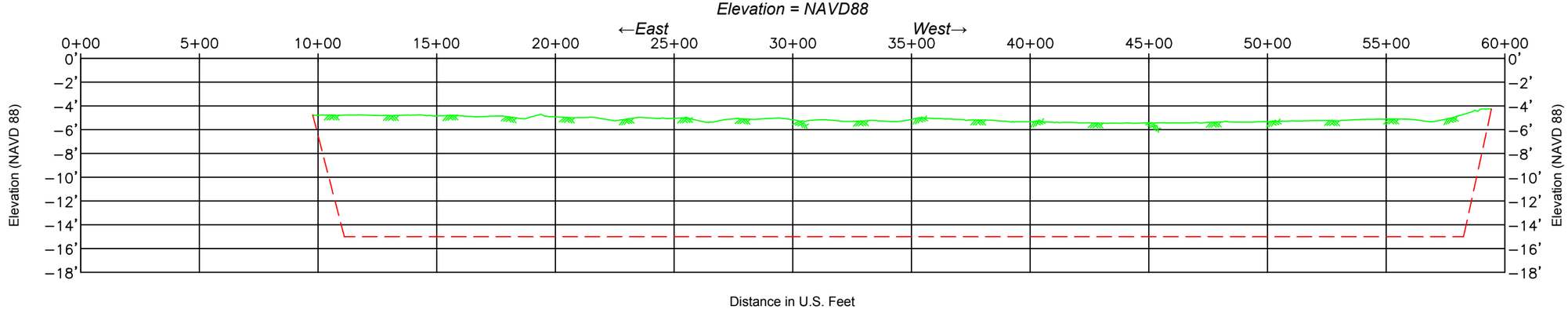

Legend
Existing Water Bottoms
Proposed Borrow Area

BORROW AREA EXHIBIT DREDGE TO -15.0' Option 2

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 2 of 2

C. H. Fenstermaker & Associates, L.L.C.
135 Regency Sq. Lafayette, LA 70508
Ph. 337-237-2200 Fax. 337-232-3299
www.fenstermaker.com

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DATE: 02/06/2018				

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Volume Summary

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* Value adjusted by cut or fill factor other than 1.0

1.3) TE-117 Island Road Conveyance Access Corridor Recommendations

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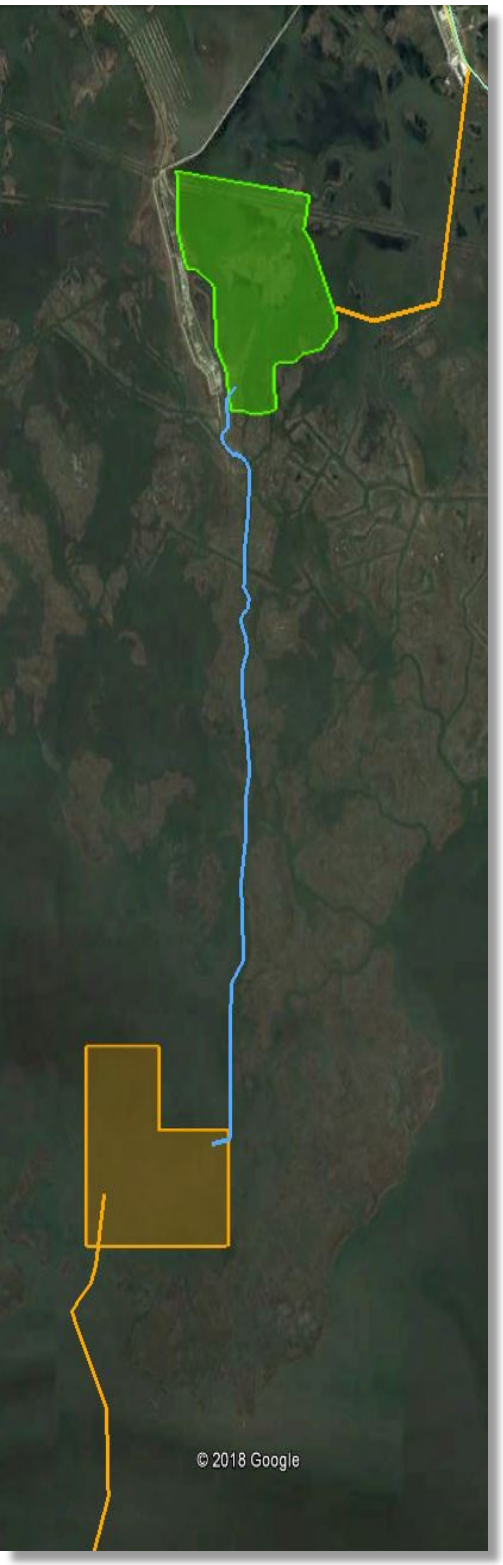


CONVEYANCE/ ACCESS CORRIDOR RECOMMENDATIONS

Project:

Island Road Marsh Creation and Nourishment Project (TE-117) – Borrow Area Geotechnical Data Review And Analysis

Terrebonne Parish, Louisiana

Prepared for:

Coastal Protection and Restoration Authority of Louisiana

Brad Miller
Project Manager
150 Terrace Avenue
Baton Rouge, La 70802
Office Phone: 225.342.4122

Prepared by:

C. H. Fenstermaker & Associates, L.L.C.

135 Regency Square · Lafayette, LA 70508 · 337.237.2200 phone · 337.232.3299 fax
www.fenstermaker.com

CONVEYANCE/ACCESS CORRIDOR RECOMMENDATIONS

Prepared for

Coastal Protection & Restoration Authority of Louisiana

in Support of

Island Road Marsh Creation and Nourishment (TE-117)

Terrebonne Parish, Louisiana

August 2018

Introduction

The proposed project's primary feature is to create 364 acres of new marsh and nourish 19 acres of saline marsh. Sediment will be hydraulically pumped from a borrow source near Lake Felicity. Containment dikes are proposed to be constructed around the marsh creation area to retain sediment during pumping. The dikes will be degraded and/or gapped no later than three years post-construction. One-half of the newly constructed marsh, approximately 182 acres, is proposed to be planted following the construction in an effort to stabilize the platform and reduce growth time for full vegetation.

Location

The Island Road Marsh Creation and Nourishment Project is located in Eastern Terrebonne Parish, Louisiana, about 12.1 miles Northeast of Cocodrie, Louisiana, between Isle De Jean Charles, Louisiana and Lake Tambour.

Scope of Work

C.H. Fenstermaker & Associates, L.L.C. was awarded a professional services indefinite delivery, indefinite quantity contract (4400005546) on September 30, 2014. Task Order #2 for this contract was issued December 6, 2016. This contract and task order expired on August 31, 2017, which was before any geotechnical data was available for review. On September 1, 2017, CPRA awarded a new indefinite delivery, indefinite quantity contract (4400012415) and Task Order 1, Island Road Marsh Creation, was issued.

Included in the scope of this task order are the requirements that:

Fenstermaker shall furnish all recommendations up to but not limited to the following information within the comprehensive engineering report:

- Recommendations on use of floathose or alternate within borrow area for dredge maneuverability;
- Recommendations on avoidance areas and use of pontoons or floathose to successfully convey over obstructions or active lines;
- Recommendations on possible locations for boosters;
- Recommendations on designing navigational crossings;
- Recommendations on designing dredge and equipment access corridors;
- Recommendations on use of equipment during dredge and equipment mobilization to various project features and overall logistics;
- Recommendations on expected use of signage or navigation light aids; and
- Assistance on establishing gulfward dredge/equipment access corridor(s).

Additional tasks to be performed in support of this task order include Survey Services, Geotechnical Recommendations and Hydraulic Modeling. These tasks were provided under separate reports.

Commencement Of Effort

In June, 2018, Fenstermaker provided the final Phase I and Phase II survey deliverables. In August, 2018, Fenstermaker submitted the final Borrow Area Hydrodynamic Model Report and Final Geotechnical Recommendation Report.

Subsequently, Fenstermaker staff began reviewing these reports to make recommendations outlined in the scope above.

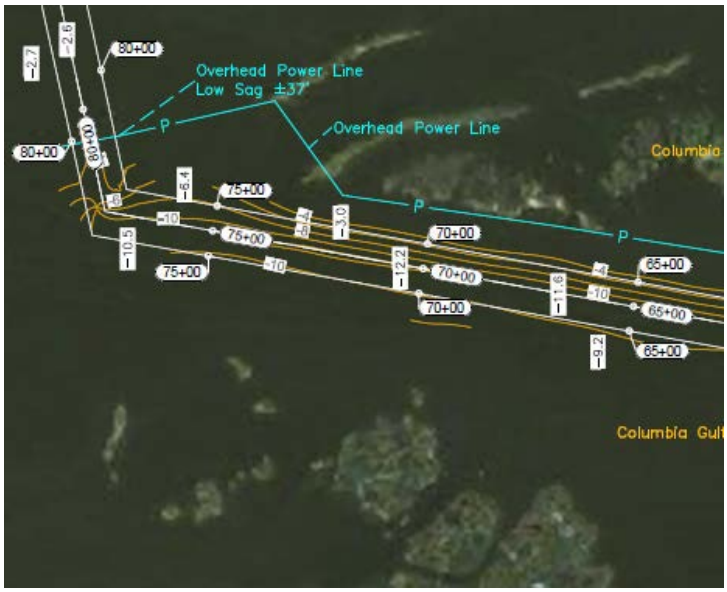
Recommendations

Recommendations on use of floathose or alternate within borrow area for dredge maneuverability:

It is recommended that the construction contractor be allowed to use float hose in the borrow area to allow for improved maneuverability during dredging operations.

Recommendations on avoidance areas and use of pontoons or floathose to successfully convey over obstructions or active lines:

Based on the topographic, bathymetric and magnetometer surveys, there are no recommended areas of avoidance, however, the following recommendations are given:



- Care should be taken in the vicinity of existing camps near station 130 (Northing 310,438'; Easting 3,553,043') of the Conveyance Corridor
- Care should be taken in the vicinity of the overhead power line that runs along the west side of the North Access Corridor and crosses the corridor near station 80 (Northing 326,826; Easting 3,561,749')
- Pontoons and floathose should be used for any pipeline crossings that were identified by the magnetometer survey

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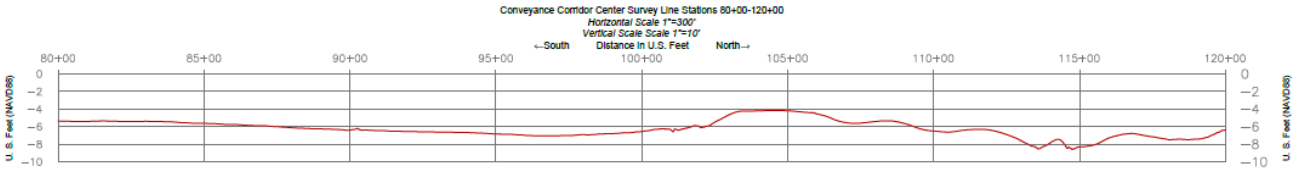
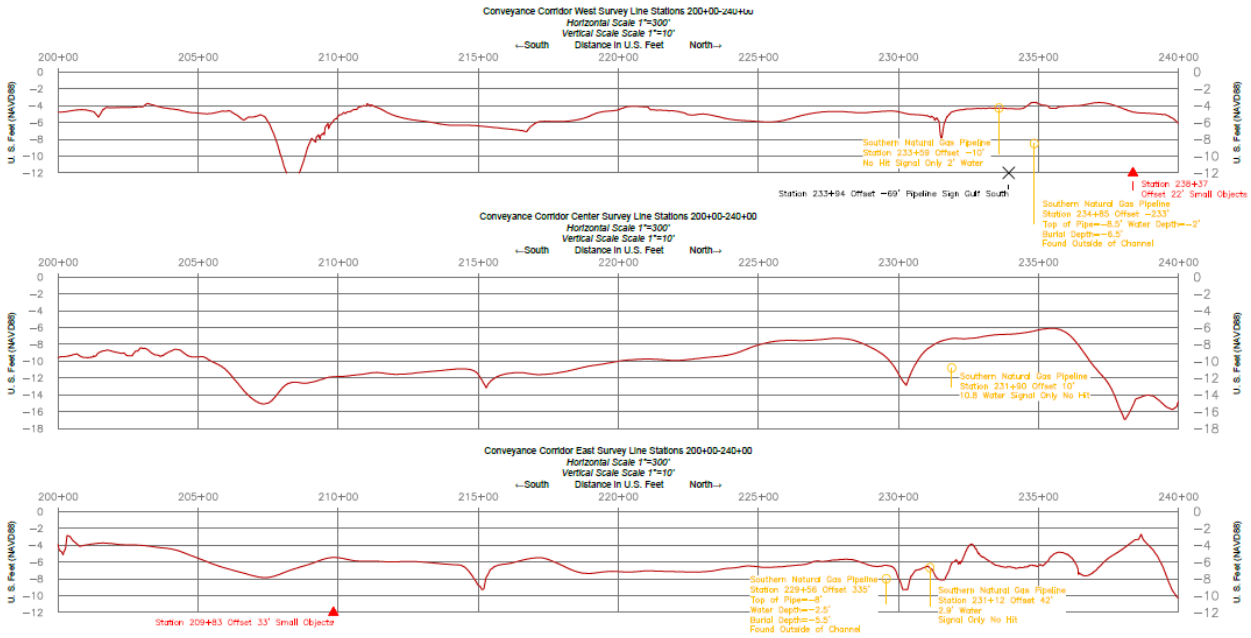
Recommendations on possible locations for boosters:

If a booster pump is necessary, a possible location is just north of station 100 of the conveyance corridor. This area is not in an oyster lease and the corridor water bottom is approximately 6 feet deep leading up to that location.



Recommendations on designing navigational crossings:

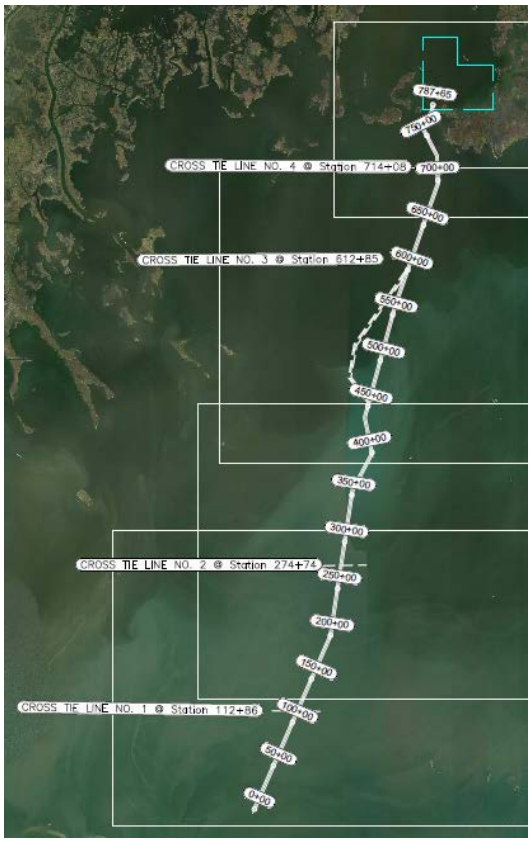
Between stations 205 and 210 of the conveyance corridor, there is a navigable canal that crosses the conveyance corridor. This canal appears to be 8 feet deep on the east side of the conveyance corridor and considerably deeper in the center and west side. It is recommended to sink the dredge pipe a minimum of 3.0 feet below the existing water bottom and to properly label this crossing with appropriate signage.



Recommendations on designing dredge and equipment access corridors:

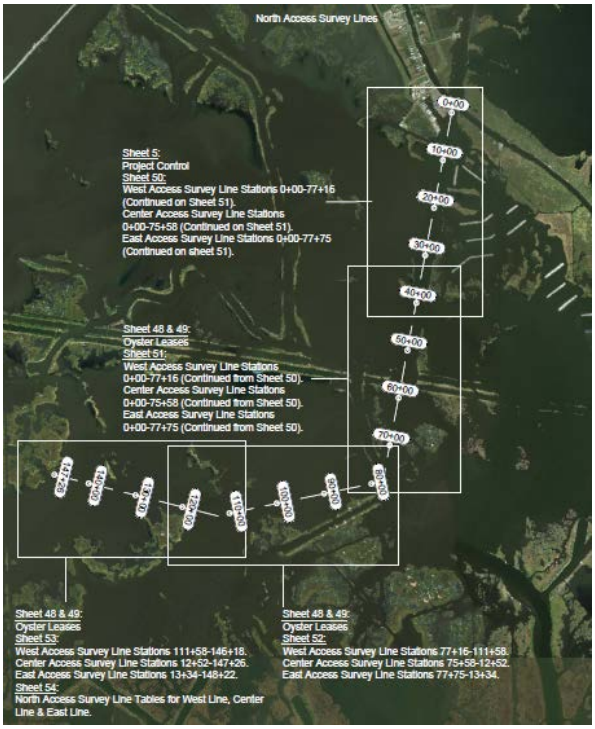
South Access Corridor: A southern access route from open waters near the Gulf of Mexico, through Lake Barre and to the borrow area was selected that maximized avoidance of apparent pipeline crossings and maintains at least 8 feet depth along most of the route. Near the borrow area, the south access corridor shallows to about 6 feet depth. Bathymetric and magnetometer surveys were collected along a center line of the route and along and west lines that were each offset approximately 150 feet from the centerline. The points, elevations and magnetometer results are included in the Phase I Survey Report and accompanying maps.

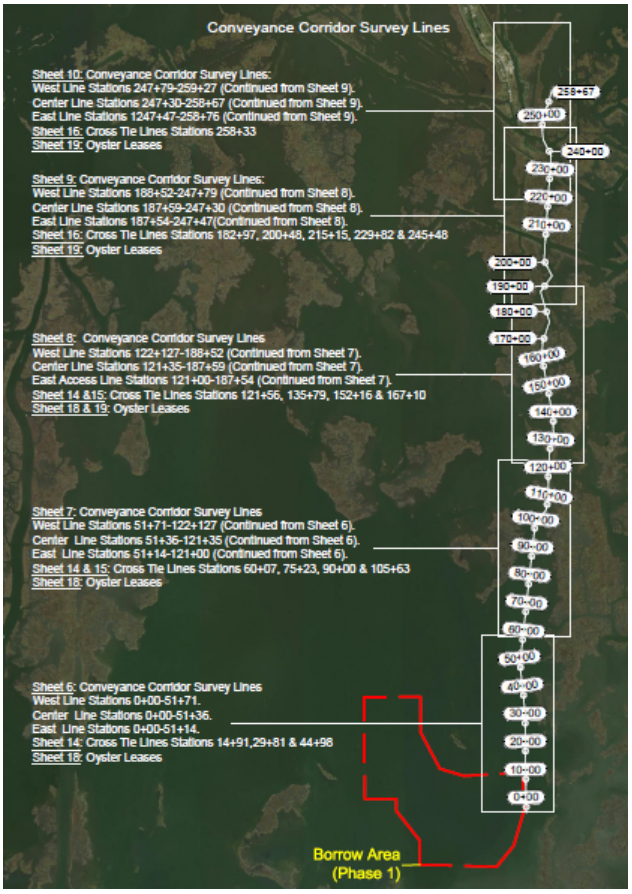
It is recommended that the full 300 feet span of the surveyed south access corridor be designated as the South Access Corridor.



North Access Corridor: A northern access route from Isle de Jean Charles Marina through Bayou Jean Charles to the project area was selected. Bathymetric and magnetometer surveys were performed along the centerline of the bayou and along east and west lines that were each offset approximately 150 feet fro m the centerline. The points, elevations and magnetometer results are included in the Phase II Survey Report and accompanying maps. One powerline crossing at 8 pipelines were located and are detailed in the Phase II Survey Report and accompanying maps. The minimum elevation of the centerline of the bayou is just over 2.0 feet NAVD 88, so shallow draft vessels may be required.

<u>It is recommended that caution be taken around the overhead powerline and submerged pipelines, but that the full 300 feet span of the surveyed north access corridor be designated as the North Access Corridor.</u>





Dredge Pipe Corridor: Bathymetric and magnetometer surveys along the centerline and apparent navigable limits of Bayou Jean Charles were performed and are included in the Phase II survey report and accompanying maps. Most of this stretch of the bayou is greater than 200 feet width, but at the northern most portion, it necks down to approximately 100 feet in width. The points, elevations and m agnetometer results are included in the Phase II Survey Report and accompanying maps. Two pipelines and one navigable waterway cross the Dredge Pipe Corridor (see above for recommended crossing methods) as shown in the Phase II Survey Report and accompanying maps.

<u>It is recommended that dredge and equipment access corridors be limited to areas between the East and West Survey Lines as displayed in the Phase II Survey Report and accompanying maps.</u>

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Recommendations on use of equipment during dredge and equipment mobilization to various project features and overall logistics:

The construction contractor should be required to confirm receipt and understanding of the North Access, South Access and Dredge Pipe Corridor bathymetric and hazard surveys. The construction contractor should be required to confine all equipment to areas between the East and West Survey Lines and to take caution around overhead powerlines and submerged pipelines.

Recommendations on expected use of signage or navigation light aids:

The Contractor shall contact the Eighth Coastal Region District of the United States Coast Guard (USCG) and determine the type and location of aids to navigation that are required to be installed or removed in order to safely perform the Work. The types of aids to navigation may include warning signs, buoys, beacons or lights. The USCG typically requires that aids to navigation be installed along dredge pipelines, temporary spoil banks and access channels.

Assistance on establishing gulfward dredge/equipment access corridor(s):

It is recommended that dredge and equipment access corridors be limited to areas between the East and West Survey Lines that are displayed, in detail, in the Southern Access Survey maps that accompany this submittal.

C.H. Fenstermaker & Associates, LLC

Garvin D Pittman, PMP
Director, Environmental Specialist

1.4) TE-117 Borrow Area Hydrodynamic Study Report

TE-117 Borrow Region Wave and Velocity Impact Analysis

Prepared By

Robert L. Miller, PhD, PE

(Lic. No. 35929)

DEPARTMENT OF CIVIL ENGINEERING

COLLEGE OF ENGINEERING

UNIVERSITY OF LOUISIANA AT LAFAYETTE

August 8, 2018

STATE OF LOUISIANA
8/8/18
ROBERT L. MILLER
License No. 35929
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

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Executive Summary

This report summarizes the hydrodynamic impact analysis for the TE-117 borrow region located in Lake Tambour in south Terrebonne Parish, LA. The aim of the analysis was to provide a numerical assessment of the potential impacts associated with the borrow area on the surrounding marsh system in terms of water velocity (i.e., current speed) and wave energy. The analysis was carried out using industry standard software modeling packages (MIKE 21, SWAN) in order to form a digital representation of the existing (pre-project) conditions. The existing conditions were modified by including the project borrow area using a worst-case fully built-out borrow layout (post-project). The numerical models were run for a variety of wind/wave scenarios for both the pre and post-project conditions. The results suggest that project impacts do not exceed 0.06 ft in terms of significant wave height (H_s) based on the SWAN model wave runs. Current velocity differences are less than 0.08 ft/s for the hydrodynamic scenario considered (winter period including the passage of extreme cold fronts). These differences are on the same order of magnitude as the practical accuracy limits for standard bathymetric measurements over soft-bottom topography and current velocity measurements in the marsh environment.

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Chapter 1

Introduction

1.1 Project Location and Description

The borrow area associated with the TE-117 marsh creation project is located in Lake Tambour above Terrebonne Bay in coastal Louisiana. This area has experienced rapid land loss and marsh fragmentation as a result of a variety of factors which have been well documented in the Louisiana Coastal Master Plan. An overview of the project location is given in Figure 1.1.

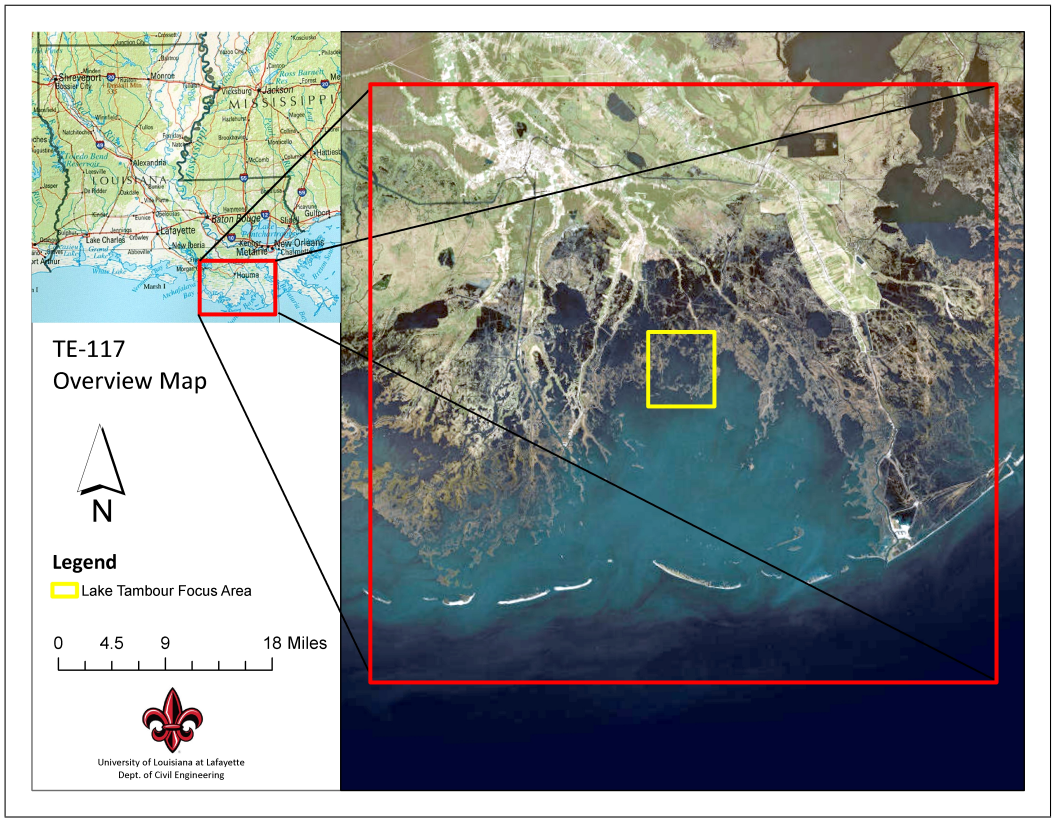

Figure 1.1: General Overview Map

1.2 Goal and Objectives

The overall goal of this effort is to provide a numerical assessment of the impact of the borrow region on surrounding marsh system in terms of wave energy and current velocity. This assessment is motivated by the fact that local wave energy and tidal exchange depends significantly on the bottom topography (i.e., bathymetry) and that alterations to the bathymetry can change the wave characteristics and tidal exchange patterns within a semi-enclosed marsh/open water environment. Given the complexity of the surrounding fragmented marsh system, and coastal Louisiana in general, advanced numerical modeling software packages (MIKE 21, SWAN) were required to conduct the analysis and to determine the overall project impacts. The specific objectives of our analysis are as follows:

1. To setup a two-dimensional wind-wave model including the borrow region and surrounding marsh areas.
2. To setup and calibrate a hydrodynamic model for water level and currents to encompass the project borrow site and surrounding regions.
3. To use the models to approximate the existing conditions in terms of wave heights and current speed and to provide a numerical assessment of the project impacts.

1.3 Scope

The overall scope of this project was to setup numerical models of the system and to conduct an impact assesment of the borrow area on the local wave energy and velocity characteristics adjacent to the project site (Figure 1.2). This includes the setup of a local SWAN (Simulating WAves Nearshore) model to analyze the project impacts on the wave spectrum and a detailed hydrodynamic model (MIKE 21) to approximate the water levels and velocity fields near the borrow region. The spectral wave model runs consist of 84 wind speed and direction combinations for both pre and post-project conditions for a grand total of 168 stationary simulation runs. The results are provided in graphical format at the end of this report and an overall summary of the analysis methodology, results, and an assessment of project impacts is also provided herein.

1.4 Outline

The report is organized as follows:

Chapter 1 The introduction is given in Chapter 1. It describes the fundamental terms used in this project. It motivates to study and understand the different techniques used in this work. This chapter also presents the outline of the objective of the report.

Chapter 2 It describes the collection, processing, and input of the data used to drive the numerical models.

Chapter 3 This chapter presents a description of the numerical models and their setup.

Chapter 4 The project impacts are summarized in Chapter 4 in addition to a discussion of uncertainties and an overall recap of the effort.

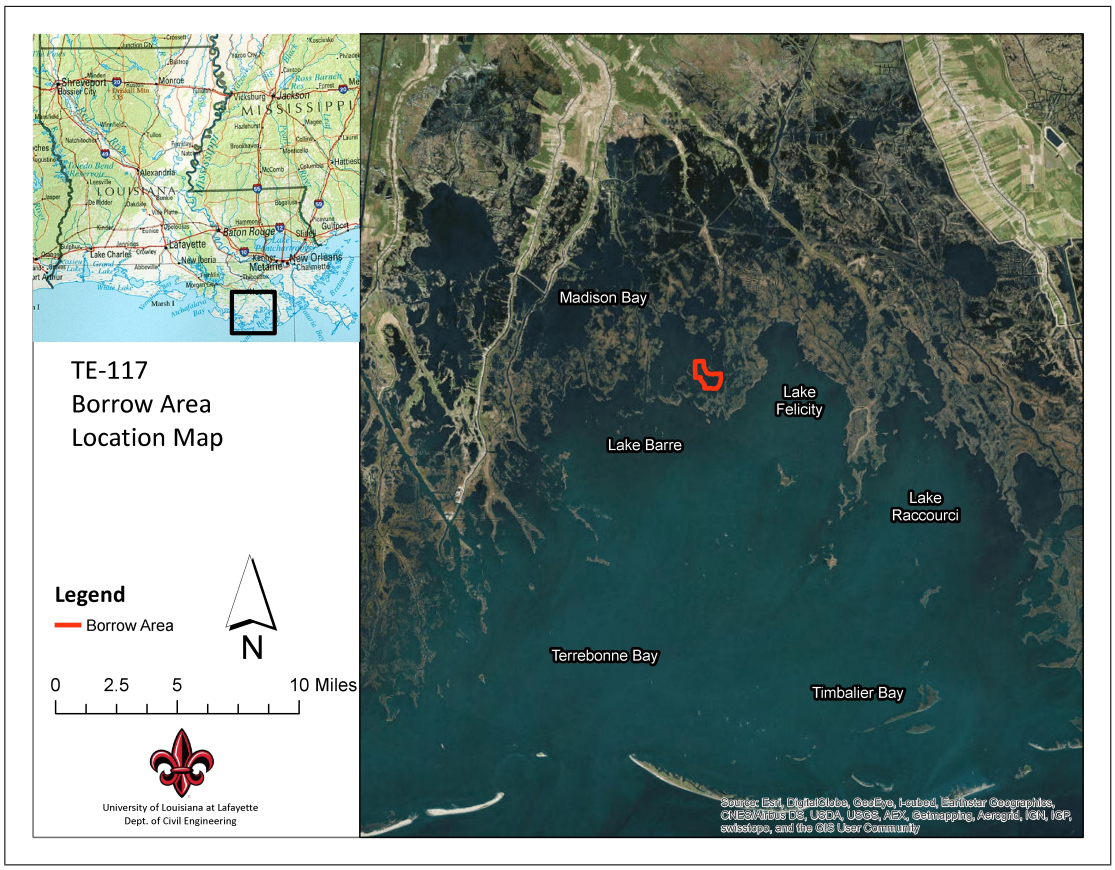

Figure 1.2: Borrow Area Location Map

Chapter 2

Data Gathering and Processing

2.1 Topographic Data

An essential element in any hydrodynamic study is the land and underwater topography (Figure 2.1). The topography input is usually given in the form of a digital elevation model (DEM) which is a generic electronic file which provides a numerical representation of ground heights. This study required the fusion of three DEM datasets including the LiDAR (Light Detection And Ranging), the USGS Gulf of Mexico topobathy dataset, and baseline profile survey data (obtained by Fenstermaker) to correct DEM discrepancies at the borrow site. The resulting DEM was then resampled to a coarser resolution for inclusion in the numerical models. The resampled DEM was then manually adjusted to re-establish marsh connectivity which was lost during the re-sampling procedure. Unless otherwise stated, all elevation data presented in this report are given relative to the North American Vertical Datum of 1988 (NAVD 88) geoid 99.

2.2 Water Level Data

Water level data was required in order to furnish the boundary conditions for the hydrodynamic model and to establish the mean high water depth which was used as the baseline for the wave modeling scenarios. Water levels were obtained from the Coastwide Reference Monitoring Network (CRMS) dataset as well as the National Oceanic Atmospheric Administration's (NOAA's) Tides and Currents (TaC) database.

2.3 Meteorological Data

Meteorological data was obtained from the NOAA TaC database as well as the offshore buoy program. Hourly wind speed and direction data from Grand Isle were subsequently

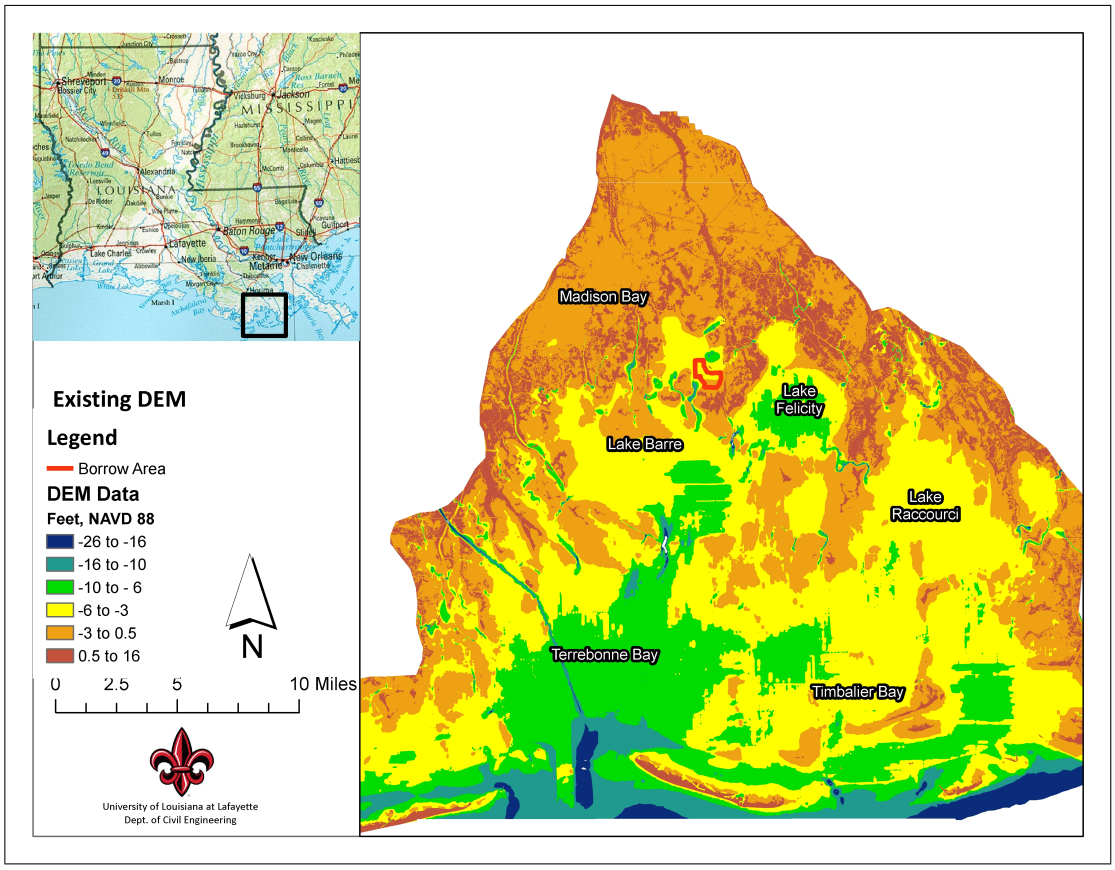

Figure 2.1: Bathymetry Data in Areas Surrounding the Borrow Region

processed to establish the wind frequency spectrum and the time series data required by the hydrodynamic model (Figure 2.2 and Figure 2.3).

Figure 2.2: Grand Isle Meteorological Station Relative to Lake Tambour Focus Area

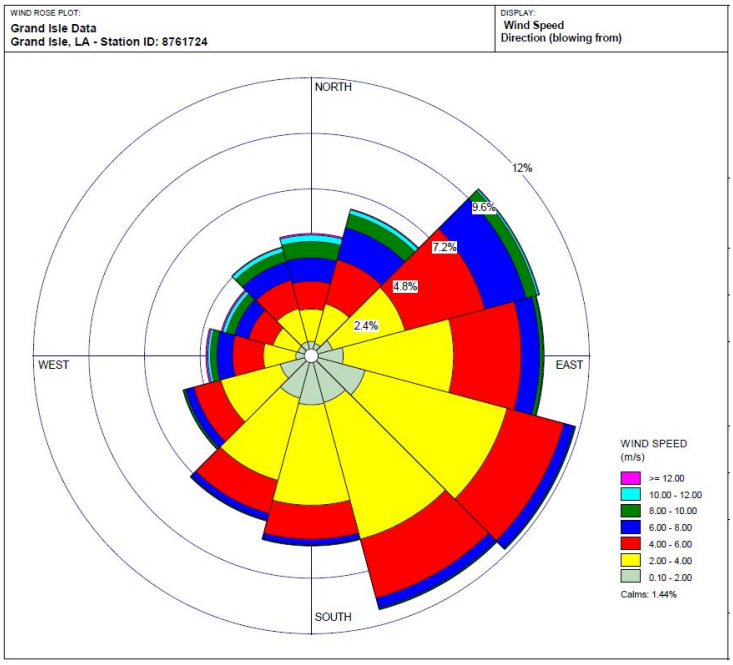

Figure 2.3: Wind Rose Summary - Grand Isle (2000-2017)

2.4 Wave Data

Wave measurements (significant wave height, H_s, direction, and wave peak period T_p) are required to construct the open water (swell) boundary conditions for numerical wave modeling studies. Although a number of site-specific monitoring efforts and research studies have been conducted within the Terrebonne Bay region in recent years, detailed wave measurements were not available within Lake Tambour at the time of this study. However, a review of the recent research efforts conducted in Terrebonne Bay (Table 2.1) as well as the offshore wave statistics at the CSI-06 monitoring station (Figure 2.4) provided valuable insight on the upper limit of the wave characteristics which could be expected within the Lake Tambour focus region (Figure 2.5).

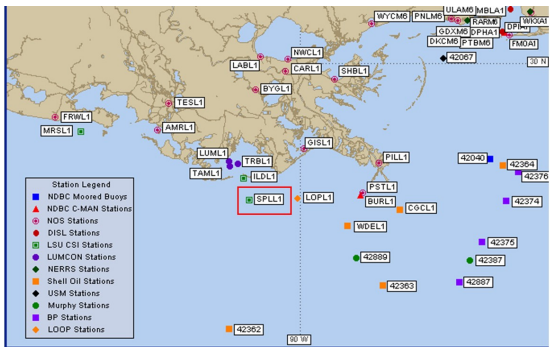

Figure 2.4: National Data Buoy Center Station - Red Highlighted Site is CSI-06

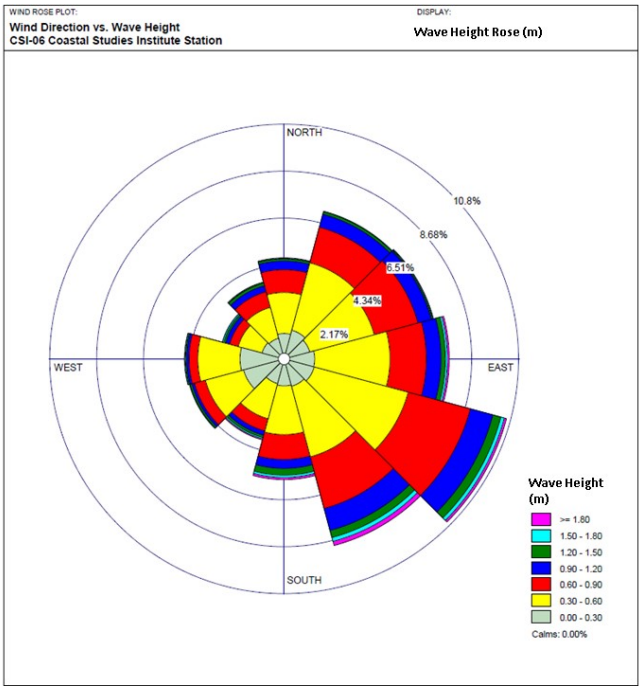

Figure 2.5: Wave Rose for CSI-06 (2009-2015)

Table 2.1: Summary of 2012 Wave Time Series Averages (Adapted from Parker, [5]) at a Site Located 7 Miles SW of Borrow Area in Terrebonne Bay (Standard Deviation in Parenthesis)

Period	H_s, **(ft)**	T_p **(s)**
12-13-2011 to 03-05-2012	0.36 (0.20)	2.99 (2.27).
03-05-2012 to 07-06-2012	0.46 (0.30)	2.92 (1.86).
07-06-2012 to 08-14-2012	0.33 (0.20)	2.46 (1.64).
12-13-2011 to 08-14-2012	0.39 (0.26)	2.86 (1.98).

2.5 Borrow Pit Design Data

The borrow pit layout data (provided by Fenstermaker) consisted of plan and profile sheets for two borrow pit configurations (Figures 2.6 and 2.7). The profile transects were used to make the local bathymetry adjustments within the borrow pit footprint. Two borrow pit configurations were provided and a composite configuration (taken as the spatial union of both footprints with the maximum depth) was used in the subsequent impact calculations.

Figure 2.6: Borrow Pit Configuration A

Figure 2.7: Borrow Pit Configuration B

Chapter 3

Numerical Modeling

3.1 Wave Analysis

Waves are a significant consideration when analyzing the impact of coastal restoration projects. Borrow activities (i.e., dredging) alter the underwater depth characteristics which can in turn alter the wave characteristics in the vicinity of the borrow site [1, 4]. The TE-117 borrow site is located in a fragmented marsh/bay system whose wave signal is primarily wind-driven. A spectral wave model (SWAN) was used to re-create the base wind/wave conditions within the vicinity of the borrow area.

The SWAN model is suitable for nearshore wave investigations since it captures the key physical processes involved with wave transformation within a shallow coastal environment. It solves the wave action balance equation in order to approximate the wave climate in the nearshore environment. The wave action balance equation is essentially a multidimensional scalar conservation law which represents the transport (advection terms) of wave energy and the subsequent amplification or damping of wave energy due to a variety of physical processes (reaction/source terms). Given the lack of detailed wave time series information within the project domain and the project execution time frame, the stationary (steady state) wave modeling option was chosen as the basis of the analysis.

The primary spectral wave model input and setup components include the underwater topography (bathymetry), physics parameters (e.g., bottom friction, wave interaction processes, frequency parameters), and the boundary conditions. Wave energy boundary conditions in general include side boundary conditions which account for wave characteristics at all open water boundaries as well as boundary forcing at the water surface due to wind effects.

3.1.1 SWAN Model

SWAN is a third generation wave model for obtaining realistic estimates of wave parameters in coastal areas, lakes and estuaries from given wind, bottom and current conditions. The model can be used on any scale relevant for wind-generated surface gravity waves. SWAN is based on the wave action balance equation with sources and sinks (3.1).

$$\frac{\partial N}{\partial t} + \frac{\partial c_x N}{\partial x} + \frac{\partial c_y N}{\partial y} + \frac{\partial c_\sigma N}{\partial \sigma} + \frac{\partial c_\theta N}{\partial \theta} = \frac{S_{tot}}{\sigma} \tag{3.1}$$

Here, N represents the action density spectrum and c represents the propagation velocities along the prescribed coordinate axes. The coordinate axes are x and y for geographical space, and σ and θ in frequency and directional space respectively. The right hand side of the equation includes the effects of wind-driven wave generation, dissipation, and nonlinear wave-wave interactions. Thus the action balance equation can be interpreted as a four-dimensional scalar conservation law (advection/reaction) with a reaction term (source) on the right hand side which takes into account atmospheric input, dissipation due to depth-induced wave breaking, bottom friction, and white-capping, triad and quadruplet nonlinear wave-wave interactions.

The SWAN model accounts for the following physics:

1. Wave propagation in time and space, shoaling, and refraction due to current and depth, frequency shifting due to currents and non-stationary depth.
2. Wave generation by wind.
3. Three- and four-wave interactions.
4. Whitecapping, bottom friction and depth-induced breaking.
5. Dissipation due to aquatic vegetation, turbulent flow and viscous fluid mud.
6. Wave-induced set-up.
7. Propagation from laboratory up to global scales.
8. Transmission through and reflection (specular and diffuse) against obstacles.
9. Diffraction.

3.1.2 Model Domain and Physics Parameters

The model domain was developed based on the composite bathymetry datasets discussed earlier in the report (Figure 3.1). Computational grids were generated for all scenarios using a Cartesian mesh with a square pixel resolution of 200 meters. The spectral directions

included the full circle for all simulations with a 10^0 resolution for a total of 36 directional bins. The discrete frequencies ranged from 0.05 to 1 Hz respectively. The JONSWAP bottom friction formulation was used with a bottom friction value of $C_{bf} = 0.019$ noting that this value is most likely conservative for the region given the shallow depths within Tambour Bay [2, 6]. All model simulations included the effects of triad interactions and default values were chosen for all other parameters.

3.1.3 Wave Model Boundary Conditions

The SWAN model simulations were run in stationary mode. However, a range of possible wind/wave combinations were developed to span the range of potential boundary conditions both at open boundaries (i.e., swell) and at the free surface (wind speed and direction). A total of 84 wind/directional scenarios were developed as the basis of the pre-post project comparative analysis. The wind boundary conditions were taken from the wind rose data compiled for Grand Isle, LA. The swell conditions were similarly developed based on the measurements published by the Coastal Studies Institute at the CSI-06 offshore platform. Strictly speaking in order to apply the offshore swell conditions, the model domain should extend far enough offshore so that the open water boundary at the downstream limit of the model domain is representative of the conditions at the monitoring gauge. For the purposes of the pre-post comparative analysis, a regional model was developed to incorporate Terrebonne Bay extending southward of the Timbalier Islands. The regional model was then used to perform a sensitivity analysis to investigate the significance of offshore swell components on Lake Tambour and more specifically whether the wave climate near the proposed borrow area is influenced by waves within the Gulf of Mexico. The regional model simulations suggested that the wave climate near the borrow area was not significantly influenced by offshore swell, but rather by the relatively large north-south open water fetch within Terrebonne Bay.

Due to the high computational cost of running the regional model over the boundary scenarios, a local model was developed for the Lake Tambour region. This local model inherited the same resolution and parameters of the larger regional model, but was significantly faster in wall clock simulation time - making it well suited for the overall project impact analysis. Given the lack of long term wave measurements inside of Terrebonne Bay and the fact that wave energy generally decreases with decreasing bathymetric depth, the wave boundary conditions for each respective wind speed and directional combination for the local model were taken directly from the CSI-06 offshore wave measurement spectra. Here, we point out that this selection most likely provides a more conservative estimate of the boundary condition at the south end of the local model. We also note that this boundary condition is applied by SWAN only when the characteristics (i.e., wind direc-

tion) are pointing into the domain (i.e., winds from the SW and SE quadrant), whereas the boundary condition is overwritten by conditions inside the model domain when the wind direction is pointing outward (i.e., winds blowing from the NE or NW quadrant) from the domain.

A marsh-inundating high tide elevation of 1.6 ft was used as the basis for the wave simulations. For comparison, the mean water level is 1.1 ft at the CRMS station nearest to the borrow area (CRMS0341-H01).

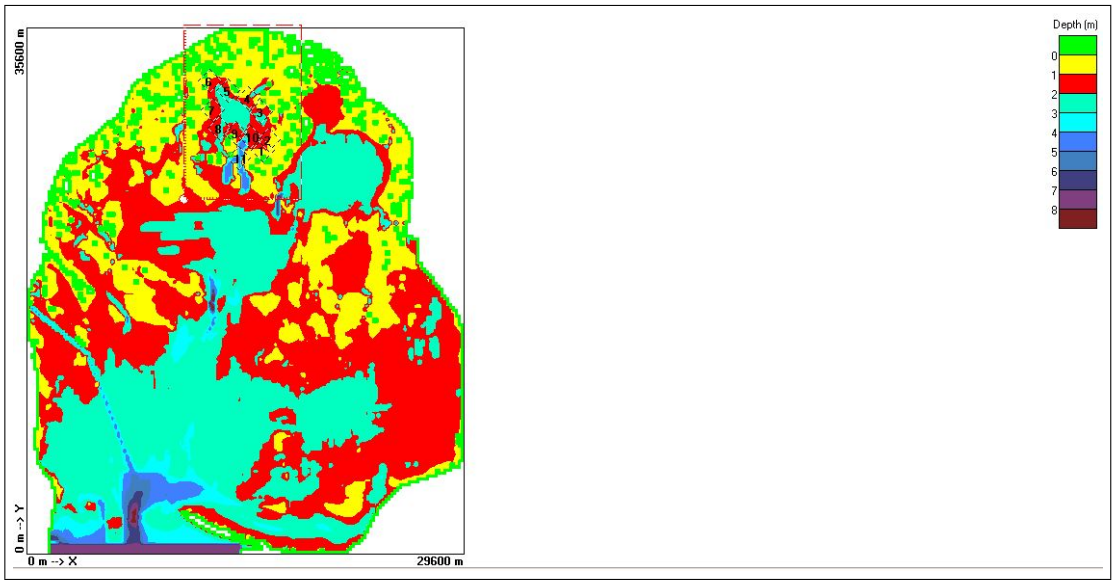

Figure 3.1: Regional SWAN Model Bathymetry Map. The Local Model Domain Outline is Shown by Dashed Lines.

3.2 Hydrodynamic Analysis

The main objective of the hydrodynamic analysis was to analyze the impact of the borrow area on wind and tide-induced currents at exposed shorelines within the Lake Tambour region. A two-dimensional full hydrodynamic model MIKE 21 by Danish Hydraulic Institute (DHI Inc.) was employed as the basis of the analysis.

3.2.1 MIKE 21 Model

MIKE 21 solves the depth-averaged equations of continuity and momentum (3.2). The model solves for current velocity and water surface elevation at locations distributed throughout the model domain and is well suited to analyze coastal systems featuring

complex shoreline configurations.

$$
\begin{aligned}
&\frac{\partial \zeta}{\partial t} + \frac{\partial p}{\partial x} + \frac{\partial q}{\partial y} = \frac{\partial d}{\partial t} \\
&\frac{\partial p}{\partial t} + \frac{\partial}{\partial x}(\frac{p^2}{h}) + \frac{\partial}{\partial y}(\frac{pq}{h}) + gh\frac{\partial \zeta}{\partial x} + \frac{gp\sqrt{p^2+q^2}}{C^2h^2} \\
&-\frac{1}{\rho_w}\left(\frac{\partial}{\partial x}(h\tau_{xx}) + \frac{\partial}{\partial y}(h\tau_{xy})\right) - \Omega_q - fVV_x + \frac{h}{\rho_w}\frac{\partial p_a}{\partial x} = 0 \\
&\frac{\partial q}{\partial t} + \frac{\partial}{\partial x}(\frac{pq}{h}) + \frac{\partial}{\partial y}(\frac{q^2}{h}) + gh\frac{\partial \zeta}{\partial y} + \frac{gq\sqrt{p^2+q^2}}{C^2h^2} \\
&-\frac{1}{\rho_w}\left(\frac{\partial}{\partial y}(h\tau_{yy}) + \frac{\partial}{\partial x}(h\tau_{xy})\right) - \Omega_p - fVV_y + \frac{h}{\rho_w}\frac{\partial p_a}{\partial y} = 0
\end{aligned}
\tag{3.2}
$$

The following symbols are used in the equations:

- $h(x, y, t)$ - water depth $(= \zeta - d)$ units in meters
- $d(x, y, t)$ - time varying bathymetric depth with units in meters
- $\zeta(x, y, t)$ - surface elevation in meters
- $p, q(x, y, t)$ - flux densities in x- and y-directions $(m^3/s/m)$, $(p, q) = (uh, vh)$ where (u, v) are depth averaged velocities in x- and y-directions
- $C(x, y)$ - Chezy resistance $(m^{1/2}/s)$
- g - acceleration due to gravity (m/s^2)
- $f(V)$ wind friction factor
- $V, V_x, V_y(x, y, t)$ - wind speed and components in x- and y- directions (m/s)
- $\Omega(x, y)$ - Coriolis parameter, latitude dependent (s^{-1})
- $p_a(x, y, t)$ - atmospheric pressure $(kg/m/s^2)$
- ρ_w - density of water (kg/m^3)
- x, y - space coordinates (m)
- t - time (s)
- $\tau_{xx}, \tau_{xy}, \tau_{yy}$ - components of effective shear stress

MIKE 21 takes into account the effects of tidal forcing at the open water boundaries, time-varying wind stress at the free surface, bottom friction, marsh wetting and drying cycles, and changes in underwater topography.

3.2.2 MIKE 21 Model Domain and Physics Parameters

The MIKE 21 model domain encompasses Lake Tambour and the areas northward in order to capture the tidal exchange near the borrow area (Figure 3.2). A rectangular grid was employed with a square pixel width of 63 meters in order to capture the narrower marsh canals surrounding the borrow site. Bathymetric corrections were applied to re-establish marsh connectivity accounting for sub-grid canals, and local bottom elevation adjustments were made at the borrow area based on Fenstermaker survey profiles. The model was setup with a constant Manning's n value of 0.025 applied uniformly throughout the model domain. The eddy viscosity parameter was set to 0.25 and wind speed and direction time series were taken from the Grand Isle meteorological station. Wetting and drying was turned on for all simulations.

3.2.3 MIKE 21 Boundary Conditions

The MIKE 21 model boundary conditions consisted of hourly water level time series obtained from the closest CRMS station. All water levels were adjusted to the common datum of NAVD 88 geoid 99 with an adjustment factor of +0.70ft applied to water levels given in geoid 012A. Rainfall and ET were not considered since their respective contribution to the local water levels and velocity fields in a semi-open coastal marsh system were expected to be small relative to the overall dominance of Gulf tides.

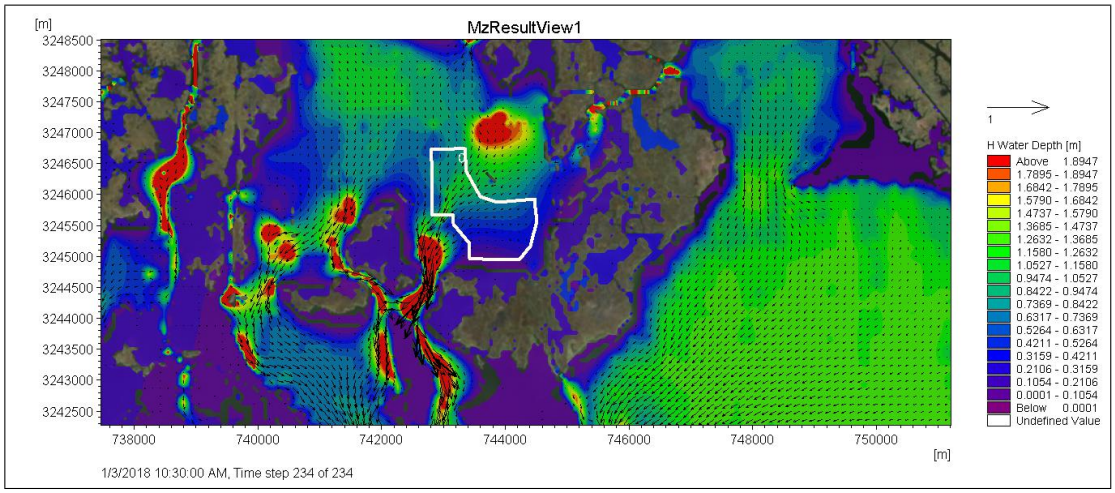

Figure 3.2: MIKE 21 Model Velocity Field Approximation.

3.2.4 MIKE 21 Model Calibration

The MIKE 21 model was calibrated against CRMS stations located within or very close to the model domain (Figures 3.3 through 3.6). The model calibration consisted of comparing

the model against CRMS hourly water level measurements. Note that detailed velocity measurements were not available at the time of the study. Overall, the model performed well compared to the measurements. The calibration period was taken to be the month of January 2018 which is representative of yearly low water conditions near the borrow area. Low water conditions represent an especially challenging target to model since bathymetric errors and frictional effects become more important with decreasing water depth.

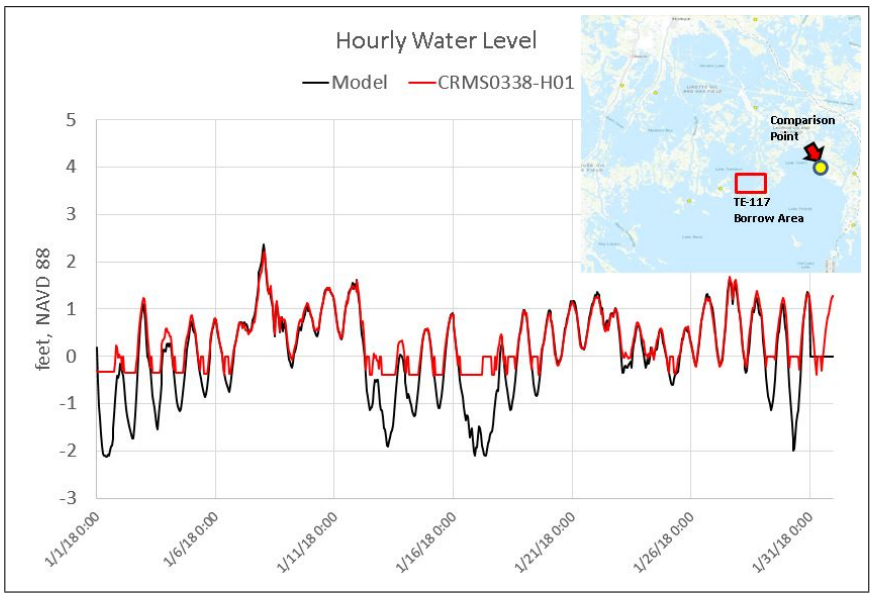

Figure 3.3: MIKE 21 Model vs. CRMS0338-H01 Hourly Water Level Comparison.

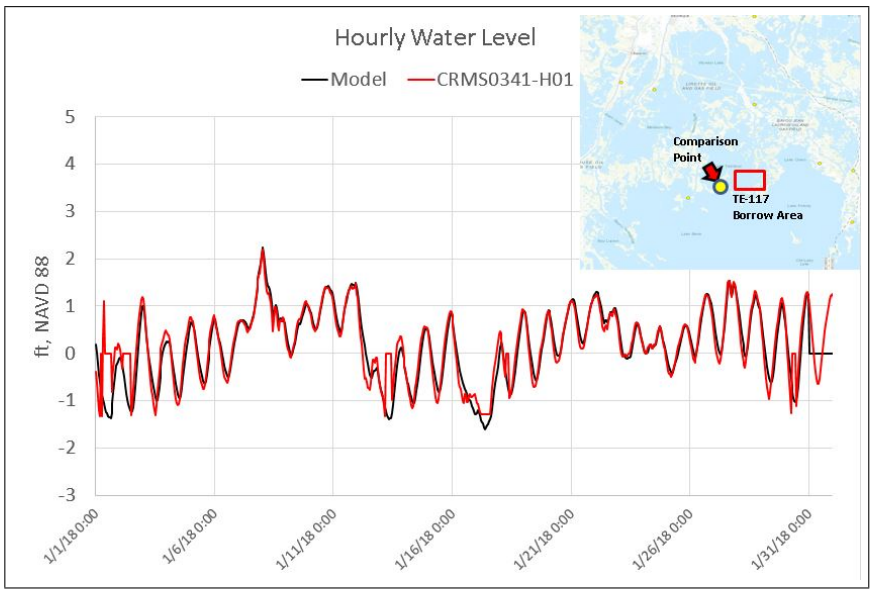

Figure 3.4: MIKE 21 Model vs. CRMS0341-H01 Hourly Water Level Comparison.

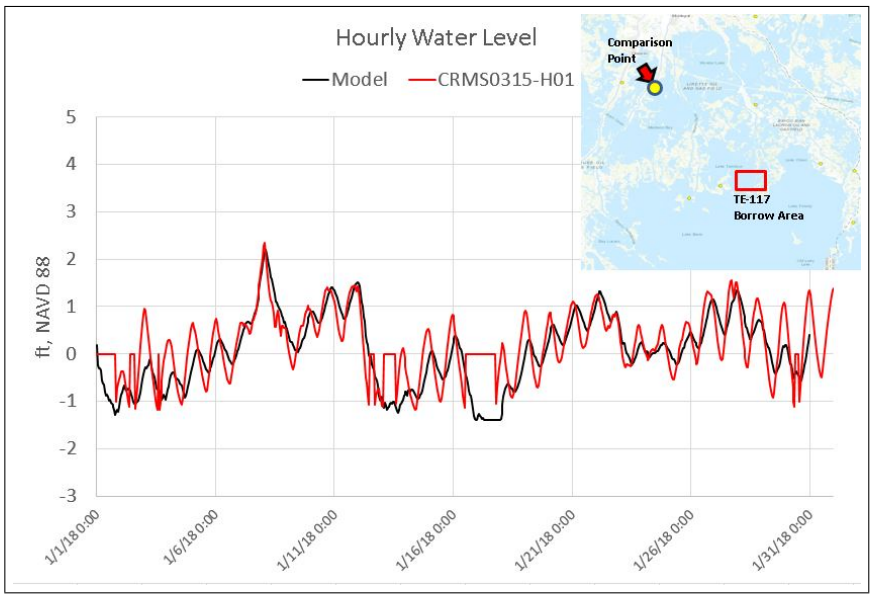

Figure 3.5: MIKE 21 Model vs. CRMS0315-H01 Hourly Water Level Comparison.

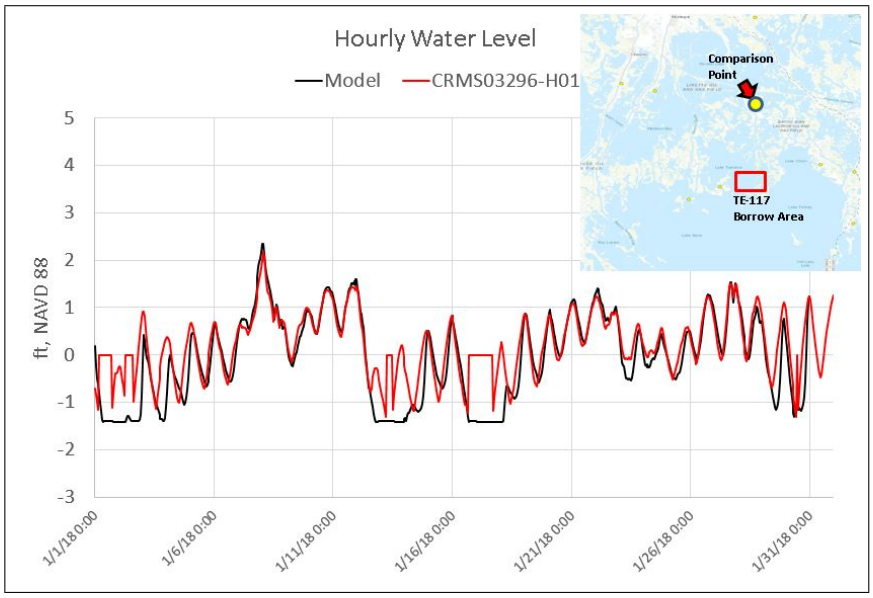

Figure 3.6: MIKE 21 Model vs. CRMS03296-H01 Hourly Water Level Comparison.

Chapter 4

Impact Assessment

4.1 Wave Impacts

A total of 84 wind speed/direction combination scenarios were simulated for the pre and post (borrow area) project scenarios in stationary mode. Each simulation provided an approximation of the significant wave height across the local model domain for pre and post-project conditions. The results from each simulation were then weighted according to the frequency of occurrence based on the Grand Isle wind rose dataset, and significant wave heights were averaged according to the relative wind/directional frequencies for a single composite pre and post project H_s layer [1]. The difference between the pre and post-project composite H_s layers was used as the basis of the impact assessment. The results suggest that the project would not increase the average significant wave heights by more than 0.07 ft within the vicinity of the borrow region. The greatest differences occurred immediately adjacent to the borrow region while exhibiting a steady decay in the wave height difference as one radiates outward from the project site (Figure 4.1).

4.2 Velocity and Stage Impacts

The calibrated MIKE 21 model was used as the baseline for the pre and post-project velocity and stage comparisons. The borrow region was implemented into the model by directly deepening the grid cells within the composite footprint of the two borrow area alternatives. The model was run over the calibration period (31 days) and provided a time-varying approximation of the hourly stages and velocities within and surrounding the project site. The hourly difference was calculated between the pre and post project scenarios for x-velocity, y-velocity, and water level. The final results were averaged arithmetically over the simulation period. The results suggest that the borrow region would not increase nearby tidal average velocities by more than 0.08 ft/sec, and water level

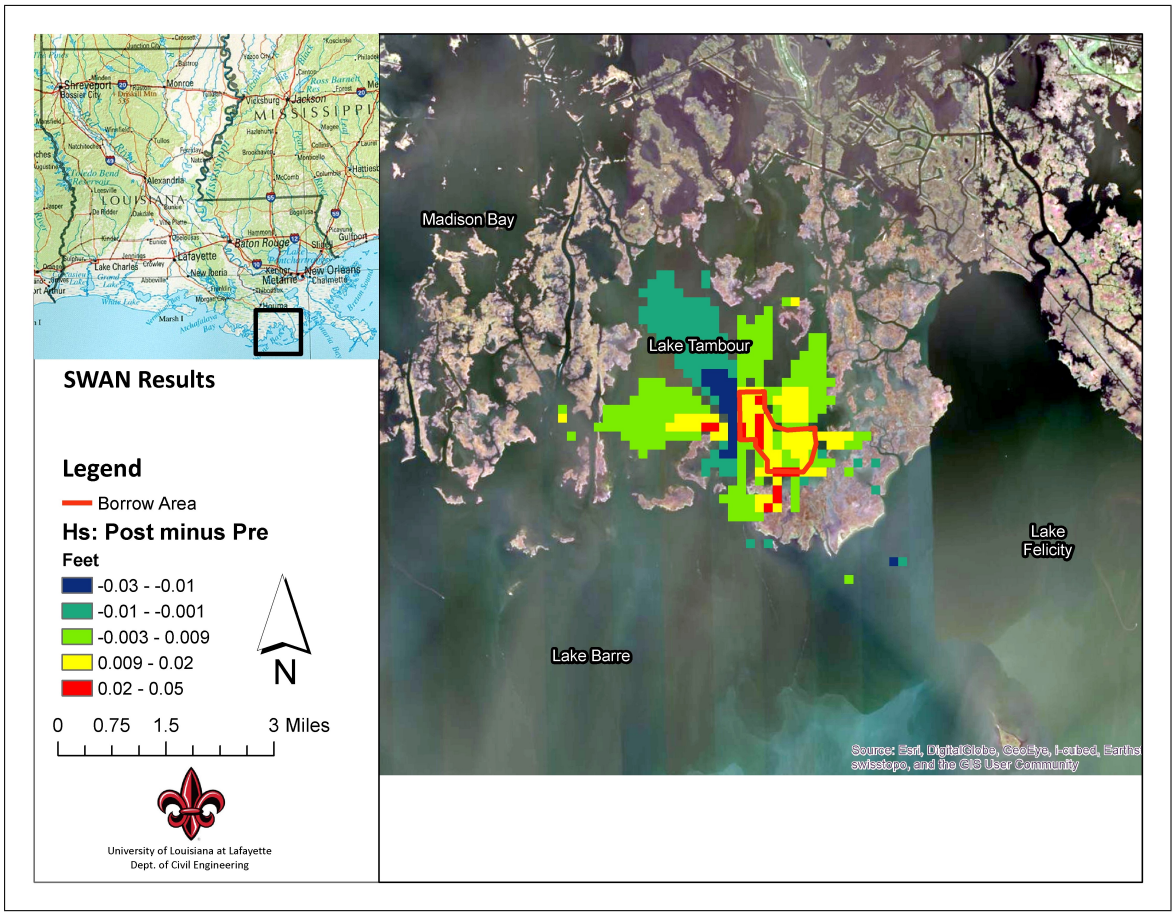

Figure 4.1: Significant Wave Height Difference Map.

deviations did not exceed 0.08 ft within the model domain (Figure 4.2). The maximum velocity increases occurred along the immediate perimeter of the borrow site. There was a slight lowering of the average water surface elevation near the tidal inlet located to the south and west of the borrow site owing to the fact that the borrow site is hydraulically connected to the submerged canal which passes through the inlet (Figure 4.3).

4.3 Modeling Uncertainties

Every numerical modeling study is subject to uncertainties with respect to data inputs, selection of parameters, and the choice of modeling tool and level of detail chosen. The main uncertainties associated with the wave modeling method used in this effort are attributable to a lack of detailed wave measurements within the Lake Tambour region and in particular within the proposed borrow region. We also point out that there were no detailed velocity measurements available (against which to compare MIKE 21) within the marsh canals or open water regions adjacent to Lake Tambour to supplement the CRMS water level measurements. We also note that spectral wave models such as SWAN are

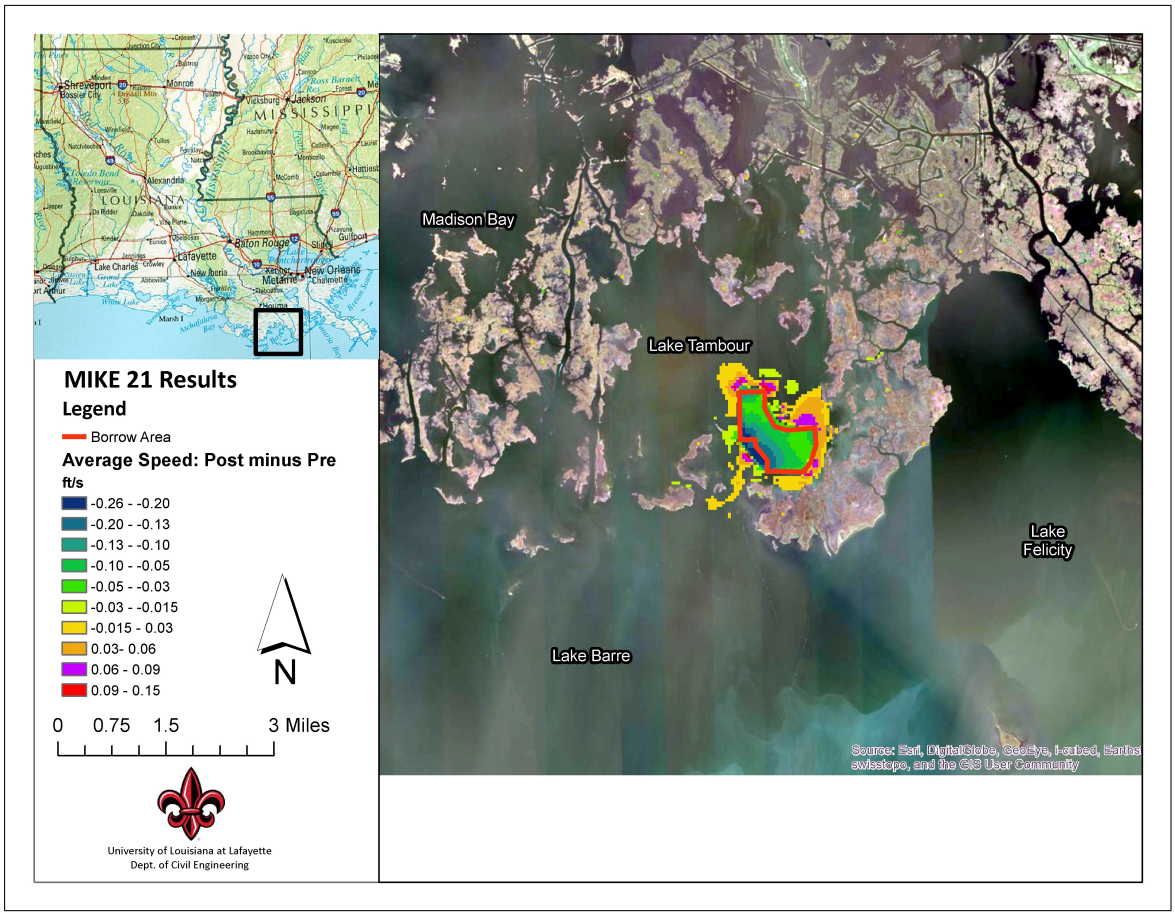

Figure 4.2: Current Speed Difference Map.

not able to directly simulate wave generated currents and this process has been identified as one of the potential contributing factors to the high rates of shoreline retreat occurring in the Terrebonne Bay system as a whole [3]. The simulations of wave-driven currents would require the use of a coupled hydrodynamic/nonstationary waves model with current enhancements provided via radiation stresses. Such an effort would require continuous current and wave measurements in the project vicinity to calibrate the models and the coupling scheme and this was well beyond the scope of the comparative analysis presented herein.

4.4 Summary and Conclusions

A detailed impact assessment was conducted for the borrow region associated with the TE-117 marsh creation project. The impact assessment included the setup and calibration of a detailed set of numerical models (SWAN, MIKE 21) encompassing the project site to provide a framework to compare the pre and post-project conditions in terms of significant wave height and tidal velocities along adjacent shorelines. The SWAN model was run in

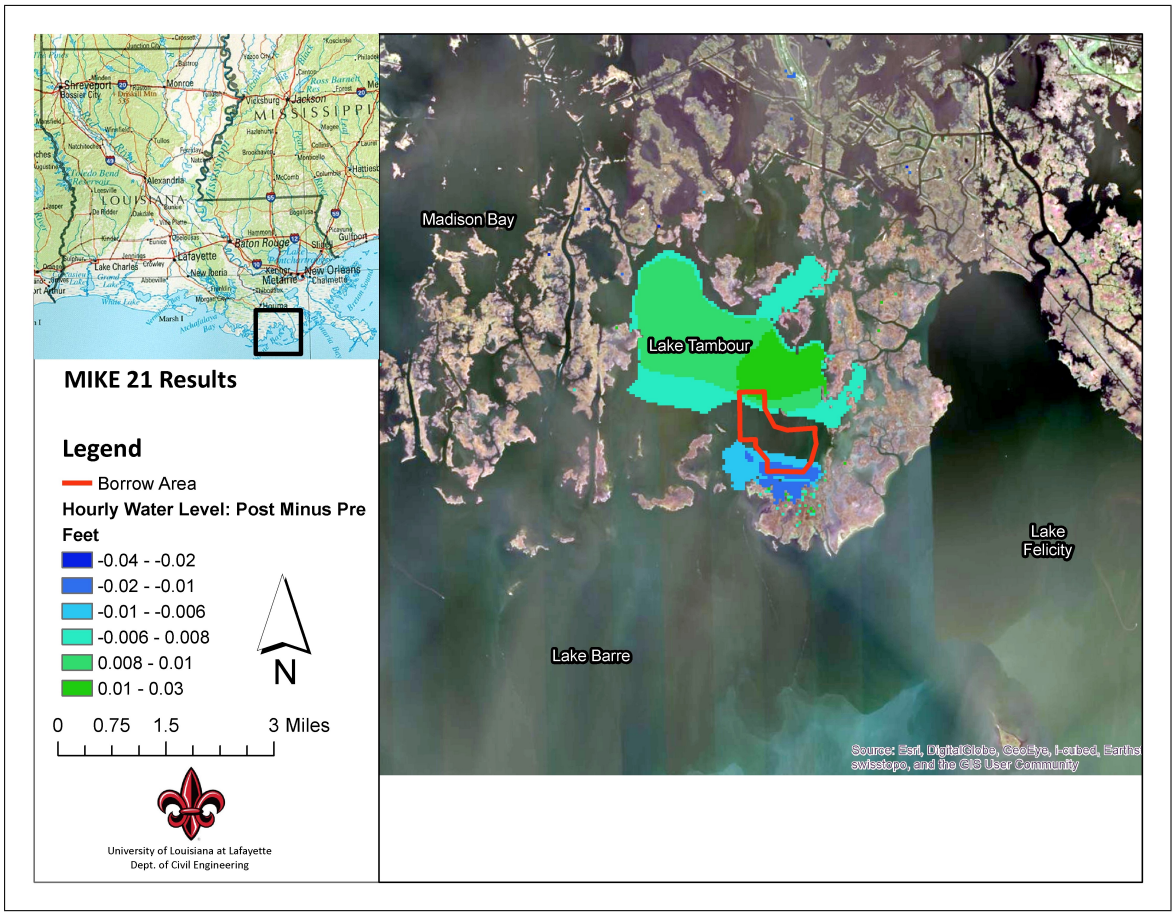

Figure 4.3: Water Level Difference Map.

stationary mode and considered 84 wind speed and direction combinations. The MIKE 21 model was run for a 31 day period over January 2018. The model results suggest that the average wave height increases did not exeed 0.06 ft and the average tidal velocities did not exeed 0.08 ft/sec. The water level variations as a result of changes in the drainage patterns did not exceed 0.03 feet anywhere within the Lake Tambour focus area. The impact values suggested by the model results are on the same order of magnitude as the practical error limits associated with measurements of underwater bathymetry and velocity in open water coastal environments.

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1.5) TE-117 Island Road Geotechnical Recommendations

Client Focused. Technology Driven.

GEOTECHNICAL DATA ANALYSIS

Project:
Island Road Marsh Creation and Nourishment Project (TE-117) – Borrow Area Geotechnical Data Review and Analysis

Terrebonne Parish, Louisiana

Prepared for:

Coastal Protection and Restoration Authority of Louisiana

Brad Miller
Project Manager
150 Terrace Avenue
Baton Rouge, LA 70802
Office Phone: 225.342.4122

Prepared by:

C. H. Fenstermaker & Associates, L.L.C.

August 2018

135 Regency Square · Lafayette, LA 70508 · 337.237.2200 phone · 337.232.3299 fax
www.fenstermaker.com

BORROW AREA GEOTECHNICAL DATA REVIEW AND ANALYSIS

Prepared for

Coastal Protection & Restoration Authority of Louisiana

in Support of

Island Road Marsh Creation and Nourishment (TE-117)

Terrebonne Parish, Louisiana

August 2018

Introduction

The primary goals of this project are to create 364 acres of new marsh and nourish 19 acres of saline marsh. Sediment will be hydraulically pumped from a borrow source near Lake Felicity. Containment dikes are proposed to be constructed around the marsh creation area to retain sediment during pumping. The dikes will be degraded and/or gapped no later than three years post-construction. One-half of the newly constructed marsh, approximately 182 acres, is proposed to be planted following the construction in an effort to stabilize the platform and reduce growth time for full vegetation.

Location

The Island Road Marsh Creation and Nourishment Project is located in Eastern Terrebonne Parish, Louisiana, about 12.1 miles Northeast of Cocodrie, Louisiana, between Isle De Jean Charles, Louisiana and Lake Tambour.

Scope of Work

C.H. Fenstermaker & Associates, L.L.C. (Fenstermaker) was awarded a professional services indefinite delivery, indefinite quantity contract (4400005546) on September 30, 2014. Task Order #2 for this contract was issued December 6, 2016. This contract and task order expired on August 31, 2017, which was before any geotechnical data was available for review. On September 1, 2017, CPRA awarded Fenstermaker a new indefinite delivery, indefinite quantity contract (4400012415). Shortly thereafter, Task Order 1, Island Road Marsh Creation, was issued.

Included in the scope of this task order are the requirements that:

Fenstermaker will review and interpret the results of the geotechnical data report related to borrow area sampling and shall utilize these findings along with the other tasks described herein to provide CPRA with at least the following information:

- Possible avoidance areas (clayballs, etc.);
- Delineating zones within borrow area for proposed excavation of optimum marsh fill material;
- Prescribing minimum offset distances between borrow area boundaries and existing shorelines to eliminate the possibility of shoreline erosion due to slope failure; and
- Construction sequencing recommendations.

The entirety of this work shall be documented within the comprehensive engineering report. Fenstermaker will organize and discuss all findings and shall furnish all recommendations up to but not limited to the following information within the comprehensive engineering report:

- Recommendations on maximum depth-of-cut contours;
- Recommendations on overdredge tolerances;
- Recommendations on avoidance areas;
- Inclusions of cut-to-fill ratio assumptions in quantity calculations; and
- Recommendations on advancing project under pay-on-the-cut or pay-on-the-fill scenarios.

Additional tasks to be performed in support of this task order include Survey Services and Hydraulic Modeling. These tasks will be provided under a separate report.

Commencement of Effort

On May 22, 2018, CPRA provided the logs for Borings B-1, B-2, B-2a, B-3, B-4, B-5, B-6 and B-7 for the Island Road Marsh Creation and Nourishment (TE-117) project that were collected by GeoEngineers on February 19 and 20, 2018. This submittal can be found in Appendix 1 of this report.

Fenstermaker then plotted these borings in the borrow area that was delineated as part of the Surveying portion of this task order and created a sediment profile to allow for visual interpretation of sediment characteristics throughout the borrow area. The layout diagrams and profiles are included as Appendix 2.

Results

Possible avoidance areas (clayballs, etc.): The inset diagram depicts the boundaries of the borrow area, the N-S and E-W stationing, and the boring locations. The boring logs do not indicate any need to avoid any area of the proposed borrow area. The boring logs were projected onto the survey reference lines (see Sheets 7 and 8 in Appendix 2). GeoEngineers also placed two cross section alignments through the borrow area (see Sheets 4, 5, and 6). No matter which projection is used, the sediment clearly consists of soft interlayered fat and lean clays with some discontinuous silt and sand layers. This investigation does not show any evidence of material that is likely to form clay balls.

Delineating zones within borrow area for proposed excavation of optimum marsh fill material: All material in the proposed borrow area appears to be suitable for use as marsh creation fill material. There were two areas where organic peat layers were identified. These include the upper four feet of Boring B-4 and the upper two feet of Boring B-6 (see Sheet 7, Appendix 2). During the dredging operation, it is believed that the peat material will be fragmented and mixed with the surrounding clay material and will not impede dredging progress.

Prescribing minimum offset distances between borrow area boundaries and existing shorelines to eliminate the possibility of shoreline erosion due to slope failure: The minimum offset distance established by Fenstermaker was 750 feet. The offset distance was established to eliminate concern for slope failure and wave propagation. Slope failure along the perimeter of the borrow area is further mitigated by establishing a maximum 10:1 (horizontal to vertical) side slope for the borrow area excavation. Waves traveling from the surrounding bay areas may experience growth after they enter the deeper borrow area. The minimum offset was selected to assure that

waves leaving the borrow area have sufficient time to collapse or degrade before encountering existing shore line areas. The hydraulic modeling task will be further defined in a separate report.

Construction sequencing recommendations: After the marsh creation area feed line is installed and secured in the borrow area, dredging may commence. It is anticipated that some areas along the south access route may require dredging as the access path enters the borrow area. The dredging interval is anticipated to be from El. -5 feet to El. -15 feet at the west end and El. -4 feet to El. -10 feet at the east end (see Sheet 7, appendix 2). Dredging should continue within the west and northwest areas working toward the southeast and ending at the northeast corner.

Recommendations on maximum depth-of-cut contours: The borrow area was designed with an essentially flat bottom at El. -15 feet (see Sheet 3, Appendix 2). Based on the boring logs provided by CPRA, it does not appear that areas or layers resistant to dredging will be encountered during the dredging operation. Depending upon the equipment selected by the contractor, it may be advisable to dredge one layer at about El. -10 feet and a second removal at the final El. -15 feet.

Recommendations on overdredge tolerances: Based on the boring logs, similar sediment encountered at El.-15 feet occurs to a depth of El. -20 feet. Therefore, vertical overdredging is not a concern. Horizontal overdredging (i.e., expanding the areal limits of the borrow area by increasing the 10:1 side slopes) should not be allowed. The 750-foot offset distance is established as the minimum offset distance for this borrow area.

Recommendations on avoidance areas: Based on the available subsurface information, there are no avoidance areas at this borrow site.

Inclusions of cut-to-fill ratio assumptions in quantity calculations: In order to assure sufficient borrow area volume, Fenstermaker assumed a cut to fill ratio of 2:1 with a calculated borrow area volume of nearly 7 million cubic yards (see Sheet 2, Appendix 2).

Recommendations on advancing project under pay-on-the-cut or pay-on-the-fill scenarios: It is considered likely that some previously dredged areas will experience sediment in-filling as the project advances. Therefore, pay-on-the-cut may not be fair to the contractor. Similarly, the purpose of this project is to recreate sustainable marsh and to nourish existing saline marsh. Therefore, it is seen as most fair (to the contractor and CPRA) to pay-on-the-fill.

STATE OF LOUISIANA
DANIEL J. AUCUTT
REG. No. 25492
REGISTERED
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING
Aug 2018

C.H. Fenstermaker & Associates, LLC

Daniel Aucutt, P.E., L. ASCE
Senior Professional Engineer

Island Road Marsh Creation and Nourishment Project (TE-117)

APPENDIX 1

GeoEngineers Data Report and Boring Logs

Geotechnical Investigation Data Report Addendum 1

Island Road Marsh Creation and Nourishment
(TE-117) Phase II
Terrebonne Parish, Louisiana

for

Louisiana Coastal Protection and Restoration Authority

April 24, 2018

GeoEngineers
Earth Science + Technology

Geotechnical Investigation Data Report Addendum 1

Island Road Marsh Creation and Nourishment
(TE-117) Phase II
Terrebonne Parish, Louisiana

for
Louisiana Coastal Protection and Restoration Authority

April 24, 2018

GeoEngineers

11955 Lakeland Park Boulevard, Suite 100
Baton Rouge, Louisiana 70809
225.293.2460

Geotechnical Investigation Data Report
Addendum 1

Island Road Marsh Creation and Nourishment (TE-117) Phase II
Terrebonne Parish, Louisiana

File No. 16715-040-03

April 24, 2018

Prepared for:

Louisiana Coastal Protection and Restoration Authority
150 Terrace Avenue
Baton Rouge, Louisiana 70802

Attention: Brad Miller

Prepared by:

GeoEngineers, Inc.
11955 Lakeland Park Boulevard, Suite 100
Baton Rouge, Louisiana 70809
225.293.2460

Jennifer E. Aguettant, PE
Senior Geotechnical Engineer

David S. Eley, PE
Principal

STATE OF LOUISIANA
DAVID S. ELEY
REG. No. 26373
REGISTERED PROFESSIONAL ENGINEER IN CIVIL ENGINEERING

JEA:DSE:kk

Disclaimer: Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

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Appendix C. Laboratory Testing Results
Appendix D. Lonnie G. Harper and Associates Survey Report
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INTRODUCTION AND PROJECT UNDERSTANDING

GeoEngineers, Inc. (GeoEngineers) is pleased to present this addendum Geotechnical Investigation Data Report to the Louisiana Coastal Protection and Restoration Authority (CPRA) for our study of the proposed borrow area for the Island Road Marsh Creation and Nourishment (TE-117) project. Our original Geotechnical Investigation Data Report was submitted February 1, 2017, for the marsh creation area investigation of the TE-117 project. Our services described herein for the borrow area were performed under our contract between CPRA and GeoEngineers (CPRA Contract No. 4400010334 "Geotechnical Services for CPRA") and were authorized by the Revised Notice to Proceed document dated January 4, 2018, for Task 1, Amendment No. 1.

The project borrow area is located in Lake Tambour which is in southeast Terrebonne Parish approximately 10 miles southeast of Montegut, Louisiana, and about 5 miles south of the Isle de Jean Charles marina on Island Road. A project vicinity map is shown in Figure 1.

Discussions of our geotechnical exploration and laboratory testing for the borrow area samples are included herein. Our engineering recommendations will be presented under separate cover. All elevations described in this report, including figures and appendices, are referenced to the North American Vertical Datum of 1988 (NAVD88), Geoid 12A.

FIELD EXPLORATION

Field exploration for the borrow area of the TE-117 project consisted of eight soil borings drilled to a depth of 20 feet each below the mudline on February 19 and 20, 2018. The exploration locations are shown in Figure 2, and subsurface profiles are provided in Figures 3 and 4. Further details of our field exploration are discussed in Appendix A. The soil boring logs and laboratory testing results are provided in Appendix B and C, respectively.

Prior to our geotechnical field exploration, boring locations were surveyed and staked in the field by Lonnie G. Harper and Associates (LGH). LGH performed a magnetometer survey around each proposed exploration point before placing the location stake. A copy of LGH's survey report is included in Appendix D.

Prior to our field exploration, Matrix New World Engineering (Matrix) prepared and sent notification letters to oyster leaseholders whose oyster leases were within 500 feet of our soil boring locations. During our field exploration, Matrix provided an oyster biologist who rode on the support boat behind the vessel with the drilling equipment to document and record our travel paths as we traveled from the dock to each boring location and then back to the dock. A copy of Matrix's report is included in Appendix E. A DVD is also included that contains video footage of the vessel's travel.

LABORATORY TESTING

Intact soft to medium semi-cohesive and cohesive samples were subjected to laboratory torvane shear testing prior to extrusion. Upon extrusion, each sample was examined to confirm or modify field classifications. The moisture content was measured for each Shelby tube sample. Unconsolidated-

undrained triaxial tests, unit weight tests, and grain size distribution tests were performed on select soil samples.

Composite samples were mixed for each soil boring to the approximate depth of dredging based on guidance from CPRA (no deeper than elevation -20 feet) and the surveyed mudline elevations. A suite of tests including: moisture content, Atterberg limits, hydrometer, grain size distribution, organic content, and specific gravity were run on each composite sample. In addition, 4 self-weight (low stress) consolidation tests were performed using samples composited as follows:

- Borings B-2, B-2a, B-3, and B-4, depths 0 to 16 feet;
- Borings B-1, B-5, B-6, and B-7, depths 0 to 16 feet;
- All borings, depths 0 to 16 feet; and,
- All borings, depths 0 to 4 feet.

Two settling column tests were also performed by SCTCS Group, LLC (SCTCS). Details of the samples and settling column test results are presented in the SCTCS report in Appendix C. Composite sample test results are presented in tabular format in Appendix C.

VARIATIONS

Interpretations of soil conditions, as described in the soil boring logs and summary tables, are based on field and laboratory data described in this report. Variations in soil conditions are likely to exist between the exploration locations and seasonal variation in surface water conditions will occur. Tidal influence should be expected in the project area and must be considered in the project design and construction.

LIMITATIONS

The information presented in this report is based on field explorations completed for this study and judgements made by GeoEngineers. This report is specific to this site and should not be used other than for the design of the Island Road Marsh Creation and Nourishment (TE-117) project located in Terrebonne Parish, Louisiana. We have provided the requested information for the addendum geotechnical data report in this document.

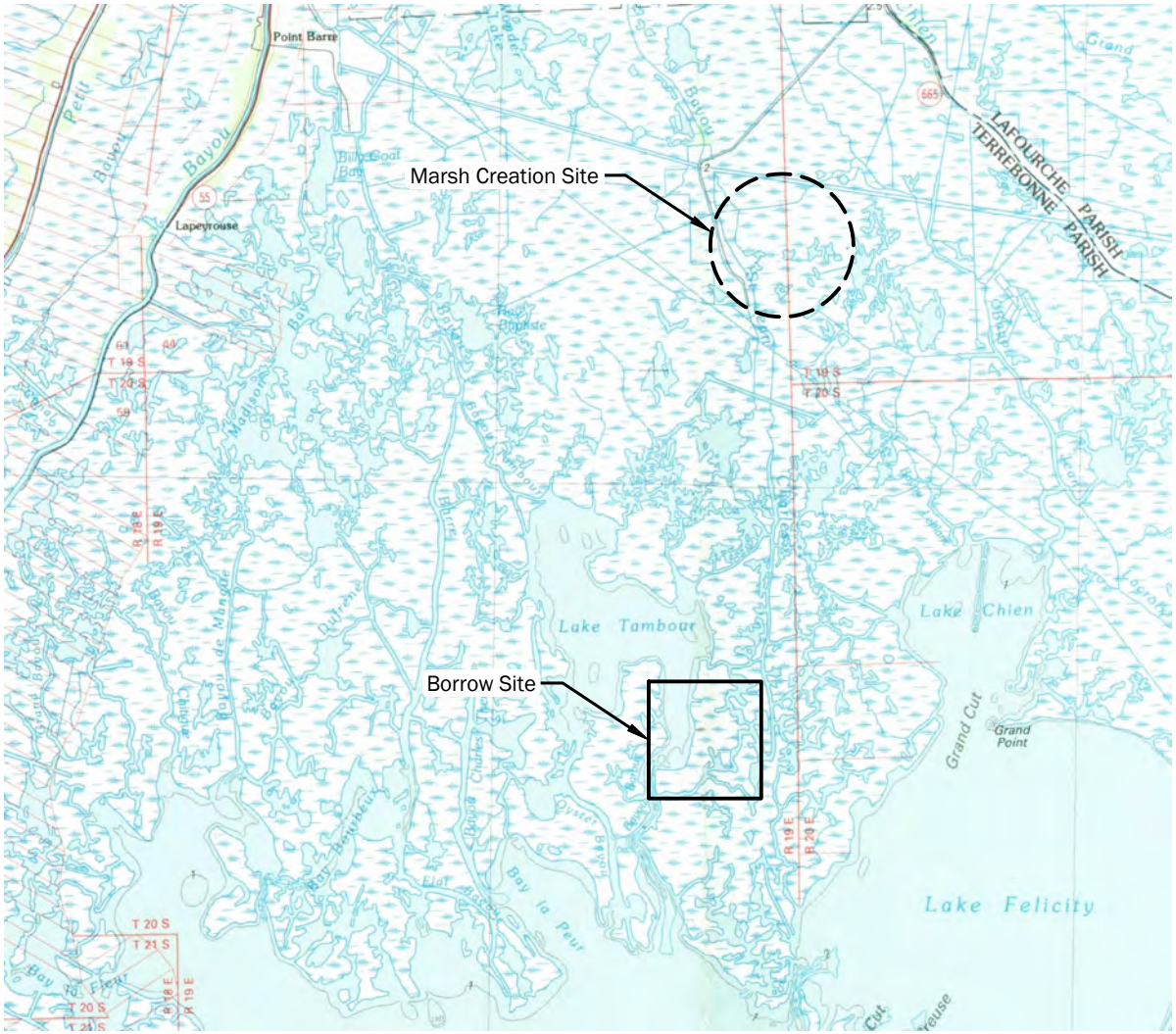
Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty or other conditions expressed or implied should be understood.

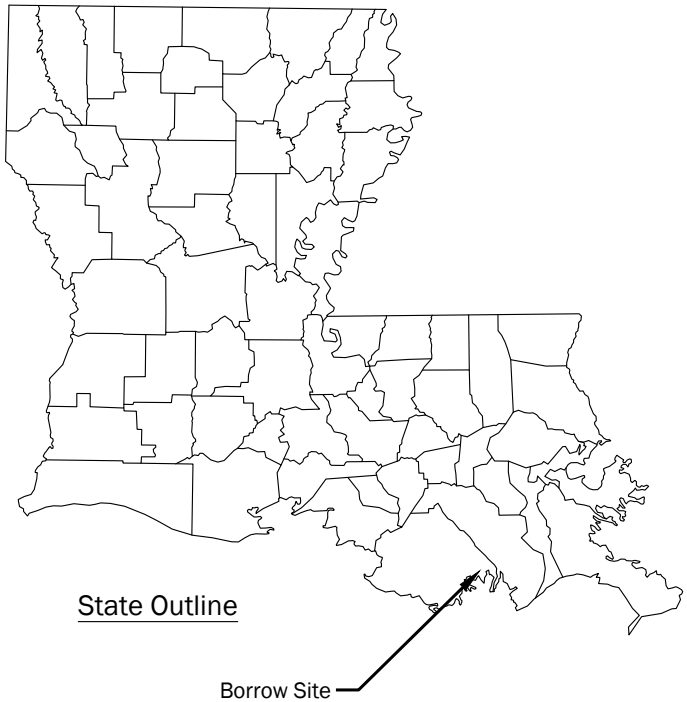
Please refer to Appendix F titled “Report Limitations and Guidelines for Use” for additional information pertaining to use of this report.

FIGURES

GeoEngineers

P:\16\16715040\CAD\03\Geotech - Final\1671504003_F01_Vicinity Map.dwg TAB:F01 - VM Date Exported: 04/23/18 - 10:40 by kcook



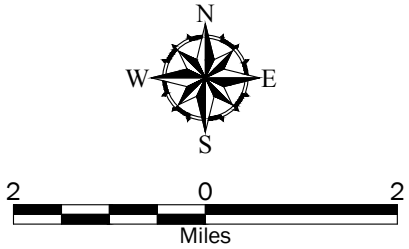


Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Details of field exploration and lab testing for the marsh creation site were included in GeoEngineers File No. 16715-040-01, dated February 1, 2017

Data Source: Topograghic image was taken from USGS, Terrebonne Bay, Dated: 1983

Projection: LA State Plane, South Zone, NAD83, US Foot



Vicinity Map

Island Road Marsh Creation & Nourishment (TE-117)
Terrebonne Parish, Louisiana

GEOENGINEERS

Figure 1

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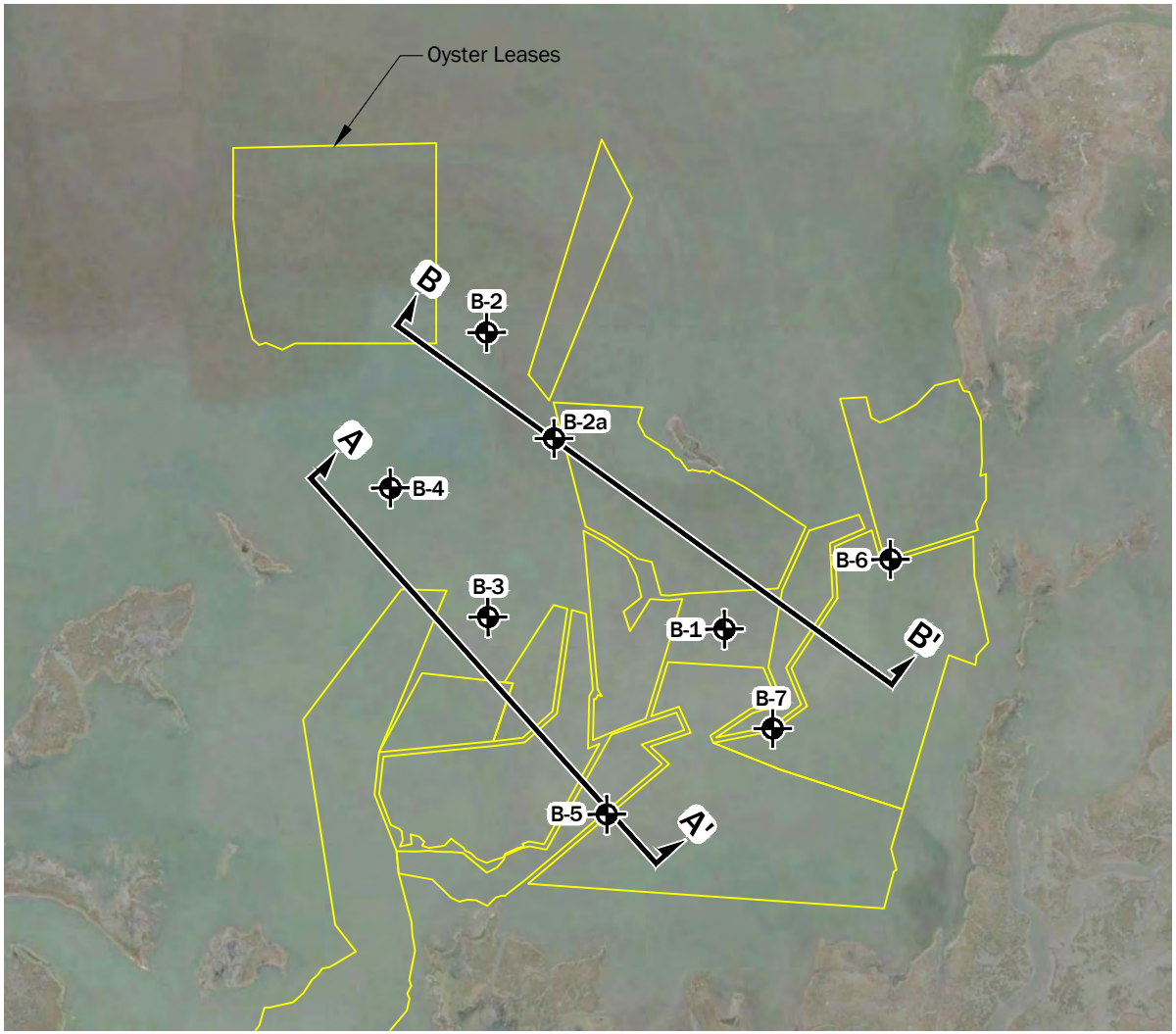


Legend

B-1 Boring by GeoEngineers, 2018

Oyster Leases

A A' Cross Section Location

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source:

1. Aerial was taken from Google Earth Pro, Imagery Dated: 1/25/2015
2. Oyster leases were taken from SONRIS, Date Downloaded: 5/18/2017

Projection: NAD83 Louisiana State Planes, Southern Zone, US Foot

N W E S

2000 0 2000

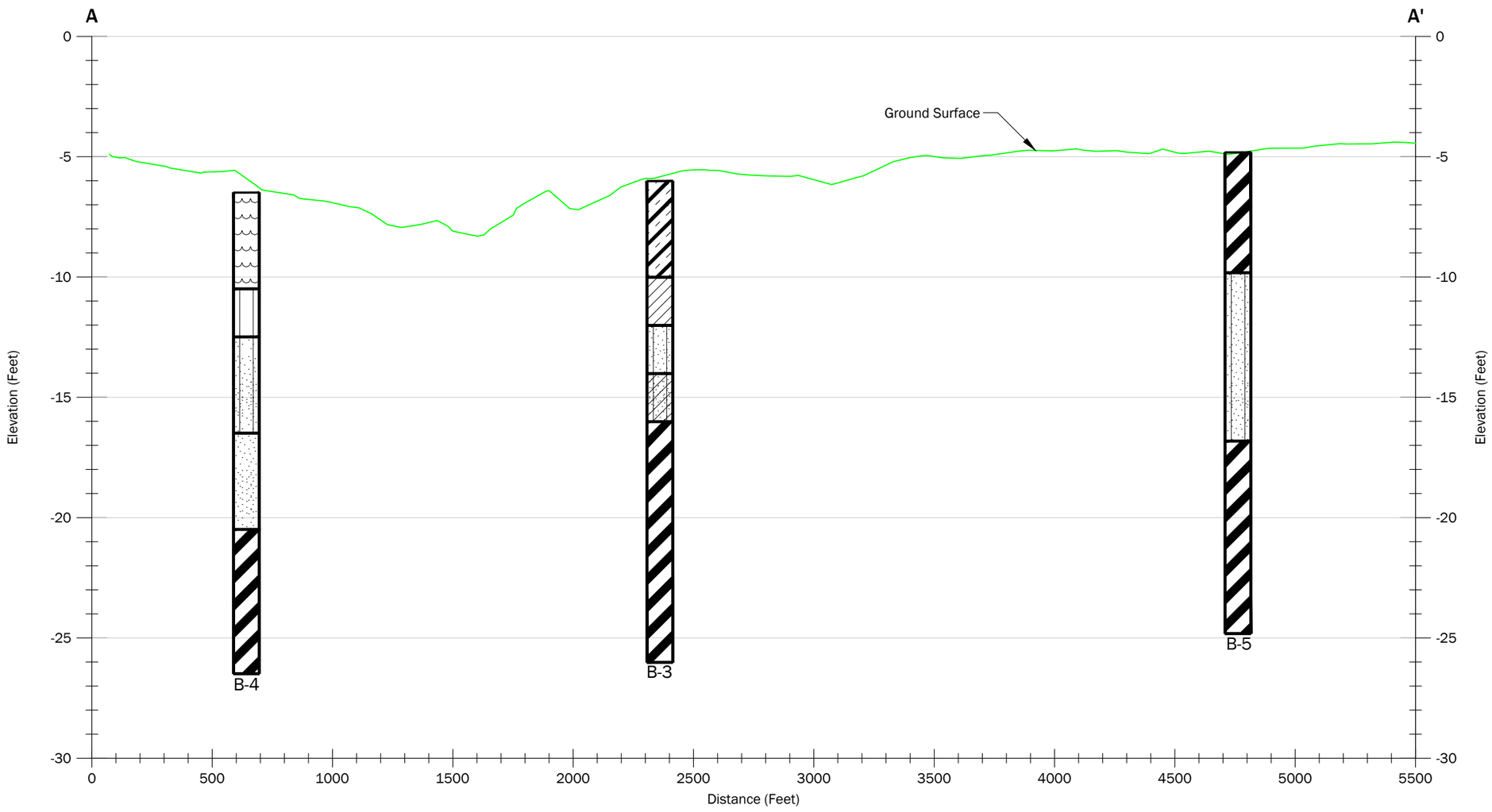
Feet

Borrow Area Boring Locations

Island Road Marsh Creation & Nourishment (TE-117)
Terrebonne Parish, Louisiana

GeoEngineers

Figure 2



Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Elevation data was taken from Fenstermaker, Dated 2/28/2017

Projection: NAD83 Louisiana State Planes, Southern Zone, US Foot

Legend

Peat	Clay
Silt	Silty Clay
Sand w/ Silt	Organic Clay
Sand	Silty Clayey Sand

500 0 500
Horizontal Scale in Feet

5 0 5
Vertical Scale in Feet
Vertical Exaggeration: 100X

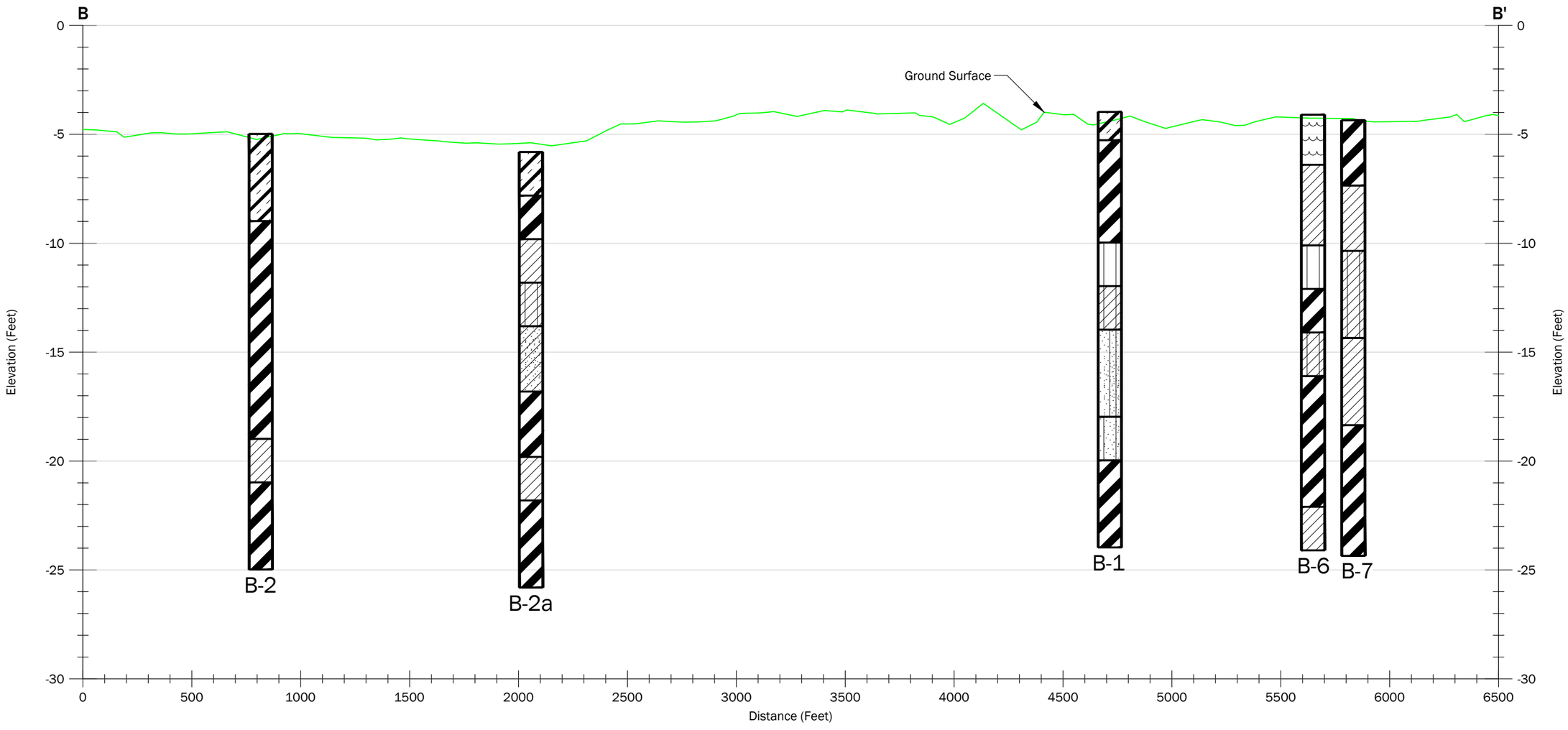
Subsurface Profile
A-A'

Island Road Marsh Creation & Nourishment (TE-117)
Terrebonne Parish, Louisiana

GEOENGINEERS

Figure 3

P:\16\16715040\CAD\03\Geotech - Final\1671504003_F02_Boring Location Plan.dwg TAB:F03 - Section AA Date Exported: 04/23/18 - 14:41 by kcook



Notes:

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Data Source: Elevation data was taken from Fenstermaker, Dated 2/28/2017

Projection: NAD83 Louisiana State Planes, Southern Zone, US Foot

Legend

- Peat
- Silt
- Sand w/ Silt
- Sand
- Silty Sand
- Sand w/ Clay
- Clay
- Silty Clay
- Organic Clay
- Silty Clayey Sand
- Sandy Clayey Silt

500 0 500
Horizontal Scale in Feet

5 0 5
Vertical Scale in Feet
Vertical Exaggeration: 100X

Subsurface Profile
B-B'

Island Road Marsh Creation & Nourishment (TE-117)
Terrebonne Parish, Louisiana

GEOENGINEERS

Figure 4

P:\16\1671504\0\CAD\03\Geotech - Final\1671504003_F02_Boring Location Plan.dwg TAB:F04 - Section BB Date Exported: 04/23/18 - 14:41 by kcook

APPENDICES

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APPENDIX A
Details of Field Exploration

APPENDIX A
DETAILS OF FIELD EXPLORATION

This appendix provides additional information regarding the field exploration completed for the borrow area for the Island Road Marsh Creation and Nourishment (TE-117) project in Terrebonne Parish, Louisiana.

Exploration Coordination

GeoEngineers notified "Louisiana One-Call" for utility locating prior to performing the field exploration. CPRA provided the required Coastal Use Permit to GeoEngineers for conducting our field exploration. Prior to our mobilization to the borrow area, LGH performed a magnetometer survey to clear the exploration locations of subsurface utilities and stake the locations in the field. In addition, Matrix prepared and sent notification letters prior to our mobilization to oyster leaseholders whose oyster leases were within 500 feet of our soil boring locations.

Soil Borings

Initially we began our field exploration on February 19, 2018 using an airboat-mounted drill rig. After drilling borings B-5 and B-7, it was decided the water was too rough and drilling conditions were unsafe using the airboat drill. Therefore, the remainder of our soil borings were drilled on February 20, 2018 using a pontoon-mounted drill rig. Soil borings were completed to depths of 20 feet below the existing mudline. The soil borings were advanced in open water. Coordinates and water depths at each boring location are included on the boring logs in Appendix B.

Sampling was conducted in general accordance with applicable ASTM standards, including collecting undisturbed-type cohesive and semi-cohesive samples with a three-inch outside diameter steel Shelby tube sampler using an Osterberg piston sampler.

Immediately upon retrieval from the subsurface, each sample was examined by our field engineer and field classified. Samples collected with Shelby tubes were examined at the bottom end of the sample for field classification. The tubes were then plugged, capped, labeled, and stored upright to reduce the likelihood of sample disturbance during transport to the GeoEngineers soil mechanics laboratory in Baton Rouge, Louisiana.

APPENDIX B
Soil Boring Logs

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Water level observed at time of exploration

Graphic Log Contact

Distinct contact between soil strata

Approximate contact between soil strata

Material Description Contact

Contact between geologic units

Contact between soil of the same geologic unit

Sampler Symbol Descriptions

- 2.4-inch I.D. split barrel
- Standard Penetration Test (SPT)
- Shelby tube
- Piston
- Direct-Push
- Bulk or grab
- Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

GEOENGINEERS

Figure B-1

Drilled	Start 2/20/2018	End 2/20/2018	Total Depth (ft)	20	Logged By / Checked By	ECK / JEA	Driller	Specialized Environmental Resources, LLC	Drilling Method	Wet Rotary
Surface Elevation (ft) / Vertical Datum	-4 / NAVD88		Hammer Data	Safety Hammer/Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Pontoon-Mounted Drill Rig				
Latitude / Longitude	29.316526 / -90.488514		System Datum	Geographic NAD83 (feet)	Depth of water to mudline at time of exploration (ft)	5.0				

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot or Pocket Pen (TSF)	Collected Sample	Sample Name	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Water Content, %	Dry Density, (pcf)	Shear Strength, (KSF)	Confining Pressure, (PSI)	Strain, %	Liquid Limit (LL), %	Plasticity Index (PI), %	Passing No. 200 Sieve, %	Torvane Shear Strength (TSF)
	0		25			1			OH	Dark gray organic clay	205	28.1							0.04
-5						2			CH	Gray clay with organic matter	40								
			17			3				Gray clay with organic matter	81								0.03
			23			4				Gray clay with trace organic matter and silt partings	76	57							0.05
-10	5		18			5			ML	Gray sandy silt with sandy clay layers	30								
			15			6			CL-ML	Gray sandy clayey silt	35							53	
-15	10		20.5			7			SP-SM	Gray sand with silt	27								
			9.5			8				Gray sand with silt and clay pockets	23							9	
			12.5			9			SM	Gray silty sand with silt fissures at bottom	30								
-20	15		22			10			CH	Gray clay with 2 inch sand layer at top and silt lenses	80								0.06
			22			11				Gray clay with silt lenses	76								0.06
	20																		

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey
*Indicates a remold was used for strength testing.

Log of Boring B-1

GEOENGINEERS

Project: Island Road Marsh Creation and Nourishment (TE-117)
Project Location: Terrebonne Parish, Louisiana
Project Number: 16715-040-03

Figure B-2
Sheet 1 of 1

Date:4/23/18 Path:P:\16\16715040\GINT\16715040-03.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_LAB_MUDLINE

Drilled	Start 2/20/2018	End 2/20/2018	Total Depth (ft)	20	Logged By / Checked By	ECK / JEA	Driller	Specialized Environmental Resources, LLC	Drilling Method	Wet Rotary
Surface Elevation (ft) / Vertical Datum	-5 / NAVD88		Hammer Data	Safety Hammer/Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Pontoon-Mounted Drill Rig				
Latitude / Longitude	29.325258 / -90.496372		System Datum	Geographic NAD83 (feet)	Depth of water to mudline at time of exploration (ft)	6.5				

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot or Pocket Pen (TSF)	Collected Sample	Sample Name	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	LABORATORY DATA: Water Content, %	Dry Density, (pcf)	Shear Strength, (KSF)	Confining Pressure, (PSI)	Strain, %	Liquid Limit (LL), %	Plasticity Index (PI), %	Passing No. 200 Sieve, %	Torvane Shear Strength (TSF)
	0		23			1			OH	Gray organic clay with sand pockets, shell fragments, and sand seams	85								0.02
			17.5			2				Dark gray organic clay with shell fragments	203	28.1							0.03
-10	5		18			3			CH	Gray clay with silt lenses and organic matter	102								0.02
			10.5			4				Gray clay with silt lenses, sand lenses, and organic matter	58								0.014
			18			5				Gray clay with silt lenses and sand lenses	40								0.04
-15	10		17			6				Gray clay with silt lenses	63								0.04
			19			7				Gray clay	85	58.7							0.04
-20	15		19			8			CL	Gray silty clay	46								0.04
			18			9			CH	Gray clay with silt lenses	66								0.065
-25	20		18			10				Gray clay with silt lenses	57								0.06

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey
*Indicates a remold was used for strength testing.

Log of Boring B-2

GEOENGINEERS

Project: Island Road Marsh Creation and Nourishment (TE-117)
Project Location: Terrebonne Parish, Louisiana
Project Number: 16715-040-03

Figure B-3
Sheet 1 of 1

Date:4/23/18 Path:P:\16\16715040\GINT\16715040-03.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_LAB_MUDLINE

Drilled	Start 2/20/2018	End 2/20/2018	Total Depth (ft)	20	Logged By / Checked By	ECK / JEA	Driller	Specialized Environmental Resources, LLC	Drilling Method	Wet Rotary
Surface Elevation (ft) / Vertical Datum	-5.8 NAVD88		Hammer Data	Safety Hammer/Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Pontoon-Mounted Drill Rig				
Latitude / Longitude	29.322131 -90.494147		System Datum	Geographic NAD83 (feet)	Depth of water to mudline at time of exploration (ft)	7.0				

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot or Pocket Pen (TSF)	Collected Sample	Sample Name	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	LABORATORY DATA: Water Content, %	Dry Density, (pcf)	Shear Strength, (KSF)	Confining Pressure, (PSI)	Strain, %	Liquid Limit (LL), %	Plasticity Index (PI), %	Passing No. 200 Sieve, %	Torvane Shear Strength (TSF)
	0		19			1			OH	Dark gray organic clay with silt	154								0.04
			18.5			2			CH	Gray clay with organic matter	40	80.6							0.045
10	5		17			3			CL	Gray silty clay with sand and silty sand with clay at bottom	38								0.045
			15			4			CL-ML	Gray sandy clayey silt	31							53	0.02
15			19			5			SP-SC	Gray sand with clay	27								
	10		21			6				Gray sand with clay									
									CH	Gray clay with silt lenses	50								0.03
			19.5			7				Gray clay with silt lenses	67	66.2							0.075
20			21			8			CL	Gray silty clay	54								0.07
	15		16			9			CH	Gray clay	81								0.04
25			16			10				Gray clay with shell fragments	74								0.08
	20																		

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey
*Indicates a remold was used for strength testing.

Log of Boring B-2a

GEOENGINEERS

Project: Island Road Marsh Creation and Nourishment (TE-117)
Project Location: Terrebonne Parish, Louisiana
Project Number: 16715-040-03

Figure B-4
Sheet 1 of 1

Date:4/23/18 Path:P:\16\16715040\GINT\16715040-03.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_LAB_MUDLINE

Drilled	Start 2/20/2018	End 2/20/2018	Total Depth (ft)	20	Logged By / Checked By	ECK / JEA	Driller	Specialized Environmental Resources, LLC	Drilling Method	Wet Rotary
Surface Elevation (ft) / Vertical Datum	-5.5 NAVD88		Hammer Data	Safety Hammer/Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Pontoon-Mounted Drill Rig				
Latitude / Longitude	29.316929 -90.496412		System Datum	Geographic NAD83 (feet)	Depth of water to mudline at time of exploration (ft)	7.0				

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot or Pocket Pen (TSF)	Collected Sample	Sample Name	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Water Content, %	Dry Density, (pcf)	Shear Strength, (KSF)	Confining Pressure, (PSI)	Strain, %	Liquid Limit (LL), %	Plasticity Index (PI), %	Passing No. 200 Sieve, %	Torvane Shear Strength (TSF)
	0		20.5			1			OH	Black organic clay	134								0.02
			22			2				Gray organic clay (very soft)	144	40.1	0.06	5	6				0.02
-10	5		18			3			CL	Gray clay with silt and sand lenses	41								0.035
			16			4			SM	Gray silty sand	33								0.02
-15			8			5			SC-SM	Gray silty clayey sand	28							14	0.02
	10		20			6			CH	Gray clay with silt lenses	96								0.04
			16			7				Gray clay (very soft)	81	55.4	0.18	5.2	4				0.06
-20	15		15			8				Gray clay	85								0.04
			7			9				Gray clay with shells	72								0.035
-25	20		15			10				Gray clay with shell fragments	79								0.085

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey
*Indicates a remold was used for strength testing.

Log of Boring B-3

GEOENGINEERS

Project: Island Road Marsh Creation and Nourishment (TE-117)
Project Location: Terrebonne Parish, Louisiana
Project Number: 16715-040-03

Figure B-5
Sheet 1 of 1

Date:4/23/18 Path:P:\16\16715040\GINT\16715040-03.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_LAB_MUDLINE

Drilled	Start 2/20/2018	End 2/20/2018	Total Depth (ft)	20	Logged By / Checked By	ECK / JEA	Driller	Specialized Environmental Resources, LLC	Drilling Method	Wet Rotary
Surface Elevation (ft) / Vertical Datum	-6.5 NAVD88		Hammer Data	Safety Hammer/Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Pontoon-Mounted Drill Rig				
Latitude / Longitude	29.320732 -90.499657		System Datum	Geographic NAD83 (feet)	Depth of water to mudline at time of exploration (ft)	7.0				

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot or Pocket Pen (TSF)	Collected Sample	Sample Name	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Water Content, %	Dry Density, (pcf)	Shear Strength, (KSF)	Confining Pressure, (PSI)	Strain, %	Liquid Limit (LL), %	Plasticity Index (PI), %	Passing No. 200 Sieve, %	Torvane Shear Strength (TSF)
	0		20			1			PT	Dark gray peat with gray clay (very soft)	292	20.1	0.08	5	13				0.03
			20			2				Brown peat	394								0.04
-10			18			3			ML	Gray sandy silt with 3 inch clay layer in center	46							77	0.07
	5		16			4			SM	Gray silty sand with clay layers	85								0.015
-15			9			5				Gray silty sand	28								0.035
	10		4			6			SP	Gray sand	23							4	0.015
			4			7				Gray sand	22								0.02
-20			20			8			CH	Gray clay (very soft)	84	54.1	0.18	6	3				0.06
	15		16			9				Gray clay with silt lenses	48								0.07
-25			11			10				Gray clay with silt lenses and shell fragments	66								0.05
	20																		

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey
*Indicates a remold was used for strength testing.

Log of Boring B-4

GEOENGINEERS

Project: Island Road Marsh Creation and Nourishment (TE-117)
Project Location: Terrebonne Parish, Louisiana
Project Number: 16715-040-03

Figure B-6
Sheet 1 of 1

Date:4/23/18 Path:P:\16\16715040\GINT\16715040-03.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_LAB_MUDLINE

Drilled	Start 2/19/2018	End 2/19/2018	Total Depth (ft)	20	Logged By / Checked By	ECK / JEA	Driller	Specialized Environmental Resources, LLC	Drilling Method	Wet Rotary
Surface Elevation (ft) / Vertical Datum	-4.3 NAVD88		Hammer Data	Safety Hammer/Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Airboat-Mounted Drill Rig				
Latitude / Longitude	29.311132 -90.492496		System Datum	Geographic NAD83 (feet)	Depth of water to mudline at time of exploration (ft)	5.0				

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot or Pocket Pen (TSF)	Collected Sample	Sample Name	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Water Content, %	Dry Density, (pcf)	Shear Strength, (KSF)	Confining Pressure, (PSI)	Strain, %	Liquid Limit (LL), %	Plasticity Index (PI), %	Passing No. 200 Sieve, %	Torvane Shear Strength (TSF)
5	0		24			1			CH	Dark gray clay with organic matter	80								
			22			2				Gray clay with organic matter (very soft)	58	67.5	0.05	5	7				
			21			3				Gray clay with silt lenses (very soft)	51	68.7	0.06	5	7				
-10	5					4			SM	Gray silty sand with trace clay	28								
			14			5				Gray silty sand with clay lenses	29							40	
			14.5			6				Gray silty sand with clay lenses	25								
-15	10		14			7				Gray silty sand with 2 inch clay layer	25								
			20			8			CH	Gray clay with silt lenses (very soft)	64	60.6	0.11	5.2	7				
			20			9				Gray clay with silty sand lenses and shells	84								
-20	15		21			10				Gray clay with silt pockets, silt seams, and shell fragments (soft)	60	61.1	0.3	6.8	6				
			4			11				Gray clay with organic matter and shells	95								
	20																		

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey
*Indicates a remold was used for strength testing.

Log of Boring B-5

GEOENGINEERS

Project: Island Road Marsh Creation and Nourishment (TE-117)
Project Location: Terrebonne Parish, Louisiana
Project Number: 16715-040-03

Figure B-7
Sheet 1 of 1

Date:4/23/18 Path:P:\16\16715040\GINT\16715040-03.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_LAB_MUDLINE

Drilled	Start 2/20/2018	End 2/20/2018	Total Depth (ft)	20	Logged By / Checked By	ECK / JEA	Driller	Specialized Environmental Resources, LLC	Drilling Method	Wet Rotary
Surface Elevation (ft) / Vertical Datum	-4.1 NAVD88		Hammer Data	Safety Hammer/Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Pontoon-Mounted Drill Rig				
Latitude / Longitude	29.318524 -90.482984		System Datum	Geographic NAD83 (feet)	Depth of water to mudline at time of exploration (ft)	5.0				

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot or Pocket Pen (TSF)	Collected Sample	Sample Name	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Water Content, %	Dry Density, (pcf)	Shear Strength, (KSF)	Confining Pressure, (PSI)	Strain, %	Liquid Limit (LL), %	Plasticity Index (PI), %	Passing No. 200 Sieve, %	Torvane Shear Strength (TSF)
	0		24.5			1			PT	Dark gray peat with clay	186								
5						2				Dark gray peat with organic clay (very soft)	336	17.6	0.11	5	14				0.03
			23.5			3				Gray peat	180								0.04
									CL	Gray silty clay with organic matter									
			18.5			4				Gray silty clay with sandy silt lenses and layers (very soft)	37	85.8	0.1	5	15				0.03
10	5																		
			16			5			ML	Gray sandy silt with clay layers	39								0.02
			14			6			CH	Gray clay with silty sand layers	58							92	
15	10		17.5			7			CL-ML	Gray clayey silt with sand	40								0.03
			14			8			CH	Gray clay with silt seams (very soft)	80	54	0.16	5.2	5				0.04
			18			9				Gray clay with sandy silt layers	62								0.04
20	15																		
			12			10				Gray clay (very soft)	77	57.8	0.11	6.8	12				0.03
			2			11			CL	Gray silty clay with shell fragments	39								
	20																		

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey
*Indicates a remold was used for strength testing.

Log of Boring B-6

GEOENGINEERS

Project: Island Road Marsh Creation and Nourishment (TE-117)
Project Location: Terrebonne Parish, Louisiana
Project Number: 16715-040-03

Figure B-8
Sheet 1 of 1

Date:4/23/18 Path:P:\16\16715040\GINT\16715040-03.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_LAB_MUDLINE

Drilled	Start 2/19/2018	End 2/19/2018	Total Depth (ft)	20	Logged By / Checked By	ECK / JEA	Driller	Specialized Environmental Resources, LLC	Drilling Method	Wet Rotary
Surface Elevation (ft) / Vertical Datum	-4.4 NAVD88		Hammer Data	Safety Hammer/Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Airboat-Mounted Drill Rig				
Latitude / Longitude	29.313612 -90.486936		System Datum	Geographic NAD83 (feet)	Depth of water to mudline at time of exploration (ft)	5.0				

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot or Pocket Pen (TSF)	Collected Sample	Sample Name	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	LABORATORY DATA: Water Content, %	Dry Density, (pcf)	Shear Strength, (KSF)	Confining Pressure, (PSI)	Strain, %	Liquid Limit (LL), %	Plasticity Index (PI), %	Passing No. 200 Sieve, %	Torvane Shear Strength (TSF)
5	0		18.5			1			CH	Dark brown clay with organic matter and shells	75								
			20			2				Dark gray clay with organic matter and shells	86								
						3			CL	Dark gray sandy clay with shells and a silty sand layer	42								
10	5					4				Dark gray silty clay									
			20			5			CL-ML	Gray sandy clayey silt	44								
			15			6				Gray sandy clayey silt	30							61	
15	10		21			7			CL	Gray sandy clay	37								
			17			8				Gray silty clay with silty sand layers and shell fragments	29	87.9							0.02
			20.5			9			CH	Gray clay with sand seams	63								0.06
20	15									Gray clay with silt seams									
			17.5			10				Gray clay with silt seams	77								0.06
			20			11				Gray clay with silt lenses, sand lenses, and shell fragments	89								0.06
	20																		

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey
*Indicates a remold was used for strength testing.

Log of Boring B-7

GEOENGINEERS

Project: Island Road Marsh Creation and Nourishment (TE-117)
Project Location: Terrebonne Parish, Louisiana
Project Number: 16715-040-03

Figure B-9
Sheet 1 of 1

Date:4/23/18 Path:P:\16\16715040\GINT\16715040-03.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_LAB_MUDLINE

APPENDIX C
Laboratory Testing Results

APPENDIX C
LABORATORY TESTING

This appendix provides additional information regarding the laboratory testing completed for the borrow area of the Island Road Marsh Creation and Nourishment (TE-117) project in Terrebonne Parish, Louisiana.

General

Soil samples obtained from the explorations were transported to our soil mechanics laboratory in Baton Rouge, Louisiana, and examined to confirm or modify field classifications. The moisture content was measured for each Shelby tube sample. Unconsolidated-undrained triaxial tests, unit weight tests, and grain size distribution tests were performed on select soil samples. Composite samples were mixed to evaluate the index properties of each soil boring to the proposed dredge depth and also for self-weight (low-stress) consolidation tests and settling column tests. The laboratory testing procedures are discussed in more detail below.

Moisture Content

Moisture content tests were completed for representative samples from each Shelby tube in general accordance with ASTM D2216. The results of these tests are presented on the logs at the respective sample depths. In addition, moisture content tests were performed on composite samples of each soil boring and for the self-weight consolidation and settling column tests, which are presented in the tabular Summary of Lab Results presented in this appendix.

Unit Weight

Unit weight was measured for select samples in general accordance with ASTM D2166. The results of these tests are presented on the logs at the respective sample depths and in the tabular Summary of Lab Results presented in this appendix.

Specific Gravity

Specific gravity tests were performed on representative composite samples for each soil boring and for the self-weight consolidation and settling column tests in general accordance with ASTM D854. The results of these tests are presented in the tabular Summary of Lab Results presented in this appendix.

Organic Content

Organic content tests were completed for representative composite samples for each soil boring and for the self-weight consolidation and settling column tests in general accordance with ASTM D2974. The results of these tests are presented in the tabular Summary of Lab Results presented in this appendix.

Atterberg Limits

Atterberg Limits tests were performed on representative composite samples for each soil boring and for the self-weight consolidation and settling column tests in general accordance with ASTM D4318. The tests were used to classify the soil as well as to evaluate its index properties. The results of the Atterberg Limits testing are presented in the tabular Summary of Lab Results presented in this appendix.

Sieve Analysis

Sieve analyses were performed on select coarse-grained samples and representative composite samples for each soil boring and for the self-weight consolidation and settling column tests in general accordance with ASTM D422. The results of the sieve analyses were plotted and classified in general accordance with the Unified Soil Classification System (USCS) and are included with this appendix. The percentage passing the U.S. No. 200 sieve of select samples is shown on the logs at the respective sample depths. The percentage passing the U.S. No. 200 sieve of composite samples is shown in the tabular Summary of Lab Results presented in this appendix.

Unconsolidated Undrained Triaxial Tests

Unconsolidated undrained (UU) triaxial tests were performed on select cohesive soil samples obtained from the borings. The tests were used to evaluate shear strength characteristics and were completed in general accordance with ASTM D2850. The results of the testing are presented on the logs at their respective sample depths and also in the tabular Summary of Lab Results presented in this appendix. In addition, stress-strain curves for each test are included in this appendix.

Self-weight (Low stress) Consolidation Tests

Self-weight consolidation tests were performed on four composite samples as previously described. The tests were performed in accordance with the methods specified in USACE Manual No. 1110-2-5027 (USACE, 1987) and the University of Texas Method (Pederson, 2001). Further details of the test method and the test results are included in the report included in this appendix.

Settling Column Tests

Two settling column tests were performed by SCTCS on composite soil samples in general accordance with the method specified in USACE Manual No. 1110-2-5027. Further details regarding the sample composition and test results are presented in the SCTCS report included in this appendix.

Soil Boring ID	Depth Interval (ft)	D2488 Visual Description	Test Type	D2216 Moisture (%)	D2166/D2850 Unit Weight (PCF) Wet	D2166/D2850 Unit Weight (PCF) Dry	D4318 Atterberg Limits LL	D4318 Atterberg Limits PL	D4318 Atterberg Limits PI	D422/D1140 /D6913 %<#200 Sieve	D2166/D2850 Shear Strength (KSF)	D2166/D2850 Remolded Strength (KSF)	D2166/D2850 Failure Strain (%)	D2166/D2850 Confining Pressure (PSI)	D2166/D2850 Failure Type	D4648 Mini Vane Shear Strength (KSF)	Comments
B-1	0.0 - 1.3	Dark gray organic clay (OH)	UDW	204.7	85.5	28.1											TV=0.04
B-1	1.3 - 2.0	Gray clay with organic matter (CH)	EXT_MC	39.5													
B-1	2.0 - 4.0	Gray clay with organic matter (CH)	EXT_MC	80.8													TV=0.03
B-1	4.0 - 6.0	Gray clay with trace organic matter (CH)	UDW	75.9	100.2	57.0											TV=0.05
B-1	6.0 - 8.0	Gray sandy silt with sandy clay layers (ML)	EXT_MC	29.7													TV=N/A
B-1	8.0 - 10.0	Gray sandy clayey silt (CL-ML)	SV	35.1						53.4							TV=N/A
B-1	10.0 - 12.0	Gray sand with silt (SM)	EXT_MC	26.9													TV=N/A
B-1	12.0 - 14.0	Gray sand with silt and clay pockets (SP-SM)	SV	22.9						9.0							TV=N/A
B-1	14.0 - 16.0	Gray silty sand with silt fissures at bottom (SM)	EXT_MC	29.8													TV=N/A
B-1	16.0 - 18.0	Gray clay with 2" sand layer at top and silt lenses (CH)	EXT_MC	79.8													TV=0.06
B-1	18.0 - 20.0	Gray clay with silt lenses (CH)	EXT_MC	75.6													TV=0.06

Disclaimer: The results presented relate only to those samples tested.
Note: ASTM standard identification numbers shown above each test description.

Multiple Shear = MS Vertical Shear = VS Angle Shear = AS
Slickensided = SLS Bulge = B Crumble = C

AASHTO ACCREDITED

Technical Responsibility: Karen Allen
Title: QAM
Date: 4/23/18

Summary of Lab Results
Project No.: 16715-040-03

Island Road Marsh Creation and Nourishment (TE-117)
Terrebonne Parish, LA

GEOENGINEERS

Soil Boring ID	Depth Interval (ft)	D2488 Visual Description	Test Type	D2216 Moisture (%)	D2166/D2850 Unit Weight (PCF) Wet	D2166/D2850 Unit Weight (PCF) Dry	D4318 Atterberg Limits LL	D4318 Atterberg Limits PL	D4318 Atterberg Limits PI	D422/D1140 /D6913 %<#200 Sieve	D2166/D2850 Shear Strength (KSF)	D2166/D2850 Remolded Strength (KSF)	D2166/D2850 Failure Strain (%)	D2166/D2850 Confining Pressure (PSI)	D2166/D2850 Failure Type	D4648 Mini Vane Shear Strength (KSF)	Comments
B-2	0.0 - 2.0	Gray organic clay with sand pockets, shell fragments, and sand seams (OH)	EXT_MC	85.0													TV=0.02
B-2	2.0 - 4.0	Dark gray organic clay with shell fragments (OH)	UDW	203.0	85.1	28.1											TV=0.03
B-2	4.0 - 6.0	Gray clay with silt lenses and organic matter (CH)	EXT_MC	102.0													TV=0.02
B-2	6.0 - 8.0	Gray clay with silt lenses, sand lenses, and organic matter (CH)	EXT_MC	57.6													TV=0.014
B-2	8.0 - 10.0	Gray clay with silt lenses and sand lenses (CH)	EXT_MC	39.9													TV=0.04
B-2	10.0 - 12.0	Gray clay with silt lenses (CH)	EXT_MC	63.1													TV=0.04
B-2	12.0 - 14.0	Gray clay (CH)	UDW	85.4	108.9	58.7											TV=0.04
B-2	14.0 - 16.0	Gray silty clay (CL)	EXT_MC	45.6													TV=0.04
B-2	16.0 - 18.0	Gray clay with silt lenses (CH)	EXT_MC	65.5													TV=0.065
B-2	18.0 - 20.0	Gray clay with silt lenses (CH)	EXT_MC	56.7													TV=0.06

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Slickensided = SLS Bulge = B Crumble = C

AASHTO ACCREDITED

Technical Responsibility: Karen Allen
Title: QAM
Date: 4/23/18

Summary of Lab Results
Project No.: 16715-040-03

Island Road Marsh Creation and Nourishment (TE-117)
Terrebonne Parish, LA

GEOENGINEERS

Soil Boring ID	Depth Interval (ft)	D2488 Visual Description	Test Type	D2216 Moisture (%)	D2166/D2850 Unit Weight (PCF) Wet	D2166/D2850 Unit Weight (PCF) Dry	D4318 Atterberg Limits LL	D4318 Atterberg Limits PL	D4318 Atterberg Limits PI	D422/D1140 /D6913 %<#200 Sieve	D2166/D2850 Shear Strength (KSF)	D2166/D2850 Remolded Strength (KSF)	D2166/D2850 Failure Strain (%)	D2166/D2850 Confining Pressure (PSI)	D2166/D2850 Failure Type	D4648 Mini Vane Shear Strength (KSF)	Comments
B-2a	0.0 - 2.0	Dark gray organic clay with silt (OH)	EXT_MC	154.1													TV=0.04
B-2a	2.0 - 4.0	Gray clay with organic matter (CH)	UDW	40.3	113.1	80.6											TV=0.045
B-2a	4.0 - 6.0	Gray silty clay with sand and silty sand with clay at bottom (CL)	EXT_MC	37.9													TV=0.045
B-2a	6.0 - 8.0	Gray sandy clayey silt (CL-ML)	SV	30.6						53.0							TV=0.02
B-2a	8.0 - 10.0	Gray sand with clay (SP-SC)	EXT_MC	27.0													TV=0
B-2a	11.0 - 12.0	Gray clay with silt lenses (CH)	EXT_MC	50.0													TV=0.03
B-2a	12.0 - 14.0	Gray clay with silt lenses (CH)	UDW	66.6	110.2	66.2											TV=0.075
B-2a	14.0 - 16.0	Gray silty clay (CL)	EXT_MC	53.9													TV=0.07
B-2a	16.0 - 18.0	Gray clay (CH)	EXT_MC	81.4													TV=0.04
B-2a	18.0 - 20.0	Gray clay with shell fragments (CH)	EXT_MC	73.6													TV=0.08

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Technical Responsibility: Karen Allen
Title: QAM
AASHTO ACCREDITED Date: 4/23/18

Summary of Lab Results
Project No.: 16715-040-03

Island Road Marsh Creation and Nourishment (TE-117)
Terrebonne Parish, LA

GEOENGINEERS

Soil Boring ID	Depth Interval (ft)	D2488 Visual Description	Test Type	D2216 Moisture (%)	D2166/D2850 Unit Weight (PCF) Wet	D2166/D2850 Unit Weight (PCF) Dry	D4318 Atterberg Limits LL	D4318 Atterberg Limits PL	D4318 Atterberg Limits PI	D422/D1140 /D6913 %<#200 Sieve	D2166/D2850 Shear Strength (KSF)	D2166/D2850 Remolded Strength (KSF)	D2166/D2850 Failure Strain (%)	D2166/D2850 Confining Pressure (PSI)	D2166/D2850 Failure Type	D4648 Mini Vane Shear Strength (KSF)	Comments
B-3	0.0 - 2.0	Black organic clay (OH)	EXT_MC	133.9													TV=0.02
B-3	2.0 - 4.0	Very soft gray organic clay (OH)	UU	143.7	97.7	40.1					0.06		5.6	5.0	MS		TV=0.02
B-3	4.0 - 6.0	Gray clay with silt and sand lenses (CL)	EXT_MC	41.3													TV=0.035
B-3	6.0 - 8.0	Gray silty sand (SM)	EXT_MC	32.6													TV=0.02
B-3	8.0 - 10.0	Gray silty clayey sand (SC-SM)	SV	27.7						14.3							TV=0.02
B-3	10.0 - 12.0	Gray clay with silt lenses (CH)	EXT_MC	95.8													TV=0.04
B-3	12.0 - 14.0	Very soft gray clay (CH)	UU	80.5	100.0	55.4					0.18		3.7	5.2	B		TV=0.06
B-3	14.0 - 16.0	Gray clay (CH)	EXT_MC	84.9													TV=0.04
B-3	16.0 - 18.0	Gray clay with shells (CH)	EXT_MC	72.4													TV=0.035
B-3	18.0 - 20.0	Gray clay with shell fragments (CH)	EXT_MC	79.4													TV=0.085

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Summary of Lab Results
Project No.: 16715-040-03

Island Road Marsh Creation and Nourishment (TE-117)
Terrebonne Parish, LA

GEOENGINEERS

Soil Boring ID	Depth Interval (ft)	D2488 Visual Description	Test Type	D2216 Moisture (%)	D2166/D2850 Unit Weight (PCF) Wet	D2166/D2850 Unit Weight (PCF) Dry	D4318 Atterberg Limits LL	D4318 Atterberg Limits PL	D4318 Atterberg Limits PI	D422/D1140 /D6913 %<#200 Sieve	D2166/D2850 Shear Strength (KSF)	D2166/D2850 Remolded Strength (KSF)	D2166/D2850 Failure Strain (%)	D2166/D2850 Confining Pressure (PSI)	D2166/D2850 Failure Type	D4648 Mini Vane Shear Strength (KSF)	Comments
B-4	0.0 - 2.0	Very soft dark gray peat with gray clay (PT)	UU	291.7	78.6	20.1					0.08		12.8	5.0	B		TV=0.03
B-4	2.0 - 4.0	Brown peat (PT)	EXT_MC	394.1													TV=0.04
B-4	4.0 - 6.0	Gray sandy silt with 3" clay layer in center (ML)	SV	46.2						77.2							TV=0.07
B-4	6.0 - 8.0	Gray silty sand with clay layers (SM)	EXT_MC	84.6													TV=0.015
B-4	8.0 - 10.0	Gray silty sand (SM)	EXT_MC	27.7													TV=0.035
B-4	10.0 - 12.0	Gray sand (SP)	SV	22.7						3.8							TV=0.015
B-4	12.0 - 14.0	Gray sand (SP)	EXT_MC	22.4													TV=0.02
B-4	14.0 - 16.0	Very soft gray clay (CH)	UU	84.0	99.5	54.1					0.18		3.1	6.0	B		TV=0.06
B-4	16.0 - 18.0	Gray clay with silt lenses (CH)	EXT_MC	48.3													TV=0.07
B-4	18.0 - 20.0	Gray clay with silt lenses and shell fragments (CH)	EXT_MC	66.0													TV=0.05

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Summary of Lab Results
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Island Road Marsh Creation and Nourishment (TE-117)
Terrebonne Parish, LA

GEOENGINEERS

Soil Boring ID	Depth Interval (ft)	D2488 Visual Description	Test Type	D2216 Moisture (%)	D2166/D2850 Unit Weight (PCF) Wet	D2166/D2850 Unit Weight (PCF) Dry	D4318 Atterberg Limits LL	D4318 Atterberg Limits PL	D4318 Atterberg Limits PI	D422/D1140 /D6913 %<#200 Sieve	D2166/D2850 Shear Strength (KSF)	D2166/D2850 Remolded Strength (KSF)	D2166/D2850 Failure Strain (%)	D2166/D2850 Confining Pressure (PSI)	D2166/D2850 Failure Type	D4648 Mini Vane Shear Strength (KSF)	Comments
B-5	0.0 - 2.0	Dark gray clay with organic matter (CH)	EXT_MC	80.2													
B-5	2.0 - 4.0	Very soft gray clay (CH)	UU	57.9	106.5	67.5					0.05		7.3	5.0	B		
B-5	4.0 - 5.0	Very soft gray clay with silt lenses (CH)	UU	50.7	103.5	68.7					0.06		6.8	5.0	B		
B-5	5.0 - 6.0	Gray silty sand with trace clay (SM)	EXT_MC	28.2													
B-5	6.0 - 8.0	Gray silty sand with clay lenses (SM)	SV	29.2						40.4							
B-5	8.0 - 10.0	Gray silty sand with clay lenses (SM)	EXT_MC	24.6													
B-5	10.0 - 12.0	Gray silty sand with 2" clay layer (SM)	EXT_MC	25.3													
B-5	12.0 - 14.0	Very soft gray clay with silt lenses (CH)	UU	64.2	99.4	60.6					0.11		6.8	5.2	B		
B-5	14.0 - 16.0	Gray clay with silty sand lenses and shells (CH)	EXT_MC	84.2													
B-5	16.0 - 18.0	Soft gray clay with silt pockets, silt seams and shell fragments (CH)	UU	60.4	98.1	61.1					0.30		6.3	6.8	B		
B-5	18.0 - 20.0	Gray clay with organic matter and shells (CH)	EXT_MC	95.3													

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Summary of Lab Results
Project No.: 16715-040-03

Island Road Marsh Creation and Nourishment (TE-117)
Terrebonne Parish, LA

GEOENGINEERS

Soil Boring ID	Depth Interval (ft)	D2488 Visual Description	Test Type	D2216 Moisture (%)	D2166/D2850 Unit Weight (PCF) Wet	D2166/D2850 Unit Weight (PCF) Dry	D4318 Atterberg Limits LL	D4318 Atterberg Limits PL	D4318 Atterberg Limits PI	D422/D1140 /D6913 %<#200 Sieve	D2166/D2850 Shear Strength (KSF)	D2166/D2850 Remolded Strength (KSF)	D2166/D2850 Failure Strain (%)	D2166/D2850 Confining Pressure (PSI)	D2166/D2850 Failure Type	D4648 Mini Vane Shear Strength (KSF)	Comments
B-6	0.0 - 1.0	Dark gray peat with gray clay (PT)	EXT_MC	186.0													TV=0.03
B-6	1.0 - 2.0	Very soft dark gray peat with organic gray clay (PT)	UU	336.4	76.6	17.6					0.11		14.1	5.0	B		TV=0.03
B-6	2.0 - 2.3	Gray peat (PT)	EXT_MC	179.8													TV=0.04
B-6	4.0 - 6.0	Very soft gray silty clay with sandy silt lenses and layers (CL)	UU	37.2	117.7	85.8					0.10		15.0	5.0	B		TV=0.03 HT to DIA Ratio is 1.66
B-6	6.0 - 8.0	Gray sandy silt with clay layers (ML)	EXT_MC	38.7													TV=0.02
B-6	8.0 - 10.0	Gray clay with silty sand layers (CH)	SV	57.9						91.9							TV=N/A
B-6	10.0 - 12.0	Gray clayey silt with sand (CL-ML)	EXT_MC	39.7													TV=0.03
B-6	12.0 - 14.0	Very soft gray clay with silt seams (CH)	UU	79.7	97.0	54.0					0.16		4.7	5.2	B		TV=0.04
B-6	14.0 - 16.0	Gray clay with sandy silt layers (CH)	EXT_MC	61.7													TV=0.04
B-6	16.0 - 18.0	Very soft gray clay (CH)	UU	76.9	102.3	57.8					0.11		11.6	6.8	B		TV=0.03
B-6	18.0 - 20.0	Gray silty clay with shell fragments (CL)	EXT_MC	39.1													TV=N/A

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Island Road Marsh Creation and Nourishment (TE-117)
Terrebonne Parish, LA

GEOENGINEERS

Soil Boring ID	Depth Interval (ft)	D2488 Visual Description	Test Type	D2216 Moisture (%)	D2166/D2850 Unit Weight (PCF) Wet	D2166/D2850 Unit Weight (PCF) Dry	D4318 Atterberg Limits LL	D4318 Atterberg Limits PL	D4318 Atterberg Limits PI	D422/D1140 /D6913 %<#200 Sieve	D2166/D2850 Shear Strength (KSF)	D2166/D2850 Remolded Strength (KSF)	D2166/D2850 Failure Strain (%)	D2166/D2850 Confining Pressure (PSI)	D2166/D2850 Failure Type	D4648 Mini Vane Shear Strength (KSF)	Comments
B-7	0.0 - 2.0	Dark brown clay with organic matter and shells (CH)	EXT_MC	75.1													
B-7	2.0 - 3.0	Dark gray clay with organic matter and shells (CH)	MC	86.1													
B-7	3.0 - 4.0	Dark gray sandy clay with shells (CL)	EXT_MC	41.8													
B-7	6.0 - 8.0	Gray sandy clayey silt (CL-ML)	EXT_MC	44.3													
B-7	8.0 - 10.0	Gray sandy clayey silt (CL-ML)	SV	30.3						61.0							
B-7	10.0 - 12.0	Gray sandy clay (CL)	EXT_MC	36.5													PPen=2.5
B-7	12.0 - 14.0	Gray silty clay with silty sand layers and shell fragments (CL)	UDW	28.7	113.2	87.9											TV=0.02, Voids in side
B-7	14.0 - 16.0	Gray clay with sand seams (CH)	EXT_MC	62.7													TV=0.06
B-7	16.0 - 18.0	Gray clay with silt seams (CH)	EXT_MC	76.8													TV=0.06
B-7	18.0 - 20.0	Gray clay with silt lenses, sand lenses, and shell fragments (CH)	EXT_MC	89.1													TV=0.06

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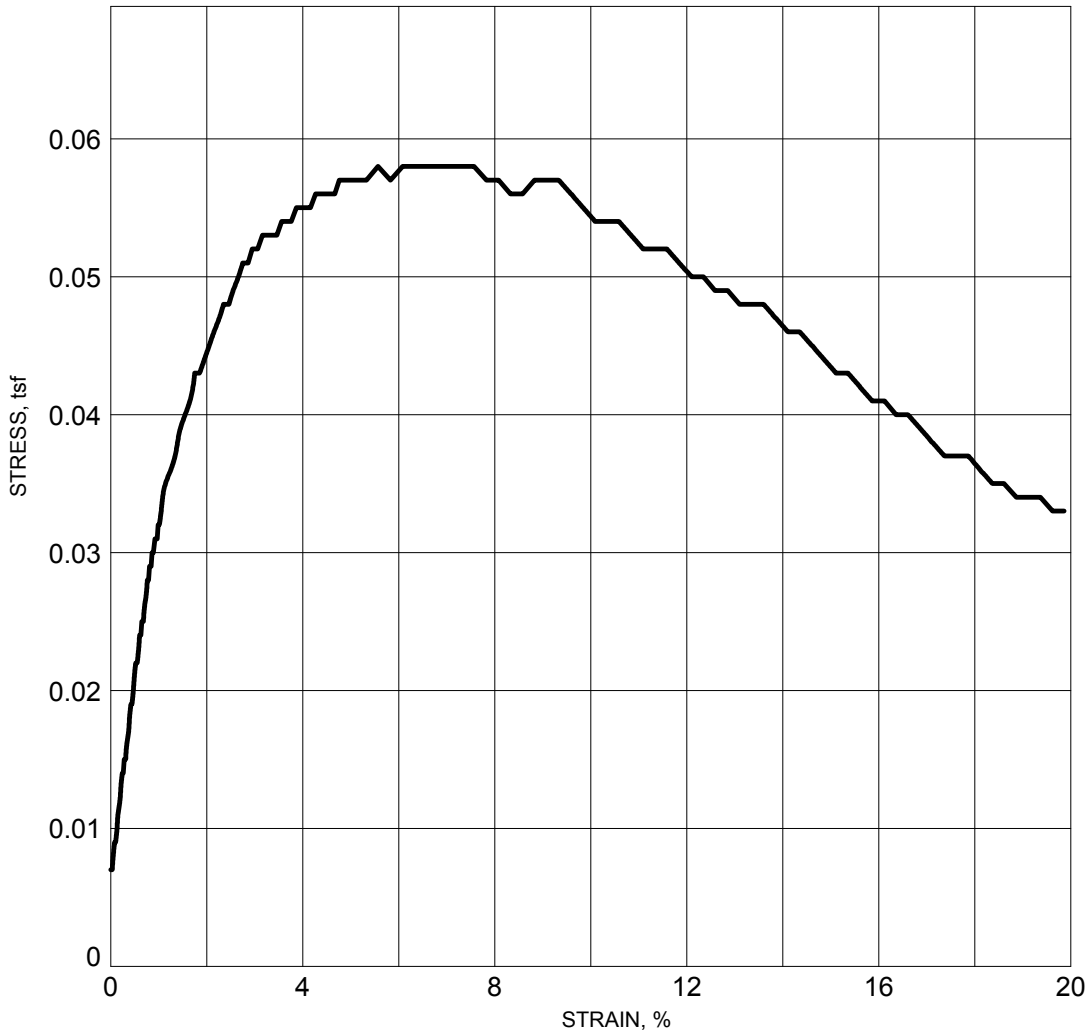
Title: QAM
Date: 4/23/18

AASHTO ACCREDITED

Summary of Lab Results
Project No.: 16715-040-03

Island Road Marsh Creation and Nourishment (TE-117)
Terrebonne Parish, LA

GEOENGINEERS



Boring ID	B-3
Depth (ft)	2-4
Water Content, %	143.7
Wet Density, pcf	97.7
Dry Density, pcf	40.1
Saturation, %	120.6
Void Ratio	3.27
Specimen Diameter	2.666
Specimen Height	5.996
Height/diameter ratio	2.25
Deviator Stress, tsf	0.058
Strain, %	5.6
Confining Pressure (psi)	5.0

Multiple Shear

Failure Sketch

LL = PL = PI =

% 200= % Organic= Assumed Gs=2.74

Description: Very soft gray organic clay (OH)

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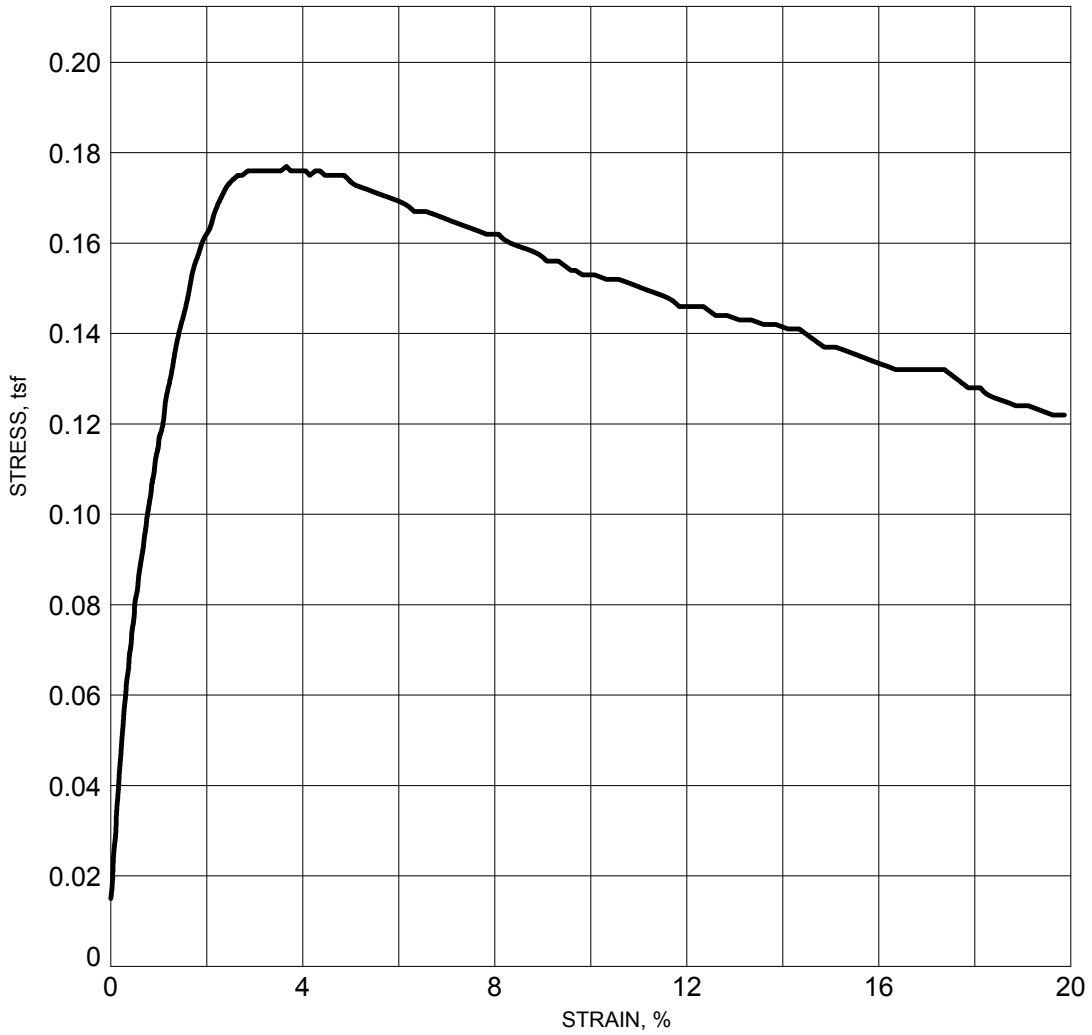
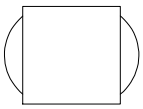
Tested By: CLP/SRT	Date Tested: 3/5/2018	**UNCONSOLIDATED UNDRAINED COMPRESSION TEST ASTM D2850**	**Island Road Marsh Creation and Nourishment (TE-117) Terrebonne Parish, LA**
Reviewed By: Karen Allen	Date Reviewed: 3/6/2018	**Project No.: 16715-040-03**	GEOENGINEERS

GEI-UNCONSOLIDATED UNDRAINED GRAPH - GEO TEMPLATE WITH LAB.GDT - 4/19/18 14:00 - P:\16\16715040\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ



Boring ID	B-3
Depth (ft)	12-14
Water Content, %	80.5
Wet Density, pcf	100.0
Dry Density, pcf	55.4
Saturation, %	105.7
Void Ratio	2.09
Specimen Diameter	2.775
Specimen Height	6.019
Height/diameter ratio	2.17
Deviator Stress, tsf	0.177
Strain, %	3.7
Confining Pressure (psi)	5.2

Bulge



Failure Sketch

LL = PL = PI =

% 200= % Organic= Assumed Gs=2.74

Description: Very soft gray clay (CH)

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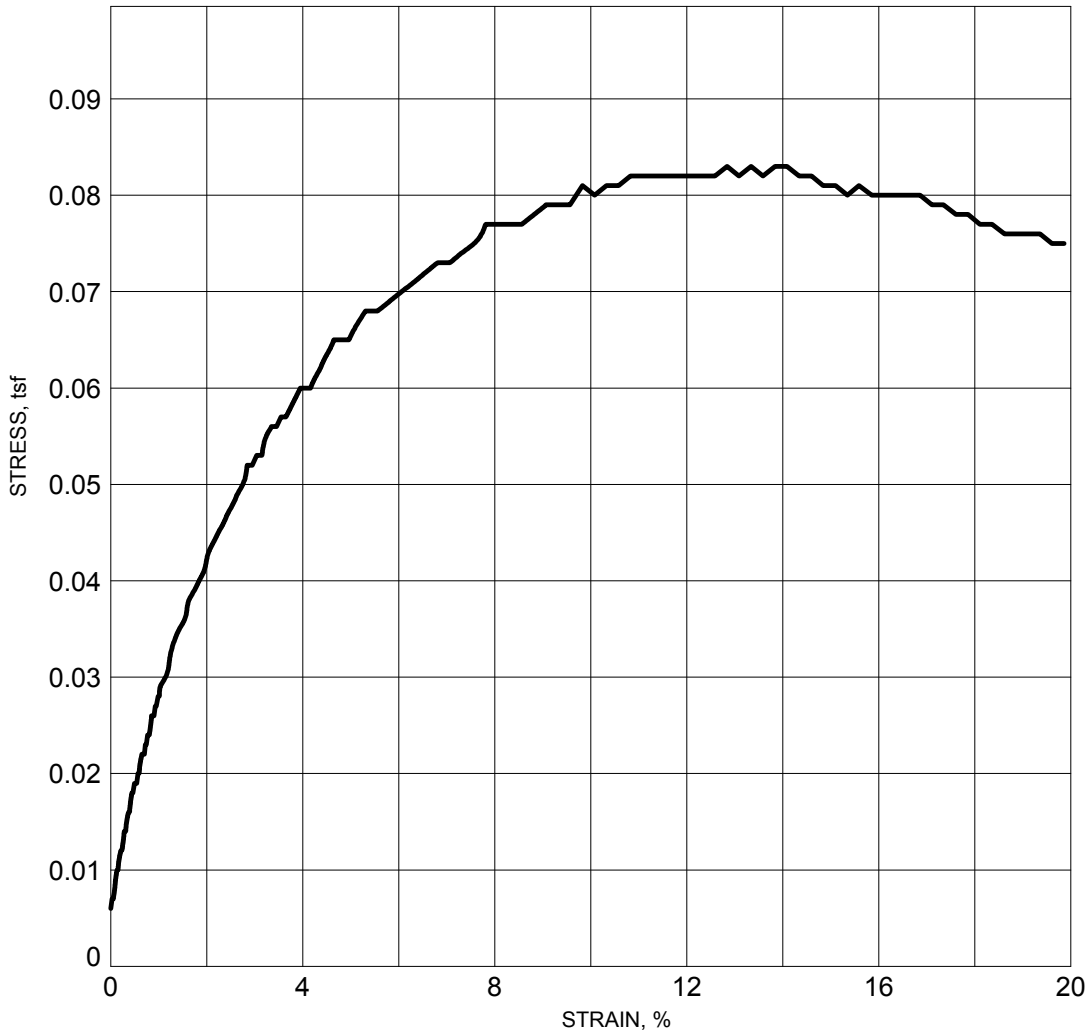
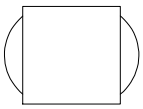
Tested By: CLP/SRT	Date Tested: 3/5/2018	**UNCONSOLIDATED UNDRAINED COMPRESSION TEST ASTM D2850**	**Island Road Marsh Creation and Nourishment (TE-117) Terrebonne Parish, LA**
Reviewed By: Karen Allen	Date Reviewed: 3/6/2018	**Project No.: 16715-040-03**	GEOENGINEERS

GEI-UNCONSOLIDATED UNDRAINED GRAPH - GEO TEMPLATE WITH LAB.GDT - 4/19/18 14:00 - P:\16\16715040\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ



Boring ID	B-4
Depth (ft)	0-2
Water Content, %	291.7
Wet Density, pcf	78.6
Dry Density, pcf	20.1
Saturation, %	106.2
Void Ratio	7.52
Specimen Diameter	2.791
Specimen Height	6.013
Height/diameter ratio	2.15
Deviator Stress, tsf	0.083
Strain, %	12.8
Confining Pressure (psi)	5.0

Bulge



Failure Sketch

LL = PL = PI =

% 200= % Organic= Assumed Gs=2.74

Description: Very soft dark gray peat with gray clay (PT)

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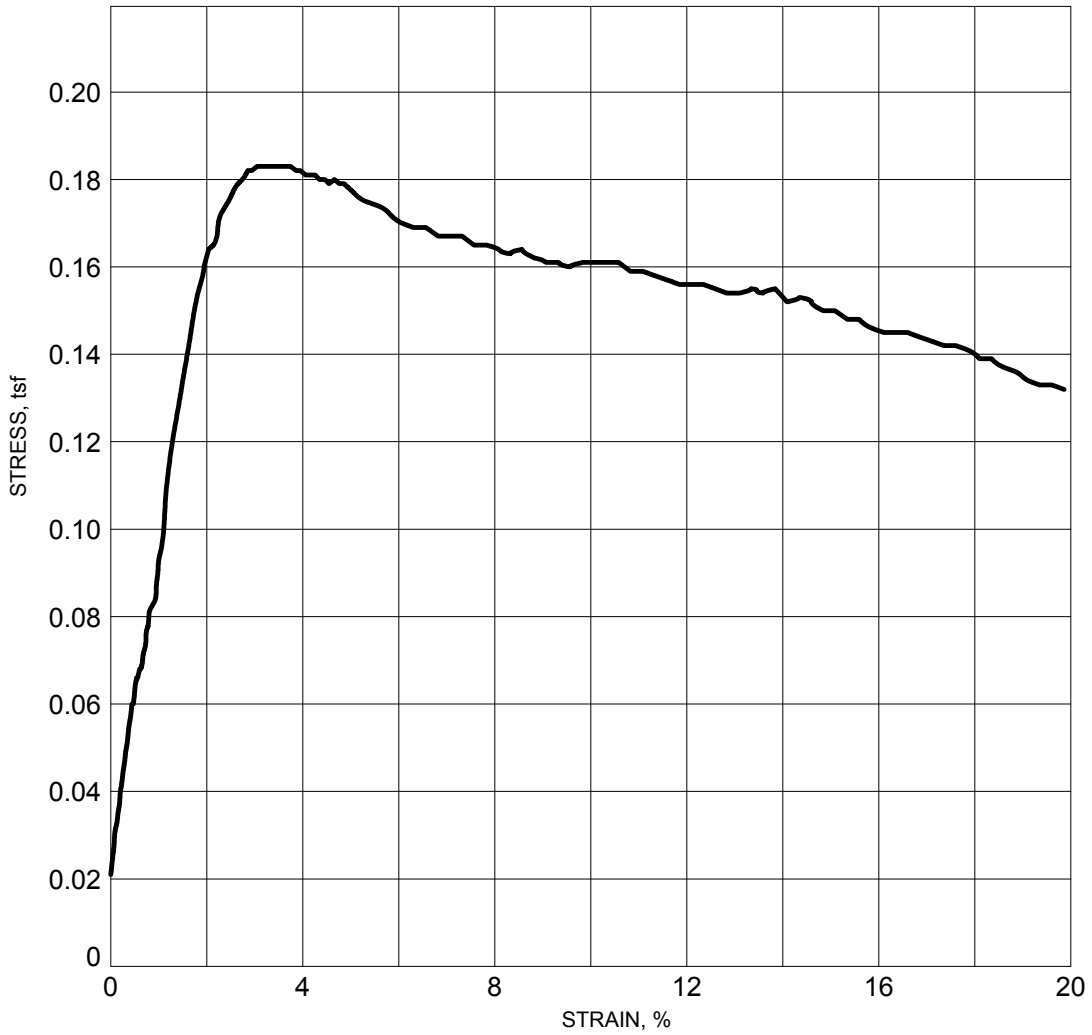
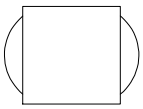
Reviewed By: Karen Allen	Date Reviewed: 3/6/2018	**Project No.: 16715-040-03**	GEOENGINEERS

GEI-UNCONSOLIDATED UNDRAINED GRAPH - GEO TEMPLATE WITH LAB.GDT - 4/19/18 14:00 - P:\16\16715040\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ



Boring ID	B-4
Depth (ft)	14-16
Water Content, %	84.0
Wet Density, pcf	99.5
Dry Density, pcf	54.1
Saturation, %	106.5
Void Ratio	2.16
Specimen Diameter	2.799
Specimen Height	6.028
Height/diameter ratio	2.15
Deviator Stress, tsf	0.183
Strain, %	3.1
Confining Pressure (psi)	6.0

Bulge



Failure Sketch

LL = PL = PI =

% 200= % Organic= Assumed Gs=2.74

Description: Very soft gray clay (CH)

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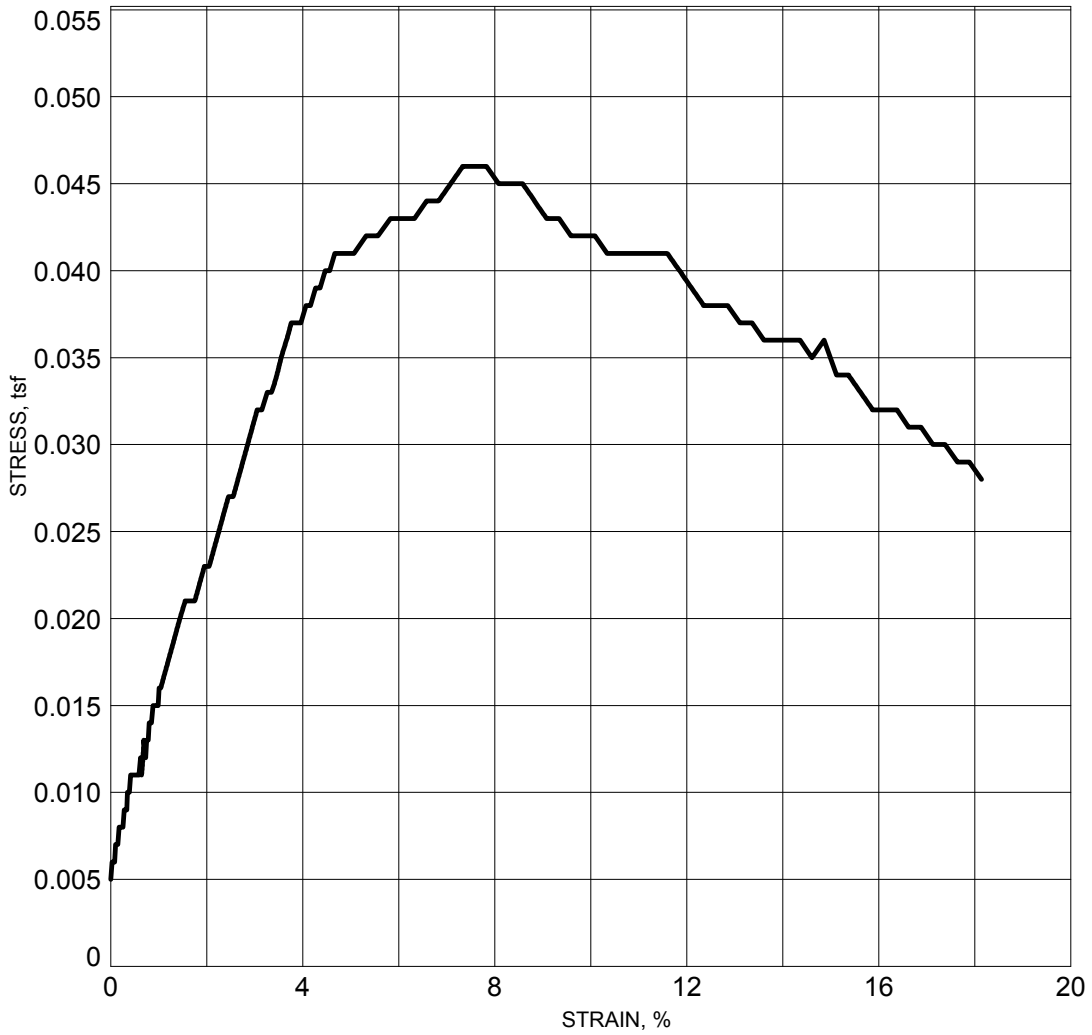
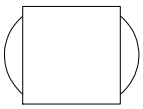
Tested By: CLP/SRT	Date Tested: 3/5/2018	**UNCONSOLIDATED UNDRAINED COMPRESSION TEST ASTM D2850**	**Island Road Marsh Creation and Nourishment (TE-117) Terrebonne Parish, LA**
Reviewed By: Karen Allen	Date Reviewed: 3/6/2018	**Project No.: 16715-040-03**	GEOENGINEERS

GEI-UNCONSOLIDATED UNDRAINED GRAPH - GEO TEMPLATE WITH LAB.GDT - 4/19/18 14:00 - P:\16\16715040\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ



Boring ID	B-5
Depth (ft)	2-4
Water Content, %	57.9
Wet Density, pcf	106.5
Dry Density, pcf	67.5
Saturation, %	103.3
Void Ratio	1.53
Specimen Diameter	2.845
Specimen Height	5.706
Height/diameter ratio	2.01
Deviator Stress, tsf	0.046
Strain, %	7.3
Confining Pressure (psi)	5.0

Bulge



Failure Sketch

LL = PL = PI =

% 200= % Organic= Assumed Gs=2.74

Description: Very soft gray clay (CH)

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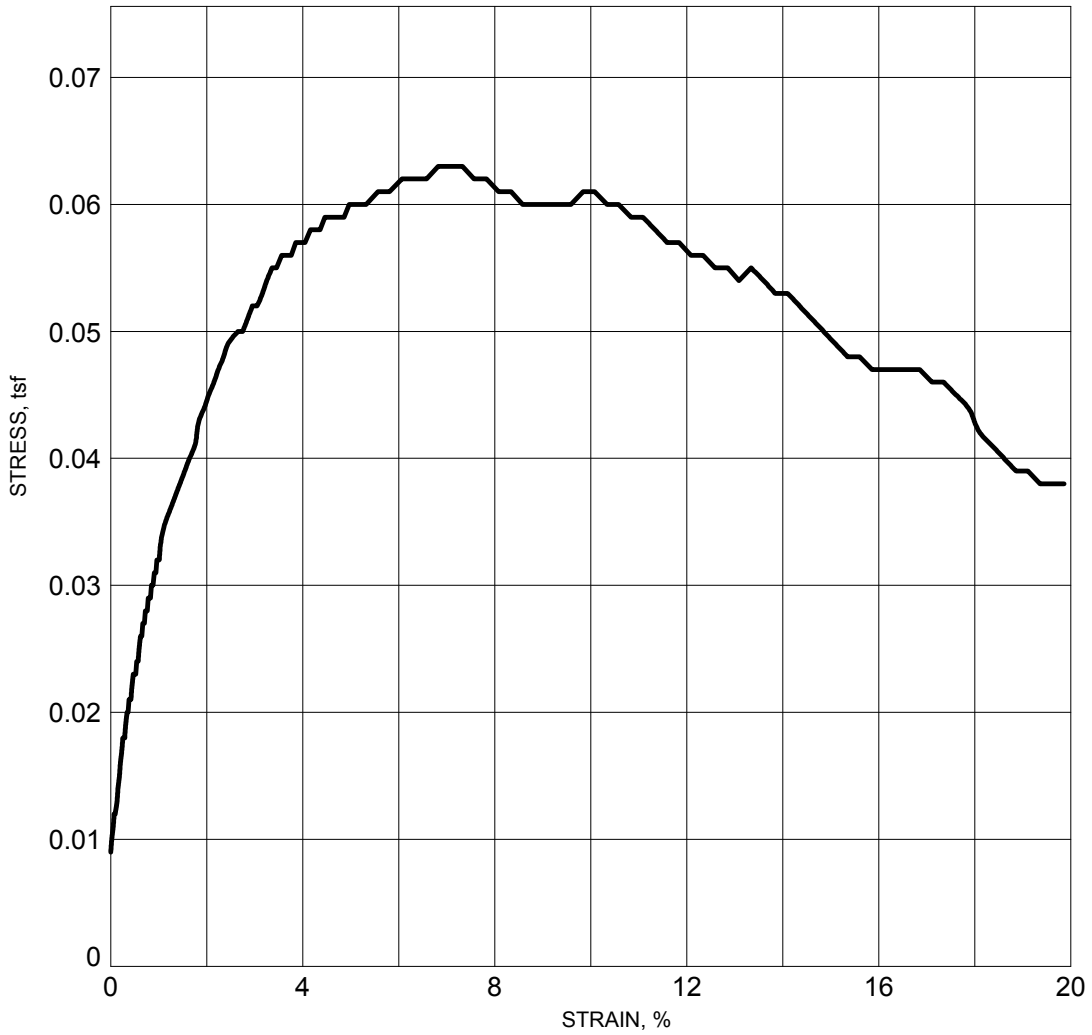
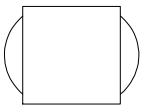
Tested By: SRT	Date Tested: 3/6/2018	**UNCONSOLIDATED UNDRAINED COMPRESSION TEST ASTM D2850**	**Island Road Marsh Creation and Nourishment (TE-117) Terrebonne Parish, LA**
Reviewed By: Karen Allen	Date Reviewed: 3/7/2018	**Project No.: 16715-040-03**	GEOENGINEERS

GEI-UNCONSOLIDATED UNDRAINED GRAPH - GEO TEMPLATE WITH LAB.GDT - 4/19/18 14:00 - P:\16\16715040\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ



Boring ID	B-5
Depth (ft)	4-5
Water Content, %	50.7
Wet Density, pcf	103.5
Dry Density, pcf	68.7
Saturation, %	93.3
Void Ratio	1.49
Specimen Diameter	2.809
Specimen Height	5.993
Height/diameter ratio	2.13
Deviator Stress, tsf	0.063
Strain, %	6.8
Confining Pressure (psi)	5.0

Bulge



Failure Sketch

LL = PL = PI =

% 200= % Organic= Assumed Gs=2.74

Description: Very soft gray clay with silt lenses (CH)

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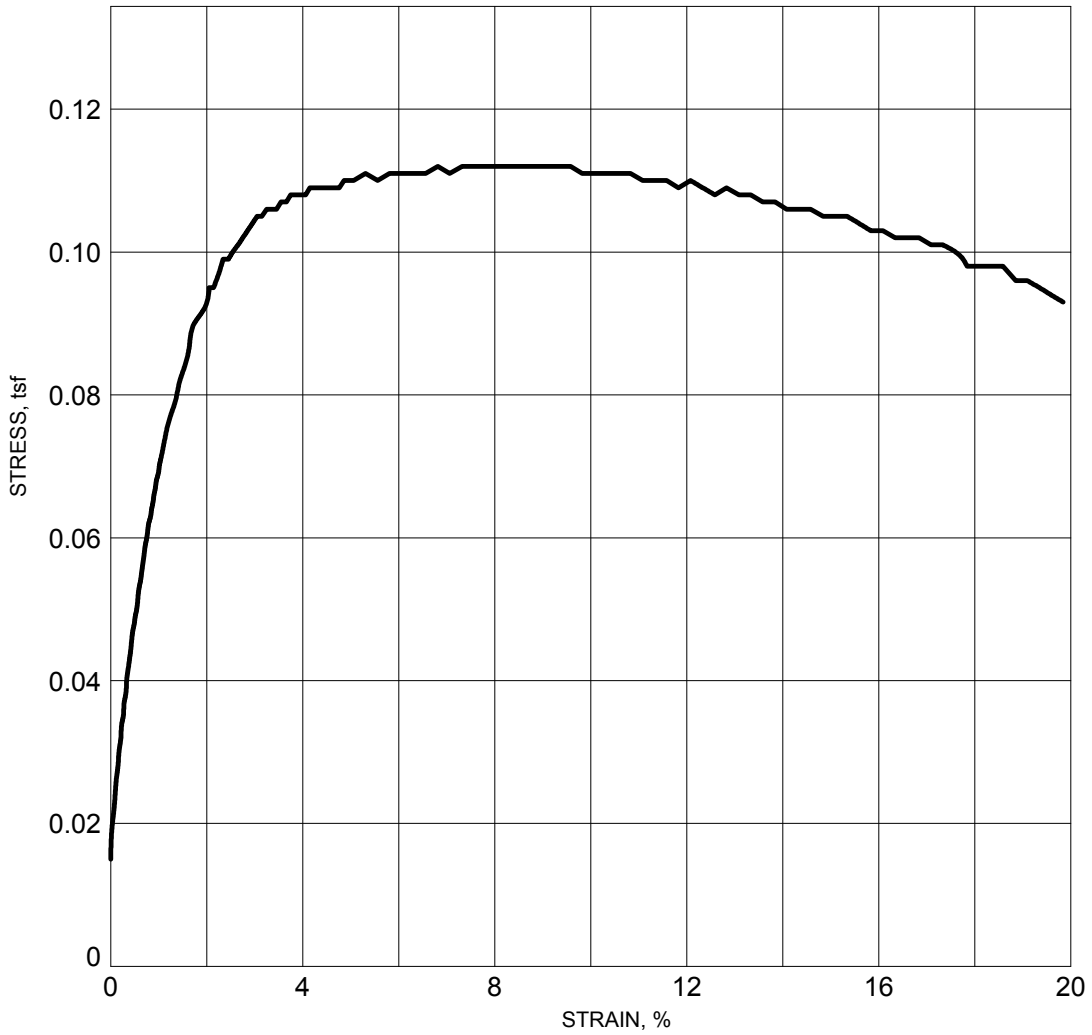
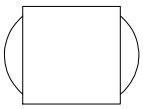
Reviewed By: Karen Allen	Date Reviewed: 3/7/2018	**Project No.: 16715-040-03**	GEOENGINEERS

GEI-UNCONSOLIDATED UNDRAINED GRAPH - GEO TEMPLATE WITH LAB.GDT - 4/19/18 14:00 - P:\16\16715040\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ



Boring ID	B-5
Depth (ft)	12-14
Water Content, %	64.2
Wet Density, pcf	99.4
Dry Density, pcf	60.6
Saturation, %	96.5
Void Ratio	1.82
Specimen Diameter	2.807
Specimen Height	6.026
Height/diameter ratio	2.15
Deviator Stress, tsf	0.112
Strain, %	6.8
Confining Pressure (psi)	5.2

Bulge



Failure Sketch

LL = PL = PI =

% 200= % Organic= Assumed Gs=2.74

Description: Very soft gray clay with silt lenses (CH)

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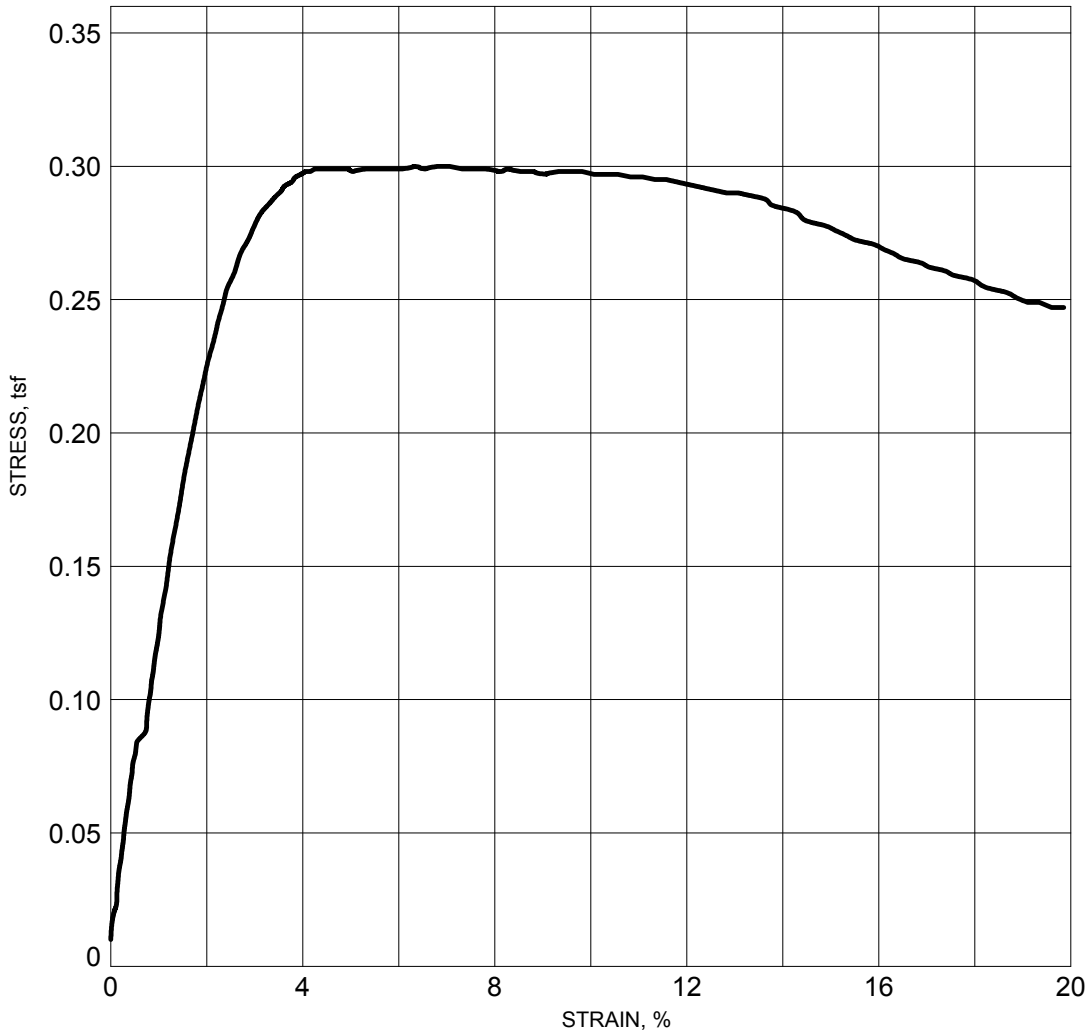
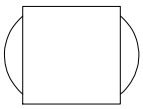
Tested By: SRT	Date Tested: 3/6/2018	**UNCONSOLIDATED UNDRAINED COMPRESSION TEST ASTM D2850**	**Island Road Marsh Creation and Nourishment (TE-117) Terrebonne Parish, LA**
Reviewed By: Karen Allen	Date Reviewed: 3/7/2018	**Project No.: 16715-040-03**	GEOENGINEERS

GEI-UNCONSOLIDATED UNDRAINED GRAPH - GEO TEMPLATE WITH LAB.GDT - 4/19/18 14:00 - P:\16\16715040\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ



Boring ID	B-5
Depth (ft)	16-18
Water Content, %	60.4
Wet Density, pcf	98.1
Dry Density, pcf	61.1
Saturation, %	92.1
Void Ratio	1.80
Specimen Diameter	2.820
Specimen Height	6.018
Height/diameter ratio	2.13
Deviator Stress, tsf	0.300
Strain, %	6.3
Confining Pressure (psi)	6.8

Bulge



Failure Sketch

LL = PL = PI =

% 200= % Organic= Assumed Gs=2.74

Description: Soft gray clay with silt pockets, silt seams and shell fragments (CH)

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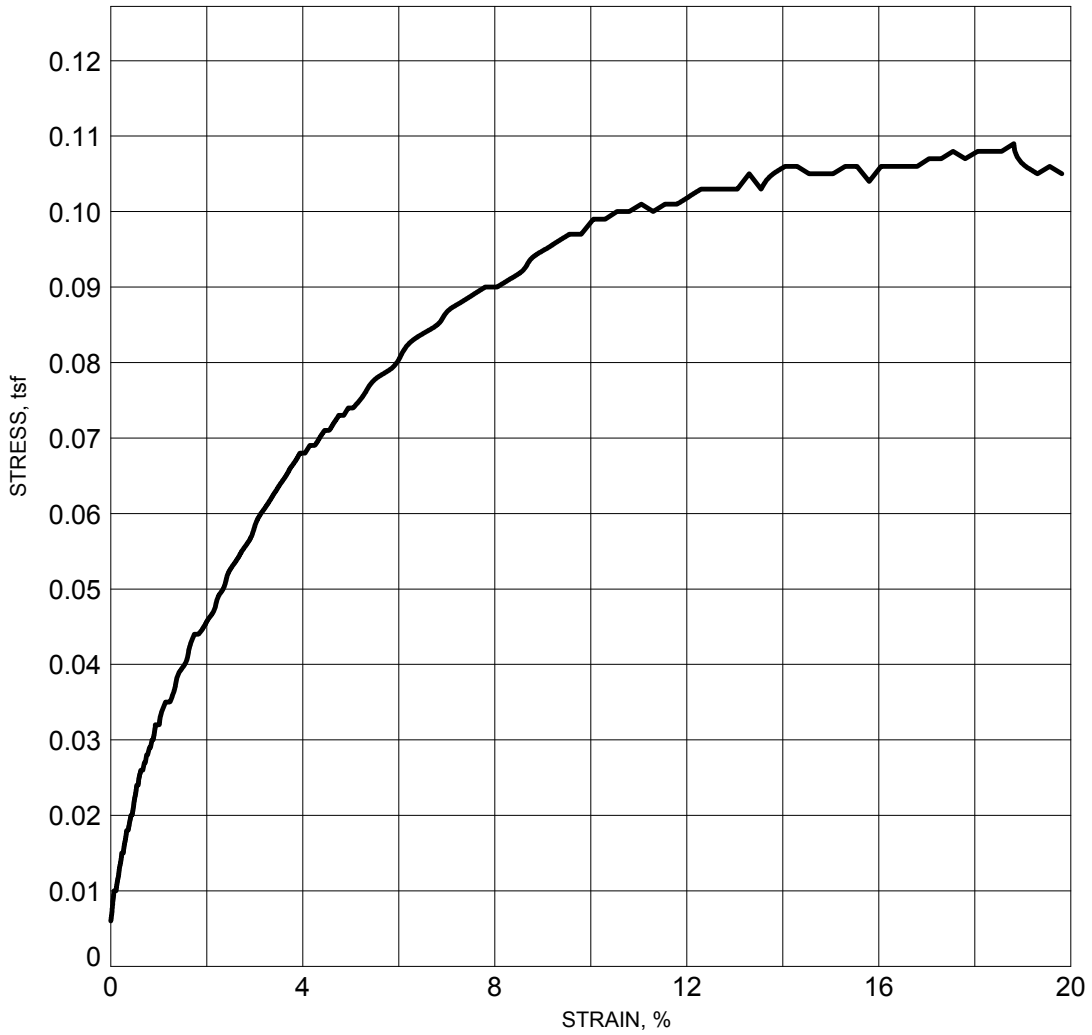
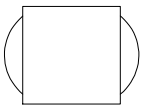
Tested By: SRT	Date Tested: 3/6/2018	**UNCONSOLIDATED UNDRAINED COMPRESSION TEST ASTM D2850**	**Island Road Marsh Creation and Nourishment (TE-117) Terrebonne Parish, LA**
Reviewed By: Karen Allen	Date Reviewed: 3/7/2018	**Project No.: 16715-040-03**	GEOENGINEERS

GEI-UNCONSOLIDATED UNDRAINED GRAPH - GEO TEMPLATE WITH LAB.GDT - 4/19/18 14:00 - P:\16\16715040\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ



Boring ID	B-6
Depth (ft)	1-2
Water Content, %	336.4
Wet Density, pcf	76.6
Dry Density, pcf	17.6
Saturation, %	105.5
Void Ratio	8.74
Specimen Diameter	2.764
Specimen Height	6.010
Height/diameter ratio	2.17
Deviator Stress, tsf	0.106
Strain, %	14.1
Confining Pressure (psi)	5.0

Bulge



Failure Sketch

LL = PL = PI =

% 200= % Organic= Assumed Gs=2.74

Description: Very soft dark gray peat with organic gray clay (PT)

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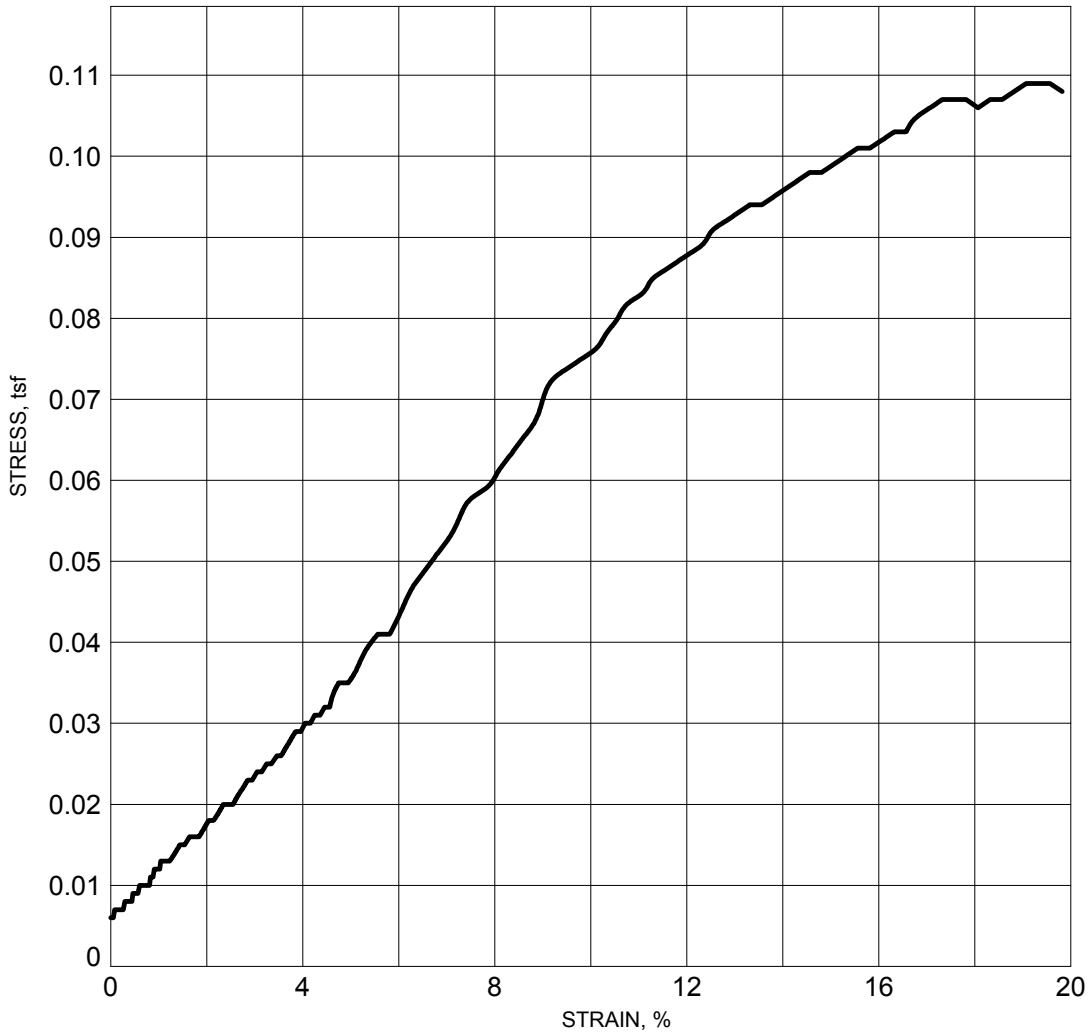
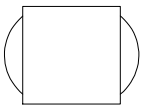
Tested By: CLP	Date Tested: 3/6/2018	**UNCONSOLIDATED UNDRAINED COMPRESSION TEST ASTM D2850**	**Island Road Marsh Creation and Nourishment (TE-117) Terrebonne Parish, LA**
Reviewed By: Karen Allen	Date Reviewed: 3/7/2018	**Project No.: 16715-040-03**	GEOENGINEERS

GEI-UNCONSOLIDATED UNDRAINED GRAPH - GEO TEMPLATE WITH LAB.GDT - 4/19/18 14:00 - P:\16\16715040\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ



Boring ID	B-6
Depth (ft)	4-6
Water Content, %	37.2
Wet Density, pcf	117.7
Dry Density, pcf	85.8
Saturation, %	102.8
Void Ratio	0.99
Specimen Diameter	2.774
Specimen Height	4.610
Height/diameter ratio	1.66
Deviator Stress, tsf	0.099
Strain, %	15.0
Confining Pressure (psi)	5.0

Bulge



Failure Sketch

LL = PL = PI =

% 200= % Organic= Assumed Gs=2.74

Description: Very soft gray silty clay with sandy silt lenses and layers (CL)

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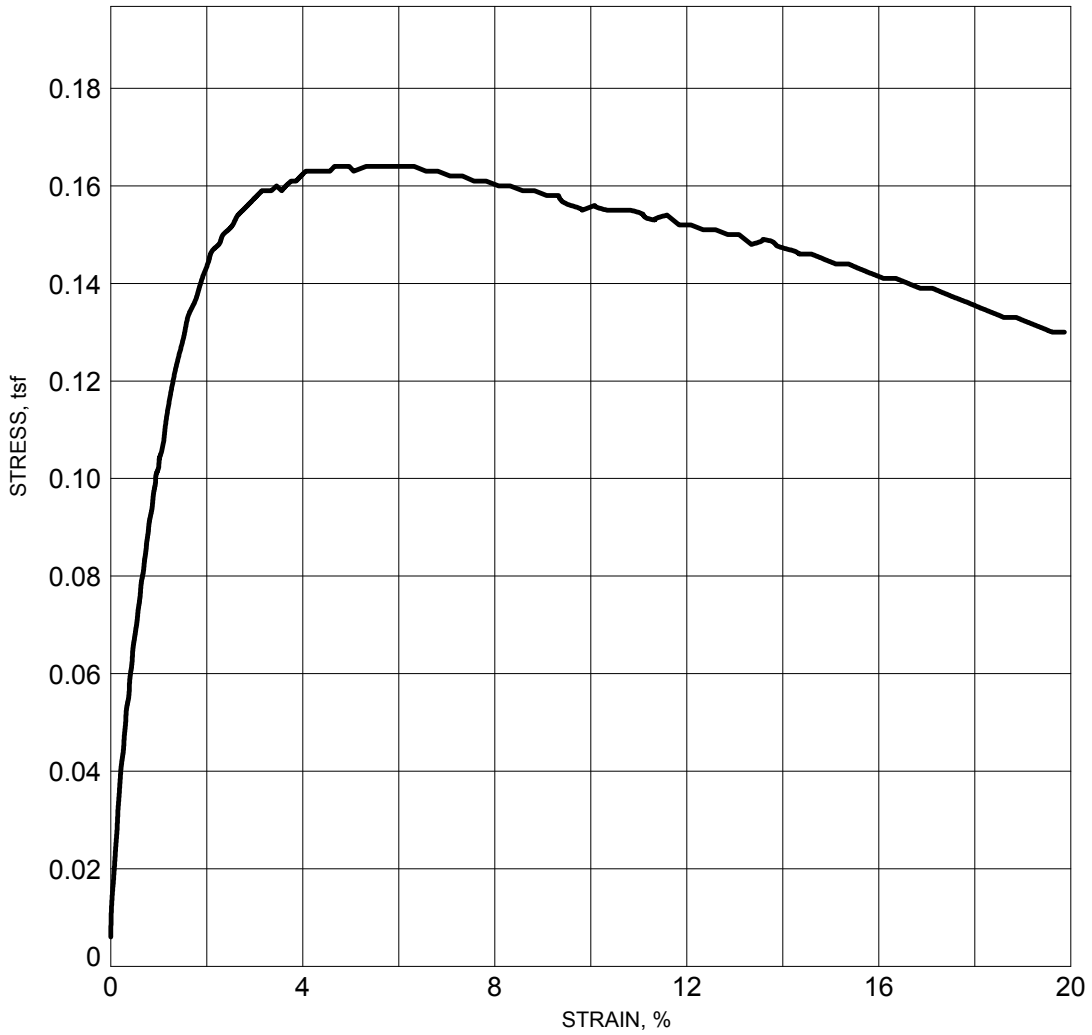
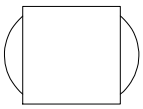
Tested By: CLP	Date Tested: 3/5/2018	**UNCONSOLIDATED UNDRAINED COMPRESSION TEST ASTM D2850**	**Island Road Marsh Creation and Nourishment (TE-117) Terrebonne Parish, LA**
Reviewed By: Karen Allen	Date Reviewed: 3/6/2018	**Project No.: 16715-040-03**	GEOENGINEERS

GEI-UNCONSOLIDATED UNDRAINED GRAPH - GEO TEMPLATE WITH LAB.GDT - 4/19/18 14:00 - P:\16\16715040\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ



Boring ID	B-6
Depth (ft)	12-14
Water Content, %	79.7
Wet Density, pcf	97.0
Dry Density, pcf	54.0
Saturation, %	100.8
Void Ratio	2.17
Specimen Diameter	2.818
Specimen Height	6.027
Height/diameter ratio	2.14
Deviator Stress, tsf	0.164
Strain, %	4.7
Confining Pressure (psi)	5.2

Bulge



Failure Sketch

LL = PL = PI =

% 200= % Organic= Assumed Gs=2.74

Description: Very soft gray clay with silt seams (CH)

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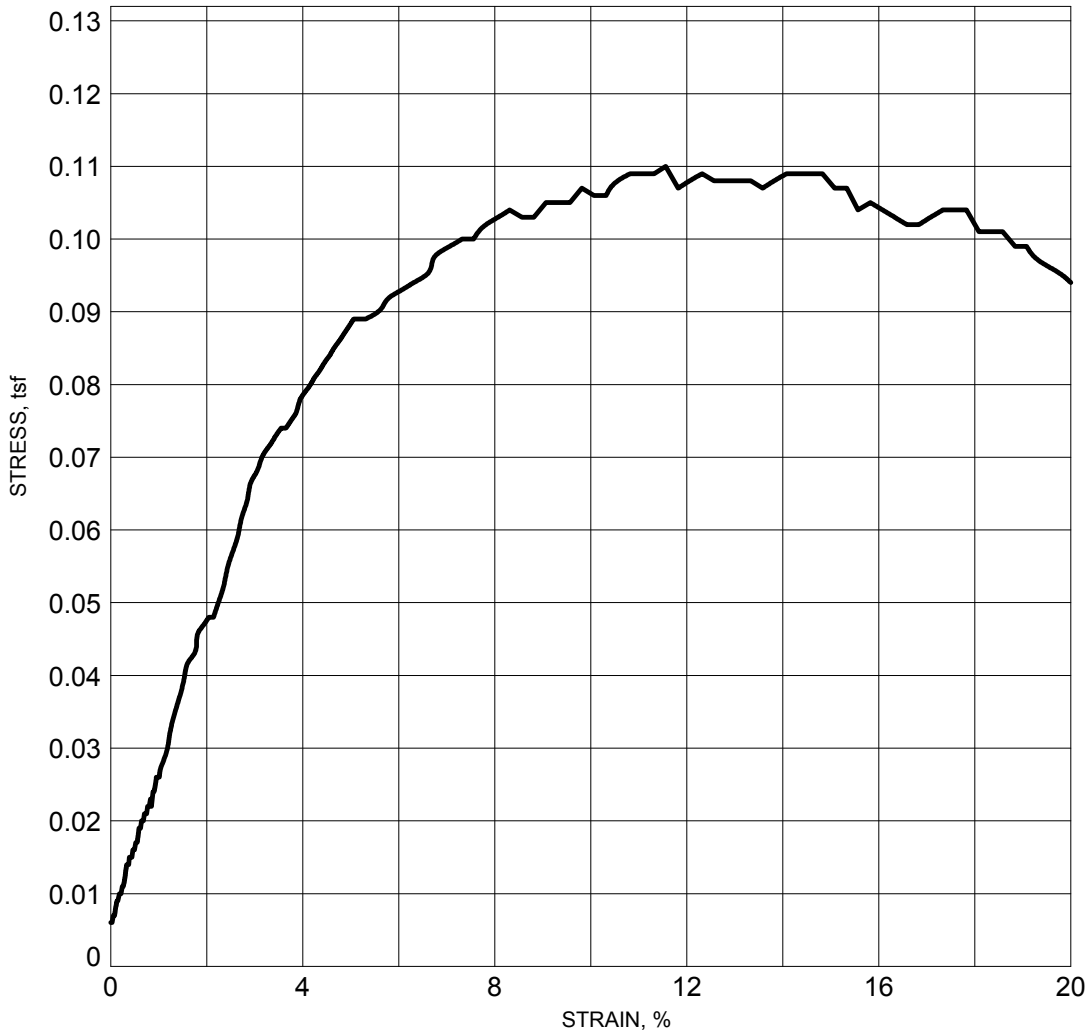
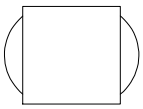
Tested By: SRT	Date Tested: 3/6/2018	**UNCONSOLIDATED UNDRAINED COMPRESSION TEST ASTM D2850**	**Island Road Marsh Creation and Nourishment (TE-117) Terrebonne Parish, LA**
Reviewed By: Karen Allen	Date Reviewed: 3/7/2018	**Project No.: 16715-040-03**	GEOENGINEERS

GEI-UNCONSOLIDATED UNDRAINED GRAPH - GEO TEMPLATE WITH LAB.GDT - 4/19/18 14:00 - P:\16\16715040\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ



Boring ID	B-6
Depth (ft)	16-18
Water Content, %	76.9
Wet Density, pcf	102.3
Dry Density, pcf	57.8
Saturation, %	107.7
Void Ratio	1.96
Specimen Diameter	2.842
Specimen Height	5.955
Height/diameter ratio	2.10
Deviator Stress, tsf	0.110
Strain, %	11.6
Confining Pressure (psi)	6.8

Bulge



Failure Sketch

LL = PL = PI =

% 200= % Organic= Assumed Gs=2.74

Description: Very soft gray clay (CH)

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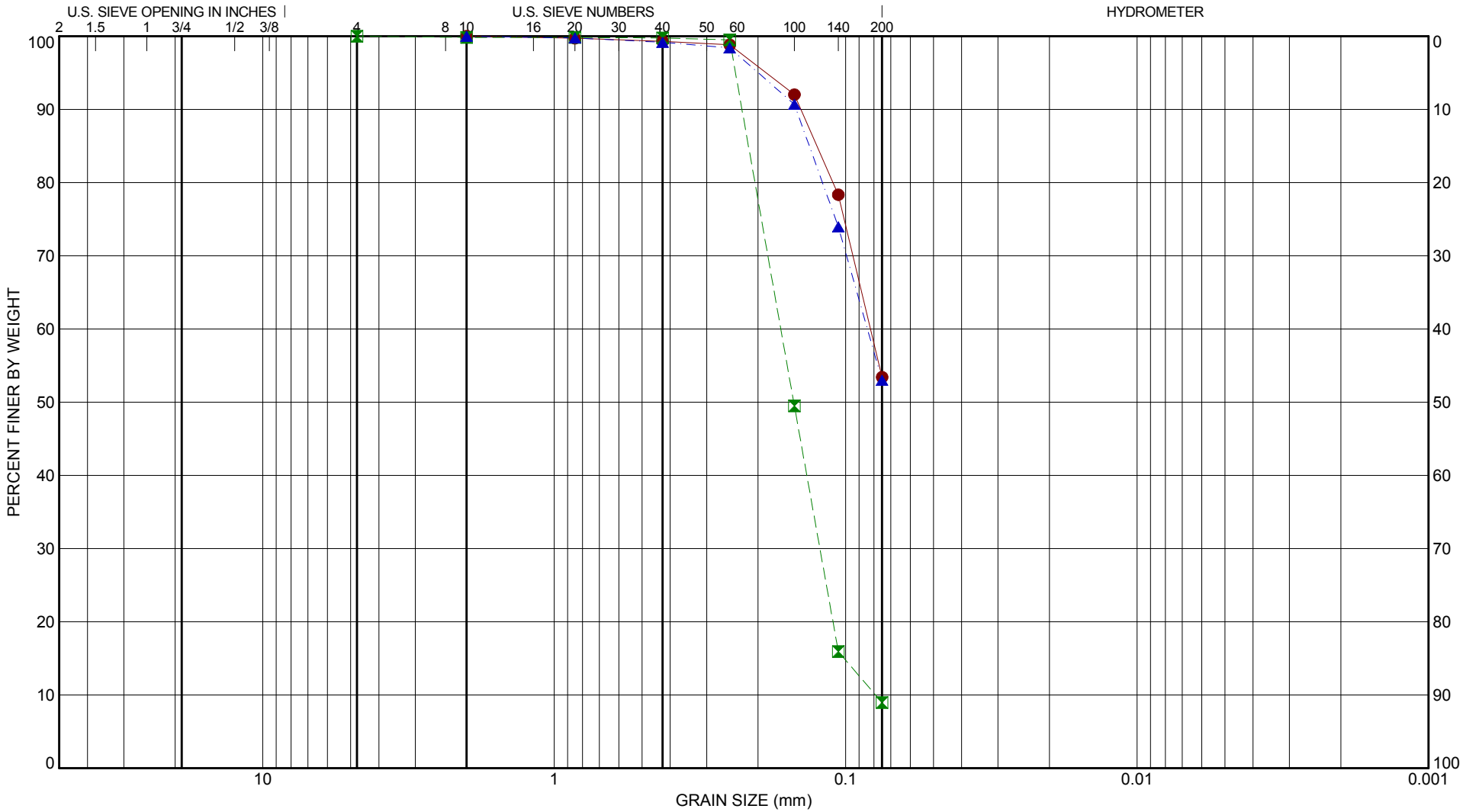
Reviewed By: Karen Allen	Date Reviewed: 3/7/2018	**Project No.: 16715-040-03**	GEOENGINEERS

GEI-UNCONSOLIDATED UNDRAINED GRAPH - GEO TEMPLATE WITH LAB.GDT - 4/19/18 14:00 - P:\16\16715040\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ

	Soil Boring ID	Depth (ft)	Classification	%Gravel	%Sand	%Silt	%Clay	D90	D60	D50	D30	D10	Cc	Cu	LL	PL	PI
●	B-1	8.0	Gray sandy clayey silt (CL-ML)	0.0	46.6	53.4		0.142	0.082								
⊠	B-1	12.0	Gray sand with silt and clay pockets (SP-SM)	0.0	91.0	9.0		0.227	0.167	0.151	0.123	0.079	1.14	2.12			
▲	B-2a	6.0	Gray sandy clayey silt (CL-ML)	0.0	47.0	53.0		0.148	0.084								



GRAVEL		SAND			SILT OR CLAY
coarse	fine	coarse	medium	fine	

Tested By:	Date Tested:	GRAIN SIZE DISTRIBUTION	Island Road Marsh Creation and Nourishment (TE-117)
NLP	3/5/2018	ASTM D422/D1140/D6913/T88	Terrebonne Parish, LA
Reviewed By:	Date Reviewed:	Project No.: 16715-040-03	GEOENGINEERS
Karen Allen	3/12/2018		

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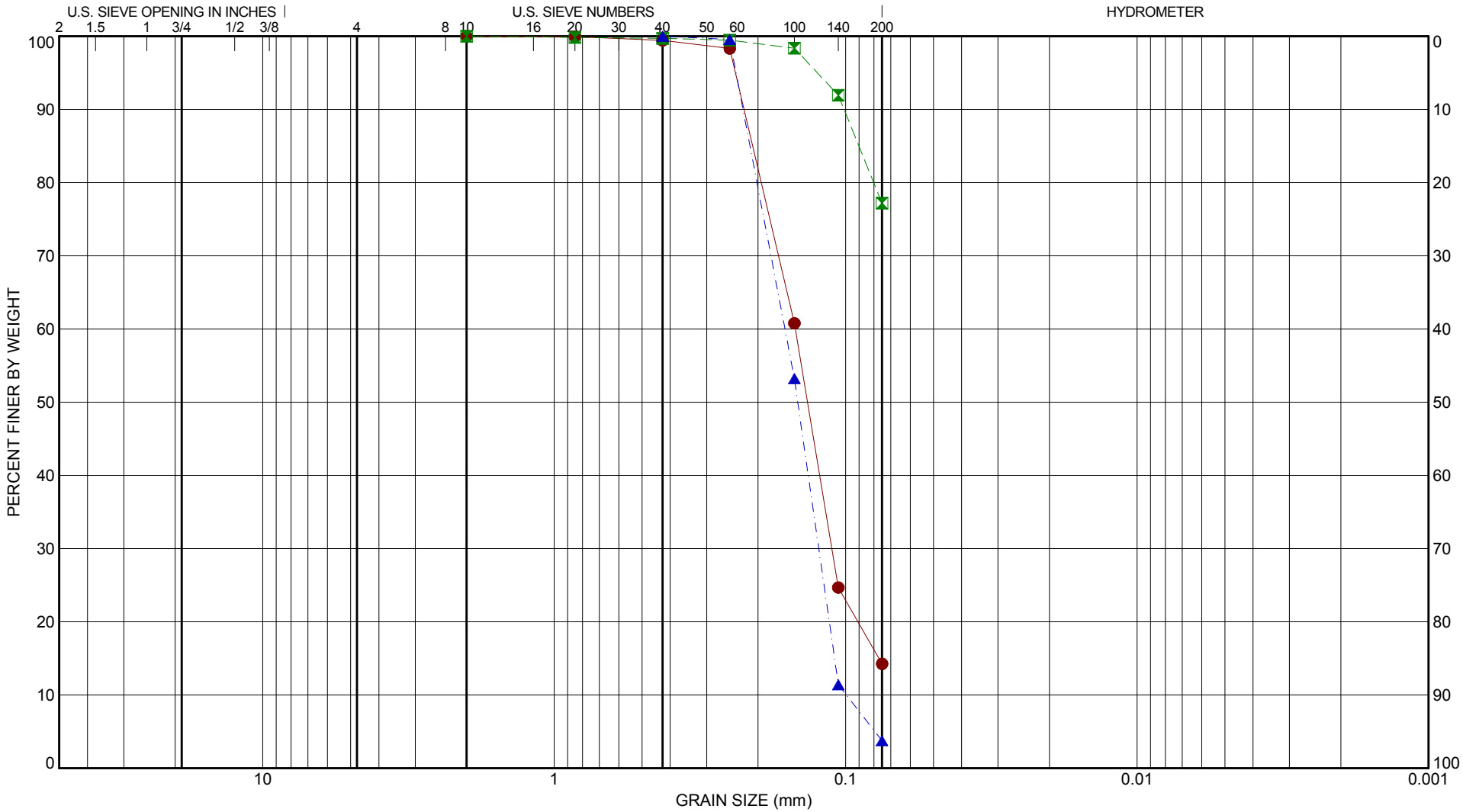
GEI - GRAIN SIZE - GEO TEMPLATE WITH LAB.GDT - 3/26/18 10:40 - P:\16\16715040\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ

	Soil Boring ID	Depth (ft)	Classification	%Gravel	%Sand	%Silt	%Clay	D90	D60	D50	D30	D10	Cc	Cu	LL	PL	PI
●	B-3	8.0	Gray silty clayey sand (SC-SM)	0.0	85.7	14.3		0.223	0.149	0.135	0.112						
⊠	B-4	4.0	Gray sandy silt with 3" clay layer in center (ML)	0.0	22.8	77.2		0.101									
▲	B-4	10.0	Gray sand (SP)	0.0	96.2	3.8		0.225	0.162	0.146	0.124	0.099	0.95	1.62			



GRAVEL		SAND			SILT OR CLAY
coarse	fine	coarse	medium	fine	

Tested By:	Date Tested:	GRAIN SIZE DISTRIBUTION	Island Road Marsh Creation and Nourishment (TE-117)
NLP	3/5/2018	ASTM D422/D1140/D6913/T88	Terrebonne Parish, LA
Reviewed By:	Date Reviewed:	Project No.: 16715-040-03	GEOENGINEERS
Karen Allen	3/12/2018		

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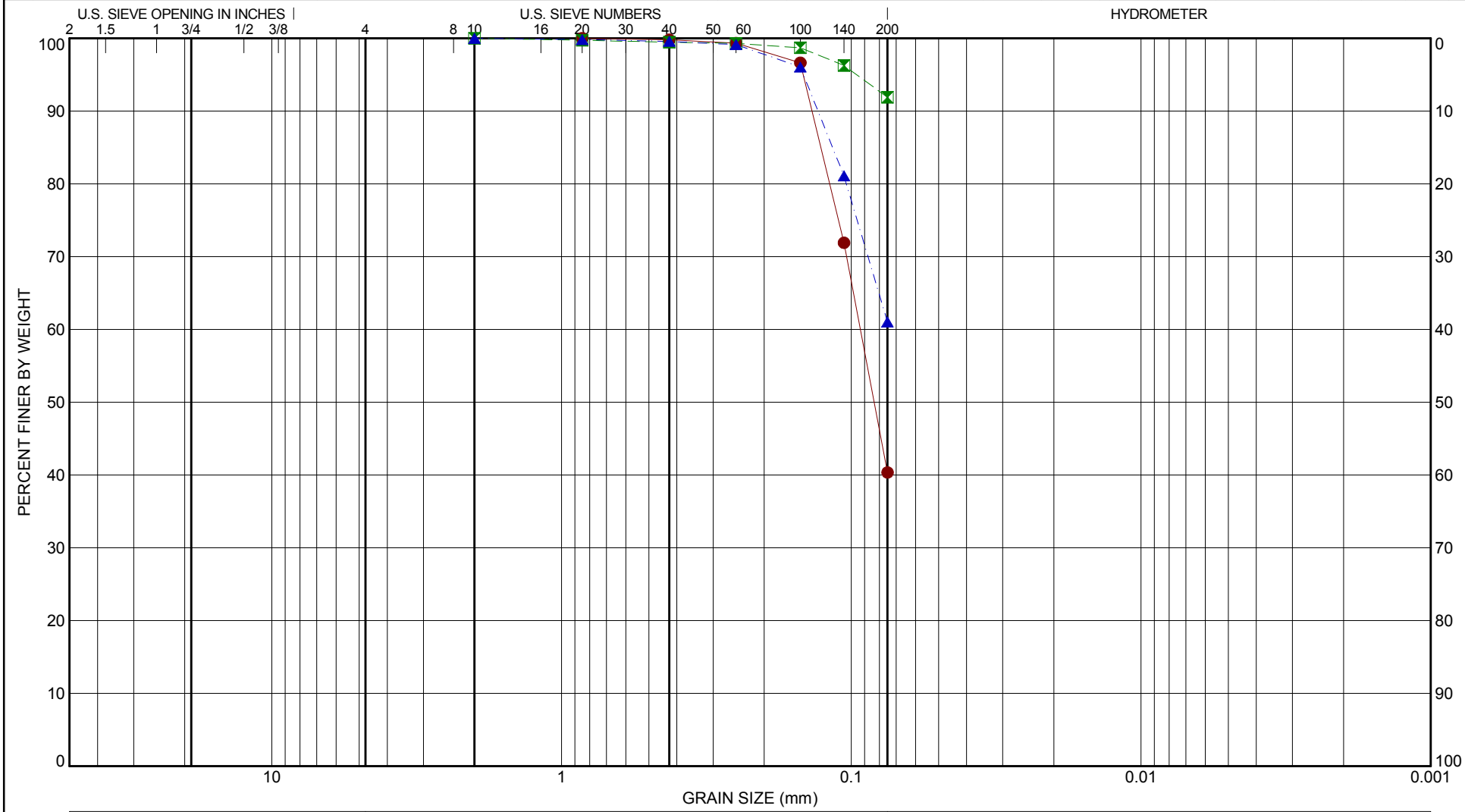
Soil Boring ID	Depth (ft)	Classification	%Gravel	%Sand	%Silt	%Clay	D90	D60	D50	D30	D10	Cc	Cu	LL	PL	PI
B-5	6.0	Gray silty sand with clay lenses (SM)	0.0	59.6	40.4		0.137	0.093	0.083							
B-6	8.0	Gray clay with silty sand layers (CH)	0.0	8.1	91.9											
B-7	8.0	Gray sandy clayey silt (CL-ML)	0.0	39.0	61.0		0.13									



GRAVEL		SAND			SILT OR CLAY
coarse	fine	coarse	medium	fine	

Tested By:	Date Tested:	GRAIN SIZE DISTRIBUTION	Island Road Marsh Creation and Nourishment (TE-117)
NLP	3/7/2018	ASTM D422/D1140/D6913/T88	Terrebonne Parish, LA
Reviewed By:	Date Reviewed:	Project No.: 16715-040-03	GEOENGINEERS
Karen Allen	3/12/2018		

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GEI - GRAIN SIZE - GEO TEMPLATE WITH LAB.GDT - 3/26/18 10:40 - P:\16\16715040\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ

Soil Boring ID	Depth Interval (ft)	D2488 Visual Description	Test Type	D2216 Moisture (%)	D2166/D2850 Unit Weight (PCF) Wet	D2166/D2850 Unit Weight (PCF) Dry	D4318 Atterberg Limits LL	D4318 Atterberg Limits PL	D4318 Atterberg Limits PI	D422/D1140 /D6913 %<#200 Sieve	D2166/D2850 Shear Strength (KSF)	D2166/D2850 Remolded Strength (KSF)	D2166/D2850 Failure Strain (%)	D2166/D2850 Confining Pressure (PSI)	D2166/D2850 Failure Type	D4648 Mini Vane Shear Strength (KSF)	Comments
Composite B-1	0.0 - 16.0	Gray clayey sand (Composite) (SC)	AL HYD SG ORG MC	50.8			35	18	17	39.3							OC=2.81%, SG=2.785
Composite B-2	0.0 - 16.0	Gray clay with sand (Composite) (CH)	AL HYD SG ORG MC	65.0			51	18	33	73.6							OC=3.76%, SG=2.823
Composite B-2a	0.0 - 14.0	Gray sandy clay (Composite) (CL)	AL HYD SG ORG MC	55.0			43	17	26	66.2							OC=3.27%, SG=2.756
Composite B-3	0.0 - 16.0	Gray clay with sand (Composite) (CH)	AL HYD SG ORG MC	62.6			51	21	30	75.7							OC=3.50%, SG=2.695
Composite B-4	0.0 - 14.0	Gray silty sand (Composite) (SM)	AL HYD SG ORG MC	51.5			NP	NP	NP	37.5							OC=2.80%, SG=2.683
Composite B-5	0.0 - 16.0	Gray sandy clay (Composite) (CL)	AL HYD SG ORG MC	53.7			40	17	23	69.7							OC=2.88%, SG=2.710
Composite B-6	0.0 - 16.0	Gray clay (Composite) (CH)	AL HYD SG ORG MC	83.2			70	26	44	96.5							OC=4.64%, SG=2.729
Composite B-7	0.0 - 16.0	Gray silty clay with sand, organic matter and shell fragments (Composite) (CL)	AL HYD SG ORG MC	47.2			41	21	20	80.8							OC=2.75%, SG=2.715

Disclaimer: The results presented relate only to those samples tested.
Note: ASTM standard identification numbers shown above each test description.

Multiple Shear = MS Vertical Shear = VS Angle Shear = AS
Slickensided = SLS Bulge = B Crumble = C

AASHTO ACCREDITED

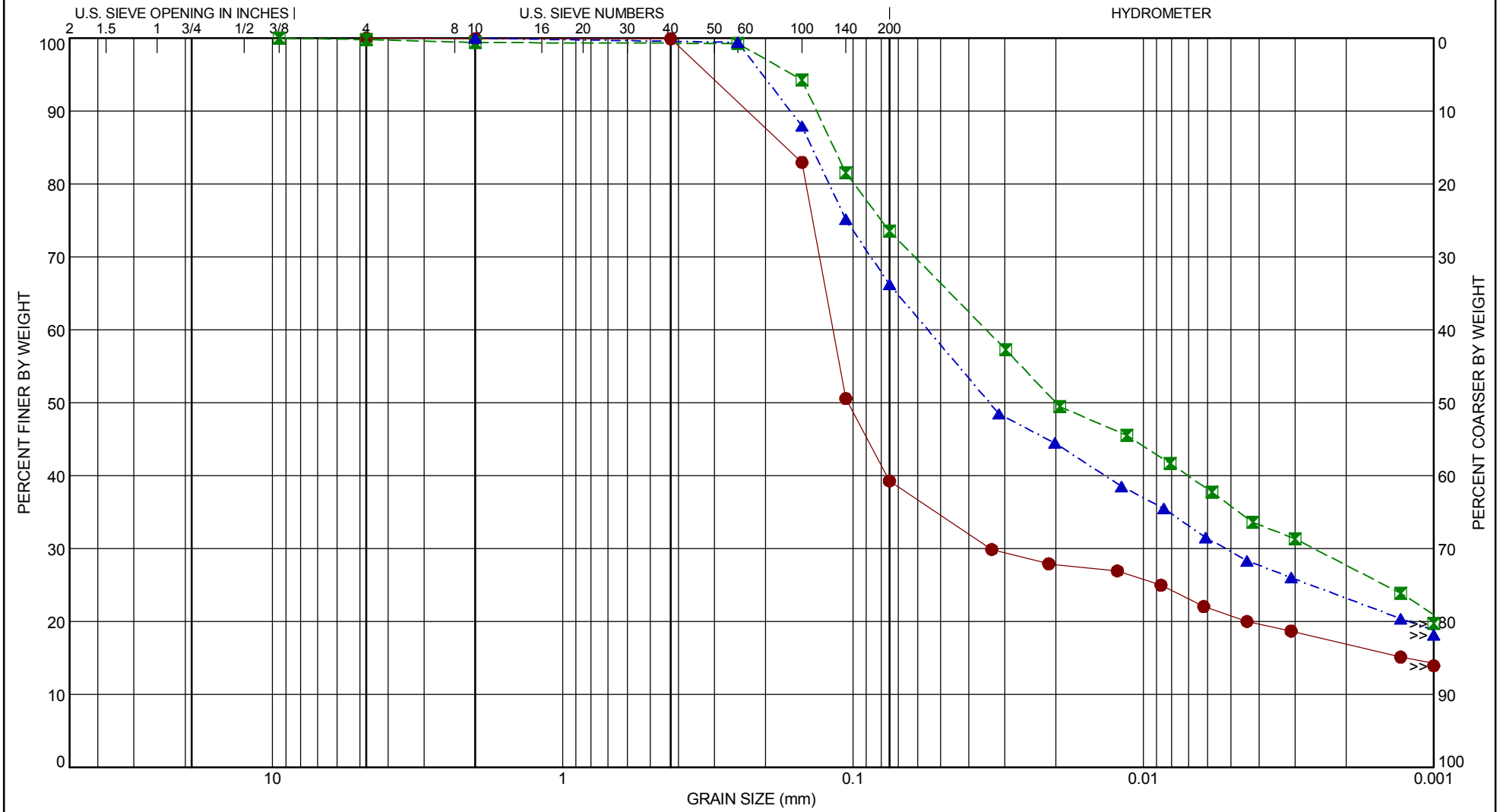
Technical Responsibility: Karen Allen
Title: QAM
Date: 4/23/18

Summary of Lab Results
Project No.: 16715-040-03

Island Road Marsh Creation and Nourishment (TE-117)
Terrebonne Parish, LA

GEOENGINEERS

	Soil Boring ID	Depth (ft)	Classification	%Gravel	%Sand	%Silt	%Clay	D90	D60	D50	D30	D10	Cc	Cu	LL	PL	PI
●	Composite B-1	0.0	Gray clayey sand (Composite) (SC)	0.0	60.7	18.5	20.8	0.231	0.117	0.104	0.034				35	18	17
⊠	Composite B-2	0.0	Gray clay with sand (Composite) (CH)	0.2	26.2	37.7	35.8	0.134	0.035	0.02	0.003				51	18	33
▲	Composite B-2a	0.0	Gray sandy clay (Composite) (CL)	0.0	33.8	36.6	29.6	0.164	0.055	0.034	0.005				43	17	26



GRAVEL		SAND			SILT OR CLAY
coarse	fine	coarse	medium	fine	

Tested By:	Date Tested:	GRAIN SIZE DISTRIBUTION	Island Road Marsh Creation and Nourishment (TE-117)
NLP	3/16/2018	ASTM D422/D1140/D6913/T88	Terrebonne Parish, LA
Reviewed By:	Date Reviewed:	Project No.: 16715-040-03	GEOENGINEERS
Karen Allen	3/26/2018		

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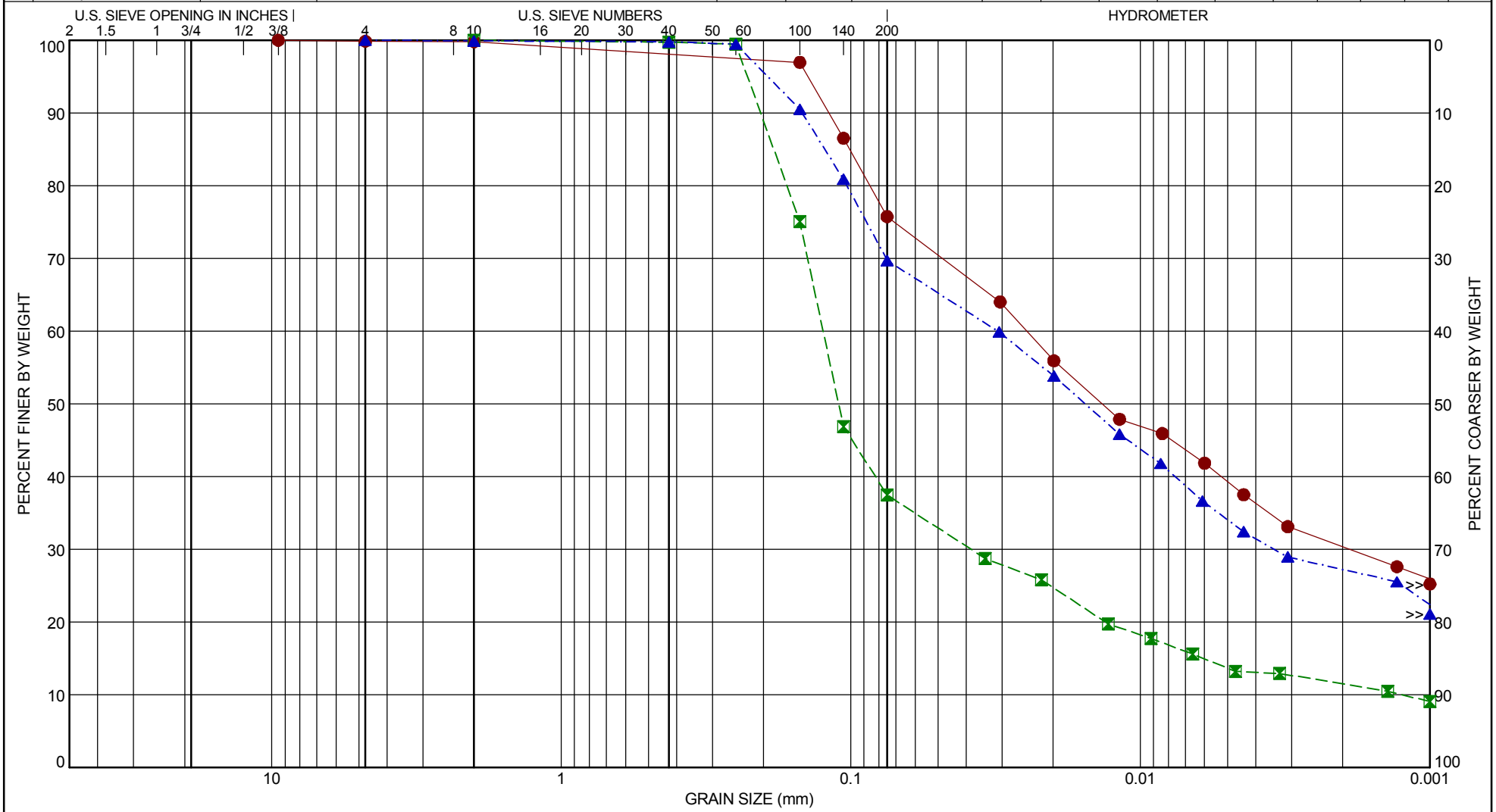
GEI - GRAIN SIZE - GEO TEMPLATE WITH LAB.GDT - 4/23/18 11:15 - P:\16\1671504\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ

	Soil Boring ID	Depth (ft)	Classification	%Gravel	%Sand	%Silt	%Clay	D90	D60	D50	D30	D10	Cc	Cu	LL	PL	PI
●	Composite B-3	0.0	Gray clay with sand (Composite) (CH)	0.1	24.1	36.5	39.3	0.119	0.025	0.014	0.002				51	21	30
⊠	Composite B-4	0.0	Gray silty sand (Composite) (SM)	0.0	62.5	23.8	13.6	0.205	0.125	0.11	0.038	0.001	9.49	99.83	NP	NP	NP
▲	Composite B-5	0.0	Gray sandy clay (Composite) (CL)	0.0	30.3	35.6	34.1	0.147	0.031	0.016	0.003				40	17	23



GRAVEL		SAND			SILT OR CLAY
coarse	fine	coarse	medium	fine	

Tested By:	Date Tested:	GRAIN SIZE DISTRIBUTION	Island Road Marsh Creation and Nourishment (TE-117)
NLP	3/16/2018	ASTM D422/D1140/D6913/T88	Terrebonne Parish, LA
Reviewed By:	Date Reviewed:	Project No.: 16715-040-03	GEOENGINEERS
Karen Allen	3/26/2018		

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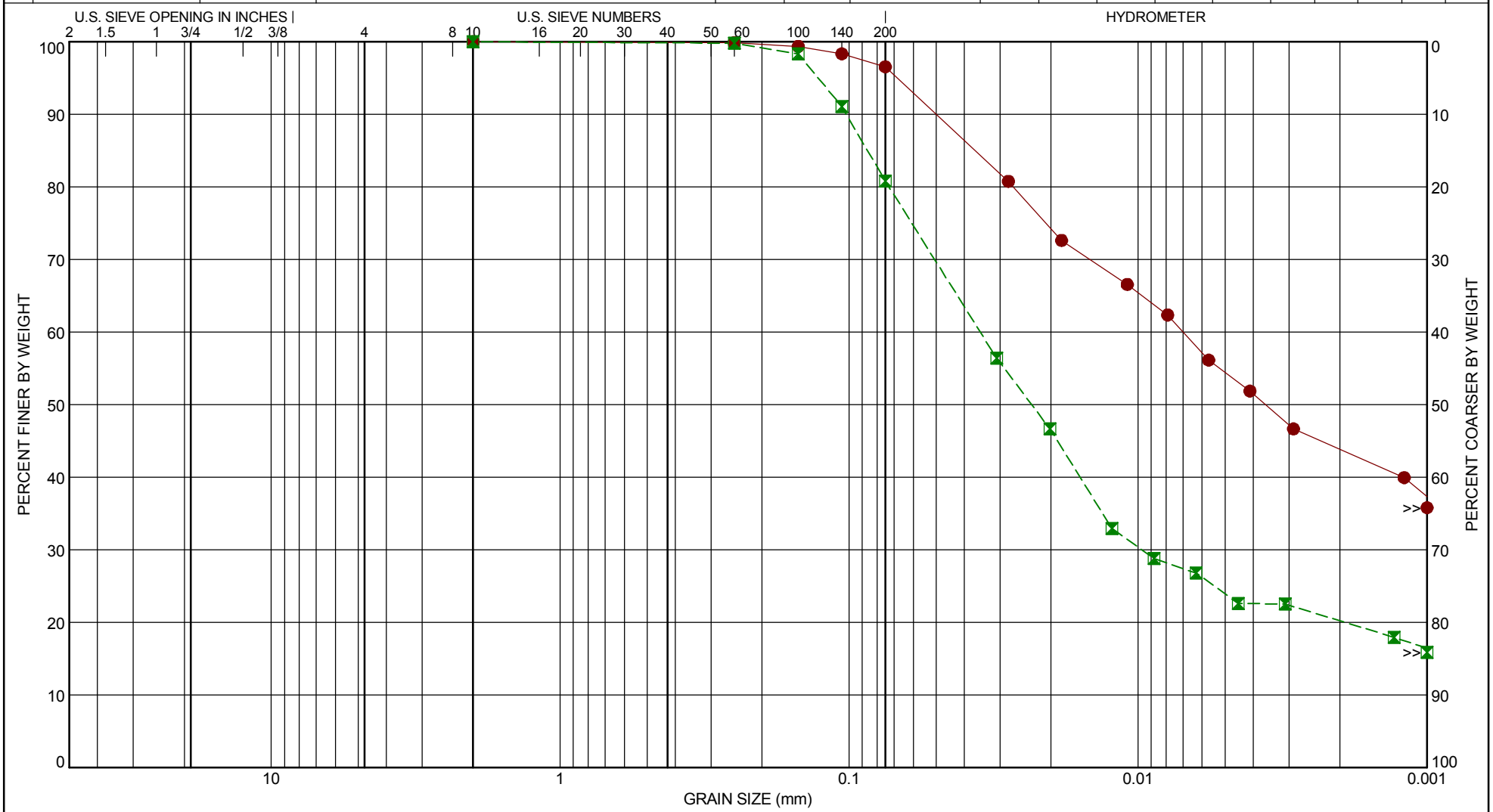
GEI - GRAIN SIZE - GEO TEMPLATE WITH LAB.GDT - 4/23/18 11:15 - P:\16\1671504\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ

	Soil Boring ID	Depth (ft)	Classification	%Gravel	%Sand	%Silt	%Clay	D90	D60	D50	D30	D10	Cc	Cu	LL	PL	PI
●	Composite B-6	0.0	Gray clay (Composite) (CH)	0.0	3.5	42.1	54.4	0.05	0.007	0.004					70	26	44
⊠	Composite B-7	0.0	Gray silty clay with sand, organic matter and shell fragments (Composite) (OH)	0.0	19.2	56.9	23.9	0.102	0.035	0.023	0.01				41	21	20



GRAVEL		SAND			SILT OR CLAY
coarse	fine	coarse	medium	fine	

Tested By:	Date Tested:	GRAIN SIZE DISTRIBUTION	Island Road Marsh Creation and Nourishment (TE-117)
NLP	3/16/2018	ASTM D422/D1140/D6913/T88	Terrebonne Parish, LA
Reviewed By:	Date Reviewed:	Project No.: 16715-040-03	GEOENGINEERS
Karen Allen	3/26/2018		

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GEI - GRAIN SIZE - GEO TEMPLATE WITH LAB.GDT - 4/23/18 11:15 - P:\16\1671504\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ

GeoEngineers
11955 Lakeland Park Boulevard, Suite 100
Baton Rouge, Louisiana 70809
225.293.2460

April 24, 2018

State of Louisiana
Louisiana Coastal Protection and Restoration Authority
150 Terrace Avenue
Baton Rouge, Louisiana, 70802

Attention: Brad A. Miller

Subject: Sediment Geotechnical Properties Report
Low-Stress Consolidation of Borrow Area Soils
TE-117 Island Road Marsh Creation and Nourishment
Terrebonne Parish, Louisiana
File No. 16715-040-03

INTRODUCTION

This document presents the results of laboratory testing to determine the index and low-stress consolidation properties of hydraulic fill material to be used for the TE-117 Island Road Marsh Creation and Nourishment Project. These tests were conducted on four (4) composite samples homogenized from Shelby tube soil cores collected from the TE-117 borrow area borings B-1 through B-7 in Lake Tambour, Terrebonne Parish, Louisiana and labeled Composite Sample No. 1 through No. 4. The composite samples combined specimens from various borings as described in Table 1, below.

TEST PROCEDURE

Equal volume specimens from each Shelby tube sample in the required depth range were homogenized to create four composite samples for use in low-stress consolidation testing, as shown in Table 1. Sufficient mixing of each composite sample was performed before testing was commenced.

TABLE 1. COMPOSITE SAMPLE SOURCE SUMMARY

Composite Sample Id.	Soil Borings	Depth Range of Composite Sample (feet below mudline)
Composite Sample No. 1	B-2, B-2a, B-3, and B-4	0 to 20
Composite Sample No. 2	B-1, B-5, B-6, B-7	0 to 20
Composite Sample No. 3	B-1 through B-7	0 to 16
Composite Sample No. 4	B-1 through B-7	0 to 4

Basic index properties, including slurry moisture content, specific gravity, Atterberg limits, organic content and particle size distribution were determined for each composite sample using the appropriate ASTM standards.

Low-stress consolidation tests were performed on these samples following the U.S. Army Corps of Engineers Manual No. 1110-2-5027 (USACE, 1987) and the University of Texas Method (Pederson, 2001) methods. To simplify sample preparation, each homogenized composite sample was diluted to 2 to 3 times its liquid limit to allow free flow of the soil. One-dimensional incremental loading was used to consolidate the samples, with stresses ranging from about 1 psf to 640 psf, with stress doubling between each load increment. The coefficient of consolidation, c_v, was determined using the square root of time method.

RESULTS

Index properties of each composite sample are summarized in Table 2. Particle size distributions for each composite sample are shown in the attached grain size distribution chart.

TABLE 2. SUMMARY OF COMPOSITE SAMPLE INDEX PROPERTIES

Composite Sample Id.	Specific Gravity	Slurry Moisture Content (%)	Atterberg Limits		Grain Size Distribution		
			Liquid Limit, LL	Plasticity Index, PI	Sand (>0.075 mm)	Silt (0.075 mm - 0.005 mm)	Clay (<0.005 mm)
1	2.700	136.2	44	25	44.4	28.7	26.9
2	2.710	154.5	45	27	21.0	44.4	34.6
3	2.662	188.1	51	31	29.5	37.2	33.3
4	2.671	418.0	134	96	5.5	32.1	62.3

Low-stress consolidation results are given below in tabular (Tables 3 through 6 for Composite Samples No. 1 through No. 4, respectively) and graphical form (Figures 1a through 4d for Composite Samples No. 1 through No. 4, respectively). Figures #a and #b are strain vs. stress and void ratio vs. stress graphs, respectively, for each composite sample. Figures #c and #d are stress vs. coefficient of consolidation (c_v) and void ratio vs. hydraulic conductivity (k) graphs, respectively, for each composite sample. The self-weight consolidation result figures presented in this document include best-fit logarithmic trend lines with correlation equations and correlation strength indicated on the plot.

Composite Sample No. 1 Results

TABLE 3. SELF-WEIGHT CONSOLIDATION TEST RESULTS FOR COMPOSITE SAMPLE NO. 1

σ'_v	δ_{100}	e_0	e_{100}	ε_{100}	C_c	$C_{\alpha e}$	t_{90}	Hdr	c_v	k
(psf)	(in)	3.805		(%)	0.951		(min)	(in)	(ft^2/day)	(ft/day)
1	0.138		3.142	13.80		0.29	864	0.461	0.0021	0.0193
2	0.195		2.869	19.47		0.05	640	0.411	0.0022	0.0095
5	0.262		2.544	26.24		0.13	335	0.381	0.0037	0.0067
10	0.343		2.156	34.31		0.05	210	0.343	0.0048	0.0069
20	0.408		1.842	40.84		0.05	144	0.309	0.0056	0.0037
30	0.497		1.415	49.74		0.00	210	0.253	0.0026	0.0025
40	0.508		1.363	50.83		0.02	566	0.248	0.0009	0.0001
80	0.555		1.137	55.51		0.03	69	0.232	0.0066	0.0010
160	0.593		0.955	59.30		0.01	96	0.210	0.0039	0.0003
320	0.626		0.796	62.62		0.02	42	0.193	0.0075	0.0002
640	0.658		0.644	65.78		0.01	34	0.176	0.0171	0.0003

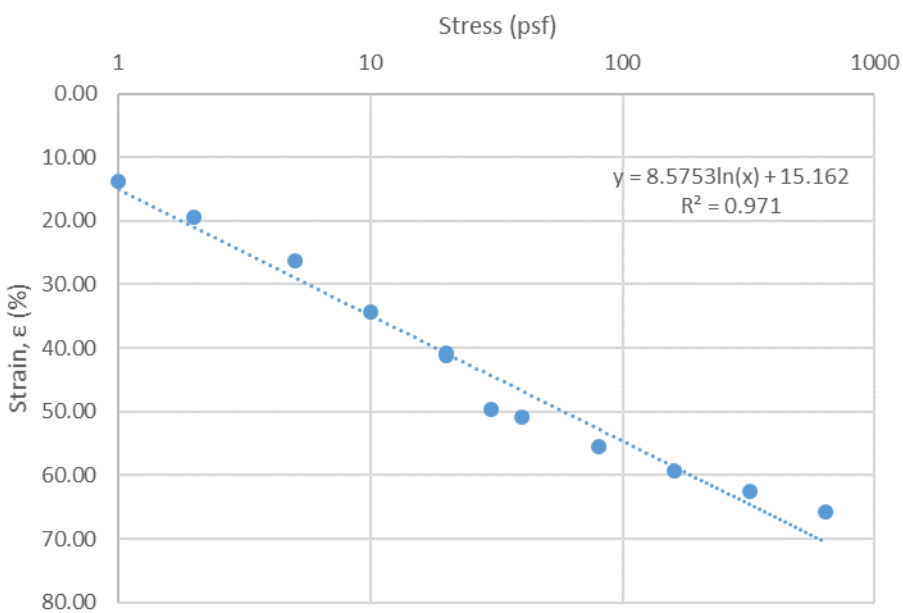


Figure 1a Axial Strain vs. Stress Plot for Composite Sample No. 1

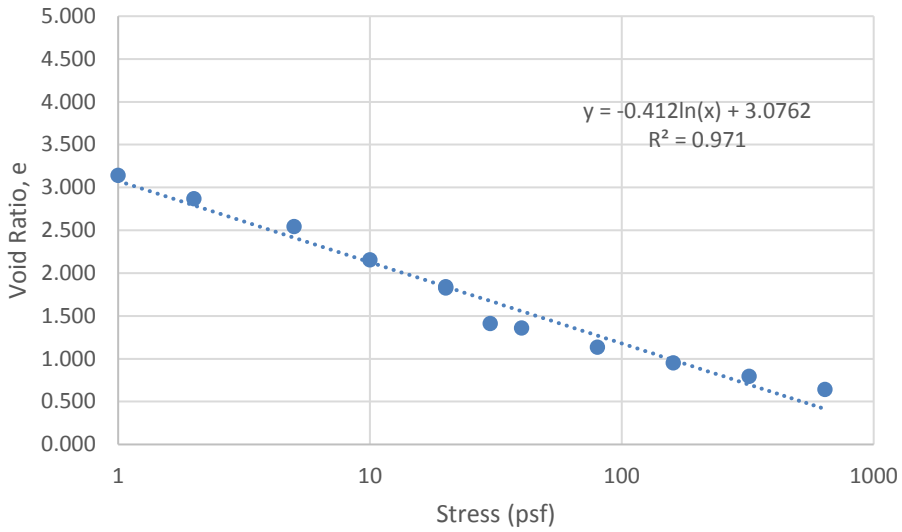


Figure 1b Void Ratio vs. Stress Plot for Composite Sample No. 1

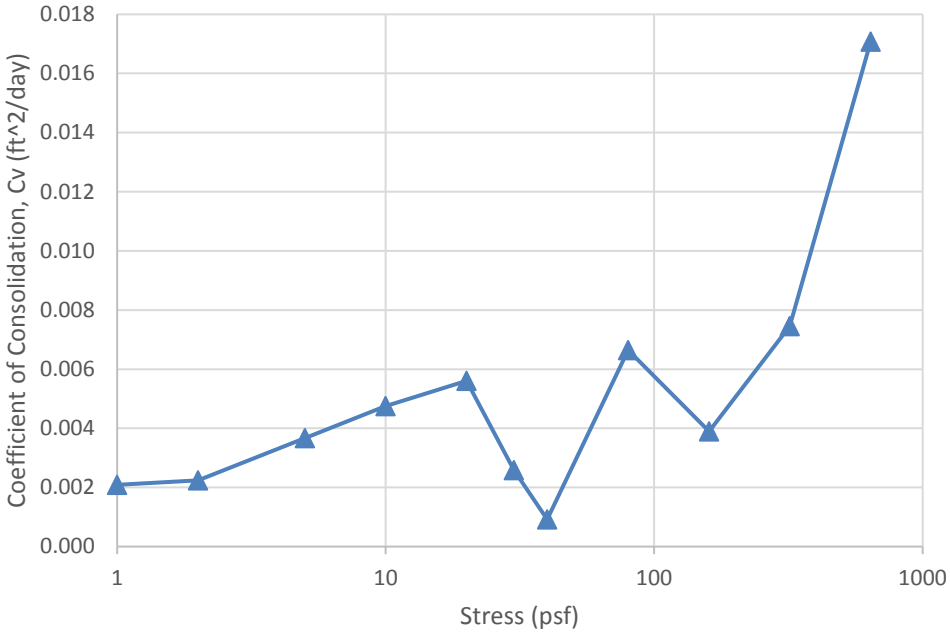


Figure 1c Coefficient of Consolidation vs. Stress Plot for Composite Sample No. 1

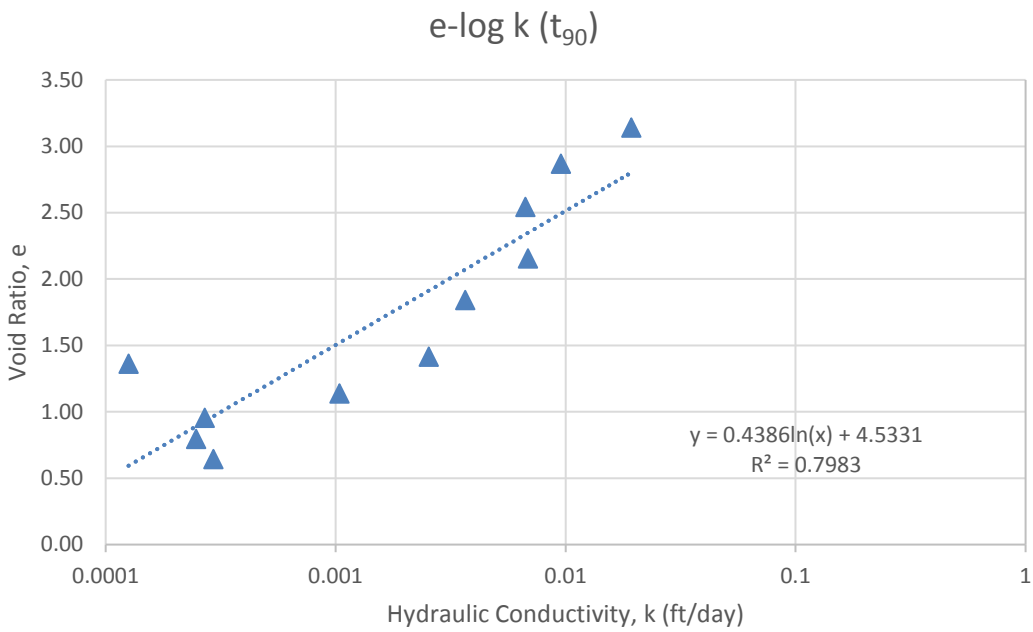


Figure 1d Hydraulic Conductivity vs. Void Ratio Plot for Composite Sample No. 1

Composite Sample No. 2 Results

TABLE 4. SELF-WEIGHT CONSOLIDATION TEST RESULTS FOR COMPOSITE SAMPLE NO. 2

σ'_v	δ_{100}	e_0	e_{100}	ε_{100}	C_c	$C_{\alpha e}$	t_{50}	Hdr	c_v	k
(psf)	(in)	4.562		(%)	0.797		(min)	(in)	(ft^2/day)	(ft/day)
1	0.204		3.430	20.35		0.13	610	0.446	0.0028	0.0390
2	0.275		3.033	27.49		0.11	650	0.376	0.0018	0.0108
5	0.348		2.628	34.77		0.05	400	0.344	0.0025	0.0055
10	0.391		2.385	39.14		0.03	400	0.313	0.0021	0.0018
20	0.438		2.123	43.85		0.03	289	0.290	0.0025	0.0012
30	0.481		1.887	48.09		0.00	144	0.262	0.0041	0.0026
40	0.493		1.821	49.28		0.02	566	0.256	0.0010	0.0001
80	0.524		1.648	52.40		0.02	66	0.245	0.0077	0.0008
160	0.555		1.476	55.49		0.02	37	0.228	0.0119	0.0006
320	0.583		1.319	58.31		0.01	20	0.213	0.0191	0.0005
640	0.609		1.173	60.94		0.01	22	0.200	0.0335	0.0004

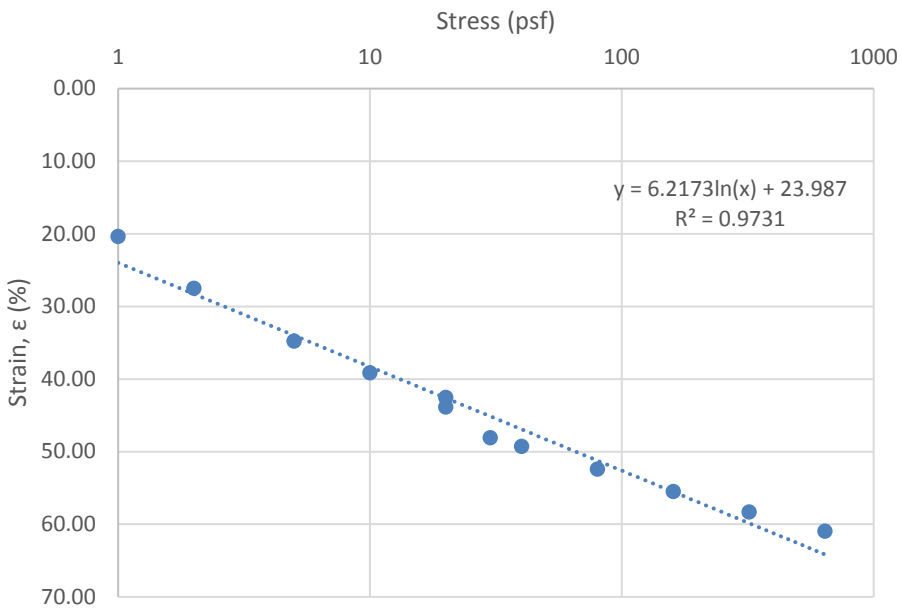


Figure 2a Axial Strain vs. Stress Plot for Composite Sample No. 2

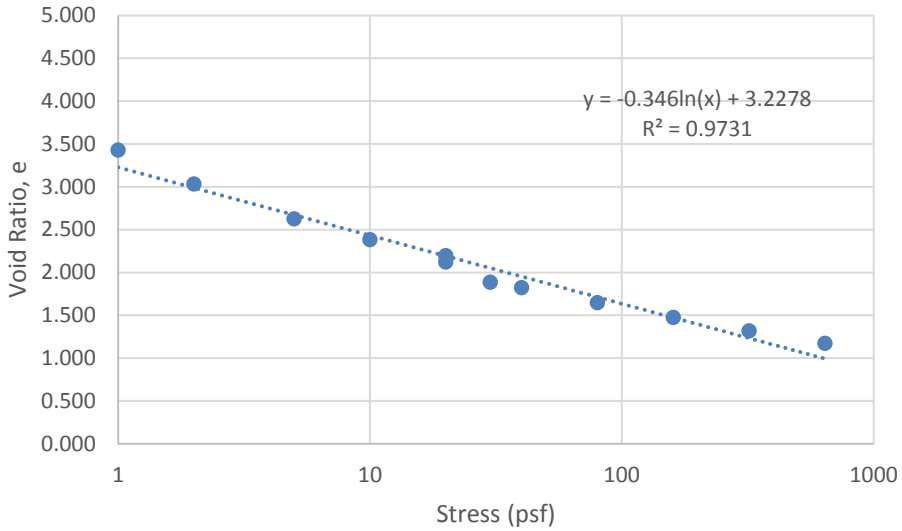


Figure 2b Void Ratio vs. Stress Plot for Composite Sample No. 2

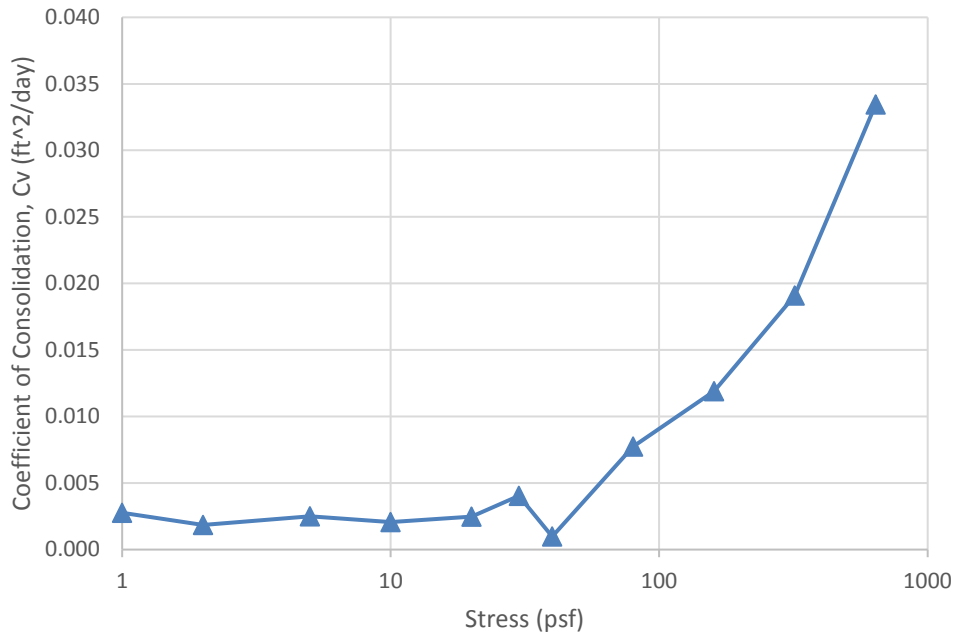


Figure 2c Coefficient of Consolidation vs. Stress Plot for Composite Sample No. 2

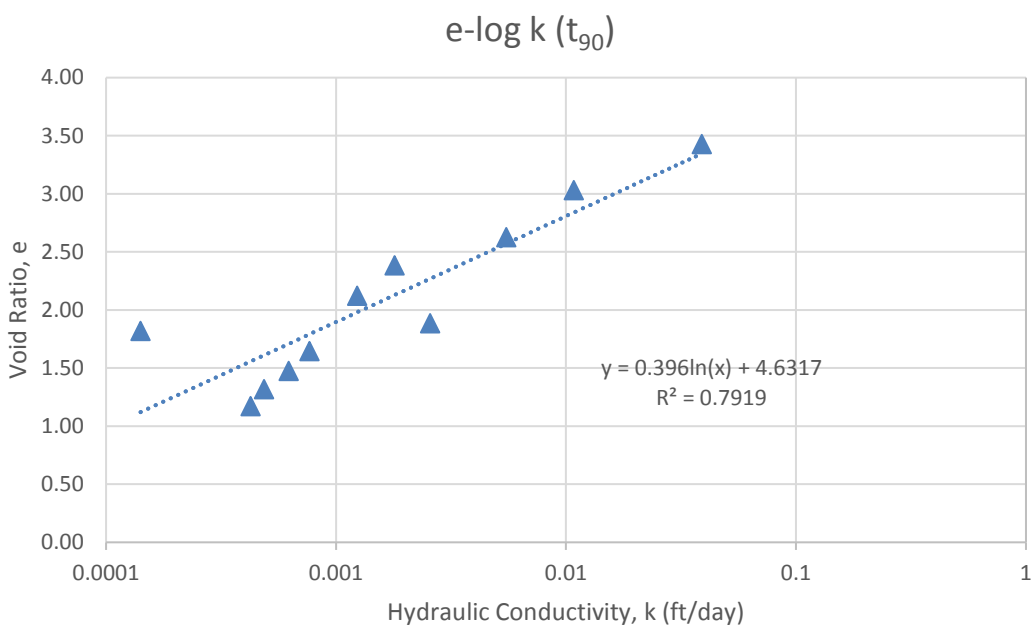


Figure 2d. Hydraulic Conductivity vs. Void Ratio Plot for Composite Sample No. 2

Composite Sample No. 3 Results

TABLE 5. SELF-WEIGHT CONSOLIDATION TEST RESULTS FOR COMPOSITE SAMPLE NO. 3

σ'_v	δ_{100}	e_0	e_{100}	ε_{100}	C_c	$C_{\alpha e}$	t_{50}	Hdr	c_v	k
(psf)	(in)	5.730		(%)	1.211		(min)	(in)	(ft^2/day)	(ft/day)
1	0.218		4.263	21.80		0.43	906	0.441	0.0018	0.0278
2	0.281		3.841	28.06		0.08	743	0.370	0.0016	0.0081
5	0.345		3.410	34.47		0.11	493	0.339	0.0020	0.0038
10	0.416		2.927	41.64		0.09	437	0.305	0.0018	0.0026
20	0.479		2.508	47.87		0.04	61	0.273	0.0104	0.0073
30	0.557		1.984	55.65		0.00	1232	0.224	0.0003	0.0004
40	0.571		1.890	57.05		0.01	986	0.216	0.0004	0.0001
80	0.606		1.650	60.62		0.02	77	0.203	0.0045	0.0006
160	0.642		1.407	64.24		0.02	50	0.184	0.0057	0.0004
320	0.671		1.215	67.09		0.01	36	0.169	0.0067	0.0002
640	0.697		1.041	69.68		0.01	27	0.156	0.0166	0.0003

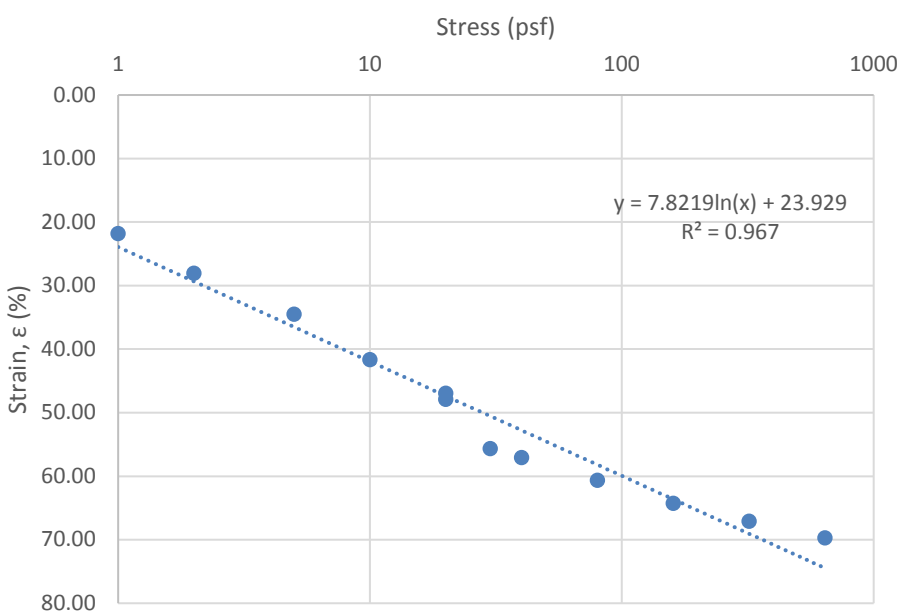


Figure 3a Axial Strain vs. Stress Plot for Composite Sample No. 3

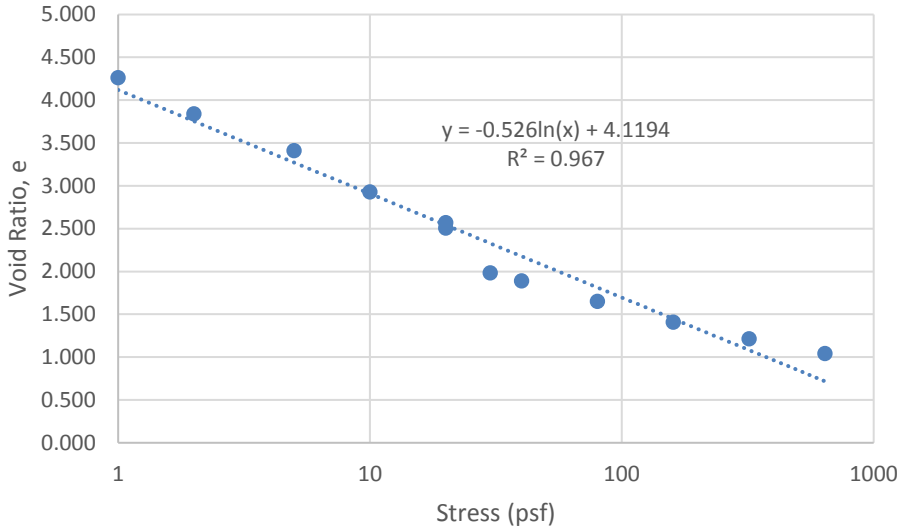


Figure 3b Void Ratio vs. Stress Plot for Composite Sample No. 3

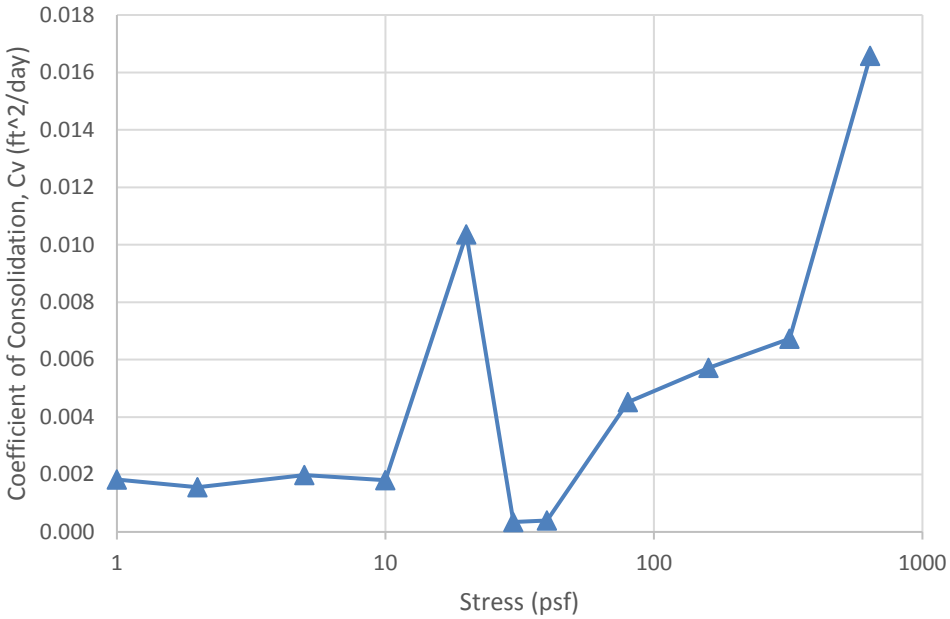


Figure 3c Coefficient of Consolidation vs. Stress Plot for Composite Sample No. 3

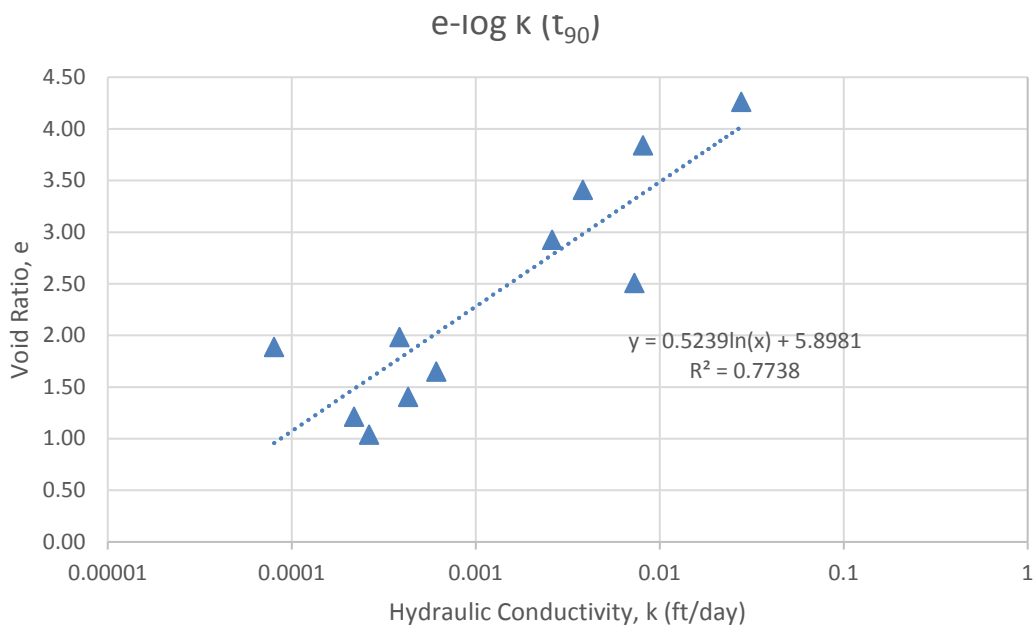


Figure 3d Hydraulic Conductivity vs. Void Ratio Plot for Composite Sample No. 3

Composite Sample NO. 4 Results

TABLE 6. SELF-WEIGHT CONSOLIDATION TEST RESULTS FOR COMPOSITE SAMPLE NO. 4

σ'_v	δ_{100}	e_0	e_{100}	ε_{100}	C_c	$C_{\alpha e}$	t_{50}	Hdr	c_v	k
(psf)	(in)	12.74		(%)	2.521		(min)	(in)	(ft^2/day)	(ft/day)
1	0.271		9.016	27.10		1.48	1289	0.426	0.0012	0.0233
2	0.347		7.976	34.67		0.29	655	0.338	0.0015	0.0101
5	0.410		7.112	40.96		0.23	506	0.306	0.0016	0.0033
10	0.493		5.960	49.34		0.23	256	0.268	0.0024	0.0046
20	0.564		4.989	56.41		0.05	54	0.231	0.0083	0.0078
30	0.617		4.269	61.65		0.00	72	0.196	0.0045	0.0061
40	0.630		4.086	62.98		0.06	590	0.188	0.0005	0.0001
80	0.668		3.558	66.82		0.10	88	0.173	0.0029	0.0005
160	0.708		3.008	70.83		0.06	61	0.152	0.0032	0.0003
320	0.742		2.547	74.18		0.05	54	0.134	0.0028	0.0001
640	0.771		2.150	77.07		0.05	34	0.119	0.0077	0.0002

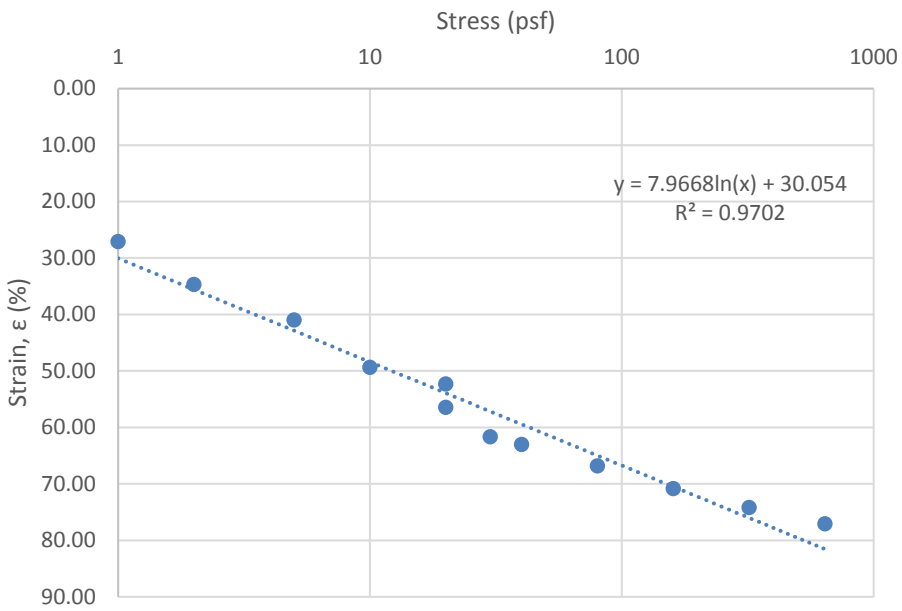


Figure 4a Axial Strain vs. Stress Plot for Composite Sample No. 4

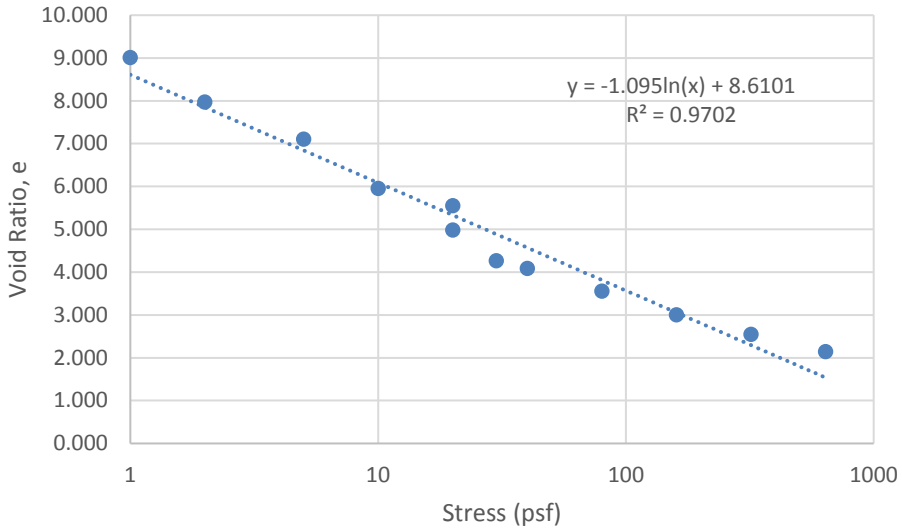


Figure 4b Void Ratio vs. Stress Plot for Composite Sample No. 4

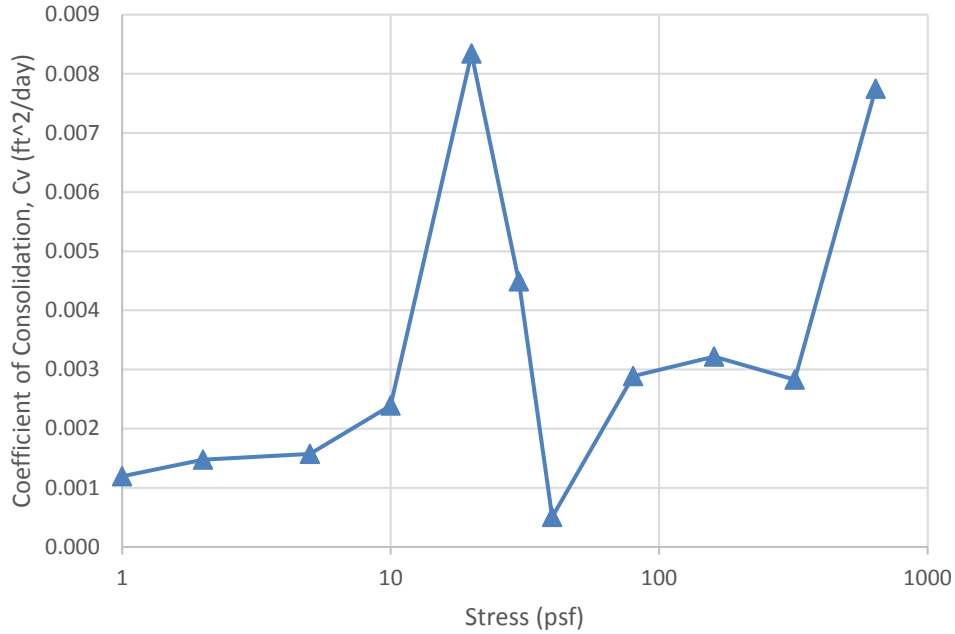


Figure 4c Coefficient of Consolidation vs. Stress Plot for Composite Sample No. 4

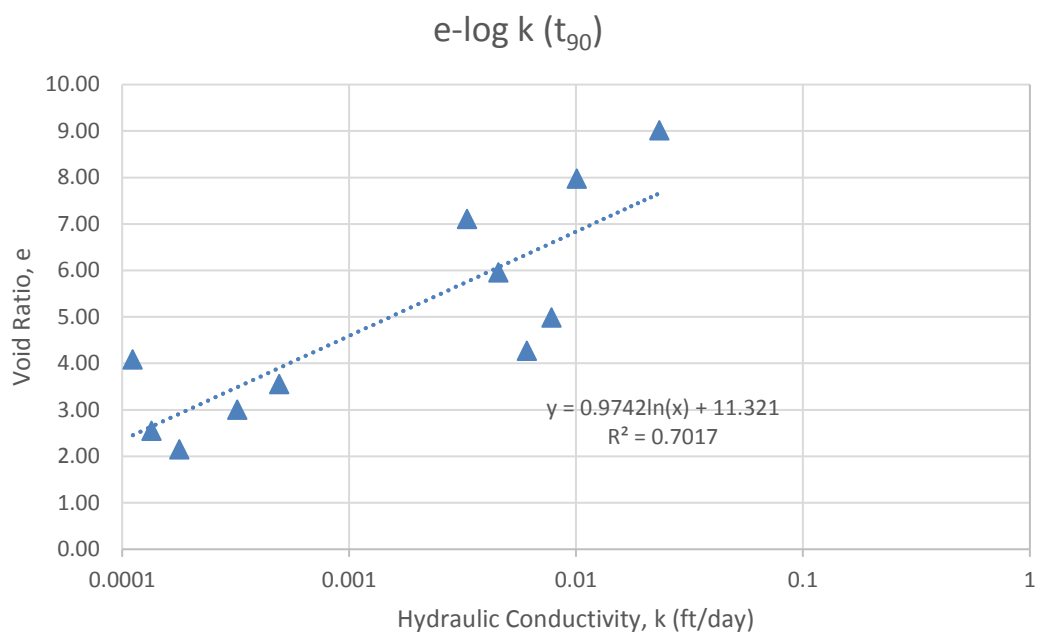


Figure 4d Hydraulic Conductivity vs. Void Ratio Plot for Composite Sample No. 4

CONCLUSION

Self-weight consolidation testing was conducted on 4 composite samples from the TE-117 borrow area in Lake Tambour for the TE-117 Island Road Marsh Creation and Nourishment Project. Test results and commentary on the tests have been provided in this document. The data generally appear fit for use in marsh creation hydraulic fill computations.

CLOSING

GeoEngineers appreciates the opportunity to work with the State of Louisiana on this project. If there are questions about the contents of this document, please contact us at 225.293.2460.

Sincerely,
GeoEngineers, Inc.

Joshua M. Pruett, P.E.
Engineer

David S. Eley, P.E.
Principal

STATE OF LOUISIANA
DAVID S. ELEY
REG. No. 26373
REGISTERED PROFESSIONAL ENGINEER IN CIVIL ENGINEERING

JMP:DSE:cc

Attachment:
Grain Size Distribution report for Low-Stress Consolidation Samples

Disclaimer: Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

Soil Boring ID	Depth Interval (ft)	D2488	Test Type	D2216	D2166/D2850		D4318			D422/D1140 /D6913	D2166/D2850					D4648	Comments
		Visual Description		Moisture (%)	Unit Weight (PCF)		Atterberg Limits			%<#200 Sieve	Shear Strength (KSF)	Remolded Strength (KSF)	Failure Strain (%)	Confining Pressure (PSI)	Failure Type	Mini Vane Shear Strength (KSF)	
					Wet	Dry	LL	PL	PI								
SWC Sample 1	0.0 - 16.0	Gray sandy clay (Composite from B-2, B-2a, B-3, B-4) (CL)	AL HYD CONS SG ORG	136.2	84.6	35.8	44	19	25	55.6							OC=3.68%, SG=2.700
SWC Sample 2	0.0 - 16.0	Gray clay with sand (Composite from B-1, B-5, B-6, B-7) (CL)	AL HYD CONS SG ORG	154.5	77.8	30.5	45	18	27	79.0							OC=2.97%, SG=2.710
SWC Sample 3	0.0 - 16.0	Gray clay with sand (Composite B-1 through B-7) (CH)	AL HYD CONS SG ORG	188.1	73.1	25.4	51	20	31	70.5							OC=3.40%, SG=2.662
SWC Sample 4	0.0 - 4.0	Gray clay (Composite from top 4 feet of all borings) (CH)	AL HYD CONS SG ORG	418.0	95.8	18.5	134	38	96	94.5							OC=5.14%, SG=2.671

Disclaimer: The results presented relate only to those samples tested.
Note: ASTM standard identification numbers shown above each test description.

Multiple Shear = MS Vertical Shear = VS Angle Shear = AS
Slickensided = SLS Bulge = B Crumble = C

AASHTO ACCREDITED

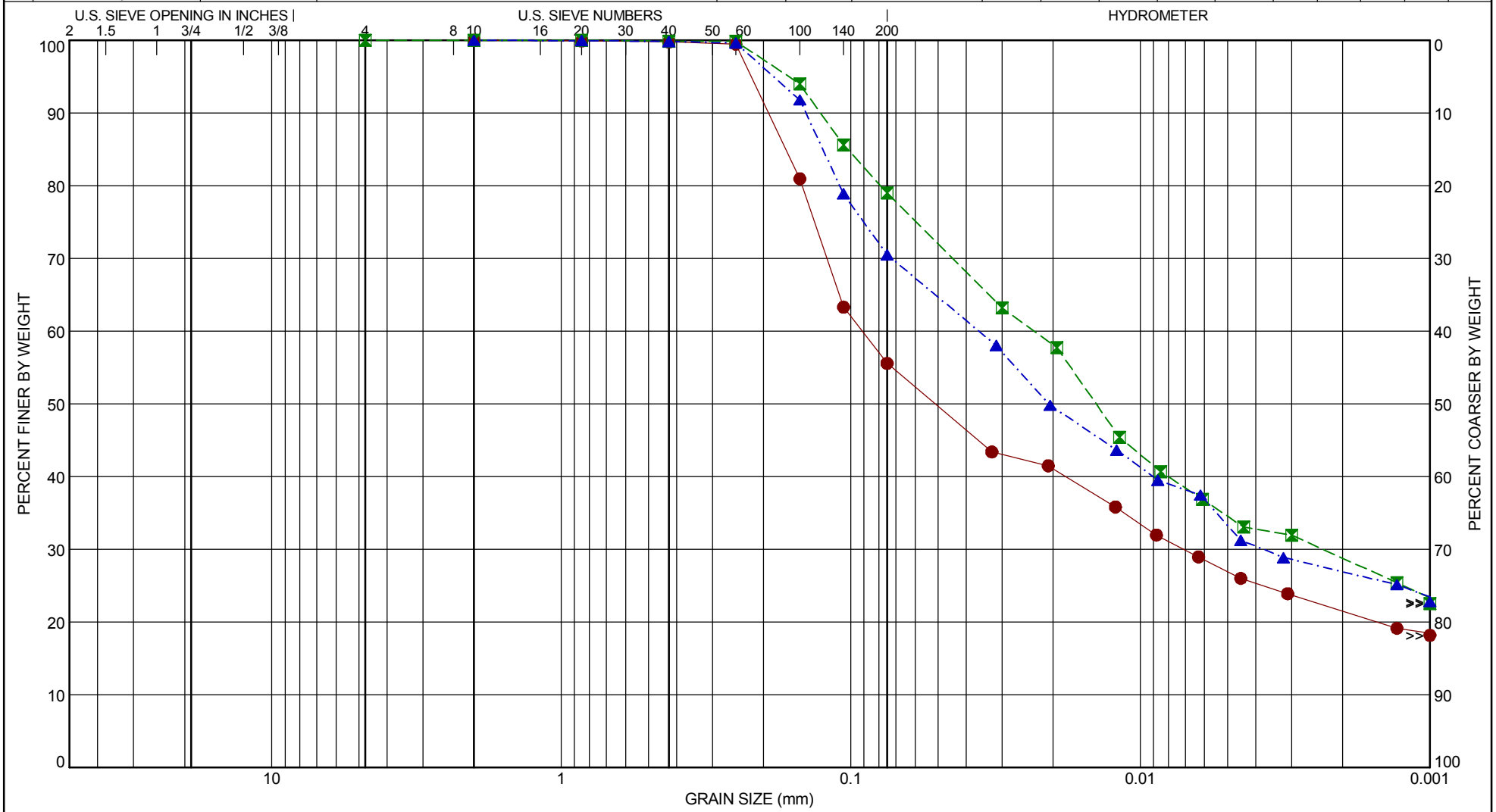
Technical Responsibility: Karen Allen
Title: QAM
Date: 4/23/18

Summary of Lab Results
Project No.: 16715-040-03

Island Road Marsh Creation and Nourishment (TE-117)
Terrebonne Parish, LA

GEOENGINEERS

	Soil Boring ID	Depth (ft)	Classification	%Gravel	%Sand	%Silt	%Clay	D90	D60	D50	D30	D10	Cc	Cu	LL	PL	PI
●	SWC Sample 1	0.0	Gray sandy clay (Composite from B-2, B-2a, B-3, B-4) (CL)	0.0	44.4	28.7	26.9	0.193	0.091	0.051	0.007				44	19	25
⊠	SWC Sample 2	0.0	Gray clay with sand (Composite from B-1, B-5, B-6, B-7) (CL)	0.0	21.0	44.4	34.6	0.127	0.023	0.014	0.002				45	18	27
▲	SWC Sample 3	0.0	Gray clay with sand (Composite B-1 through B-7) (CH)	0.0	29.5	37.2	33.3	0.143	0.036	0.021	0.004				51	20	31



GRAVEL		SAND			SILT OR CLAY
coarse	fine	coarse	medium	fine	

Tested By:	Date Tested:	GRAIN SIZE DISTRIBUTION	Island Road Marsh Creation and Nourishment (TE-117)
NLP	3/19/2018	ASTM D422/D1140/D6913/T88	Terrebonne Parish, LA
Reviewed By:	Date Reviewed:	Project No.: 16715-040-03	GEOENGINEERS
Karen Allen	3/26/2018		

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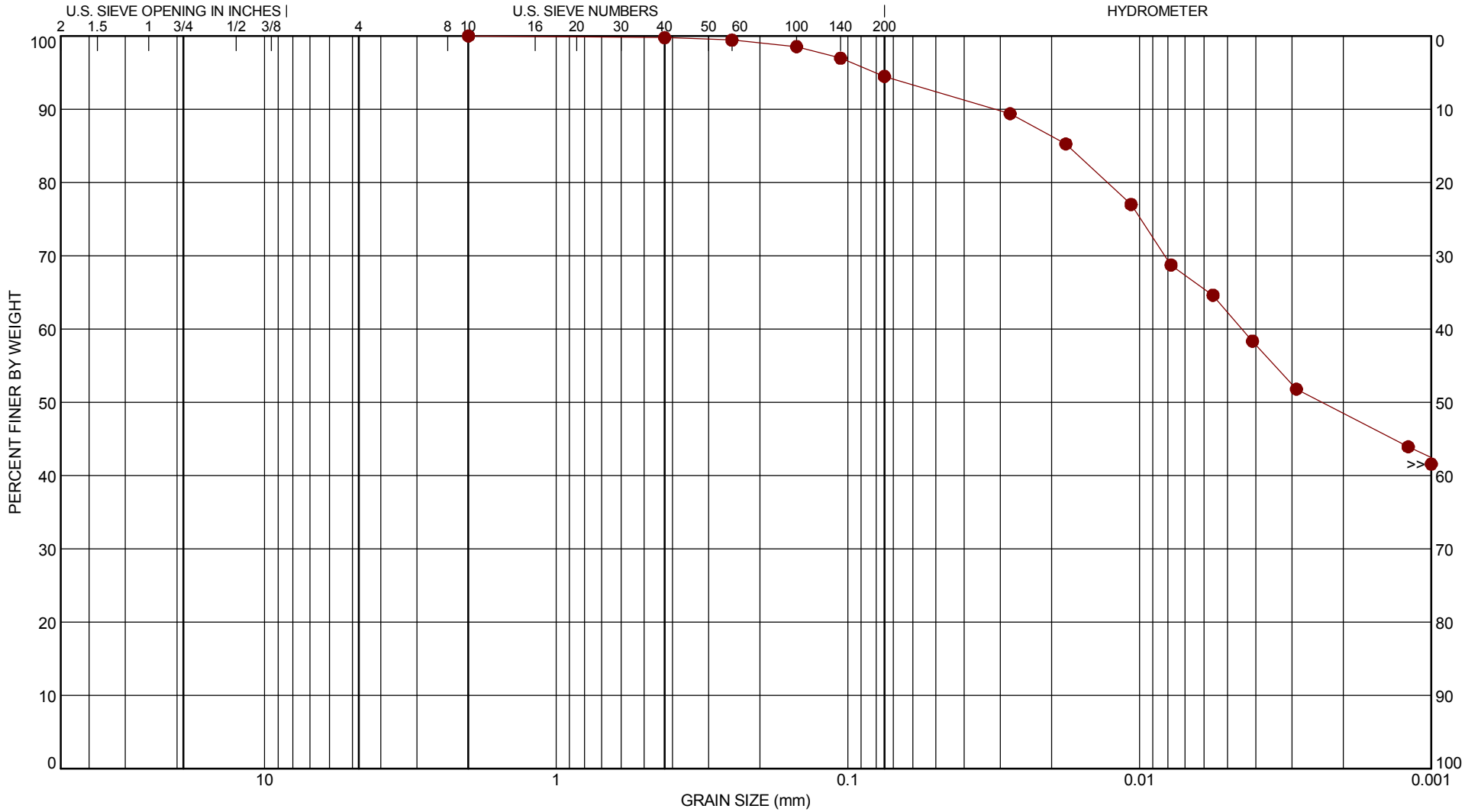
GEI - GRAIN SIZE - GEO TEMPLATE WITH LAB.GDT - 4/23/18 11:16 - P:\16\1671504\03\LAB\GINT LAB\16715-040-03 BR LAB.GPJ

Soil Boring ID	Depth (ft)	Classification	%Gravel	%Sand	%Silt	%Clay	D90	D60	D50	D30	D10	Cc	Cu	LL	PL	PI
SWC Sample 4	0.0	Gray clay (Composite from top 4 feet of all borings) (CH)	0.0	5.5	32.1	62.3	0.031	0.004	0.002					134	38	96



GRAVEL		SAND			SILT OR CLAY
coarse	fine	coarse	medium	fine	

Tested By:	Date Tested:	GRAIN SIZE DISTRIBUTION	Island Road Marsh Creation and Nourishment (TE-117)
NLP	3/16/2018	ASTM D422/D1140/D6913/T88	Terrebonne Parish, LA
Reviewed By: Karen Allen	Date Reviewed: 3/26/2018	Project No.: 16715-040-03	GEOENGINEERS

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Final Report:

Settling Properties of Fine-Grained Sediments: LDNR-CPRA Island Road Marsh Creation and Nourishment (TE-117) Phase II (GeoEngineers Project No. 016715-040-03)

Submitted to:

Jennifer Aguettant, P.E.
Geotechnical Engineer
GeoEngineers, Inc.
11955 Lakeland Park Blvd., Suite 100
Baton Rouge, LA 70809
Phone: (225) 293-2460
Email: jaguettant@geoengineers.com

Submitted by:

William M. Moe, Ph.D., P.E.
Principal and Project Manager
SCTCS Group LLC
LBTC, Building 3000
8000 Innovation Park Drive
Baton Rouge, LA 70820
Phone: (225) 803-3945
Email: wmoe@sctcs.com

April 6, 2018

SCTCS GROUP LLC

1.0 Introduction, Scope, and Objectives

The objective of the testing reported here was to evaluate the settling properties of fine-grained sediments which may be hydraulically dredged in support of the LDNR-CPRA Island Road Marsh Creation and Nourishment (TE-117) Phase II project (GeoEngineers Project No. 016715-040-03).

2.0 Experimental Procedures and Results

2.1 Materials Provided for Testing

Sediment core samples from eight borings labelled as shown in Table 1 from the proposed dredging area were provided by GeoEngineers, Inc. for pilot-scale settling column testing (see Appendix A for chain of custody form).

Table 1. Sediment core samples used to prepare fine-grained sediment slurry for pilot-scale settling column testing

Sediment Sample Boring ID
16715-040-03, B-1
16715-040-03, B-2
16715-040-03, B-2a
16715-040-03, B-3
16715-040-03, B-4
16715-040-03, B-5
16715-040-03, B-6
16715-040-03, B-7

Eight five-gallon buckets of water from the proposed dredging area, labelled as shown in Tables 2 and 3, were also provided by GeoEngineers, Inc. for laboratory testing. The salinity of the eight water samples was measured gravimetrically with drying at 180 ºC[1]. Results, grouped by samples that were composited for testing, are reported in Tables 2 and 3 in units of parts per thousand (ppt).

Table 2. Water samples used to prepare fine-grained sediment slurry for pilot-scale settling column test Sample 1

Water Bucket ID	Salinity (ppt)
16715-040-03, B-2	24.4
16715-040-03, B-2a	24.4
16715-040-03, B-3	24.2
16715-040-03, B-4	24.2
Average	24.3

Table 3. Water samples used to prepare fine-grained sediment slurry for pilot-scale settling column test Sample 2

Water Bucket ID	Salinity (ppt)
16715-040-03, B-1	24.4
16715-040-03, B-5	23.1
16715-040-03, B-6	24.2
16715-040-03, B-7	23.0
Average	23.6

2.2 Pilot-Scale Settling Column Test Results for Sample 1 (Composite of sediment from boring ID numbers B-2, B-2a, B-3, and B-4)

As requested by GeoEngineers, two settling column tests were performed using composited sediment samples. The first test, hereafter referred to as Sample 1, utilized sediment composited from boring IDs B-2, B-2a, B-3, and B-4. The sediment from each boring was placed into a separate container and homogenized via mechanical mixing. Then, a composite sample was created by transferring an equal mass (wet basis) from each of the separate borings B-2, B-2a, B-3, and B-4 to a mixing barrel to create a composite sample. Slurry was then prepared by mixing an equal volume of water from each of the B-2, B-2a, B-3, and B-4 sampling locations plus tap water supplemented with synthetic sea salts (Instant Ocean) to match the average salinity of the four water samples (average salinity of 24.3 parts per thousand (ppt) – see Table 2).

Slurry containing the fine-grained fraction of sediments was obtained by thoroughly mixing the slurry and then allowing coarse grained materials (e.g., sand and shells), to separate by differential settling as described in the US Army Corps of Engineers Manual No. 1110-2-5027[1].

The fine-grained sediment slurry was loaded into a large-scale (8.0 inch ID) column while mixing with air sparging as described in the US Army Corps of Engineers Manual No. 1110-2-5027[1]. Solids concentrations in the slurry at the start of the settling test were measured in samples collected along the height of the column at one foot intervals (see Table B1 in Appendix B for tabulated data). The average particulate concentration at the start of the settling test was 147.3 g/L.

A readily visible sediment-water interface was observed shortly (<20 minutes) after the start of the settling test, indicating zone settling. The height of the sediment-water interface above the bottom of the column was measured and recorded over a period lasting more than 15 days as depicted in Figure 1 (see Table C1 in Appendix C for tabulated data). As shown in Figure 1, zone settling was observed during the first portion of the settling test, followed by compression settling thereafter.

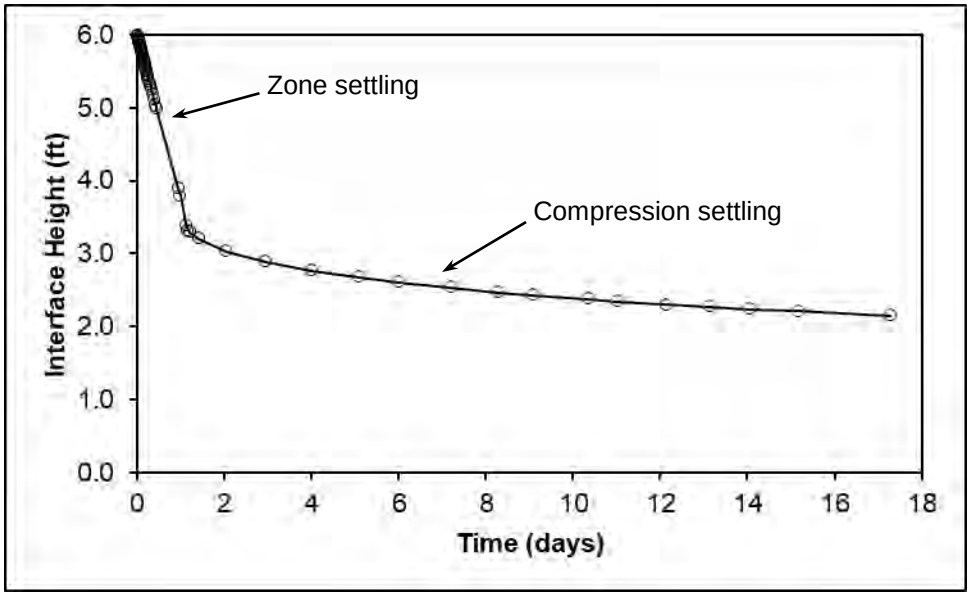


Figure 1. Interface height as a function of time during the pilot-scale settling test with Sample 1 (composite of sediment from boring B-2, B-2a, B-3, and B-4).

Data for the first 28 hours of the settling test are depicted separately in Figure 2. A linear regression was performed for settling data in the time interval of 0 to 28 hours (during which zone settling was observed) with the resulting equation and correlation coefficient shown on the graph. The slope of the regression line, which corresponds to the zone settling velocity, was 0.095 ft/hr (2.29 ft/day).

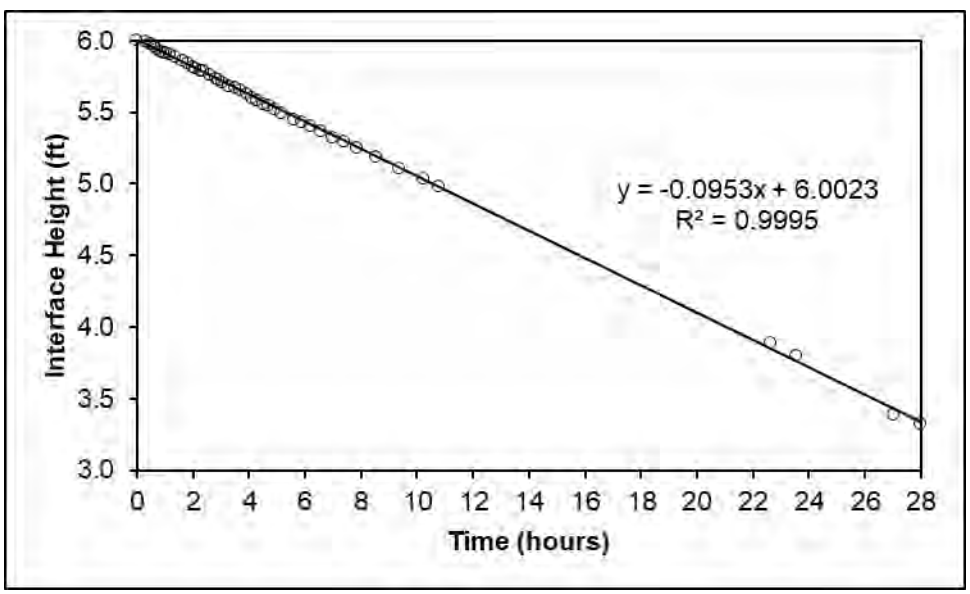


Figure 2. Interface height as a function of time during the zone settling portion of the pilot-scale settling test with Sample 1 (composite of borings B-2, B-2a, B-3, and B-4).

For the portion of the settling test during which compression settling was observed, the concentration in the settled solids at each time interval was calculated using the following equation (equation 3-11 in ref. 1).

$$C = \frac{C_o H_i}{H_t}$$

Where:

C = slurry suspended solids concentration at time t (g/L)
C_o = initial slurry suspended solids concentration (g/L)
H_i = initial slurry height (ft)
H_t = height of the interface at time t (ft)

The corresponding suspended solids concentration as a function of time during compression settling is depicted in Figure 3.

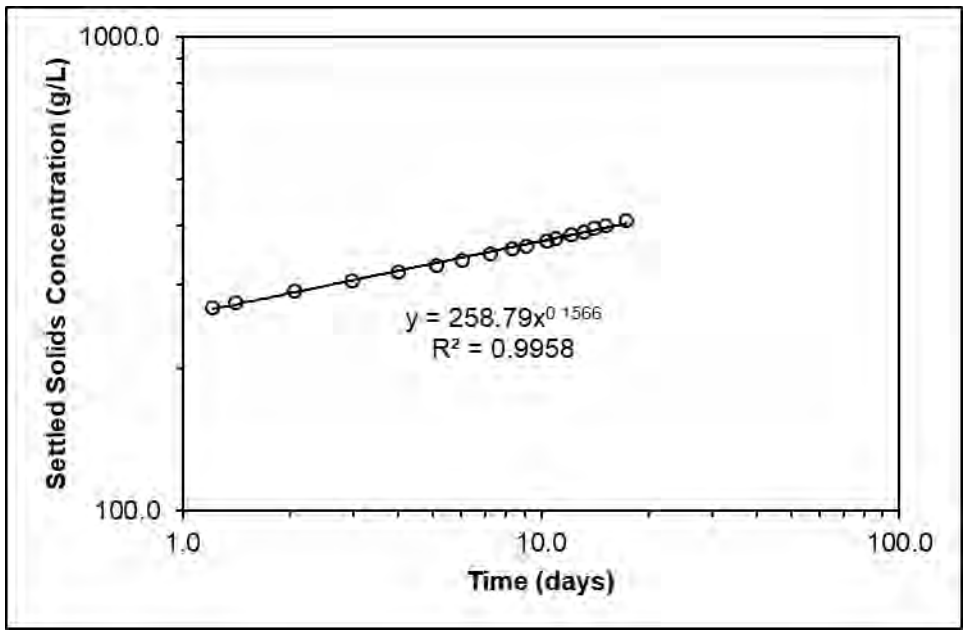


Figure 3. Concentration of settled solids as a function of time during the compression settling portion of the pilot-scale settling test with sample 1 (composite of borings B-2, B-2a, B-3, and B-4).

For analysis of flocculent settling as described in the US Army Corps of Engineers Manual No. 1110-2-5027[1], water samples were collected from the clarified layer above the sediment-water interface for measurement of total suspended (TSS) following Standard Method 2450D[2]. The first of these samples, collected 6.0 hours after the start of settling when the sediment-water interface was sufficiently below the uppermost sample port (height of 5.5 ft) to allow sample collection, had a TSS concentration of 58 mg/L. Concentrations decreased over time during the first day and were <25 mg/L after 23 hours (see Table D1 in Appendix D for tabulated data).

2.3 Pilot-Scale Settling Column Test Results for Sample 2 (Composite of sediment from boring ID numbers B-1, B-5, B-6, and B-7)

The second pilot-scale settling column test, hereafter referred to as Sample 2, utilized sediment composited from boring IDs B-1, B-5, B-6, and B-7. The sediment from each boring was placed into a separate container and homogenized via mechanical mixing. Then, a composite sample was created by transferring an equal mass (wet basis) from each of the separate borings B-1, B-5, B-6, and B-7 to a mixing barrel to create a composite sample. Slurry was then prepared by mixing an equal volume of water from each of the B-1, B-5, B-6, and B-7 sampling locations plus tap water supplemented with synthetic sea salts (Instant Ocean) to match the average salinity of the four water samples (average salinity of 23.6 parts per thousand (ppt) – see Table 3). Slurry containing the fine-grained fraction of sediments was obtained by thoroughly mixing the slurry and then allowing coarse grained materials (e.g., sand and shells), to separate by differential settling as described in the US Army Corps of Engineers Manual No. 1110-2-5027[1]. The particulate concentration in the initial fine-grained sediment slurry, which utilized all of the material available from boring B-5, was below the target concentration of 150 g/L. To achieve a concentration near the target level of 150 g/L, additional sediment was added to the initial slurry preparation to increase the particulate concentration. Because additional sediment was not available from boring B-5, the additional sediment was not an equal amount of sediment from each boring. As requested by GeoEngineers, the shortfall in material from B-5 was compensated by adding equal masses of material from borings B-1 and B-7. Masses of sediment (wet basis) from each boring utilized in preparing the final fine-grained slurry employed in the Sample 2 pilot-scale settling column test is summarized in Table 4.

Table 4. Sediment (wet mass basis) added to prepare fine-grained sediment slurry for pilot-scale settling column test Sample 2

Sediment boring ID	Initial sediment mass added (kg)	Additional sediment mass added (kg)	Total sediment mass (kg)	Mass percent from the boring in the final composite (%)
16715-040-03, B-1	4.55	6.00	10.55	30.8
16715-040-03, B-5	4.55	0	4.55	13.3
16715-040-03, B-6	4.55	4.00	8.55	25.0
16715-040-03, B-7	4.55	6.00	10.55	30.8

After the second addition of sediment to the previously prepared slurry, the slurry was thoroughly remixed and then coarse grained materials were separated by differential settling as described in the US Army Corps of Engineers Manual No. 1110-2-5027[1]. The fine-grained sediment slurry was then loaded into a large-scale (8.0 inch ID) column while mixing with air sparging as described in the US Army Corps of Engineers Manual No. 1110-2-5027[1]. Solids concentrations in the slurry at the start of the settling test were measured in samples collected along the height of the column at one foot intervals (see Table B2 in Appendix B for tabulated data). The average particulate concentration at the start of the settling test was 151.3 g/L.

A readily visible sediment-water interface was observed shortly (<30 minutes) after the start of the settling test, indicating zone settling. The height of the sediment-water interface above the bottom of the column was measured and recorded over a period lasting more than 15 days as depicted in Figure 4 (see Table C2 in Appendix C for tabulated data). As shown in Figure 4, zone settling was observed during the initial portion of the settling test, followed by compression settling.

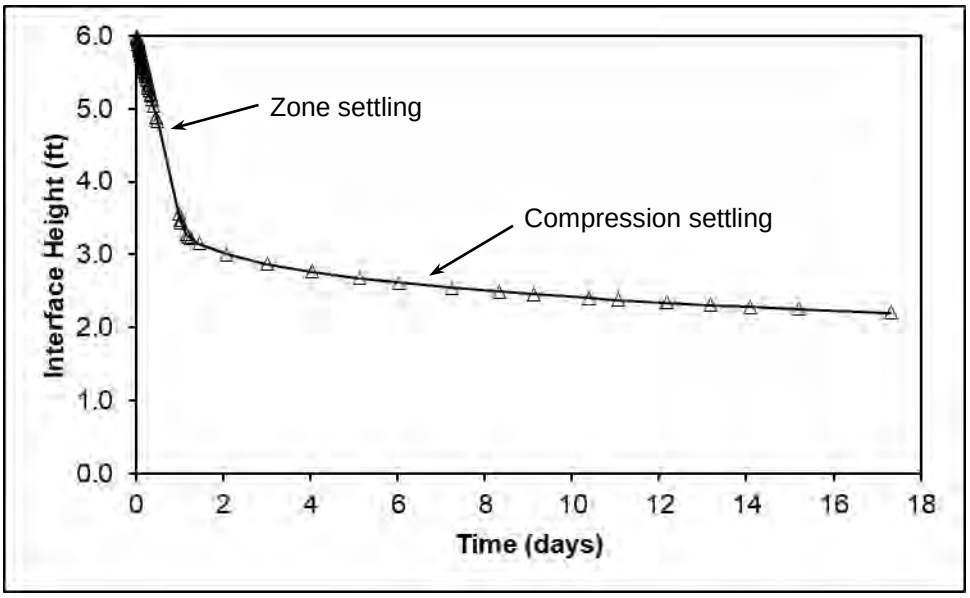


Figure 4. Interface height as a function of time during the pilot-scale settling test with Sample 2 (composite of sediment from boring B-1, B-5, B-6, and B-7).

Data from the first 25 hours of the settling test are depicted separately in Figure 5. A linear regression was performed for settling data in the time interval of 0 to 25 hours (during which zone settling was observed) with the resulting equation and correlation coefficient shown on the graph. The slope of the regression line, which corresponds to the zone settling velocity, was 0.105 ft/hr (2.52 ft/day).

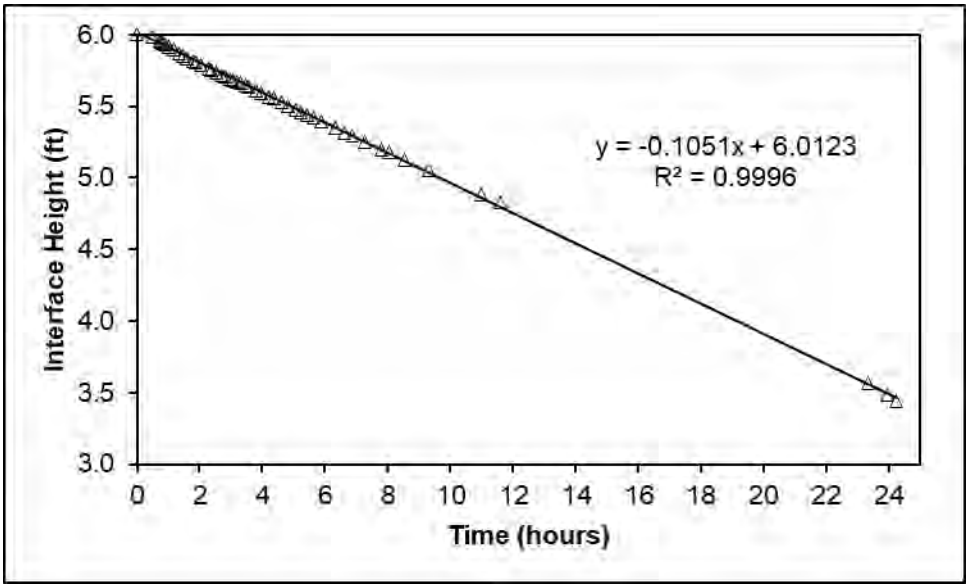


Figure 5. Interface height as a function of time during the zone settling portion of the pilot-scale settling test with Sample 2 (composite of borings B-1, B-5, B-6, and B-7).

For the portion of the settling test during which compression settling was observed, the concentration in the settled solids at each time interval was calculated using the following equation (equation 3-11 in ref. 1).

$$C = \frac{C_o H_i}{H_t}$$

Where:

C = slurry suspended solids concentration at time t (g/L)
C_o = initial slurry suspended solids concentration (g/L)
H_i = initial slurry height (ft)
H_t = height of the interface at time t (ft)

The corresponding suspended solids concentration as a function of time during compression settling is depicted in Figure 6.

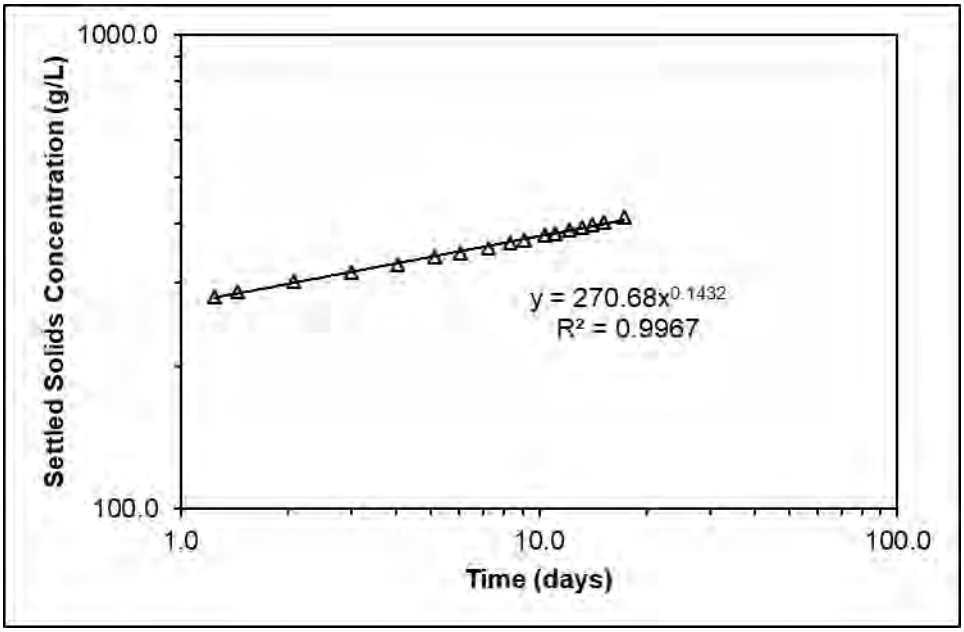


Figure 6: Concentration of settled solids as a function of time during the compression settling portion of the pilot-scale settling test with Sample 2 (composite of borings B-1, B-5, B-6, and B-7).

For analysis of flocculent settling as described in the US Army Corps of Engineers Manual No. 1110-2-5027[1], water samples were collected from the clarified layer above the sediment-water interface for measurement of total suspended (TSS) following Standard Method 2450D[2]. The first of these samples, collected 5.7 hours after the start of settling when the sediment-water interface was sufficiently below the uppermost sample port (height of 5.5 ft) to allow sample collection, had a TSS concentration of 56 mg/L. Concentrations decreased during the first day of settling and were <25 mg/L after 24 hours (see Table D2 in Appendix D for tabulated data).

2.4 Data Comparisons

For comparison purposes, the settling behavior observed during the zone settling interval for Sample 1 [composited sediment from borings B-2, B-2a, B-3, and B-4 (C_o=147.3 g/L)] is shown in comparison with the data from the zone settling portion of the data collected during testing of Sample 2 [composited sediment from borings B-1, B-5, B-6, and B-7 (C_o=151.3 g/L)]. As shown in Figure 7, the zone settling behavior was similar for both samples but with slightly faster zone settling in Sample 2.

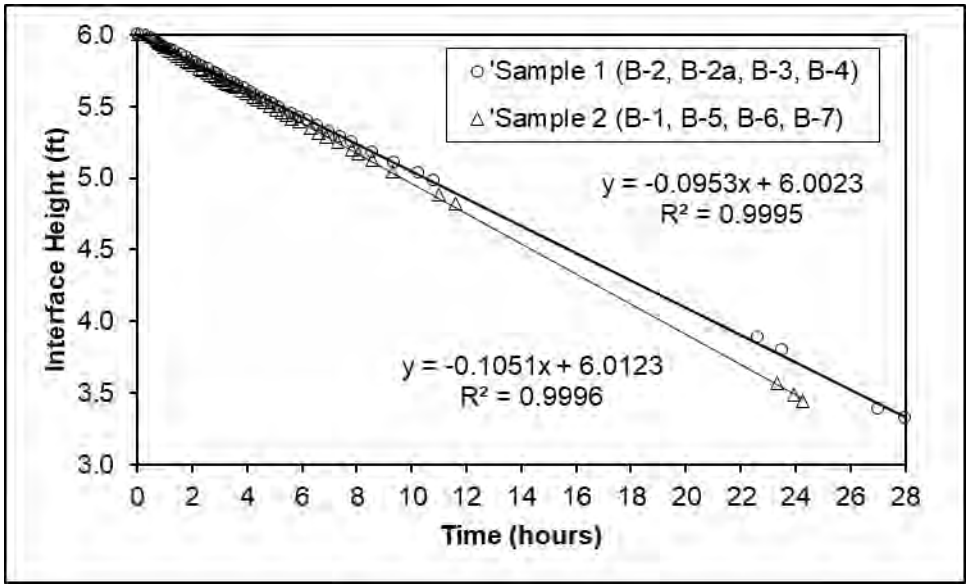


Figure 7: Interface height as a function of time during the zone settling portion of pilot-scale settling column tests with Samples 1 and 2.

Also for comparison purposes, the compression settling behavior of the settled solids in the two pilot-scale settling column tests is shown below in Figure 8. As shown in the figure, the two composited sediment samples exhibited very similar compression settling.

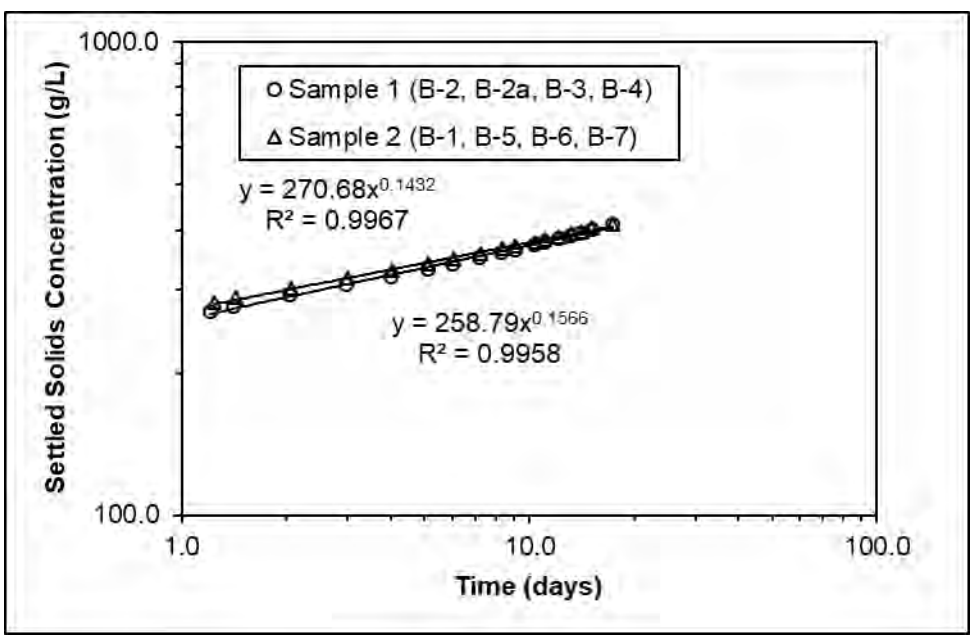


Figure 8: Concentration of settled solids as a function of time during the compression settling portion of the pilot-scale settling tests conducted with fine-grained sediment slurry.

3.0 References

[1] US Army Corps of Engineers (1987) *Engineering and Design - Confined Disposal of Dredged Material*, Engineer Manual No. 1110-2-5027.

[2] American Public Health Association (1998) *Standard Methods for the Examination of Water and Wastewater*, 20th Edition, American Water Works Association, Water Pollution Control Federation, Washington, DC.

Appendix A

GEOTECHNICAL CHAIN OF CUSTODY FORM

Project Name:	Island Road Marsh creation	Project Manager:	Jennie Aguettant
Project Number:	16715-040-03	Laboratory:	Baton Rouge
Date:	3/7/2018	Page:	1 of 1

Notes:

Please see below for laboratory testing assignments. Please save all samples and return the samples to GeoEngineers after testing.

Boring Number	Depth							Settling Column	
B-1									
B-2									
B-2a									
B-3	8 CRATES								
B-4									
B-5									
B-6									
B-7									
(5) BUCKETS OF SITE WATER									
S#1	Composite	B-2,	B-2a,	B-3,	B-4			X	
S#2	Composite	B-1,	B-5,	B-6,	B-7			X	

Report to: Jennifer Aguettant
jaguettant@geoengineers.com
PH # 225-439-9124 or 663-1511

Test Type
UU = Unconsolidated - Undrained Triaxial
U = Unconfined Compression
MC = Moisture Content
AL = Atterberg Limit
Sieve Analysis = Particle Size Analysis
-200 = #200 Wash

Settling Column Test

Released by:	[signature]	Date:	3/7/18
Accepted by:	William Moe	Date:	3/7/18
Released by:		Date:	
Accepted by:		Date:	

GEOENGINEERS

Appendix B

Table B1. Particulate concentrations measured in samples collected from side ports at the start (t=0) of the pilot-scale settling column test for Sample 1 (composited sediment from borings B-2, B-2a, B-3, and B-4).

Port height (ft)[a]	Particulate Conc. (g/L)
1.0	147.7
2.0	149.3
3.0	147.5
4.0	148.0
5.0	146.4
6.0	145.2
Average	**147.3**

[a] As measured from the bottom of the column

Table B2. Particulate concentrations measured in samples collected from side ports at the start (t=0) of the pilot-scale settling column test for Sample 2 (composited sediment from borings B-1, B-5, B-6, and B-7).

Port height (ft)[a]	Particulate Conc. (g/L)
1.0	152.3
2.0	152.4
3.0	151.1
4.0	150.3
5.0	151.0
6.0	150.6
Average	**151.3**

[a] As measured from the bottom of the column

Appendix C

Table C1. Interface height as a function of time during the pilot-scale column settling test for Sample 1 (borings B-2, B-2a, B-3, and B-4).

The height of the sediment-water interface above the bottom of the column was recorded as a function of time as summarized in the table below.

Elapsed Time (hr)	Elapsed Time (days)	Solids Interface Height (ft)	Head height (ft)	Settled Solids Conc. (g/L)[a]
0.00	0.000	6.000	6.000	147.3
0.30	0.013	5.992	6.000	147.5
0.48	0.020	5.975	6.000	147.9
0.63	0.026	5.958	6.000	148.3
0.73	0.031	5.942	6.000	148.7
0.85	0.035	5.925	6.000	149.2
0.95	0.040	5.917	6.000	149.4
1.02	0.042	5.908	6.000	149.6
1.18	0.049	5.900	6.000	149.8
1.33	0.056	5.883	6.000	150.2
1.62	0.067	5.858	6.000	150.9
1.80	0.075	5.842	6.000	151.3
2.00	0.083	5.817	6.000	151.9
2.10	0.088	5.808	6.000	152.2
2.25	0.094	5.792	6.000	152.6
2.35	0.098	5.783	6.000	152.8
2.58	0.108	5.758	6.000	153.5
2.82	0.117	5.733	6.000	154.2
2.90	0.121	5.725	6.000	154.4
3.05	0.127	5.708	6.000	154.8
3.28	0.137	5.683	6.000	155.5
3.50	0.146	5.667	6.000	156.0
3.67	0.153	5.650	6.000	156.4
3.90	0.163	5.625	6.000	157.1
4.12	0.172	5.600	6.000	157.8
4.28	0.178	5.583	6.000	158.3
4.50	0.188	5.558	6.000	159.0
4.68	0.195	5.542	6.000	159.5

[a] Calculated using equation 3-11 in ref. 1 based on the measured particulate concentrations at t=0 and the height of the sediment-water interface at each time interval.

Table C1. Continued from previous page.

Elapsed Time (hr)	Elapsed Time (days)	Solids Interface Height (ft)	Head height (ft)	Settled Solids Conc. (g/L) [a]
4.92	0.205	5.517	6.000	160.2
5.17	0.215	5.492	6.000	160.9
5.62	0.234	5.450	6.000	162.2
5.88	0.245	5.425	6.000	162.9
6.18	0.258	5.400	5.975	163.7
6.57	0.274	5.367	5.975	164.7
7.00	0.292	5.325	5.975	166.0
7.40	0.308	5.292	5.958	167.0
7.83	0.326	5.250	5.958	168.3
8.55	0.356	5.183	5.950	170.5
9.38	0.391	5.108	5.950	173.0
10.25	0.427	5.033	5.950	175.6
10.80	0.450	4.983	5.933	177.4
22.63	0.943	3.892	5.933	227.1
23.53	0.981	3.800	5.858	232.6
27.02	1.126	3.388	5.858	260.9
28.00	1.167	3.325	5.858	265.8
29.00	1.208	3.292	5.858	268.5
33.75	1.406	3.204	5.858	275.8
49.00	2.042	3.033	5.858	291.4
71.12	2.963	2.888	5.858	306.1
96.22	4.009	2.771	5.858	319.0
122.43	5.101	2.679	5.858	329.9
144.38	6.016	2.608	5.858	338.8
172.83	7.201	2.533	5.858	348.9
199.33	8.306	2.471	5.858	357.7
218.05	9.085	2.433	5.858	363.2
248.88	10.370	2.375	5.858	372.1
264.70	11.029	2.346	5.858	376.8
291.28	12.137	2.304	5.858	383.6
315.58	13.149	2.271	5.858	389.2
337.72	14.072	2.242	5.858	394.3
364.42	15.184	2.208	5.858	400.2
415.02	17.292	2.154	5.858	410.3

[a] Calculated using equation 3-11 in ref. 1 based on the measured particulate concentrations at t=0 and the height of the sediment-water interface at each time interval.

Table C2. Interface height as a function of time during the pilot-scale column settling test for Sample 2 (borings B-1, B-5, B-6, and B-7).

The height of the sediment-water interface above the bottom of the column was recorded as a function of time as summarized in the table below.

Elapsed Time (hr)	Elapsed Time (days)	Solids Interface Height (ft)	Head height (ft)	Settled Solids Conc. (g/L)[a]
0.00	0.000	6.000	6.000	151.3
0.48	0.020	5.983	6.000	151.7
0.72	0.030	5.958	6.000	152.4
0.78	0.033	5.950	6.000	152.6
0.83	0.035	5.942	6.000	152.8
0.90	0.038	5.933	6.000	153.0
1.02	0.042	5.917	6.000	153.4
1.18	0.049	5.892	6.000	154.1
1.35	0.056	5.867	6.000	154.7
1.47	0.061	5.850	6.000	155.2
1.60	0.067	5.833	6.000	155.6
1.82	0.076	5.817	6.000	156.1
1.88	0.078	5.808	6.000	156.3
2.03	0.085	5.792	6.000	156.7
2.28	0.095	5.758	6.000	157.6
2.35	0.098	5.750	6.000	157.9
2.53	0.106	5.733	6.000	158.3
2.70	0.113	5.717	6.000	158.8
2.80	0.117	5.708	6.000	159.0
2.98	0.124	5.692	6.000	159.5
3.07	0.128	5.683	6.000	159.7
3.18	0.133	5.667	6.000	160.2
3.30	0.138	5.658	6.000	160.4
3.48	0.145	5.642	6.000	160.9
3.55	0.148	5.633	6.000	161.1
3.78	0.158	5.608	6.000	161.9
3.97	0.165	5.592	6.000	162.3
4.22	0.176	5.567	6.000	163.1
4.38	0.183	5.550	6.000	163.6
4.60	0.192	5.525	6.000	164.3

[a] Calculated using equation 3-11 in ref. 1 based on the measured particulate concentrations at t=0 and the height of the sediment-water interface at each time interval.

Table C2. Continued from previous page.

Elapsed Time (hr)	Elapsed Time (days)	Solids Interface Height (ft)	Head height (ft)	Settled Solids Conc. (g/L)[a]
4.83	0.201	5.500	6.000	165.1
5.05	0.210	5.475	6.000	165.8
5.23	0.218	5.458	6.000	166.3
5.42	0.226	5.442	6.000	166.8
5.63	0.235	5.417	6.000	167.6
5.90	0.246	5.392	5.975	168.4
6.33	0.264	5.350	5.975	169.7
6.62	0.276	5.317	5.975	170.7
6.87	0.286	5.292	5.967	171.6
7.28	0.303	5.250	5.967	172.9
7.80	0.325	5.200	5.950	174.6
8.05	0.335	5.175	5.950	175.4
8.55	0.356	5.125	5.950	177.1
9.30	0.388	5.050	5.942	179.8
10.98	0.458	4.883	5.942	185.9
11.58	0.483	4.825	5.892	188.1
23.33	0.972	3.567	5.892	254.5
23.95	0.998	3.483	5.892	260.6
24.25	1.010	3.442	5.842	263.8
27.73	1.156	3.275	5.842	277.2
28.75	1.198	3.254	5.842	279.0
29.75	1.240	3.233	5.842	280.8
34.47	1.436	3.158	5.842	287.4
49.70	2.071	3.008	5.842	301.8
71.83	2.993	2.871	5.842	316.2
96.93	4.039	2.763	5.842	328.6
123.13	5.131	2.675	5.842	339.4
145.08	6.045	2.617	5.842	346.9
173.57	7.232	2.550	5.842	356.0
200.05	8.335	2.492	5.842	364.3
218.75	9.115	2.458	5.842	369.3
249.58	10.399	2.404	5.842	377.6

[a] Calculated using equation 3-11 in ref. 1 based on the measured particulate concentrations at t=0 and the height of the sediment-water interface at each time interval.

Table C2. Continued from previous page.

Elapsed Time (hr)	Elapsed Time (days)	Solids Interface Height (ft)	Head height (ft)	Settled Solids Conc. (g/L)[a]
265.40	11.058	2.379	5.842	381.6
292.00	12.167	2.346	5.842	387.0
316.30	13.179	2.308	5.842	393.3
338.43	14.101	2.283	5.842	397.6
365.13	15.214	2.254	5.842	402.7
415.73	17.322	2.200	5.842	412.6

[a] Calculated using equation 3-11 in ref. 1 based on the measured particulate concentrations at t=0 and the height of the sediment-water interface at each time interval.

Appendix D

Table D1. Total suspended solids (TSS) concentrations measured above the sediment-water interface for characterization of flocculent settling during the Sample 1 pilot-scale column settling test (composited sediment from borings B-2, B-2a, B-3, and B-4).

Sample Extraction Time (hr)	Port Height (ft)[a]	Head Height (ft)[a]	Depth of Sample Extraction (ft)[b]	TSS (mg/L)
6.0	5.50	6.00	0.50	58
7.0	5.50	5.98	0.48	37
8.0	5.50	5.96	0.46	31
10.5	5.50	5.95	0.45	25
23	5.50	5.93	0.43	<25[c]
23	5.00	5.93	0.93	<25[c]
23	4.50	5.93	1.43	<25[c]
23	4.00	5.93	1.93	<25[c]

[a] As measured from the bottom of the column

[b] Relative to the top liquid level

[c] The mass of dry residue retained on the filter was less than 2.5 mg (the minimum required for an acceptable analysis). The result is reported here as <25 mg/L [calculated as the minimum residue mass required for acceptable analysis, 2.5 mg, divided by the sample volume filtered (0.10 L)].

Table D2. Total suspended solids (TSS) concentrations measured above the sediment-water interface for characterization of flocculent settling during the Sample 2 pilot-scale column settling test (composited sediment from borings B-1, B-5, B-6, and B-7).

Sample Extraction Time (hr)	Port Height (ft)[a]	Head Height (ft)[a]	Depth of Sample Extraction (ft)[b]	TSS (mg/L)
5.7	5.50	6.00	0.50	56
6.7	5.50	5.98	0.48	46
7.7	5.50	5.97	0.47	41
8.7	5.50	5.95	0.45	36
11	5.50	5.94	0.44	<25[c]
11	5.00	5.94	0.94	25
24	5.50	5.89	0.39	<25[c]
24	5.00	5.89	0.89	<25[c]
24	4.50	5.89	1.39	<25[c]
24	4.00	5.89	1.89	<25[c]

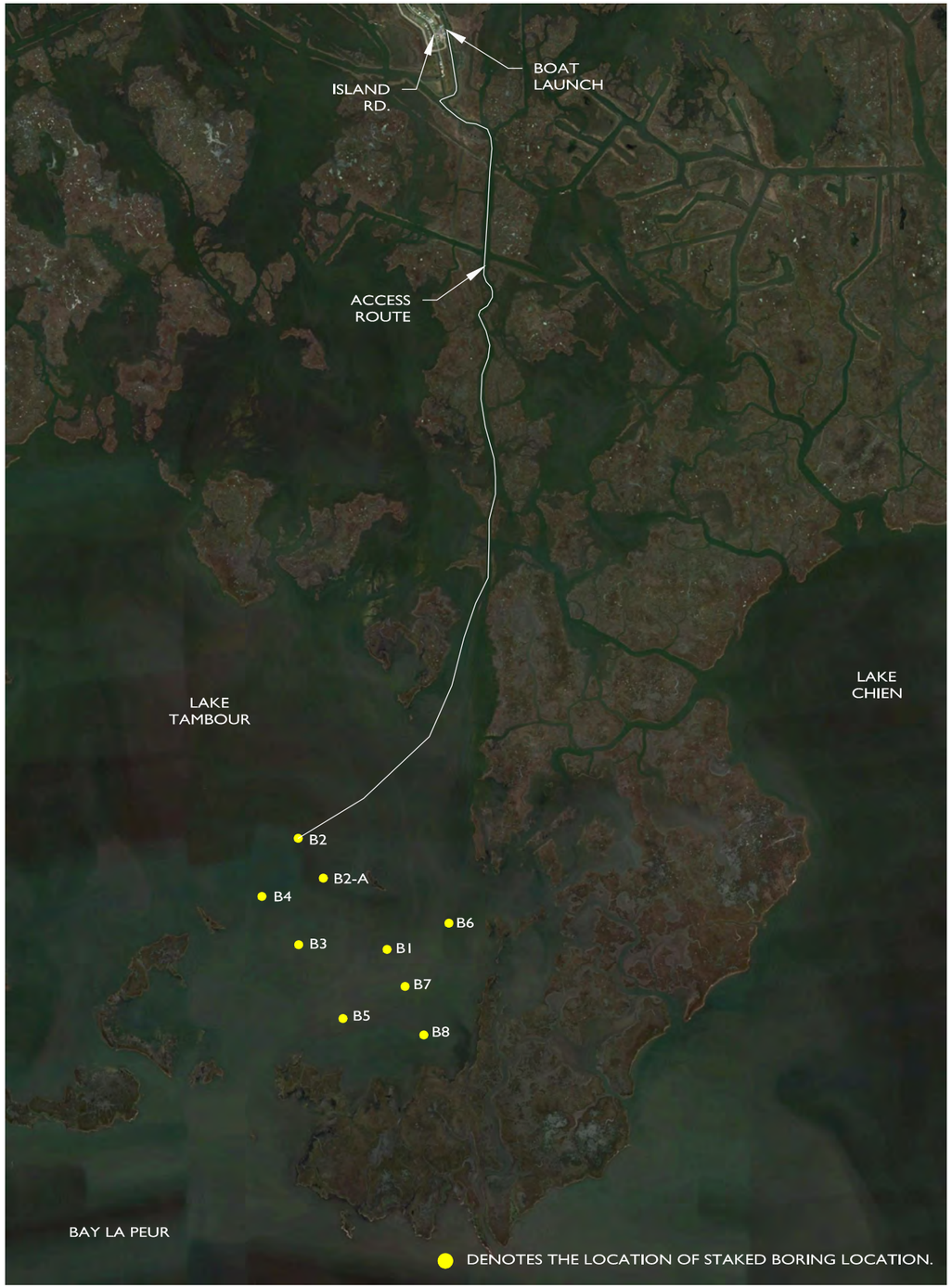
[a] As measured from the bottom of the column

[b] Relative to the top liquid level

[c] The mass of dry residue retained on the filter was less than 2.5 mg (the minimum required for an acceptable analysis). The result is reported here as <25 mg/L [calculated as the minimum residue mass required for acceptable analysis, 2.5 mg, divided by the sample volume filtered (0.10 L)].

APPENDIX D
Lonnie G. Harper and Associates Survey Report

TERREBONNE PARISH
LOUISIANA



1 BORING LOCATIONS

SCALE: 1" = 4,000'

POINT NUMBER	NORTHING (US SURVEY FEET)	EASTING (US SURVEY FEET)	LATTITUDE (NORTH)	LONGITUDE (WEST)	WATER BOTTOM ELEVATION	WATER DEPTH
B1	297,938.72	3,550,075.64	29° 18'59.49299"	90° 29' 18.64995"	-3.97	4.06
B2	301,095.81	3,547,548.02	29° 19' 30.92983"	90° 29' 46.94034"	-4.98	5.07
B2-A	299,963.83	3,548,265.59	29° 19' 19.67197"	90° 29' 38.92794"	-5.81	5.9
B3	298,066.75	3,547,557.60	29° 19' 00.94333"	90° 29' 47.08204"	-5.47	5.56
B4	299,442.26	3,546,513.27	29° 19' 14.63538"	90° 29' 58.76534"	-6.49	6.58
B5	295,967.86	3,548,821.00	29° 18' 40.07407"	90° 29' 32.98516"	-4.28	4.37
B6	298,678.53	3,551,832.66	29° 19' 06.68798"	90° 28' 58.74143"	-4.1	4.19
B7	296,882.75	3,550,586.19	29° 18' 49.00225"	90° 29' 12.97111"	-4.35	4.44
B8	295,502.77	3,551,119.49	29° 18' 35.30229"	90° 29' 07.06273"	-3.54	3.63
AVERAGE TOP OF WATER ELEVATION OBSERVED DURING FIELD SURVEY WAS +0.09 FT, NAVD 88.						

GENERAL NOTES

1. ALL DISTANCES AND ELEVATIONS ARE EXPRESSED IN TERMS OF FEET UNLESS OTHERWISE DENOTED.
2. THE HORIZONTAL COORDINATES AND ELEVATIONS ON THIS SURVEY ARE REFERENCED TO THE NATIONAL SPATIAL REFERENCE SYSTEM AND WERE DERIVED BY RECENT GPS OBSERVATIONS. THE HORIZONTAL AND VERTICAL DATUMS FOR THIS REFERENCE SYSTEM ARE NAD 83 AND NAVD 88, RESPECTIVELY. THE REFERENCE FRAME FOR NAD 83 AND NAVD 88 IS CURRENTLY 2011, MA11, PA11 (EPOCH 2010). THE NAVD 88 ELEVATIONS ARE BASED ON GEOID 12B. BASIS OF BEARINGS IS SPC LSZ-1702.
3. ALL COORDINATE CONVERSIONS FROM NAD 83 TO WGS84 LAT. & LONG. WERE PERFORMED USING NGS NADCON UTILITY SOFTWARE.
4. NO EASEMENTS OR UNDERGROUND UTILITIES WERE DETERMINED OR LOCATED DURING THIS SURVEY.
5. A MAGNETOMETER SURVEY WAS PERFORMED AROUND EACH OF THE BORING LOCATIONS SHOWN. NO UNDERGROUND UTILITIES OR OIL/GAS WELLS WERE DETECTED WITHIN 50 FEET OF THE LOCATIONS SHOWN.

NORTH ARROW

REVISION DATE	REVISED BY	DESCRIPTION

LONNIE G. HARPER & ASSOCIATES, INC.
CIVIL ENGINEERING AND LAND SURVEYING
2746 HWY. NO. 384, BELL CITY, LOUISIANA 70630
PHONE: (337) 905-1079 FAX: (337) 905-1076

BORING LOCATIONS

GEOENGINEERS, INC.
TE-117 ISLAND ROAD PROJECT
TERREBONNE PARISH, LOUISIANA

SEAL

STATE OF LOUISIANA
LONNIE G. HARPER
REG. NO. 4326
REGISTERED
02/18/2018
LAND SURVEYOR

LONNIE G. HARPER, P.L.S.
REG. NO. 4326
LONNIE G. HARPER & ASSOC., INC.
GRAND CHENIER, LOUISIANA

DRAWN BY C.L.W.	DATE 02/16/2018
DESIGNED BY C.L.W.	HOR. SCALE 1" = 4,000'
APPROVED BY L.G.H.	VERT. SCALE N.A.
PROJECT NO. 2018-09	SHEET 01 OF 01

APPENDIX E
Matrix New World Engineering Report

Matrix New World Engineering, Land Surveying and
Landscape Architecture, PC
4451 Bluebonnet Blvd., Suite E
Baton Rouge, LA 70809
www.Matrixneworld.com WBE/DBE/SBE
MATRIXNEWORLD
Engineering Progress

VIA ELECTRONIC MAIL
Jaguettant@geoengineers.com

February 22, 2018

Ms. Jennifer Aguettant, P.E.
Senior Geotechnical Engineer
GeoEngineers, Inc.
11955 Lakeland Park Blvd., Suite 100
Baton Rouge, LA 70809

Re: Geotechnical Drill Vessel Tracking across LDWF Oyster Leases for the Collection of Eight (8) 3"-Diameter Soil Boring Locations within the Proposed Borrow Location for Island Road Marsh Creation and Nourishment (TE-0117) project in Lake Tambour Area, Terrebonne Parish, Louisiana for GeoEngineers, Inc. (LDNR CUP# 20170975) Matrix Project No. 17-789

Dear Ms. Aguettant:

Matrix New World Engineering (Matrix) is submitting this vessel tracking report to GeoEngineers, Inc. (GeoEngineers) to document the tracking of geotechnical drilling equipment and vessels in relation to potential oyster lease liabilities of the above-mentioned project. The drilling equipment and vessels provided by Specialized Environmental Resources, Inc. (SER) accessed the eight (8) previously proposed and permitted core sample locations on February 19 and 20, 2018 from the Isle De Jean Charles Marina located near the end of Island Road in Terrebonne Parish, Louisiana. Matrix provided an Oyster Lease Damage Evaluation Board (OLDEB) certified oyster biologist, who utilized a Hemisphere A101 DGPS to collect real-time track data with Chesapeake SonarWiz 7.0 software. The biologist also took photographs and video, and logged the movements of the vessels across the oyster leases and access routes. Attached are **Figures 1** and **2**, which show the tracks taken by the vessels each day. **Attachments A** and **B** provide photographs and log notes, respectively.

Geotechnical Drilling at Sites B5 and B7 - February 19th, 2018

On February 19th, three (3) airboats were used to perform the geotechnical boring. One airboat was designed to carry the drilling apparatus, while the second and third airboats were utilized as support vessels carrying additional supplies and crew. Upon leaving the dock, all vessels tracked behind one another and followed the same track into the first sediment boring location, B5. The Matrix biologist

rode and recorded the track from the lead airboat. The airboats created no visible disturbance to the water bottom during access or while moving onto the B5 location. Upon arrival at the previously surveyed and staked sample location, the drill vessel utilized pole spuds to anchor into position and prepared to drill. During the drilling process, water and sediments were brought to the surface and onto the drill vessel with insignificant amounts of sediment being washed overboard throughout the sample collection process. Each core sample collected was transferred from the drill vessel to the support vessel and logged, plugged and capped by a GeoEngineers engineer. Upon completion of the sample collection at the B5 location, the vessels moved northeast to the B7 location. The drilling process remained the same and only negligible amounts of sediment were washed back into the lake during the drilling process. The winds were picking up throughout the day and wave heights were increasing. Also, with a water depth of approximately 5 feet, the airboats became unstable for drilling and maneuverability of the vessels was declining. The captains of the airboats decided the winds and water depths created an unsafe environment for the use of airboats and determined that the remaining sampling locations needed to be accessed with different vessels. After completing the sample collection at B7, the vessels returned to the launch. Times of travel and the vessel tracks are provided in the attached figures and log notes.

Geotechnical Drilling at Sites B6, B1, B3, B4, B2a and B2 - February 20th, 2018

The following day, February 20th, a 30'x8' pontoon deck boat, powered by two Suzuki 175 horsepower outboard engines, was used to pull (in a side-tow) a second 25'x8' pontoon drill barge. These vessels drafted approximately 1.5 to 2.0 feet and were a more stable option when drilling in water depths of 5 feet. The Matrix biologist rode and recorded the track of the deck boat. Access was made to Lake Tambour following the same route taken the day prior. The first drill location was B6 and again the drill barge was anchored at this location using two pole spuds. The drilling process remained the same as previously described and the remaining locations were accessed and sampled in the following order: B6, B1, B3, B4, B2a, and finally B2. Upon completion of the final sample collection, the vessels returned to the launch following the same route previously used. Times of travel and the vessel tracks are provided in the attached figures and log notes.

Biologist Observations

No water bottom impacts were observed by the biologist while the vessels were moving across oyster leases within the sample collection area. The access route from the dock to the sample collection area is a well-traveled navigable waterway (Bayou St. Jean Charles), in which oyster leases are also located. No

water bottom impacts were observed by the biologist while the vessels traversed these leases. No oystermen or vessels approached the project area during drilling or moving between locations. Portions of the access route and vessel tracks were also recorded on video and will be included on a DVD with this report.

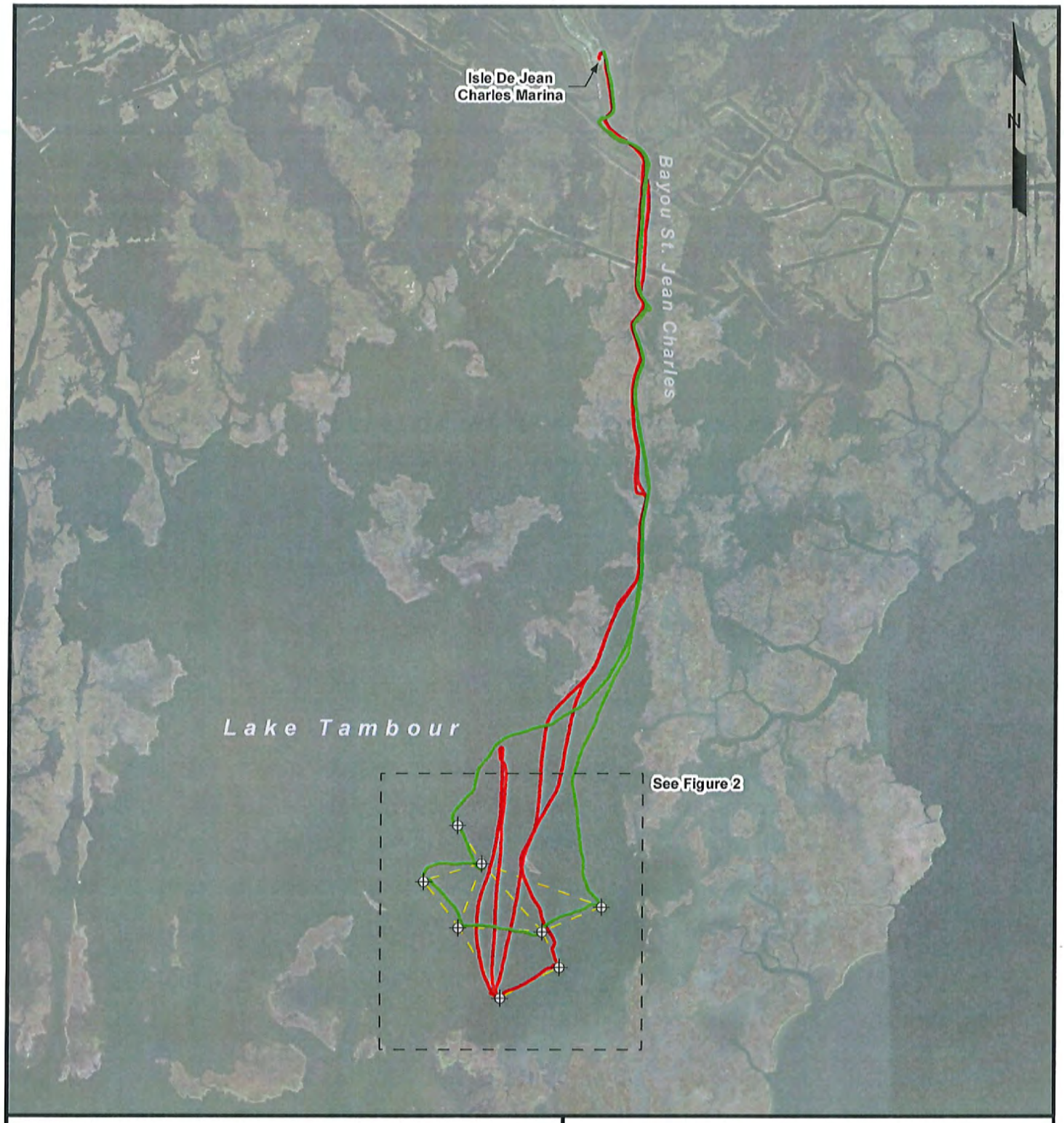
Matrix appreciates the opportunity to assist GeoEngineers with this project. If you have any questions regarding the recorded vessels tracks, daily log or require additional information, please do not hesitate to contact me at (225) 304-1563 or by email sroy@matrixneworld.com.

Sincerely,

Sarah K. Roy

Sarah Roy
Marine Services Manager

FIGURES



Legend

- Geotechnical Drilling Rig Track (2/19/2018)
- Geotechnical Drilling Rig Track (2/20/2018)
- Permitted Access Routes
- Boring Location

Source: Base map comprised of ESRI World Imagery.

Access Overview Map

Geotechnical Drilling Rig Track Across Lake Tambour
Lake Tambour Area, Terrebonne Parish, Louisiana

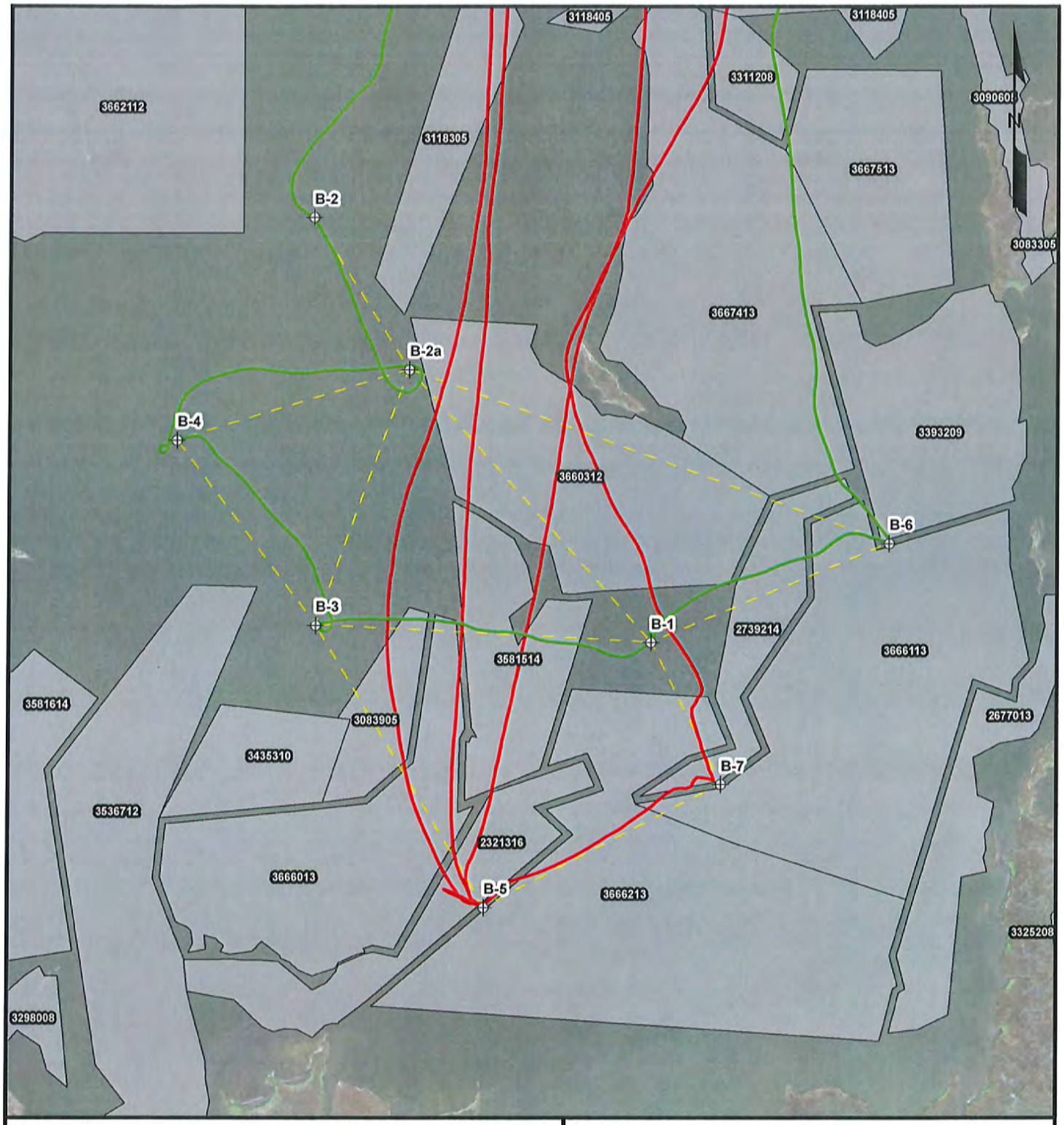
GeoEngineers, Inc.
Island Road Marsh Creation Project (TE-0117)

4,000 2,000 0 4,000 Feet

MATRIXNEWORLD
Engineering Progress

Approved By	SKR
Date	2/21/2018
Drawing No.	17-789-A003

1
Figure No.



Legend

- Geotechnical Drilling Rig Track (2/19/2018)
- Geotechnical Drilling Rig Track (2/20/2018)
- Permitted Access Routes
- Boring Locations
- Oyster Leases

Source: Base map comprised of ESRI World Imagery.

Access Detail Map

Geotechnical Drilling Rig Track Across Lake Tambour
Lake Tambour Area, Terrebonne Parish, Louisiana

GeoEngineers, Inc.
Island Road Marsh Creation Project (TE-0117)

1,000 500 0 1,000 Feet

MATRIXNEWORLD
Engineering Progress

Approved By	SKR
Date	2/21/2018
Drawing No.	17-789-A004

2
Figure No.

ATTACHMENT A
PHOTOGRAPHS

MATRIXNEWORLD
Engineering Progress

	GEOENGINEERS, INC.
Site Name:	Island Road Marsh Creation Project (TE-0117) Sediment Boring Vessel Track
Site Location:	Lake Tambour, Terrebonne Parish, Louisiana
Date:	February 19, 2018

Photograph: 1

Direction:

South

Comments:

Heading down Bayou St. Jean Charles.

Photograph: 2

Direction:

Northeast

Comments:

Looking at drill airboat and support airboat moving onto location at B7.

MATRIXNEWORLD
Engineering Progress

	GEOENGINEERS, INC.
Site Name:	Island Road Marsh Creation Project (TE-0117) Sediment Boring Vessel Track
Site Location:	Lake Tambour, Terrebonne Parish, Louisiana
Date:	February 19, 2018

Photograph: 3

Direction:

Southwest

Comments:

Drill airboat and support airboat on location at B7.

Photograph: 4

Direction:

West

Comments:

Drill airboat moving from B7 to B5 location.

	GEOENGINEERS, INC.
Site Name:	Island Road Marsh Creation Project (TE-0117) Sediment Boring Vessel Track
Site Location:	Lake Tambour, Terrebonne Parish, Louisiana
Date:	February 20, 2018

Photograph: 5

Direction:

Southwest

Comments:

View of larger pontoon boat (Lillian B) with smaller drill barge tied to starboard side in tow from Isle De Jean Charles Marina.

Photograph: 6

Direction:

North

Comments:

View of Lillian B pontoon boat wake as it is headed south into Bayou St. Jean Charles.

MATRIXNEWORLD
Engineering Progress

	GEOENGINEERS, INC.
Site Name:	Island Road Marsh Creation Project (TE-0117) Sediment Boring Vessel Track
Site Location:	Lake Tambour, Terrebonne Parish, Louisiana
Date:	February 20, 2018

Photograph: 7

Direction:

Northeast

Comments:

View of Lillian B pontoon boat wake as it is headed down Bayou St. Jean Charles.

Photograph: 8

Direction:

West

Comments:

View of Lillian B pontoon boat wake as it is crossing leases from B6 to B1.

ATTACHMENT B
VESSEL TRACK DAILY LOG

Oyster Biologist Log Record of Vessel Track for GeoEngineers, Inc. 8 Sediment Boring Locations in Lake Tambour, Terrebonne Parish, LA for CPRA Island Road Marsh Creation (TE-0117) Borrow Area

Entered By	Entry Date	Latitude	Longitude	Log Entry
S. Roy	2/19/18	29° 18.66867' N	090° 29.55397' W	0845 mobilized with GeoEngineers (Erich), 3 SER Airboats (1 driller, 2 support), SER employees at Isle De Jean Charles Marina
S. Roy	2/19/18	29° 18.66828' N	090° 29.55423' W	0909 Left Isle De Jean Charles Marina, headed to B5 location
S. Roy	2/19/18	29° 18.66856' N	090° 29.55386' W	0930 arrived at B5 location
S. Roy	2/19/18	29° 18.66861' N	090° 29.55448' W	0945 Left B5 location to go get lost bucket - back to B5 location, drilling to begin at B5
S. Roy	2/19/18	29° 18.67536' N	090° 29.56980' W	1033 Finished at B5 location move to B7 location
S. Roy	2/19/18	29° 18.82002' N	090° 29.22042' W	1047 arrived and begin drill at B7
S. Roy	2/19/18	29° 18.82052' N	090° 29.22032' W	1123 finished at B7, winds picking up, unsafe to continue drilling today, headed back to dock
S. Roy	2/19/18	29° 23.29594' N	090° 28.95715' W	1151 arrived at dock, work today cancelled due to unsafe conditions
S. Roy	2/20/18	29° 23.30663' N	090° 28.95912' W	0943 mobilized @ Isle De Jean Charles Marina dock with the 30x8 pontoon vessel Lillian B (2 Suzuki Outboard 175hp motors) and a 25'x10' drill barge (pontoon) will be towed along side Lillian B. All vessels owned and operated by SER.
S. Roy	2/20/18	29° 19.11407' N	090° 28.97630' W	1043 arrived and begin drill at B6
S. Roy	2/20/18	29° 19.11363' N	090° 28.97636' W	1124 finished at B6 location, moving to B1
S. Roy	2/20/18	29° 18.99298' N	090° 29.30625' W	1135 arrived and begin drill at B1
S. Roy	2/20/18	29° 18.99021' N	090° 29.31278' W	1206 finished at B1, headed to B3
S. Roy	2/20/18	29° 19.01584' N	090° 29.78072' W	1211 arrived and begin drill at B3
S. Roy	2/20/18	29° 19.01153' N	090° 29.76261' W	1242 finished at B3, headed to B4
S. Roy	2/20/18	29° 19.24299' N	090° 29.97648' W	1246 arrived and begin drill at B4

Oyster Biologist Log Record of Vessel Track for GeoEngineers, Inc. 8 Sediment Boring Locations in Lake Tambour, Terrebonne Parish, LA for CPRA Island Road Marsh Creation (TE-0117) Borrow Area

Entered By	Entry Date	Latitude	Longitude	Log Entry
S. Roy	2/20/18	29° 19.23797' N	090° 29.99491' W	1328 finished at B4, headed to B2a
S. Roy	2/20/18	29° 19.33257' N	090° 29.64710' W	1333 arrived and begin drill at B2a
S. Roy	2/20/18	29° 19.32757' N	090° 29.63561' W	1417 finished at B2a, headed to B2
S. Roy	2/20/18	29° 19.51634' N	090° 29.78807' W	1421 arrived and begin drill at B2
S. Roy	2/20/18	29° 19.51667' N	090° 29.78943' W	1453 finished at B2, all drill sites accessed and completed, returning to dock
S. Roy	2/20/18	29° 23.29562' N	090° 28.95286' W	1539 returned to dock, tracks saved and project complete

APPENDIX F
Report Limitations and Guidelines for Use

APPENDIX F
REPORT LIMITATIONS AND GUIDELINES FOR USE

This appendix provides information to help you manage your risks with respect to the use of this report.

Geotechnical Services Are Performed for Specific Purposes, Persons and Projects

This report has been prepared for the Coastal Protection and Restoration Authority (CPRA). The information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. No party other than CPRA, may rely on the product of our services unless we agree to such reliance in advance and in writing. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted geotechnical practices in this area at the time this report was prepared. Use of this report is not recommended for any purpose or project except the one originally contemplated.

A Geotechnical Engineering or Geologic Report Is Based on a Unique Set of Project-Specific Factors

This report has been prepared for the Island Road Marsh Creation and Nourishment (TE-117) project located in Terrebonne Parish, Louisiana. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure;
- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or
- project ownership.

If important changes are made after the date of this report, we recommend that GeoEngineers be given the opportunity to review our interpretations and recommendations. Based on that review, we can provide written modifications or confirmation, as appropriate.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by man-made events such as construction on or adjacent to the site, or by natural events such as hurricanes, floods, earthquakes, slope instability or groundwater fluctuations. If more than a few months have passed since issuance of our report or

work product, or if any of the described events may have occurred, please contact GeoEngineers before applying this report for its intended purpose so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

Most Geotechnical and Geologic Findings Are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies the specific subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an informed opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

Geotechnical Engineering Report Recommendations Are Not Final

The construction recommendations included in this report are preliminary and should not be considered final. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers is unable to assume responsibility for the recommendations in this report without performing construction observation.

We recommend that you allow sufficient monitoring, testing and consultation during construction by GeoEngineers to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes if the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions.

A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

Misinterpretation of this report by members of the design team or by contractors can result in costly problems. GeoEngineers can help reduce the risks of misinterpretation by conferring with appropriate members of the design team after submitting the report, reviewing pertinent elements of the design team's plans and specifications, participating in pre-bid and preconstruction conferences, and providing construction observation.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. The logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Photographic or electronic reproduction is acceptable, but separating logs from the report can create a risk of misinterpretation.

Give Contractors a Complete Report and Guidance

To help prevent costly problems associated with unanticipated subsurface conditions, we recommend giving contractors the complete geotechnical engineering or geologic report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report's accuracy is limited. In addition, encourage them to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer.

Contractors Are Responsible for Site Safety on Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and adjacent properties.

Read These Provisions Closely

It is important to recognize that the geoscience practices (geotechnical engineering, geology and environmental science) are less exact than other engineering and natural science disciplines. Without this understanding, there may be expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory "limitations" provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you need to know more how these "Report Limitations and Guidelines for Use" apply to your project or site.

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants, and no conclusions or inferences should be drawn regarding Biological Pollutants as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria and viruses, and/or any of their byproducts.

A Client that desires these specialized services is advised to obtain them from a consultant who offers services in this specialized field.

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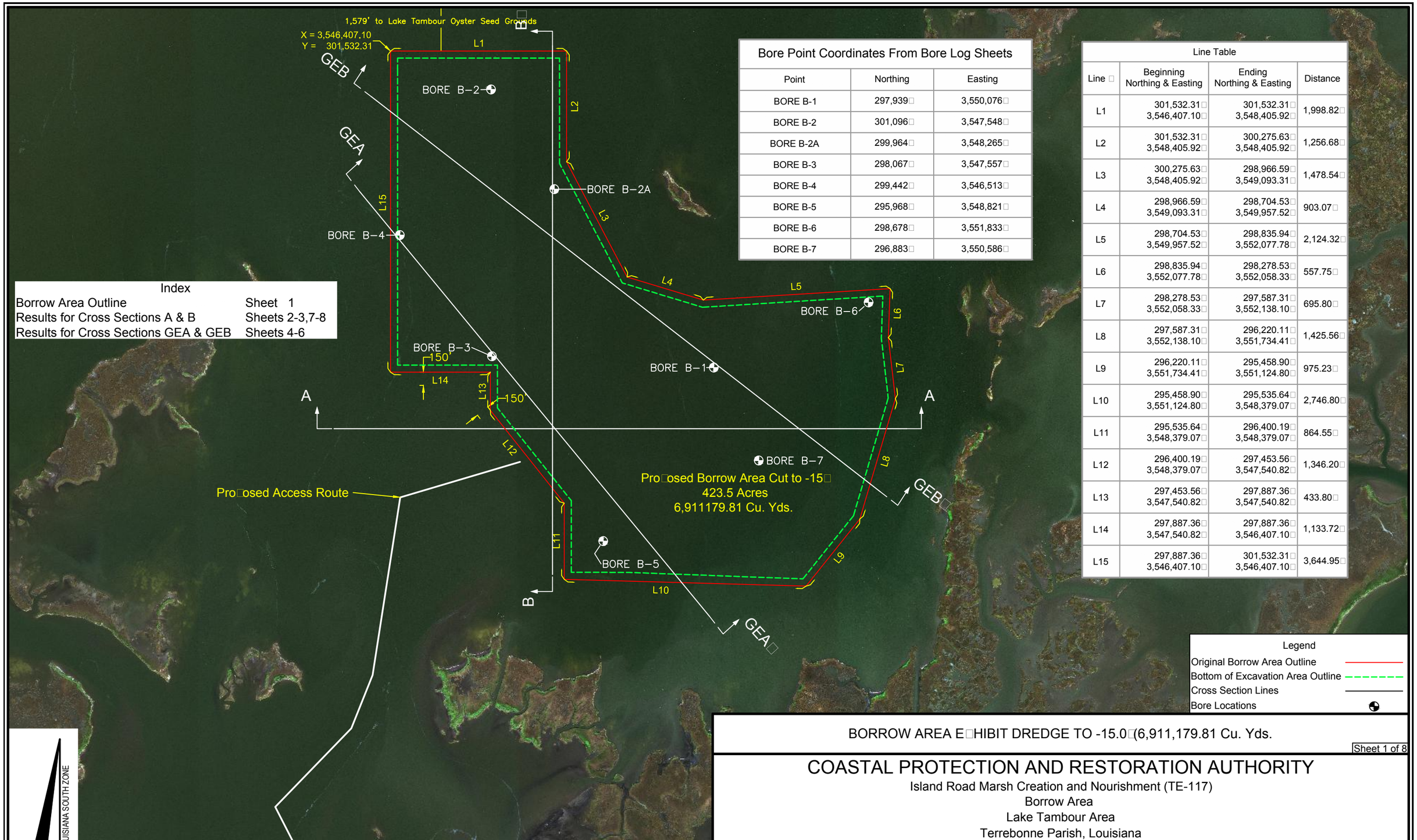
GeoEngineers

Island Road Marsh Creation and Nourishment Project (TE-117)

APPENDIX 2

C.H. Fenstermaker and Associates, LLC

Borrow Area Layout and Profiles



Index	
Borrow Area Outline	Sheet 1
Results for Cross Sections A & B	Sheets 2-3,7-8
Results for Cross Sections GEA & GEB	Sheets 4-6

Bore Point Coordinates From Bore Log Sheets

Point	Northing	Easting
BORE B-1	297,939	3,550,076
BORE B-2	301,096	3,547,548
BORE B-2A	299,964	3,548,265
BORE B-3	298,067	3,547,557
BORE B-4	299,442	3,546,513
BORE B-5	295,968	3,548,821
BORE B-6	298,678	3,551,833
BORE B-7	296,883	3,550,586

Line Table

Line	Beginning Northing & Easting	Ending Northing & Easting	Distance
L1	301,532.31 3,546,407.10	301,532.31 3,548,405.92	1,998.82
L2	301,532.31 3,548,405.92	300,275.63 3,548,405.92	1,256.68
L3	300,275.63 3,548,405.92	298,966.59 3,549,093.31	1,478.54
L4	298,966.59 3,549,093.31	298,704.53 3,549,957.52	903.07
L5	298,704.53 3,549,957.52	298,835.94 3,552,077.78	2,124.32
L6	298,835.94 3,552,077.78	298,278.53 3,552,058.33	557.75
L7	298,278.53 3,552,058.33	297,587.31 3,552,138.10	695.80
L8	297,587.31 3,552,138.10	296,220.11 3,551,734.41	1,425.56
L9	296,220.11 3,551,734.41	295,458.90 3,551,124.80	975.23
L10	295,458.90 3,551,124.80	295,535.64 3,548,379.07	2,746.80
L11	295,535.64 3,548,379.07	296,400.19 3,548,379.07	864.55
L12	296,400.19 3,548,379.07	297,453.56 3,547,540.82	1,346.20
L13	297,453.56 3,547,540.82	297,887.36 3,547,540.82	433.80
L14	297,887.36 3,547,540.82	297,887.36 3,546,407.10	1,133.72
L15	297,887.36 3,546,407.10	301,532.31 3,546,407.10	3,644.95

Legend

- Original Borrow Area Outline
- Bottom of Excavation Area Outline
- Cross Section Lines
- Bore Locations

NAD 83 LOUISIANA SOUTH ZONE

Scale: 1" = 1,000

1,000 0 500 1,000

NOTE: This plat is not a boundary, route or unitization survey, and as such, does not comply with the "Standards of Practice for Property Boundary Surveys, Route Surveys and/or Unitization Surveys" as adopted by the Louisiana Professional Engineering & Land Surveying Board.

BORROW AREA EXHIBIT DREDGE TO -15.0 (6,911,179.81 Cu. Yds.

Sheet 1 of 8

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
Terrebonne Parish, Louisiana

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	REVISIONS			
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PROJ. MGR.: DA				
DATE: 05/17/2018				

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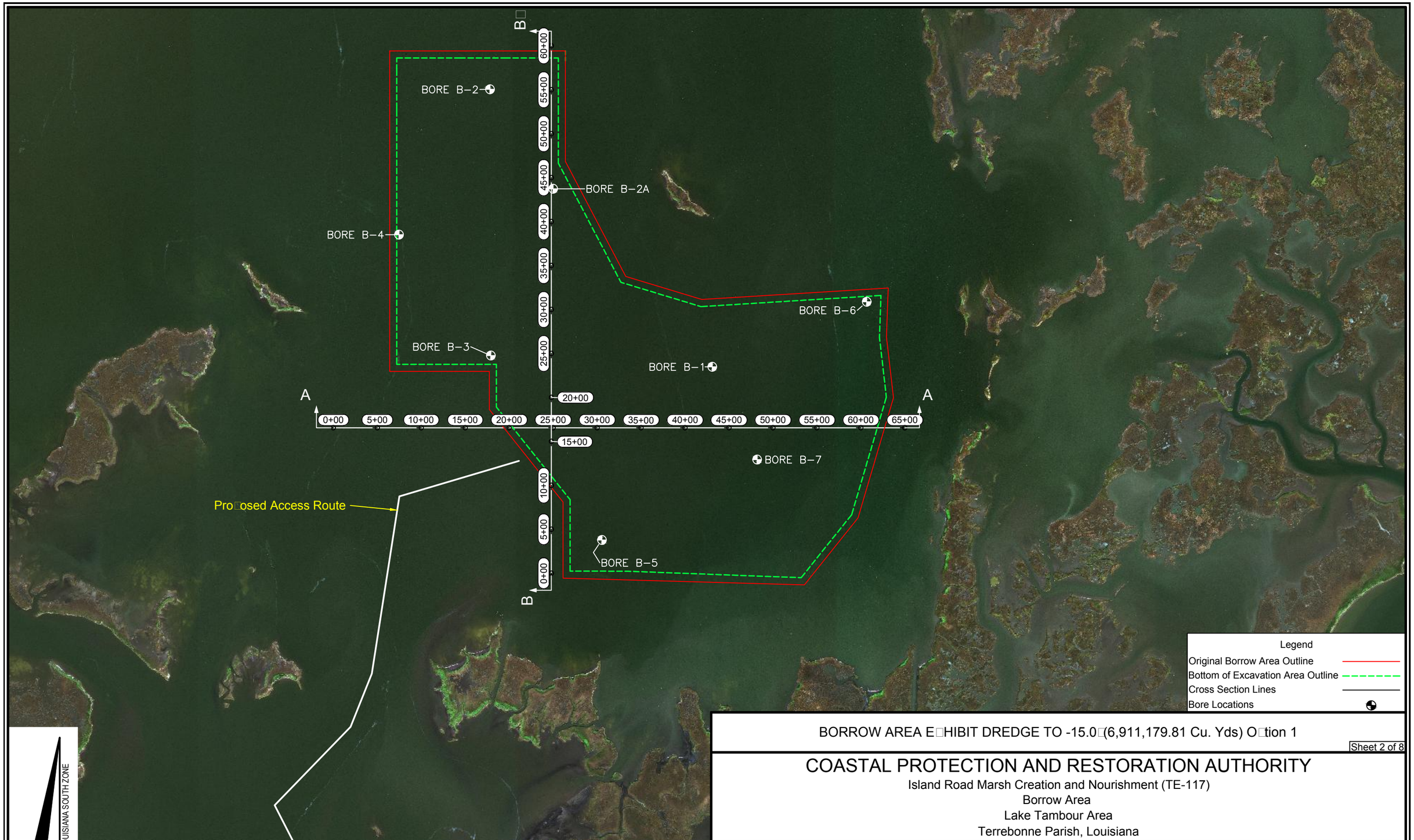

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BORROW AREA EXHIBIT DREDGE TO -15.0 (6,911,179.81 Cu. Yds) Option 1

Sheet 2 of 8

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
Terrebonne Parish, Louisiana

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A-A

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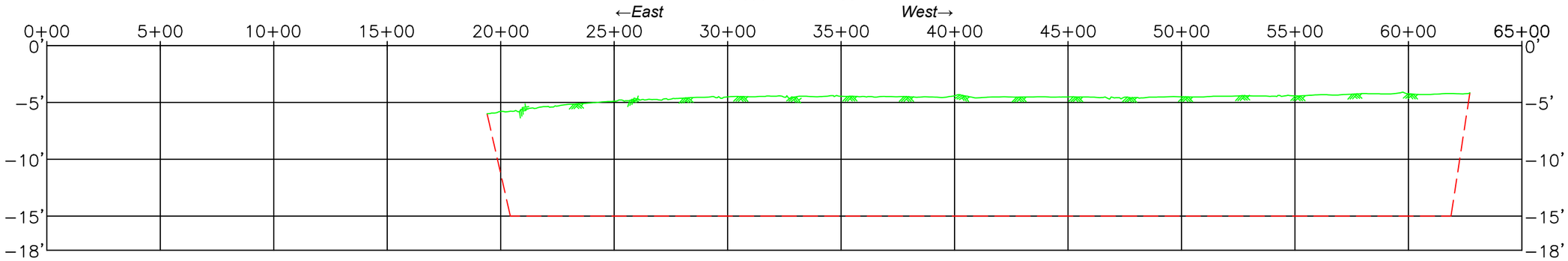
Vertical Scale 1" = 10'
Elevation = NAVD88



B-B

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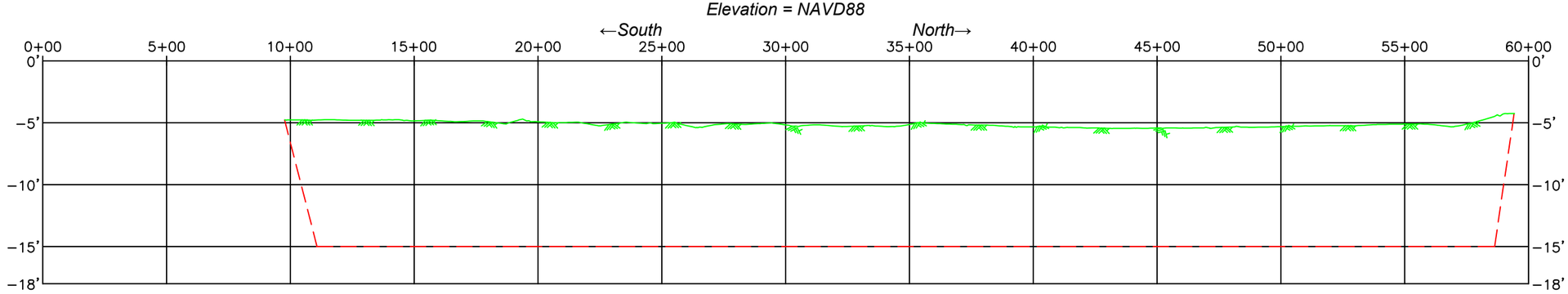
Vertical Scale 1" = 10'
Elevation = NAVD88



NOTE: This plat is not a boundary, route or unitization survey, and as such, does not comply with the "Standards of Practice for Property Boundary Surveys, Route Surveys and/or Unitization Surveys" as adopted by the Louisiana Professional Engineering & Land Surveying Board.

Legend

Existing Water Bottoms

Pro□osed Borrow De□th

BORROW AREA E□HIBIT DREDGE TO -15.0□O□tion 1

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 3 of 8

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NAD 83 LOUISIANA SOUTH ZONE

Scale: 1" = 1,000□

1,000□ 0 500□ 1,000□

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BORE POINT E□HIBIT

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)

BORE LOCATIONS

Lake Tambour Area

Terrebonne Parish, Louisiana

Sheet 4 of 8

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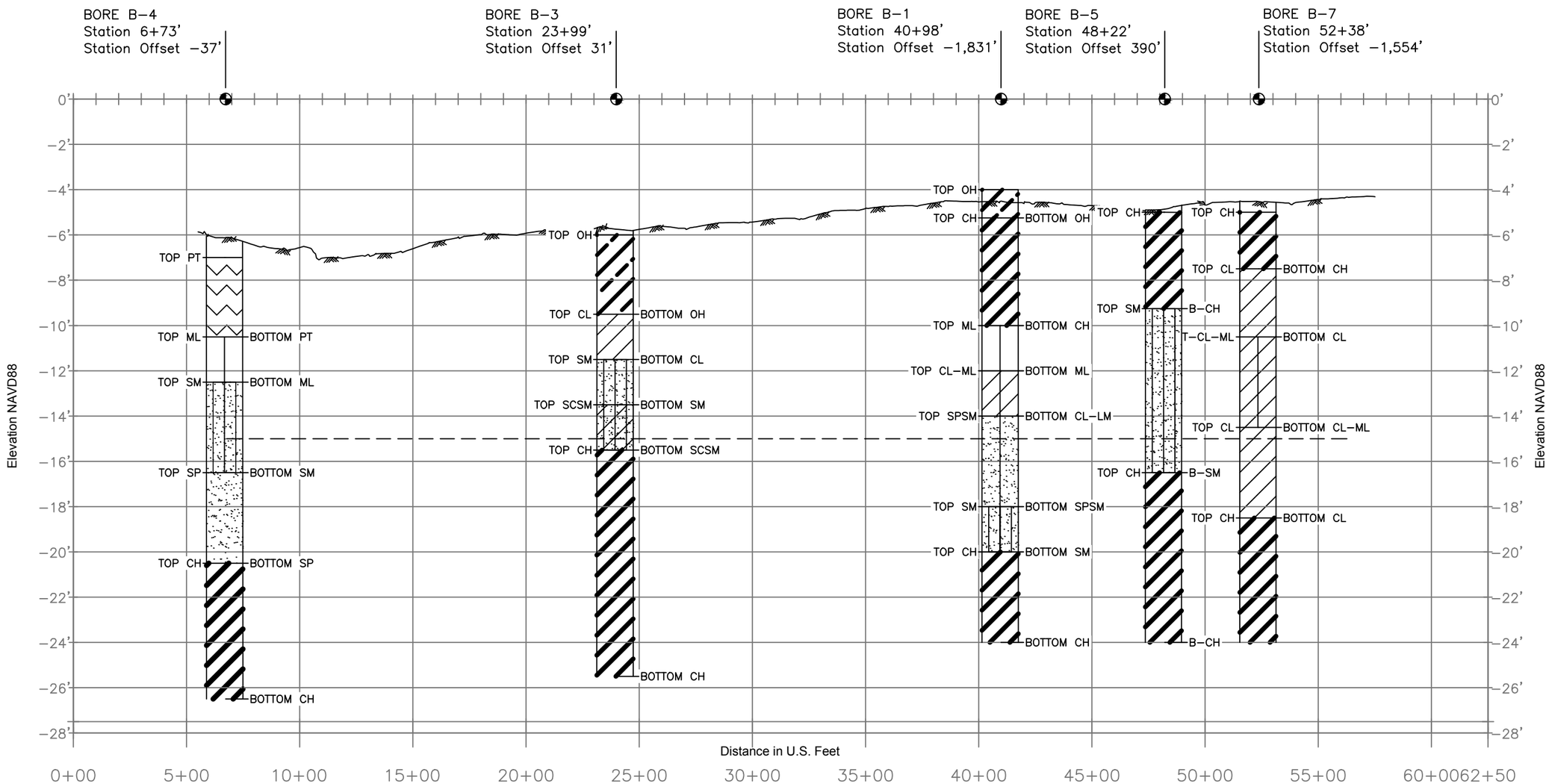
GEA

Horizontal Scale 1" = 500'

Vertical Scale 1" = 5'

Elevation = NAVD88

←Northwesterly *Southeasterly→*



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Legend

Existing Water Bottoms

Pro□osed Borrow De□th

Grou□ Classifications

PT		OH	
ML		CL	
SM		SCSM	
SP		CL=ML	
CH			

BORROW AREA E□HIBIT DREDGE TO -15.0□O□tion 1

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)

Borrow Area

Lake Tambour Area

Terrebonne Parish, Louisiana

Sheet 5 of 8

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GEB

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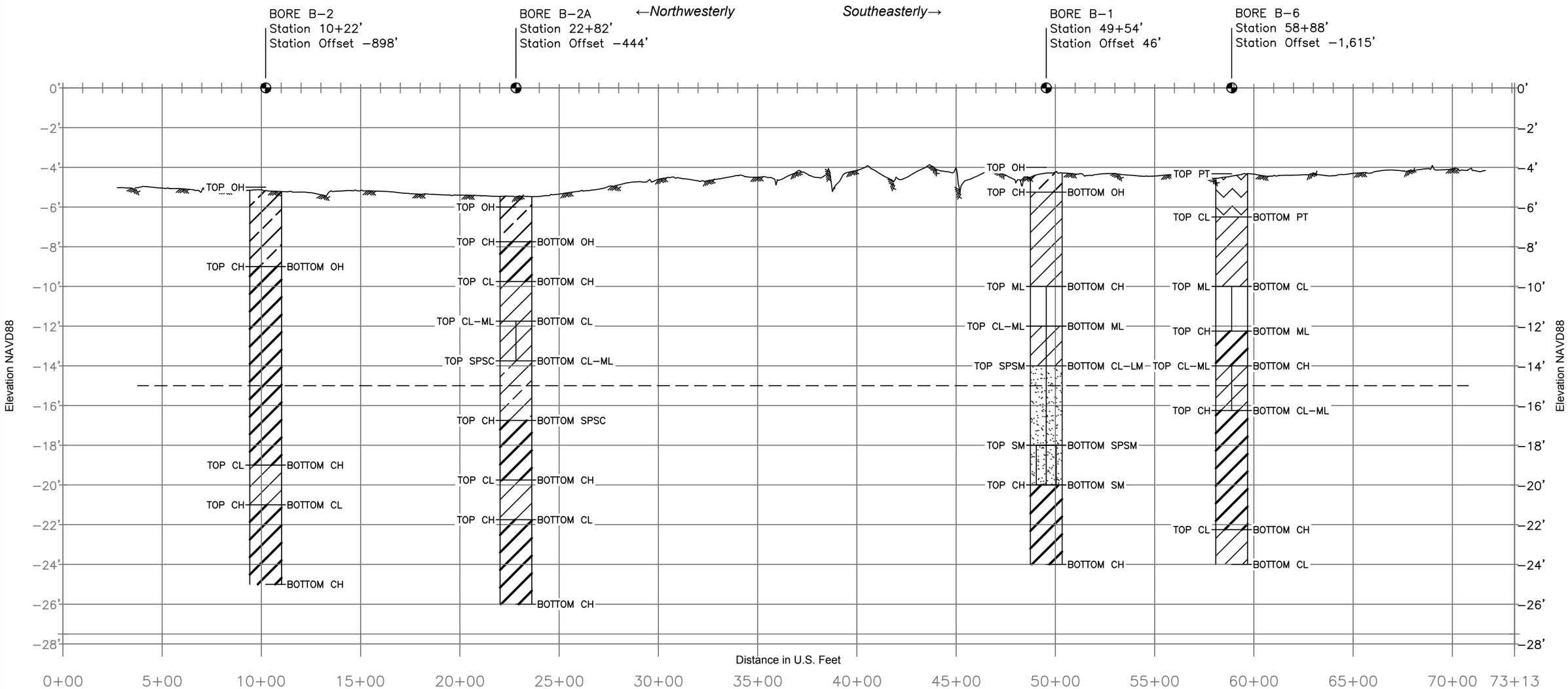
Vertical Scale 1" = 5'

Elevation = NAVD88



Legend

Existing Water Bottoms

Pro□osed Borrow Area

Grou□ Classifications

CH		PT	
CL		SM	
CL-ML		SPSC	
ML		SPSM	
OH			

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BORROW AREA E□HIBIT DREDGE TO -15.0□O□tion 1

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)

Borrow Area

Lake Tambour Area

Terrebonne Parish, Louisiana

Sheet 6 of 8

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A-A

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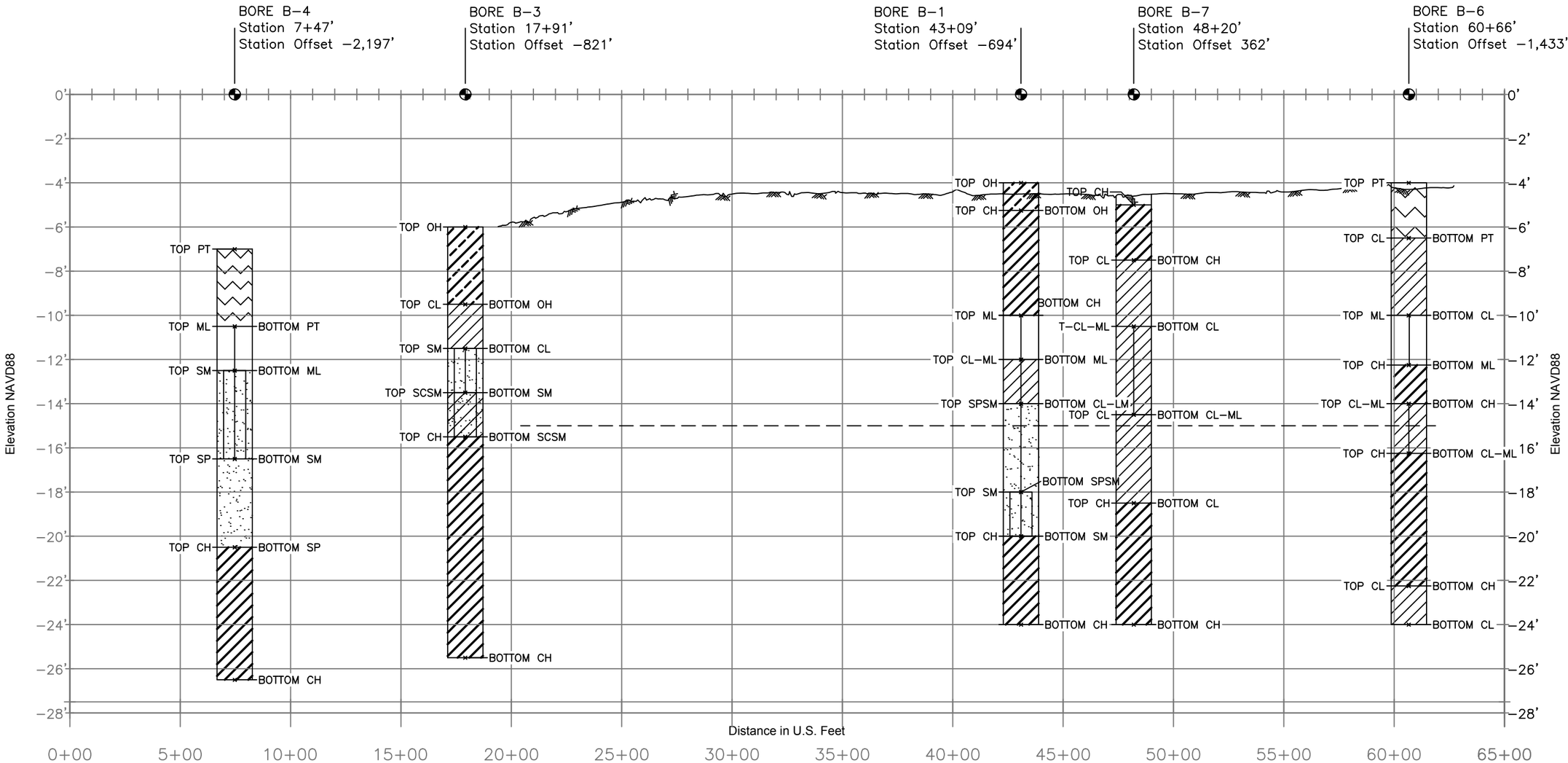
Vertical Scale 1" = 5'
Elevation = NAVD88

←Northwesterly *Southeasterly→*



Legend

Existing Water Bottoms

Pro□osed Borrow De□th

Grou□ Classifications

CH		SM	
CL		SCSM	
CL-ML		SPSM	
OH		PT	
SP		ML	

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BORROW AREA E□HIBIT DREDGE TO -15.0□O□tion 1

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 7 of 8

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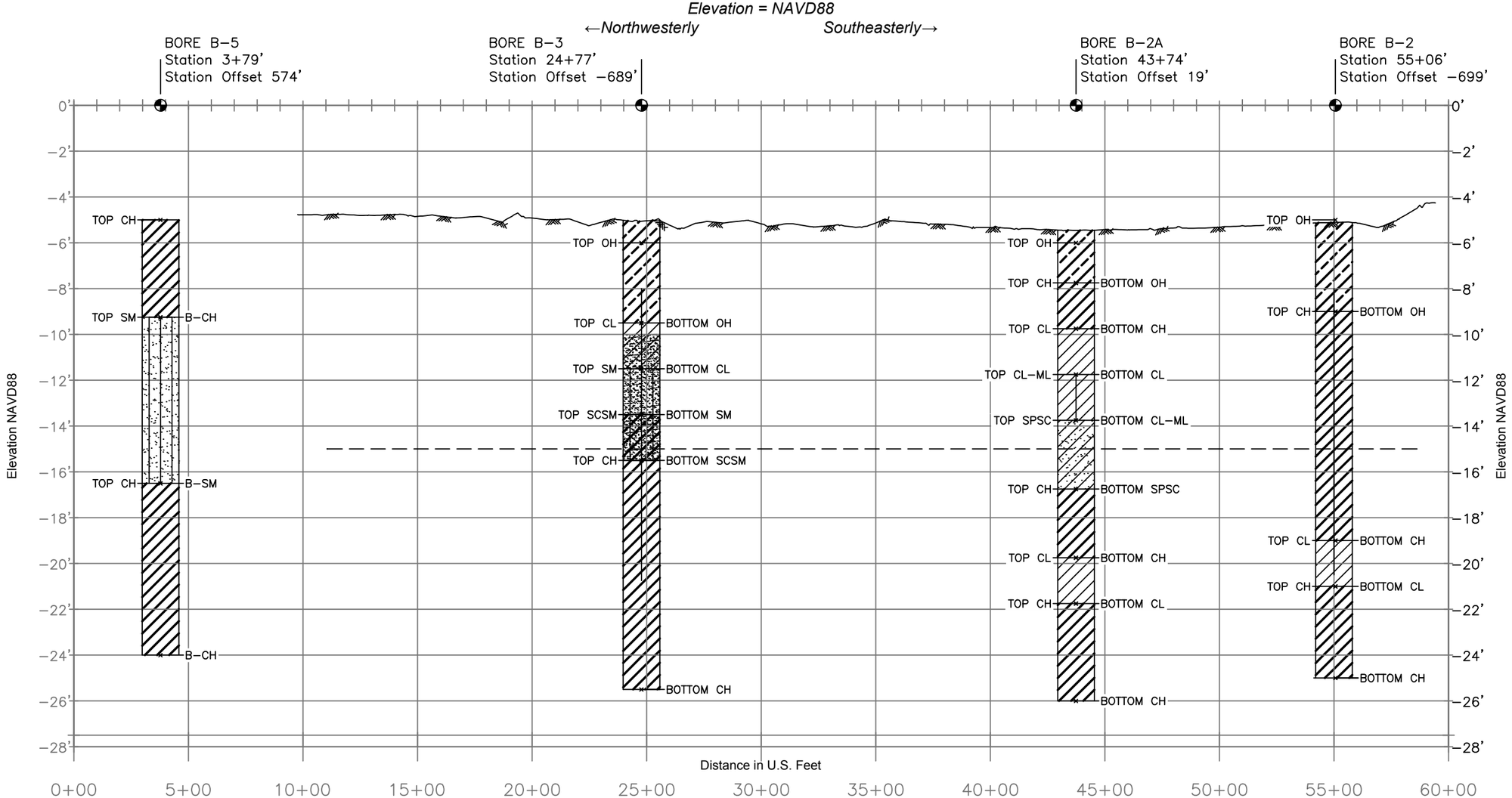
Elevation = NAVD88



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Grou□ Classifications

CH		SM	
CL		SCSM	
CL-ML		SPSC	
OH			

Legend

Existing Water Bottoms	
Pro□osed Borrow De□th	

BORROW AREA E□HIBIT DREDGE TO -15.0□O□tion 1

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
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Sheet 8 of 8

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1.6) TE-117 Cultural Resources Report of Negative Findings

NEGATIVE FINDINGS REPORT FOR MONITORING REMOTE SENSING FOR THE ISLAND ROAD MARSH CREATION PROJECT (TE-117), TERREBONNE PARISH, LOUISIANA

By
Rhonda L. Smith, Dorion Ray, and Elizabeth Seleen

Report Submitted by

Jill-Karen Yakubik, Ph.D., RPA
Principal Investigator

Earth Search, Inc.
P.O. Box 770336
New Orleans, LA 70177-0336

Prepared for

C.H. Fenstermaker & Associates, LLC
135 Regency Square
Lafayette, LA 70508

March 2017

CHAPTER 1
INTRODUCTION

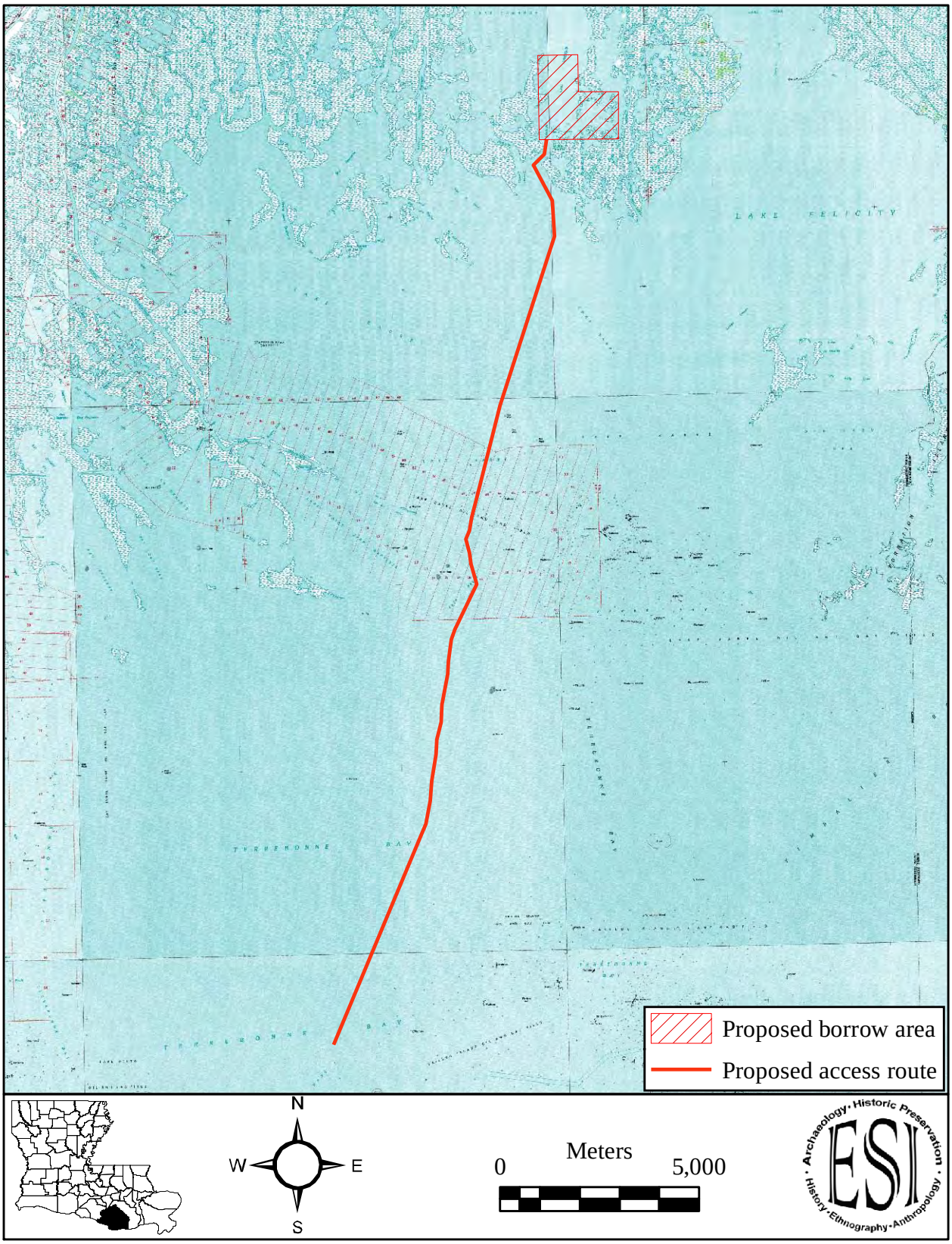
Earth Search, Inc. (ESI), monitored the single-beam bathymetry, magnetometer surveys, and anomaly probing undertaken by C.H. Fenstermaker & Associates, LLC for the Island Road Marsh Creation Project (TE-117) in Terrebonne Parish, Louisiana. The work was performed for the Coastal Protection and Restoration Authority (CPRA). CPRA proposes to borrow soils from the southern end of Lake Tambour and use these for "the creation and/or nourishment of approximately 383 acres of emergent saline marsh that will form a land bridge along portions of the perimeter of Cutoff Canal, Twin Pipelines Canals, and Island Road" (CPRA Project Sheet 2017). Throughout the surveys and probing an archaeologist from ESI was present on the boat to identify, investigate, and report the possibility of cultural deposits and artifacts. Such cultural features would include wrecks and submerged middens.

Project Area Description

The project area lies in Townships 20-22 South, Range 19 East and includes an access route and a borrow area in Lake Tambour (Figure 1). The southern access route measured approximately 25.1 kilometers (km) (15.6 miles [mi]), extending from just northwest of Timbalier Island across Terrebonne Bay and Lake Barre to Lake Tambour. The borrow area in the southern portion of Lake Tambour is approximately 335 hectares (ha) (827.9 acres [A]) in size.

Report Organization

Chapter 2 provides a brief summary of the Environmental Setting. Previous cultural investigations are described in Chapter 3. Chapter 4 presents the results of the monitoring. ESI's recommendations are provided in Chapter 5.



Excerpt from the USGS *Lake Tambour, Lake Felicity, Lake La Graisse, and Cat Island Pass, LA* 1:24,000 quadrangle showing the location of the proposed borrow area and access route.

CHAPTER 2
ENVIRONMENTAL SETTING

The project area lies in the Terrebonne Basin in southeastern Louisiana. The Terrebonne Basin lies entirely within the Lafourche delta complex. While the general deltaic sequences are well understood, there remains considerable debate over the age and extent of particular complexes (Saucier 1994; Smith et al. 1986; Weinstein and Gagliano 1985; and Weinstein and Kelley 1992). Smith et al. (1986:61-62) suggest that the Teche delta complex deposited sediments south and west of Houma, Louisiana, between 4,500 and 3,500 years BP. According to this scenario, the easternmost extent of the delta lobe is in the vicinity of Houma (Smith et al. 1986:Figure 11). Weinstein and Gagliano (1985:123) argue for an earlier depositional sequence, spanning an interval from 5,800 to 3,900 years BP, with the easternmost boundary of the complex located at least 30 mi (48 km) east of Houma (Weinstein and Kelley 1992:4). The extent of the later Lafourche Delta Complex is also in debate. Smith et al. (1986) suggest that sediment deposition in the vicinity of the project area first occurred with the development of the Lafourche distributary system between 2,000 and 1,000 years BP. Weinstein and Gagliano (1985) and Weinstein and Kelley (1992) argue that the Lafourche complex reoccupied part of the former Teche system, creating overlapping deposits in the vicinity of the project area and as far west as the eastern Terrebonne Marsh.

This argument is very important to the interpretation of archaeological resources in the region. Following Smith et al. (1986), the earliest human occupations in the project area and the surrounding area could not have occurred until after 2,000 to 1,000 years BP. This interpretation of the depositional sequence is difficult to reconcile with the archaeological record. Weinstein and Kelley (1992) discuss several sites that date to the Poverty Point and Tchula periods.

Based on the archaeological evidence and more recent delineations of the deltaic complexes in the region, Saucier (1994:279) agrees that the most likely scenario involves the reoccupation of Teche distributary systems by the Lafourche Complex. This creation of delta lobes and subsequent overlapping of deltaic deposits have created a variety of environments. These environments of deposition can be characterized as natural levees, distributary channels, crevasse splays, swamps, lakes, and marshes. The project area is mainly on open water with the borrow area consisting of submerged interdistributary marsh. Any natural levees in the area are also almost entirely submerged.

Interdistributary marsh/deposits. Interdistributary marshes depend on the balance between inorganic sedimentation and the growth of vegetation. "During delta lobe progradation, enough inorganic sediments must enter interdistributary bays from overbank flooding to form intratidal mudflats" (Saucier 1994:145). The vegetation that colonizes these mudflats helps to trap sediments from subsequent floods. This combination of inorganic sediments and organic sediments (plant detritus) creates interdistributary deposits. The type of vegetation growing in the interdistributary areas defines the type of marsh. These may be freshwater marsh (limited to the most inland areas), saline (limited to within about 10 mi [4 km] of the coast), and intermediate brackish water marsh.

CHAPTER 3
PREVIOUS INVESTIGATIONS

Prior to the commencement of fieldwork, a comprehensive literature search and records review was performed. For the purposes of the background research the study area included the project area (e.g. proposed access route and borrow area) and a .5 mi (.8 km) radius buffer. Background research included examination of records maintained by the Louisiana Divisions of Archaeology and Historic Preservation, Baton Rouge, Louisiana. Cultural resources reports, site files, National Register (NRHP) records, and previously recorded standing structure files were reviewed for the project area. Geomorphological data, maps, and aerial photographs were examined and reviewed. Background research was used to determine the kind of resources that might be present in the project area and to provide a context for the evaluation of cultural resources should any be encountered during field investigations.

The research revealed that there have been two previous cultural resources investigations near the southern end of the proposed access route. There are no previously recorded archaeological sites, standing structures, or NRHP properties within the study area or project area. There have been a few obstructions and wrecks recorded in the study area, but none of these lie within the project area. The previous cultural resources surveys are summarized below.

Kelley et al. (2008) (22-3077). In 2007 and 2008, Coastal Environments, Inc. (CEI), undertook a Phase I survey for the New Orleans District, US Army Corps of Engineers (NODCOE). The survey was concerned with those areas that could be affected by the deepening of the Houma Navigation Canal. The cultural resources investigations included remote sensing. One survey area included the Timbalier Island area, which is immediately south of the beginning of the current access route. The CEI survey of the Timbalier Island Area identified 32 pipelines and two individual anomalies. Neither of the anomalies was considered to be related to cultural resources. Additionally, neither anomaly lies within the current study area (Kelley et al. 2008:117).

Nowak et al. (2010) (22-3433). Researchers with R. Christopher Goodwin & Associates (RCG&A) analyzed existing data to determine the probability for cultural resources within six areas proposed for shoreline restoration in Terrebonne Basin. One of these areas was Timbalier Island. None of the areas were considered high probability for prehistoric or historic sites (Nowak et al. 2010:64).

CHAPTER 4
RESULTS OF MONITORING

An archaeologist was present on the boat during the remote sensing surveys and when the various anomalies were probed. During the surveys, no exposed wrecks were observed. In addition, no cultural deposits such as shell middens were identified. Known obstructions were avoided. None of the anomalies that were probed provided any evidence of a wreck or an archaeological site.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

This document has provided the results of the archaeological monitoring undertaken by ESI for Fenstermaker. Based on the background research, it was considered unlikely that any archaeological sites, prehistoric or historic, would be encountered during the remote sensing surveys. Archaeological sites would most likely occur on barrier islands and along natural levees. Neither of these types of landforms is located within the project area. Thus, the only cultural resource likely to be identified within the project area would be ship/boat wrecks. Dangerous known wrecks and obstructions were avoided. The 20 or so anomalies that were probed were more indicative of pipelines and other oil industry-related features. There was no evidence to suggest that any of the anomalies represented historic wrecks. Also, as anticipated, none of the anomalies appeared to represent a submerged archaeological site. ESI does not recommend any additional cultural resources investigations prior to the implementation of the project.

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2.1) TE-117 Final Survey Report – Phase I and II

SURVEY REPORT

For the

Coastal Protection and Restoration Authority of Louisiana

Island Road Marsh Creation and Nourishment (TE-117) - Phases I & II
Bathymetric, Topographic, Magnetometer, Sub-Bottom Profile Surveys
and Archaeological Investigations within the
Proposed Southern Access Route, Proposed Borrow Area,
Conveyance Corridor, and Northern Access Route

Prepared By

C. H. Fenstermaker and Associates, L.L.C.

CPRA Contract No.: 4400005546, Task 2
CPRA Contract No.: 4400012415, Task 1
CHF Job No.: 2165051

Prepared: 1/9/2018

STATE OF LOUISIANA
Ricardo M. Johnson
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Louisiana Registration No. 4767

135 Regency Square · Lafayette, LA 70508 · 337.237.2200 phone · 337.232.3299 fax
www.fenstermaker.com

Client Focused. Technology Driven.

SURVEY REPORT

Project:

Island Road Marsh Creation and Nourishment Project (TE-117) - Phases I & II

Bathymetric, Topographic, Magnetometer, Sub-Bottom Profile Surveys and Archaeological Investigations within the Proposed Southern Access Route, Proposed Borrow Area, Northern Access Route, and Conveyance Corridor

Jefferson Parish, Louisiana

Prepared for:

Coastal Protection and Restoration Authority of Louisiana

Brad Miller
Project Manager
150 Terrace Avenue
Baton Rouge, La 70802
Office Phone: 225.342.4122

Prepared by:

C. H. Fenstermaker & Associates, L.L.C.

January 2018

SURVEY METHODOLOGY REPORT

Prepared for

Coastal Protection & Restoration Authority of Louisiana

in Support of

Island Road Marsh Creation and Nourishment (TE-117) - Phase I

Lafourche Parish, Louisiana

March 2017

Introduction

The proposed project's primary feature is to create 364 acres of new marsh and nourish 19 acres of saline marsh. Sediment will be hydraulically pumped from a borrow source near Lake Felicity. Containment dikes are proposed to be constructed around the marsh creation area to retain sediment during pumping. The dikes will be degraded and/or gapped no later than three years post-construction. One-half of the newly constructed marsh, approximately 182 acres, is proposed to be planted following the construction in an effort to stabilize the platform and reduce growth time for full vegetation.

Location

The Island Road Marsh Creation and Nourishment Project is located in Eastern Terrebonne Parish, Louisiana, about 12.1 miles Northeast of Cocodrie, Louisiana, between Isle De Jean Charles, Louisiana and Lake Tambour.

Scope of Work Phase I

Specific surveying tasks that will be performed by Fenstermaker in support of the Phase I surveying and reporting are:

- Static GPS Observations on Secondary Benchmarks
- Southern Access Route Survey: Bathymetric and Magnetometer Surveys, Marine Archaeology
- Borrow Area Survey: Bathymetric, Topographic and Magnetometer Surveys, Marine Archaeology, Sub-bottom Profiles
- Investigation and Probing of Pipelines and Anomalies within the Southern Access Route and Borrow Area

Additional tasks to be performed in support of this task order include Geotechnical Engineering and Hydraulic Modeling. These tasks will be provided under a separate report.

Pre-Planning Phase I Surveys

Prior to receiving a Notice to Proceed on December 6, 2016 from the Coastal Protection and Restoration Authority of Louisiana (CPRA), C.H. Fenstermaker & Associates, LLC (Fenstermaker) performed Desktop Research and a Reconnaissance Survey to obtain information vital to the planning and preparation of surveys that were performed in support of Phase I and Phase II of this survey effort. The Final Survey Report for the reconnaissance surveys and deliverables were submitted to CPRA on October 18, 2016 and revised on November 1, 2016.

The Island Road Marsh Creation and Nourishment Phase I - Scope of Work consists of the following tasks:

- Static Global Positioning System (GPS) surveys to update and install reference control
- Bathymetric and magnetometer surveys within the Proposed South Access Route

- Probing pipeline anomalies to determine depth of cover within the South Access Route
- Bathymetric, magnetometer, and sub-bottom profiles within the Proposed Borrow Area
- Real-time Kinematic (RTK) topographic surveys to locate shoreline of islands within and adjacent to Proposed Borrow Area
- Probing anomalies within the Proposed Borrow Area.
- Archaeological Investigations within South Access Route and Proposed Borrow Area
- Once all survey tasks have been completed, reports and deliverables will be submitted to CPRA

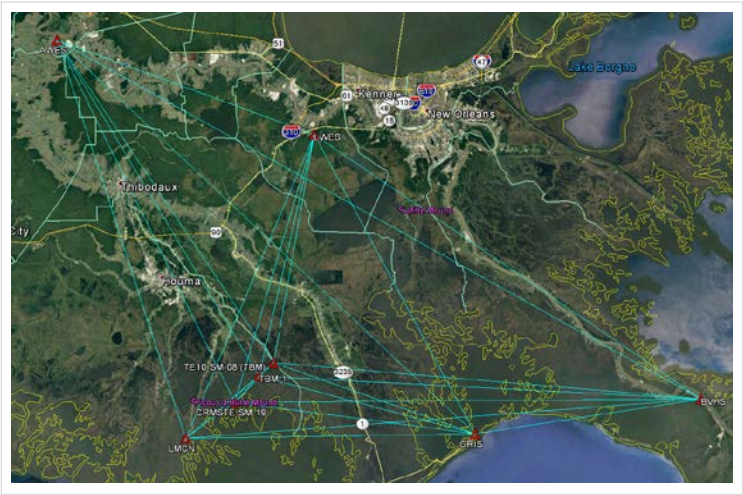
Upon receiving the Notice to Proceed for Phase I efforts, Fenstermaker prepared and submitted a Work Schedule, a Work Plan, and a static GPS network plan. The required benchmarks and transect lines were plotted in Trimble Business Center (TBC) software as per the scope of work to facilitate in accurately performing the static GPS, bathymetric and topographic surveys. Once the commencement date was determined, the landowners were contacted to acquire permission for right of entry.

On January 3, 2017, Right-of-Entry Permits were requested from Apache Louisiana Minerals, LLC and ConocoPhillips. Agreements between Fenstermaker and the Landowners were signed and executed on January 5, 2017.

Static GPS Survey at Reference Control Monuments

On Monday, January 9, 2017, a survey crew was mobilized with and traveled from the Lafayette office to the Island Road project site in order to perform the required survey tasks. Coordinates for the reference monuments were setup in the TBC project file, and then uploaded into the positioning device.

Once at the project site, the Fenstermaker crew located two existing monuments to be utilized as the project reference control and installed one temporary benchmark. GPS monument “CRMSTE-SM-19” was located in the marsh, West of Lake Tambour and consisted of a 9/16 inch diameter spherical datum point attached to a 9/16-inch stainless steel sectional rods that were driven to refusal. This monument was encased within a 6-inch PVC pipe filled with sand and set in concrete with a protective aluminum access cover. Monument “TE10-SM-08 TBM” was recovered at the Point Au Chenes Marina and consists of a steel rod imbedded in concrete set flush with the ground. An additional monument “TBM-1” was installed at Island de Jean Charles Marina and consists of a rebar set flush with the ground. Monument datasheets can be found in Section C of this report.



To begin the static survey, the survey crew installed GPS base receivers at each monument. A two-meter fixed height tripod was used to eliminate human error that could have been introduced by miss-measurement of the GPS antenna height. Once all necessary equipment was installed, the base unit was initialized and a static GPS session began.

During each GPS session, a raw data file was created on the GPS base receiver. The monument name, Julian date, session number and antenna height was keyed into each receiver. The survey technicians completed GPS logsheets, while in the field, to document information about the survey as well as other pertinent monument details. Information on the log sheets included the monument stamping, actual survey start and stop times, the GPS antenna height measurements, weather conditions, satellite information as well as any problems that were encountered during the survey. The log sheet also serves as a quality control check by the data processor when the data is downloaded from the GPS receiver, confirming that the monument names and antenna heights were keyed in correctly.

Upon completing the static GPS survey, GPS log sheets and GPS raw data files were downloaded, then uploaded to Fenstermaker's ftp site. All GPS raw data files were converted to RINEX format then submitted to the NGS Online Positioning User Service (OPUS) Program[1] for an independent solution. Comparisons were made between the OPUS results at each GPS base station control point and the final adjustment results. The final tabulated OPUS adjustment results can be found in Section C of this report.

Static GPS Downloading, Processing & Adjustments

At the end of each day, GPS log sheets were checked and compared to the data files on the receivers. The raw GPS data was then downloaded into the project file created in TBC software. The IGS Precise Ephemeris was also downloaded from the National Geodetic Survey (NGS) Internet website for each day that GPS data was collected. Raw data files were downloaded for CORS[2] stations that were located nearest to or within the project area from the NGS CORS site and/or the Center for GeoInfomatics (C4G)[3] website for the same observation periods.

After performing the initial processing of the static GPS to generate baseline vectors, a report was generated and reviewed to determine and eliminate cycle slips and noisy or unhealthy satellites which dilute the precision. The GPS baseline vectors were re-processed and the data was loaded into the adjustment program. All necessary adjustments were performed using the TBC Network Adjustment software.

Prior to performing the network adjustment, the published coordinate sheets were downloaded from the NGS website and reviewed. The published values for the annual upward velocities was used to calculate the vertical change over time[4] and applied to the published ellipsoid heights for each CORS station. Of the five CORS stations included in this adjustment, "AWES" was selected to be held fixed in a minimally constrained adjustment due to its vertical stability based on the annual velocity.

The adjustment for the GPS network was minimally constrained to the published adjusted NAD83 (2011) Epoch 2010.00 and the published ellipsoid height plus the upward velocity over time at the antenna reference point (ARP) for CORS station "AWES". A re-adjustment was performed and all outliners removed from the adjustment. A scale factor was determined from the Statistics Summary and applied to the network and re-adjusted until the Chi-Square Test passed with a 95% confidence level.

The minimally constrained adjustment was performed by holding to the published values, with subsidence applied, for the antenna reference points (ARP) for CORS Stations "AWES", then comparing the adjustment values generated to the published values, subsidence applied, for CORS stations "BVHS", "GRIS", "LMCN"' and "LWES". Orthometric heights (elevations) were calculated by applying the Geoid12B model. Adjusted orthometric heights on the CORS stations were compared to their published NAVD88 values as a quality control check. Additionally, all GPS files were submitted to the NGS Online Positioning User Service (OPUS) Program for an independent

[1] The National Geodetic Survey operates the On-line Positioning User Service (OPUS) as a means to provide GPS users easier access to the National Spatial Reference System (NSRS). OPUS allows users to submit their GPS data files to NGS, where the data will be processed to determine a position using NGS computers and software. Each data file that is submitted will be processed with respect to 3 CORS sites.

[2] The National Geodetic Survey (NGS) coordinates two networks of continuously operating reference stations (CORS): the National CORS network and the Cooperative CORS network. Each CORS site provides Global Positioning System (GPS) carrier phase and code range measurements in support of 3-dimensional positioning activities throughout the United States and its territories. Surveyors, GIS/LIS professionals, engineers, scientists, and others can apply CORS data to position points at which GPS data have been collected. The CORS system enables positioning accuracies that approach a few centimeters relative to the National Spatial Reference System, both horizontally and vertically.

[3] Over the last 13 years, C4G has established a statewide network of over 70 Continuously Operating Reference Stations (CORS), 26 of which are National CORS providing the data that ties Louisiana into the National Spatial Reference System (NSRS) defined and managed by the National Geodetic Survey (NGS). The NSRS is a consistent national coordinate system that specifies latitude, longitude, height, scale, gravity, and orientation throughout the Nation, as well as how these values change with time.

[4] The NGS published annual velocities were calculated in August 2011 and the static GPS observations for this project were collected in January 2017, representing a 6.4 year time difference.

solution and comparisons made with the final adjustment results. GPS files were also submitted to OPUS Shared and approved to be published on the NGS website for future reference.

The published horizontal datum for OPUS is based on the Continuously Operating Reference Stations (CORS) which is NAD83 (2011) 2010.00 epoch. The vertical datum is North American Vertical Datum of 1988 (NAVD88) using Geoid 12B.

RTK Survey of Island Shorelines within the Proposed Borrow Area

At the commencement of the project, the RTK base unit was initialized using the C4G Real-time Network. A quality control shot was measured near the base monument with the roving unit to verify that the system was operational and delivering corrected positions. The base unit was then activated to begin additional static data collection while simultaneously transmitting DGPS corrections to the RTK rover. The crew then navigated by airboat to the small islands located within and adjacent to the Proposed Borrow Area. Using a long pole with the RTK unit attached to the end, the survey crew collected the horizontal position along the island shoreline. This was achieved by initializing the RTK system to collect continuous topo, recording a position approximately every 20 feet while the surveyor manipulated the pole back and forth through brackets with rollers mounted to the side of the airboat. As the airboat operator navigated at idle speed, the surveyor followed the shoreline visually by placing the tag line at the water's edge. In addition, water surface shots were acquired several times during the day. The average water surface elevation was applied to all the topographic survey points collected along the water's edge.

As an additional quality control check, static GPS was collected at the base station concurrent with the RTK survey so that post processing could be performed utilizing the NGS Online Positioning User Service (OPUS) Program as an independent check. Upon completion of the RTK survey, the data logger was downloaded and the information checked and validated daily.

GPS and RTK Survey Equipment

The equipment used for the static GPS survey consisted of a Trimble© Navigation's dual-frequency R8 GNSS Mod-3 GPS receiver with integrated GPS antenna; Trimble© Navigation's dual-frequency R6 GNSS GPS receiver with integrated GPS antenna; Trimble R7 GNSS with Zephyr Geodetic Antennas, also called base stations. A two-meter fixed height tripod was used to eliminate human error that could be introduced by miss-measurement of the

GPS antenna heights. The GPS data was downloaded, processed and adjusted using TBC Software. The Geoid12B model was used to determine the geoid separation and applied to the ellipsoid heights to determine elevation as specified in the scope.

To perform the RTK survey, a rover consisting of a Trimble© Navigation's dual-frequency R8 GNSS GPS receiver with an integrated GPS antenna and a radio link was employed to transmit corrections to the rover from the base setup. A two-meter fixed height rod was used at the rover to capture topographic features, except for shots taken in deep water which required a modified adapter pole. The data was collected and stored on a Trimble© TSC3 datalogger and downloaded using TBC, version 3.8.

Single-beam Bathymetric Surveys

Prior to commencing the single beam bathymetric surveys, coordinates and line files for the proposed transect lines were provided to the survey crew. On Tuesday, January 10, 2017, the bathymetric survey crew commenced single beam surveys at the project site. Positioning was accomplished using C4G Real-time Network (RTN), initialized and a quality check performed nearby.

Data acquisition for the single beam survey was accomplished using HYPACK® digital data acquisition and navigation software. An Echotrac MKIII fathometer was used to determine the water depths along the pre-plotted transect lines. The fathometer was integrated with RTN to accurately position in three dimensions. Water surface shots were taken in the morning and afternoon by the bathymetric survey crew using RTN to obtain the water surface elevations relative to NAVD88 using Geoid12B. Bar checks were performed at the beginning of the day to determine the correct sound velocity of the water column. An Odom DigiBar Sound Velocity sensor was cast every morning to help verify Bar Checks.

Back at the office, all of the raw data was imported into HYPACK® program, which includes the raw bathymetry data, the corrected tide file, and the CRP/transducer offset file. A graphic image was generated so that the digital sounder data could be swath edited to remove outliers. The final adjusted and edited file was exported in ascii format and vertically adjusted using NAVD88-Geoid12B.

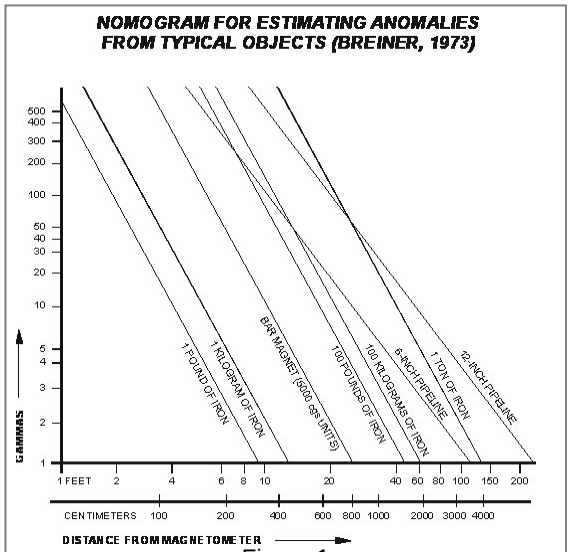


Figure 1

Magnetometer Hazard Surveys

Unidentified anomalies were located from the marine vessel using a Geometrics 882 Marine magnetometer. While performing the single-beam bathymetric surveys to locate water bottoms along the planned track lines, the survey crew also performed a magnetometer survey to locate the possibility of underwater hazards along the Proposed Southern Access Route from the gulf to the Proposed Borrow Area. The contacts are presumed to represent articles of ferrous debris which are either buried below the mudline or too small to be acoustically detected and probably associated with debris. A table of the recorded magnetic anomalies, identified and unidentified, is listed in this report. The unidentified anomalies are also numerically listed in a table located on a map included in this report.

A nomogram (see Figure 1) provides a visual reference of the relationship between a ferrous object and magnetic deflection generated by the object. The amplitude and signature width of a magnetic deflection are dependent on a variety of factors that include object size and configuration, ferrous content, and distance from the sensor (Breiner, 1973). Since all of the variables involved in anomaly classification are not readily available, the nomogram provides only a rough estimate for anomalies and source size. The positions of the unidentified anomalies were recorded using the onboard Differential GPS system. Water surface shots were taken

occasionally by the crew using C4G RTN to obtain the water surface elevations relative to NAVD88 using Geoid12B.

Back at the office, all of the raw data was imported into SonarWiz, which includes the raw magnetometer data and Magnetometer tow point position on the vessel. The magnetometer data is then laid back using the recorded laid back values. A hydrographic survey specialist analyzed each file picking all magnetometer anomalies. The specialist then exported a file with all anomaly positions and amplitudes to be mapped.

Bathymetric Survey Equipment

Horizontal positioning was logged real-time using a Trimble R7 GPS Receiver integrated with RTN for DGPS corrections resulting in a 5cm horizontal accuracy or better. Pitch and roll was recorded with the CDL MiniTilt Motion Sensor to correct for motion changes. Odom Echotrac MkIII was also used to determine water depths along all transect lines. Bathymetry data was corrected for velocity and adjusted to NAVD88 using Geoid12B.

Sub-Bottom Profile Surveys

While the Fenstermaker survey crew was performing bathymetric and magnetometer surveys within the Proposed Borrow Area, a Geophysicist subcontracted from Oceaneering International, Inc. accompanied the survey crew and performed a sub-bottom profile study of the entire borrow area. The results of this study and methodology report are included with this Survey Report.

Archaeological Investigations

While the Fenstermaker survey crew performed the magnetometer surveys and probing within the Proposed Borrow Area, Southern Access Route, and Alternate Access Route, a Marine Archaeologist subcontracted from Earth Search, Inc. accompanied the survey crew to perform an archaeological investigation. The results of this investigation will be provided as soon as they are available from the Earth Search, Inc.

SURVEY METHODOLOGY REPORT

Prepared for

Coastal Protection & Restoration Authority of Louisiana

in Support of

Island Road Marsh Creation and Nourishment (TE-117) - Phase II

Lafourche Parish, Louisiana

December 2017

Introduction

The proposed project's primary feature is to create 364 acres of new marsh and nourish 19 acres of saline marsh. Sediment will be hydraulically pumped from a borrow source near Lake Felicity. Containment dikes are proposed to be constructed around the marsh creation area to retain sediment during pumping. The dikes will be degraded and/or gapped no later than three years post-construction. One-half of the newly constructed marsh, approximately 182 acres, is proposed to be planted following the construction in an effort to stabilize the platform and reduce growth time for full vegetation.

Location

The Island Road Marsh Creation and Nourishment Project is located in Eastern Terrebonne Parish, Louisiana, about 12.1 miles Northeast of Cocodrie, Louisiana, between Isle de Jean Charles, Louisiana and Lake Tambour.

Scope of Work Phase II

The Island Road Marsh Creation and Nourishment Phase II Scope of Work consists of the following tasks:

- Static Global Positioning System (GPS) surveys on reference control monuments
- Bathymetric and magnetometer surveys within the Proposed North Access Route (3.1 Miles)
- Probing pipeline anomalies to determine depth of cover within the North Access Route
- Bathymetric and magnetometer surveys within the Proposed Conveyance Corridor
- Probing anomalies within the Proposed Conveyance Corridor.
- Topographic surveys along the bankline/nearshore of Proposed Conveyance Corridor
- Reporting and deliverables

Additional tasks to be performed in support of this task order include Geotechnical Engineering and Hydraulic Modeling. These tasks will be provided under a separate report.

Pre-Planning Phase II Surveys

Prior to receiving a Notice to Proceed for Phase II Surveys on August 16, 2017 from the Coastal Protection and Restoration Authority of Louisiana (CPRA), C.H. Fenstermaker & Associates, LLC (Fenstermaker) requested a Work Schedule and a Work Plan.

Upon receiving the Notice to Proceed for the Phase II efforts, Fenstermaker prepared and submitted a Work Schedule and a Work Plan. The required benchmarks and transect lines were plotted in Trimble Business Center (TBC) software as per the scope of work to facilitate in accurately performing the static GPS, bathymetric and topographic surveys. Once the commencement date was scheduled for Monday, August 14, 2017, the landowners were contacted to acquire permission for right of entry.

On August 8, 2017, Right-of-Entry Permits were requested from Apache Louisiana Minerals, LLC and ConocoPhillips. An agreement between Fenstermaker and Apache was signed and executed on August 9, 2017. An executed agreement between Fenstermaker and ConocoPhillips was delayed in signing due to the point of

contact and supervisors out on training. An executed agreement dated August 9, 2017 was received by email on August 24th.

After a week delay, Fenstermaker survey crews mobilized and traveled to the project site on Monday, August 21, 2017 to commence Phase II survey tasks. Progress was halted on August 25th due to Tropical Storm Harvey which was situated in the Gulf of Mexico. Surveys resumed under a new CPRA General Engineering Contract on November 6, 2017 and surveys were completed on November 10th.

Topographic, Bathymetric and Magnetometer Surveys along the Proposed Conveyance Corridor and Proposed Northern Access Route

Upon arriving at the Isle de Jean Charles Marina on Monday, August 21st, the survey crew installed a GPS Base receiver on monument "TBM-1". Quality control checks were performed on the bathymetric equipment to verify that the system was delivering corrected positions. After completing the quality checks, the survey crew navigated along eighteen (18) pre-plotted transect lines and collected singlebeam bathymetry at 1500-foot intervals. Topographic surveys were performed on August 24th along transects to capture the existing ground elevations over the spoil banks.

Singlebeam bathymetry within the Proposed Northern Access Corridor was performed on August 22nd and consisted of a centerline profile and offsets left and right. The following day, the crew performed topographic surveys to locate existing pipeline signs, bulkheads, pilings, and power poles along the Proposed Northern Access Route. The low sag of an existing high-powerline crossing the proposed route was located conventionally by installing a pair of control points with RTK adjacent to the powerline crossing, then utilizing a reflectorless Total Station. Points along the wire were located and recorded on the instrument to facilitate in determining the clearance between the low sag and the water surface.

On November 6th and 7th, the survey crew performed soundings and singlebeam bathymetry along the centerline of Bayou Jean Charles, then along offsets either side of the centerline from the Marina to the proposed Borrow Area located 5 miles south of the Marina. After completing the bathymetric surveys on November 7th, all identified anomalies were investigated to determine and identify the source by circling the anomaly with the magnetometer. The survey crew navigated around each anomaly location to determine if the source was an existing pipeline. If a pipeline was identified through multiple mag hits, the pipeline would be manually probed to determine its location and depth of cover, then the location recorded with RTK. In addition, all pipeline markers were photographed and their locations were tied-in with RTK.

Topographic, bathymetric, magnetometer surveys and probing pipelines within the Proposed Conveyance Corridor and Proposed Northern Access Route were performed from August 21st through August 25, 2017, and was halted due to Hurricane Harvey. After receiving a notice to proceed under a new CPRA Engineering Contract for Phase II, survey work continued on November 6th and was completed on November 10, 2017.

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FINAL NOTE

Please be advised that the data which was collected during the survey of this project represents an epoch, a snapshot at the time that the survey was performed. Due to the effects of crustal motion, subsidence, upheaval, drought and other conditions which influence the physical position and stability of surface monuments, topographic features, and other structures within the Louisiana Coastal Zone, it is recommended that GPS monuments used for this project be re-observed and reprocessed on future surveys using the same reference control, if possible, for the purpose of updating the three dimensional position of the reference monuments.

The GPS/RTK Survey protocols performed in support of this project was in accordance with the Coastal Protection and Restoration Authority of Louisiana requirements as described in "*A Contractor's Guide to the Standards of Practice Required by Louisiana Department of Natural Resources, Coastal Restoration Division for Contractor's Performing GPS Surveys and Establishing GPS Derived Orthometric Heights Within the Louisiana Coastal Zone Primary GPS Network*" dated January 2014. All Static GPS was adjusted using Trimble Business Center software to determine the final reference control monument positions.

C.H. Fenstermaker & Associates, LLC

Ricardo M. Johnson, PLS LA Reg. 4767
Director of Coastal Services, Survey & Mapping

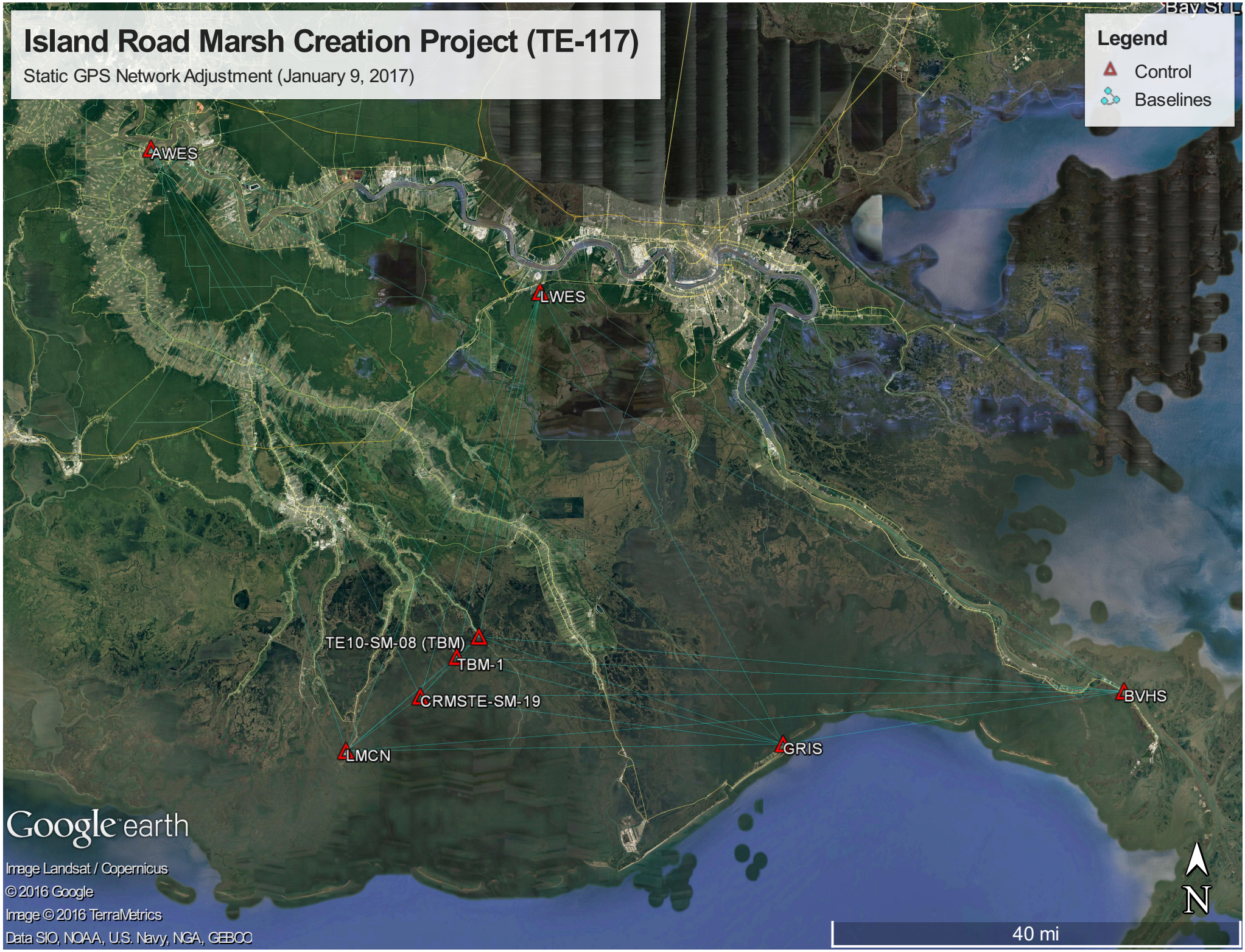
SECTION B

Static GPS & OPUS Solutions

GPS Network Map
Static GPS Adjustment Report
Adjustment Results Tabulation
CORS Published Coordinates
Static Adjustment Comparison with Subsidence
OPUS Comparisons to Static Adjustment
Monument Datasheets

Island Road Marsh Creation Project (TE-117)

Static GPS Network Adjustment (January 9, 2017)



Island Road Marsh Creation

C.H. Fenstermaker & Associates, LLC
135 Regency Square
Lafayette, LA 70508
USA
Phone: 337 237-2200

Project File Data		Coordinate System	
Name:	T:\2016\2165051.10\GPS\TE-117_Island_Road.vce	Name:	United States/State Plane 1983
Size:	86 KB	Datum:	NAD 1983 (Conus)
Modified:	1/17/2017 11:04:03 AM (UTC:-6)	Zone:	Louisiana South 1702
Time zone:	Central Standard Time	Geoid:	GEOID12B (Conus)
Reference number:	CPRA 4400005546 Task#2	Vertical datum:	NAVD88 2011
Description:			
Comment 1:	Minimally Constrained Adjustment Holding AWES		
Comment 2:	Accounting for Subsidence at AWES based on Published Velocity		
Comment 3:			

Network Adjustment Report

Adjustment Settings

Set-Up Errors

GNSS

Error in Height of Antenna: 0.002 m
Centering Error: 0.002 m

Covariance Display

Horizontal:

Propagated Linear Error [E]: U.S.
Constant Term [C]: 0.000 m
Scale on Linear Error [S]: 1.960

Three-Dimensional

Propagated Linear Error [E]: U.S.
Constant Term [C]: 0.000 m
Scale on Linear Error [S]: 1.960

Adjustment Statistics

Number of Iterations for Successful Adjustment: 2
Network Reference Factor: 1.01
Chi Square Test (95%): Passed
Precision Confidence Level: 95%
Degrees of Freedom: 63

Post Processed Vector Statistics

Reference Factor: 1.01
Redundancy Number: 63.00
A Priori Scalar: 0.61

Control Coordinate Comparisons

Values shown are control coordinates minus adjusted coordinates.

Point ID	ΔNorthing (Meter)	ΔEasting (Meter)	ΔElevation (Meter)	ΔHeight (Meter)
BVHS	-0.011	0.009	?	0.034
GRIS	-0.007	0.001	?	0.043
LMCN	-0.003	-0.011	?	0.058
LWES	-0.002	0.001	?	0.010

Control Point Constraints

Point ID	Type	North σ (Meter)	East σ (Meter)	Height σ (Meter)	Elevation σ (Meter)
AWES	Local	Fixed	Fixed	Fixed	
Fixed = 0.000001(Meter)					

Adjusted Grid Coordinates

Point ID	Northing (Meter)	Northing Error (Meter)	Easting (Meter)	Easting Error (Meter)	Elevation (Meter)	Elevation Error (Meter)	Constraint
AWES	177432.189	?	1033770.252	?	17.665	?	LLh
BVHS	94330.395	0.001	1187136.941	0.001	9.582	0.003	
CRMSTE-SM-19	92488.910	0.001	1076896.735	0.001	0.259	0.004	
GRIS	85659.181	0.001	1133733.354	0.001	8.300	0.003	
LMCN	83878.415	0.001	1065321.879	0.001	9.598	0.003	
LWES	155629.923	0.001	1095022.853	0.001	10.179	0.003	
TBM-1	98720.458	0.001	1082555.563	0.001	1.436	0.003	
TE10-SM-08 (TBM)	101920.340	0.001	1086001.428	0.001	0.453	0.003	

Adjusted Geodetic Coordinates

Point ID	Latitude	Longitude	Height (Meter)	Height Error (Meter)	Constraint
AWES	N30°06'00.96248"	W90°58'58.63439"	-8.957	?	LLh
BVHS	N29°20'12.49008"	W89°24'23.01055"	-14.282	0.003	
CRMSTE-SM-19	N29°19'55.15797"	W90°32'29.75908"	-24.262	0.004	
GRIS	N29°15'55.88323"	W89°57'26.26229"	-15.676	0.003	

LMCN	N29°15'17.90435"	W90°39'40.65170"	-14.801	0.003	
LWES	N29°54'01.29542"	W90°20'57.83373"	-15.720	0.003	
TBM-1	N29°23'16.23108"	W90°28'58.30311"	-23.197	0.003	
TE10-SM-08 (TBM)	N29°24'59.30957"	W90°26'49.59523"	-24.238	0.003	

Adjusted ECEF Coordinates

Point ID	X (Meter)	X Error (Meter)	Y (Meter)	Y Error (Meter)	Z (Meter)	Z Error (Meter)	3D Error (Meter)	Constraint
AWES	-94741.307	?	-5521870.287	?	3179990.218	?	?	LLh
BVHS	57650.874	0.001	-5564332.946	0.003	3106491.017	0.002	0.004	
CRMSTE-SM-19	-52602.392	0.001	-5564635.706	0.003	3106020.912	0.002	0.004	
GRIS	4150.431	0.001	-5568495.421	0.003	3099600.478	0.002	0.004	
LMCN	-64275.240	0.001	-5568698.342	0.003	3098580.776	0.002	0.004	
LWES	-33745.473	0.001	-5533654.434	0.003	3160795.616	0.002	0.004	
TBM-1	-46872.109	0.001	-5561652.387	0.003	3111417.149	0.002	0.004	
TE10-SM-08 (TBM)	-43389.500	0.001	-5560121.592	0.003	3114181.576	0.002	0.004	

Error Ellipse Components

Point ID	Semi-major axis (Meter)	Semi-minor axis (Meter)	Azimuth
BVHS	0.002	0.002	105°
CRMSTE-SM-19	0.002	0.002	172°
GRIS	0.002	0.002	120°
LMCN	0.002	0.002	167°
LWES	0.002	0.002	164°
TBM-1	0.002	0.002	156°
TE10-SM-08 (TBM)	0.002	0.002	154°

Adjusted GNSS Observations

Observation ID		Observation	A-posteriori Error	Residual	Standardized Residual
TBM-1 --> TE10-SM-08 (TBM) (PV3)	**Az.**	47°32'43"	0.063 sec	-0.196 sec	-3.614
	ΔHt.	-1.042 m	0.003 m	-0.004 m	-1.251
	Ellip Dist.	4702.565 m	0.001 m	0.007 m	5.771
LWES --> TE10-SM-08 (TBM) (PV32)	**Az.**	190°01'36"	0.005 sec	0.001 sec	0.280
	ΔHt.	-8.518 m	0.003 m	0.002 m	0.550
	Ellip Dist.	54464.880 m	0.001 m	0.003 m	2.298
LWES --> TBM-1 (PV34)	**Az.**	192°50'54"	0.005 sec	0.000 sec	0.054
	ΔHt.	-7.476 m	0.003 m	-0.002 m	-0.697

	Ellip Dist.	58262.093 m	0.001 m	-0.003 m	-2.150
TBM-1 --> CRMSTE-SM-19 (PV1)	**Az.**	222°40'02"	0.036 sec	-0.019 sec	-0.567
	ΔHt.	-1.065 m	0.004 m	0.008 m	1.785
	Ellip Dist.	8417.615 m	0.002 m	0.002 m	1.349
AWES --> TE10-SM-08 (TBM) (PV10)	**Az.**	145°30'15"	0.003 sec	0.002 sec	0.782
	ΔHt.	-15.281 m	0.003 m	0.003 m	0.907
	Ellip Dist.	91821.228 m	0.001 m	0.002 m	1.765
LMCN --> CRMSTE-SM-19 (PV26)	**Az.**	53°41'29"	0.021 sec	-0.002 sec	-0.104
	ΔHt.	-9.461 m	0.004 m	-0.007 m	-1.625
	Ellip Dist.	14426.271 m	0.002 m	0.000 m	0.128
BVHS --> TE10-SM-08 (TBM) (PV14)	**Az.**	275°15'01"	0.003 sec	-0.004 sec	-1.489
	ΔHt.	-9.957 m	0.003 m	0.000 m	0.058
	Ellip Dist.	101421.476 m	0.001 m	0.001 m	0.656
GRIS --> TE10-SM-08 (TBM) (PV19)	**Az.**	289°29'54"	0.006 sec	-0.006 sec	-1.262
	ΔHt.	-8.563 m	0.003 m	0.001 m	0.251
	Ellip Dist.	50426.219 m	0.001 m	0.000 m	0.197
BVHS --> TBM-1 (PV16)	**Az.**	273°21'43"	0.003 sec	0.003 sec	1.078
	ΔHt.	-8.915 m	0.003 m	0.002 m	0.578
	Ellip Dist.	104674.810 m	0.001 m	-0.001 m	-0.858
AWES --> TBM-1 (PV12)	**Az.**	148°23'07"	0.003 sec	-0.001 sec	-0.514
	ΔHt.	-14.240 m	0.003 m	0.000 m	0.171
	Ellip Dist.	92609.590 m	0.001 m	-0.001 m	-1.061
LWES --> CRMSTE-SM-19 (PV33)	**Az.**	196°30'32"	0.005 sec	0.000 sec	0.049
	ΔHt.	-8.542 m	0.004 m	-0.001 m	-0.245
	Ellip Dist.	65694.416 m	0.002 m	-0.001 m	-0.837
GRIS --> TBM-1 (PV21)	**Az.**	285°00'08"	0.006 sec	0.004 sec	0.789
	ΔHt.	-7.521 m	0.003 m	-0.001 m	-0.228
	Ellip Dist.	52818.494 m	0.001 m	0.000 m	0.264
GRIS --> CRMSTE-SM-19 (PV20)	**Az.**	277°32'13"	0.005 sec	0.004 sec	0.766
	ΔHt.	-8.586 m	0.004 m	0.000 m	-0.095
	Ellip Dist.	57245.478 m	0.001 m	0.000 m	0.149
TE10-SM-08 (TBM) --> CRMSTE-SM-19 (PV2)	**Az.**	224°25'58"	0.023 sec	-0.014 sec	-0.658
	ΔHt.	-0.024 m	0.004 m	0.003 m	0.737
	Ellip Dist.	13109.249 m	0.002 m	0.001 m	0.483
GRIS --> LWES (PV29)	**Az.**	331°44'00"	0.004 sec	0.001 sec	0.248
	ΔHt.	-0.045 m	0.003 m	0.000 m	0.118
	Ellip Dist.	79968.461 m	0.001 m	-0.001 m	-0.652
AWES --> GRIS (PV18)	**Az.**	132°43'50"	0.002 sec	0.000 sec	0.153
	ΔHt.	-6.719 m	0.003 m	0.000 m	-0.180
	Ellip Dist.	135708.355 m	0.001 m	-0.001 m	-0.619

LWES --> BVHS (PV30)	**Az.**	124°08'12"	0.003 sec	0.001 sec	0.503
	ΔHt.	1.439 m	0.003 m	0.001 m	0.278
	Ellip Dist.	110651.787 m	0.001 m	0.000 m	0.345
LMCN --> TE10-SM-08 (TBM) (PV25)	**Az.**	49°14'02"	0.011 sec	0.004 sec	0.428
	ΔHt.	-9.437 m	0.003 m	0.000 m	-0.015
	Ellip Dist.	27443.859 m	0.001 m	-0.001 m	-0.461
LMCN --> LWES (PV28)	**Az.**	22°49'26"	0.004 sec	-0.001 sec	-0.448
	ΔHt.	-0.919 m	0.003 m	0.000 m	0.000
	Ellip Dist.	77659.078 m	0.001 m	0.000 m	-0.010
AWES --> LMCN (PV24)	**Az.**	161°32'19"	0.003 sec	-0.001 sec	-0.402
	ΔHt.	-5.844 m	0.003 m	-0.001 m	-0.322
	Ellip Dist.	98735.900 m	0.001 m	0.000 m	-0.025
GRIS --> LMCN (PV22)	**Az.**	269°11'35"	0.004 sec	0.000 sec	-0.052
	ΔHt.	0.875 m	0.003 m	-0.001 m	-0.376
	Ellip Dist.	68434.060 m	0.001 m	0.000 m	0.358
BVHS --> GRIS (PV17)	**Az.**	261°44'17"	0.005 sec	-0.002 sec	-0.324
	ΔHt.	-1.394 m	0.003 m	0.000 m	-0.148
	Ellip Dist.	54102.997 m	0.001 m	0.000 m	0.023
AWES --> CRMSTE-SM-19 (PV11)	**Az.**	153°15'30"	0.003 sec	-0.001 sec	-0.314
	ΔHt.	-15.305 m	0.004 m	-0.001 m	-0.308
	Ellip Dist.	95269.326 m	0.001 m	0.000 m	-0.114
AWES --> BVHS (PV13)	**Az.**	118°37'41"	0.002 sec	0.000 sec	0.290
	ΔHt.	-5.325 m	0.003 m	0.000 m	-0.122
	Ellip Dist.	174443.675 m	0.001 m	0.000 m	0.025
BVHS --> LMCN (PV23)	**Az.**	266°03'10"	0.002 sec	0.000 sec	-0.207
	ΔHt.	-0.519 m	0.003 m	0.000 m	-0.188
	Ellip Dist.	122262.549 m	0.001 m	0.000 m	0.285
LMCN --> TBM-1 (PV27)	**Az.**	49°36'04"	0.013 sec	-0.001 sec	-0.119
	ΔHt.	-8.396 m	0.003 m	0.001 m	0.260
	Ellip Dist.	22744.021 m	0.001 m	0.000 m	0.270
AWES --> LWES (PV31)	**Az.**	109°46'04"	0.005 sec	-0.001 sec	-0.224
	ΔHt.	-6.763 m	0.003 m	0.000 m	-0.153
	Ellip Dist.	65021.870 m	0.001 m	0.000 m	-0.268
BVHS --> CRMSTE-SM-19 (PV15)	**Az.**	270°00'03"	0.003 sec	0.000 sec	0.077
	ΔHt.	-9.980 m	0.004 m	0.000 m	-0.106
	Ellip Dist.	110256.386 m	0.001 m	0.000 m	0.017

Covariance Terms

From Point	To Point		Components	A-posteriori Error	Horiz. Precision	3D Precision

					(Ratio)	(Ratio)
AWES	BVHS	**Az.**	118°37'41"	0.002 sec	1 : 120811775	1 : 120813137
		ΔHt.	-5.325 m	0.003 m		
		ΔElev.	-8.083 m	0.003 m		
		Ellip Dist.	174443.675 m	0.001 m		
AWES	GRIS	**Az.**	132°43'50"	0.002 sec	1 : 93909050	1 : 93909462
		ΔHt.	-6.719 m	0.003 m		
		ΔElev.	-9.364 m	0.003 m		
		Ellip Dist.	135708.355 m	0.001 m		
AWES	LMCN	**Az.**	161°32'19"	0.003 sec	1 : 68157152	1 : 68156181
		ΔHt.	-5.844 m	0.003 m		
		ΔElev.	-8.066 m	0.003 m		
		Ellip Dist.	98735.900 m	0.001 m		
AWES	LWES	**Az.**	109°46'04"	0.005 sec	1 : 45383819	1 : 45381917
		ΔHt.	-6.763 m	0.003 m		
		ΔElev.	-7.486 m	0.003 m		
		Ellip Dist.	65021.870 m	0.001 m		
BVHS	GRIS	**Az.**	261°44'17"	0.005 sec	1 : 36886845	1 : 36884201
		ΔHt.	-1.394 m	0.003 m		
		ΔElev.	-1.281 m	0.003 m		
		Ellip Dist.	54102.997 m	0.001 m		
BVHS	LMCN	**Az.**	266°03'10"	0.002 sec	1 : 83789749	1 : 83805667
		ΔHt.	-0.519 m	0.003 m		
		ΔElev.	0.017 m	0.003 m		
		Ellip Dist.	122262.549 m	0.001 m		
BVHS	LWES	**Az.**	304°36'10"	0.003 sec	1 : 76741165	1 : 76755148
		ΔHt.	-1.439 m	0.003 m		
		ΔElev.	0.597 m	0.003 m		
		Ellip Dist.	110651.787 m	0.001 m		
CRMSTE-SM-19	AWES	**Az.**	333°28'38"	0.003 sec	1 : 63883078	1 : 63880459
		ΔHt.	15.305 m	0.004 m		
		ΔElev.	17.406 m	0.004 m		
		Ellip Dist.	95269.326 m	0.001 m		
CRMSTE-SM-19	BVHS	**Az.**	89°26'41"	0.003 sec	1 : 73731555	1 : 73739322
		ΔHt.	9.980 m	0.004 m		
		ΔElev.	9.323 m	0.004 m		
		Ellip Dist.	110256.386 m	0.001 m		
CRMSTE-SM-19	GRIS	**Az.**	97°15'04"	0.005 sec	1 : 38467516	1 : 38470004
		ΔHt.	8.586 m	0.004 m		
		ΔElev.	8.042 m	0.004 m		
		Ellip Dist.	57245.478 m	0.001 m		
CRMSTE-SM-19	LMCN	**Az.**	233°44'59"	0.021 sec	1 : 9610325	1 : 9611610
		ΔHt.	9.461 m	0.004 m		
		ΔElev.	9.340 m	0.004 m		
		Ellip Dist.	14426.271 m	0.002 m		

CRMSTE-SM-19	LWES	**Az.**	16°24'50"	0.005 sec	1 : 43447552	1 : 43447926
		ΔHt.	8.542 m	0.004 m		
		ΔElev.	9.920 m	0.004 m		
		Ellip Dist.	65694.416 m	0.002 m		
CRMSTE-SM-19	TE10-SM-08 (TBM)	**Az.**	44°23'11"	0.023 sec	1 : 8725907	1 : 8726797
		ΔHt.	0.024 m	0.004 m		
		ΔElev.	0.194 m	0.004 m		
		Ellip Dist.	13109.249 m	0.002 m		
GRIS	LMCN	**Az.**	269°11'35"	0.004 sec	1 : 47058464	1 : 47063511
		ΔHt.	0.875 m	0.003 m		
		ΔElev.	1.298 m	0.003 m		
		Ellip Dist.	68434.060 m	0.001 m		
GRIS	LWES	**Az.**	331°44'00"	0.004 sec	1 : 55418386	1 : 55416964
		ΔHt.	-0.045 m	0.003 m		
		ΔElev.	1.878 m	0.003 m		
		Ellip Dist.	79968.461 m	0.001 m		
LMCN	LWES	**Az.**	22°49'26"	0.004 sec	1 : 53025890	1 : 53025728
		ΔHt.	-0.919 m	0.003 m		
		ΔElev.	0.580 m	0.003 m		
		Ellip Dist.	77659.078 m	0.001 m		
TBM-1	AWES	**Az.**	328°38'00"	0.003 sec	1 : 63860548	1 : 63859851
		ΔHt.	14.240 m	0.003 m		
		ΔElev.	16.228 m	0.003 m		
		Ellip Dist.	92609.590 m	0.001 m		
TBM-1	BVHS	**Az.**	92°50'03"	0.003 sec	1 : 71921737	1 : 71927842
		ΔHt.	8.915 m	0.003 m		
		ΔElev.	8.146 m	0.003 m		
		Ellip Dist.	104674.810 m	0.001 m		
TBM-1	CRMSTE-SM-19	**Az.**	222°40'02"	0.036 sec	1 : 5605693	1 : 5606319
		ΔHt.	-1.065 m	0.004 m		
		ΔElev.	-1.177 m	0.004 m		
		Ellip Dist.	8417.615 m	0.002 m		
TBM-1	GRIS	**Az.**	104°44'42"	0.006 sec	1 : 36456285	1 : 36458281
		ΔHt.	7.521 m	0.003 m		
		ΔElev.	6.864 m	0.003 m		
		Ellip Dist.	52818.494 m	0.001 m		
TBM-1	LMCN	**Az.**	229°41'19"	0.013 sec	1 : 15665721	1 : 15666643
		ΔHt.	8.396 m	0.003 m		
		ΔElev.	8.162 m	0.003 m		
		Ellip Dist.	22744.021 m	0.001 m		
TBM-1	LWES	**Az.**	12°46'57"	0.005 sec	1 : 39839653	1 : 39839536
		ΔHt.	7.476 m	0.003 m		
		ΔElev.	8.742 m	0.003 m		
		Ellip Dist.	58262.093 m	0.001 m		
TBM-1	TE10-SM-08 (TBM)	**Az.**	47°32'43"	0.063 sec	1 : 3245151	1 : 3245337

		ΔHt.	-1.042 m	0.003 m		
		ΔElev.	-0.983 m	0.003 m		
		Ellip Dist.	4702.565 m	0.001 m		
TE10-SM-08 (TBM)	AWES	**Az.**	325°46'13"	0.003 sec	1 : 63085580	1 : 63084772
		ΔHt.	15.281 m	0.003 m		
		ΔElev.	17.212 m	0.003 m		
		Ellip Dist.	91821.228 m	0.001 m		
TE10-SM-08 (TBM)	BVHS	**Az.**	94°44'23"	0.003 sec	1 : 69558028	1 : 69563387
		ΔHt.	9.957 m	0.003 m		
		ΔElev.	9.129 m	0.003 m		
		Ellip Dist.	101421.476 m	0.001 m		
TE10-SM-08 (TBM)	GRIS	**Az.**	109°15'30"	0.006 sec	1 : 34717995	1 : 34719530
		ΔHt.	8.563 m	0.003 m		
		ΔElev.	7.847 m	0.003 m		
		Ellip Dist.	50426.219 m	0.001 m		
TE10-SM-08 (TBM)	LMCN	**Az.**	229°20'20"	0.011 sec	1 : 18878312	1 : 18879468
		ΔHt.	9.437 m	0.003 m		
		ΔElev.	9.145 m	0.003 m		
		Ellip Dist.	27443.859 m	0.001 m		
TE10-SM-08 (TBM)	LWES	**Az.**	9°58'42"	0.005 sec	1 : 37146677	1 : 37146755
		ΔHt.	8.518 m	0.003 m		
		ΔElev.	9.726 m	0.003 m		
		Ellip Dist.	54464.880 m	0.001 m		

ISLAND ROAD MARSH CREATION PROJECT (TE-117) - STATIC GPS ADJUSTMENT (MIN CONSTRAINED AT AWES)

NAD83 (2011) Epoch 2010.00 - LA State Plane - South Zone (1702) - NAVD88 (Geoid12B)

Station	Latitude	Longitude	Ellipsoid Height (Mtr)	Northing (Mtr)	Easting (Mtr)	Northing (Ft)	Easting (Ft)	Elevation (Mtr)	Elevation (Ft)	Description
AWES	**30d06'00.96248"**	**-90d58'58.63439"**	**-8.957**	**177,432.189**	**1,033,770.252**	**582,125.44**	**3,391,627.90**	**17.665**	**57.96**	**CORS**
BVHS	29d20'12.49009"	-89d24'23.01055"	-14.282	94,330.395	1,187,136.941	309,482.30	3,894,798.44	9.582	31.44	CORS
GRIS	29d15'55.88323"	-89d57'26.26229"	-15.676	85,659.181	1,133,733.354	281,033.50	3,719,590.18	8.300	27.23	CORS
LMCN	29d15'17.90435"	-90d39'40.65170"	-14.801	83,878.415	1,065,321.879	275,191.10	3,495,143.53	9.598	31.49	CORS
LWES	29d54'01.29542"	-90d20'57.83373"	-15.720	155,629.923	1,095,022.853	510,595.84	3,592,587.47	10.179	33.40	CORS
CRMSTE-SM-19	29d19'55.15797"	-90d32'29.75908"	-24.262	92,488.910	1,076,896.735	303,440.70	3,533,118.70	0.259	0.85	Deep Rod Mon.
TBM-1	29d23'16.23108"	-90d28'58.30311"	-23.197	98,720.458	1,082,555.563	323,885.37	3,551,684.37	1.436	4.71	TBM
TE10-SM-08 (TBM)	29d24'59.30957"	-90d26'49.59523"	-24.238	101,920.340	1,086,001.428	334,383.65	3,562,989.68	0.453	1.49	Iron Rod

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                              ***IGS 08***
                AWES 147 BC ALWES (AWES),  LOUISIANA

 Retrieved from NGS DataBase on 05/07/14 at 15:37:48.
 ____________________________________________________________________________
|                                                                            |
|         Antenna Reference Point(ARP): AWES 147 BC ALWES CORS ARP           |
|         -------------------------------------------------------            |
|                              PID = DL8631                                  |
|                                                                            |
|                                                                            |
| IGS08 POSITION (EPOCH 2005.0)                                              |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     X =    -94741.963 m     latitude    =  30 06 00.98196 N               |
|     Y =  -5521868.793 m     longitude   = 090 58 58.65985 W               |
|     Z =   3179990.053 m     ellipsoid height =  -10.323   m               |
|                                                                            |
| IGS08 VELOCITY                                                             |
| Predicted with HTDP_3.1.2 Aug 2011.                                        |
|     VX =  -0.0123 m/yr      northward =  -0.0014 m/yr                      |
|     VY =  -0.0005 m/yr      eastward  =  -0.0123 m/yr                      |
|     VZ =  -0.0012 m/yr      upward    =   0.0000 m/yr                      |
|                                                                            |
|                                                                            |
| NAD_83 (2011) POSITION (EPOCH 2010.0)                                      |
| Transformed from IGS08 (epoch 2005.0) position in Aug 2011.                |
|     X =    -94741.307 m     latitude    =  30 06 00.96248 N               |
|     Y =  -5521870.291 m     longitude   = 090 58 58.63439 W               |
|     Z =   3179990.221 m     ellipsoid height =   -8.952   m    -8.957 m (2017)
|                                                                            |
| NAD_83 (2011) VELOCITY                                                     |
| Transformed from IGS08 velocity in Aug 2011.                               |
|     VX =   0.0016 m/yr      northward =  -0.0003 m/yr                      |
|     VY =   0.0005 m/yr      eastward  =   0.0016 m/yr                      |
|     VZ =  -0.0007 m/yr      upward    =  -0.0008 m/yr     x 6.4yrs = 0.005 m
|____________________________________________________________________________|
|                                                                            |
| L1 Phase Center of the current GPS antenna: AWES 147 BC ALWES CORS L1 PC C |
| -------------------------------------------------------------------------- |
| The Zephyr GNSS Geodetic II - RoHS compliant antenna                       |
| (Antenna Code = TRM57971.00     NONE) was installed on 14Mar2014.          |
|       The L2 phase center is 0.009 m below the L1 phase center.            |
|                              PID = DP2661                                  |
|                                                                            |
|                                                                            |
| IGS08 POSITION (EPOCH 2005.0)                                              |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     X =    -94741.964 m     latitude    =  30 06 00.98199 N               |
|     Y =  -5521868.850 m     longitude   = 090 58 58.65986 W               |
|     Z =   3179990.087 m     ellipsoid height =  -10.256   m               |
|                                                                            |
| The IGS08 VELOCITY of the L1 PC is the same as that for the ARP.           |
|                                                                            |
|                                                                            |
| NAD_83 (2011) POSITION (EPOCH 2010.0)                                      |
```

```
| Transformed from IGS08 (epoch 2005.0) position in Aug 2011.                |
|     X =    -94741.308 m     latitude    =  30 06 00.96252 N                |
|     Y =  -5521870.348 m     longitude   = 090 58 58.63440 W                |
|     Z =   3179990.255 m     ellipsoid height =   -8.885   m                |
|                                                                            |
| The NAD_83 (2011) VELOCITY of the L1 PC is the same as that for the ARP.   |
|____________________________________________________________________________|
```

* Latitude, longitude and ellipsoid height are computed from their corresponding cartesian coordinates using dimensions for the GRS 80 ellipsoid: semi-major axis = 6,378,137.0 meters
  flattening = 1/298.257222101...

* WARNING: Mixing of antenna types can lead to errors of up to 10 cm. in height unless antenna-phase-center variation and antenna-phase-center offset are properly modeled. See next comment.

* The coordinates shown on this page were computed using absolute antenna calibrations. CORS coordinates began using absolute antenna calibrations beginning with IGS08 and NAD 83 (2011, MA11, PA11). For additional information on the derivation of these positions and velocities and antenna calibrations consult:
  http://geodesy.noaa.gov/CORS/coords.shtml
  http://geodesy.noaa.gov/ANTCAL

* For more site specific information on the equipment history and monumentation type consult:
  ftp://geodesy.noaa.gov/cors/station_log/awes.log.txt
  http://geodesy.noaa.gov/cgi-cors/corsage_2.prl?site=awes

* The position & velocity were revised in Aug 2011.

```
                              ***IGS 08***
                BOOTHVILLE (BVHS),  LOUISIANA

 Created on 31Aug2011 at 09:34:47.
 ____________________________________________________________________________
|                                                                            |
|         Antenna Reference Point(ARP): BOOTHVILLE CORS ARP                  |
|         ------------------------------------------------                   |
|                              PID = DE8091                                  |
|                                                                            |
|                                                                            |
| IGS08 POSITION (EPOCH 2005.0)                                              |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     X =     57650.228 m     latitude    =  29 20 12.50899 N                |
|     Y =  -5564331.481 m     longitude   = 089 24 23.03392 W                |
|     Z =   3106490.858 m     ellipsoid height =  -15.642   m                |
|                                                                            |
| IGS08 VELOCITY                                                             |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     VX =  -0.0120 m/yr      northward =  -0.0009 m/yr                      |
|     VY =   0.0029 m/yr      eastward  =  -0.0120 m/yr                      |
|     VZ =  -0.0027 m/yr      upward    =  -0.0040 m/yr                      |
|                                                                            |
|                                                                            |
| NAD_83 (2011) POSITION (EPOCH 2010.0)                                      |
| Transformed from IGS08 (epoch 2005.0) position in Aug 2011.                |
|     X =     57650.883 m     latitude    =  29 20 12.48974 N                |
|     Y =  -5564332.980 m     longitude   = 089 24 23.01021 W                |
|     Z =   3106491.024 m     ellipsoid height =  -14.248   m  -14.279m (2017)
|                                                                            |
| NAD_83 (2011) VELOCITY                                                     |
| Transformed from IGS08 velocity in Aug 2011.                               |
|     VX =   0.0016 m/yr      northward =  -0.0005 m/yr                      |
|     VY =   0.0039 m/yr      eastward  =   0.0016 m/yr                      |
|     VZ =  -0.0028 m/yr      upward    =  -0.0048 m/yr     x 6.4yrs = 0.031 m
|____________________________________________________________________________|
|                                                                            |
| L1 Phase Center of the current GPS antenna: BOOTHVILLE CORS L1 PC C        |
| ------------------------------------------------------------------         |
| The Zephyr GNSS Geodetic II - RoHS compliant antenna                       |
| (Antenna Code = TRM57971.00     NONE) was installed on 18Feb2010.          |
|        The L2 phase center is 0.009 m below the L1 phase center.           |
|                              PID = DL7813                                  |
|                                                                            |
|                                                                            |
| IGS08 POSITION (EPOCH 2005.0)                                              |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     X =     57650.228 m     latitude    =  29 20 12.50902 N                |
|     Y =  -5564331.539 m     longitude   = 089 24 23.03393 W                |
|     Z =   3106490.892 m     ellipsoid height =  -15.575   m                |
|                                                                            |
| The IGS08 VELOCITY of the L1 PC is the same as that for the ARP.           |
|                                                                            |
|                                                                            |
| NAD_83 (2011) POSITION (EPOCH 2010.0)                                      |
```

```
| Transformed from IGS08 (epoch 2005.0) position in Aug 2011.                |
|     X =     57650.883 m     latitude    =  29 20 12.48978 N                |
|     Y =  -5564333.037 m     longitude   = 089 24 23.01022 W                |
|     Z =   3106491.058 m     ellipsoid height =  -14.181   m                |
|                                                                            |
| The NAD_83 (2011) VELOCITY of the L1 PC is the same as that for the ARP.   |
|____________________________________________________________________________|
|                                                                            |
|         Monument: BOOTHVILLE MON                                           |
|         ------------------------                                           |
|                                PID = DH8931                                |
|         Inscribed: NONE                                                    |
|                                                                            |
|                                                                            |
| IGS08 POSITION (EPOCH 2005.0)                                              |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     X =     57650.227 m     latitude    =  29 20 12.50899 N                |
|     Y =  -5564331.412 m     longitude   = 089 24 23.03392 W                |
|     Z =   3106490.819 m     ellipsoid height =  -15.721   m                |
|                                                                            |
| The IGS08 VELOCITY of the monument is the same as that for the ARP.        |
|                                                                            |
|                                                                            |
| NAD_83 (2011) POSITION (EPOCH 2010.0)                                      |
| Transformed from IGS08 (epoch 2005.0) position in Aug 2011.                |
|     X =     57650.882 m     latitude    =  29 20 12.48974 N                |
|     Y =  -5564332.910 m     longitude   = 089 24 23.01021 W                |
|     Z =   3106490.985 m     ellipsoid height =  -14.328   m                |
|                                                                            |
| The NAD_83 (2011) VELOCITY of the monument is the same as that for the ARP. |
|____________________________________________________________________________|
```

```
 * Latitude, longitude and ellipsoid height are computed from their
   corresponding cartesian coordinates using dimensions for the
   GRS 80 ellipsoid: semi-major axis = 6,378,137.0 meters
                          flattening = 1/298.257222101...


 * WARNING: Mixing of antenna types can lead to errors of up to 10 cm.
   in height unless antenna-phase-center variation and antenna-phase-center
   offset are properly modeled.  See next comment.

 * The coordinates shown on this page were computed using absolute antenna
   calibrations.  CORS coordinates began using absolute antenna calibrations
   beginning with IGS08 and NAD 83 (2011, MA11, PA11).  For additional
   information on the derivation of these positions and velocities and
   antenna calibrations consult:
   http://geodesy.noaa.gov/CORS/coords.shtml
   http://geodesy.noaa.gov/ANTCAL


 * For more site specific information on the equipment history and
   monumentation type consult:
   ftp://geodesy.noaa.gov/cors/station_log/bvhs.log.txt
```

http://geodesy.noaa.gov/cgi-cors/corsage_2.prl?site=bvhs

* The position & velocity were revised in Aug 2011.

```
                              ***IGS 08***
                GRAND ISLE (GRIS),  LOUISIANA

 Retrieved from NGS DataBase on 12/13/13 at 07:58:48.
 ____________________________________________________________________________
|                                                                            |
|         Antenna Reference Point(ARP): GRAND ISLE CORS ARP                  |
|         ------------------------------------------------                   |
|                              PID = DH7121                                  |
|                                                                            |
|                                                                            |
| IGS08 POSITION (EPOCH 2005.0)                                              |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     X =      4149.776 m     latitude    =  29 15 55.90203 N                |
|     Y =  -5568493.981 m     longitude   = 089 57 26.28652 W                |
|     Z =   3099600.334 m     ellipsoid height =  -17.002   m                |
|                                                                            |
| IGS08 VELOCITY                                                             |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     VX =  -0.0118 m/yr      northward =  -0.0009 m/yr                      |
|     VY =   0.0059 m/yr      eastward  =  -0.0118 m/yr                      |
|     VZ =  -0.0043 m/yr      upward    =  -0.0073 m/yr                      |
|                                                                            |
|                                                                            |
| NAD_83 (2011) POSITION (EPOCH 2010.0)                                      |
| Transformed from IGS08 (epoch 2005.0) position in Aug 2011.                |
|     X =      4150.432 m     latitude    =  29 15 55.88300 N                |
|     Y =  -5568495.462 m     longitude   = 089 57 26.26226 W                |
|     Z =   3099600.493 m     ellipsoid height =  -15.632   m   -15.684m (2017)
|                                                                            |
| NAD_83 (2011) VELOCITY                                                     |
| Transformed from IGS08 velocity in Aug 2011.                               |
|     VX =   0.0018 m/yr      northward =  -0.0003 m/yr                      |
|     VY =   0.0069 m/yr      eastward  =   0.0018 m/yr                      |
|     VZ =  -0.0042 m/yr      upward    =  -0.0081 m/yr    x 6.4yrs = 0.052 m
|____________________________________________________________________________|
|                                                                            |
| L1 Phase Center of the current GPS antenna: GRAND ISLE CORS L1 PC C        |
| ---------------------------------------------------------------------      |
| The Zephyr GNSS Geodetic II - RoHS compliant antenna                       |
| (Antenna Code = TRM57971.00     NONE) was installed on 11Dec2013.          |
|        The L2 phase center is 0.009 m below the L1 phase center.          |
|                              PID = DO9968                                  |
|                                                                            |
|                                                                            |
| IGS08 POSITION (EPOCH 2005.0)                                              |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     X =      4149.776 m     latitude    =  29 15 55.90207 N                |
|     Y =  -5568494.038 m     longitude   = 089 57 26.28653 W                |
|     Z =   3099600.368 m     ellipsoid height =  -16.936   m                |
|                                                                            |
| The IGS08 VELOCITY of the L1 PC is the same as that for the ARP.           |
|                                                                            |
|                                                                            |
| NAD_83 (2011) POSITION (EPOCH 2010.0)                                      |
```

```
| Transformed from IGS08 (epoch 2005.0) position in Aug 2011.                |
|     X =      4150.432 m     latitude    =  29 15 55.88304 N                |
|     Y =  -5568495.520 m     longitude   = 089 57 26.26227 W                |
|     Z =   3099600.527 m     ellipsoid height =  -15.565   m               |
|                                                                            |
| The NAD_83 (2011) VELOCITY of the L1 PC is the same as that for the ARP.   |
|____________________________________________________________________________|
```

* Latitude, longitude and ellipsoid height are computed from their corresponding cartesian coordinates using dimensions for the GRS 80 ellipsoid: semi-major axis = 6,378,137.0 meters
  flattening = 1/298.257222101...

* WARNING: Mixing of antenna types can lead to errors of up to 10 cm. in height unless antenna-phase-center variation and antenna-phase-center offset are properly modeled. See next comment.

* The coordinates shown on this page were computed using absolute antenna calibrations. CORS coordinates began using absolute antenna calibrations beginning with IGS08 and NAD 83 (2011, MA11, PA11). For additional information on the derivation of these positions and velocities and antenna calibrations consult:
  http://geodesy.noaa.gov/CORS/coords.shtml
  http://geodesy.noaa.gov/ANTCAL

* For more site specific information on the equipment history and monumentation type consult:
  ftp://geodesy.noaa.gov/cors/station_log/gris.log.txt
  http://geodesy.noaa.gov/cgi-cors/corsage_2.prl?site=gris

* The position & velocity were revised in Aug 2011.

```
                              ***IGS 08***
                LUMCON (LMCN),  LOUISIANA

 Retrieved from NGS DataBase on 06/19/14 at 14:45:54.
 ____________________________________________________________________________
|                                                                            |
|         Antenna Reference Point(ARP): LUMCON CORS ARP                      |
|         ---------------------------------------------                      |
|                              PID = DF5771                                  |
|                                                                            |
|                                                                            |
| IGS08 POSITION (EPOCH 2005.0)                                              |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     X =    -64275.913 m     latitude    =  29 15 17.92319 N                |
|     Y =  -5568696.913 m     longitude   = 090 39 40.67725 W                |
|     Z =   3098580.644 m     ellipsoid height =  -16.106   m                |
|                                                                            |
| IGS08 VELOCITY                                                             |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     VX =  -0.0106 m/yr      northward =  -0.0014 m/yr                      |
|     VY =   0.0052 m/yr      eastward  =  -0.0107 m/yr                      |
|     VZ =  -0.0045 m/yr      upward    =  -0.0066 m/yr                      |
|                                                                            |
|                                                                            |
| NAD_83 (2011) POSITION (EPOCH 2010.0)                                      |
| Transformed from IGS08 (epoch 2005.0) position in Aug 2011.                |
|     X =    -64275.251 m     latitude    =  29 15 17.90427 N                |
|     Y =  -5568698.394 m     longitude   = 090 39 40.65211 W                |
|     Z =   3098580.802 m     ellipsoid height =  -14.743   m   -14.790m (2017)
|                                                                            |
| NAD_83 (2011) VELOCITY                                                     |
| Transformed from IGS08 velocity in Aug 2011.                               |
|     VX =   0.0030 m/yr      northward =  -0.0005 m/yr                      |
|     VY =   0.0062 m/yr      eastward  =   0.0029 m/yr                      |
|     VZ =  -0.0041 m/yr      upward    =  -0.0074 m/yr    x 6.4yrs = 0.047 m
|____________________________________________________________________________|
|                                                                            |
| L1 Phase Center of the current GPS antenna: LUMCON CORS L1 PC C            |
| ---------------------------------------------------------------            |
| The Zephyr GNSS Geodetic II - RoHS compliant antenna                       |
| (Antenna Code = TRM57971.00     NONE) was installed on 11Jun2014.          |
|        The L2 phase center is 0.009 m below the L1 phase center.          |
|                              PID = DP3824                                  |
|                                                                            |
|                                                                            |
| IGS08 POSITION (EPOCH 2005.0)                                              |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     X =    -64275.914 m     latitude    =  29 15 17.92323 N                |
|     Y =  -5568696.970 m     longitude   = 090 39 40.67726 W                |
|     Z =   3098580.678 m     ellipsoid height =  -16.039   m                |
|                                                                            |
| The IGS08 VELOCITY of the L1 PC is the same as that for the ARP.           |
|                                                                            |
|                                                                            |
| NAD_83 (2011) POSITION (EPOCH 2010.0)                                      |
```

```
| Transformed from IGS08 (epoch 2005.0) position in Aug 2011.                |
|     X =    -64275.252 m     latitude    =  29 15 17.90431 N                |
|     Y =  -5568698.452 m     longitude   = 090 39 40.65212 W                |
|     Z =   3098580.836 m     ellipsoid height =  -14.676   m                |
|                                                                            |
| The NAD_83 (2011) VELOCITY of the L1 PC is the same as that for the ARP.   |
|____________________________________________________________________________|
```

```
 * Latitude, longitude and ellipsoid height are computed from their
   corresponding cartesian coordinates using dimensions for the
   GRS 80 ellipsoid: semi-major axis = 6,378,137.0 meters
                          flattening = 1/298.257222101...


 * WARNING: Mixing of antenna types can lead to errors of up to 10 cm.
   in height unless antenna-phase-center variation and antenna-phase-center
   offset are properly modeled.  See next comment.

 * The coordinates shown on this page were computed using absolute antenna
   calibrations.  CORS coordinates began using absolute antenna calibrations
   beginning with IGS08 and NAD 83 (2011, MA11, PA11).  For additional
   information on the derivation of these positions and velocities and
   antenna calibrations consult:
   http://geodesy.noaa.gov/CORS/coords.shtml
   http://geodesy.noaa.gov/ANTCAL


 * For more site specific information on the equipment history and
   monumentation type consult:
   ftp://geodesy.noaa.gov/cors/station_log/lmcn.log.txt
   http://geodesy.noaa.gov/cgi-cors/corsage_2.prl?site=lmcn


 * The ITRF00 & NAD_83 positions & velocities were revised in Nov. 2008.
 * The position & velocity were revised in Aug 2011.
```

```
                              ***IGS 08***
                LAKEWOOD ELMENTRY (LWES),  LOUISIANA

 Retrieved from NGS DataBase on 05/07/14 at 15:37:46.
 ____________________________________________________________________________
|                                                                            |
|         Antenna Reference Point(ARP): LAKEWOOD ELMENTRY CORS ARP           |
|         -------------------------------------------------------            |
|                              PID = DJ9603                                  |
|                                                                            |
|                                                                            |
| IGS08 POSITION (EPOCH 2005.0)                                              |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     X =    -33746.131 m     latitude    =  29 54 01.31464 N               |
|     Y =  -5533652.961 m     longitude   = 090 20 57.85857 W               |
|     Z =   3160795.454 m     ellipsoid height =  -17.075   m               |
|                                                                            |
| IGS08 VELOCITY                                                             |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     VX =  -0.0116 m/yr      northward =  -0.0001 m/yr                      |
|     VY =   0.0036 m/yr      eastward  =  -0.0116 m/yr                      |
|     VZ =  -0.0021 m/yr      upward    =  -0.0041 m/yr                      |
|                                                                            |
|                                                                            |
| NAD_83 (2011) POSITION (EPOCH 2010.0)                                      |
| Transformed from IGS08 (epoch 2005.0) position in Aug 2011.                |
|     X =    -33745.472 m     latitude    =  29 54 01.29535 N               |
|     Y =  -5533654.444 m     longitude   = 090 20 57.83368 W               |
|     Z =   3160795.619 m     ellipsoid height =  -15.710   m   -15.741m (2017) |
|                                                                            |
| NAD_83 (2011) VELOCITY                                                     |
| Transformed from IGS08 velocity in Aug 2011.                               |
|     VX =   0.0022 m/yr      northward =   0.0007 m/yr                      |
|     VY =   0.0046 m/yr      eastward  =   0.0022 m/yr                      |
|     VZ =  -0.0018 m/yr      upward    =  -0.0049 m/yr   x 6.4yrs = 0.031 m |
|____________________________________________________________________________|
|                                                                            |
| L1 Phase Center of the current GPS antenna: LAKEWOOD ELMENTRY CORS L1 PC C |
| -------------------------------------------------------------------------- |
| The Zephyr GNSS Geodetic II - RoHS compliant antenna                       |
| (Antenna Code = TRM57971.00     NONE) was installed on 21Mar2014.          |
|        The L2 phase center is 0.009 m below the L1 phase center.          |
|                              PID = DP2658                                  |
|                                                                            |
|                                                                            |
| IGS08 POSITION (EPOCH 2005.0)                                              |
| Computed in Aug 2011 using data through gpswk 1631.                        |
|     X =    -33746.131 m     latitude    =  29 54 01.31467 N               |
|     Y =  -5533653.019 m     longitude   = 090 20 57.85858 W               |
|     Z =   3160795.488 m     ellipsoid height =  -17.008   m               |
|                                                                            |
| The IGS08 VELOCITY of the L1 PC is the same as that for the ARP.           |
|                                                                            |
|                                                                            |
| NAD_83 (2011) POSITION (EPOCH 2010.0)                                      |
```

```
| Transformed from IGS08 (epoch 2005.0) position in Aug 2011.                |
|     X =    -33745.473 m     latitude    =  29 54 01.29539 N                |
|     Y =  -5533654.502 m     longitude   = 090 20 57.83369 W                |
|     Z =   3160795.653 m     ellipsoid height =  -15.643   m               |
|                                                                            |
| The NAD_83 (2011) VELOCITY of the L1 PC is the same as that for the ARP.   |
|____________________________________________________________________________|
```

* Latitude, longitude and ellipsoid height are computed from their corresponding cartesian coordinates using dimensions for the GRS 80 ellipsoid: semi-major axis = 6,378,137.0 meters
  flattening = 1/298.257222101...

* WARNING: Mixing of antenna types can lead to errors of up to 10 cm. in height unless antenna-phase-center variation and antenna-phase-center offset are properly modeled. See next comment.

* The coordinates shown on this page were computed using absolute antenna calibrations. CORS coordinates began using absolute antenna calibrations beginning with IGS08 and NAD 83 (2011, MA11, PA11). For additional information on the derivation of these positions and velocities and antenna calibrations consult:
  http://geodesy.noaa.gov/CORS/coords.shtml
  http://geodesy.noaa.gov/ANTCAL

* For more site specific information on the equipment history and monumentation type consult:
  ftp://geodesy.noaa.gov/cors/station_log/lwes.log.txt
  http://geodesy.noaa.gov/cgi-cors/corsage_2.prl?site=lwes

* The position & velocity were revised in Aug 2011.

ISLAND ROAD MARSH CREATION PROJECT (TE-117) - STATIC GPS ADJUSTMENT (MINIMALLY CONSTRAINED AT AWES)

NAD83 (2011) Epoch 2010.00 - LA State Plane - South Zone (1702) - NAVD88 (Geoid12B)

Static GPS Results Compared to Calculated Ellipsoid Heights with Subidence Applied

CORS Station	Latitude	Longitude	Ellipsoid Height (Mtr)	NGS Published Ellipsoid Hgt (Mtr) August 2011	NGS Published Annual Velocity (Mtr)	Calculated Ellipsoid Hgt (Mtr) January 2017	Difference Static GPS Minus Calc Velocity
AWES	**30d06'00.96248"**	**-90d58'58.63439"**	**-8.957**	-8.952	-0.0008	-8.957	**0.000**
BVHS	29d20'12.49009"	-89d24'23.01055"	-14.282	-14.248	-0.0048	-14.279	**-0.003**
GRIS	29d15'55.88323"	-89d57'26.26229"	-15.676	-15.632	-0.0081	-15.684	**0.008**
LMCN	29d15'17.90435"	-90d39'40.65170"	-14.801	-14.743	-0.0074	-14.790	**-0.011**
LWES	29d54'01.29542"	-90d20'57.83373"	-15.720	-15.710	-0.0049	-15.741	**0.021**

Ellipsoid Height for AWES CORS ARP was calculated by applying the Subidence over the 6.4 year period to the NGS Published Ellipsoid Height

ISLAND ROAD MARSH CREATION PROJECT (TE-117) - STATIC GPS ADJUSTMENT COMPARED TO OPUS

NAD83 (2011) Epoch 2010.00 - LA State Plane - South Zone (1702) - NAVD88 (Geoid12B)

Monument CRMSTE-SM-19

Station	Latitude	Longitude	Ellipsoid Height (Mtr)	Northing (Mtr)	Easting (Mtr)	Northing (Ft)	Easting (Ft)	Elevation (Mtr)	Elevation (Ft)	Description
69920091.17o	29°19'55.15795"	90°32'29.75910"	-24.261	92,488.910	1,076,896.735	303,440.70	3,533,118.70	0.260	0.85	OPUS Solution
CRMSTE-SM-19	**29°19'55.15797"**	**90°32'29.75908"**	**-24.262**	**92,488.910**	**1,076,896.735**	**303,440.70**	**3,533,118.70**	**0.259**	**0.85**	**Deep Rod Mon.**
Difference=	***-00°00'00.00008"***	***00°00'00.00010"***	***-0.001***	***0.000***	***0.000***	***0.00***	***0.00***	***-0.001***	***0.00***	

Monument TE10-SM-08 (TBM)

Station	Latitude	Longitude	Ellipsoid Height (Mtr)	Northing (Mtr)	Easting (Mtr)	Northing (Ft)	Easting (Ft)	Elevation (Mtr)	Elevation (Ft)	Description
91620090.17o	29°24'59.30968"	90°26'49.59514"	-24.230	101,920.344	1,086,001.431	334,383.66	3,562,989.69	0.461	1.51	OPUS Solution
TE10-SM-08 (TBM)	**29°24'59.30957"**	**90°26'49.59523"**	**-24.238**	**101,920.340**	**1,086,001.428**	**334,383.65**	**3,562,989.68**	**0.453**	**1.49**	**Iron Rod**
Difference=	***-00°00'00.00012"***	***00°00'00.00012"***	***-0.008***	***0.0***	***0.0***	***-0.01***	***-0.01***	***-0.008***	***-0.03***	

Control Point TBM-1

Station	Latitude	Longitude	Ellipsoid Height (Mtr)	Northing (Mtr)	Easting (Mtr)	Northing (Ft)	Easting (Ft)	Elevation (Mtr)	Elevation (Ft)	Description
78210090.17o	29°23'16.23102"	90°28'58.30309"	-23.193	98,720.456	1,082,555.564	323,885.36	3,551,684.38	1.440	4.72	OPUS Solution
23372330.17o	29°23'16.23156"	90°28'58.30288"	-23.189	98,720.473	1,082,555.569	323,885.42	3,551,684.39	1.444	4.74	OPUS Solution
23372350.17o	29°23'16.23124"	90°28'58.30284"	-23.207	98,720.463	1,082,555.570	323,885.39	3,551,684.40	1.426	4.68	OPUS Solution
23372360.17o	29°23'16.23142"	90°28'58.30270"	-23.214	98,720.468	1,082,555.574	323,885.40	3,551,684.41	1.414	4.64	OPUS Solution
23372361.17o	29°23'16.23145"	90°28'58.30262"	-23.223	98,720.470	1,082,555.576	323,885.41	3,551,684.42	1.410	4.63	OPUS Solution
23372370.17o	29°23'16.23127"	90°28'58.30331"	-23.217	98,720.464	1,082,555.558	323,885.39	3,551,684.36	1.416	4.65	OPUS Solution
23373100.17o	29°23'16.23091"	90°28'58.30356"	-23.221	98,720.453	1,082,555.551	323,885.35	3,551,684.33	1.412	4.63	OPUS Solution
23373110.17o	29°23'16.23160"	90°28'58.30334"	-23.218	98,720.474	1,082,555.557	323,885.42	3,551,684.35	1.415	4.64	OPUS Solution
23373132.17o	29°23'16.23203"	90°28'58.30302"	-23.224	98,720.487	1,082,555.565	323,885.46	3,551,684.38	1.409	4.62	OPUS Solution
OPUS AVERAGE	**29°23'16.23139"**	**90°28'58.30304"**	**-23.212**	**98,720.468**	**1,082,555.565**	**323,885.40**	**3,551,684.38**	**1.421**	**4.66**	**AVERAGE**
TBM-1	**29°23'16.23108"**	**90°28'58.30311"**	**-23.197**	**98,720.458**	**1,082,555.563**	**323,885.37**	**3,551,684.37**	**1.436**	**4.71**	**TBM**
Difference=	***00°00'00.00002"***	***00°00'00.00005"***	***0.015***	***-0.010***	***-0.002***	***-0.03***	***-0.01***	***0.015***	***0.05***	

Control Point TBM-2

Station	Latitude	Longitude	Ellipsoid Height (Mtr)	Northing (Mtr)	Easting (Mtr)	Northing (Ft)	Easting (Ft)	Elevation (Mtr)	Elevation (Ft)	Description
2337234B.17o	29°23'14.79329"	90°28'58.88831"	-23.943	98,676.074	1,082,540.113	323,739.75	3,551,633.68	0.689	2.26	OPUS Solution

ISLAND ROAD MARSH CREATION PROJECT (TE-117) - STATIC GPS ADJUSTMENT COMPARED TO OPUS

NAD83 (2011) Epoch 2010.00 - LA State Plane - South Zone (1702) - NAVD88 (Geoid12B)

Control Point TBM-3

Station	Latitude	Longitude	Ellipsoid Height (Mtr)	Northing (Mtr)	Easting (Mtr)	Northing (Ft)	Easting (Ft)	Elevation (Mtr)	Elevation (Ft)	Description
97560240.17o	29°18'23.89007"	90°30'11.82784"	-24.146	89,705.265	1,080,638.278	294,308.02	3,545,394.08	0.287	0.94	OPUS Solution
97560241.17o	29°18'23.89010"	90°30'11.82794"	-24.145	89,705.266	1,080,638.275	294,308.03	3,545,394.07	0.288	0.94	OPUS Solution
97560250.17o	29°18'23.88978"	90°30'11.82794"	-24.143	89,705.256	1,080,638.275	294,307.99	3,545,394.07	0.29	0.95	OPUS Solution
97560310.17o	29°18'23.89010"	90°30'11.82751"	-24.155	89,705.266	1,080,638.286	294,308.03	3,545,394.11	0.278	0.91	OPUS Solution
97560320.17o	29°18'23.89014"	90°30'11.82769"	-24.149	89,705.267	1,080,638.282	294,308.03	3,545,394.09	0.284	0.93	OPUS Solution
97560330.17o	29°18'23.89036"	90°30'11.82802"	-24.142	89,705.274	1,080,638.273	294,308.05	3,545,394.06	0.291	0.95	OPUS Solution
OPUS AVERAGE	**29°18'23.89009"**	**90°30'11.82782"**	**-24.147**	**89,705.266**	**1,080,638.278**	**294,308.03**	**3,545,394.08**	**0.286**	**0.94**	**AVERAGE**

Control Point TBM-4

Station	Latitude	Longitude	Ellipsoid Height (Mtr)	Northing (Mtr)	Easting (Mtr)	Northing (Ft)	Easting (Ft)	Elevation (Mtr)	Elevation (Ft)	Description
69920200.17o	29°15'02.98145"	90°39'48.65533"	-23.923	83,417.694	1,065,108.471	273,679.55	3,494,443.37	0.469	1.54	OPUS Solution

VICINITY MAP Not to Scale Image from Google Earth Pro ©2017

Station Name: "CRMSTE-SM-19"

Location: This station is located in Terrebonne Parish on property owned by Apache Corporation and is situated on the west bank of Bayou Barre, approximately 4.5 mi. southeasterly from Pat's Bayou side Marina boat landing located on LA Highway 55 in Montegut, Louisiana. For right-of-entry permit, please call Timothy Allen at (985) 879-3528, x.19.

Monument Description: NGS style floating sleeve monument; datum point set on 9/16" stainless steel sectional rods driven 76 feet to refusal, set in sand filled 6" PVC pipe with access cover set in concrete, flush with ground.

Stamping: CRMSTE SM 19

Installation Date: 2005 **Date of Survey:** January 9, 2017

Monument Established By: Morris P. Hebert, Inc.

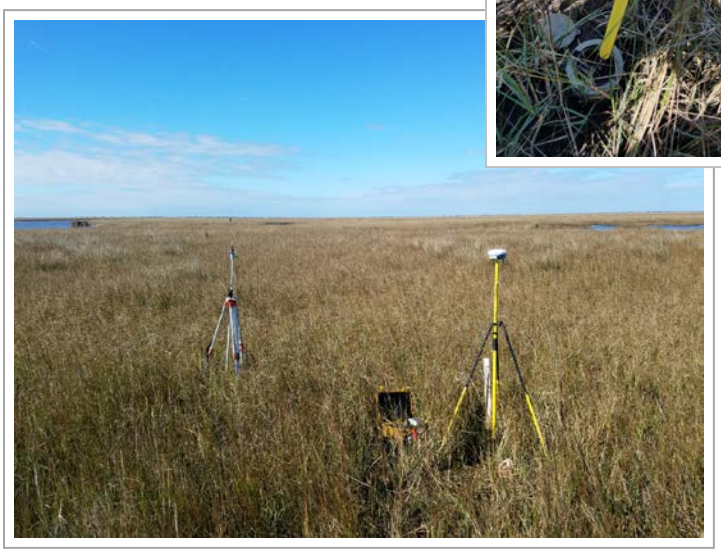
NAD83 (2011) Epoch 2010.00 Geodetic Position
Lat. 29° 19' 55.15797" N
Long. 090° 32' 29.75908" W

NAD83 (2011) Epoch 2010.00- LSZ (1702) Ft
N= 303,440.70'
E= 3,533,118.70'

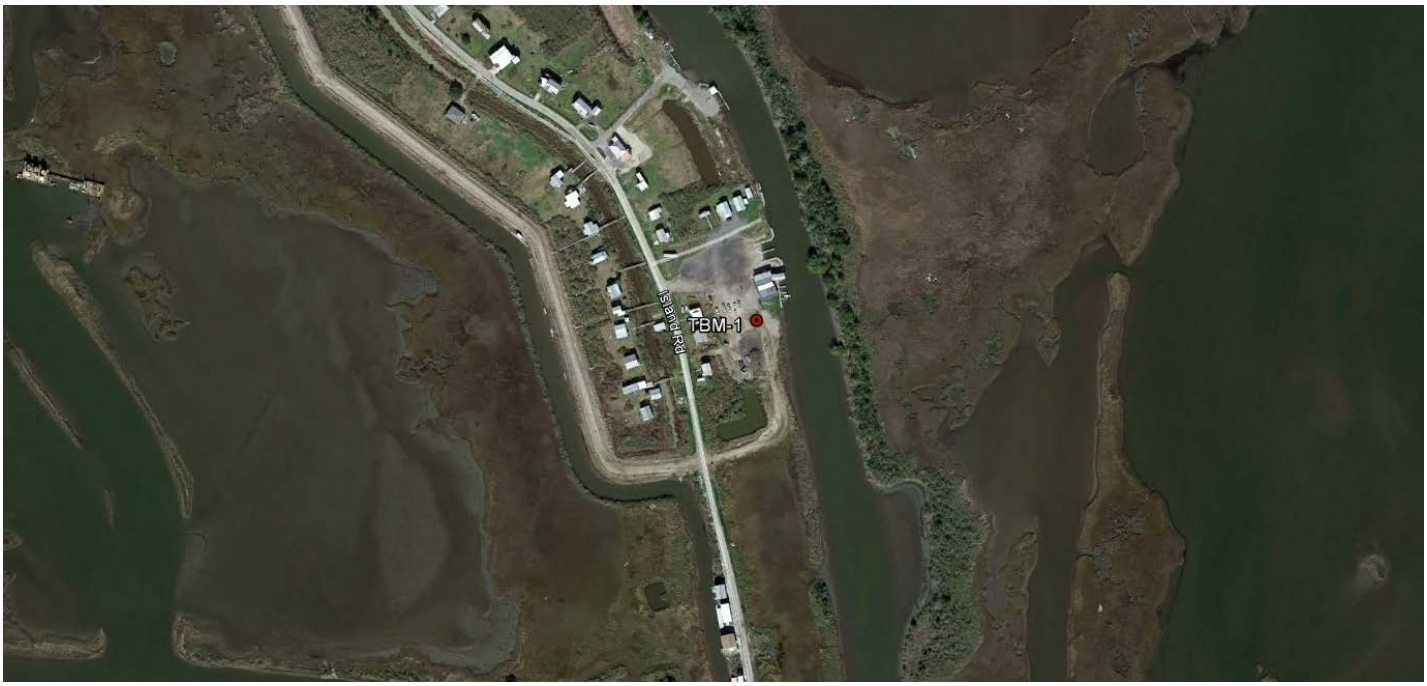
NAVD88 Height (2011)
Elevation = 0.85 feet (0.259 mtrs)

Ellipsoid Height (2011) = -24.262 mtrs.
Geoid12A Height = -24.520 mtrs.

FOR REFERENCE ONLY
Elevation (Geoid03) = 1.21 ft. (0.369 mtrs)
Ellipsoid Height = -24.254 mtrs.
Elevation (Geoid99) = 1.53 ft. (0.467 mtrs)
Ellipsoid Height = -24.259 mtrs.



Adjusted Position Established C.H. Fenstermaker & Associates, LLC. for the Coastal Protection & Restoration Authority of Louisiana



VICINITY MAP Not to Scale Image from Google Earth Pro ©2017

Station Name: "TBM-1"

Location: To reach the station from the courthouse in Houma, travel south on Hwy 24 for 9.75 mi (15.69 km) to junction with Hwy 55. Travel south on Hwy 55 for 4.25 mi (6.84 km) to junction with Hwy 665 (Pointe aux Chenes Rd). Turn left on Hwy 665 and travel east, then south for 8.5 miles (13.67 km) to the junction of Island Road. Turn Left and proceed Southwest, thence south on Island Road for a distance of 4.1 Miles (6.64 km) to Island de Jean Charles Marina and the station is on the left. The station is a 80d Nail set in the southeast corner of the parking lot, approximately 51 feet southwest from the southwest corner of the Marina and 70 feet west from the south end of a bulhead..

Monument Description: Survey disk set on top of steel rod imbedded in concrete flush with ground.

Stamping: N/A

Installation Date: January 9, 2017 **Date of Survey:** January 9, 2017

Monument Established By: C.H. Fenstermaker & Associates, LLC

NAD83 (2011) Epoch 2010.00 Geodetic Position
Lat. 29° 23' 16.23108" N
Long. 090° 28' 58.30311" W

NAD83 (2011) Epoch 2010.00- LSZ (1702) Ft
N= 323,885.37
E= 3,551,684.37

NAVD88 Height (2011)
Elevation = 4.71 feet (1.436 mtrs)

Ellipsoid Height (2011) = -23.197 mtrs.
Geoid12B Height = -24.633 mtrs.

Adjusted Position Established C.H. Fenstermaker & Associates, LLC. for the Coastal Protection & Restoration Authority of Louisiana

VICINITY MAP Not to Scale Image from Google Earth Pro ©2017

Station Name: "TE10 SM 08" (TBM)

Location: To reach the station from the courthouse in Houma, travel south on Hwy 24 for 9.75 mi (15.69 km) to junction with Hwy 55. Travel south on Hwy 55 for 4.25 mi (6.84 km) to junction with Hwy 665. Turn left on Hwy 665 and travel south for 9.93 miles (15.98 km) and the station is on the left. The station is a 2 inch disk in concrete.

Monument Description: Survey disk set on top of steel rod imbedded in concrete flush with ground.

Stamping: N/A

Installation Date: N/A **Date of Survey:** January 9, 2017

Monument Established By: Gulf South Engineers, Inc.

NAD83 (2011) Epoch 2010.00 Geodetic Position
Lat. 29° 24' 59.30957" N
Long. 090° 26' 49.59523" W

NAD83 (2011) Epoch 2010.00- LSZ (1702) Ft
N= 334,383.65
E= 3,562,989.68

NAVD88 Height (2011)
Elevation = 1.49 feet (0.453 mtrs)

Ellipsoid Height (2011) = -24.238 mtrs.
Geoid12B Height = -24.691 mtrs.

FOR REFERENCE ONLY
Elevation (Geoid99) = 2.27 ft. (0.693 mtrs)
Ellipsoid Height = -24.210 mtrs.

Adjusted Position Established C.H. Fenstermaker & Associates, LLC. for the Coastal Protection & Restoration Authority of Louisiana

SECTION C

Magnetometer Survey

Magnetometer Survey Methodology and Equipment Specifications
Table of Anomalies

Magnetometer Surveys to Locate Potential Hazards

Instruments utilized for the survey included a Trimble® R7 GNSS RTK GPS (RTK) system providing centimeter accuracy positioning and a Geometrics® 882 Cesium Marine Magnetometer.

The magnetometer on M/V BB 9 was operated in a towed configuration with the tow point at the stern of the vessel. The magnetometer dataset was collected through HYPACK® at a sampling rate of 10 Hz and a very high sensitivity of less than 0.1 gammas. Chesapeake Technology, Inc.'s SonarWiz.SBP software was used to interpret the magnetometer dataset.

Included in this Report Section is a list of anomalies that were recorded within the Southern Access Route (See Section H, pages 11-25) and Proposed Borrow Area (See Section H, Page 31). This list includes various attributes associated with each magnetic anomaly and include comments regarding the results from probing. In some cases, water depths exceeded the limits of probing, therefore the potential pipeline depth of cover could not be determined.

Significant anomalies that were located and identified on this survey are associated with existing pipelines and plugged and abandoned wells, all of which are located within the Proposed Southern Access Route. The remainder of these anomalies are determined to be consistent with targets usually associated with minor debris such as crab traps, teal cans and buckets, etc. No significant anomalies such as pipelines or wells were identified within the Proposed Borrow Area.

Conclusion

The magnetometer records do not indicate the evidence of any pipelines within the study area, however, while reasonable efforts are made to locate all pipelines and magnetic anomalies, the equipment used and the characteristics of pipelines themselves make it impossible to guarantee total success. Accordingly, it is incumbent upon the owners, operators and/or contractors conducting operations, to do so with extreme caution, and recognize that hazards in addition to those detected and reported by Fenstermaker may exist within the areas of operation in spite of Fenstermaker's most diligent efforts.

The presence of debris can have an adverse impact on the success of construction activities. The locations of all the magnetic anomalies should be considered during the planned project and investigated or avoided as deemed appropriate by CPRA.

Louisiana (Louisiana One Call™ www.laonecall.com) maintains an information center and link between those who dig (excavators) and those who own and operate underground facilities (operators). It is advisable and in most states, law, for the contractor to contact the center for assistance in locating and marking underground utilities.

Magnetometers

The advantage of this type of equipment is sensitivity and speed of data acquisition. This equipment uses a passive system, which means it detects the earth's magnetic field. This equipment can be mounted on a non-ferrous vehicle, as a tow fish assembly, or hand carried. The sensitivity of this unit is also a disadvantage. The magnetometer can detect changes in the earth's magnetic field at incredible distances. However it becomes harder to distinguish between different changes caused by various types of objects, and or situations (i.e. wells, ferrous anomalies and debris, ditches etc.)

Client Focused. Technology Driven.

Cesium Magnetometers

Magnetometers measure the local magnetic field strength. When an operator uses a cesium magnetometer to detect the presence of pipelines, they rely on local distortions in the earth's magnetic field. Typically pipelines will produce a magnetic signature that is very distinctive but in some cases there are physical limitations that will challenge the operator. Several factors such as pipeline age, orientation, mechanical and thermal history, construction, and depth affect the magnetic signature.

As well as the earth's magnetic field, some archaeological features have a measurable magnetic field. Burning will cause substances to become magnetized, metals such as iron have a strong magnetic field, and even the fill of a ditch will show up because there are magnetic particles in soil, so if you have a deeper depth of soil because of a ditch, you will get more of a magnetic field to measure.

The cesium magnetometer is a passive device that pumps light through an alkali vapor capsule as a means to accurately measure magnetic intensity. The cesium magnetometers sensitivity and the sample rate make it the best tool for detecting small magnetic changes.

Typically weak magnetic fields are measured in nanotesla (nT)/gammas, and stronger magnetic fields are measured in gauss (G). The earth's magnetic field varies but is usually around 50000 nT or about .5 gauss.

When the operator detects an anomaly, there is no indication that the signal is a pipeline. The operator must try to locate other anomalies and see if they line up. If there is a lot of ferrous debris in the survey area, the operator may find it difficult to make sense of the data.

Geometrics Model G-882 Cesium Magnetometer Description and Specifications

The G-822 is a marine magnetometer is used in deeper water applications and/or when magnetic contour mapping is required. The sensor is usually towed above the water bottom. The magnetic signal output is interfaced with a computer along with GPS and to provide magnetic contour maps.

The model G-882 cesium-vapor marine magnetometer provides the same high performance as our airborne instruments delivering high resolution results in all types of survey applications. The G-882 is a low cost, compact system designed for professional surveys in shallow or deep water.

The G-882 magnetometer's digital output can be recorded with any serial data logger but its full potential is obtained when used with our MagLog Lite™ software to log, display and print GPS positioned measurement results. The price, performance and reliability of the G–882 make it the best value of any marine magnetometer available today. The G-882 is designed for operation from small vessels for shallow water surveys as well as for large survey vessels for deep tow applications (4,000 psi rating, telemetry over steel coax available to 10Km). Being small and lightweight (40 lbs net, no extra weights) it is easily deployed and operated by one person. Power may be supplied from a 24 to 30 VDC battery power or the included 110/220 VAC power supply. The standard G-882 tow cable includes a Vectran strength member and can be built to up to 700m (no telemetry required). The shipboard end of the tow cable is attached to an included junction box or optional on-board cable for quick and simple hookup to a power source. Output data can be recorded on any Windows 98, ME, NT, 2000 or XP computer equipped with RS-232 serial ports. Best of all, the rugged G-882 is designed for and has been used successfully everywhere in the world for all types of applications.

The G-882 Cesium magnetometer provides the same operating sensitivity and sample rates as the larger deep tow model G-880. MagLogLite™ Logging Software is offered with each magnetometer and allows recording and display of data and position with Automatic Anomaly Detection. Additional options include: MagMap plotting and contouring software and post-acquisition processing software MagPick™ (free from our website.)

Specifications

- **Operating Principle:** Self-oscillating split-beam Cesium Vapor (non-radioactive)
- **Operating Range:** 20,000 to 100,000 nT
- **Operating Zones:** The earth's field vector should be at an angle greater than 6o from the sensor's equator and greater than 6o away from the sensor's long axis. Automatic hemisphere switching.
- **CM-221 Counter Sensitivity:** <0.004 nT/ pHz rms. Typically 0.02 nT P-P at a 0.1 second sample rate or 0.002 nT at 1 second sample rate. Up to 40 samples per second
- **Heading Error:** <1 nT over entire 360o spin and tumble
- **Absolute Accuracy:** <3 nT throughout range
- **Output:** RS-232 at 1,200 to 19,200 Baud

Island Road Marsh Creation (TE-117) - Magnetometer Survey within the Proposed Southern Access Route

Note: Avoidance areas are highlighted in Gold

Anomaly No.	Line Number	RecShot	Gamma	Duration	Type	Northing	Easting	Comment	Water Depth	Cover
Anomaly 1	2	315	286.2	199.2	dipole	222475	3528287	Nothing Found		
Anomaly 2	3	295	275.7	133.5	complex	225879	3529953	Nothing Found		
Anomaly 3	3	276	195.1	112.9	dipole	232518	3532771	Nothing Found		
Anomaly 4	2	344	58.6	45.9	dipole	235160	3533822	Nothing Found		
Anomaly 5	3	265	583.8	818.1	complex	236607	3534605	2 Pipelines Found	10'	0.5' & 5.5'
Anomaly 6	2	349	2001.4	309.1	dipole	237140	3534692	2 Pipelines Found	10'	0.5' & 4.5'
Anomaly 7	1	495	2419.7	586.2	complex	237327	3534612	2 Pipelines Found	10'	0.5' & 4.5'
Anomaly 8	2	350	158.9	46.9	monopole	237456	3534845	2 Pipelines Found	10'	0.5' & 4.5'
Anomaly 9	3	262	721.4	101.7	monopole	237456	3534981	2 Pipelines Found	10'	0.5' & 4.5'
Anomaly 10	1	495	711.1	281	dipole	237651	3534728	2 Pipelines Found	10'	0.5' & 4.5'
Anomaly 11	2	350	330.8	71.8	monopole	237663	3534915	2 Pipelines Found	10'	0.5' & 4.5'
Anomaly 12	3	256	70.6	83.4	dipole	239645	3535768	Further Investigation		
Anomaly 13	1	460	419.6	381.7	dipole	250814	3537161	Nothing Found		
Anomaly 14	1	459	149.4	398.4	complex	251134	3537198	Nothing Found		
Anomaly 15	2	607	1333.9	269.3	complex	251140	3537360	Nothing Found		
Anomaly 16	3	226	242	145.9	dipole	251203	3537506	Nothing Found		
Anomaly 17	2	608	504	256.5	complex	251417	3537402	Nothing Found		
Anomaly 18	3	225	679.9	615.1	complex	251458	3537539	Nothing Found		
Anomaly 19	1	437	534.7	227.1	dipole	259407	3539538	Further Investigation		
Anomaly 20	1	436	510.2	259.4	dipole	259556	3539509	Further Investigation		
Anomaly 21	3	201	349.1	519.2	dipole	259577	3539828	Further Investigation		
Anomaly 22	2	23	428.6	142.5	dipole	259610	3539636	Further Investigation		
Anomaly 23	5	749	306.6	235.7	dipole	264284	3538961	Possible P&A Well		
Anomaly 24	3	188	126.9	137.8	dipole	264320	3539886	Nothing Found		
Anomaly 25	93	628	2009.9	336.1	complex	264447	3539015	Possible P&A Well		
Anomaly 26	6	755	7426.9	317.5	dipole	264520	3539133	Possible P&A Well		
Anomaly 27	3	187	167.2	196.2	monopole	264814	3540058	Nothing Found		
Anomaly 28	2	34	163.9	53.5	dipole	265101	3539962	Nothing Found		
Anomaly 29	5	744	2929.8	332.5	dipole	265774	3537783	Nothing Found		
Anomaly 30	1	420	127.5	305.1	dipole	265905	3539997	Nothing Found		
Anomaly 31	5	742	691	120.5	dipole	266416	3537429	Nothing Found		
Anomaly 32	3	181	446.1	74.8	dipole	266943	3540623	Nothing Found		
Anomaly 33	6	763	234.8	136.3	dipole	267109	3537778	Nothing Found		

Island Road Marsh Creation (TE-117) - Magnetometer Survey within the Proposed Southern Access Route

Note: Avoidance areas are highlighted in Gold

Anomaly No.	Line Number	RecShot	Gamma	Duration	Type	Northing	Easting	Comment	Water Depth	Cover
Anomaly 34	5	738	387.5	190.1	dipole	268337	3537767	Pipeline Found	9.0'	7.0'
Anomaly 35	1	414	1439.5	390.2	dipole	268376	3540701	Pipeline Found	10.5'	3.5'
Anomaly 36	3	178	701.3	156.6	dipole	268457	3541000	Pipeline Found	10.5'	3.5'
Anomaly 37	6	767	1506.3	488.9	complex	268461	3538057	Pipeline Found	9.0'	7.5'
Anomaly 38	93	638	960.9	237.6	complex	268470	3537919	Pipeline Found	9.0'	7.0'
Anomaly 39	5	738	333.7	184.8	dipole	268533	3537799	Nothing Found		
Anomaly 40	2	41	629.8	53.9	monopole	268589	3540881	Pipeline Found	10.5'	3.5'
Anomaly 41	1	413	315.1	502.1	dipole	268644	3540760	Pipeline Found	10.5'	3.5'
Anomaly 42	3	177	262.5	200.6	dipole	268651	3541078	Pipeline Found	10.5'	3.5'
Anomaly 43	93	638	215.1	127.3	dipole	268658	3537939	Nothing Found		
Anomaly 44	6	768	919.6	170.5	complex	268702	3538089	Nothing Found		
Anomaly 45	2	41	290.2	55	dipole	268767	3540940	Nothing Found		
Anomaly 46	6	769	172.1	103	monopole	269251	3538210	Nothing Found		
Anomaly 47	3	175	1630	453.5	complex	269401	3541264	Pipeline Found	9.5'	2.0'
Anomaly 48	3	175	151	155.2	monopole	269683	3541358	Pipeline Found	9.5'	2.0'
Anomaly 49	2	43	4979.8	212.4	dipole	269722	3541225	Pipeline Found	10'	1.5'
Anomaly 50	1	411	763.4	245.2	dipole	269811	3541068	Pipeline Found	10'	1.5'
Anomaly 51	2	43	343	116.1	dipole	269879	3541247	Pipeline Found	10'	1.5'
Anomaly 52	1	410	1035.9	350.3	dipole	270057	3541150	Pipeline Found	10'	1.5'
Anomaly 53	6	775	156.6	109.5	monopole	270898	3539115	Nothing Found		
Anomaly 54	6	780	163.2	79.5	monopole	272597	3540295	Nothing Found		
Anomaly 55	6	781	165.5	53.4	dipole	272646	3540337	Nothing Found		
Anomaly 56	3	167	760	299.9	complex	272889	3542232	Pipeline Found	9.0'	2.5'
Anomaly 57	3	161	174.2	218.1	complex	275236	3542978	Pipeline Found	8.0'	4.0'
Anomaly 58	1	399	2016.9	453.1	dipole	275426	3542730	Pipeline Found	8.0'	4.0'
Anomaly 59	2	56	385.3	73.3	monopole	275460	3542890	Pipeline Found	8.0'	4.0'
Anomaly 60	6	790	126.2	120.7	complex	275716	3542471	Pipeline Found	8.3'	4.0'
Anomaly 61	5	718	546.8	205.1	dipole	275774	3542166	Pipeline Found	8.2'	3.8'
Anomaly 62	93	658	2425.9	233.9	dipole	275813	3542361	Pipeline Found	8.3'	3.7'
Anomaly 63	6	792	96.1	79.7	monopole	276157	3542782	Nothing Found		
Anomaly 64	3	139	85.5	229.3	monopole	284563	3546212	Nothing Found		
Anomaly 65	1	377	53.6	126.1	dipole	286092	3546431	Nothing Found		
Anomaly 66	3	698	75.9	239.9	complex	286937	3546981	Nothing Found		

Island Road Marsh Creation (TE-117) - Magnetometer Survey within the Proposed Southern Access Route

Note: Avoidance areas are highlighted in Gold

Anomaly No.	Line Number	RecShot	Gamma	Duration	Type	Northing	Easting	Comment	Water Depth	Cover
Anomaly 67	1	368	75.2	74.6	dipole	290103	3546387	Nothing Found		
Anomaly 68	3	685	57.2	127.6	dipole	292016	3545739	Nothing Found		
Anomaly 69	1	361	20.9	76.6	dipole	293106	3545044	Nothing Found		
Anomaly 70	1	358	827.9	190.2	dipole	294120	3545901	Water Depth	20'	
Anomaly 71	1	357	114.1	153.6	monopole	294347	3546006	Water Depth	18'	
Anomaly 72	2	101	51.2	47.5	monopole	294485	3546215	Water Depth	20'	
Anomaly 73	1	357	109.1	114.4	monopole	294633	3546086	Water Depth	18'	

Island Road Marsh Creation (TE-117) - Magnetometer Survey within the Proposed Borrow Area

Note: Avoidance areas are highlighted in Gold

Anomaly No.	Line Number	RecShot	Gamma	Duration	Type	Northing	Easting	Comment	Water Depth	Cover
Anomaly 75	23	1524	49	57	dipole	295280	3547402	Nothing Found		
Anomaly 76	19	859	67	138	monopole	295283	3546238	Anomaly found 16' Water	16'	
Anomaly 77	23	1523	111	50	monopole	295289	3547886	Nothing Found		
Anomaly 78	23	1527	234	212	monopole	295291	3546062	Anomaly found 16' Water	16'	
Anomaly 79	24	1559	78	63	monopole	295380	3546229	Anomaly found 16' Water	16'	
Anomaly 80	24	1561	328	261	monopole	295385	3547099	Nothing Found		
Anomaly 81	24	1559	404	105	monopole	295388	3546114	Anomaly found 16' Water	16'	
Anomaly 82	25	1500	52	57	dipole	295489	3547222	Nothing Found		
Anomaly 83	25	1499	571	130	dipole	295501	3546706	Oyster Bed		
Anomaly 84	17	892	228	146	dipole	295503	3547234	Oyster Bed		
Anomaly 85	26	1587	1830	91	dipole	295583	3547154	Oyster Bed		
Anomaly 86	17	1860	3410	79	dipole	295628	3547235	Oyster Bed		
Anomaly 87	17	892	52	49	dipole	295658	3547234	Oyster Bed		
Anomaly 88	31	1456	190	73	complex	296075	3548022	Nothing Found		
Anomaly 89	15	928	224	50	dipole	296235	3548230	Nothing Found		
Anomaly 90	33	1429	241	185	dipole	296275	3545851	Crab Traps		
Anomaly 91	15	928	95	120	complex	296348	3548229	Nothing Found		
Anomaly 92	35	1425	288	341	dipole	296477	3546772	Nothing Found		
Anomaly 93	37	1397	472	185	dipole	296661	3546778	Nothing Found		
Anomaly 94	37	1395	657	84	dipole	296665	3545835	Nothing Found		
Anomaly 95	18	1896	422	129	dipole	296702	3546752	Anomaly Found		
Anomaly 96	38	1684	1178	162	dipole	296751	3546717	Nothing Found		
Anomaly 97	18	866	335	142	complex	296794	3546730	Nothing Found		
Anomaly 98	40	1902	1703	21	complex	296954	3546021	Nothing Found		
Anomaly 99	40	1902	240	40	dipole	296981	3545835	Nothing Found		
Anomaly 100	18	1895	382	73	dipole	297061	3546736	Crab Traps		
Anomaly 101	41	1363	344	121	monopole	297062	3546957	Crab Traps		
Anomaly 102	43	1359	80	33	dipole	297250	3545824	Nothing Found		
Anomaly 103	43	1357	798	111	dipole	297257	3546746	Crab Traps		
Anomaly 104	44	1723	244	172	dipole	297360	3547423	Signal Only		
Anomaly 105	9	1941	134	58	dipole	297376	3551227	Oyster Bed		
Anomaly 106	17	888	74	75	dipole	297521	3547241	Signal Only		
Anomaly 107	47	1324	8683	91	dipole	297643	3546837	Anomaly Found Object on Sea Floor		

Island Road Marsh Creation (TE-117) - Magnetometer Survey within the Proposed Borrow Area

Note: Avoidance areas are highlighted in Gold

Anomaly No.	Line Number	RecShot	Gamma	Duration	Type	Northing	Easting	Comment	Water Depth	Cover
Anomaly 108	18	868	156	206	dipole	297737	3546739	Anomaly Found Object on Sea Floor		
Anomaly 109	7	1922	65	88	dipole	298228	3552227	Nothing Found		
Anomaly 110	10	1948	274	46	dipole	298505	3550736	Oyster Bed		
Anomaly 111	59	1223	408	44	monopole	298813	3547211	Nothing Found		
Anomaly 112	59	1210	1630	38	complex	298828	3552200	Nothing Found		
Anomaly 113	59	1211	2918	165	complex	298837	3551783	Nothing Found		
Anomaly 114	59	1210	1727	41	complex	298838	3552020	Nothing Found		
Anomaly 115	59	1210	1361	56	complex	298839	3551955	Nothing Found		
Anomaly 116	60	1987	799	52	complex	298911	3545945	Crab Traps		
Anomaly 117	60	1987	1213	50	complex	298915	3545894	Crab Traps		
Anomaly 118	60	1987	828	50	complex	298918	3545859	Crab Traps		
Anomaly 119	60	1987	2901	13	complex	298920	3545803	Crab Traps		
Anomaly 120	61	1197	50	56	dipole	299019	3547658	Nothing Found		
Anomaly 121	63	1095	75	42	dipole	299215	3547282	Crab Traps		
Anomaly 122	63	1096	151	46	monopole	299219	3547360	Crab Traps		
Anomaly 123	64	1075	147	57	monopole	299303	3546585	Nothing Found		
Anomaly 124	64	1074	110	42	dipole	299324	3546049	Nothing Found		
Anomaly 125	65	1106	60	53	dipole	299375	3546083	Nothing Found		
Anomaly 126	65	1107	92	53	dipole	299387	3545801	Crab Traps		
Anomaly 127	67	1109	97	52	dipole	299605	3545904	Nothing Found		
Anomaly 128	67	1112	62	120	complex	299610	3547456	Nothing Found		
Anomaly 129	73	1135	46	77	complex	300194	3547635	Nothing Found		
Anomaly 130	74	1039	82	77	dipole	300290	3546363	Nothing Found		
Anomaly 131	75	1141	101	50	dipole	300379	3545908	Crab Traps		
Anomaly 132	76	1027	49	52	monopole	300486	3546710	Crab Traps		
Anomaly 133	78	1021	52	70	dipole	300680	3547047	Nothing Found		
Anomaly 134	79	1160	66	52	dipole	300786	3546999	Nothing Found		
Anomaly 135	79	1162	247	81	dipole	300792	3547766	Nothing Found		
Anomaly 136	79	1159	117	30	dipole	300798	3546621	Crab Traps		
Anomaly 137	16	912	92	104	dipole	300884	3547731	Nothing Found		
Anomaly 138	80	1012	85	53	monopole	300888	3546926	Nothing Found		
Anomaly 139	81	1168	129	45	dipole	300986	3547875	Nothing Found		
Anomaly 140	20	832	241	83	dipole	301030	3545735	Crab Traps		

Island Road Marsh Creation (TE-117) - Magnetometer Survey within the Proposed Borrow Area

Note: Avoidance areas are highlighted in Gold

Anomaly No.	Line Number	RecShot	Gamma	Duration	Type	Northing	Easting	Comment	Water Depth	Cover
Anomaly 141	83	1176	158	69	dipole	301165	3546280	Nothing Found		
Anomaly 142	84	1881	109	53	dipole	301272	3546918	Crab Traps		
Anomaly 143	87	959	71	72	dipole	301562	3545880	Nothing Found		
Anomaly 144	87	961	356	45	dipole	301564	3546675	Nothing Found		

Island Road Marsh Creation (TE-117) - Magnetometer Survey within the Proposed North Access Route & Conveyance Corridor

Note: Avoidance areas are highlighted in Gold

Anomaly No.	LineNum	RecShot	Gamma	Duration	Type	Northing	Easting	Comment
an1	1	2005	449	124	DIPOLE	321631	3552736	Harvest Gas Pipeline 9.8' Cover
an2	1	2007	1001	76	DIPOLE	321076	3552905	Nothing Found
an3	1	2007	1353	67	DIPOLE	321002	3552939	Nothing Found
an4	1	2007	152	64	COMPLEX	320943	3552961	Nothing Found
an5	1	2007	805	45	DIPOLE	320844	3553000	Nothing Found
an6	1	2007	966	48	MONOPOLE	320808	3553001	Nothing Found
an7	1	2007	75	44	MONOPOLE	320748	3552995	Nothing Found
an8	1	2009	300	71	MONOPOLE	320245	3552945	Pipeline Too Deep To Hit In Canal
an9	1	2009	61	52	MONOPOLE	320194	3552940	Pipeline Too Deep To Hit In Canal
an10	1	2010	94	37	MONOPOLE	319641	3552875	Nothing Found
an11	1	2011	108	35	DIPOLE	319227	3552863	Nothing Found
an12	1	2012	2646	113	DIPOLE	318631	3552798	Nothing Found
an13	1	2015	52	22	MONOPOLE	317370	3552743	Nothing Found
an14	1	2019	473	119	COMPLEX	315713	3552707	Nothing Found
an15	1	2020	68	37	MONOPOLE	315526	3552795	Nothing Found
an16	1	2022	169	51	COMPLEX	315214	3552863	Nothing Found
an17	1	2023	352	72	COMPLEX	314874	3552890	Nothing Found
an18	1	2031	111	60	COMPLEX	311860	3552851	Nothing Found
an19	1	2032	95	109	DIPOLE	311170	3553016	Nothing Found
an20	1	2033	78	252	COMPLEX	310728	3553063	Nothing Found
an21	1	2034	343	194	COMPLEX	310303	3552986	Lots of Debris
an22	1	2035	120	147	MONOPOLE	309701	3552931	Nothing Found
an23	1	2044	106	194	DIPOLE	305537	3552070	Nothing Found
an24	1	2049	236	50	DIPOLE	303057	3551845	Nothing Found
an25	2	2085	677	87	MONOPOLE	310438	3553043	Lots of Debris
an26	2	2086	104	88	COMPLEX	310525	3553065	Lots of Debris
an27	2	2092	224	86	MONOPOLE	313760	3552776	Nothing Found
an28	2	2097	1140	101	DIPOLE	315975	3552704	Butterfly Net Dock
an29	2	2102	106	92	DIPOLE	318526	3552939	Nothing Found
an30	2	2106	445	153	MONOPOLE	320294	3553107	Pipeline Too Deep To Hit In Canal
an31	2	2107	115	159	COMPLEX	320850	3553088	Nothing Found
an32	2	2108	229	247	COMPLEX	321144	3552949	Nothing Found
an33	2	2109	2938	176	DIPOLE	321777	3552775	Nothing Found
an34	3	2113	71	105	DIPOLE	322534	3552898	Nothing Found
an35	3	2115	213	120	MONOPOLE	321840	3552766	Nothing Found
an36	3	2115	2302	194	DIPOLE	321633	3552797	Harvest Gas Pipeline 9.8' Cover

Island Road Marsh Creation (TE-117) - Magnetometer Survey within the Proposed North Access Route & Conveyance Corridor

Note: Avoidance areas are highlighted in Gold

Anomaly No.	LineNum	RecShot	Gamma	Duration	Type	Northing	Easting	Comment
an37	3	2117	104	158	COMPLEX	320979	3553103	Nothing Found
an38	3	2117	5958	182	COMPLEX	320826	3553149	Nothing Found
an39	3	2118	295	116	MONOPOLE	320129	3553094	Pipeline Too Deep To Hit In Canal
an40	3	2119	564	131	COMPLEX	319984	3553088	Pipeline Too Deep To Hit In Canal
an41	3	2119	85	79	MONOPOLE	319617	3553095	Nothing Found
an42	3	2121	982	66	DIPOLE	318936	3553025	Nothing Found
an43	3	2121	57	98	MONOPOLE	318635	3553004	Nothing Found
an44	3	2123	354	98	MONOPOLE	317596	3552921	Nothing Found
an45	3	2124	68	66	MONOPOLE	317390	3552903	Nothing Found
an46	3	2127	926	150	MONOPOLE	316084	3552810	Butterfly Net Dock
an47	3	2127	164	163	MONOPOLE	315948	3552752	Butterfly Net Dock
an48	3	2130	97	69	MONOPOLE	314245	3552850	Nothing Found
an49	3	2132	149	64	MONOPOLE	313327	3552879	Nothing Found
an50	3	2136	74	74	DIPOLE	311569	3553168	Nothing Found
an51	3	2137	111	64	MONOPOLE	310953	3553182	Nothing Found
an52	3	2138	2978	216	DIPOLE	310236	3553051	Lots of Debris
an53	3	2140	215	84	DIPOLE	309615	3553007	Nothing Found
an54	3	2140	109	171	MONOPOLE	309266	3553003	Nothing Found
an55	3	2144	505	41	DIPOLE	307448	3552662	Nothing Found
an56	6	2170	1895	249	DIPOLE	299099	3552479	Nothing Found
an57	6	2170	940	6	DIPOLE	299085	3552228	Nothing Found
an58	6	2170	1612	14	MONOPOLE	299085	3552221	Nothing Found
an59	6	2170	1861	7	MONOPOLE	299086	3552206	Nothing Found
an60	6	2170	447	22	COMPLEX	299086	3552194	Nothing Found
an61	6	2170	463	4	MONOPOLE	299086	3552172	Nothing Found
an62	6	2170	375	2	MONOPOLE	299086	3552167	Nothing Found
an63	6	2170	246	4	MONOPOLE	299086	3552152	Nothing Found
an64	6	2170	125	4	MONOPOLE	299086	3552148	Nothing Found
an65	6	2170	462	42	COMPLEX	299086	3552112	Nothing Found
an66	6	2170	868	4	MONOPOLE	299086	3552087	Nothing Found
an67	6	2170	587	29	COMPLEX	299085	3552072	Nothing Found
an68	6	2170	1109	4	MONOPOLE	299085	3552053	Nothing Found
an69	6	2170	549	13	COMPLEX	299085	3552043	Nothing Found
an70	6	2171	1308	5	COMPLEX	299084	3552033	Nothing Found
an71	6	2171	1404	8	MONOPOLE	299084	3552026	Nothing Found
an72	6	2171	607	8	COMPLEX	299084	3552018	Nothing Found

Island Road Marsh Creation (TE-117) - Magnetometer Survey within the Proposed North Access Route & Conveyance Corridor

Note: Avoidance areas are highlighted in Gold

Anomaly No.	LineNum	RecShot	Gamma	Duration	Type	Northing	Easting	Comment
an73	6	2171	1568	8	MONOPOLE	299084	3552010	Nothing Found
an74	6	2171	1359	5	COMPLEX	299083	3552003	Nothing Found
an75	6	2171	1842	12	MONOPOLE	299083	3551997	Nothing Found
an76	6	2171	2216	6	DIPOLE	299082	3551984	Nothing Found
an77	8	2176	635	3	MONOPOLE	302100	3552250	Nothing Found
an78	8	2176	2037	5	MONOPOLE	302099	3552236	Nothing Found
an79	8	2176	1524	7	MONOPOLE	302100	3552245	Nothing Found
an80	8	2176	1667	3	MONOPOLE	302099	3552234	Nothing Found
an81	8	2176	380	3	MONOPOLE	302098	3552230	Nothing Found
an82	8	2176	334	3	MONOPOLE	302098	3552225	Nothing Found
an83	8	2176	109	2	COMPLEX	302098	3552228	Nothing Found
an84	8	2176	158	2	MONOPOLE	302097	3552222	Nothing Found
an85	8	2176	134	2	COMPLEX	302092	3552187	Nothing Found
an86	8	2176	274	7	COMPLEX	302090	3552171	Nothing Found
an87	8	2176	309	3	MONOPOLE	302089	3552166	Nothing Found
an88	8	2176	1829	17	MONOPOLE	302088	3552162	Nothing Found
an89	8	2176	1534	18	COMPLEX	302085	3552134	Nothing Found
an90	10	2182	133	2	MONOPOLE	305106	3552510	Nothing Found
an91	10	2182	171	2	MONOPOLE	305106	3552507	Nothing Found
an92	10	2182	298	5	COMPLEX	305106	3552504	Nothing Found
an93	10	2182	401	2	MONOPOLE	305105	3552499	Nothing Found
an94	10	2182	2246	532	COMPLEX	305105	3552493	Nothing Found
an95	10	2183	1891	46	COMPLEX	305081	3551960	Nothing Found
an96	10	2183	1201	37	COMPLEX	305081	3551885	Nothing Found
an97	14	2196	378	6	COMPLEX	311084	3553233	Nothing Found
an98	14	2196	1749	54	MONOPOLE	311083	3553228	Nothing Found
an99	14	2196	425	11	COMPLEX	311074	3553174	Nothing Found
an100	14	2196	595	13	COMPLEX	311073	3553162	Nothing Found
an101	14	2196	692	9	COMPLEX	311072	3553147	Nothing Found
an102	14	2196	1117	6	COMPLEX	311072	3553140	Nothing Found
an103	14	2196	250	7	COMPLEX	311059	3552985	Nothing Found
an104	14	2196	3495	19	DIPOLE	311059	3552979	Nothing Found
an105	14	2197	193	4	COMPLEX	311060	3552961	Nothing Found
an106	15	2199	1820	19	COMPLEX	312586	3552964	Nothing Found
an107	15	2199	1856	27	COMPLEX	312572	3552870	Nothing Found
an108	15	2199	1871	79	COMPLEX	312568	3552845	Nothing Found

Island Road Marsh Creation (TE-117) - Magnetometer Survey within the Proposed North Access Route & Conveyance Corridor

Note: Avoidance areas are highlighted in Gold

Anomaly No.	LineNum	RecShot	Gamma	Duration	Type	Northing	Easting	Comment
an109	15	2199	189	5	COMPLEX	312554	3552769	Nothing Found
an110	15	2199	257	3	COMPLEX	312553	3552763	Nothing Found
an111	15	2199	275	4	MONOPOLE	312553	3552761	Nothing Found
an112	15	2200	1534	20	COMPLEX	312553	3552742	Nothing Found
an113	15	2200	697	2	MONOPOLE	312553	3552740	Nothing Found
an114	15	2200	292	7	COMPLEX	312554	3552736	Nothing Found
an115	17	2205	1929	50	COMPLEX	315588	3552860	Nothing Found
an116	17	2205	454	1	DIPOLE	315575	3552778	Nothing Found
an117	18	2208	1355	12	COMPLEX	317056	3552851	Anomaly
an118	18	2208	1854	18	COMPLEX	317056	3552769	Anomaly
an119	19	2211	1885	41	COMPLEX	318580	3552848	Nothing Found
an120	19	2211	1548	10	COMPLEX	318568	3552812	Nothing Found
an121	20	2213	691	26	MONOPOLE	320098	3553056	Pipeline Too Deep To Hit In Canal
an122	1	2221	1697	13	MONOPOLE	334348	3563115	High Boat Traffic Nothing Found
an123	1	2221	269	45	MONOPOLE	334267	3563103	High Boat Traffic Nothing Found
an124	1	2221	5531	216	COMPLEX	334090	3563092	High Boat Traffic Nothing Found
an125	1	2222	2828	41	MONOPOLE	333927	3563064	High Boat Traffic Nothing Found
an126	1	2222	89	19	MONOPOLE	333822	3563047	High Boat Traffic Nothing Found
an127	1	2223	267	72	MONOPOLE	333551	3563005	Pipelines Found
an128	1	2223	484	87	COMPLEX	333376	3562976	Pipelines Found
an129	1	2224	994	36	MONOPOLE	333222	3562942	Pipelines Found
an130	1	2225	1966	136	DIPOLE	332482	3562810	Crab Traps
an131	1	2227	2473	87	DIPOLE	331595	3562657	Crab Traps
an132	1	2229	130	33	DIPOLE	330557	3562482	Pipeline Found
an133	1	2229	574	33	DIPOLE	330452	3562459	Pipeline Found
an134	1	2230	321	124	DIPOLE	330346	3562437	Pipeline Found
an135	1	2231	185	40	DIPOLE	329382	3562302	Crab Traps
an136	1	2232	499	42	DIPOLE	329211	3562282	Crab Traps
an137	1	2232	329	37	DIPOLE	329115	3562268	Crab Traps
an138	1	2233	665	324	COMPLEX	328682	3562229	Pipelines Found
an139	1	2233	1722	140	MONOPOLE	328473	3562157	Pipelines Found
an140	1	2236	88	79	DIPOLE	326826	3561749	Nothing Found
an141	2	2239	2491	45	DIPOLE	326486	3561487	Crab Traps
an142	2	2239	1988	85	COMPLEX	326456	3561415	Crab Traps
an143	2	2240	842	28	COMPLEX	326395	3561164	Crab Traps
an144	2	2240	2309	118	COMPLEX	326391	3561133	Crab Traps

Island Road Marsh Creation (TE-117) - Magnetometer Survey within the Proposed North Access Route & Conveyance Corridor

Note: Avoidance areas are highlighted in Gold

Anomaly No.	LineNum	RecShot	Gamma	Duration	Type	Northing	Easting	Comment
an145	2	2240	1930	268	COMPLEX	326343	3560828	Crab Traps
an146	2	2241	2280	174	COMPLEX	326326	3560719	Crab Traps
an147	2	2241	2081	44	COMPLEX	326318	3560599	Crab Traps
an148	2	2245	1983	25	COMPLEX	326252	3560568	Crab Traps
an149	2	2245	1805	33	COMPLEX	326255	3560536	Crab Traps
an150	2	2245	1808	13	COMPLEX	326258	3560367	Crab Traps
an151	2	2245	1612	104	COMPLEX	326254	3560341	Crab Traps
an152	2	2246	2002	29	COMPLEX	326229	3560233	Crab Traps
an153	2	2246	79	5	MONOPOLE	326223	3560214	Crab Traps
an154	2	2246	170	3	MONOPOLE	326222	3560208	Crab Traps
an155	2	2246	277	9	COMPLEX	326213	3560183	Crab Traps
an156	2	2246	2072	97	COMPLEX	326155	3559972	Crab Traps
an157	2	2246	192	6	COMPLEX	326150	3559953	Crab Traps
an158	2	2246	198	5	COMPLEX	326149	3559947	Crab Traps
an159	2	2246	264	6	COMPLEX	326148	3559944	Crab Traps
an160	2	2246	294	8	COMPLEX	326147	3559940	Crab Traps
an161	2	2246	332	9	COMPLEX	326144	3559933	Crab Traps
an162	2	2247	345	5	COMPLEX	326143	3559927	Crab Traps
an163	2	2247	266	8	COMPLEX	326140	3559919	Crab Traps
an164	2	2247	135	4	MONOPOLE	326138	3559911	Crab Traps
an165	2	2247	439	10	COMPLEX	326135	3559904	Crab Traps
an166	2	2247	1551	15	COMPLEX	326127	3559796	Crab Traps
an167	2	2247	658	21	MONOPOLE	326139	3559706	Crab Traps
an168	2	2247	1287	57	COMPLEX	326122	3559646	Crab Traps
an169	2	2248	1104	52	MONOPOLE	326085	3559543	Pipelines Found
an170	2	2248	1726	55	MONOPOLE	326065	3559482	Pipelines Found
an171	3	2250	355	4	DIPOLE	326036	3559351	Nothing Found Multiple Crab Traps in area
an172	3	2250	1139	10	DIPOLE	326035	3559347	Nothing Found Multiple Crab Traps in area
an173	3	2250	124	5	COMPLEX	326031	3559334	Nothing Found Multiple Crab Traps in area
an174	3	2250	435	6	COMPLEX	326029	3559329	Nothing Found Multiple Crab Traps in area
an175	3	2250	449	3	MONOPOLE	326027	3559321	Nothing Found Multiple Crab Traps in area
an176	3	2250	1407	23	MONOPOLE	326021	3559300	Nothing Found
an177	3	2250	589	10	COMPLEX	326019	3559292	Nothing Found Multiple Crab Traps in area
an178	3	2250	1521	10	COMPLEX	326016	3559283	Nothing Found Multiple Crab Traps in area
an179	3	2250	1581	5	MONOPOLE	326013	3559267	Nothing Found Multiple Crab Traps in area
an180	3	2250	571	8	COMPLEX	326012	3559260	Nothing Found Multiple Crab Traps in area

Island Road Marsh Creation (TE-117) - Magnetometer Survey within the Proposed North Access Route & Conveyance Corridor

Note: Avoidance areas are highlighted in Gold

Anomaly No.	LineNum	RecShot	Gamma	Duration	Type	Northing	Easting	Comment
an181	3	2250	1840	88	COMPLEX	325995	3559196	Nothing Found Multiple Crab Traps in area
an182	3	2250	1752	35	COMPLEX	325985	3559157	Nothing Found Multiple Crab Traps in area
an183	3	2252	324	20	MONOPOLE	326068	3559454	Pipelines Found
an184	4	2265	231	107	MONOPOLE	326355	3555947	Nothing Found
an185	4	2265	180	103	MONOPOLE	326387	3555824	Nothing Found
an186	6	2278	423	36	DIPOLE	325991	3558725	Nothing Found
an187	7	2282	1843	104	COMPLEX	326201	3559603	Crab Traps
an188	7	2283	60	13	MONOPOLE	326313	3560247	Crab Traps
an189	7	2287	434	21	DIPOLE	326565	3561580	Crab Traps
an190	7	2287	252	20	MONOPOLE	326567	3561621	Crab Traps
an191	8	2293	1457	809	COMPLEX	328732	3562023	Pipelines Found
an192	8	2295	56	52	MONOPOLE	330176	3562311	Nothing Found
an193	8	2296	369	183	MONOPOLE	330618	3562382	Pipeline Found
an194	8	2298	83	71	MONOPOLE	331833	3562611	Crab Traps
an195	8	2299	107	106	DIPOLE	332287	3562686	Crab Traps
an196	8	2299	92	72	MONOPOLE	332416	3562711	Crab Traps
an197	8	2299	1136	73	MONOPOLE	332521	3562731	Crab Traps
an198	8	2299	103	74	DIPOLE	332723	3562763	Crab Traps
an199	8	2300	340	86	DIPOLE	333184	3562864	Pipelines Found
an200	8	2300	110	184	MONOPOLE	333343	3562891	Pipelines Found
an201	8	2301	53	75	MONOPOLE	333474	3562914	Pipelines Found
an202	8	2301	325	142	COMPLEX	333606	3562939	Pipelines Found
an203	8	2301	973	94	MONOPOLE	333785	3562960	High Boat Traffic Nothing Found
an204	8	2302	3213	303	COMPLEX	334211	3563039	High Boat Traffic Nothing Found
an205	9	2304	518	107	COMPLEX	334295	3563034	High Boat Traffic Nothing Found
an206	9	2304	496	128	COMPLEX	334142	3562965	High Boat Traffic Nothing Found
an207	9	2305	1819	167	COMPLEX	334000	3562921	High Boat Traffic Nothing Found
an208	9	2305	397	171	MONOPOLE	333819	3562873	High Boat Traffic Nothing Found
an209	9	2306	570	162	DIPOLE	333590	3562844	Pipelines Found
an210	9	2307	60	134	DIPOLE	333188	3562759	Pipelines Found
an211	9	2308	96	60	MONOPOLE	332601	3562651	Crab Traps
an212	9	2308	87	100	DIPOLE	332429	3562619	Crab Traps
an213	9	2310	83	58	DIPOLE	331313	3562425	Crab Traps
an214	9	2311	105	61	DIPOLE	330655	3562295	Pipeline Found
an215	9	2312	80	198	COMPLEX	330520	3562269	Pipeline Found
an216	9	2315	708	111	COMPLEX	328836	3561959	Pipelines Found

Island Road Marsh Creation (TE-117) - Magnetometer Survey within the Proposed North Access Route & Conveyance Corridor

Note: Avoidance areas are highlighted in Gold

Anomaly No.	LineNum	RecShot	Gamma	Duration	Type	Northing	Easting	Comment
an217	9	2315	2057	485	COMPLEX	328593	3561919	Pipelines Found
an218	9	2317	1195	56	COMPLEX	327609	3561736	Nothing Found
an219	9	2319	230	43	MONOPOLE	326894	3561596	Nothing Found
an220	9	2319	70	36	DIPOLE	326834	3561583	Nothing Found
an221	9	2319	102	63	MONOPOLE	326792	3561574	Nothing Found
an222	9	2319	99	40	MONOPOLE	326684	3561593	Crab Traps
an223	10	2321	2399	24	COMPLEX	326618	3561512	Crab Traps
an224	10	2321	6578	37	COMPLEX	326611	3561411	Crab Traps
an225	10	2321	320	5	COMPLEX	326598	3561334	Crab Traps
an226	10	2321	461	9	COMPLEX	326595	3561320	Crab Traps
an227	10	2321	1739	72	MONOPOLE	326588	3561292	Crab Traps
an228	10	2321	666	32	COMPLEX	326574	3561241	Crab Traps
an229	10	2322	1829	26	COMPLEX	326565	3561204	Crab Traps
an230	10	2323	2614	500	COMPLEX	326487	3560788	Crab Traps
an231	10	2323	2071	192	COMPLEX	326454	3560585	Crab Traps
an232	10	2324	125	2	MONOPOLE	326402	3560365	Crab Traps
an233	10	2324	923	3	MONOPOLE	326399	3560349	Crab Traps
an234	10	2324	671	4	DIPOLE	326397	3560332	Crab Traps
an235	10	2326	1091	66	MONOPOLE	326235	3559429	Pipelines Found
an236	11	2329	7064	116	MONOPOLE	326230	3559349	Pipelines Found
an237	12	2339	328	70	DIPOLE	326632	3555530	Nothing Found

Island Road Marsh Creation Project - Results from Probing Existing Pipelines

Point ID	Northing	Easting	Elevation	GNSS Vector Observation.Start Time	Water Surface Elev	Cover	Water Depth	Water Bottom Elevation	Top Pipe Elevation	OWNER	TYPE	METHOD
037-6	275821.28	3542181.20	0.32	2/6/2017 12:48	0.51	3.8	8.2	-7.7	-11.5	UNKNOWN	NATURAL_GAS	PROBED
037-7	275749.03	3542300.93	0.27	2/6/2017 12:51	0.51	3.7	8.3	-7.8	-11.5	UNKNOWN	NATURAL_GAS	PROBED
037-8	275660.31	3542441.53	0.45	2/6/2017 12:52	0.51	4.0	8.3	-7.8	-11.8	UNKNOWN	NATURAL_GAS	PROBED
037-9	275521.69	3542666.69	0.59	2/6/2017 12:53	0.51	4.0	8.0	-7.5	-11.5	UNKNOWN	NATURAL_GAS	PROBED
037-10	275388.58	3542878.14	0.07	2/6/2017 12:54	0.51	4.0	8.0	-7.5	-11.5	UNKNOWN	NATURAL_GAS	PROBED
037-11	275287.36	3543037.38	0.16	2/6/2017 12:55	0.51	4.0	8.0	-7.5	-11.5	UNKNOWN	NATURAL_GAS	PROBED
038-3	268419.88	3538086.35	1.52	2/7/2017 9:47	-0.12	7.0	9.0	-9.1	-16.1	UNKNOWN	NATURAL_GAS	PROBED
038-4	268414.18	3537946.50	1.71	2/7/2017 9:51	-0.12	7.0	9.0	-9.1	-16.1	UNKNOWN	NATURAL_GAS	PROBED
038-5	268407.69	3537807.65	2.03	2/7/2017 9:52	-0.12	7.5	9.0	-9.1	-16.6	UNKNOWN	NATURAL_GAS	PROBED
047-374	269581.35	3541243.27	-0.22	2/16/2017 12:37	0.01	1.0	10.1	-10.1	-11.1	UNKNOWN	NATURAL_GAS	PROBED
047-375	269671.01	3541223.28	-0.21	2/16/2017 12:39	0.01	1.0	10.0	-10.0	-11.0	UNKNOWN	NATURAL_GAS	PROBED
047-376	269751.13	3541209.42	0.19	2/16/2017 12:41	0.01	1.5	10.0	-10.0	-11.5	UNKNOWN	NATURAL_GAS	PROBED
047-377	269445.59	3541271.56	-0.19	2/16/2017 13:02	0.01	2.0	9.5	-9.5	-11.5	UNKNOWN	NATURAL_GAS	PROBED
047-379	268525.11	3540730.42	-0.09	2/16/2017 14:48	0.01	3.5	10.5	-10.5	-14.0	UNKNOWN	NATURAL_GAS	PROBED
047-380	268531.66	3540853.50	-0.01	2/16/2017 14:50	0.01	2.5	10.5	-10.5	-13.0	UNKNOWN	NATURAL_GAS	PROBED
047-381	268536.67	3540940.72	-0.18	2/16/2017 14:50	0.01	3.5	10.5	-10.5	-14.0	UNKNOWN	NATURAL_GAS	PROBED
047-382	268537.75	3540978.68	-0.32	2/16/2017 14:51	0.01	3.5	10.5	-10.5	-14.0	UNKNOWN	NATURAL_GAS	PROBED
047-383	268536.93	3540993.57	-0.14	2/16/2017 14:51	0.01	3.5	10.5	-10.5	-14.0	UNKNOWN	NATURAL_GAS	PROBED
049-6	236585.93	3534637.98	0.60	2/18/2017 9:43	0.23	5.5	10.0	-9.8	-15.3	UNKNOWN	NATURAL_GAS	PROBED
049-7	236596.23	3534637.85	0.23	2/18/2017 9:43	0.23	0.5	10.0	-9.8	-10.3	UNKNOWN	NATURAL_GAS	PROBED
049-8	236752.58	3534636.95	0.26	2/18/2017 9:49	0.25	7.0	10.0	-9.8	-16.8	UNKNOWN	NATURAL_GAS	PROBED
049-9	236920.92	3534641.56	0.42	2/18/2017 9:54	0.26	0.5	10.0	-9.7	-10.2	UNKNOWN	NATURAL_GAS	PROBED
049-10	236920.70	3534638.23	0.26	2/18/2017 9:54	0.26	6.0	10.0	-9.7	-15.7	UNKNOWN	NATURAL_GAS	PROBED
049-11	237088.85	3534633.46	0.44	2/18/2017 10:14	0.33	4.5	10.0	-9.7	-14.2	UNKNOWN	NATURAL_GAS	PROBED
049-12	237496.42	3534632.53	0.26	2/18/2017 10:29	0.38	5.5	10.0	-9.6	-15.1	UNKNOWN	NATURAL_GAS	PROBED
049-13	269878.39	3541178.40	0.46	2/18/2017 11:57	0.68	1.5	10.0	-9.3	-10.8	UNKNOWN	NATURAL_GAS	PROBED
049-14	270171.53	3541111.36	0.16	2/18/2017 12:03	0.70	1.5	10.0	-9.3	-10.8	UNKNOWN	NATURAL_GAS	PROBED
049-16	268515.12	3540523.56	0.40	2/18/2017 12:17	0.76	3.5	10.0	-9.2	-12.7	UNKNOWN	NATURAL_GAS	PROBED
049-17	268502.23	3540236.36	0.37	2/18/2017 12:22	0.77	4.0	10.0	-9.2	-13.2	UNKNOWN	NATURAL_GAS	PROBED

Island Road Marsh Creation Project - Results from Probing Existing Pipelines

Point ID	Northing	Easting	Elevation	GNSS Vector Observation.Start Time	Water Surface Elev	Cover	Water Depth	Water Bottom Elevation	Top Pipe Elevation	OWNER	TYPE	METHOD
049-18	268550.12	3541271.77	0.38	2/18/2017 12:52	0.87	4.5	10.0	-9.1	-13.6	UNKNOWN	NATURAL_GAS	PROBED
236-289	320489.64	3552721.23	0.62	8/24/2017 14:07	0.31	6.5	2.0	-1.7	-8.2	GULF_SOUTH	NATURAL_GAS	PROBED
236-290	320002.89	3553419.88	0.61	8/24/2017 14:26	0.31	5.5	2.5	-2.2	-7.7	GULF_SOUTH	NATURAL_GAS	PROBED
236-291	325553.68	3560008.52	0.21	8/24/2017 14:56	0.31	6.0	2.5	-2.2	-8.2	GENESIS	PETROLEUM	PROBED
236-292	325137.60	3560449.72	0.56	8/24/2017 15:14	0.31	5.0	2.0	-1.7	-6.7	SHELL	PETROLEUM	PROBED
236-293	326099.02	3559529.30	0.57	8/24/2017 15:25	0.31	6.0	4.0	-3.7	-9.7	GENESIS	PETROLEUM	PROBED
236-294	326653.64	3559049.10	0.56	8/24/2017 15:32	0.31	6.5	3.5	-3.2	-9.7	GENESIS	PETROLEUM	PROBED
237-5	328654.33	3562433.06	0.60	8/25/2017 9:57	0.65	8.4	2.3	-1.7	-10.1	KOCH	NATURAL_GAS	PROBED
237-6	328848.64	3562403.69	0.51	8/25/2017 10:08	0.66	7.0	2.0	-1.3	-8.3	ENLINK MIDSTREAM	NATURAL_GAS	PROBED
237-7	330133.17	3562664.28	1.22	8/25/2017 11:32	0.69	5.0	3.5	-2.8	-7.8	OTHER	NATURAL_GAS	PROBED
237-8	330924.06	3562072.62	0.50	8/25/2017 11:43	0.75	5.0	3.0	-2.2	-7.2	OTHER	NATURAL_GAS	PROBED
313-3	320249.54	3553029.46	-0.28	11/9/2017 8:31	0.00	?	10.8	-10.8	?	UNKNOWN	NATURAL_GAS	MAG
313-4	320176.88	3553138.23	-0.37	11/9/2017 8:34	0.00	?	2.9	-2.9	?	UNKNOWN	NATURAL_GAS	MAG
313-5	320349.79	3552934.94	-0.39	11/9/2017 8:37	0.00	?	2.0	-2.0	?	UNKNOWN	NATURAL_GAS	MAG
313-6	321666.53	3553201.04	0.10	11/9/2017 10:11	0.00	4.4	0.0	0.0	-4.4	HARVEST	NATURAL_GAS	PROBED
313-7	321713.10	3552561.74	0.50	11/9/2017 10:24	0.00	6.2	0.0	0.0	-6.2	HARVEST	NATURAL_GAS	PROBED
313-8	321702.33	3552696.66	0.05	11/9/2017 10:34	0.00	6.2	0.0	0.0	-6.2	HARVEST	NATURAL_GAS	PROBED
313-9	321692.09	3552836.25	-0.24	11/9/2017 10:40	0.00	7.0	0.0	0.0	-7.0	HARVEST	NATURAL_GAS	PROBED
313-10	328540.03	3562341.22	-1.30	11/9/2017 13:00	0.00	9.8	1.0	-1.0	-10.8	HARVEST	NATURAL_GAS	PROBED
314-5	328876.54	3562242.08	0.84	11/10/2017 9:01	0.28	11.0	5.6	-5.3	-16.3	UNKNOWN	NATURAL_GAS	PROBED
314-6	328919.80	3561971.52	0.12	11/10/2017 9:23	0.23	10.0	5.0	-4.8	-14.8	UNKNOWN	NATURAL_GAS	PROBED
314-7	328798.24	3561949.98	1.18	11/10/2017 11:05	0.00	?	0.0	0.0	?	KOCH	NATURAL_GAS	MAG
314-8	328756.07	3562190.40	0.79	11/10/2017 11:09	-0.01	?	0.0	0.0	?	KOCH	NATURAL_GAS	MAG
314-9	328745.81	3562258.76	0.84	11/10/2017 11:10	-0.02	?	0.0	0.0	?	KOCH	NATURAL_GAS	MAG
314-10	328552.41	3562238.45	-0.05	11/10/2017 11:21	-0.04	12.8	4.2	-4.2	-17.0	COLUMBIA_GULF	NATURAL_GAS	PROBED
314-11	328599.21	3561899.76	0.90	11/10/2017 12:38	-0.22	?	4.0	-4.2	?	COLUMBIA_GULF	NATURAL_GAS	MAG
314-12	328552.90	3562120.67	-0.98	11/10/2017 12:41	-0.22	?	4.0	-4.2	?	COLUMBIA_GULF	NATURAL_GAS	MAG
314-13	328561.12	3562168.54	-1.01	11/10/2017 12:43	-0.23	?	4.0	-4.2	?	COLUMBIA_GULF	NATURAL_GAS	MAG
314-14	330388.48	3562478.61	-1.21	11/10/2017 13:24	-0.32	?	3.5	-3.8	?	UNKNOWN	NATURAL_GAS	MAG

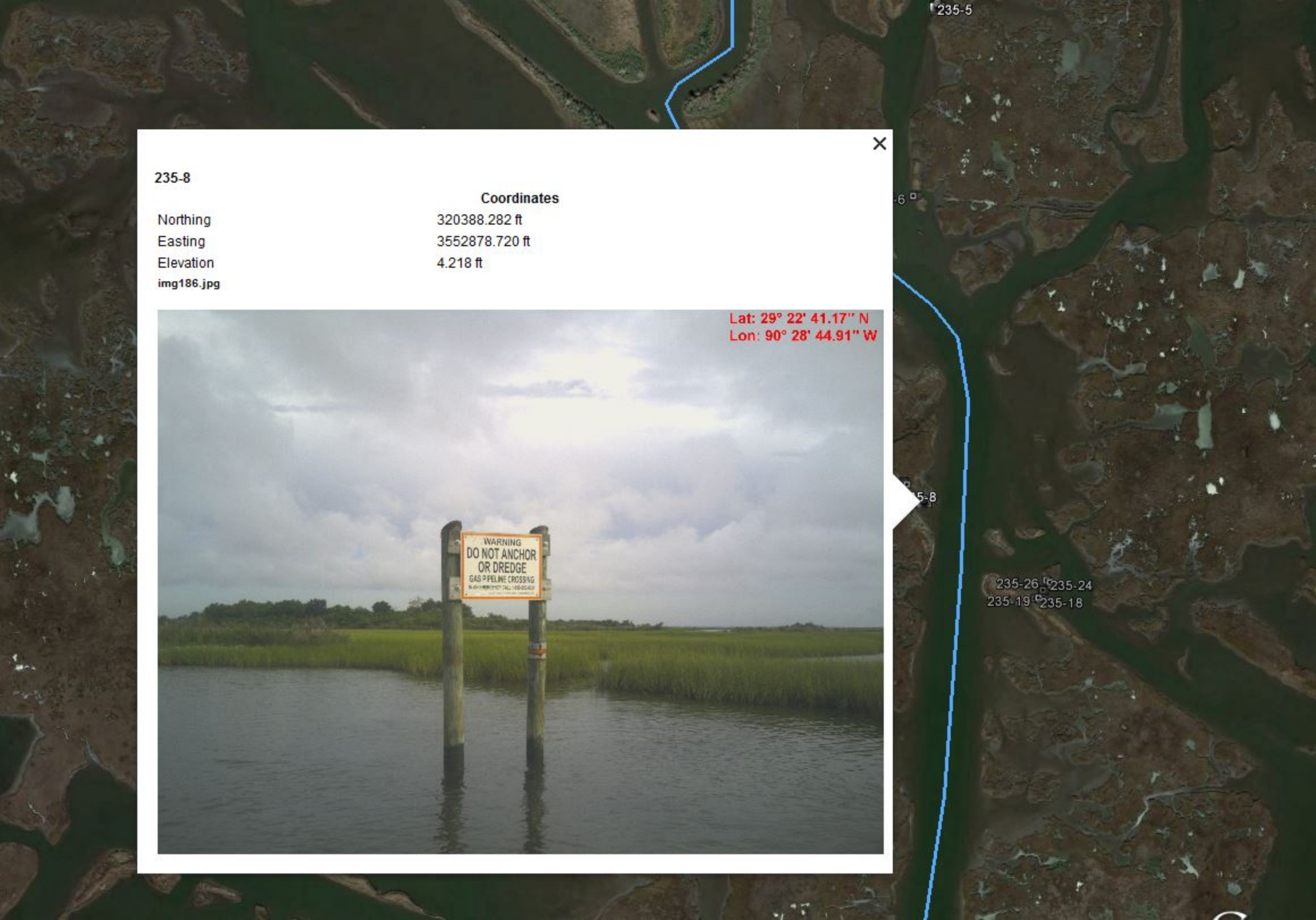
Island Road Marsh Creation Project - Results from Probing Existing Pipelines

Point ID	Northing	Easting	Elevation	GNSS Vector Observation.Start Time	Water Surface Elev	Cover	Water Depth	Water Bottom Elevation	Top Pipe Elevation	OWNER	TYPE	METHOD
314-15	330494.11	3562375.72	0.79	11/10/2017 13:24	-0.32	?	14.1	-14.4	?	UNKNOWN	NATURAL_GAS	MAG
314-16	333611.33	3562850.55	0.45	11/10/2017 14:03	-0.32	?	17.0	-17.3	?	HARVEST	NATURAL_GAS	MAG
314-17	333444.14	3562991.41	0.59	11/10/2017 14:04	-0.32	?	13.0	-13.3	?	HARVEST	NATURAL_GAS	MAG
314-18	333293.06	3562967.63	0.57	11/10/2017 14:07	-0.32	?	4.5	-4.8	?	WILLIAMS_ENERGY	NATURAL_GAS	MAG
314-19	333282.92	3562730.46	0.61	11/10/2017 14:08	-0.32	?	4.5	-4.8	?	WILLIAMS_ENERGY	NATURAL_GAS	MAG

SECTION D

Photos

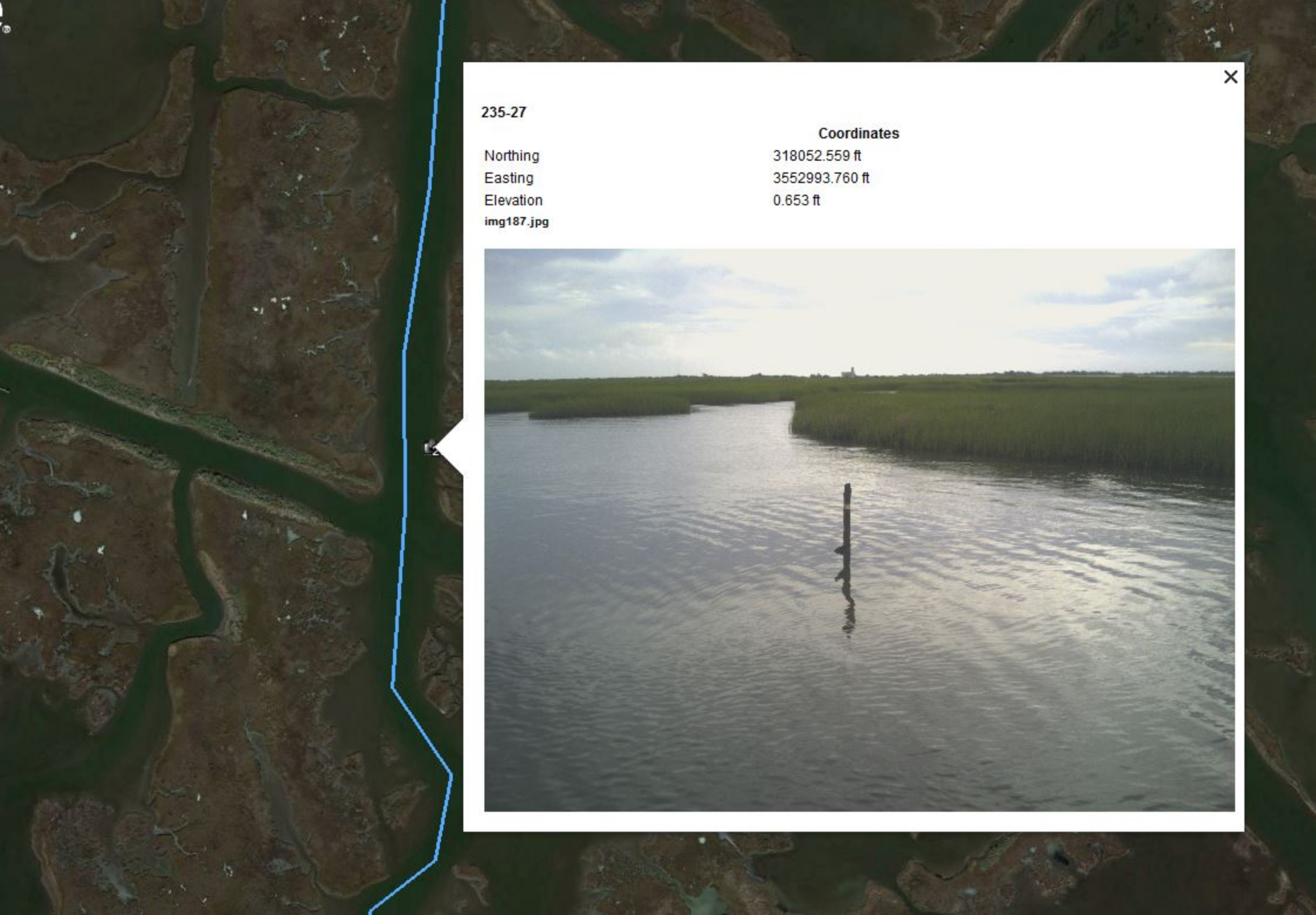
235-5
Coordinates
Northing 322509.990 ft
Easting 3552920.248 ft
Elevation 0.694 ft
img185.jpg
235-6
1532 ft
CRMS3296-CR-H01



235-8

	Coordinates
Northing	320388.282 ft
Easting	3552878.720 ft
Elevation	4.218 ft

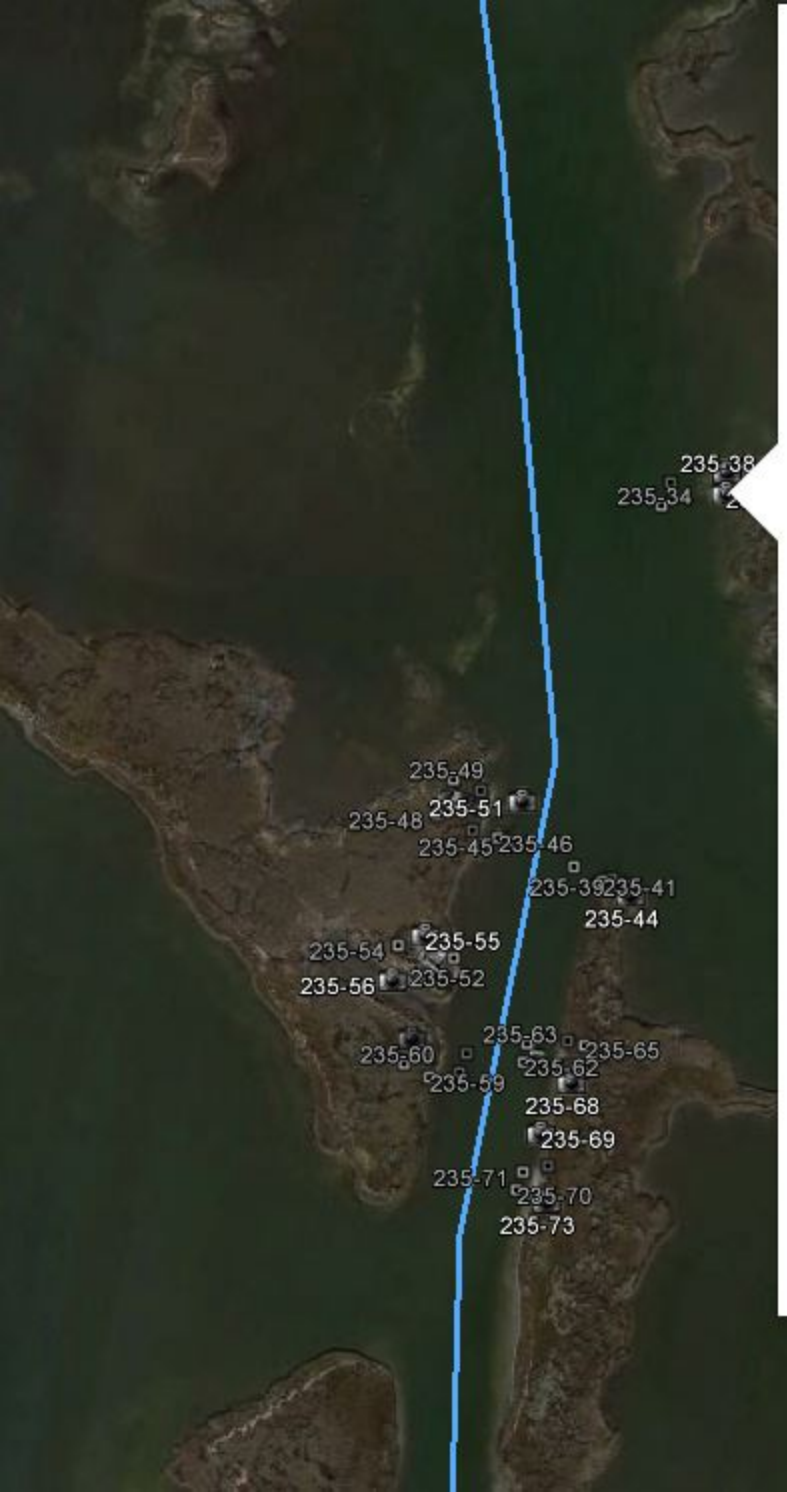
img186.jpg



235-27

	Coordinates
Northing	318052.559 ft
Easting	3552993.760 ft
Elevation	0.653 ft

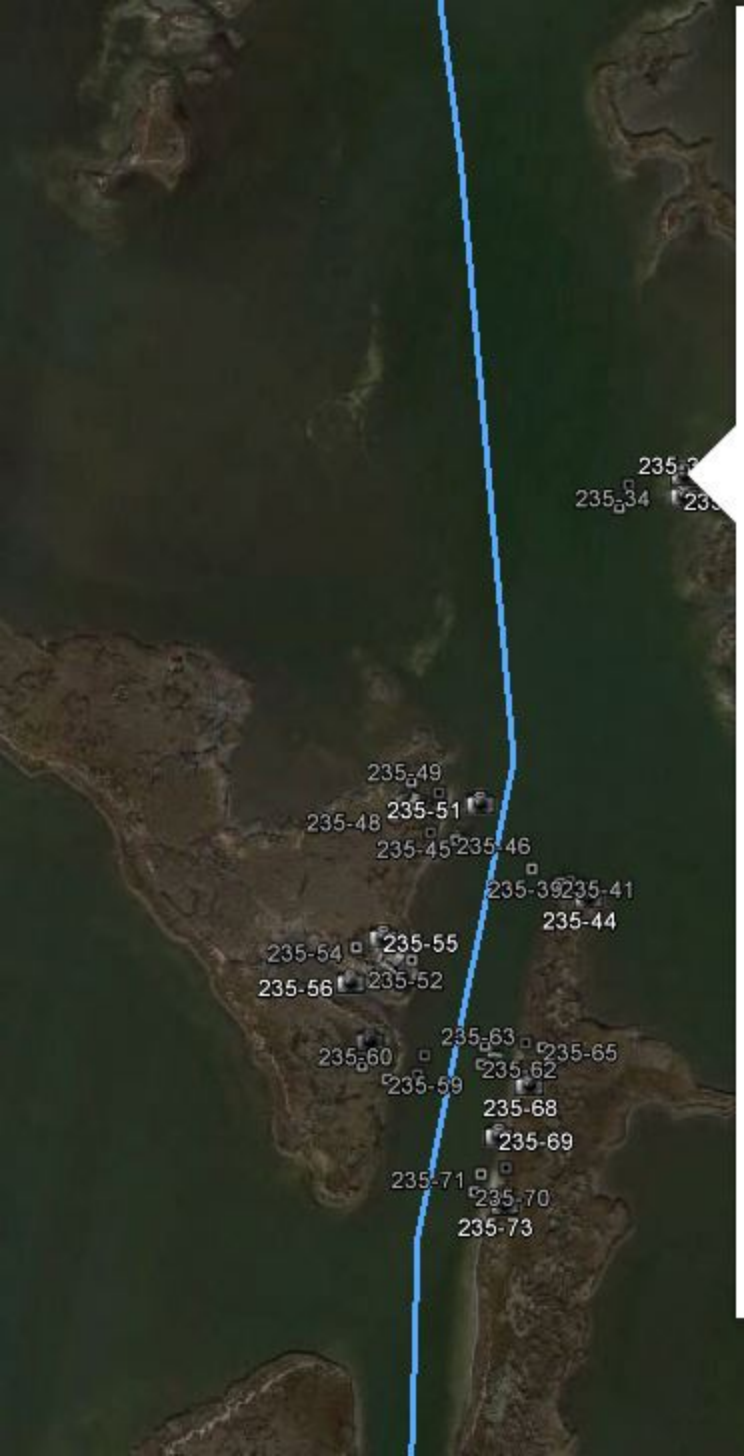
img187.jpg



235-37

Coordinates	
Northing	311307.788 ft
Easting	3553391.071 ft
Elevation	0.386 ft

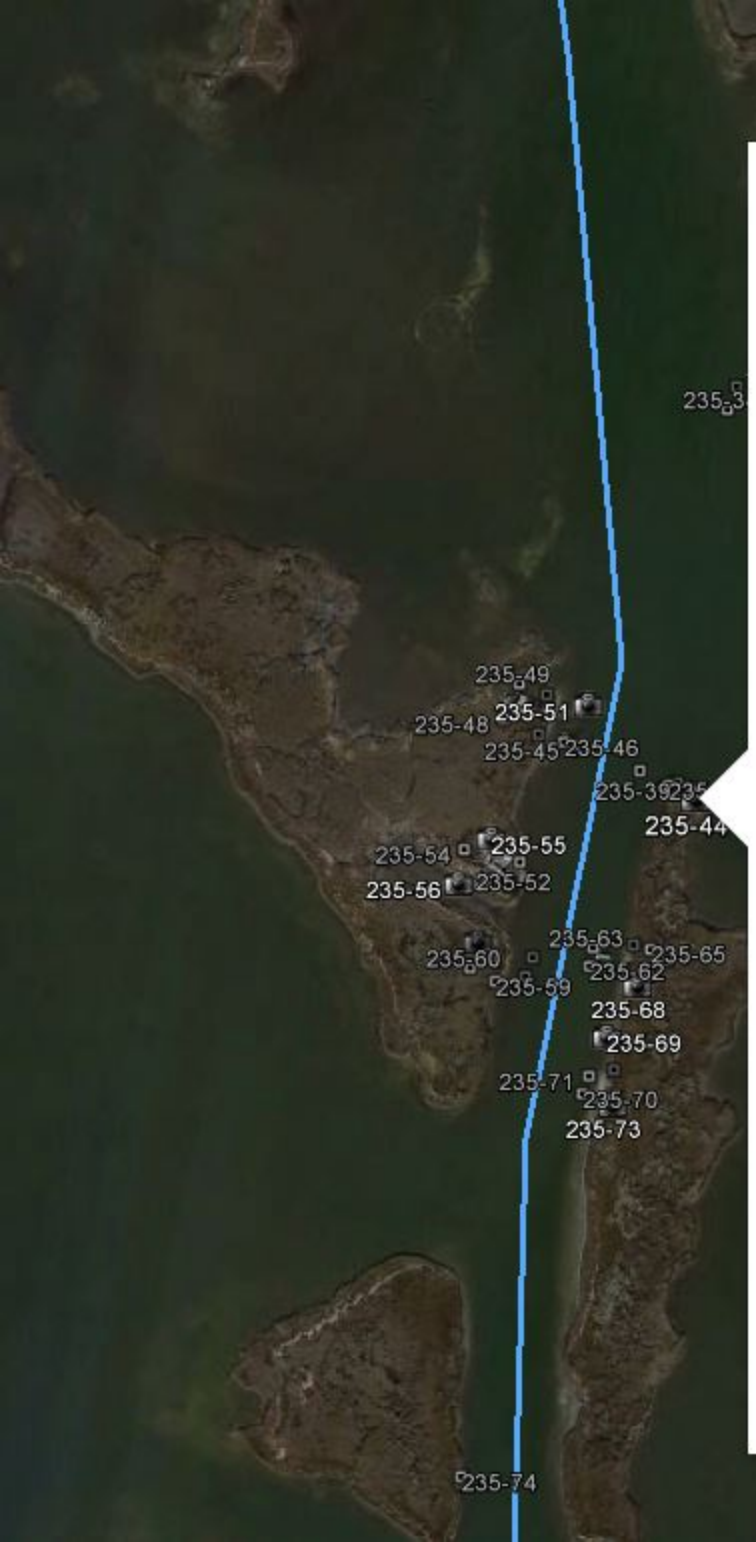
img189.jpg



235-38

Coordinates	
Northing	311338.281 ft
Easting	3553391.877 ft
Elevation	0.447 ft

img190.jpg



235-44

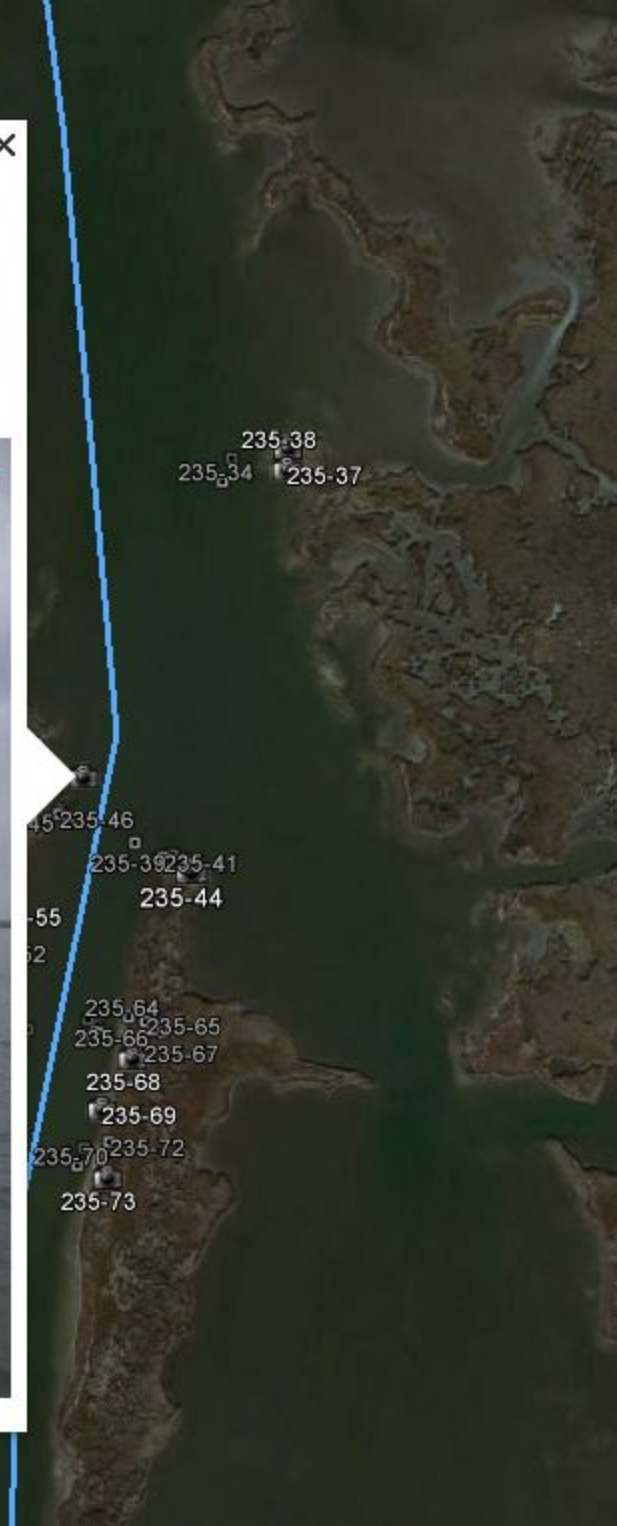
Coordinates	
Northing	310712.540 ft
Easting	3553253.337 ft
Elevation	0.439 ft

img191.jpg

235-51

	Coordinates
Northing	310850.333 ft
Easting	3553091.711 ft
Elevation	0.503 ft

img192.jpg



235-55

Coordinates	
Northing	310651.436 ft
Easting	3552949.379 ft
Elevation	1.521 ft

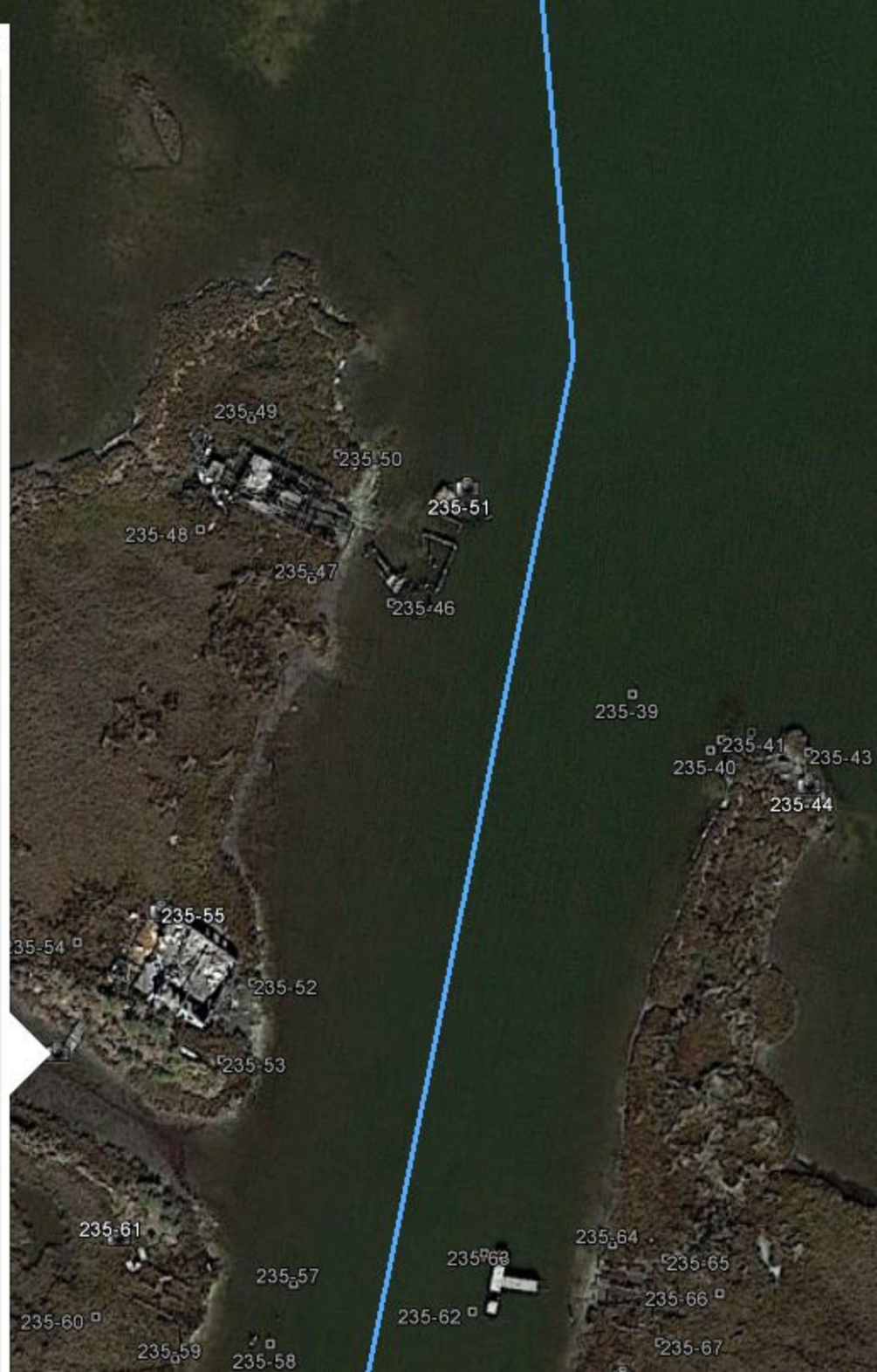
img193.jpg

235-56

	Coordinates
Northing	310584.629 ft
Easting	3552900.915 ft
Elevation	0.519 ft

img195.jpg

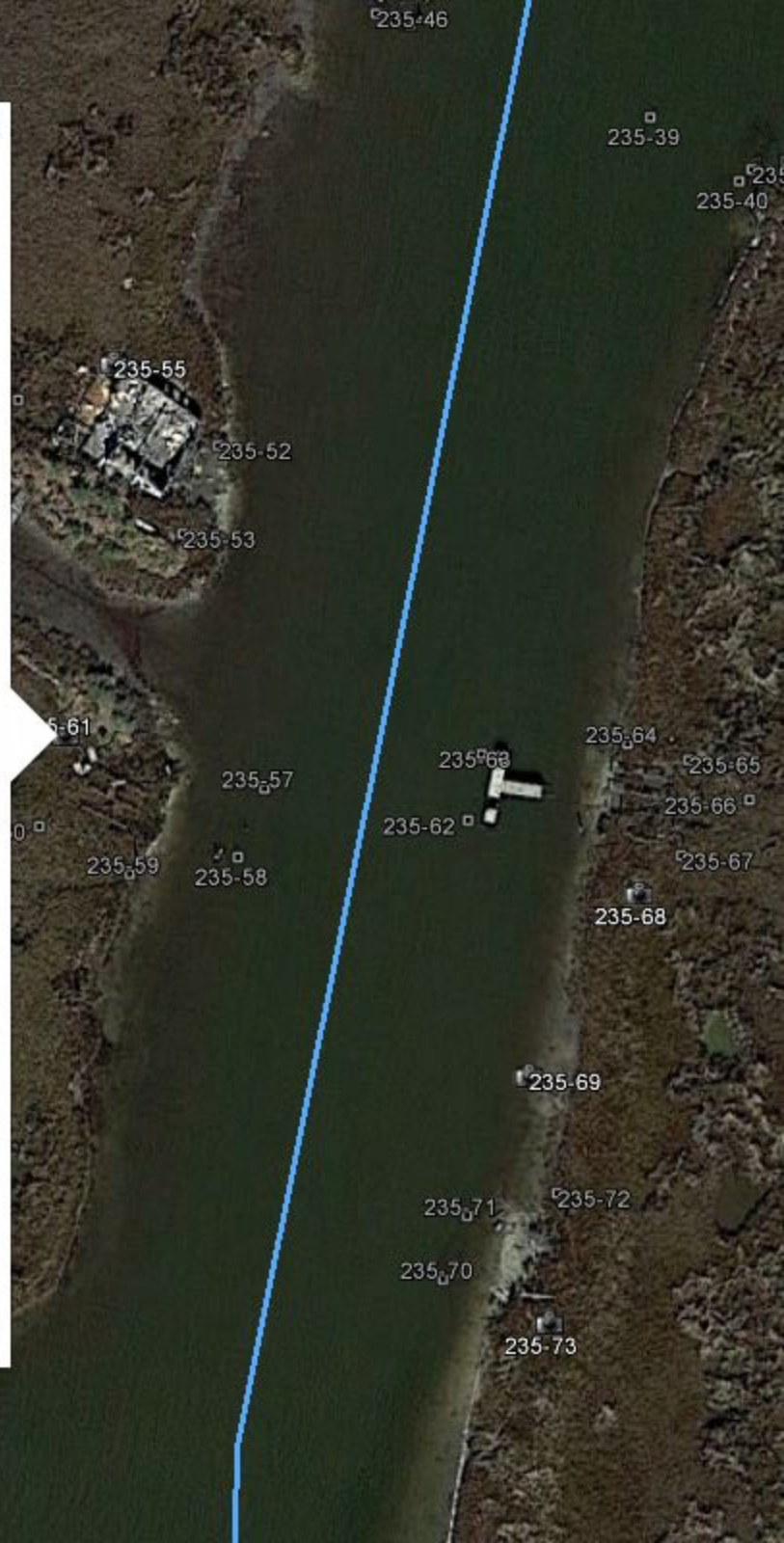
img194.jpg



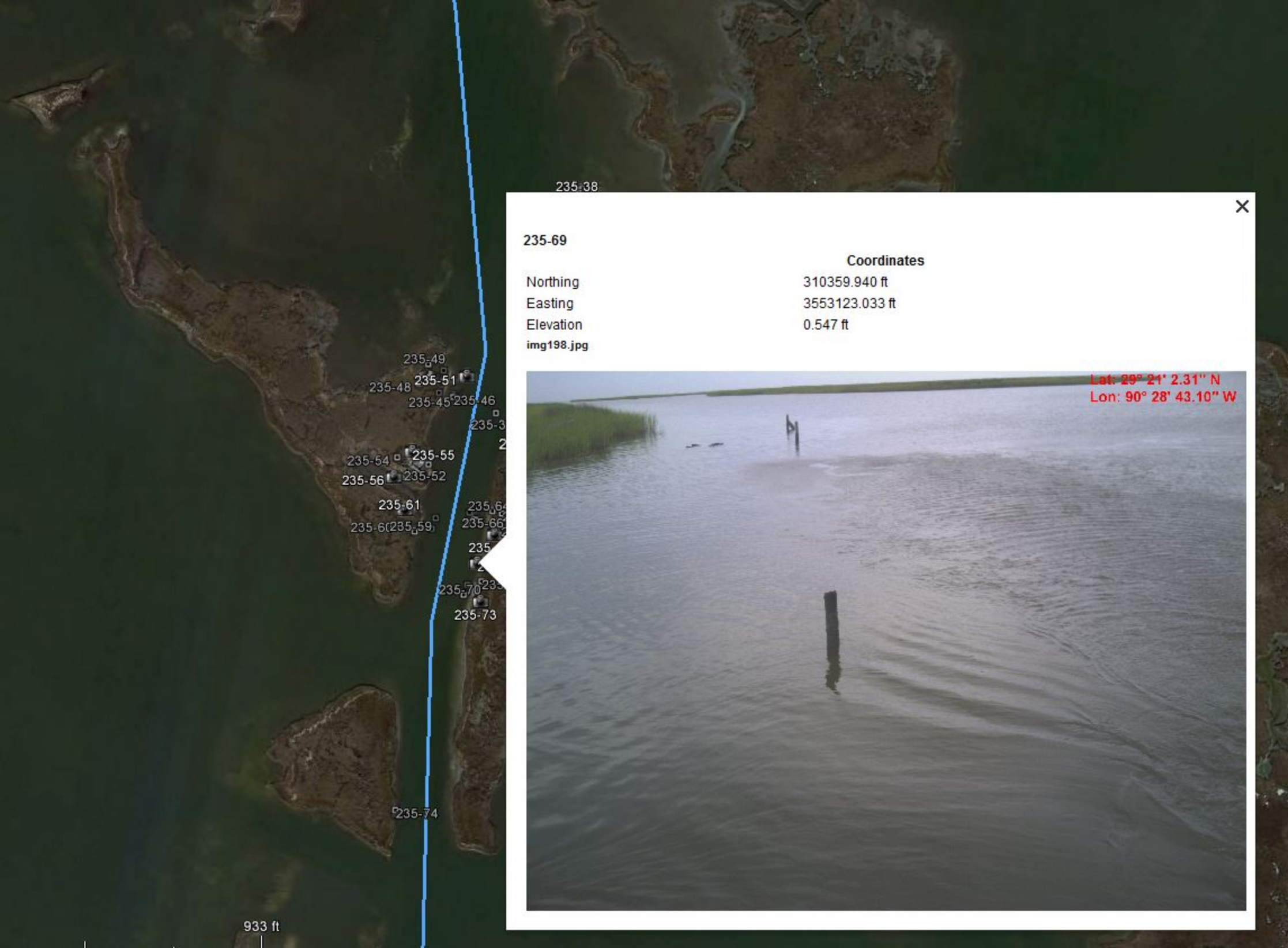
235-61

Coordinates	
Northing	310498.625 ft
Easting	3552930.369 ft
Elevation	1.541 ft

img196.jpg



235-49
235-51
235-48
235-45
235-46
235-39
235-55
235-54
235-56
235-52
235-64
235-60
235-57
235-59
235-68
235-69
235-71
235-70
235-73
235-74
235-68
Coordinates
Northing 310435.109 ft
Easting 3553167.903 ft
Elevation 1.739 ft
img197.jpg
Lat: 29° 21' 3.25" N
Lon: 90° 28' 44.11" W

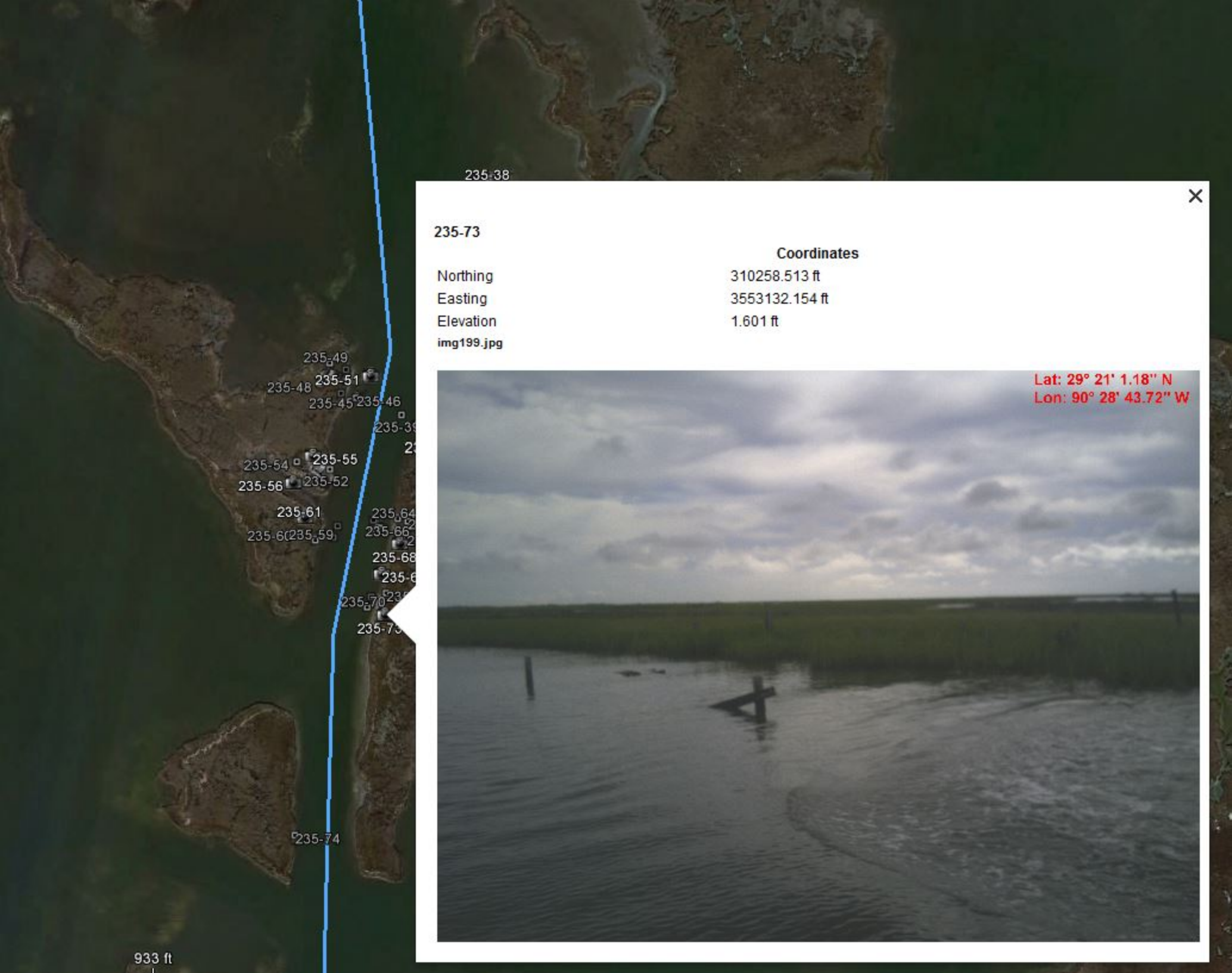


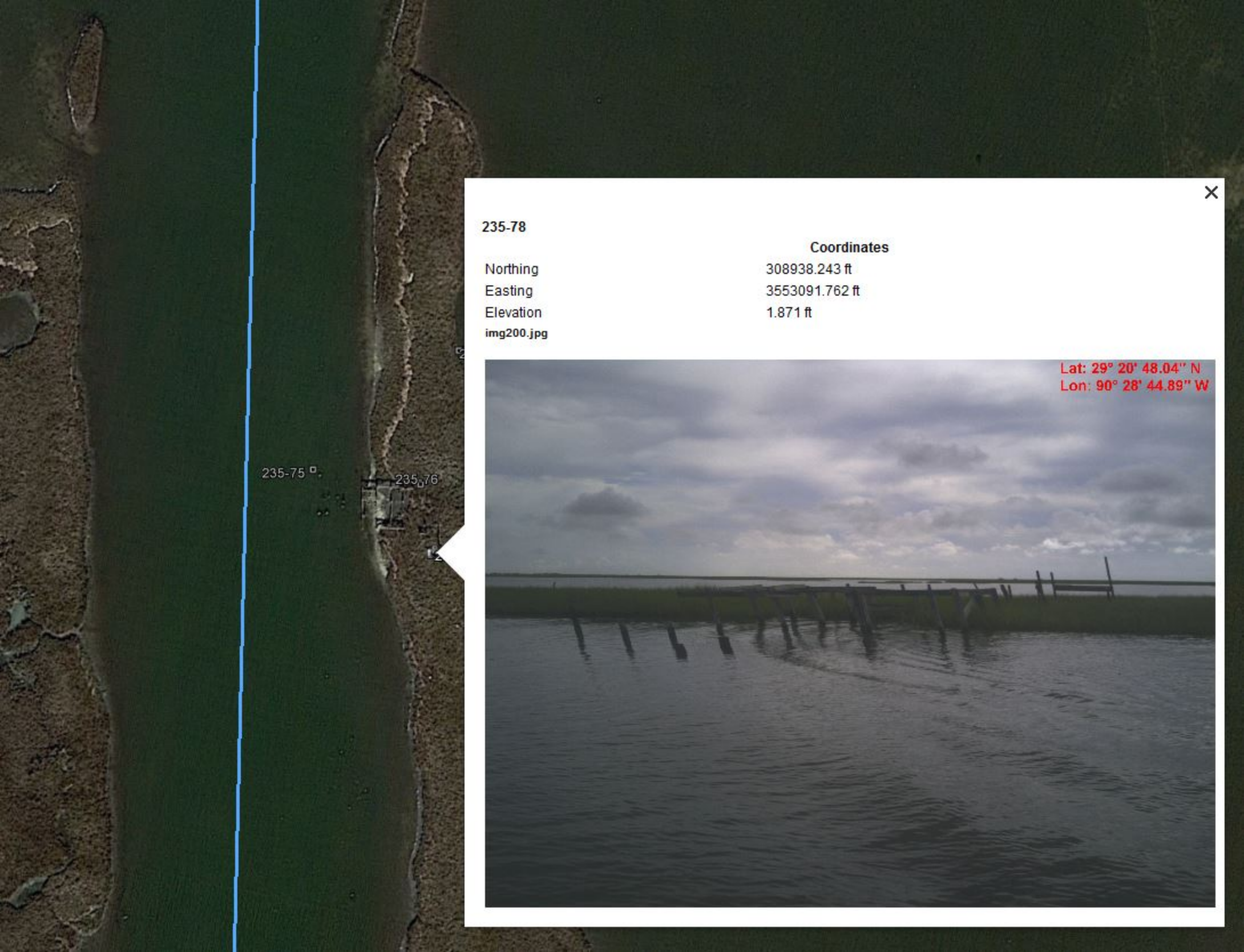
235-69

Coordinates	
Northing	310359.940 ft
Easting	3553123.033 ft
Elevation	0.547 ft

img198.jpg

Lat: 29° 21' 2.31" N
Lon: 90° 28' 43.10" W


235-38
235-49
235-51
235-48
235-45
235-46
235-55
235-54
235-56
235-52
235-61
235-59
235-64
235-66
235-68
235-70
235-74
933 ft
235-73
Coordinates
Northing 310258.513 ft
Easting 3553132.154 ft
Elevation 1.601 ft
img199.jpg
Lat: 29° 21' 1.18" N
Lon: 90° 28' 43.72" W



235-78

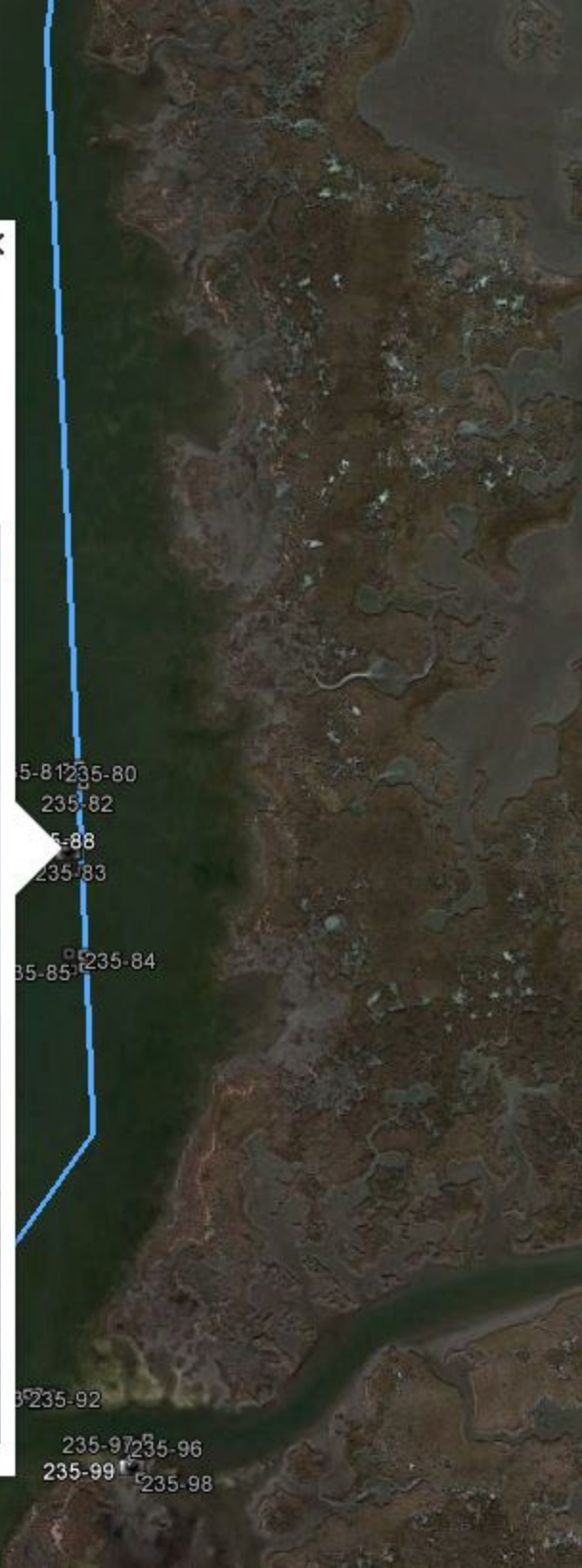
	Coordinates
Northing	308938.243 ft
Easting	3553091.762 ft
Elevation	1.871 ft

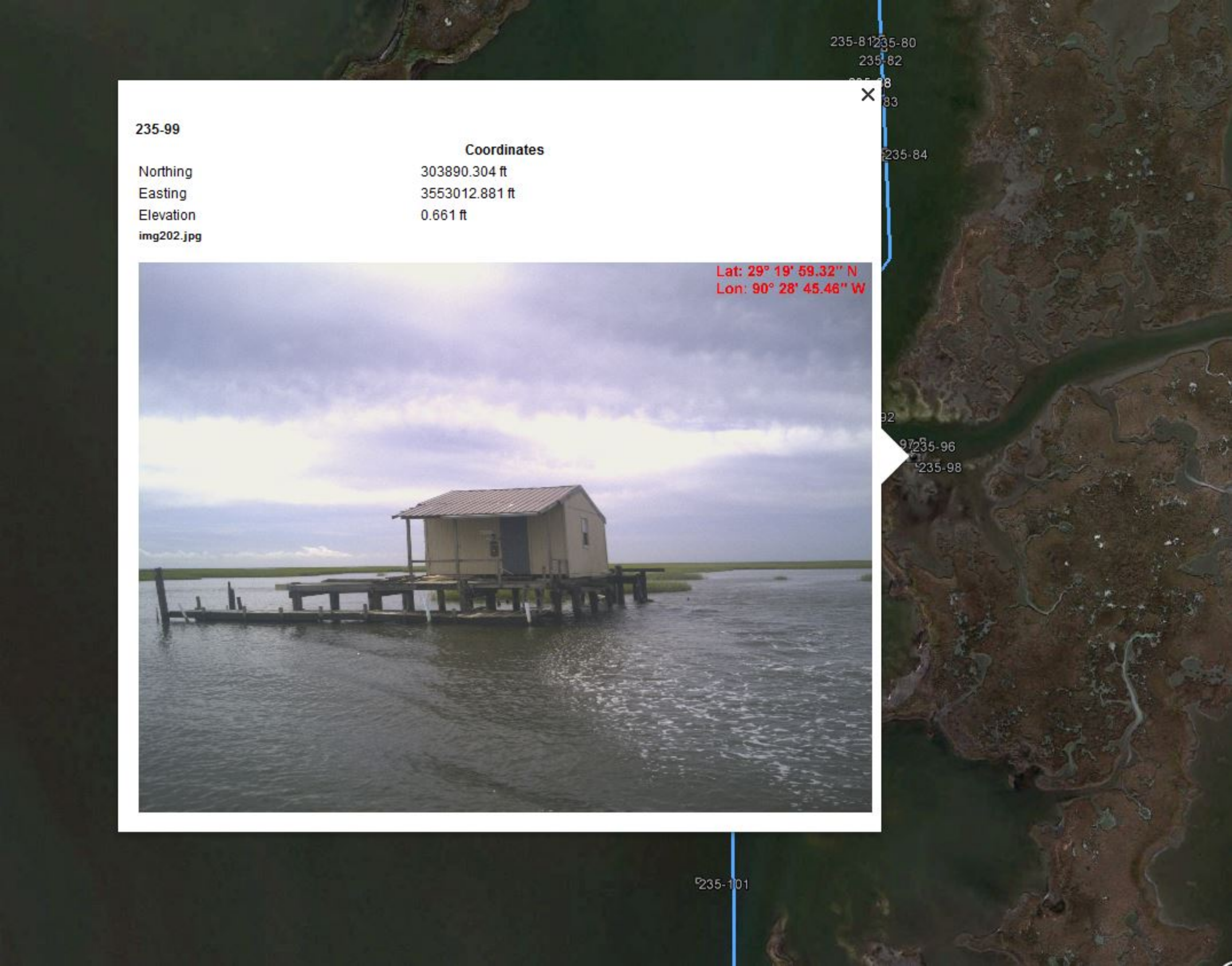
img200.jpg

235-88

Coordinates	
Northing	305334.581 ft
Easting	3552850.450 ft
Elevation	0.528 ft

img201.jpg

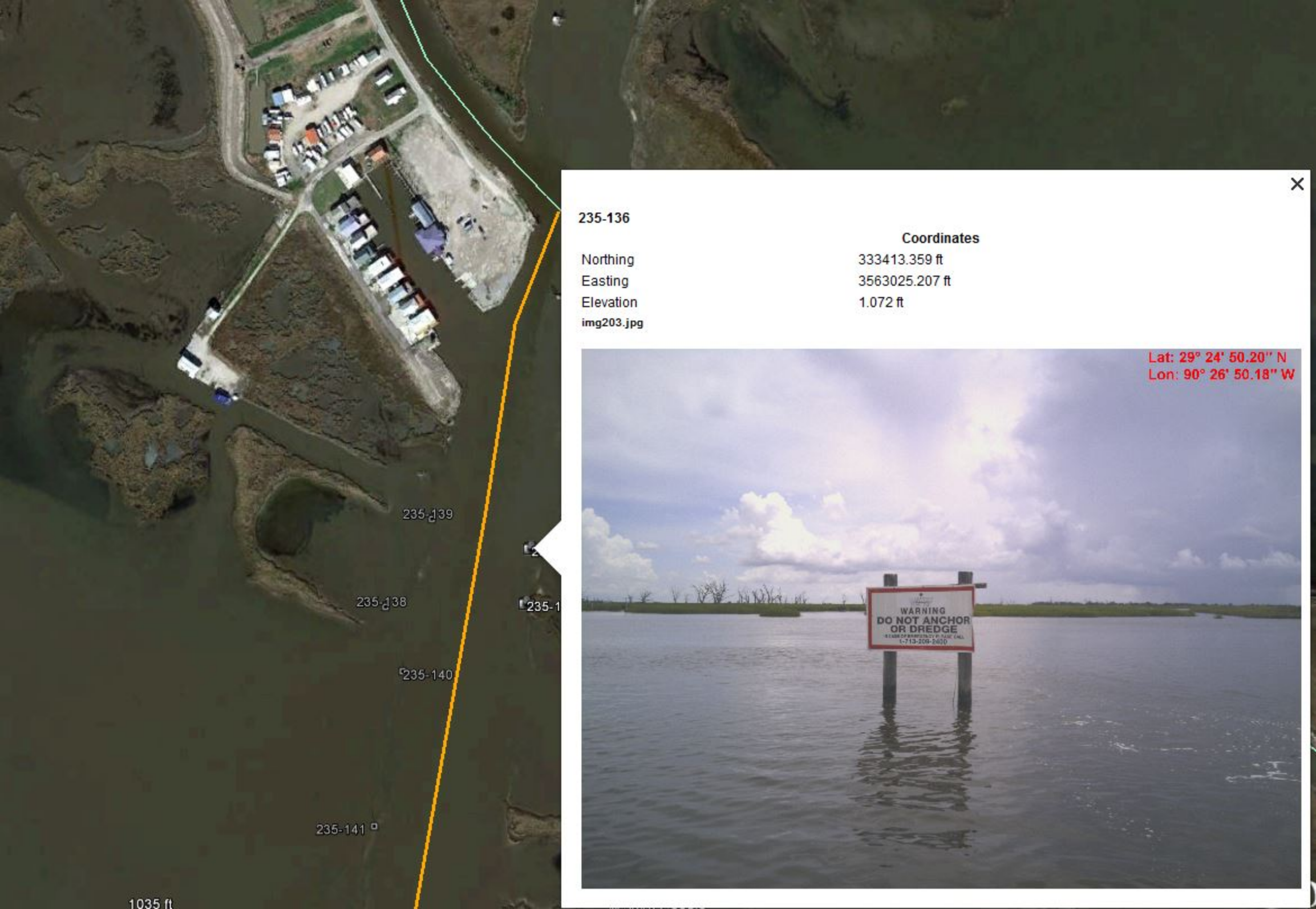




235-99

	Coordinates
Northing	303890.304 ft
Easting	3553012.881 ft
Elevation	0.661 ft

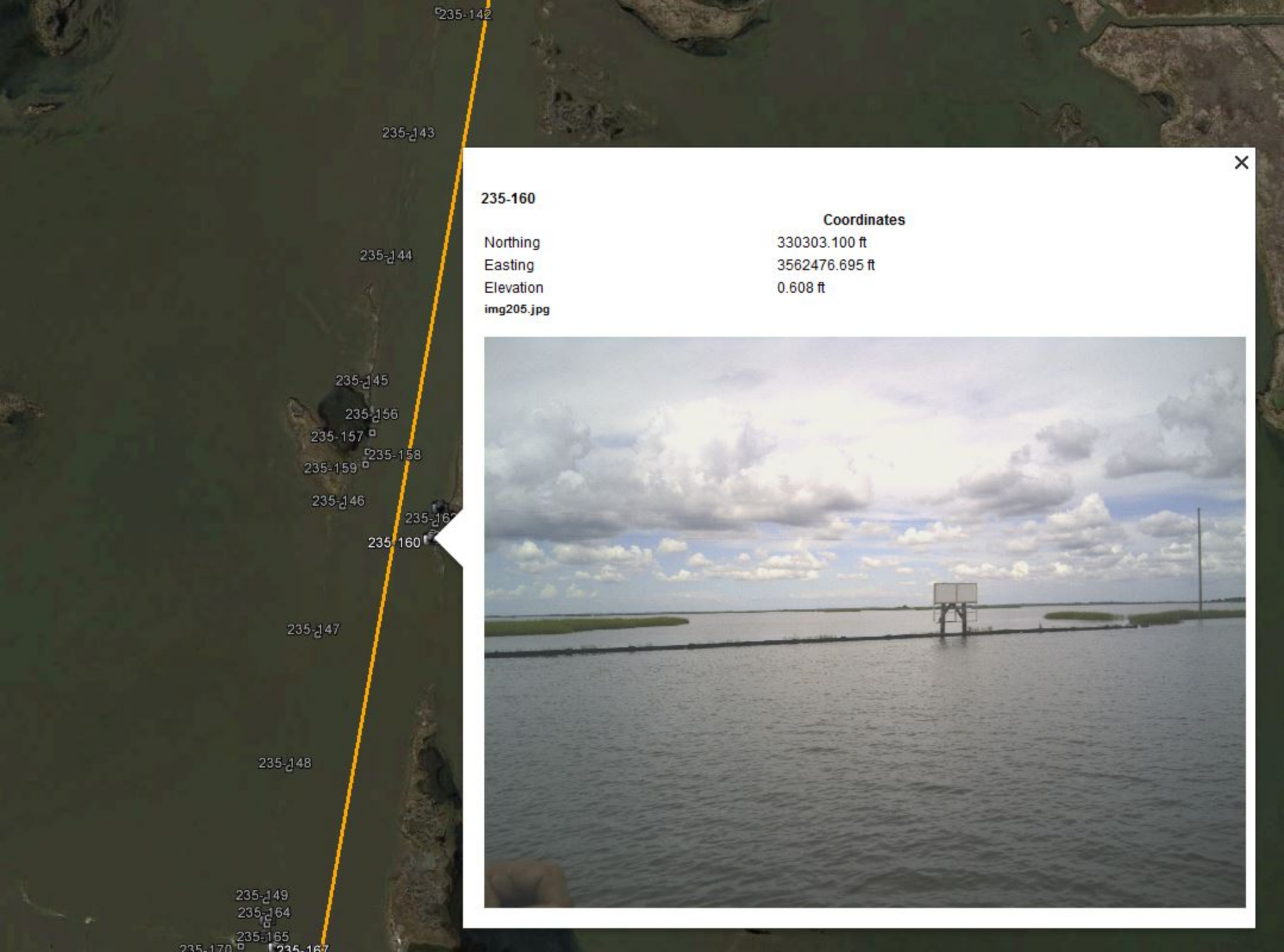
img202.jpg


235-139
235-138
235-140
235-141
1035 ft
235-136
Coordinates
Northing 333413.359 ft
Easting 3563025.207 ft
Elevation 1.072 ft
img203.jpg
Lat: 29° 24' 50.20" N
Lon: 90° 26' 50.18" W
WARNING
DO NOT ANCHOR
OR DREDGE

235-137

Coordinates	
Northing	333253.086 ft
Easting	3563012.769 ft
Elevation	3.048 ft

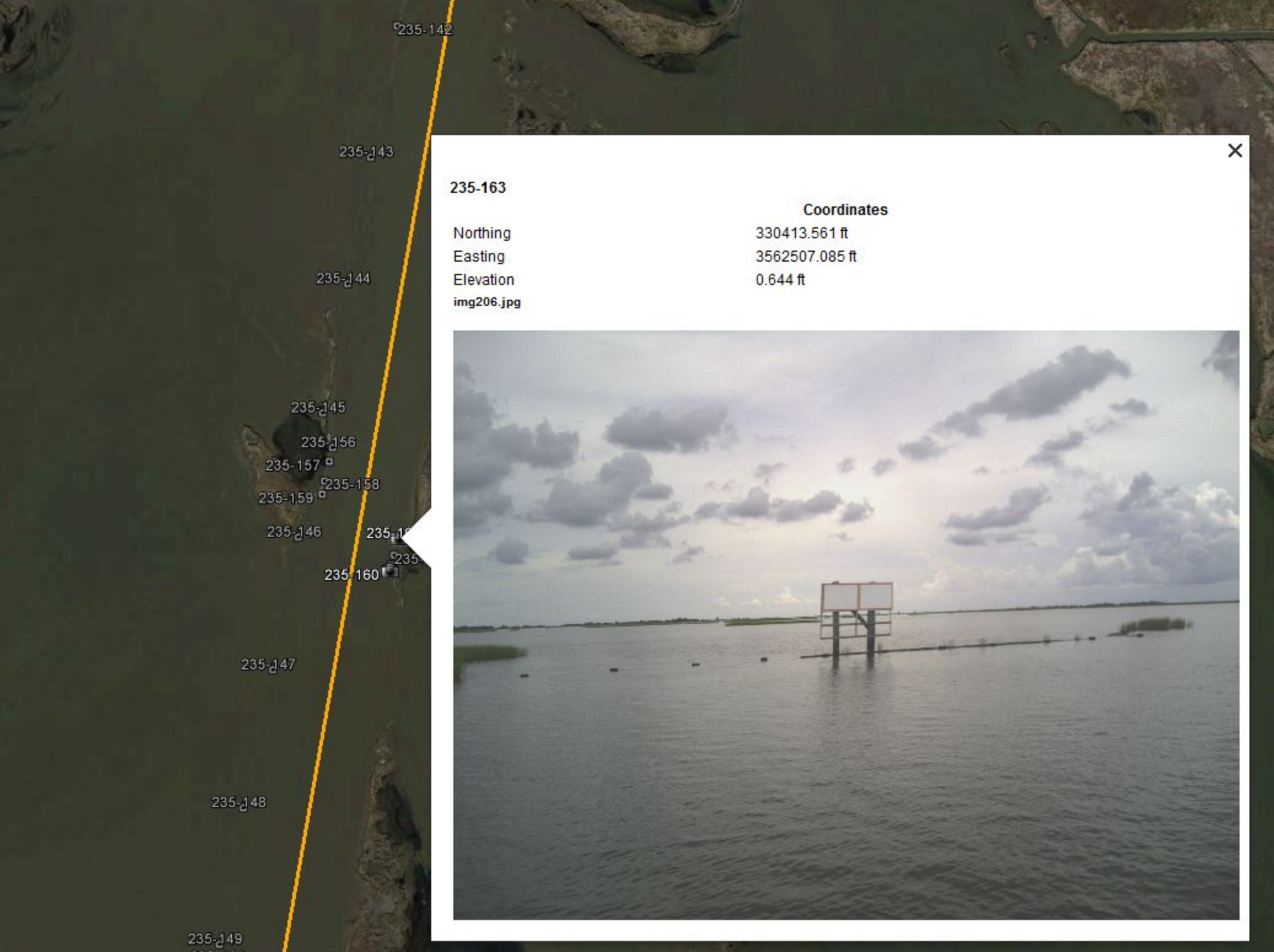
img204.jpg



235-160

	Coordinates
Northing	330303.100 ft
Easting	3562476.695 ft
Elevation	0.608 ft

img205.jpg



235-163

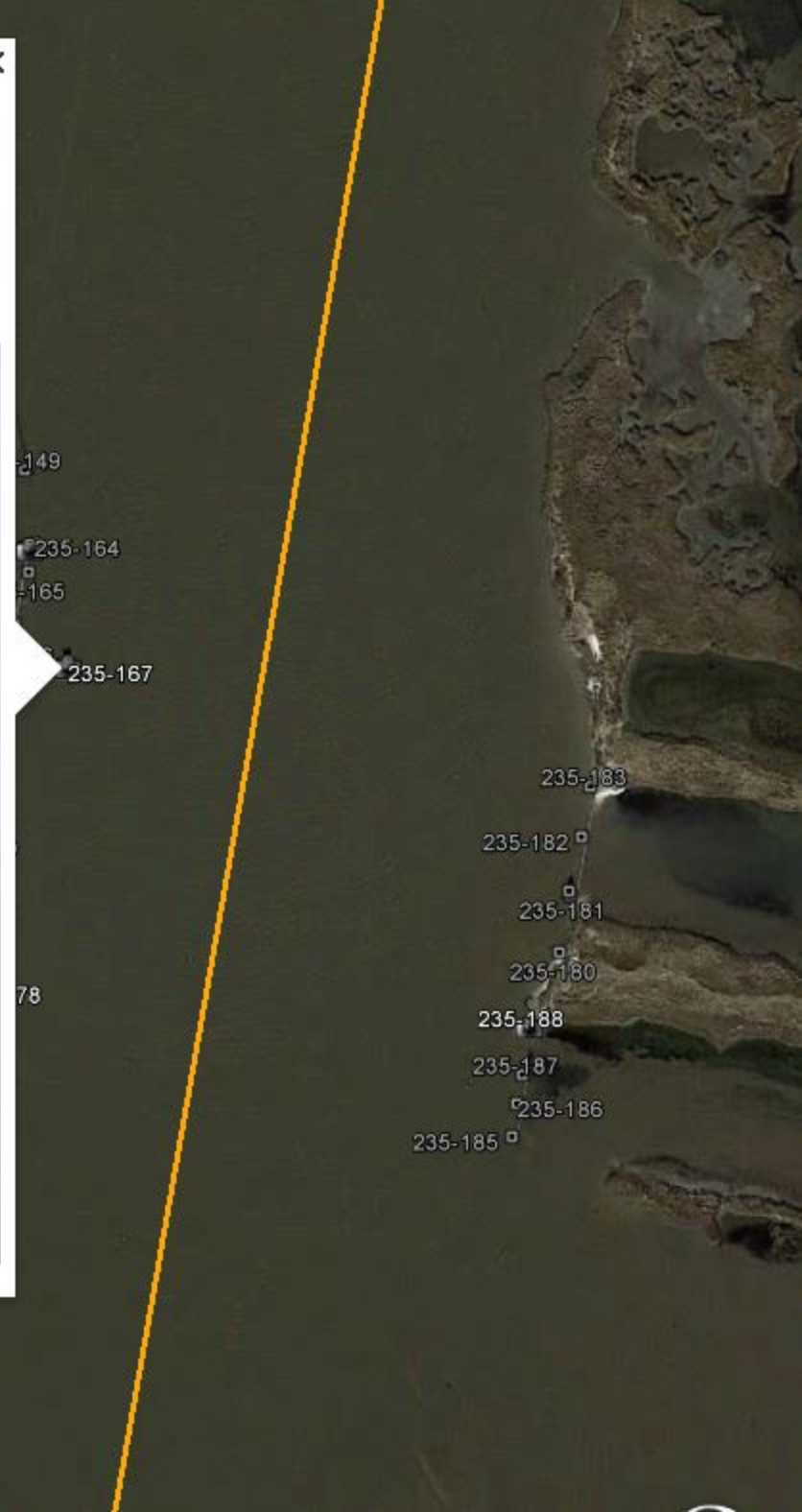
	Coordinates
Northing	330413.561 ft
Easting	3562507.085 ft
Elevation	0.644 ft

img206.jpg

235-167

	Coordinates
Northing	328867.358 ft
Easting	3561941.230 ft
Elevation	5.912 ft

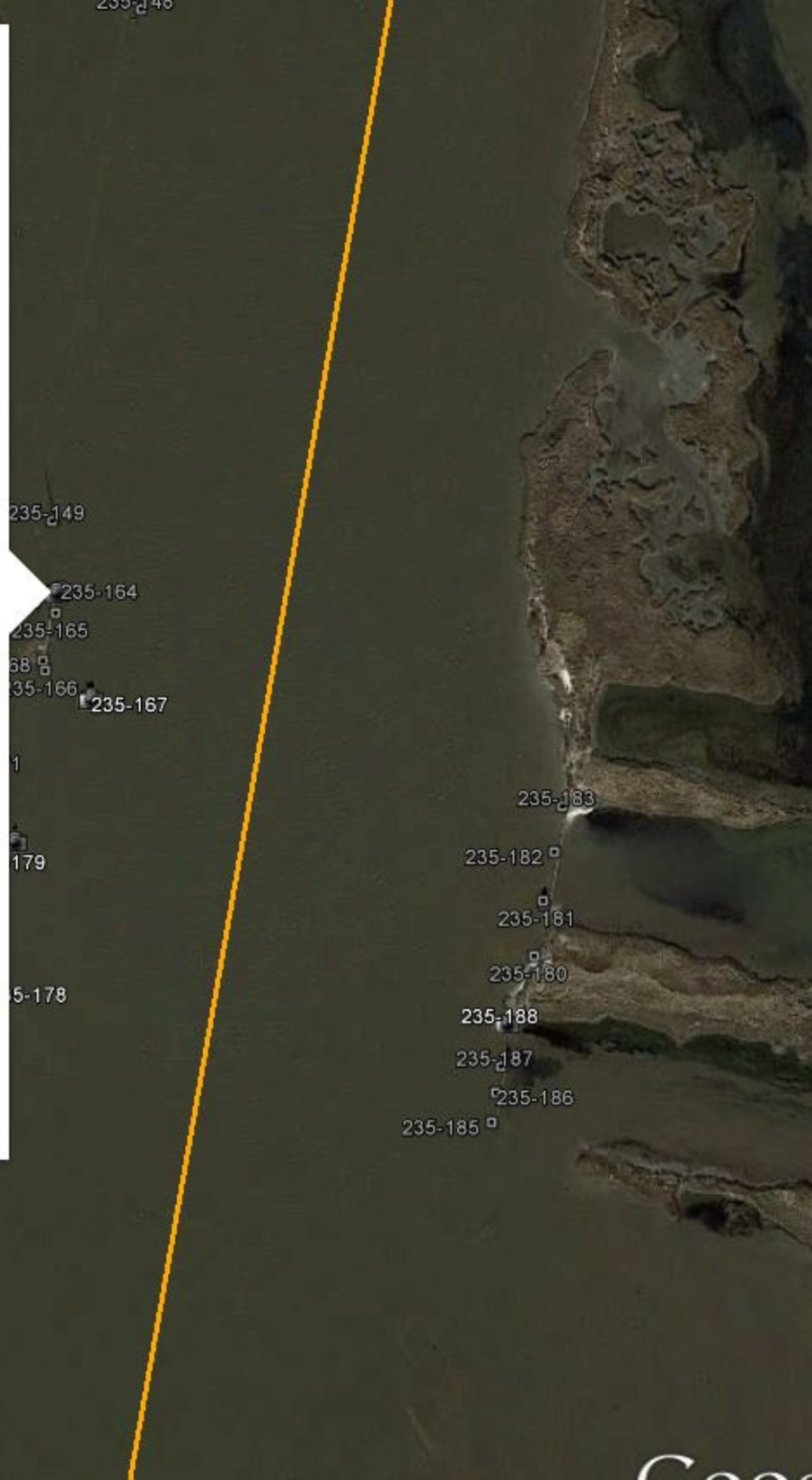
img207.jpg



235-169

Coordinates	
Northing	328963.468 ft
Easting	3561908.928 ft
Elevation	1.461 ft

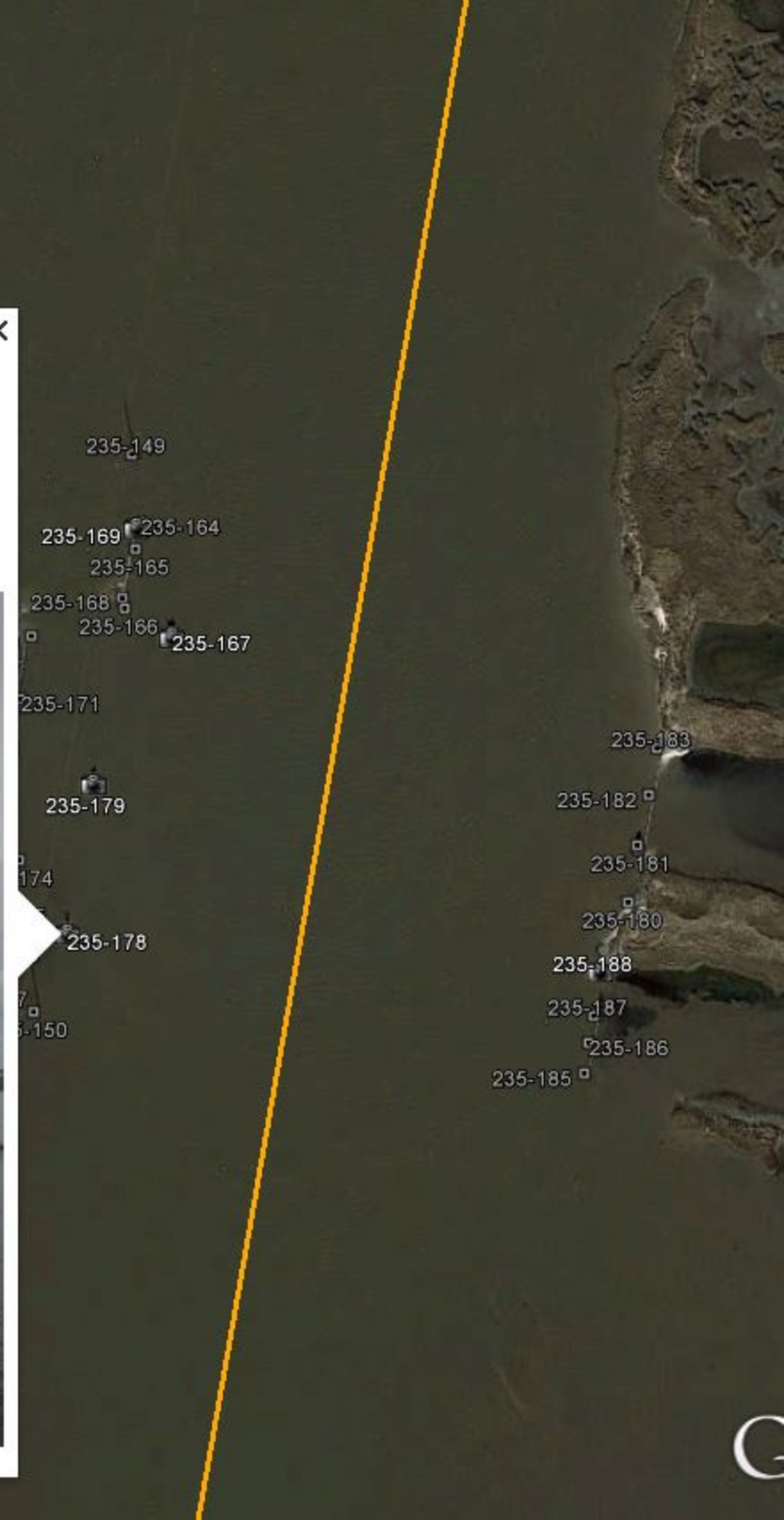
img208.jpg



235-178

Coordinates	
Northing	328605.256 ft
Easting	3561850.520 ft
Elevation	4.862 ft

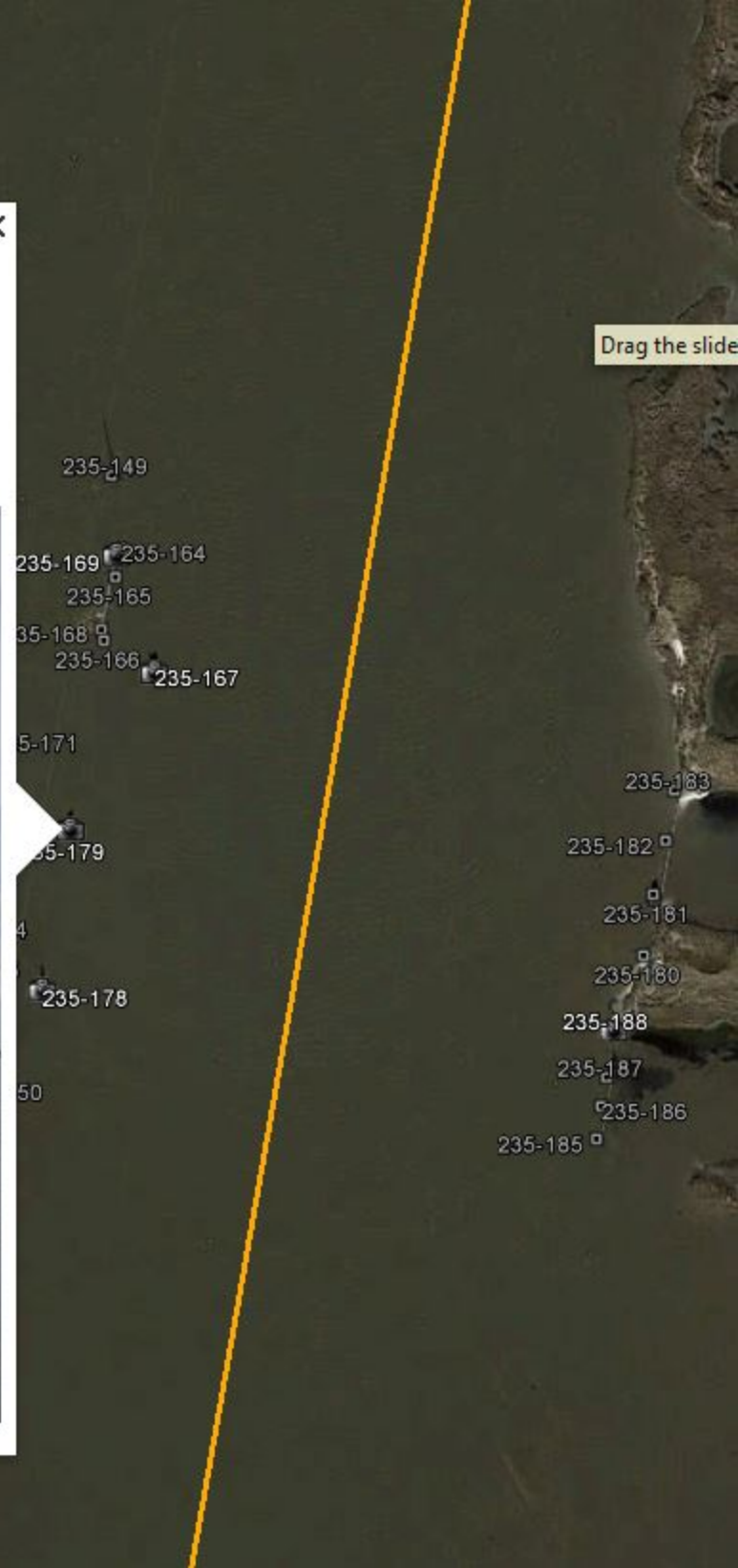
img210.jpg

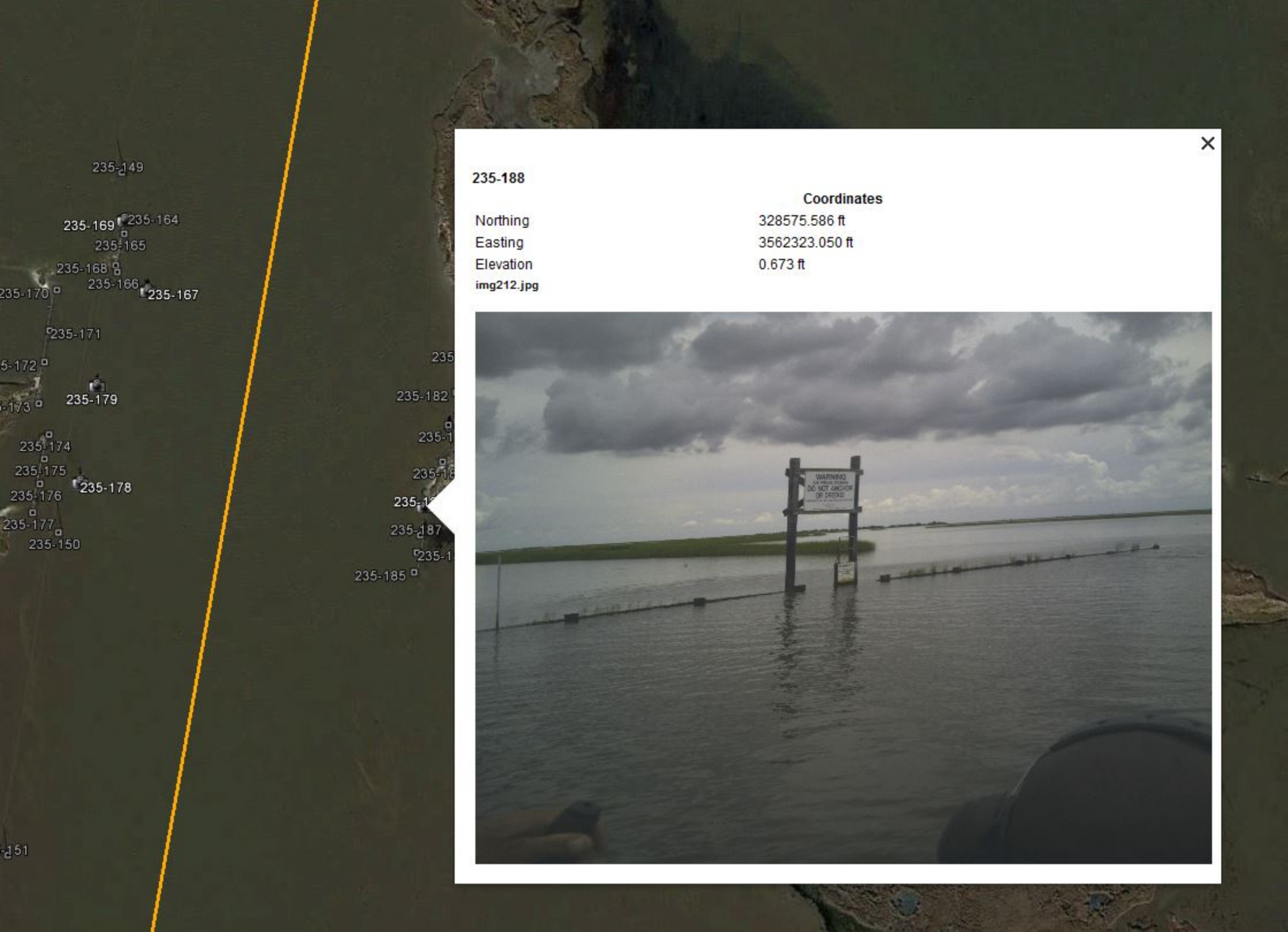


235-179

	Coordinates
Northing	328737.312 ft
Easting	3561872.455 ft
Elevation	5.179 ft

img211.jpg





235-188

Coordinates	
Northing	328575.586 ft
Easting	3562323.050 ft
Elevation	0.673 ft

img212.jpg

235-201

	Coordinates
Northing	325578.841 ft
Easting	3560071.053 ft
Elevation	0.761 ft

img213.jpg

1278 ft

Google e

235-202
Coordinates
Northing 325549.894 ft
Easting 3560004.006 ft
Elevation 0.841 ft
img214.jpg
WARNING
PETROLEUM
-197
35-198
235-200
-202

2.2) TE-117 Phase 1 South Access and Borrow Area Maps

STATE OF LOUISIANA
COASTAL PROTECTION AND RESTORATION AUTHORITY

INDEX

ACCESS, BORROW AREA SOUNDINGS AND MAGNETOMETER SURVEY IN SUPPORT OF: ISLAND ROAD MARSH CREATION AND NOURISHMENT TE-117 TERREBONNE PARISH, LOUISIANA

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3	Index to Access Survey Lines & Borrow Area Survey Lines
4-9	Index to Survey Results Access Survey Lines & Borrow Area Survey Lines
10	Project Control
11-14	Access Survey Lines & Cross Tie Lines
15-16	Access Survey Line Tables & Cross Tie Line Tables
17-18	Oyster Leases Along Access Survey Lines
19-66	Survey Results Access Survey Lines, Soundings, Water Bottom Profiles, Anomalies & Pipeline Probing
67	Borrow Area Survey Lines
68	Borrow Area Survey Line Table
69	Borrow Area Oyster Leases
70-71	Borrow Area Anomalies & Anomaly Table
72-93	Borrow Area Survey Results Water Bottom Profiles

General Notes:

1. Plane Coordinates Shown Hereon are in U. S. Survey Feet and are relative to the North American Datum of 1983 (2011) based on State Plane Coordinate System for Louisiana South □one. (1702)

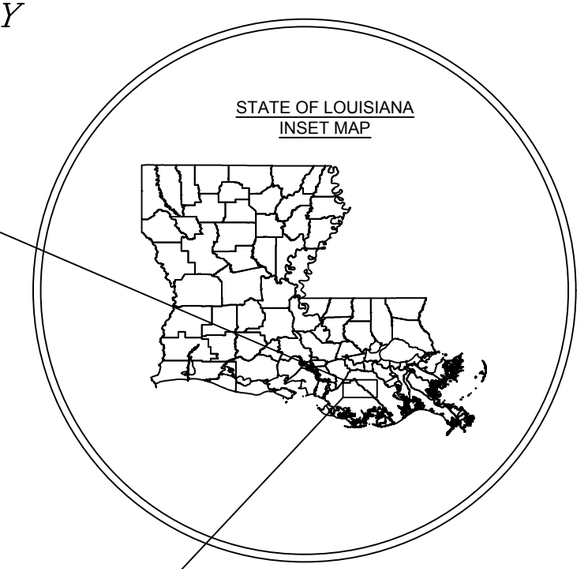
2. Elevations are in feet and tenths and refer to North American Vertical Datum of 1988 NAVD88) Geoid 12B.

3. To□ogra□hic and Hydrogra□hic Positions obtained using a combination of GULFNet RTN (VRS) and Real Time □inematic (RT□).

4. & The Access, Borrow Area and Bank Line Ties were □erformed by C. H. Fenstermaker Associates, L. L. C. in January and February 2017.

5. The information de□icted on this ma□ re□resents the results of surveys made on the date indicated and can only be considered as indicating the general conditions existing at the time.

6. Aerial imagery: EARTHSTAR GEOGRAPHICS, Year of data acquisition □rimarily years 2014 and 2015, a few scenes from 2013. htt□://www.teracolor.net/datas□ecs.html



SCALE: 1"=30,000□

15,000□ 7,500□ 0□ 15,000□ 30,000□

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

NAD83 (2011) LOUISIANA SOUTH

TITLE SHEET

COASTAL PROTECTION AND RESTORATION AUTHORITY
Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 1 of 93

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DRAWN BY: TSM	□	BY:	DATE:	DESCRIPTION:
PROJ. MGR.: RMJ				
DATE: 05/17/2018				

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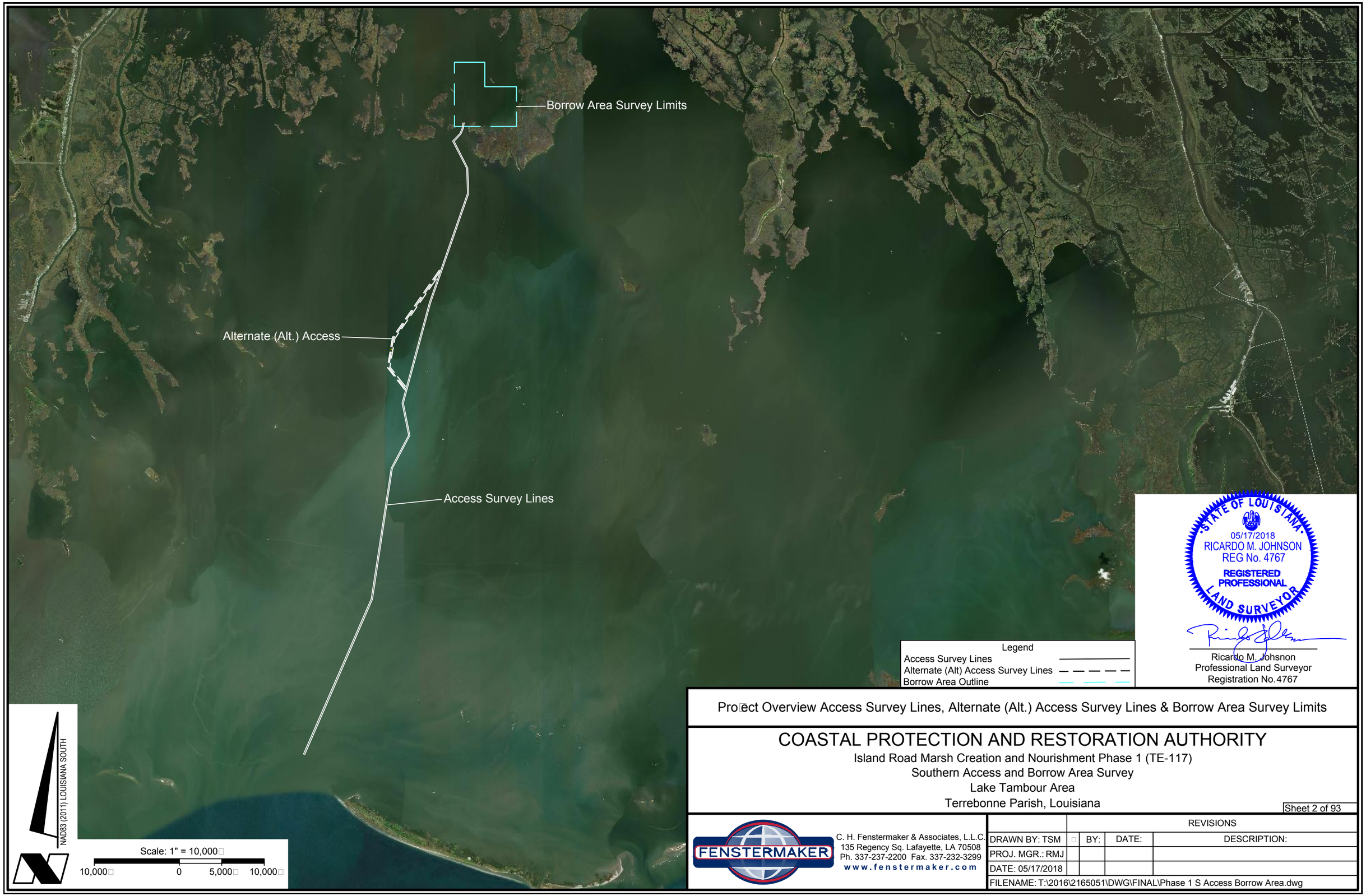

Project Overview Access Survey Lines, Alternate (Alt.) Access Survey Lines & Borrow Area Survey Limits

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Southern Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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DATE: 05/17/2018			

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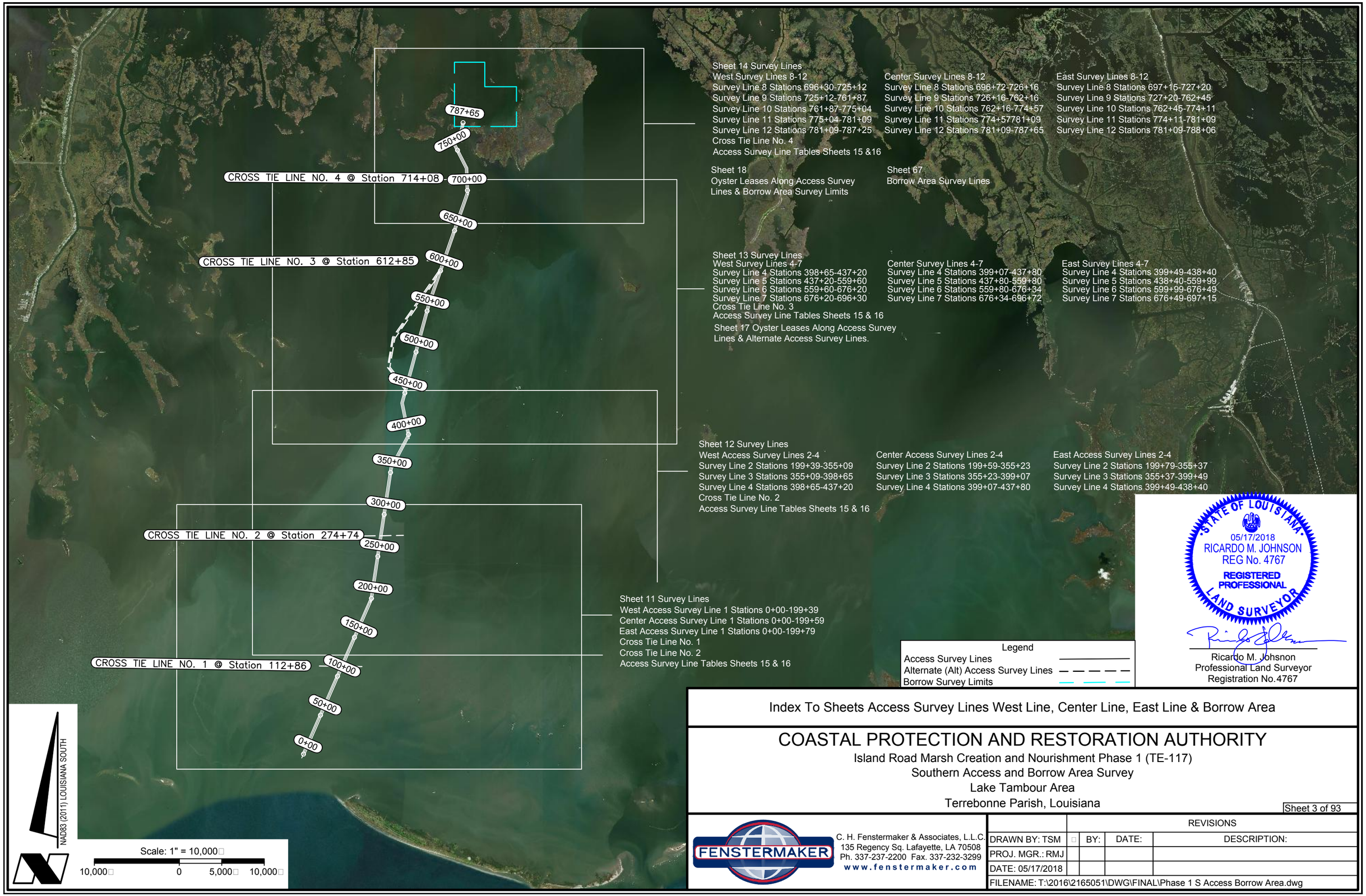

Index To Sheets Access Survey Lines West Line, Center Line, East Line & Borrow Area

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
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Terrebonne Parish, Louisiana

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PROJ. MGR.: RMJ				
DATE: 05/17/2018				

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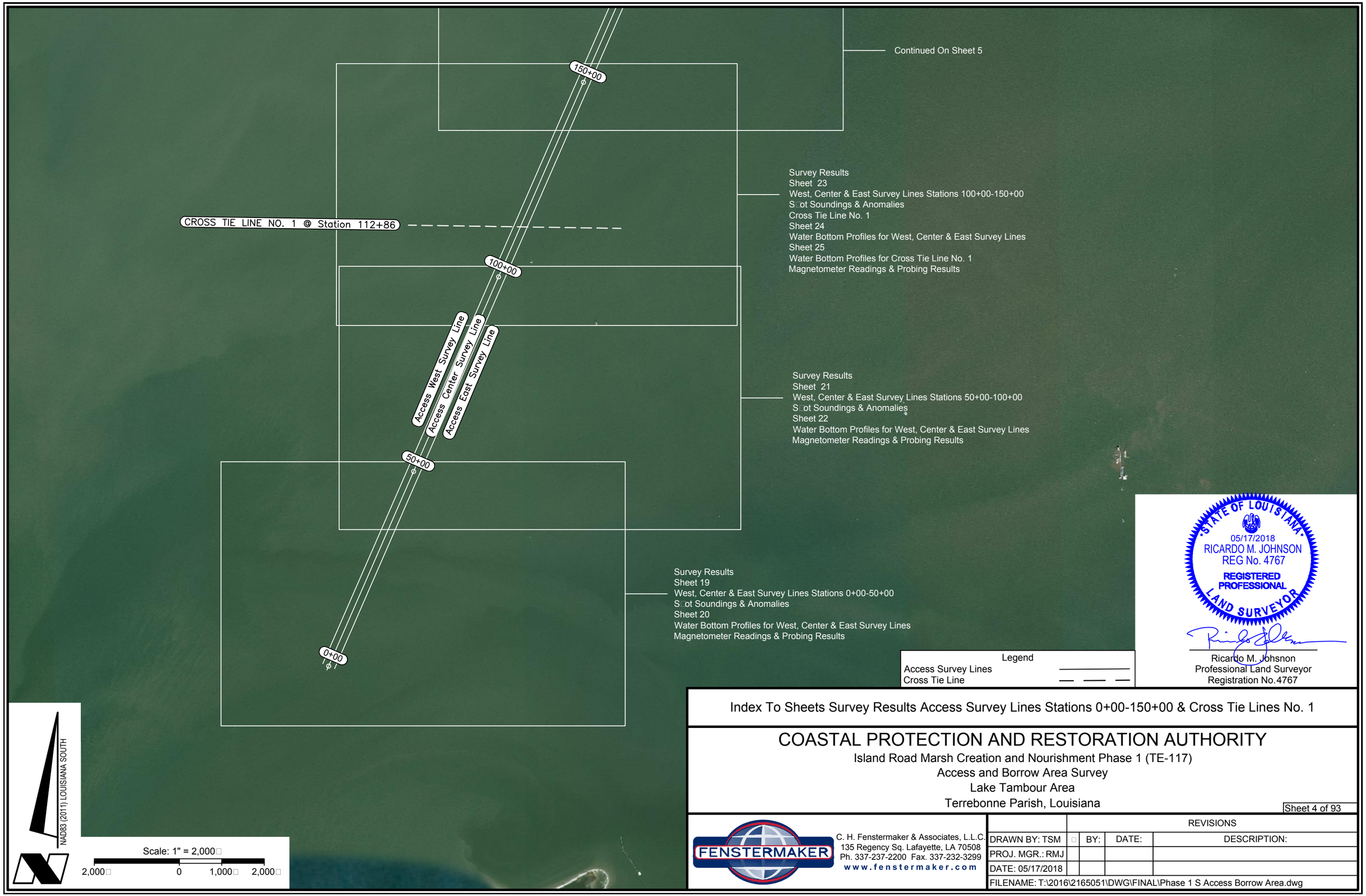

Index To Sheets Survey Results Access Survey Lines Stations 0+00-150+00 & Cross Tie Lines No. 1

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
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Terrebonne Parish, Louisiana

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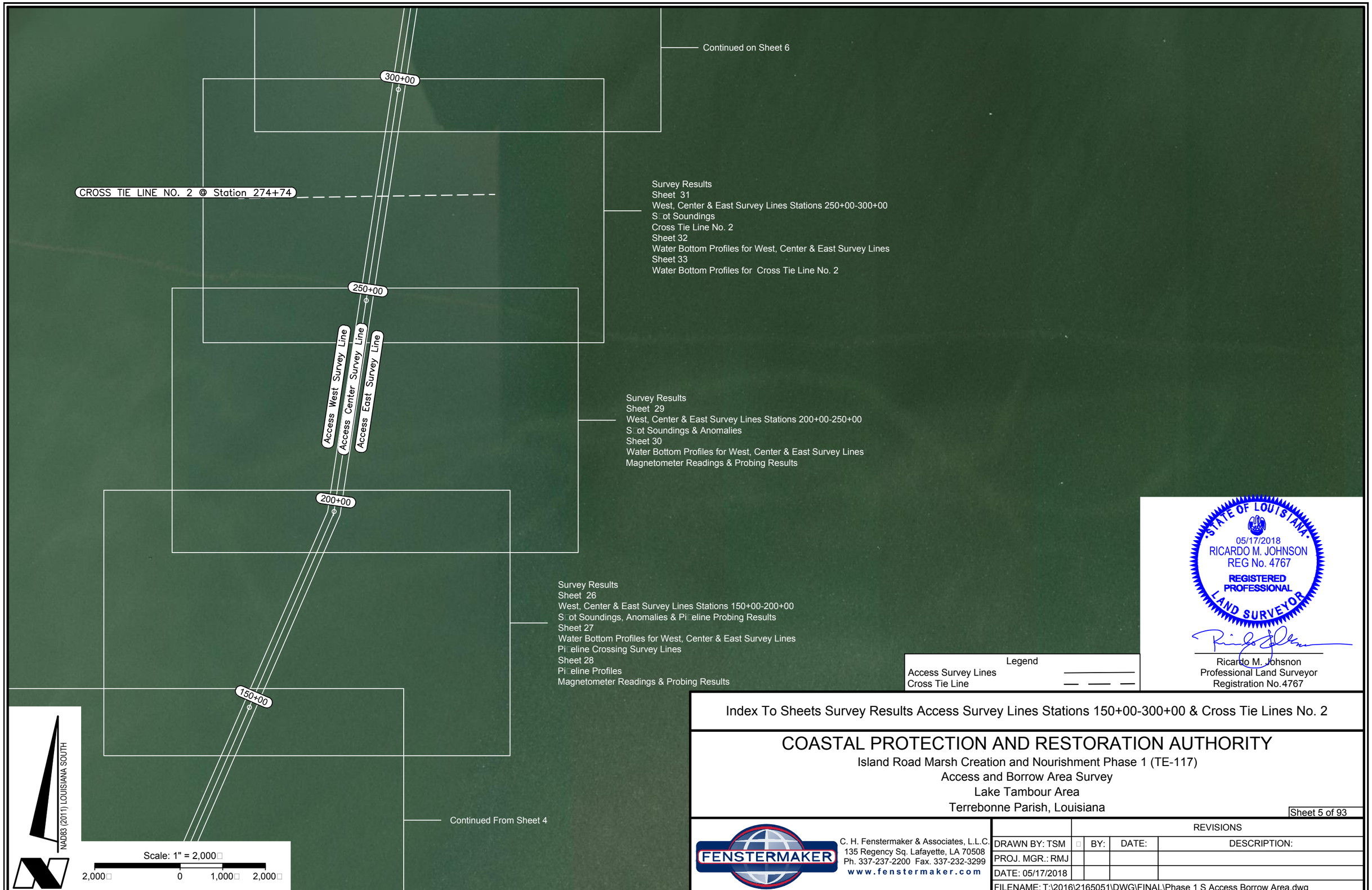

Index To Sheets Survey Results Access Survey Lines Stations 150+00-300+00 & Cross Tie Lines No. 2

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Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
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Lake Tambour Area
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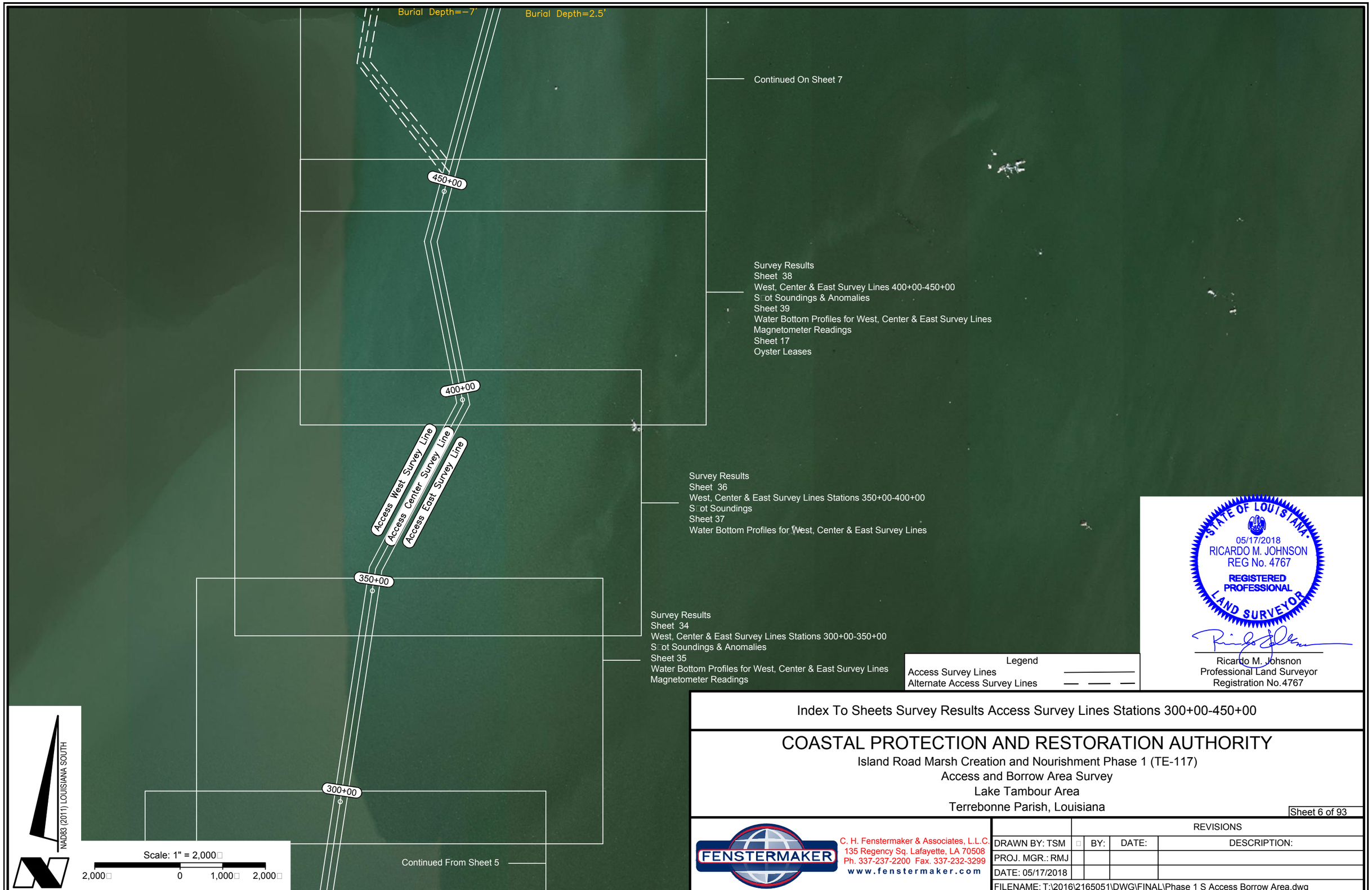

Index To Sheets Survey Results Access Survey Lines Stations 300+00-450+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

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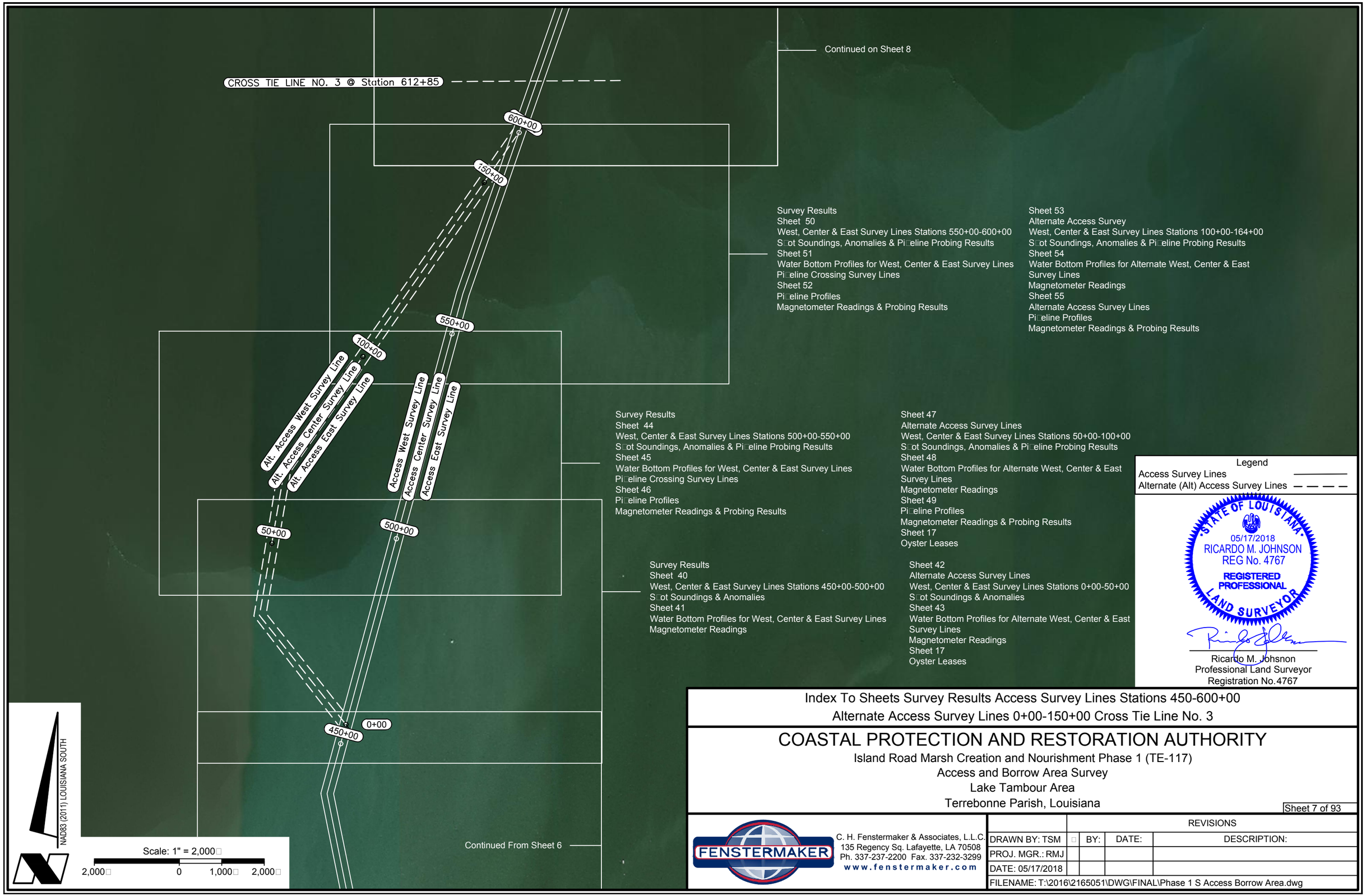

Index To Sheets Survey Results Access Survey Lines Stations 450-600+00
Alternate Access Survey Lines 0+00-150+00 Cross Tie Line No. 3

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
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PROJ. MGR.: RMJ			
DATE: 05/17/2018			

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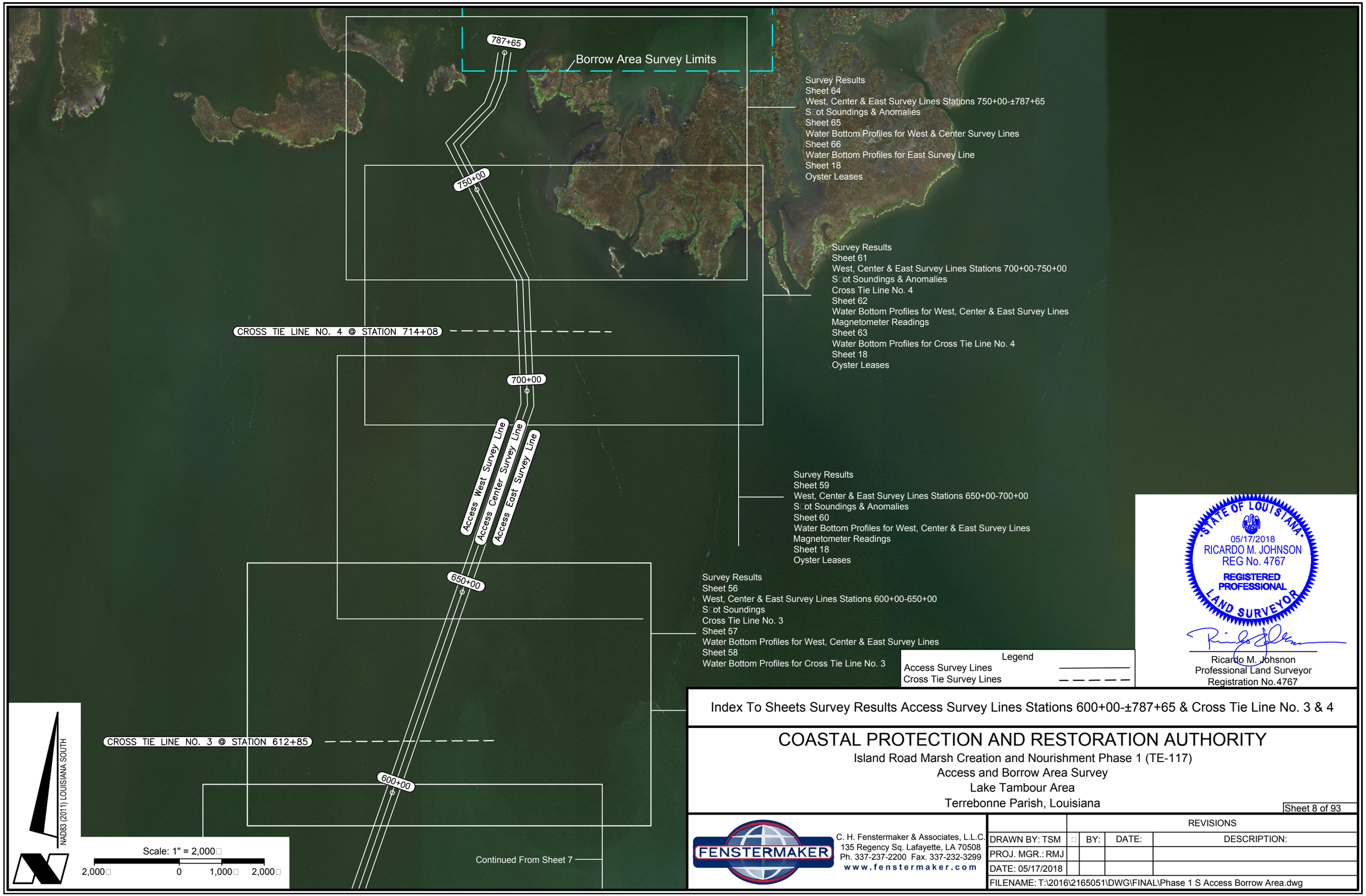

Index To Sheets Survey Results Access Survey Lines Stations 600+00-±787+65 & Cross Tie Line No. 3 & 4

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
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Lake Tambour Area
Terrebonne Parish, Louisiana

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PROJ. MGR.: RMJ			
DATE: 05/17/2018			

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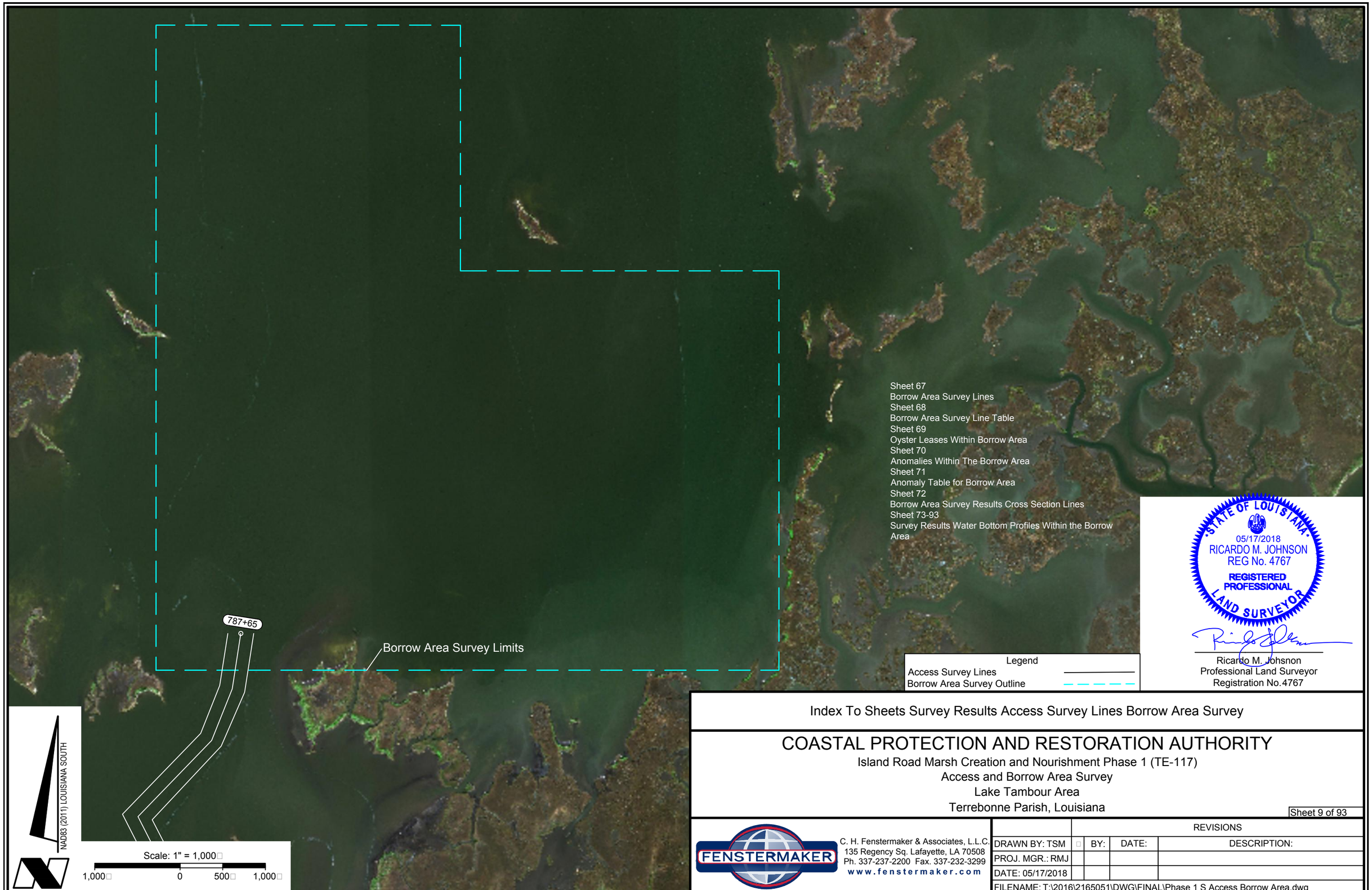

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COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
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Lake Tambour Area
Terrebonne Parish, Louisiana

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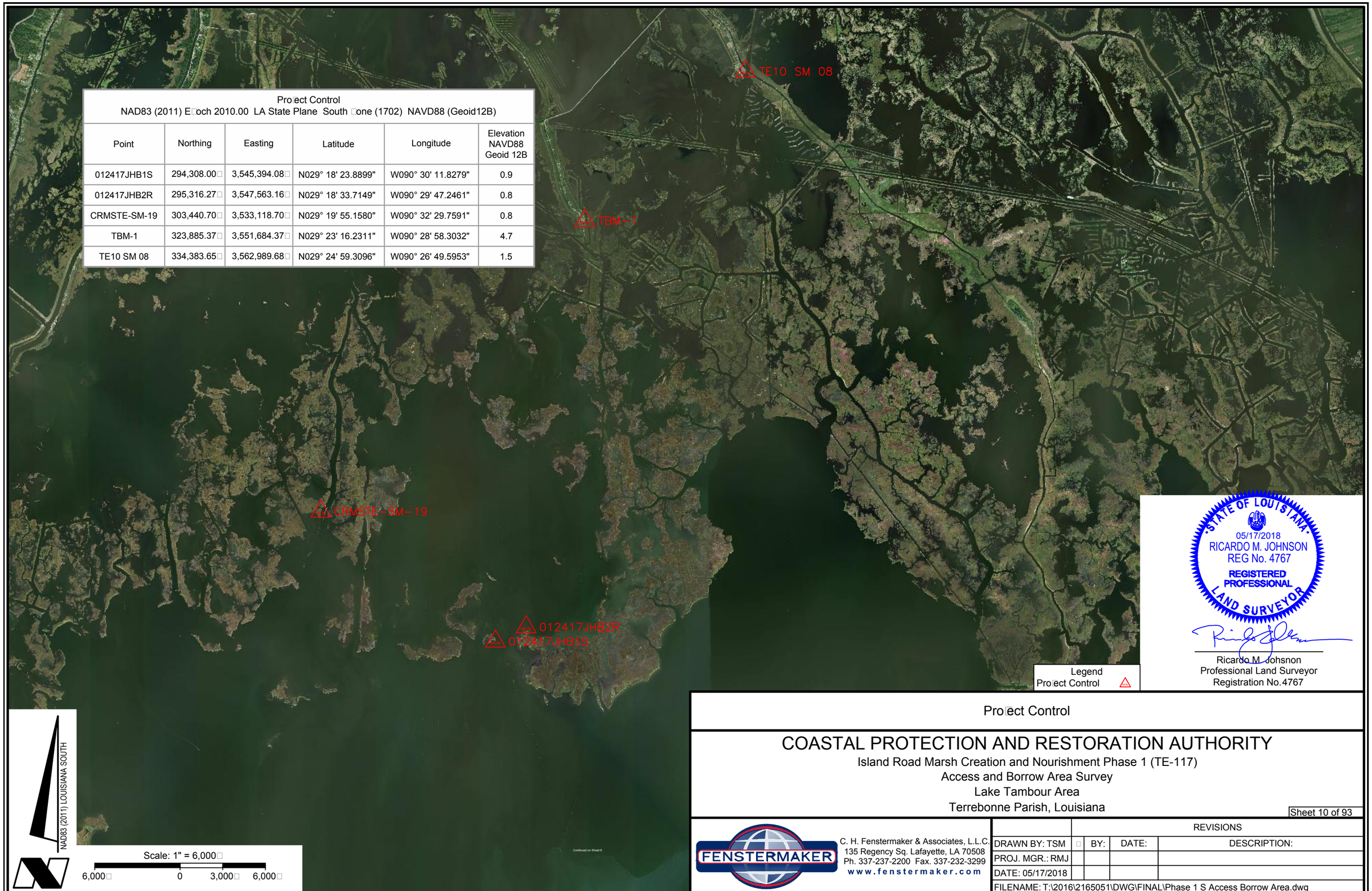

Project Control
NAD83 (2011) Epoch 2010.00 LA State Plane South Zone (1702) NAVD88 (Geoid12B)

Point	Northing	Easting	Latitude	Longitude	Elevation NAVD88 Geoid 12B
012417JHB1S	294,308.00	3,545,394.08	N029° 18' 23.8899"	W090° 30' 11.8279"	0.9
012417JHB2R	295,316.27	3,547,563.16	N029° 18' 33.7149"	W090° 29' 47.2461"	0.8
CRMSTE-SM-19	303,440.70	3,533,118.70	N029° 19' 55.1580"	W090° 32' 29.7591"	0.8
TBM-1	323,885.37	3,551,684.37	N029° 23' 16.2311"	W090° 28' 58.3032"	4.7
TE10 SM 08	334,383.65	3,562,989.68	N029° 24' 59.3096"	W090° 26' 49.5953"	1.5

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Project Control

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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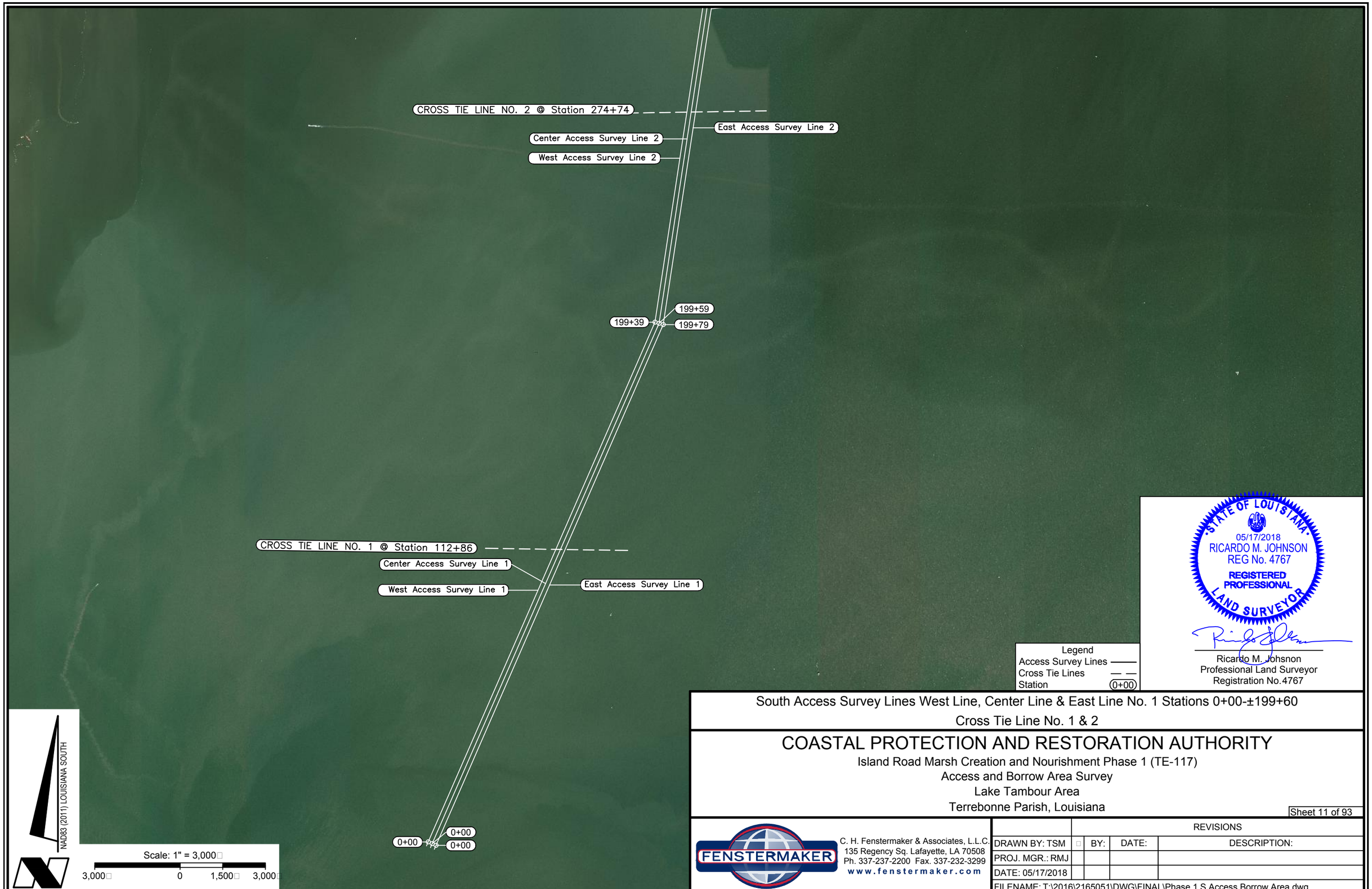

South Access Survey Lines West Line, Center Line & East Line No. 1 Stations 0+00-±199+60

Cross Tie Line No. 1 & 2

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)

Access and Borrow Area Survey

Lake Tambour Area

Terrebonne Parish, Louisiana

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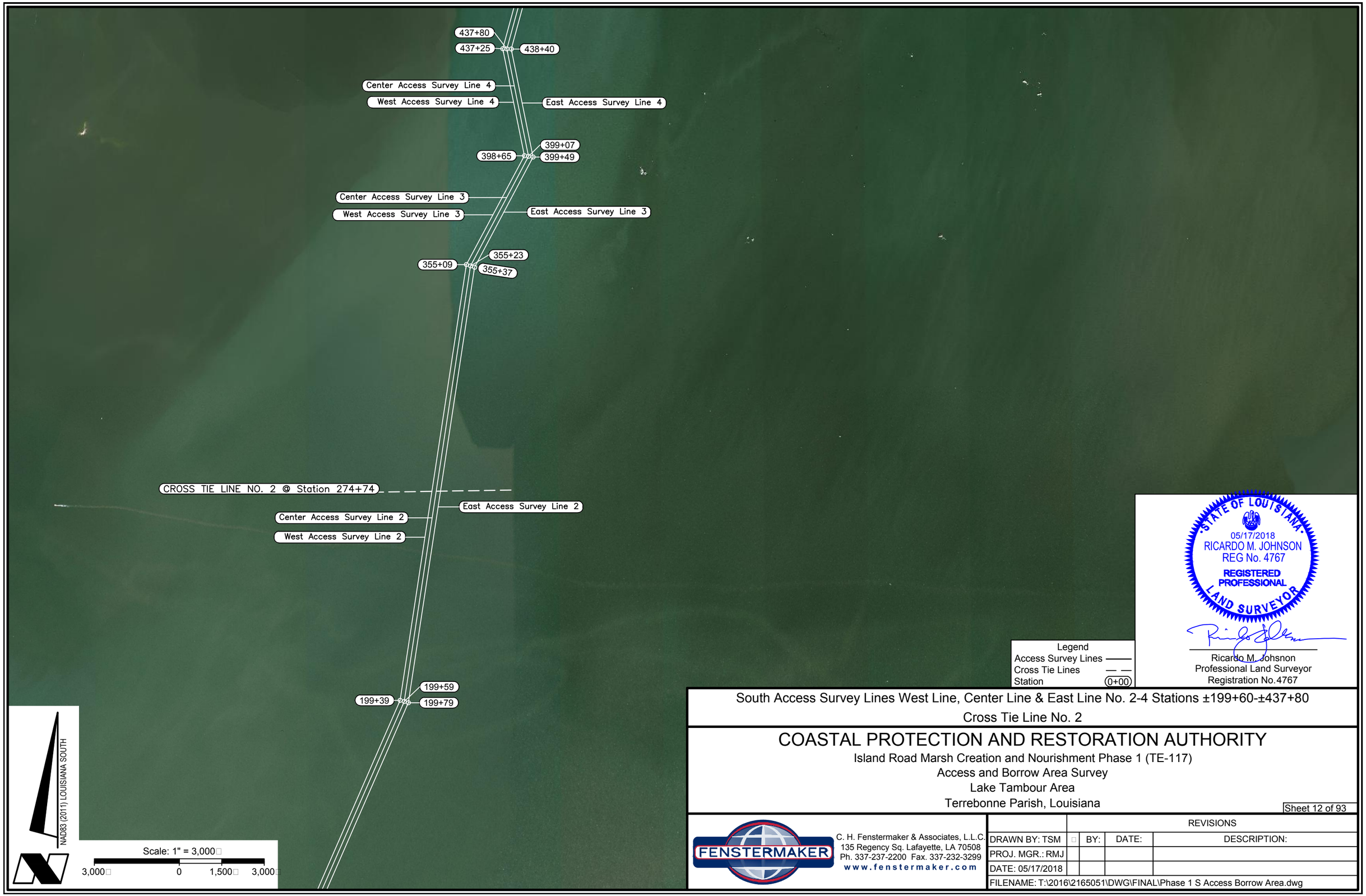

South Access Survey Lines West Line, Center Line & East Line No. 2-4 Stations ±199+60-±437+80

Cross Tie Line No. 2

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)

Access and Borrow Area Survey

Lake Tambour Area

Terrebonne Parish, Louisiana

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DRAWN BY: TSM	BY:	DATE:	DESCRIPTION:
PROJ. MGR.: RMJ			
DATE: 05/17/2018			

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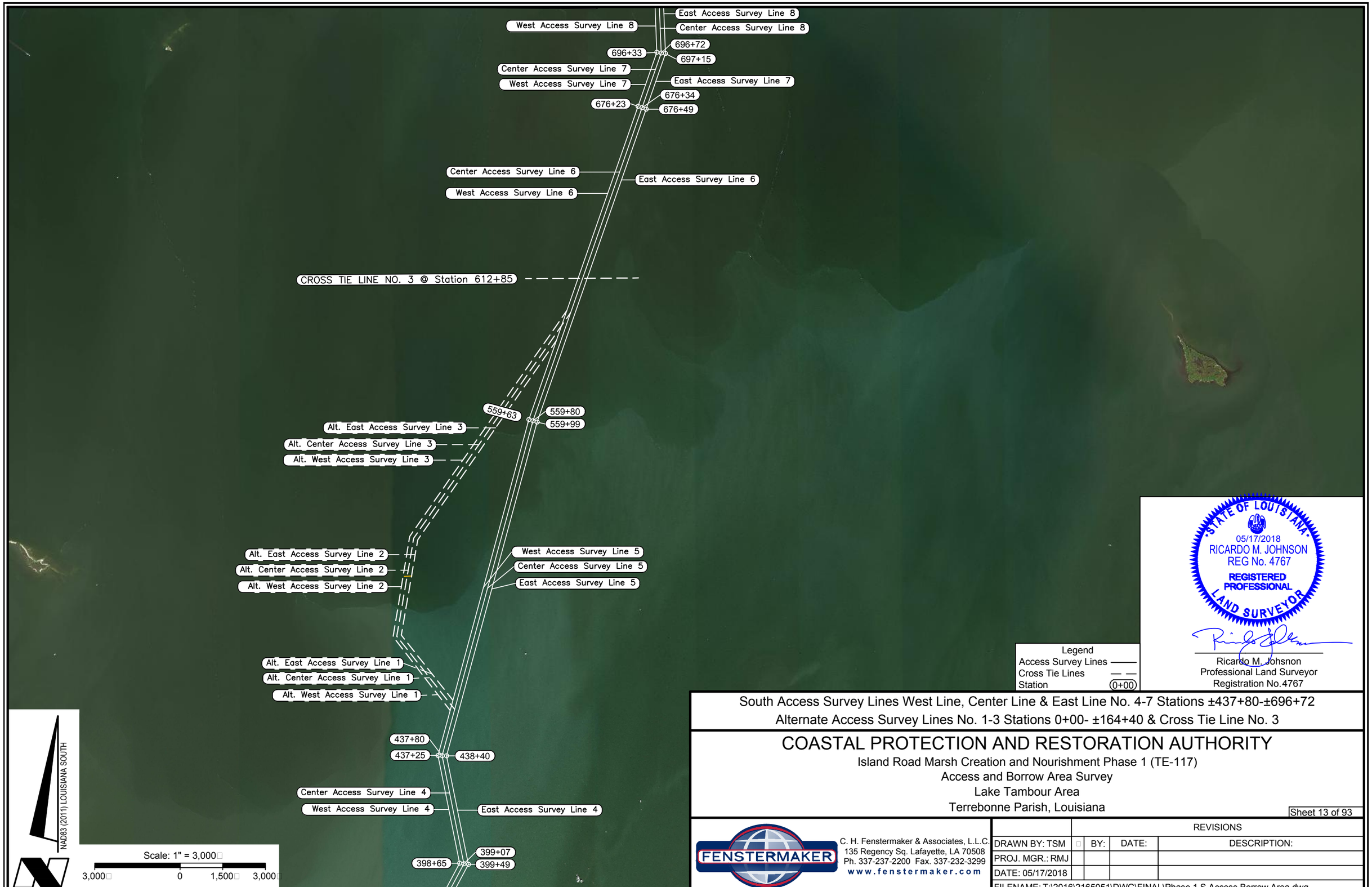

Legend
Access Survey Lines
Cross Tie Lines
Station (0+00)

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

South Access Survey Lines West Line, Center Line & East Line No. 4-7 Stations ±437+80-±696+72
Alternate Access Survey Lines No. 1-3 Stations 0+00- ±164+40 & Cross Tie Line No. 3

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 13 of 93

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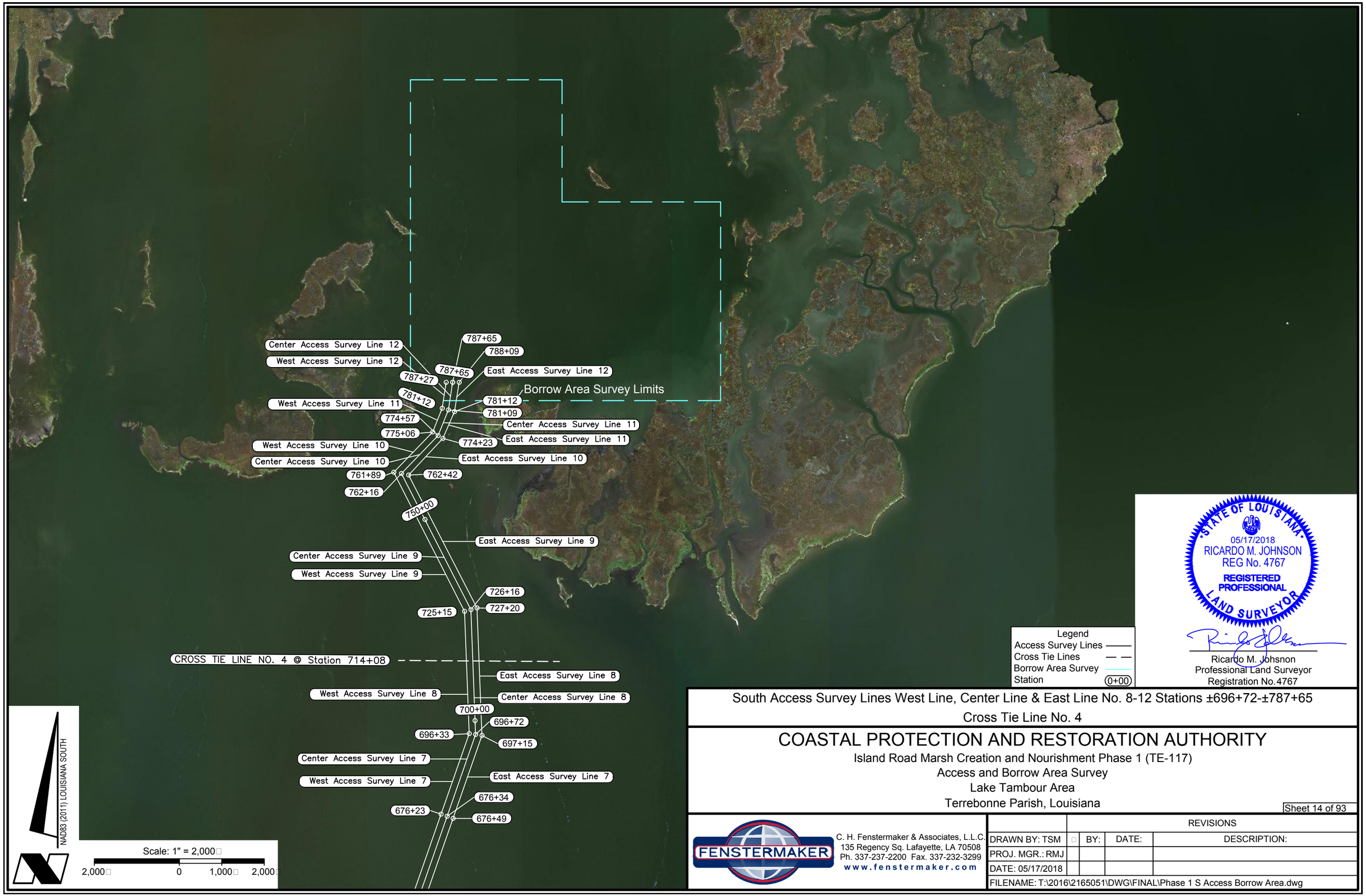

South Access Survey Lines West Line, Center Line & East Line No. 8-12 Stations ±696+72-±787+65

Cross Tie Line No. 4

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)

Access and Borrow Area Survey

Lake Tambour Area

Terrebonne Parish, Louisiana

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Access West Survey Line Table

SEGMENT	P. O. B.	P. O. E.	Bearing	Distance
West Access Survey Line 1	0+00 220,808.01' 3,527,396.02'	199+39 239,083.89' 3,535,368.96'	N23° 34' 10"E	19,939.29'
West Access Survey Line 2	199+39 239,083.89' 3,535,368.96'	355+09 254,476.80' 3,537,711.88'	N08° 39' 16"E	15,570.20'
West Access Survey Line 3	355+09 254,476.80' 3,537,711.88'	398+65 258,320.97' 3,539,758.82'	N28° 02' 04"E	4,355.18'
West Access Survey Line 4	398+65 258,320.97' 3,539,758.82'	437+25 262,105.25' 3,538,995.75'	N11° 24' 02"W	3,860.45'
West Access Survey Line 5	437+25 262,105.25' 3,538,995.75'	559+63 273,917.80' 3,542,193.87'	N15° 08' 57"E	12,237.83'
West Access Survey Line 6	559+63 273,917.80' 3,542,193.87'	676+23 284,927.74' 3,546,032.57'	N19° 13' 17"E	11,659.95'
West Access Survey Line 7	676+23 284,927.74' 3,546,032.57'	696+33 286,825.43' 3,546,694.21'	N19° 13' 17"E	2,009.73'
West Access Survey Line 8	696+33 286,825.43' 3,546,694.21'	725+15 289,705.52' 3,546,585.45'	N02° 09' 45"W	2,882.14'
West Access Survey Line 9	725+15 289,705.52' 3,546,585.45'	761+89 292,979.87' 3,544,918.25'	N26° 59' 02"W	3,674.36'
West Access Survey Line 10	761+89 292,979.87' 3,544,918.25'	775+06 293,926.65' 3,545,834.25'	N44° 03' 12"E	1,317.37'
West Access Survey Line 11	775+06 293,926.65' 3,545,834.25'	781+12 294,488.65' 3,546,058.48'	N21° 45' 04"E	605.08'
West Access Survey Line 12	781+12 294,488.65' 3,546,058.48'	787+27 295,096.95' 3,546,153.00'	N08° 49' 55"E	615.60'

Access Center Survey Line Table

SEGMENT	P. O. B.	P. O. E.	Bearing	Distance
Center Access Survey Line 1	0+00 220,748.03' 3,527,533.51'	199+59 239,041.91' 3,535,514.30'	N23° 34' 10"E	19,958.93'
Center Access Survey Line 2	199+59 239,041.91' 3,535,514.30'	355+23 254,429.07' 3,537,855.34'	N08° 39' 03"E	15,564.23'
Center Access Survey Line 3	355+23 254,429.07' 3,537,855.34'	399+07 258,302.31' 3,539,907.80'	N27° 55' 10"E	4,383.44'
Center Access Survey Line 4	399+07 258,302.31' 3,539,907.80'	437+80 262,099.35' 3,539,142.57'	N11° 23' 40"W	3,873.38'
Center Access Survey Line 5	437+80 262,099.35' 3,539,142.57'	559+80 273,873.42' 3,542,337.25'	N15° 10' 50"E	12,199.78'
Center Access Survey Line 6	559+80 273,873.42' 3,542,337.25'	676+34 284,878.36' 3,546,174.21'	N19° 13' 17"E	11,654.66'
Center Access Survey Line 7	676+34 284,878.36' 3,546,174.21'	696+72 286,802.79' 3,546,845.17'	N19° 13' 17"E	2,038.05'
Center Access Survey Line 8	696+72 286,802.79' 3,546,845.17'	726+16 289,744.49' 3,546,734.09'	N02° 09' 45"W	2,943.79'
Center Access Survey Line 9	726+16 289,744.49' 3,546,734.09'	762+16 292,951.22' 3,545,099.24'	N27° 00' 48"W	3,599.42'
Center Access Survey Line 10	762+16 292,951.22' 3,545,099.24'	774+57 293,843.60' 3,545,962.61'	N44° 03' 12"E	1,241.68'
Center Access Survey Line 11	774+57 293,843.60' 3,545,962.61'	781+09 294,448.84' 3,546,204.09'	N21° 45' 04"E	651.63'
Center Access Survey Line 12	781+09 294,448.84' 3,546,204.09'	787+65 295,097.29' 3,546,304.85'	N08° 49' 55"E	656.23'

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Access Survey Lines West Line & Center Liine Tables

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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Access East Survey Line Table

SEGMENT	P. O. B.	P. O. E.	Bearing	Distance
East Access Survey Line 1	0+00 220,688.05' 3,527,670.99'	199+79 238,999.93' 3,535,659.64'	N23° 34' 10"E	19,978.57'
East Access Survey Line 2	199+79 238,999.93' 3,535,659.64'	355+37 254,381.33' 3,537,999.80'	N08° 39' 03"E	15,558.40'
East Access Survey Line 3	355+37 254,381.33' 3,537,999.80'	399+49 258,279.42' 3,540,065.43'	N27° 55' 10"E	4,411.56'
East Access Survey Line 4	399+49 258,279.42' 3,540,065.43'	438+40 262,094.25' 3,539,296.61'	N11° 23' 40"W	3,891.53'
East Access Survey Line 5	438+40 262,094.25' 3,539,296.61'	559+99 273,829.03' 3,542,480.63'	N15° 10' 50"E	12,159.07'
East Access Survey Line 6	559+99 273,829.03' 3,542,480.63'	676+49 284,828.98' 3,546,315.84'	N19° 13' 17"E	11,649.37'
East Access Survey Line 7	676+49 284,828.98' 3,546,315.84'	697+15 286,780.15' 3,546,996.14'	N19° 13' 17"E	2,066.37'
East Access Survey Line 8	697+15 286,780.15' 3,546,996.14'	727+20 289,782.67' 3,546,877.83'	N02° 15' 23"W	3,004.84'
East Access Survey Line 9	727+20 289,782.67' 3,546,877.83'	762+42 292,915.59' 3,545,267.13'	N27° 12' 31"W	3,522.72'
East Access Survey Line 10	762+42 292,915.59' 3,545,267.13'	774+23 293,776.67' 3,546,074.53'	N43° 09' 26"E	1,180.41'
East Access Survey Line 11	774+23 293,776.67' 3,546,074.53'	781+12 294,409.03' 3,546,349.71'	N23° 31' 01"E	689.64'
East Access Survey Line 12	781+12 294,409.03' 3,546,349.71'	788+09 295,097.63' 3,546,456.70'	N08° 49' 55"E	696.86'

Access Alternate West Survey Line Table

SEGMENT	P. O. B.	P. O. E.	Bearing	Distance
Alt. Center Access Survey Line 1	0+00 263,730.13' 3,539,585.05'	32+78 266,299.05' 3,537,549.49'	N38° 23' 34"W	3,277.62'
Alt. Center Access Survey Line 2	32+78 266,299.05' 3,537,549.49'	67+77 269,748.03' 3,538,143.10'	N09° 45' 56"E	3,499.69'
Alt. Center Access Survey Line 3	67+77 269,748.03' 3,538,143.10'	164+40 277,678.57' 3,543,663.94'	N34° 50' 37"E	9,662.98'

Access Alternate Center Survey Line Table

SEGMENT	P. O. B.	P. O. E.	Bearing	Distance
Alt. Center Access Survey Line 1	0+00 263,730.13' 3,539,585.05'	32+78 266,299.05' 3,537,549.49'	N38° 23' 34"W	3,277.62'
Alt. Center Access Survey Line 2	32+78 266,299.05' 3,537,549.49'	67+77 269,748.03' 3,538,143.10'	N09° 45' 56"E	3,499.69'
Alt. Center Access Survey Line 3	67+77 269,748.03' 3,538,143.10'	164+40 277,678.57' 3,543,663.94'	N34° 50' 37"E	9,662.98'

Access Alternate East Survey Line Table

SEGMENT	P. O. B.	P. O. E.	Bearing	Distance
Alt. East Access Survey Line 1	0+00 264,056.17' 3,539,518.09'	29+13 266,339.66' 3,537,708.69'	N38° 23' 34"W	2,913.47'
Alt. East Access Survey Line 2	29+13 266,339.66' 3,537,708.69'	63+13 269,689.71' 3,538,285.27'	N09° 45' 56"E	3,399.30'
Alt. East Access Survey Line 3	63+13 269,689.71' 3,538,285.27'	148+49 276,695.46' 3,543,162.32'	N34° 50' 37"E	8,536.16'

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Access East Survey Line Table
Alternate Access West, Center & East Survey Lines

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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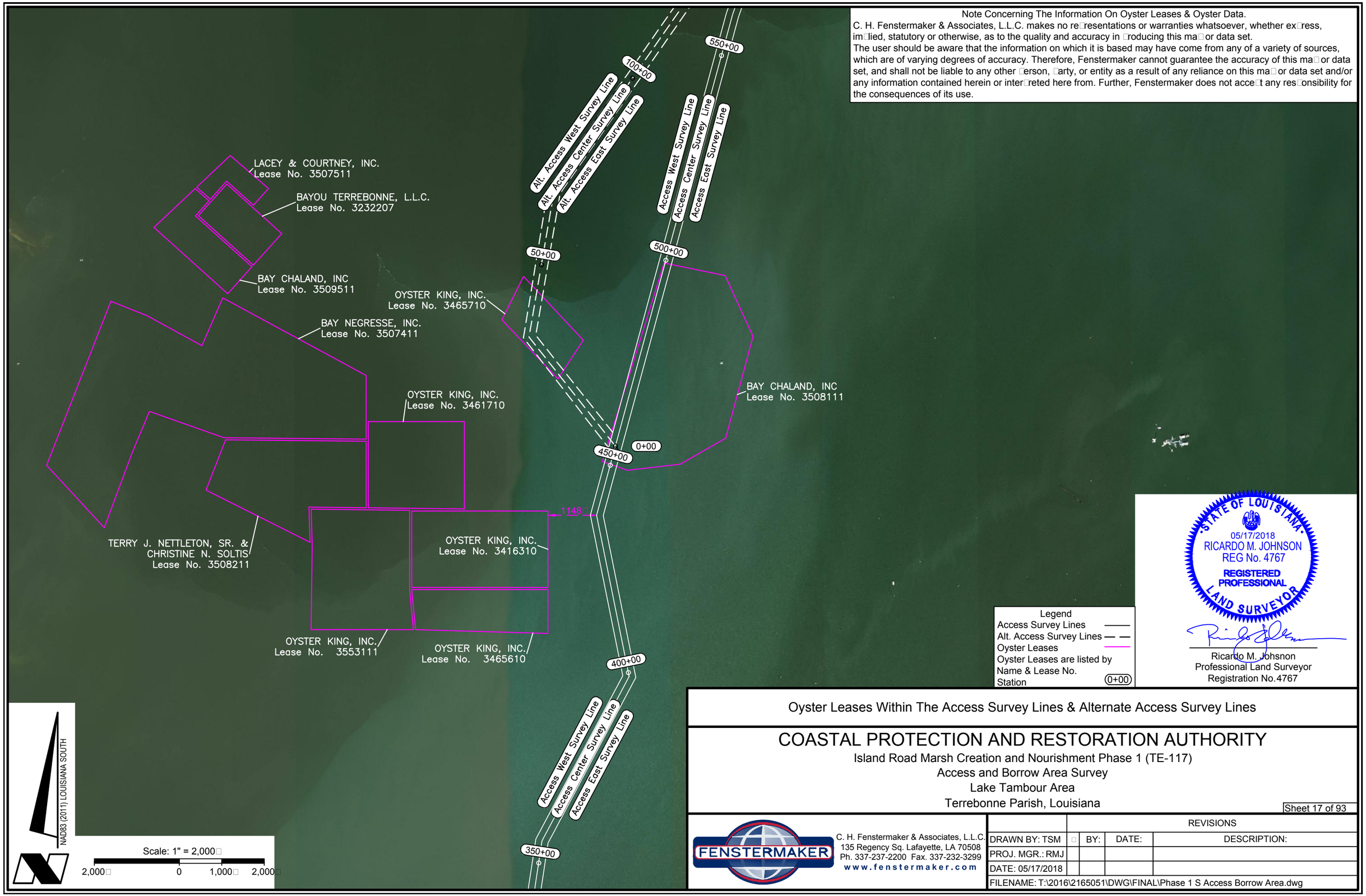

Legend

Access Survey Lines

Alt. Access Survey Lines

Oyster Leases

Oyster Leases are listed by Name & Lease No.

Station (0+00)

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johsnon
Professional Land Surveyor
Registration No.4767

Oyster Leases Within The Access Survey Lines & Alternate Access Survey Lines

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)

Access and Borrow Area Survey

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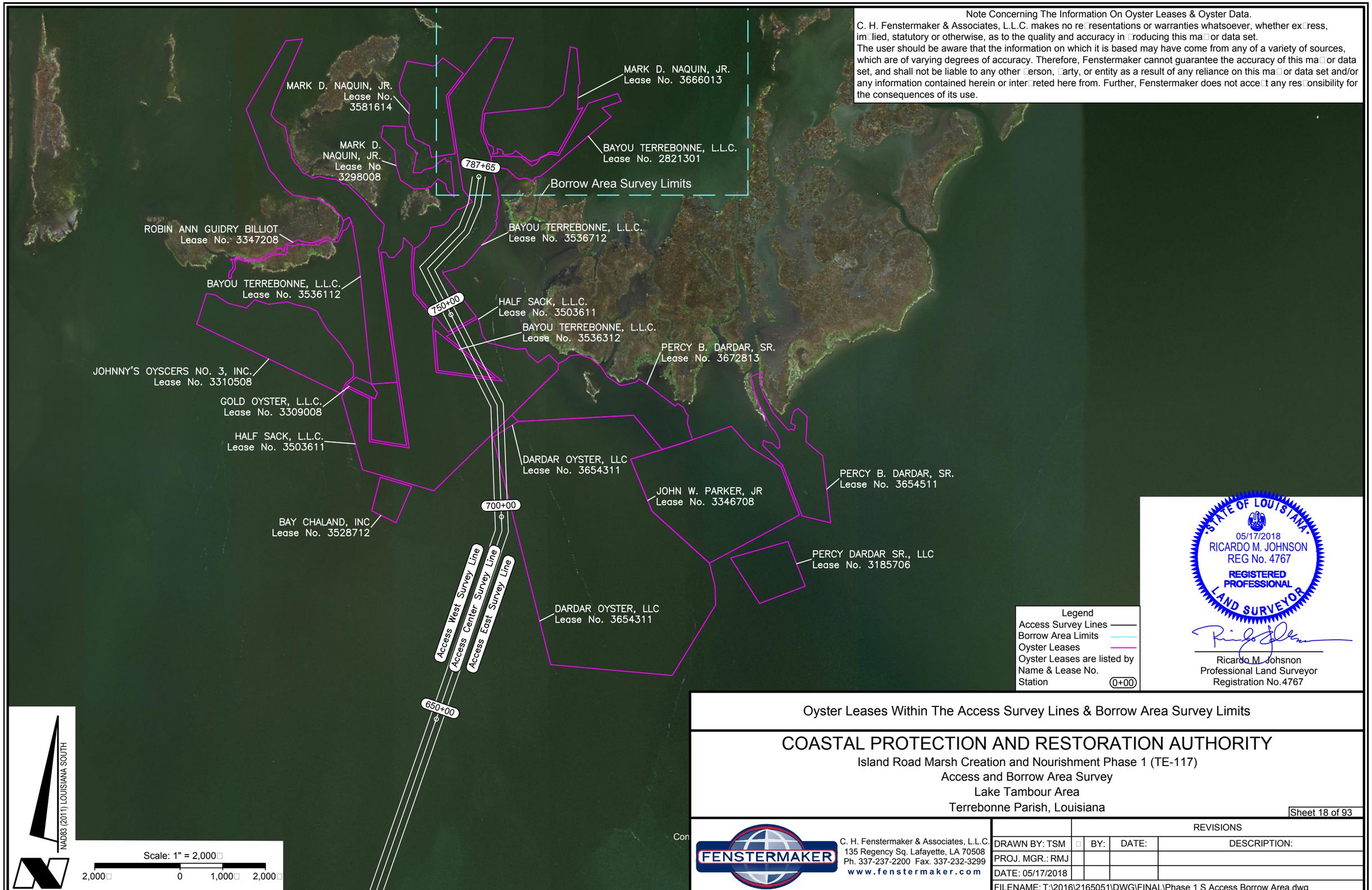

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Legend
Access Survey Lines
Borrow Area Limits
Oyster Leases
Oyster Leases are listed by Name & Lease No.
Station (0+00)

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johsnon
Professional Land Surveyor
Registration No.4767

Oyster Leases Within The Access Survey Lines & Borrow Area Survey Limits

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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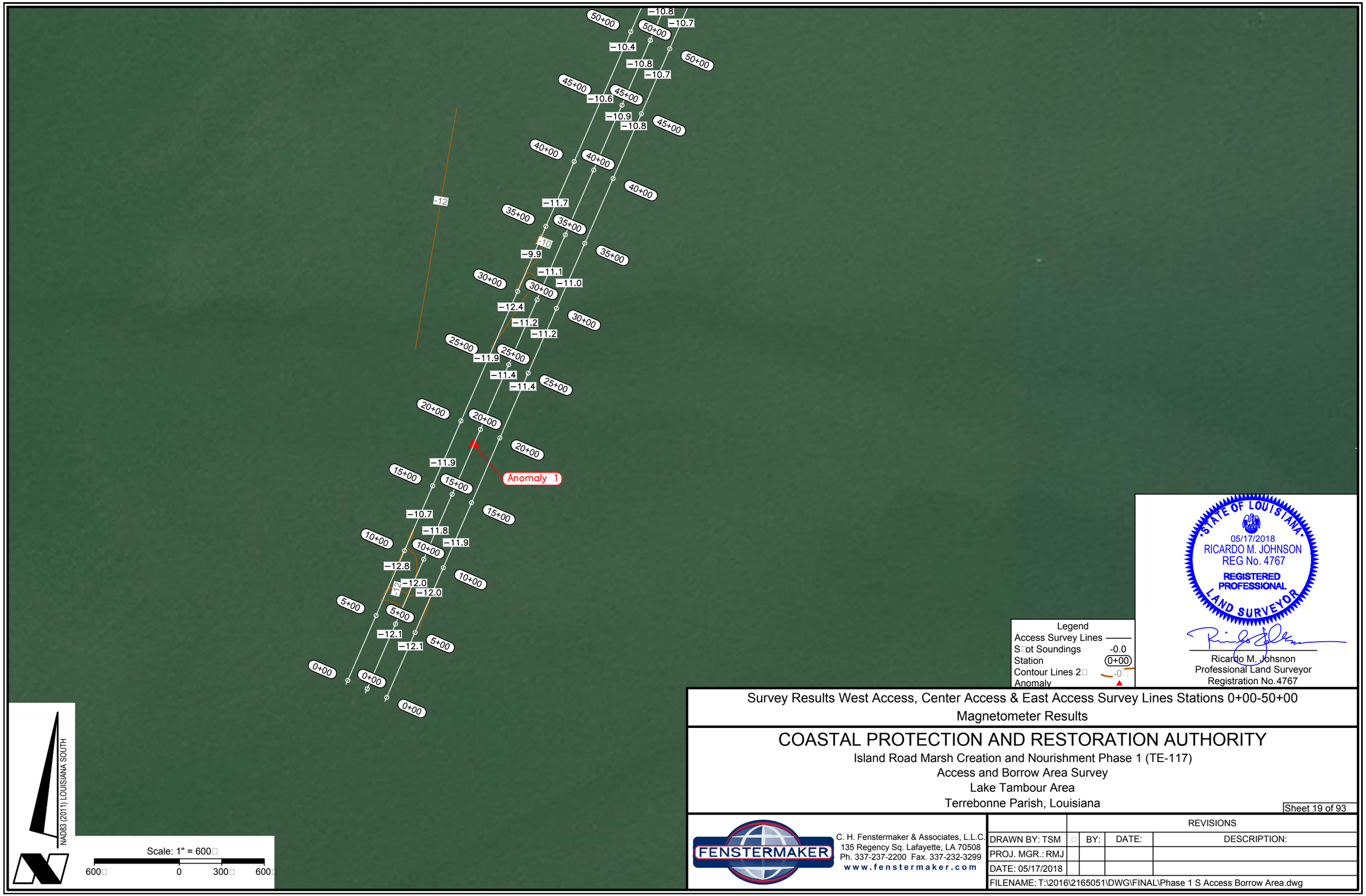

Survey Results West Access, Center Access & East Access Survey Lines Stations 0+00-50+00

Magnetometer Results

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)

Access and Borrow Area Survey

Lake Tambour Area

Terrebonne Parish, Louisiana

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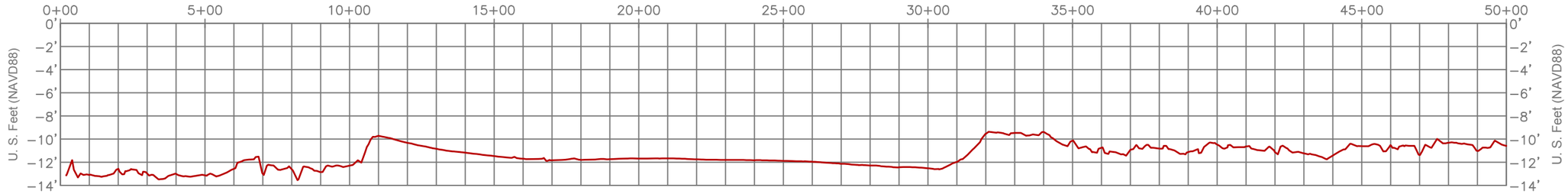
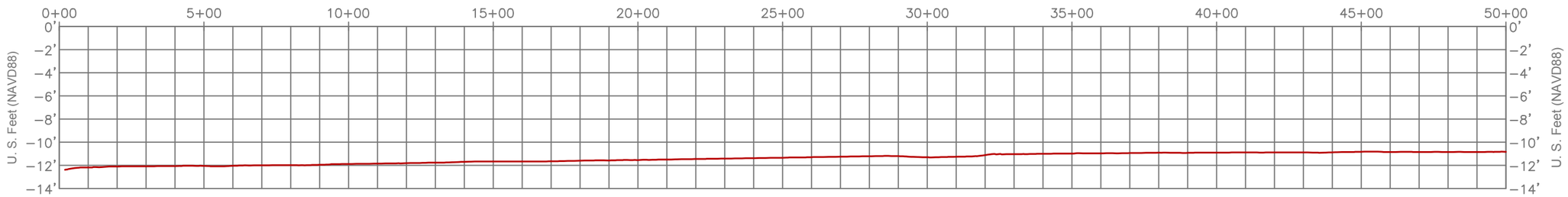
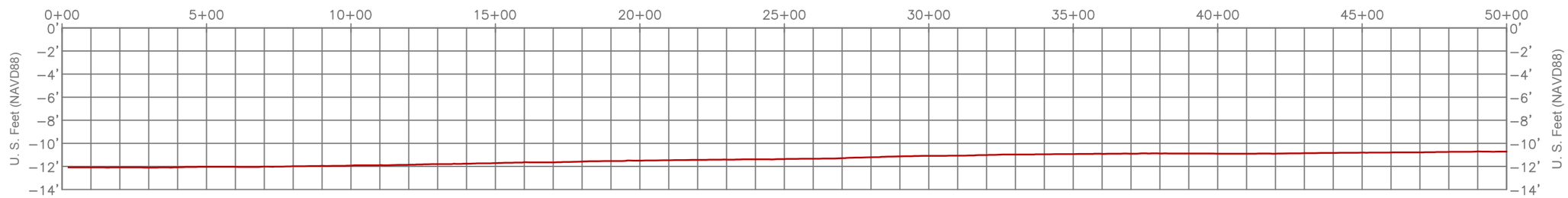
West Access Survey Line Stations 0+00-50+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 0+00-50+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 0+00-50+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Magnetometer Readings

Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 1	222,475	3,528,287	286.2	199.2	Dipole	Nothing Found

Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Survey Results Profiles & Magnetometer Readings for Stations 0+00-50+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
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Terrebonne Parish, Louisiana

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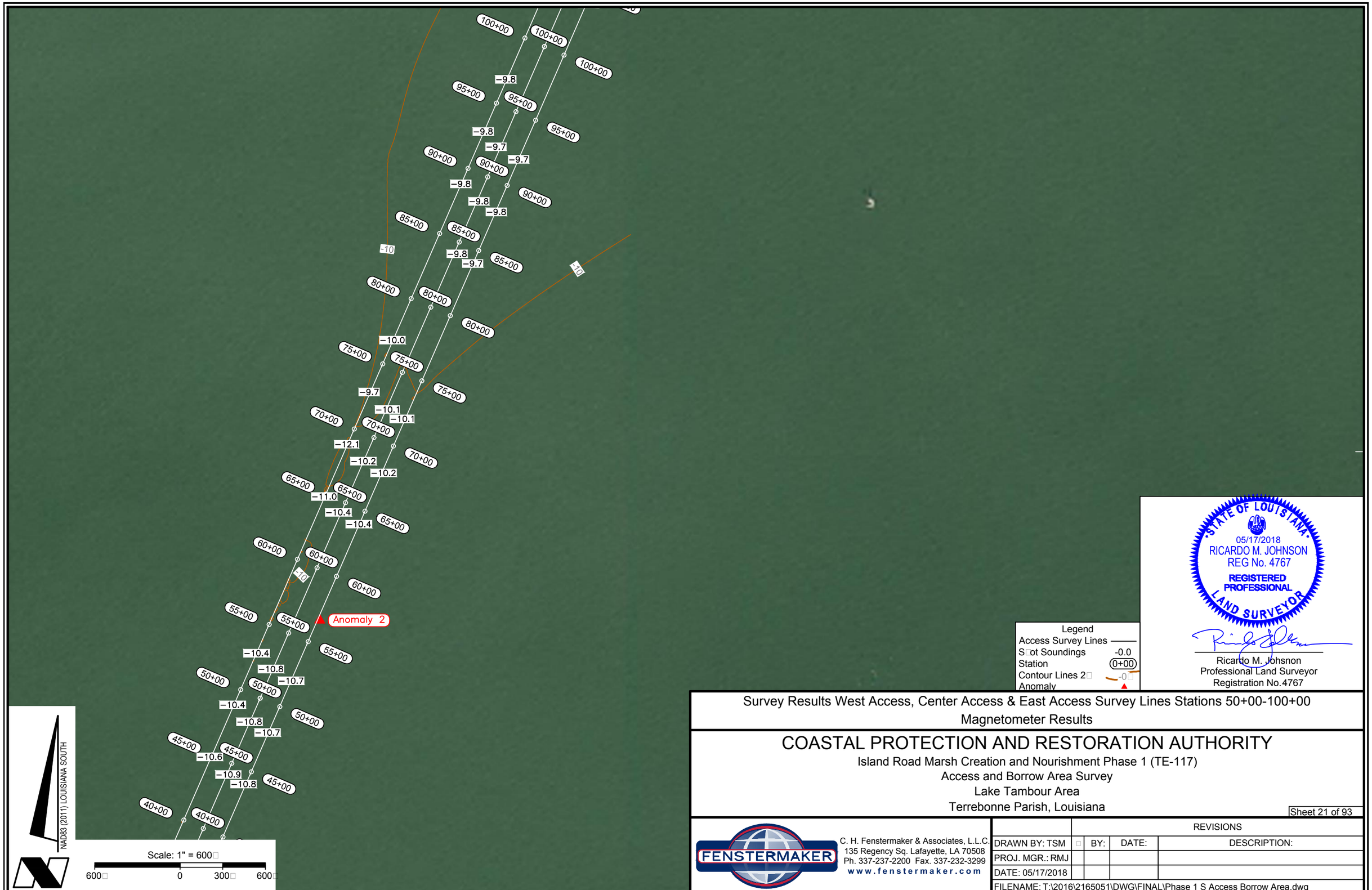

Survey Results West Access, Center Access & East Access Survey Lines Stations 50+00-100+00

Magnetometer Results

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)

Access and Borrow Area Survey

Lake Tambour Area

Terrebonne Parish, Louisiana

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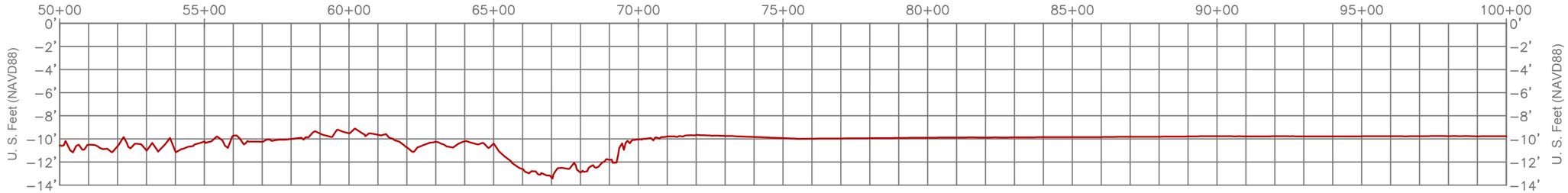
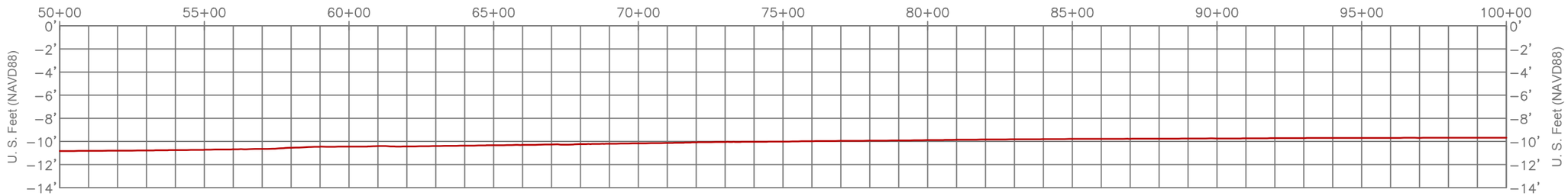
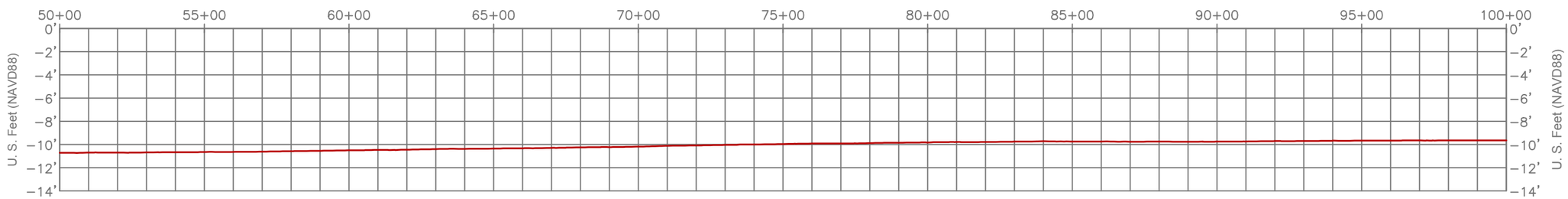
West Access Survey Line Stations 50+00-100+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 50+00-100+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 50+00-100+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Magnetometer Readings						
Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 2	225,879	3,529,953	275.7	133.5	Complex	Nothing Found

Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results Profiles & Magnetometer Readings for Stations 50+00-100+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
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Lake Tambour Area
Terrebonne Parish, Louisiana

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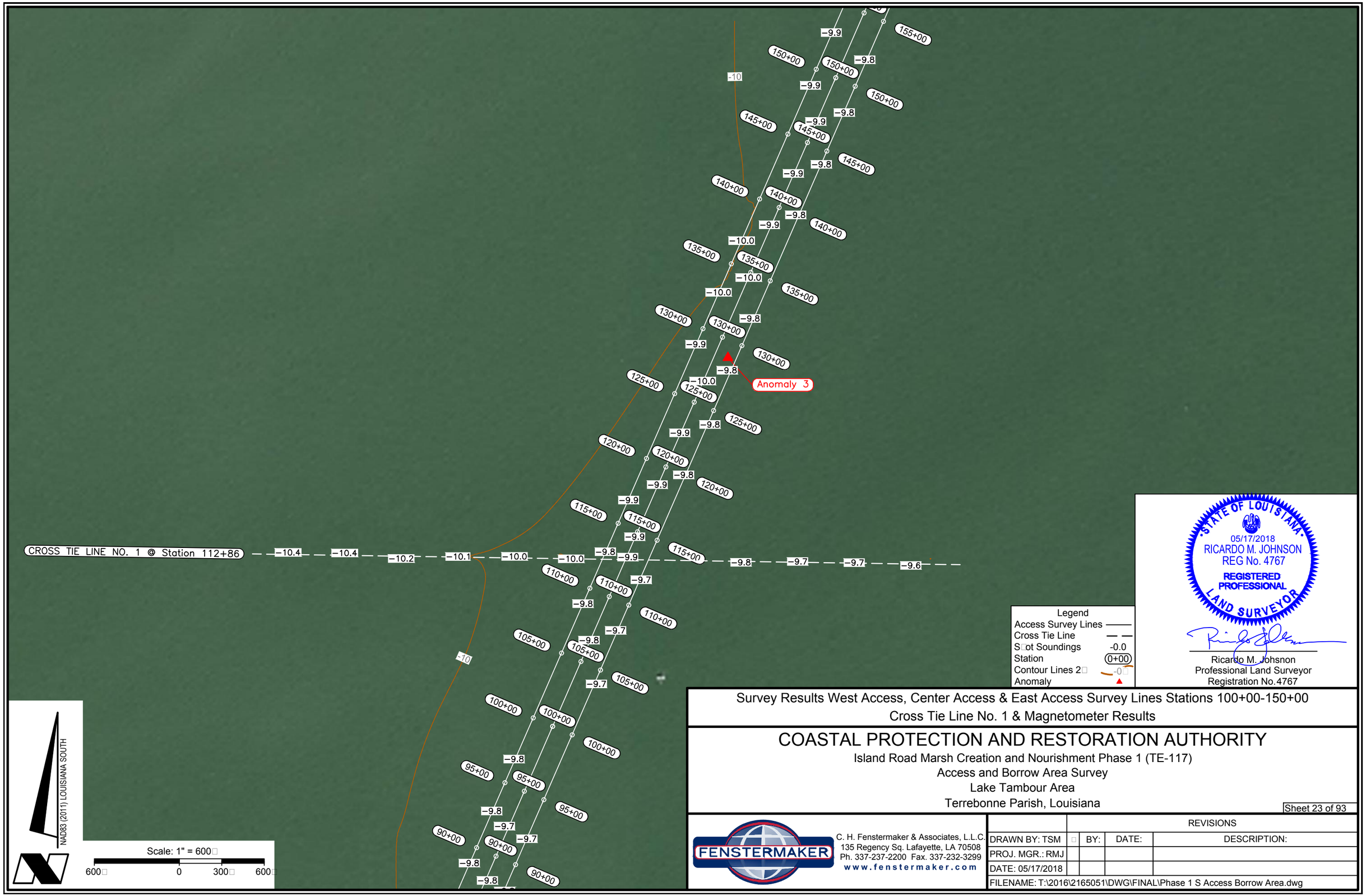

Survey Results West Access, Center Access & East Access Survey Lines Stations 100+00-150+00
Cross Tie Line No. 1 & Magnetometer Results

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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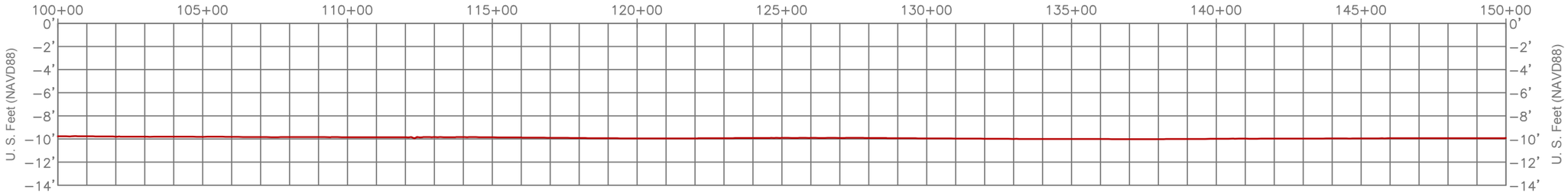
DRAWN BY: TSM		BY:	DATE:	DESCRIPTION:
PROJ. MGR.: RMJ				
DATE: 05/17/2018				

FILENAME: T:\2016\2165051\DWG\FINAL\Phase 1 S Access Borrow Area.dwg

West Access Survey Line Stations 100+00-150+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 100+00-150+00
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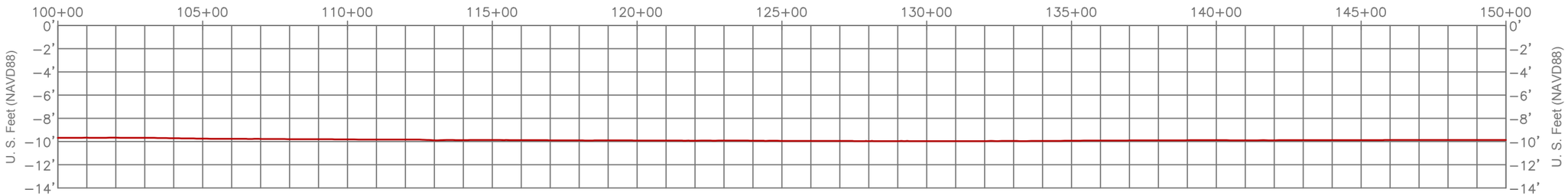
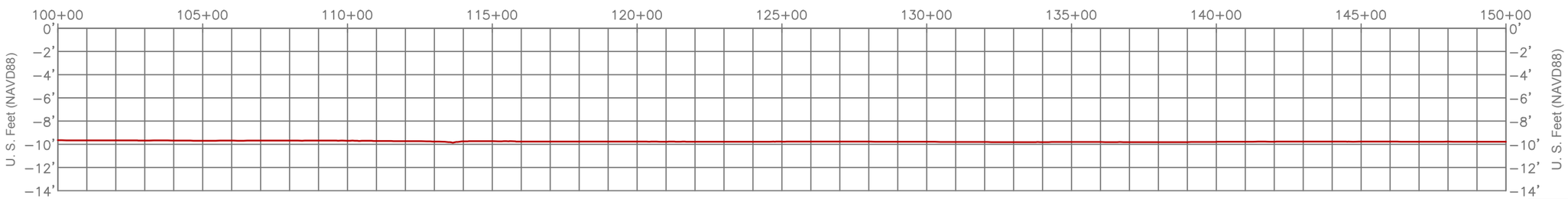
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 100+00-150+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results Profiles for Stations 100+00-150+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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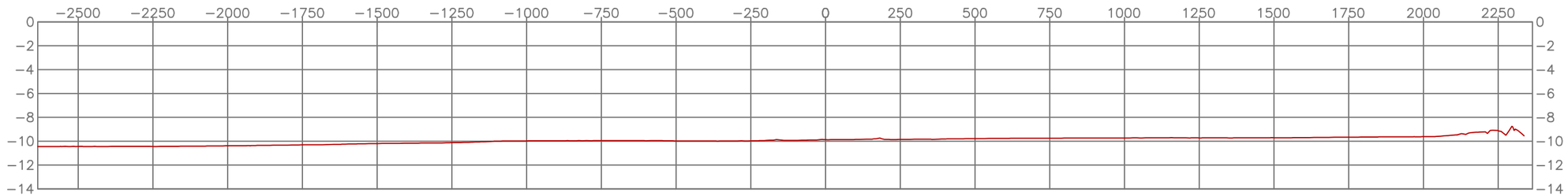
Cross Tie Line No. 1 At Station 112+86
Horizontal Scale 1" = 400
Vertical Scale 1" = 10
←West Distance In U. S. Feet East→



Magnetometer Readings						
Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 3	232,518	3,532,771	195.1	112.9	Dipole	Nothing Found

Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Survey Results Profile for Cross Tie Line No. 1 & Magnetometer Readings for Stations 100+00-150+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
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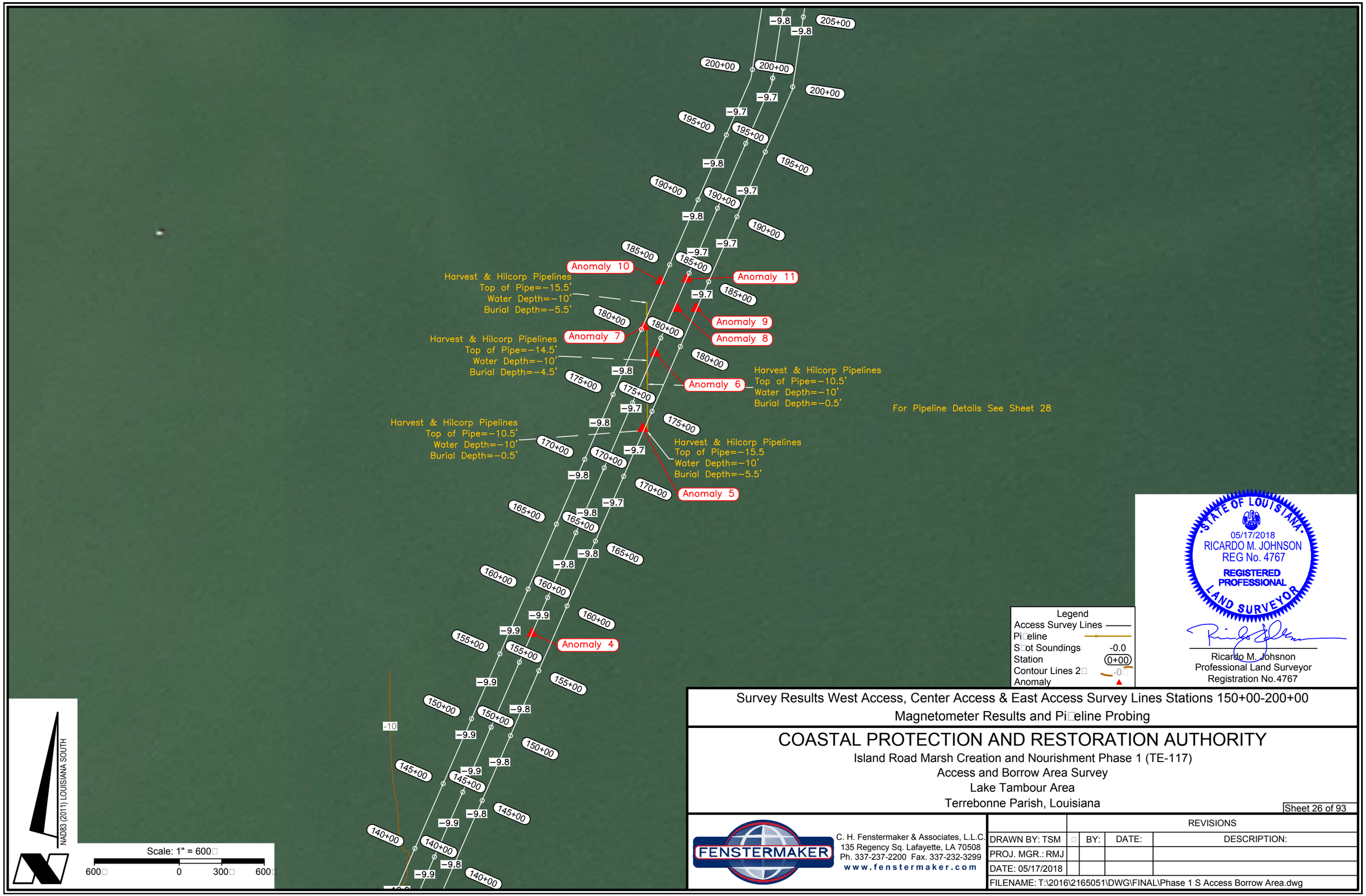

Legend

Access Survey Lines	
Pipeline	
Spot Soundings	-0.0
Station	0+00
Contour Lines 2	-0
Anomaly	

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REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results West Access, Center Access & East Access Survey Lines Stations 150+00-200+00
Magnetometer Results and Pipeline Probing

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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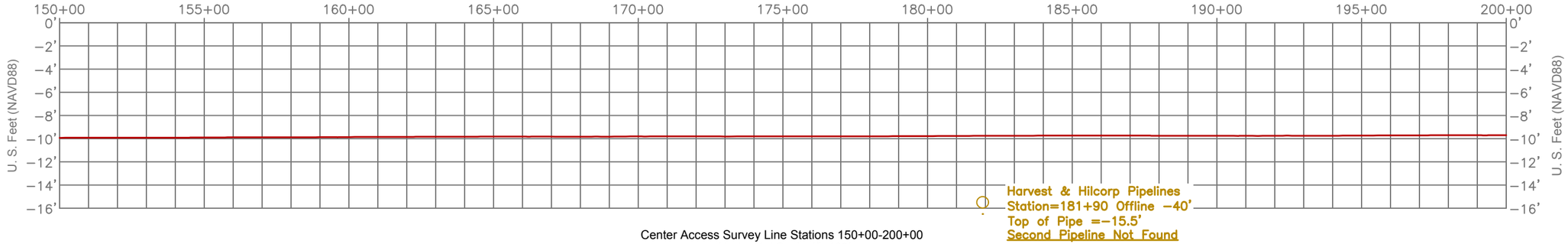
West Access Survey Line Stations 150+00-200+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 150+00-200+00
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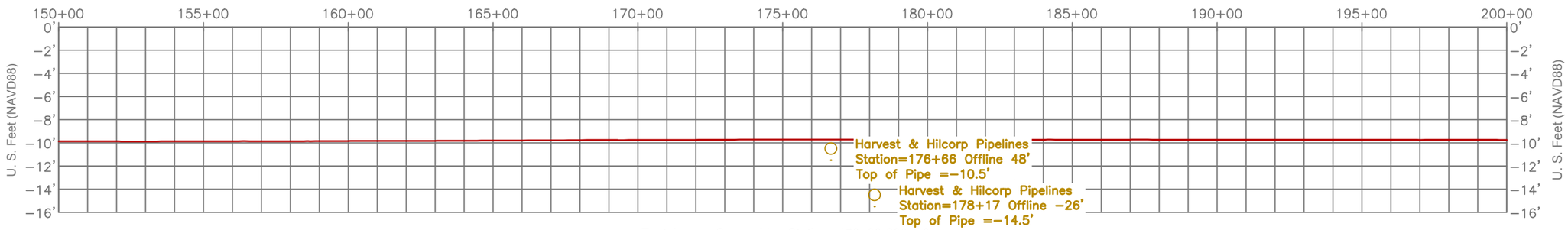
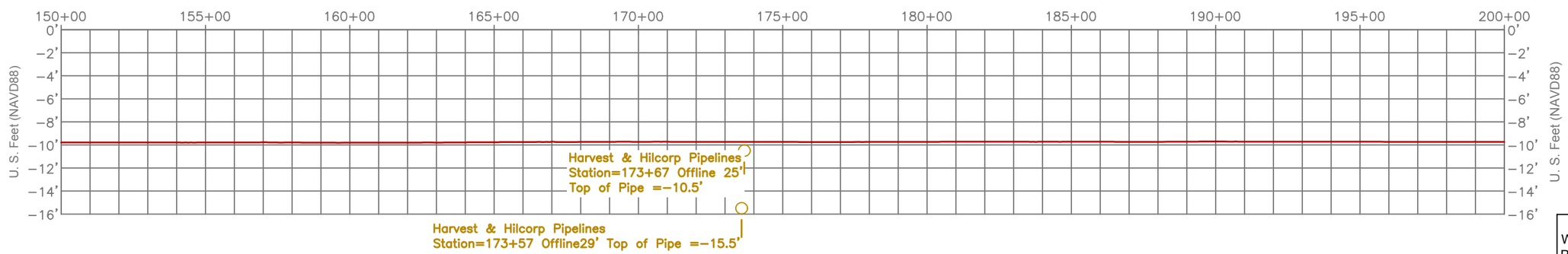
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 150+00-200+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Legend
Water Bottoms
Pi□eline

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results Profiles for Stations 150+00-200+00
Pi□eline Probing Results & Magnetometer Readings Sheet 28

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 27 of 93

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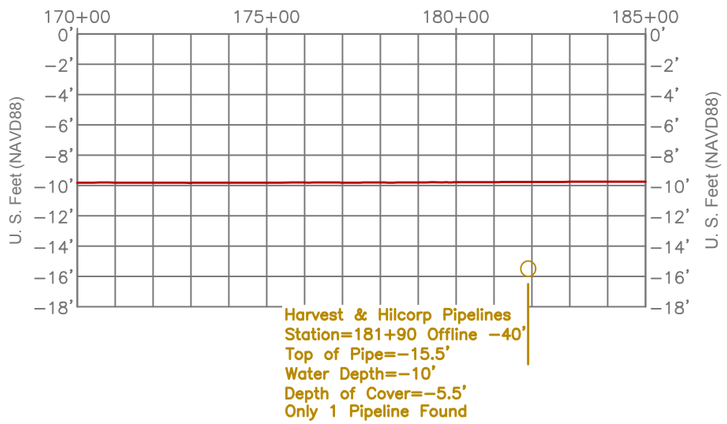
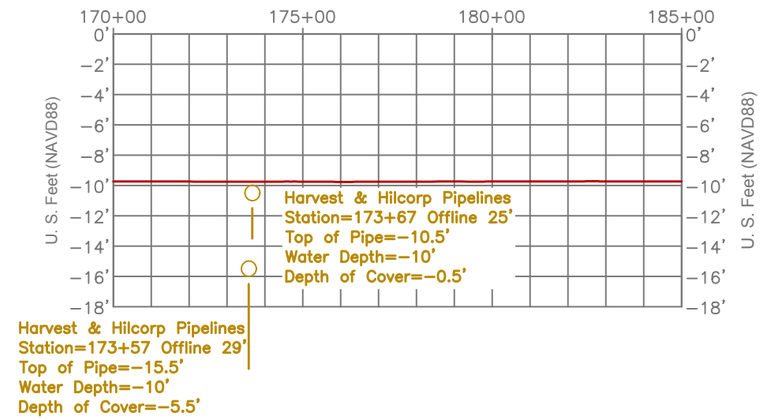
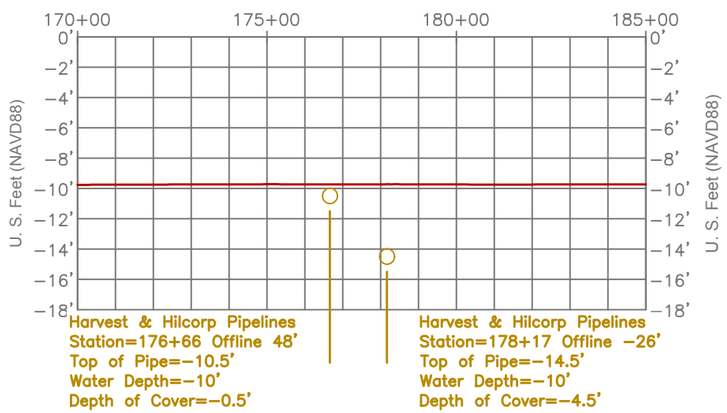
West Access Survey Line Stations 170+00-185+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 170+00-185+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 170+00-185+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Magnetometer Readings						
Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 4	235,160	3,533,822	58.6	45.9	Dipole	Nothing Found
Anomaly 5	236,607	3,534,605	583.8	818.1	Complex	Two Pipelines Found
Anomaly 6	237,140	3,534,692	2001.4	309.1	Dipole	Two Pipelines Found
Anomaly 7	237,327	3,534,612	2419.7	586.2	Complex	Two Pipelines Found
Anomaly 8	237,456	3,534,845	158.9	46.9	Monopole	Two Pipelines Found
Anomaly 9	237,456	3,534,981	721.4	101.7	Monopole	Two Pipelines Found
Anomaly 10	237,651	3,534,728	711.1	281	Dipole	Two Pipelines Found
Anomaly 11	237,663	3,534,915	330.8	71.8	Monopole	Two Pipelines Found

Legend
Water Bottoms
Pipeline

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Pipeline Probing Results Between Stations 175+00-185+00 & Magnetometer Readings

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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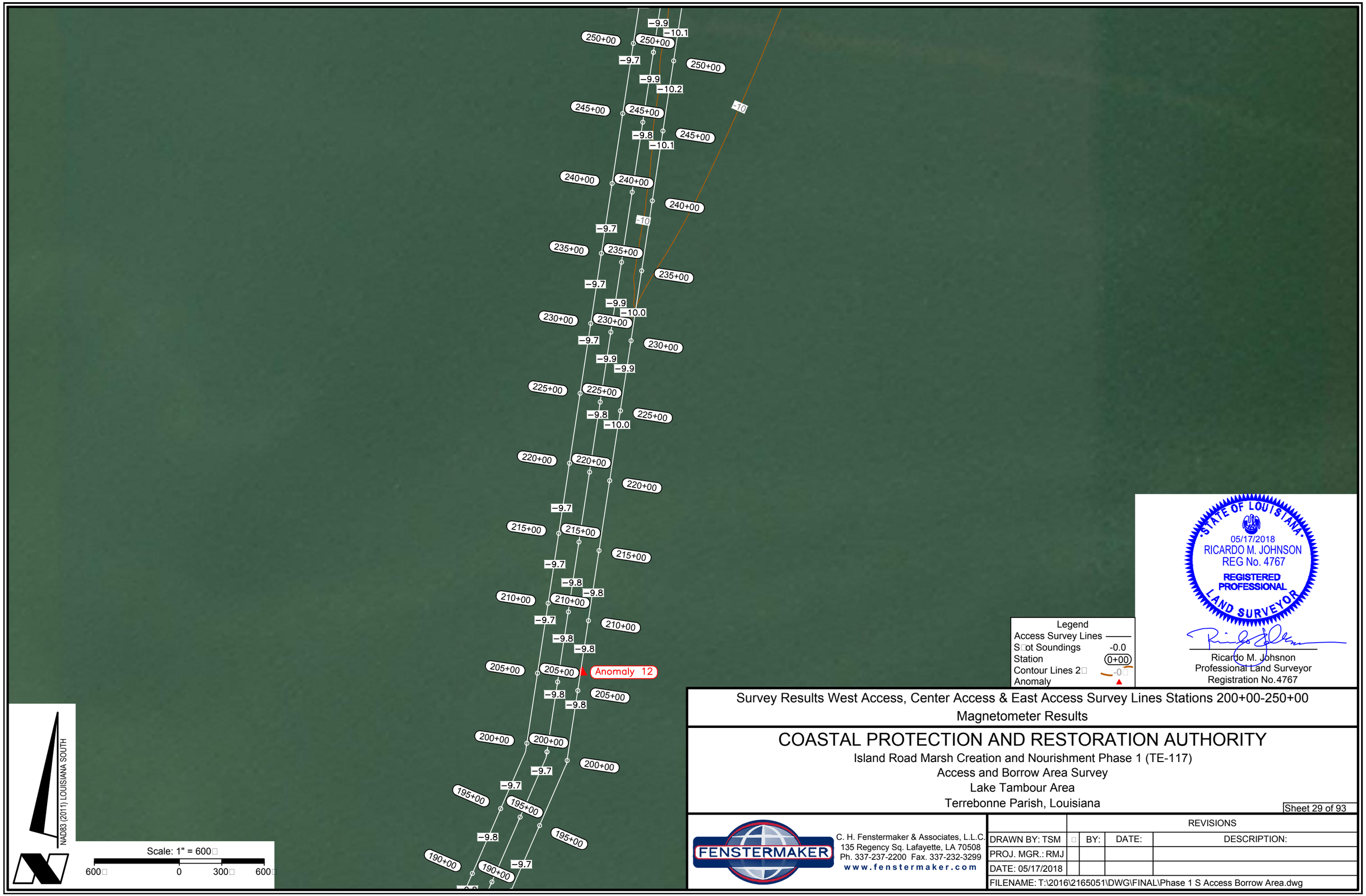

Survey Results West Access, Center Access & East Access Survey Lines Stations 200+00-250+00

Magnetometer Results

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)

Access and Borrow Area Survey

Lake Tambour Area

Terrebonne Parish, Louisiana

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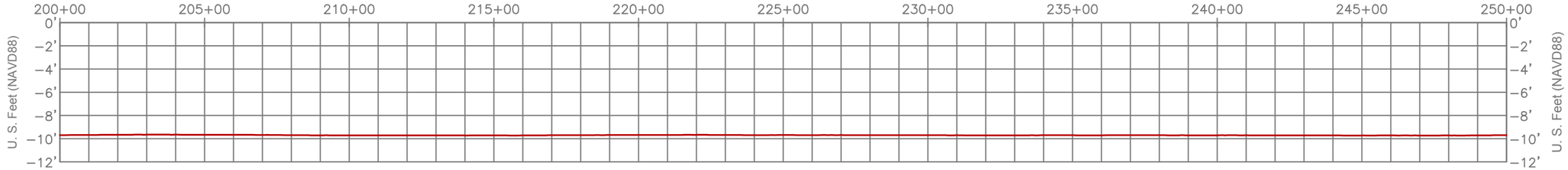
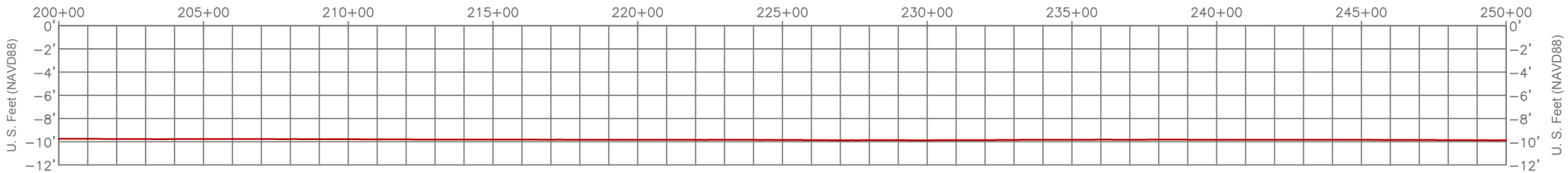
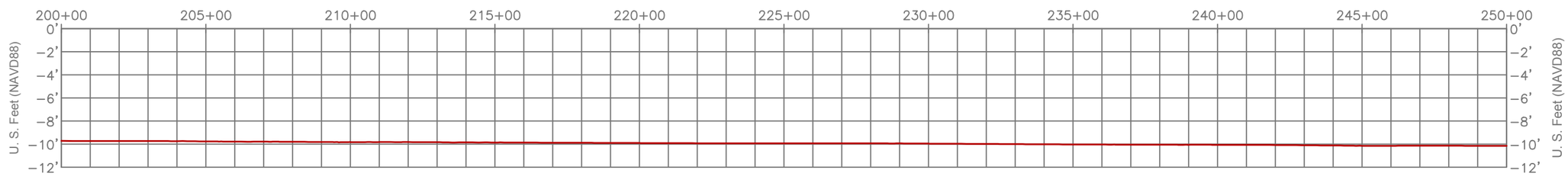
West Access Survey Line Stations 200+00-250+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 200+00-250+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 200+00-250+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Magnetometer Readings						
Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 12	239,645	3,535,768	70.6	83.4	Dipole	Further Investigation

Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results Profiles for Stations 200+00-250+00 & Magnetometer Readings

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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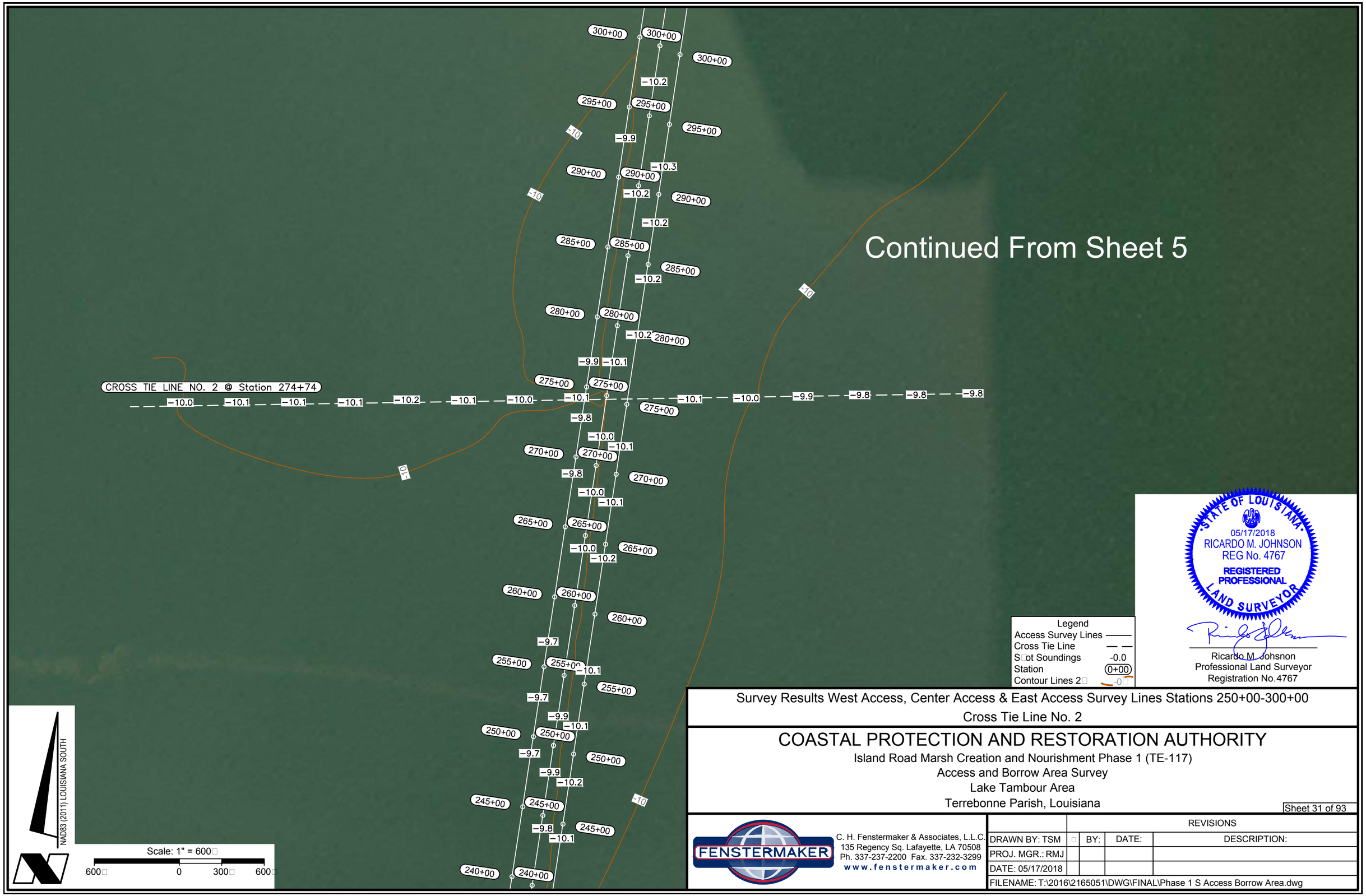

Survey Results West Access, Center Access & East Access Survey Lines Stations 250+00-300+00

Cross Tie Line No. 2

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)

Access and Borrow Area Survey

Lake Tambour Area

Terrebonne Parish, Louisiana

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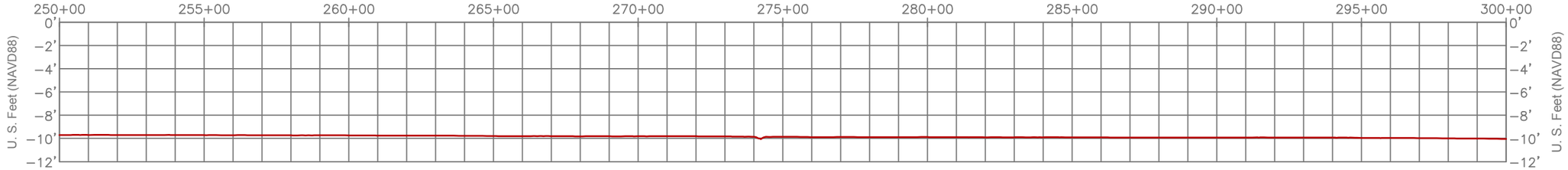
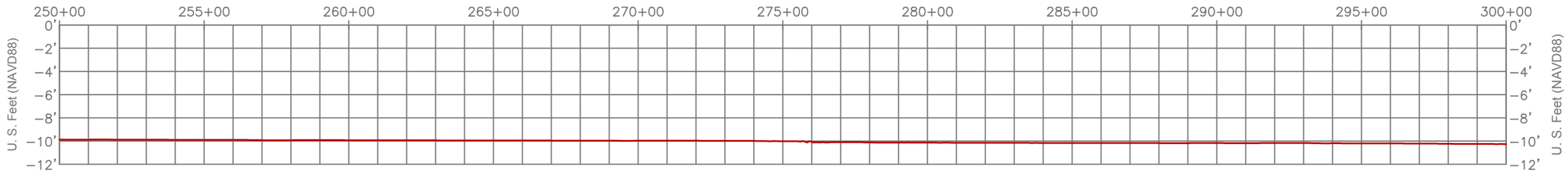
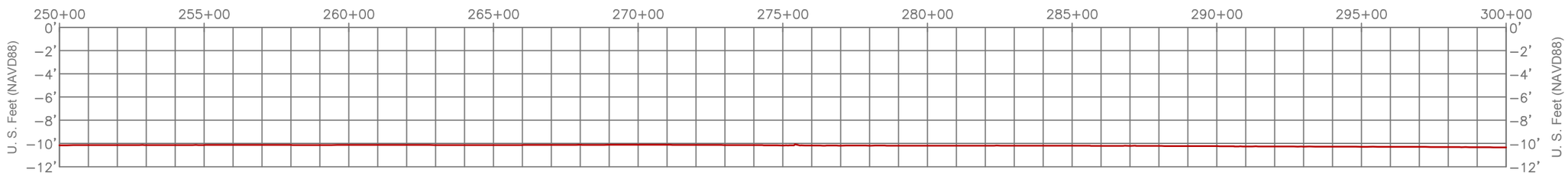
West Access Survey Line Stations 250+00-300+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 250+00-300+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 250+00-300+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
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Survey Results Profiles for Stations 250+00-300+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
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Lake Tambour Area
Terrebonne Parish, Louisiana

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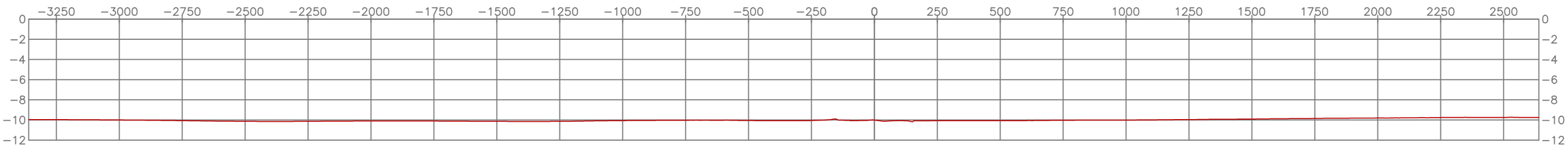
Cross Tie Line No. 2 At Station 274+74
Horizontal Scale 1" = 400
Vertical Scale 1" = 10
←West Distance In U. S. Feet East→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
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Survey Results Profiles for Cross Tie Line No. 2

COASTAL PROTECTION AND RESTORATION AUTHORITY

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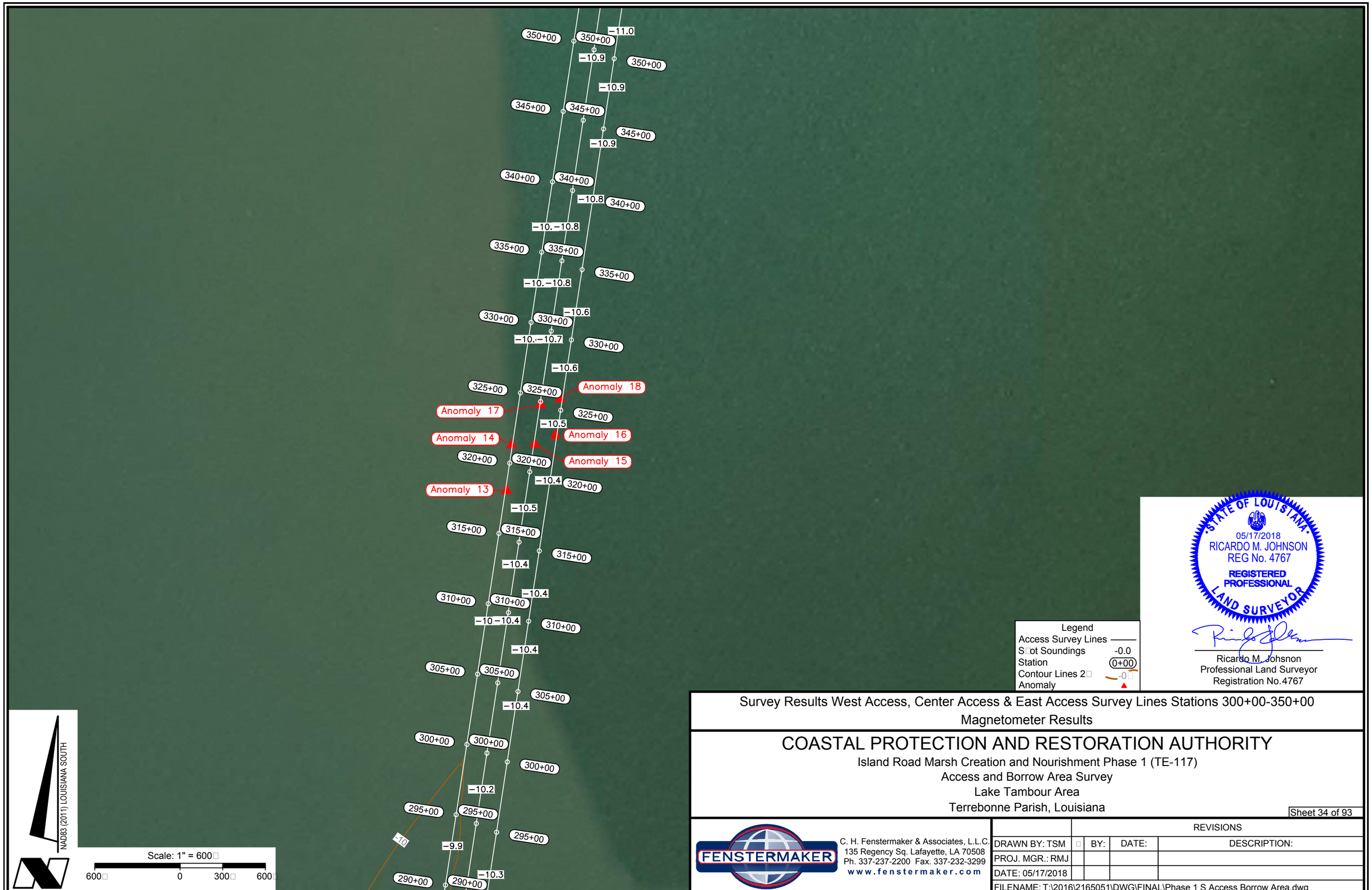

Survey Results West Access, Center Access & East Access Survey Lines Stations 300+00-350+00

Magnetometer Results

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)

Access and Borrow Area Survey

Lake Tambour Area

Terrebonne Parish, Louisiana

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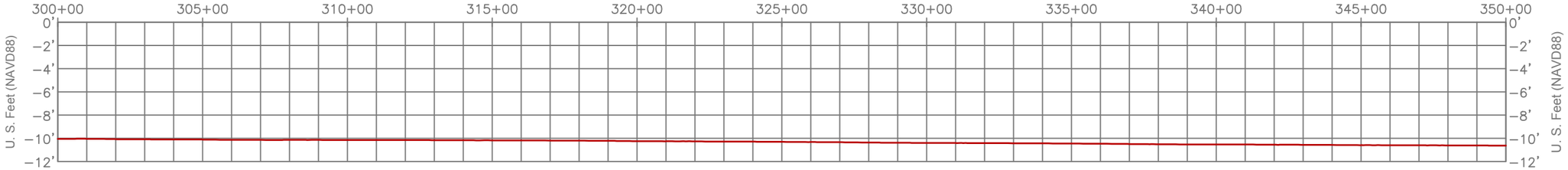
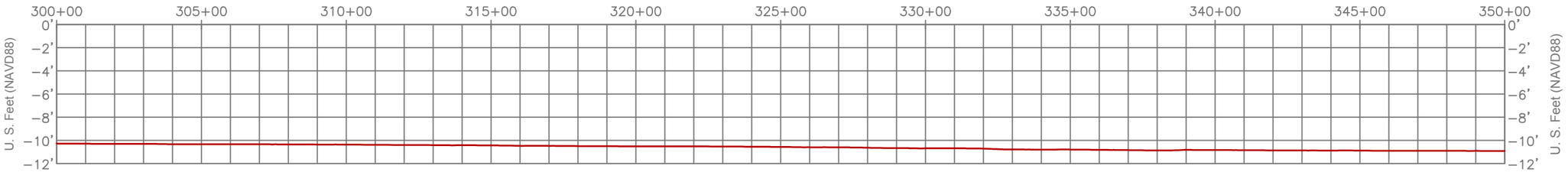
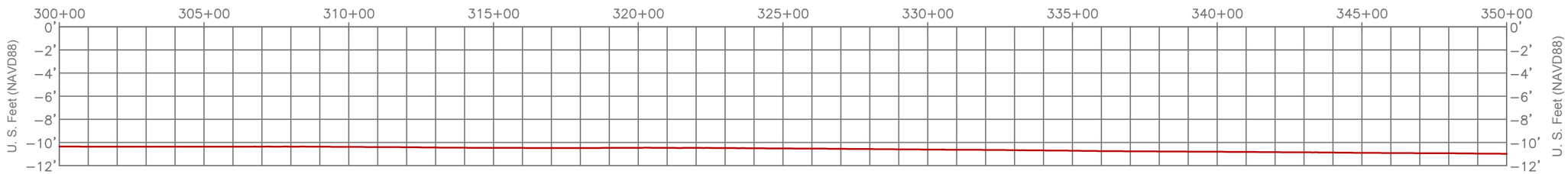
West Access Survey Line Stations 300+00-350+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 300+00-350+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 300+00-350+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Magnetometer Readings						
Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 13	250,814	3,537,161	419.6	381.7	Dipole	Nothing Found
Anomaly 14	251,134	3,537,198	149.4	398.4	Complex	Nothing Found
Anomaly 15	251,140	3,537,360	1333.9	269.3	Complex	Nothing Found

Magnetometer Readings						
Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 16	251,203	3,537,506	242	145.9	Dipole	Nothing Found
Anomaly 17	251,417	3,537,402	504	256.5	Complex	Nothing Found
Anomaly 18	251,458	3,537,539	679.9	615.1	Complex	Nothing Found

Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results Profiles for Stations 300+00-350+00 & Magnetometer Readings

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 35 of 93

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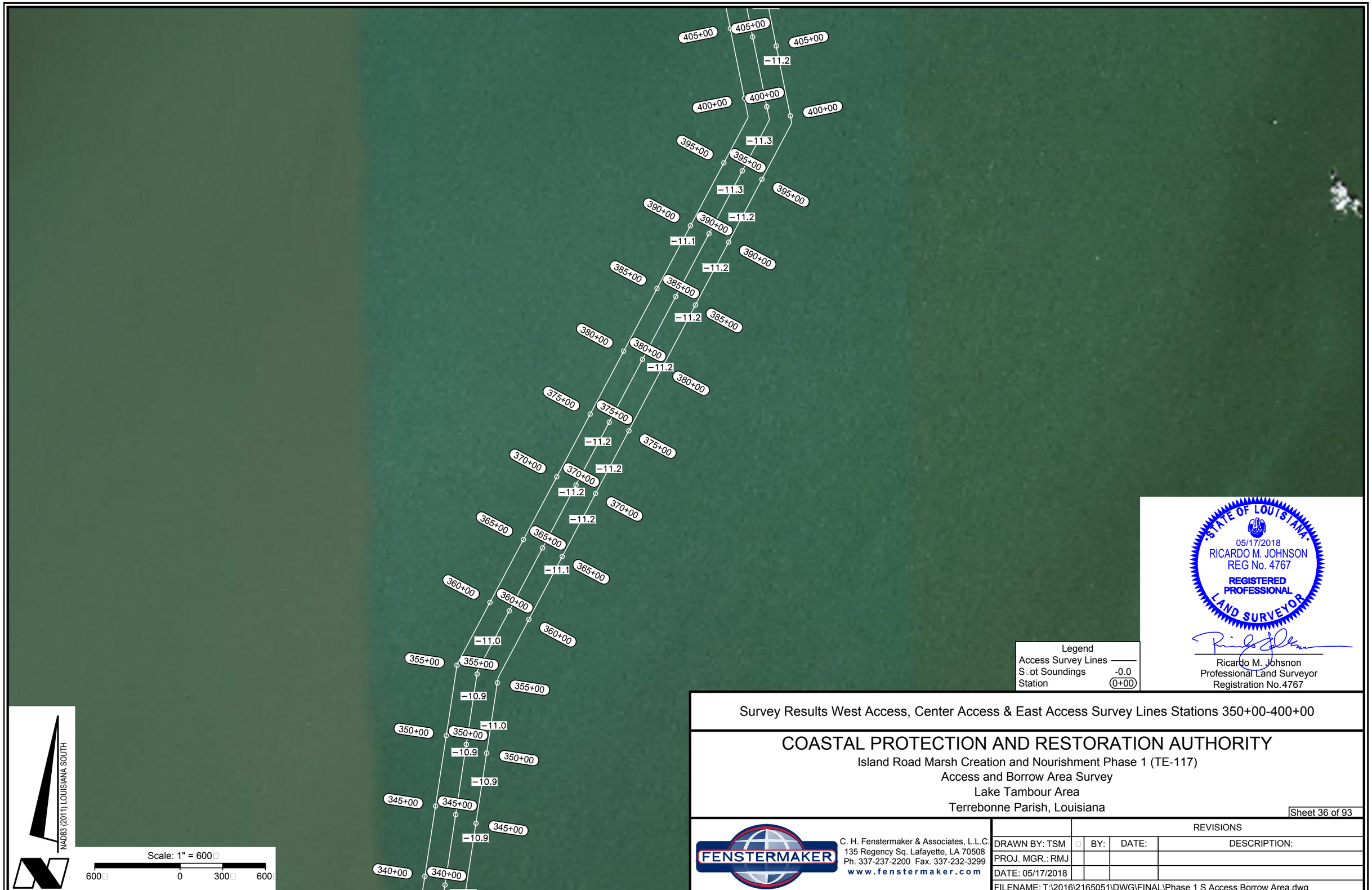
PROJ. MGR.: RMJ			
DATE: 05/17/2018			

FILENAME: T:\2016\2165051\DWG\FINAL\Phase 1 S Access Borrow Area.dwg



Survey Results West Access, Center Access & East Access Survey Lines Stations 350+00-400+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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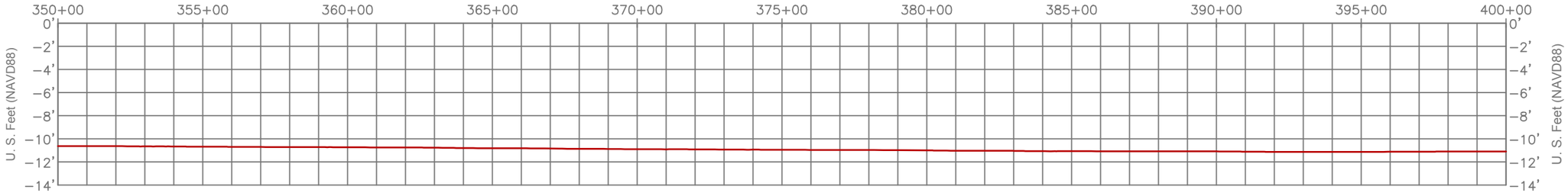
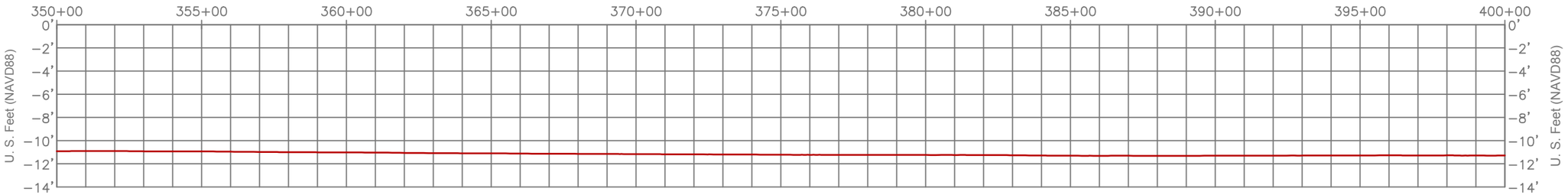
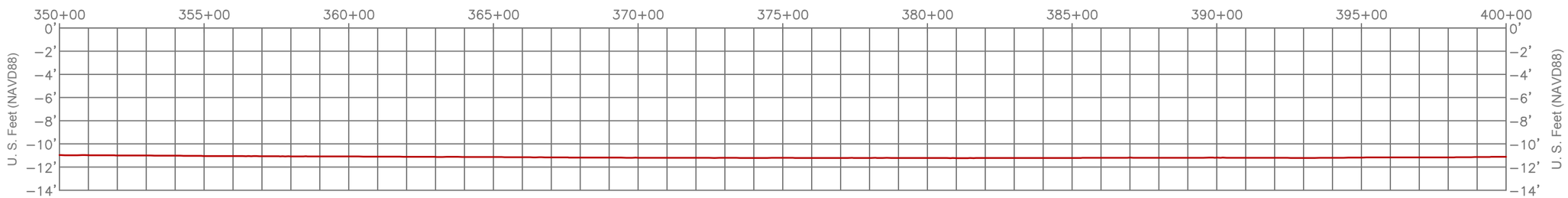
West Access Survey Line Stations 350+00-400+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 350+00-400+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 350+00-400+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
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Professional Land Surveyor
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Survey Results Profiles for Stations 350+00-400+00 & Magnetometer Readings

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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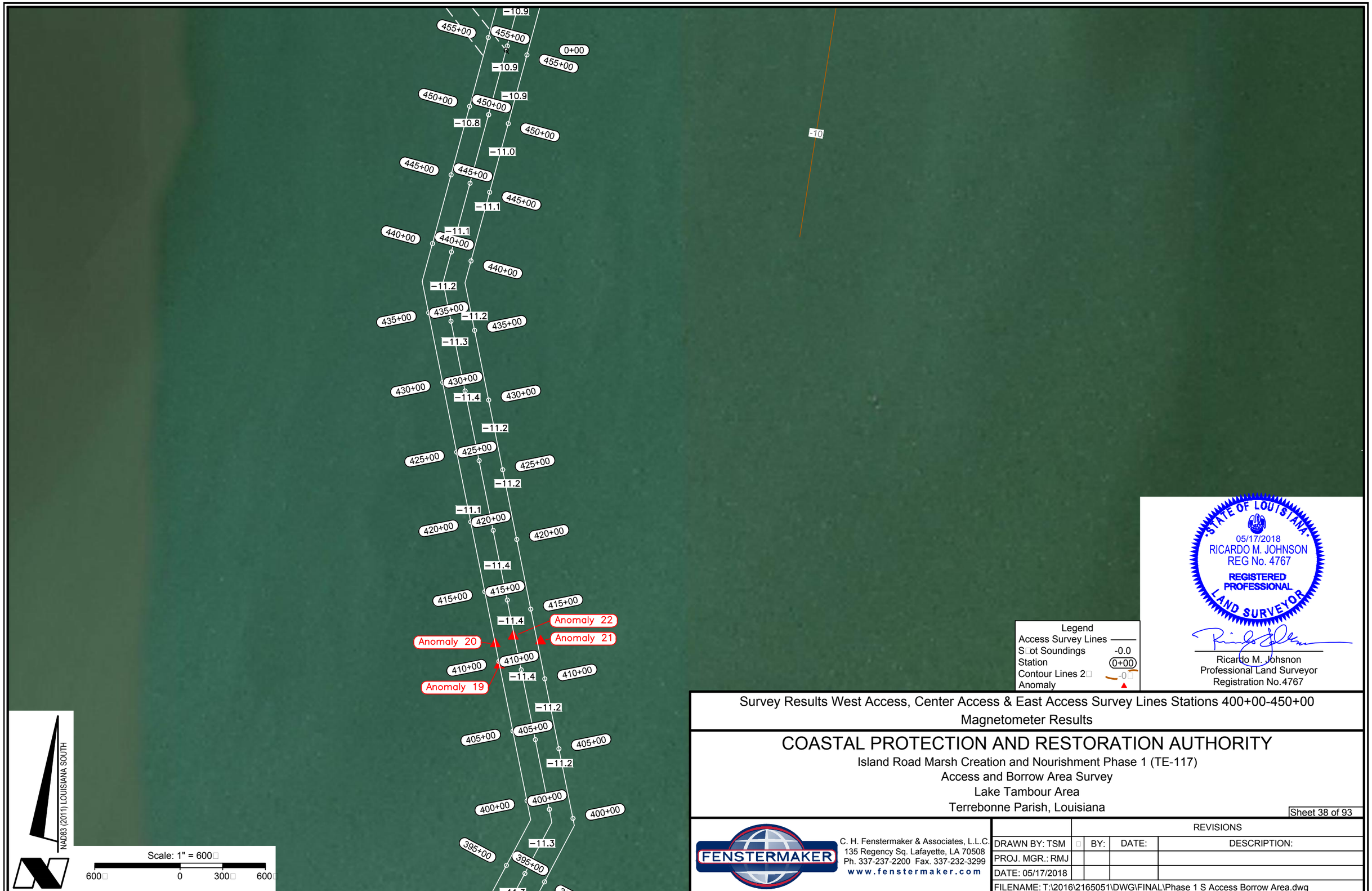

Survey Results West Access, Center Access & East Access Survey Lines Stations 400+00-450+00

Magnetometer Results

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)

Access and Borrow Area Survey

Lake Tambour Area

Terrebonne Parish, Louisiana

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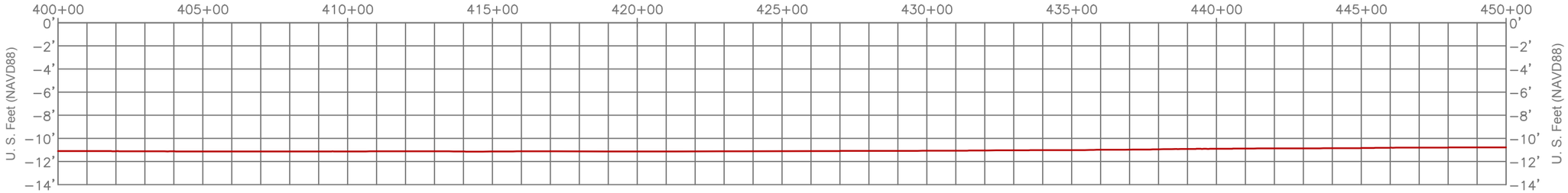
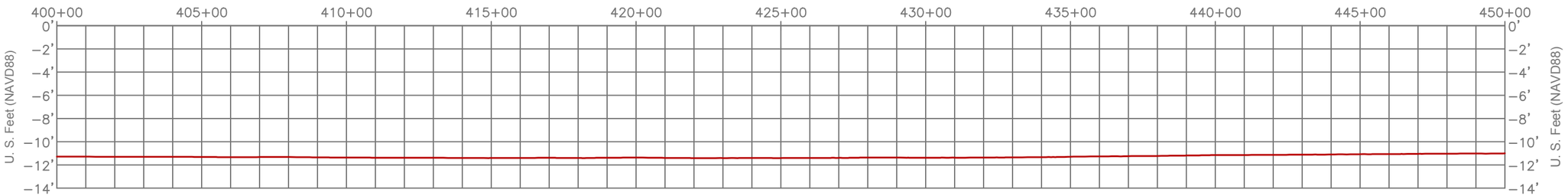
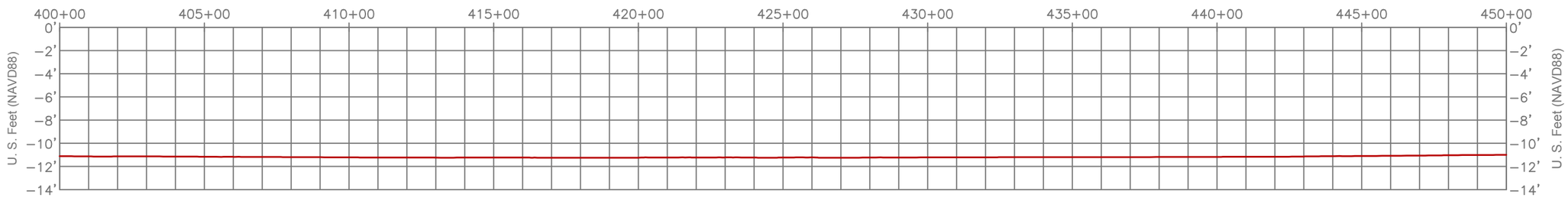
West Access Survey Line Stations 400+00-450+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 400+00-450+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 400+00-450+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Magnetometer Readings

Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 19	259,407	3,539,538	534.7	227.1	Dipole	Further Investigation
Anomaly 20	259,556	3,539,509	510.2	259.4	Dipole	Further Investigation

Magnetometer Readings

Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 21	259,577	3,539,828	349.1	519.2	Dipole	Further Investigation
Anomaly 22	259,610	3,539,636	428.6	142.5	Dipole	Further Investigation

Legend
Water Bottoms

STATE OF LOUISIANA
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Survey Results Profiles for Stations 400+00-450+00 & Magnetometer Readings

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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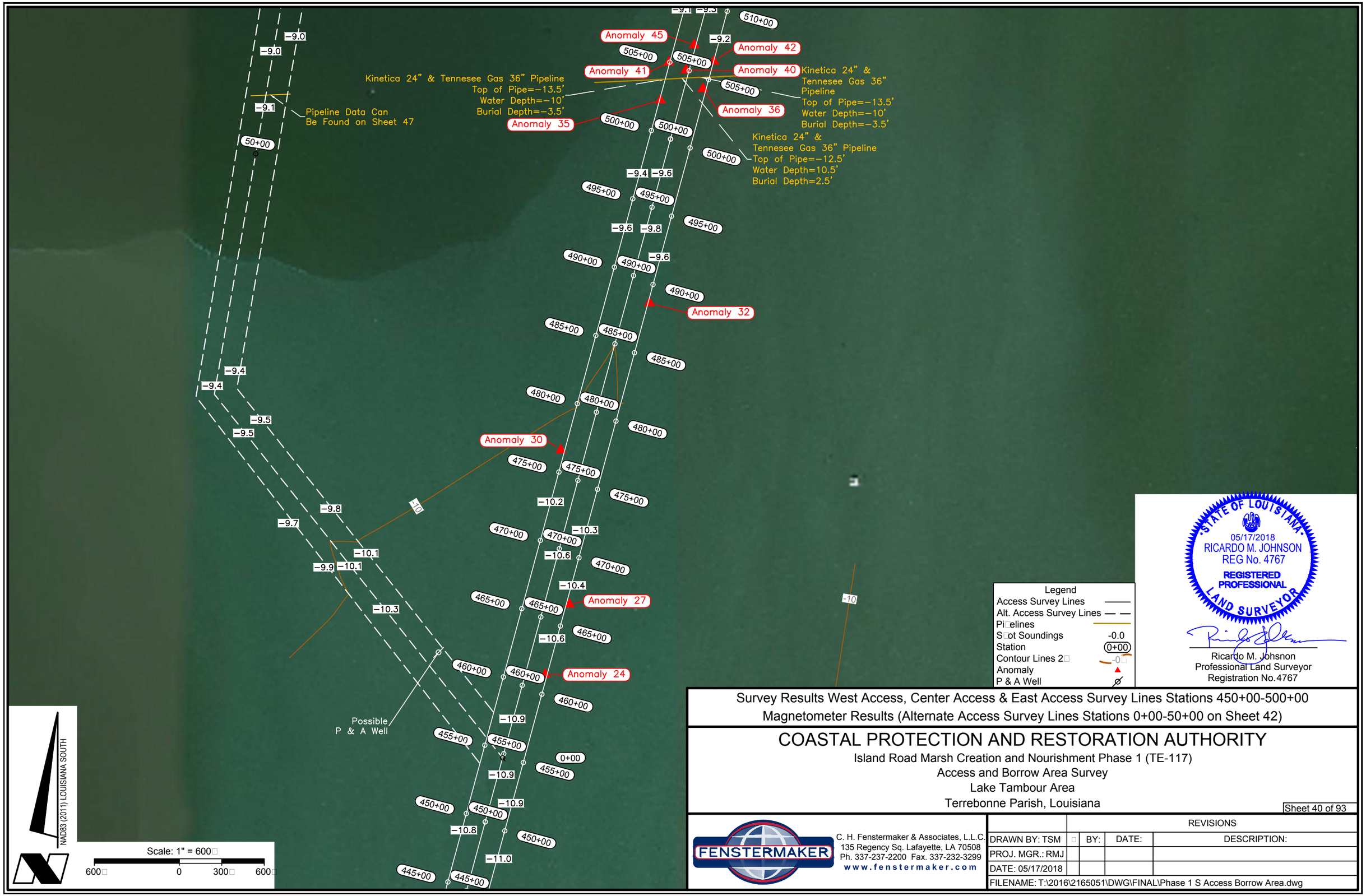

Survey Results West Access, Center Access & East Access Survey Lines Stations 450+00-500+00
Magnetometer Results (Alternate Access Survey Lines Stations 0+00-50+00 on Sheet 42)

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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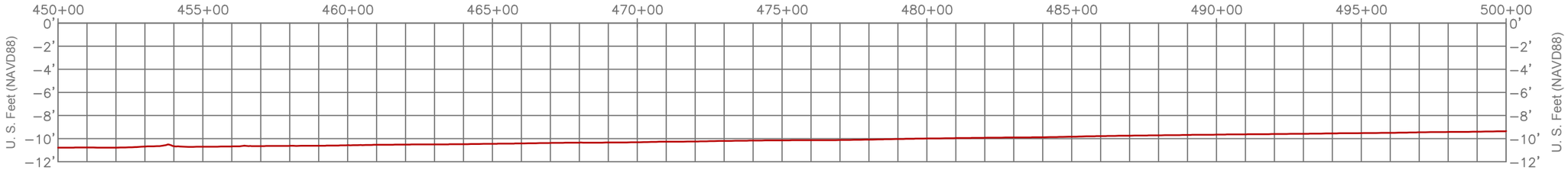
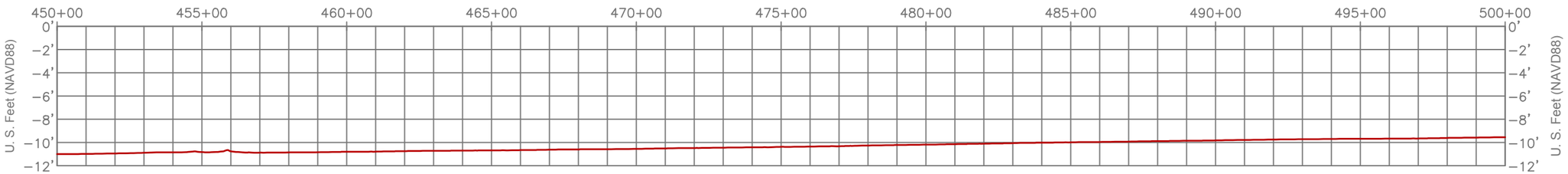
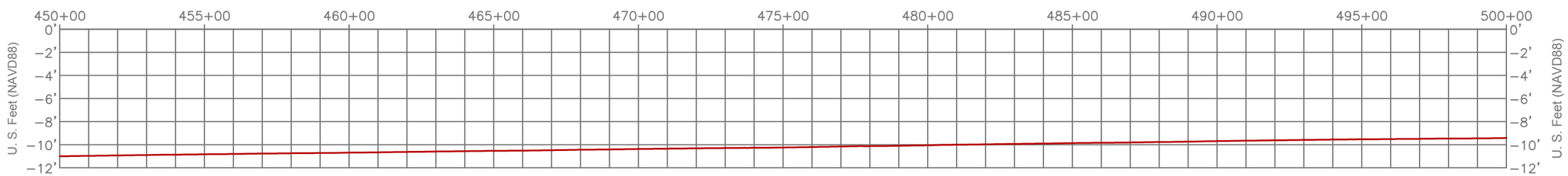
West Access Survey Line Stations 450+00-500+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 450+00-500+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 450+00-500+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Magnetometer Readings						
Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 24	264,320	3,539,886	126.9	137.8	Dipole	Nothing Found
Anomaly 27	264,814	3,540,058	167.2	196.2	Monopole	Nothing Found

Magnetometer Readings						
Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 30	265,905	3,539,997	127.5	305.1	Dipole	Nothing Found
Anomaly 32	266,943	3,540,623	446.1	74.8	Dipole	Nothing Found

Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
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Survey Results Profiles for Stations 450+00-500+00 & Magnetometer Readings

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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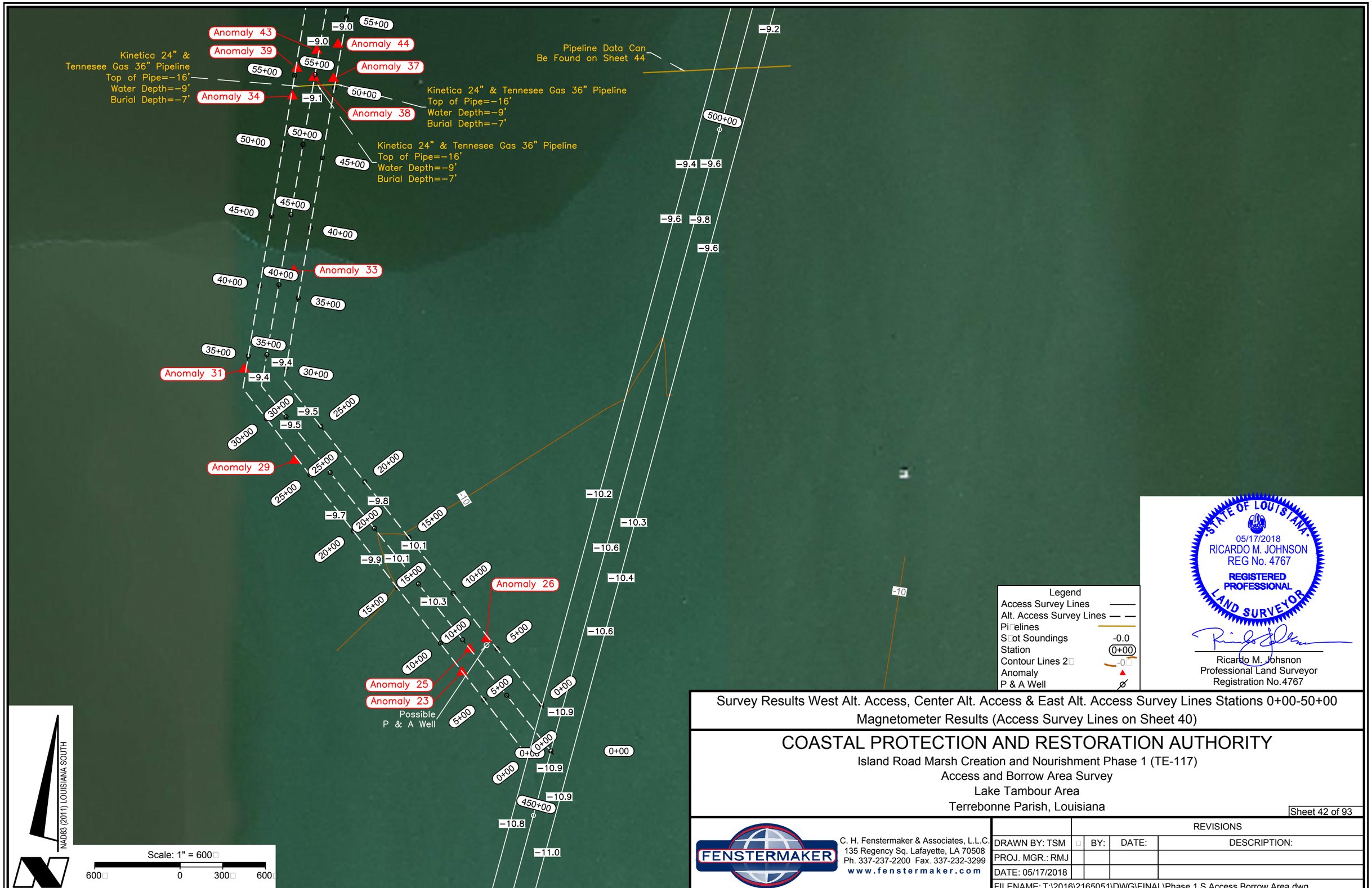

Survey Results West Alt. Access, Center Alt. Access & East Alt. Access Survey Lines Stations 0+00-50+00
Magnetometer Results (Access Survey Lines on Sheet 40)

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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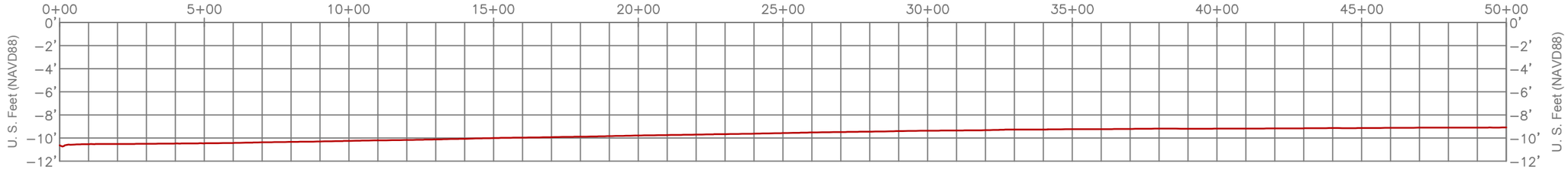
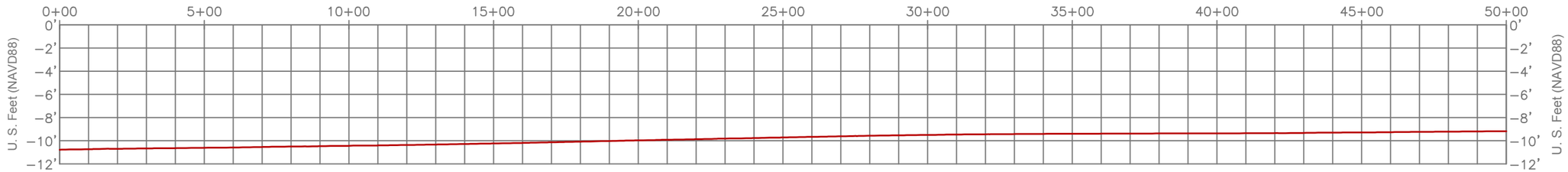
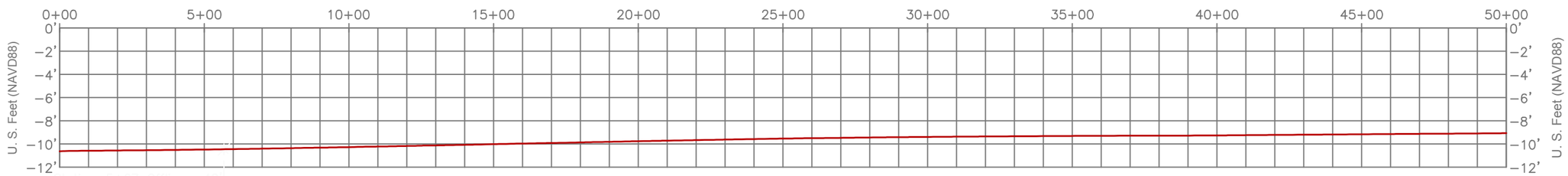
Alt West Access Survey Line Stations 0+00-50+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Alt Center Access Survey Line Stations 0+00-50+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Alt East Access Survey Lines Stations 0+00-50+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Magnetometer Readings						
Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 23	264,284	3,538,961	306.6	235.7	Dipole	Possible P & A Well
Anomaly 25	264,447	3,539,015	2009.9	336.1	Complex	Possible P & A Well
Anomaly 26	264,520	3,539,133	7426.9	317.5	Dipole	Possible P & A Well

Magnetometer Readings						
Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 29	265,774	3,537,783	2929.8	332.5	Dipole	Nothing Found
Anomaly 31	266,416	3,537,429	691	120.5	Dipole	Nothing Found
Anomaly 33	267,109	3,537,778	234.8	136.3	Dipole	Nothing Found

Legend
Water Bottoms
P & A Well

STATE OF LOUISIANA
05/17/2018
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COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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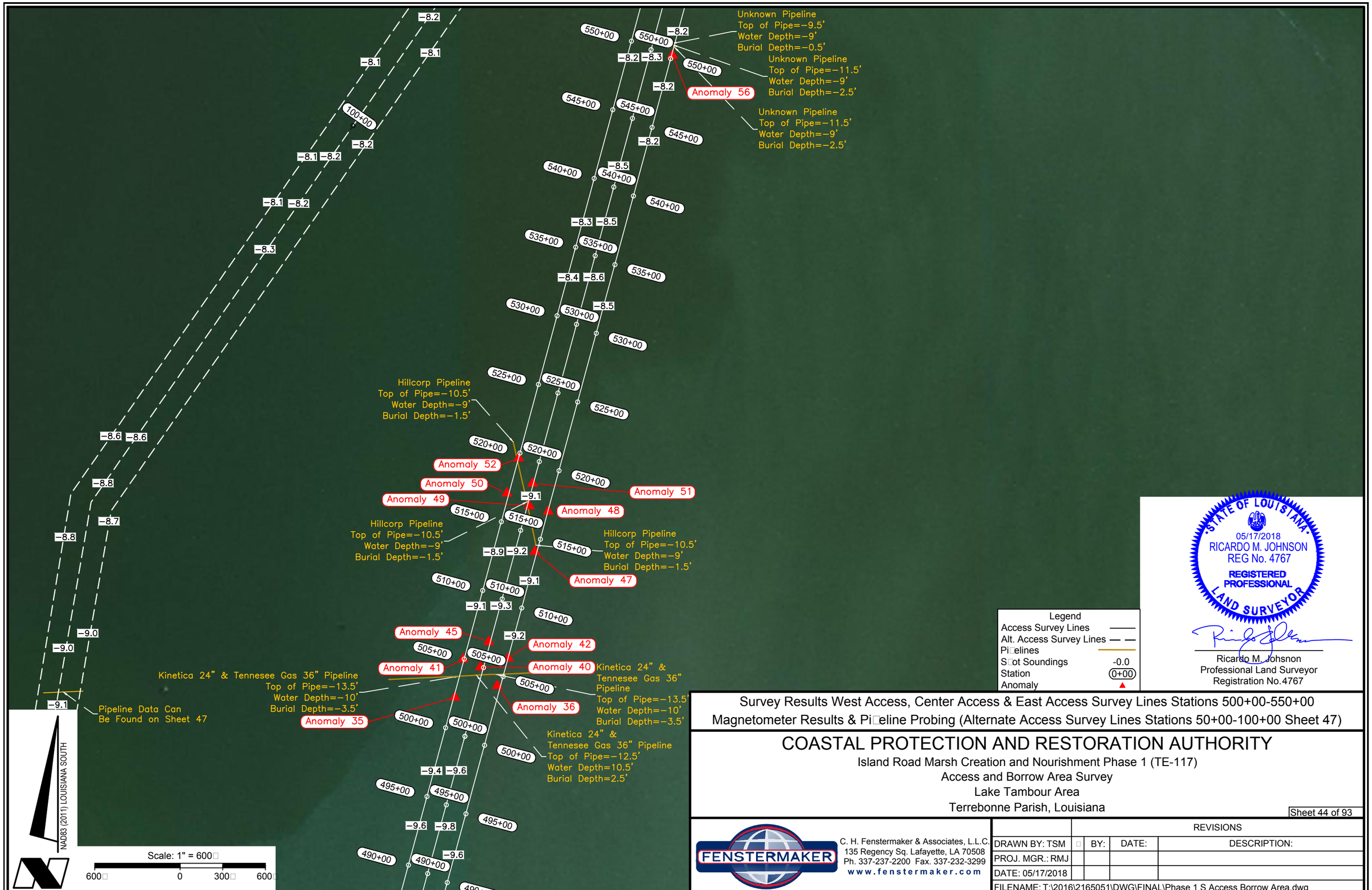

Survey Results West Access, Center Access & East Access Survey Lines Stations 500+00-550+00
Magnetometer Results & Pipeline Probing (Alternate Access Survey Lines Stations 50+00-100+00 Sheet 47)

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 44 of 93

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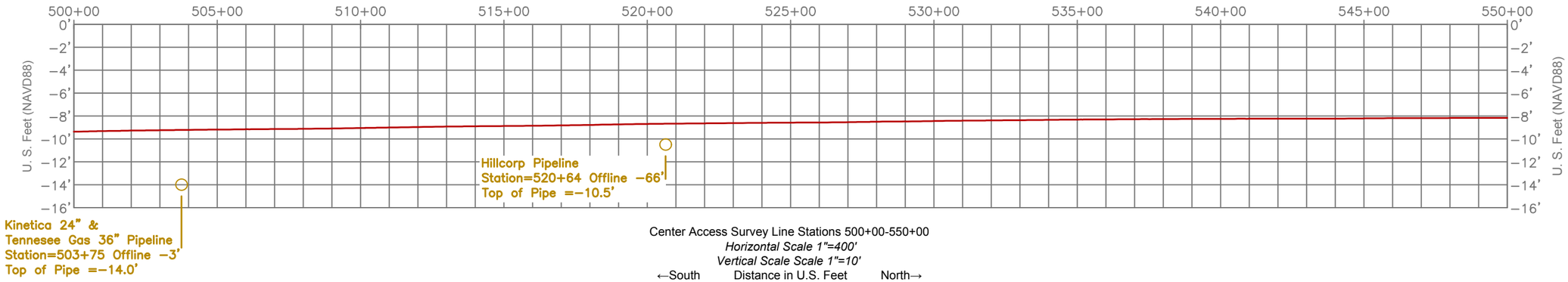
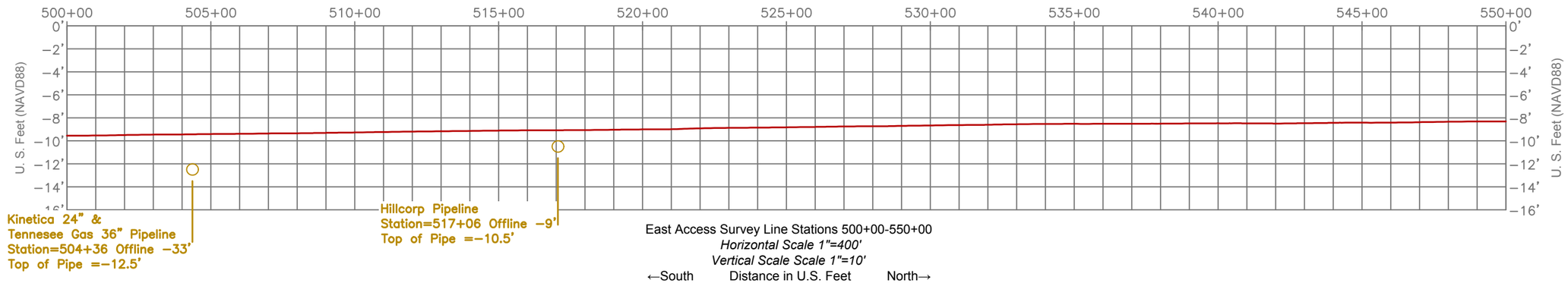
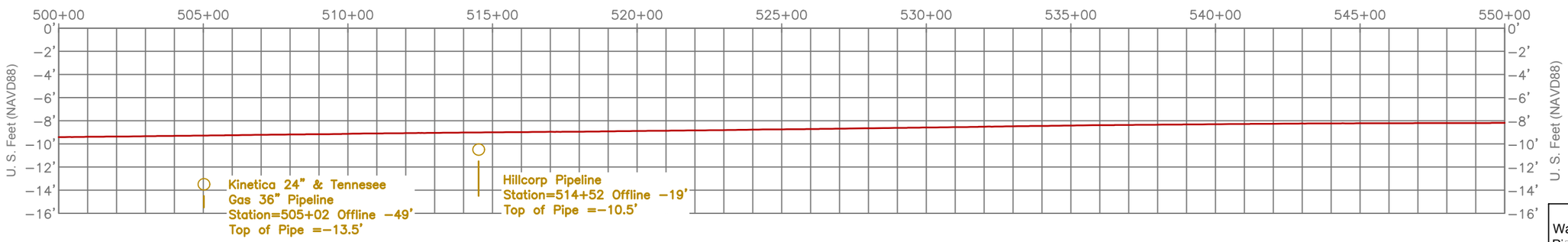
West Access Survey Line Stations 500+00-550+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 500+00-550+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 500+00-550+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Legend
Water Bottoms
Pi□eline

STATE OF LOUISIANA
05/17/2018
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Survey Results Profiles for Stations 500+00-550+00
Pi□eline Probing Results & Magnetometer Readings Sheet 46

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
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Lake Tambour Area
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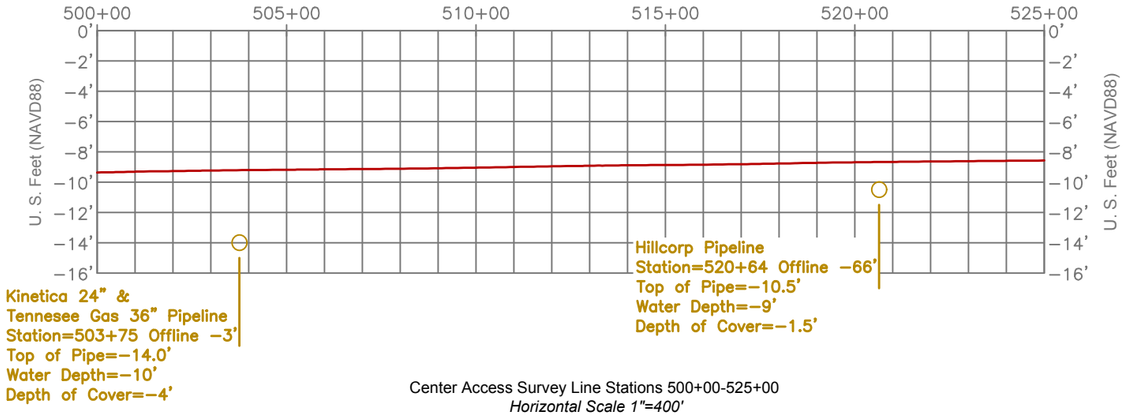
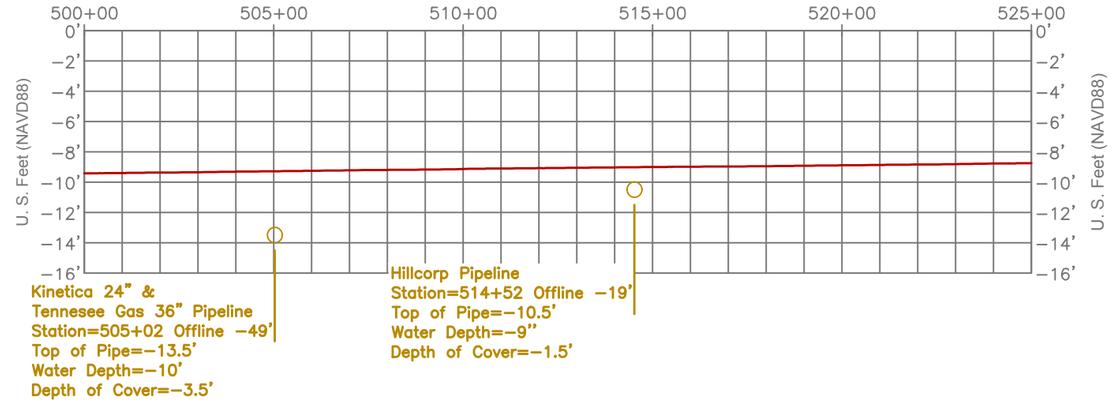
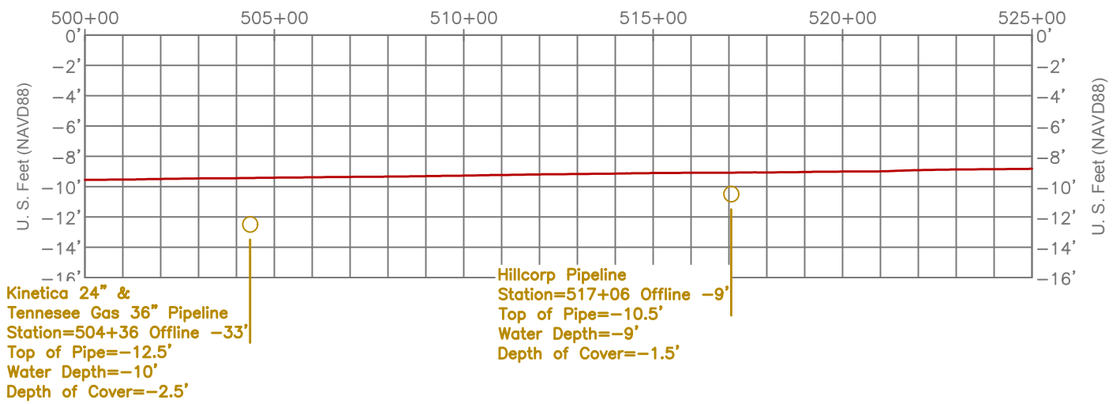
West Access Survey Line Stations 500+00-525+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 500+00-525+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 500+00-525+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Magnetometer Readings

Anomaly No.	Northing	Easting	Gamma	Duration	Ty□e	Comment
Anomaly 35	268,376	3,540,701	1439.5	390.2	Di□ole	Pi□eline Found
Anomaly 36	268,457	3,541,000	701.3	156.6	Di□ole	Pi□eline Found
Anomaly 40	268,589	3,540,881	629.8	53.9	Mono□ole	Pi□eline Found
Anomaly 41	268,644	3,540,760	315.1	502.1	Di□ole	Pi□eline Found
Anomaly 42	268,651	3,541,078	262.5	200.6	Di□ole	Pi□eline Found
Anomaly 45	268,767	3,540,940	290.2	55	Di□ole	Nothing Found
Anomaly 47	269,401	3,541,264	1630	453.5	Com□lex	Pi□eline Found
Anomaly 48	269,683	3,541,358	151	155.2	Mono□ole	Pi□eline Found
Anomaly 49	269,722	3,541,225	4979.8	212.4	Di□ole	Pi□eline Found
Anomaly 50	269,811	3,541,068	763.4	245.2	Di□ole	Pi□eline Found
Anomaly 51	269,879	3,541,247	343	116.1	Di□ole	Pi□eline Found
Anomaly 52	270,057	3,541,150	1035.9	350.3	Di□ole	Pi□eline Found
Anomaly 56	272,889	3,542,232	760	299.9	Com□lex	Pi□eline Found

Legend
Water Bottoms
Pi□eline

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Ricardo M. Johnson
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Survey Results Pi□eline Crossing Profiles for Stations 500+00-525+00 & Magnetometer Readings

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 46 of 93

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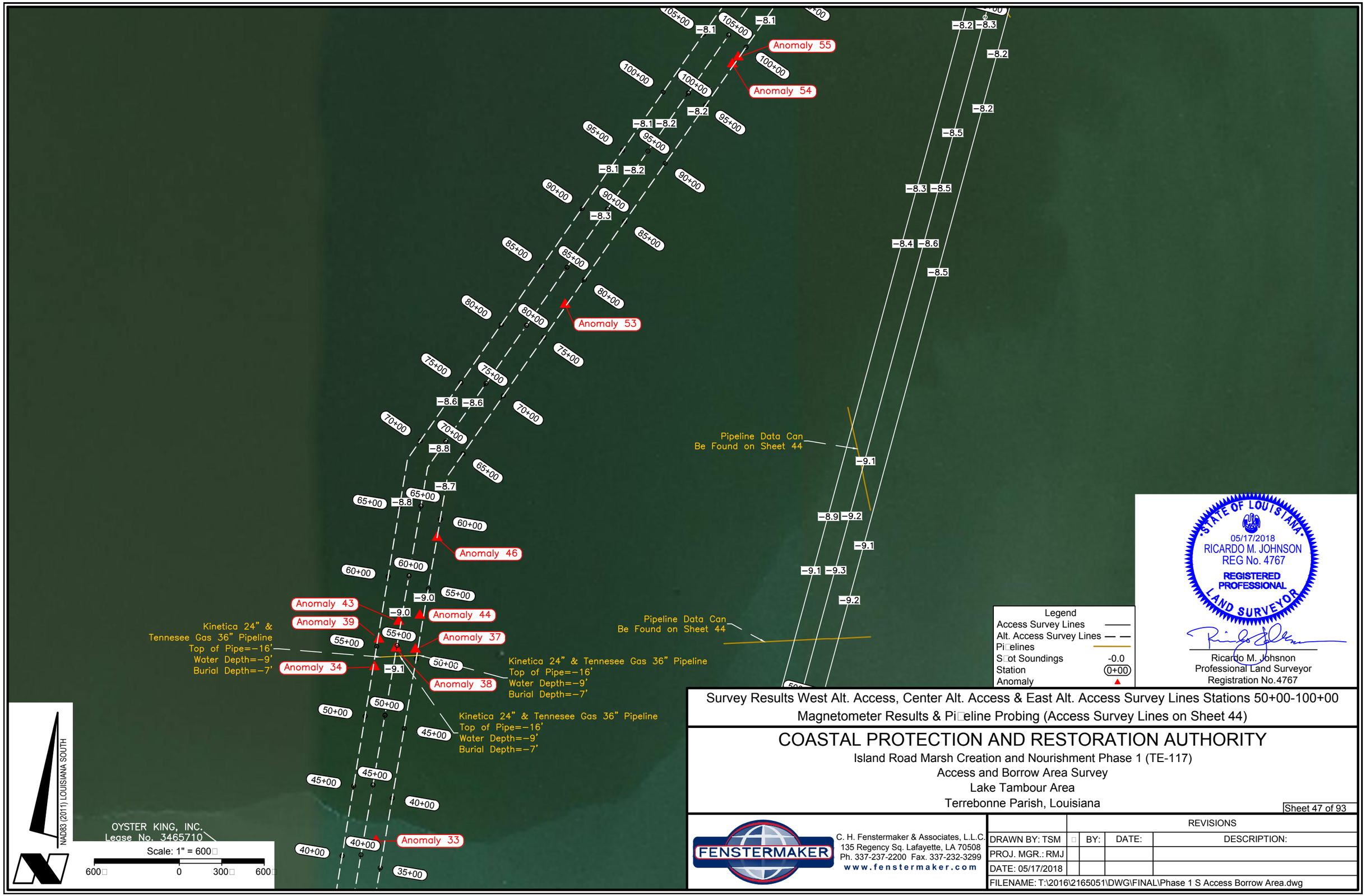
DATE: 05/17/2018				

FILENAME: T:\2016\2165051\DWG\FINAL\Phase 1 S Access Borrow Area.dwg



Survey Results West Alt. Access, Center Alt. Access & East Alt. Access Survey Lines Stations 50+00-100+00
Magnetometer Results & Pipeline Probing (Access Survey Lines on Sheet 44)

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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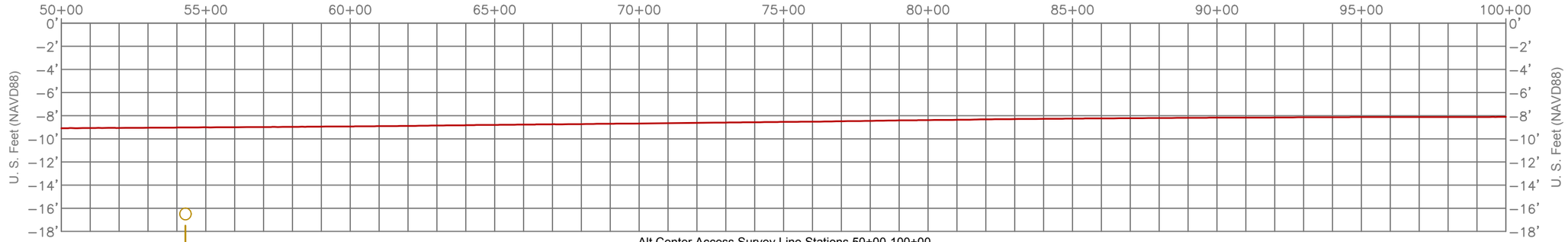
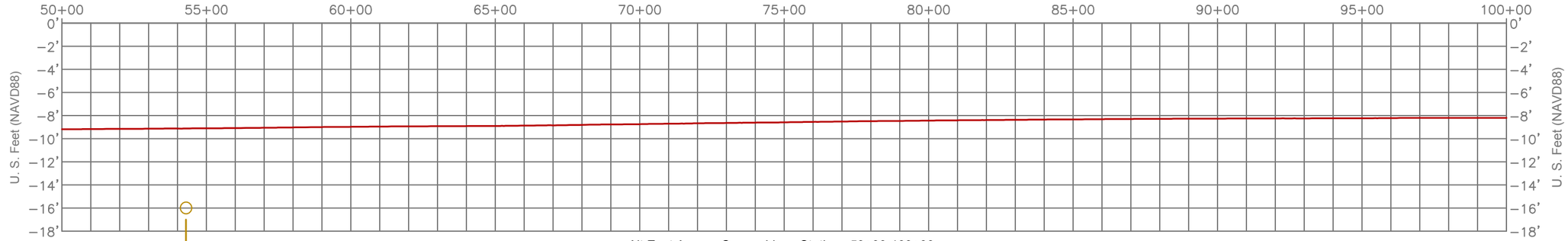
Alt West Access Survey Line Stations 50+00-100+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



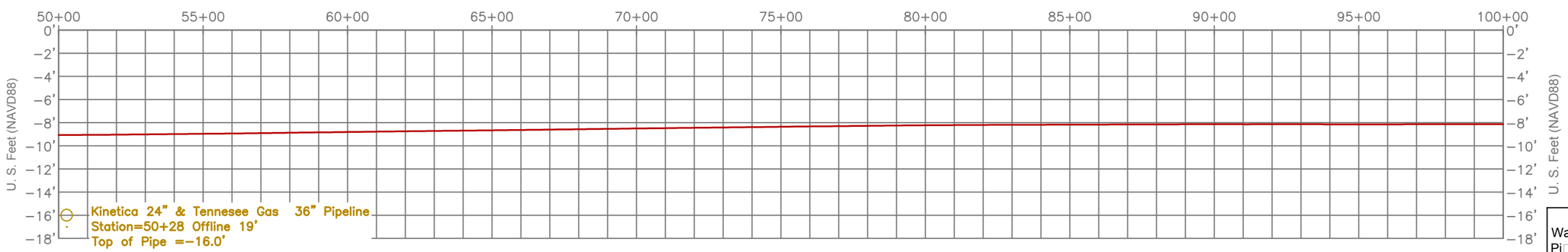
Kinetica 24" & Tennesee Gas 36" Pipeline
Station=54+30 Offline 37'
Top of Pipe =−16.5'

Alt Center Access Survey Line Stations 50+00-100+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Kinetica 24" & Tennesee Gas 36" Pipeline
Station=54+29 Offline 32'
Top of Pipe =−16.0'

Alt East Access Survey Lines Stations 50+00-100+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Kinetica 24" & Tennesee Gas 36" Pipeline
Station=50+28 Offline 19'
Top of Pipe =−16.0'

Legend
Water Bottoms
Pi□eline

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results Profiles for Alternate Access Stations 50+00-100+00
Pi□eline Probing Results & Magnetometer Readings Sheet 49

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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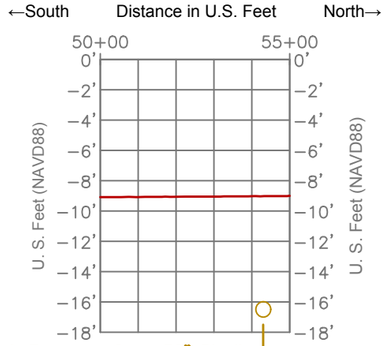
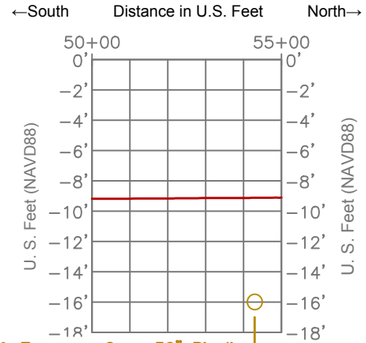
Alt West Access Survey Line Stations 50+00-55+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'



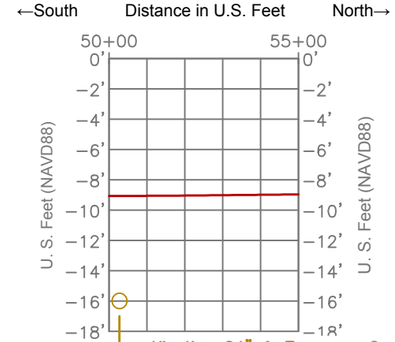
Kinetica 24" & Tennesee Gas 36" Pipeline
Station=54+30 Offline 37'
Top of Pipe=−16.5'
Water Depth=−9'
Depth of Cover=−7.5'

Alt Center Access Survey Line Stations 50+00-55+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'



Kinetica 24" & Tennesee Gas 36" Pipeline
Station=54+29 Offline 32'
Top of Pipe=−16.0'
Water Depth=−9'
Depth of Cover=−7'

Alt East Access Survey Lines Stations 50+00-55+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'



Kinetica 24" & Tennesee Gas 36" Pipeline
Station=50+28 Offline 19'
Top of Pipe=−16.0'
Water Depth=−9'
Depth of Cover=−7'

Magnetometer Readings

Anomaly No.	Northing	Easting	Gamma	Duration	Ty□e	Comment
Anomaly 34	268,337	3,537,767	387.5	190.1	Di□ole	Pi□eline Found
Anomaly 37	268,460	3,538,057	1506.3	488.9	Com□lex	Pi□eline Found
Anomaly 38	268,470	3,537,919	960.9	237.6	Com□lex	Pi□eline Found
Anomaly 39	268,533	3,537,799	333.7	184.8	Di□ole	Nothing Found
Anomaly 43	268,658	3,537,939	215.1	127.3	Di□ole	Nothing Found
Anomaly 44	268,702	3,538,089	919.6	170.5	Com□lex	Nothing Found
Anomaly 46	269,251	3,538,210	172.1	103	Mono□ole	Nothing Found
Anomaly 53	270,898	3,539,115	156.6	109.5	Mono□ole	Nothing Found

Legend
Water Bottoms
Pi□eline

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Survey Results Pi□eline Profiles for Alternate Access Stations 50+00-100+00 & Magnetometer Readings

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 49 of 93

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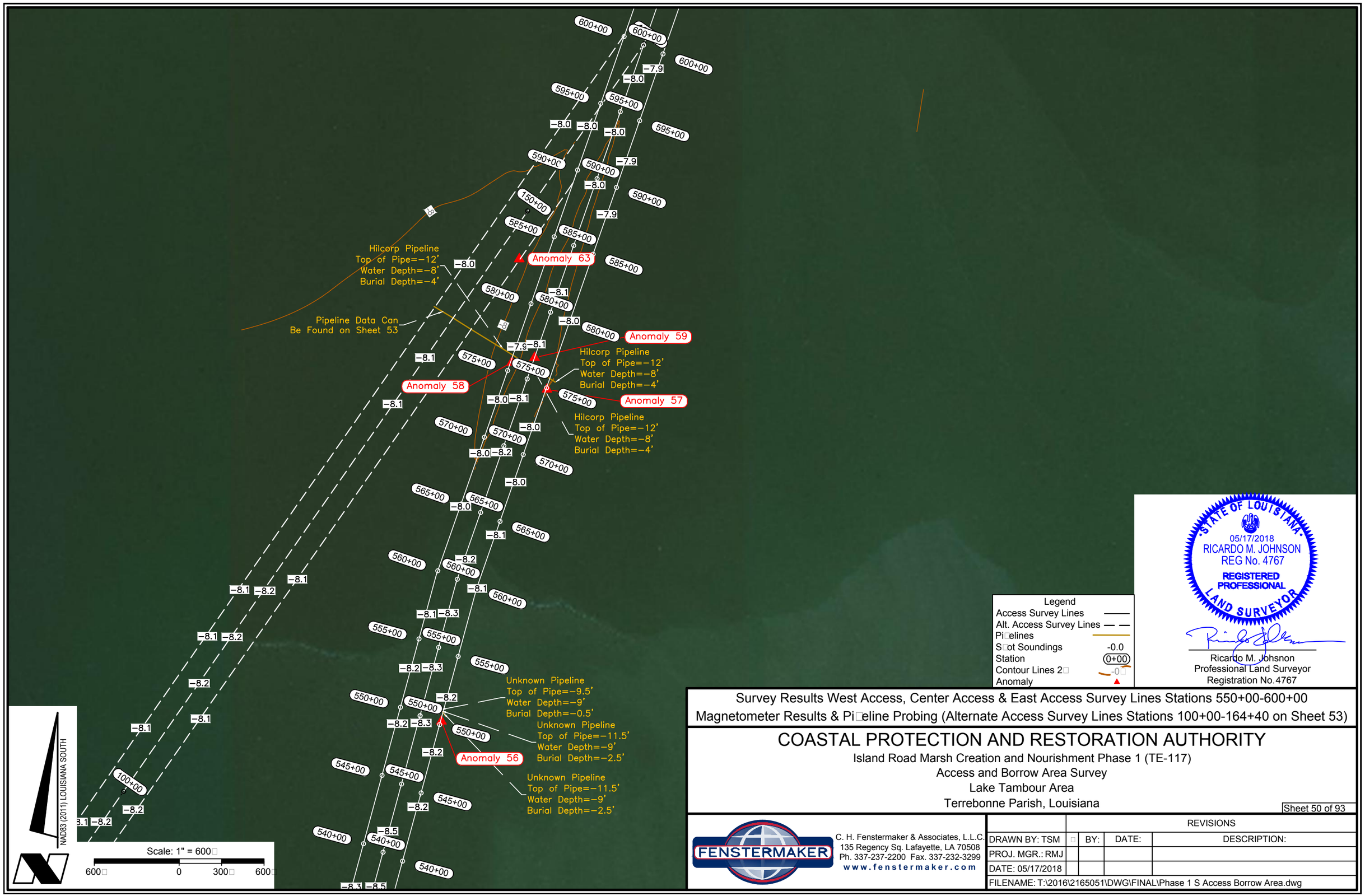

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results West Access, Center Access & East Access Survey Lines Stations 550+00-600+00
Magnetometer Results & Pipeline Probing (Alternate Access Survey Lines Stations 100+00-164+40 on Sheet 53)

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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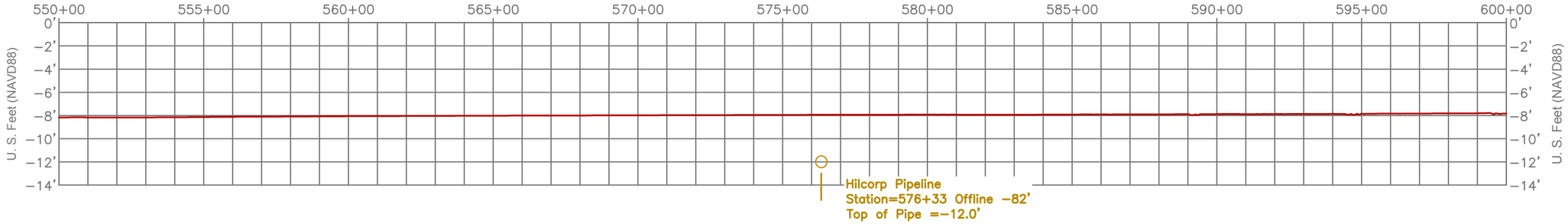
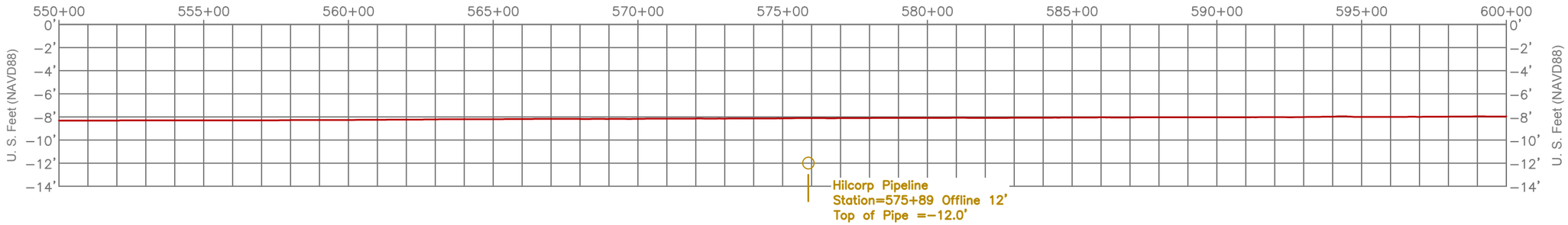
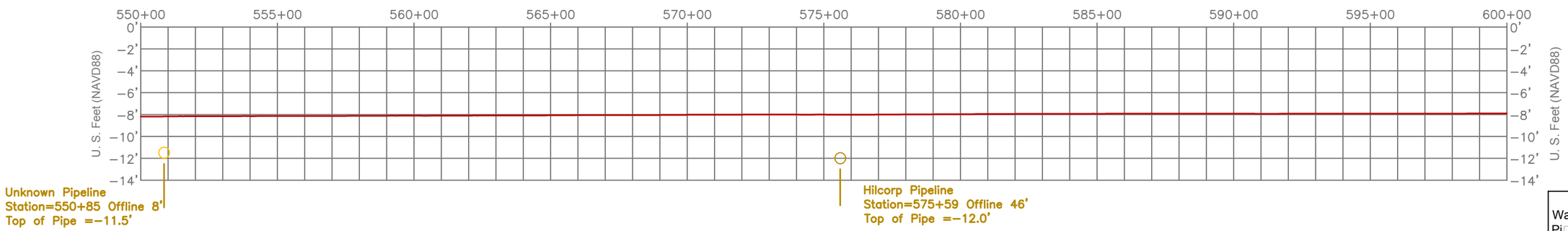
West Access Survey Line Stations 550+00-600+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 550+00-600+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 550+00-600+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Legend
Water Bottoms
Pi□eline

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results Profiles for Stations 550+00-600+00
Pi□eline Probing Results & Magnetometer Readings Sheet 52

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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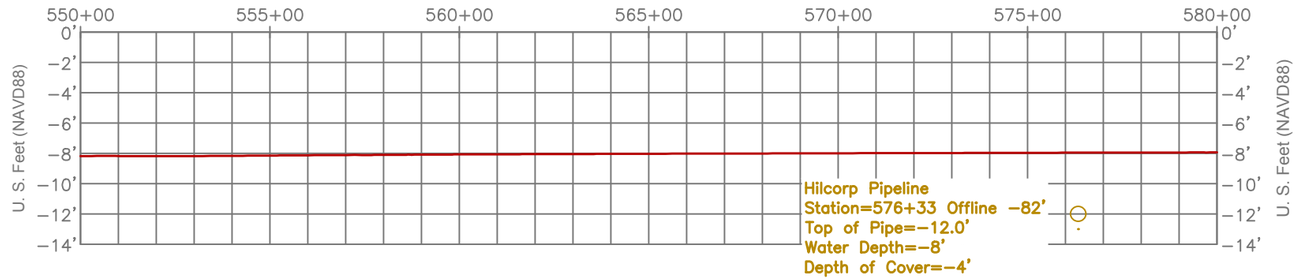
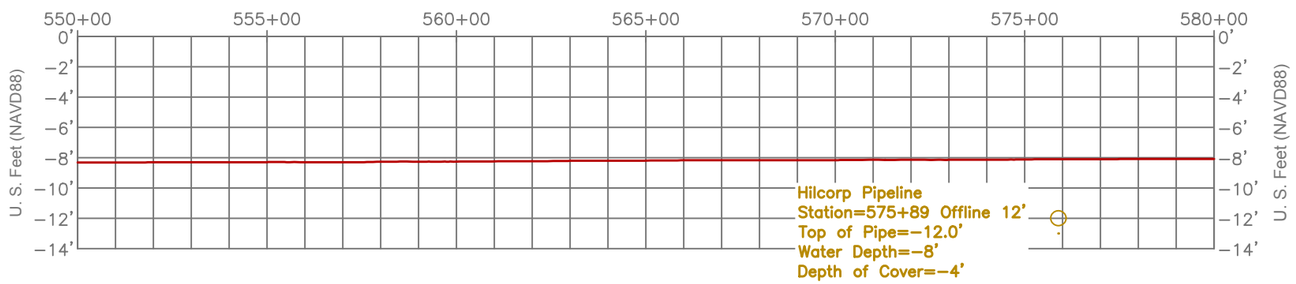
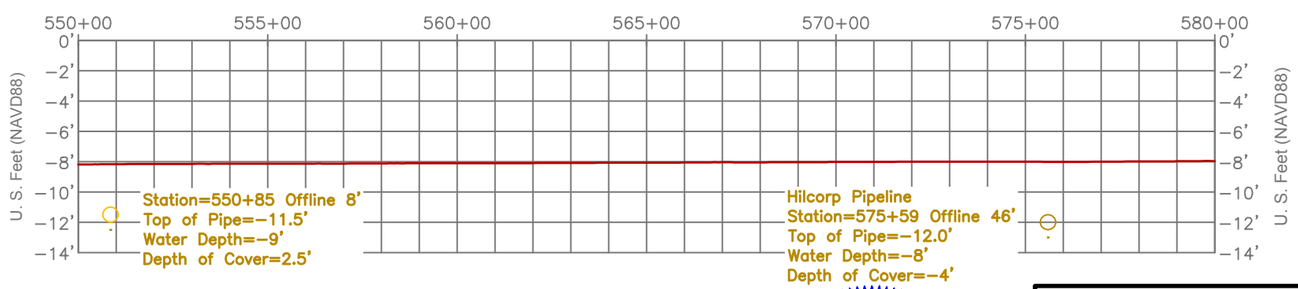
West Access Survey Line Stations 550+00-580+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 550+00-580+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 550+00-580+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Magnetometer Readings						
Anomaly No.	Northing	Easting	Gamma	Duration	Ty□e	Comment
Anomaly 56	272,889	3,542,232	760	299.9	Com□lex	Pi□eline Found
Anomaly 57	275,236	3,542,978	174.2	218.1	Com□lex	Pi□eline Found
Anomaly 58	275,426	3,542,730	2016.9	453.1	Di□ole	Pi□eline Found
Anomaly 59	275,460	3,542,890	385.3	73.3	Mono□ole	Pi□eline Found

Legend
Water Bottoms
Pi□eline

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results Pi□eline Crossing Profiles for Stations 550+00-580+00 & Magnetometer Readings

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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Survey Results West Alt. Access, Center Alt. Access & East Alt. Access Survey Lines Stations 100+00-164+40
Magnetometer Results & Pipeline Probing (Access Survey Lines on Sheet 50)

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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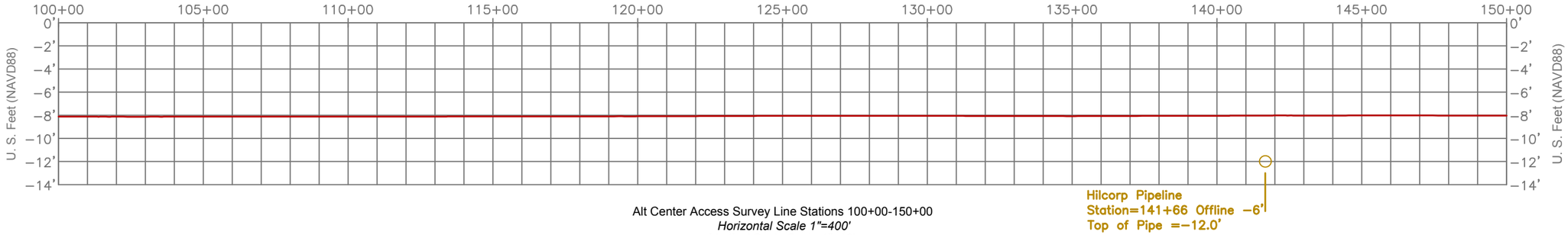
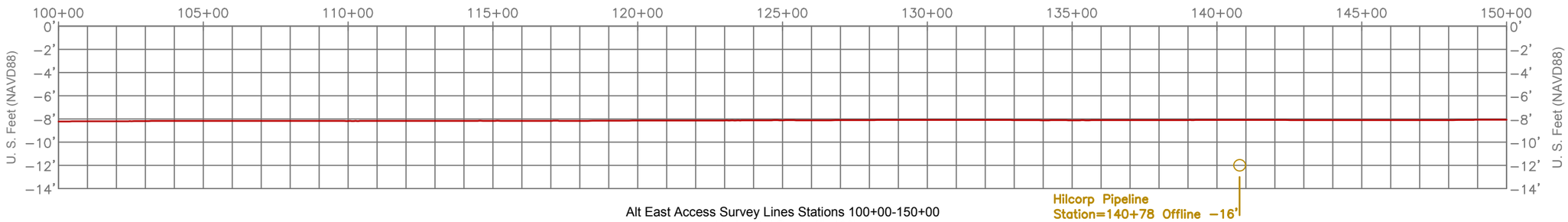
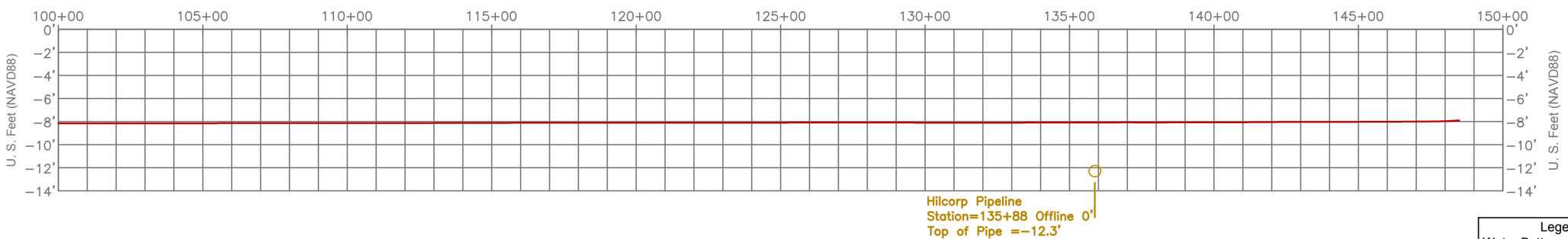
Alt West Access Survey Line Stations 100+00-150+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Alt Center Access Survey Line Stations 100+00-150+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Alt East Access Survey Lines Stations 100+00-150+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Legend
Water Bottoms
Pi□eline

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results Profiles for Alternate Access Stations 150+00-150+00
Pi□eline Probing Results & Magnetometer Readings Sheet 55

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 54 of 93

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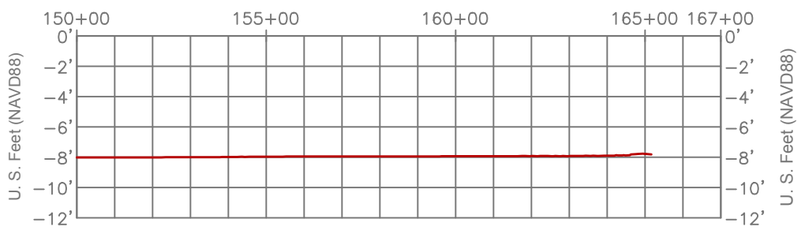
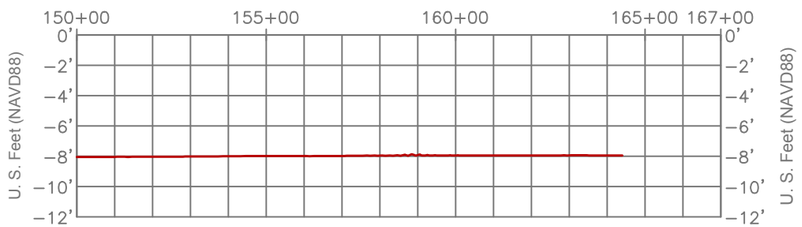
Alt West Access Survey Line Stations 150+00-167+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→

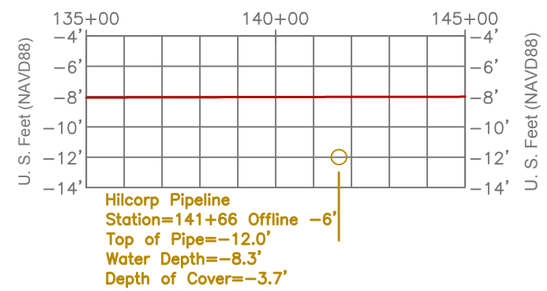


Alt Center Access Survey Line Stations 150+00-167+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→

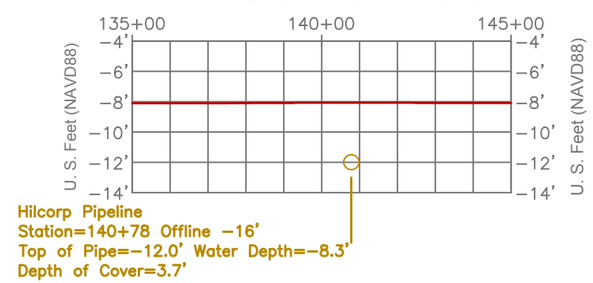


Alt. East Access Survey Line Ends on Station 148+49

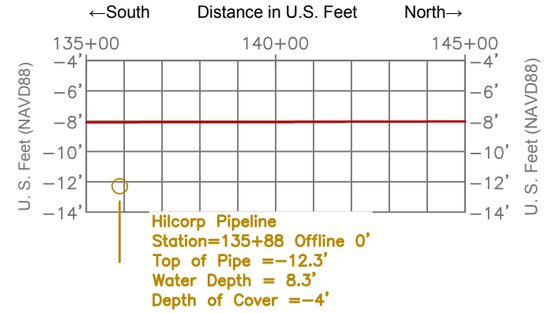
Alt West Access Survey Line Stations 135+00-145+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Alt Center Access Survey Line Stations 135+00-145+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Alt East Access Survey Lines Stations 135+00-145+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Magnetometer Readings

Anomaly No.	Northing	Easting	Gamma	Duration	Ty□e	Comment
Anomaly 54	272,597	3,540,295	163.2	79.5	Mono□ole	Nothing Found
Anomaly 55	272,646	3,540,337	165.5	53.4	Di□ole	Nothing Found
Anomaly 60	275,716	3,542,471	126.2	120.7	Com□lex	Pi□eline Found
Anomaly 61	275,774	3,542,166	546.8	205.1	Di□ole	Pi□eline Found
Anomaly 62	275,813	3,542,361	2425.9	233.9	Di□ole	Pi□eline Found
Anomaly 63	276,157	3,542,782	96.1	79.7	Mono□ole	Nothing Found

Legend
Water Bottoms
Pi□eline

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
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Ricardo M. Johnson
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Survey Results Profiles for Alternate Access Stations 150+00-±165+00
Pi□eline Crossing Profiles For Stations 135+00-145+00 & Magnetometer Readings

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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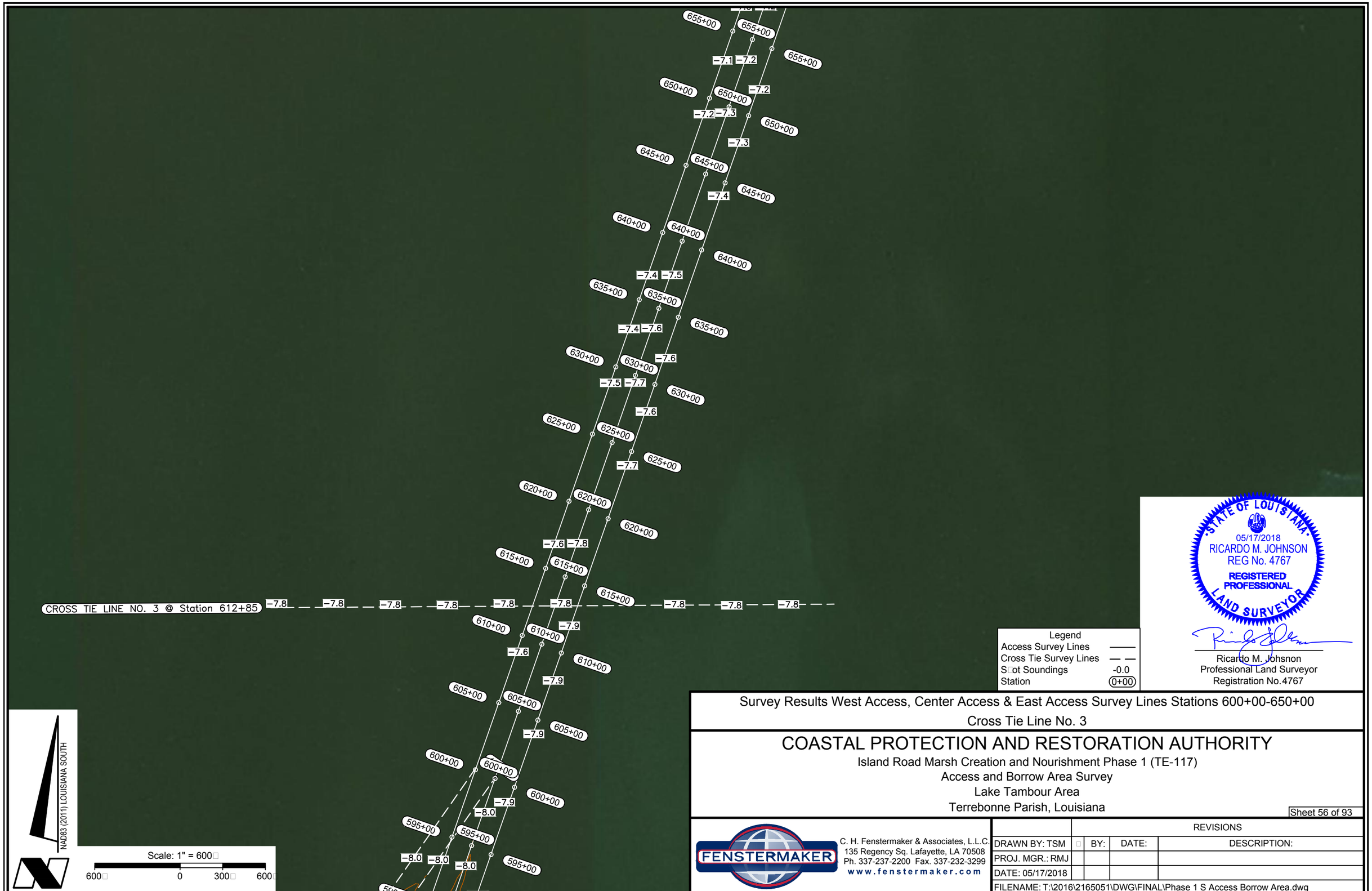
655+00
655+00
655+00
-7.1
-7.2
650+00
650+00
650+00
-7.2
-7.2
-7.3
-7.3
645+00
645+00
645+00
-7.4
640+00
640+00
640+00
-7.4
-7.5
635+00
635+00
635+00
-7.4
-7.6
630+00
630+00
630+00
-7.6
-7.5
-7.7
625+00
625+00
625+00
-7.6
-7.7
620+00
620+00
620+00
-7.6
-7.8
615+00
615+00
615+00
CROSS TIE LINE NO. 3 @ Station 612+85
-7.8
-7.8
-7.8
-7.8
-7.8
-7.8
-7.8
-7.8
-7.8
610+00
610+00
610+00
-7.9
-7.6
605+00
605+00
605+00
-7.9
-7.9
600+00
600+00
600+00
-7.9
-8.0
595+00
595+00
595+00
-8.0
-8.0
-8.0
NAD83 (2011) LOUISIANA SOUTH
Scale: 1" = 600
600 0 300 600
STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR
Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767
Legend
Access Survey Lines
Cross Tie Survey Lines
Spot Soundings -0.0
Station 0+00
Survey Results West Access, Center Access & East Access Survey Lines Stations 600+00-650+00
Cross Tie Line No. 3
COASTAL PROTECTION AND RESTORATION AUTHORITY
Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana
Sheet 56 of 93
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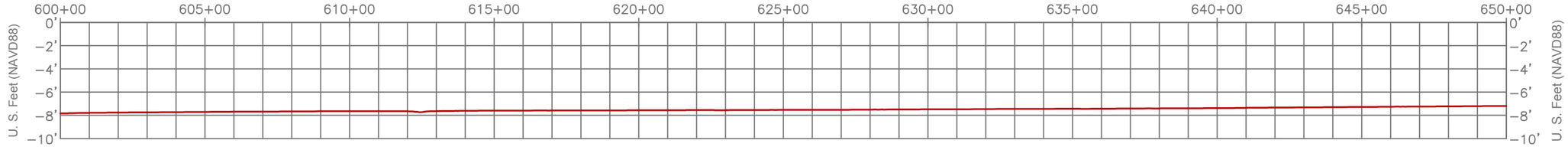
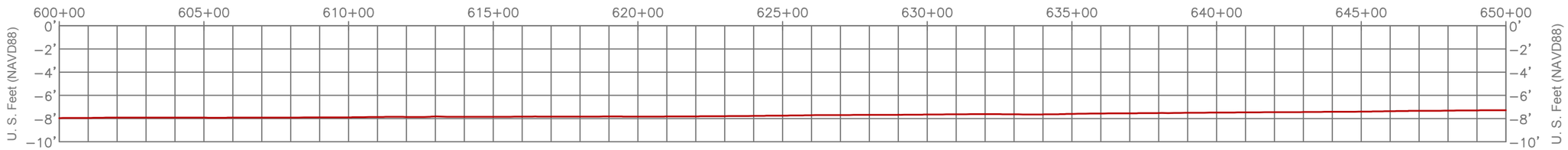
PROJ. MGR.: RMJ
DATE: 05/17/2018
BY:
DATE:
DESCRIPTION:
FILENAME: T:\2016\2165051\DWG\FINAL\Phase 1 S Access Borrow Area.dwg

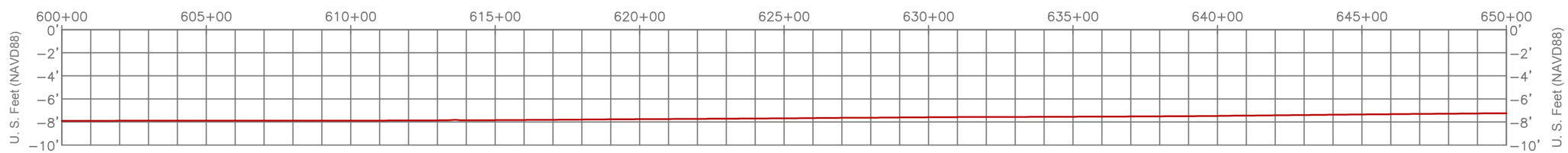
West Access Survey Line Stations 600+00-650+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 600+00-650+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 600+00-650+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results Profiles for Stations 600+00-650+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
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DATE: 05/17/2018				

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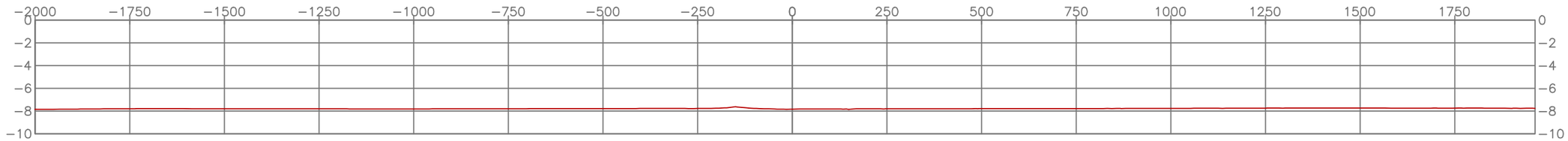
Cross Tie Line No. 3 At Station 612+85
Horizontal Scale 1" = 400
Vertical Scale 1" = 13
←West Distance In U. S. Feet East→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results Profiles for Cross Tie Line No. 3

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
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Lake Tambour Area
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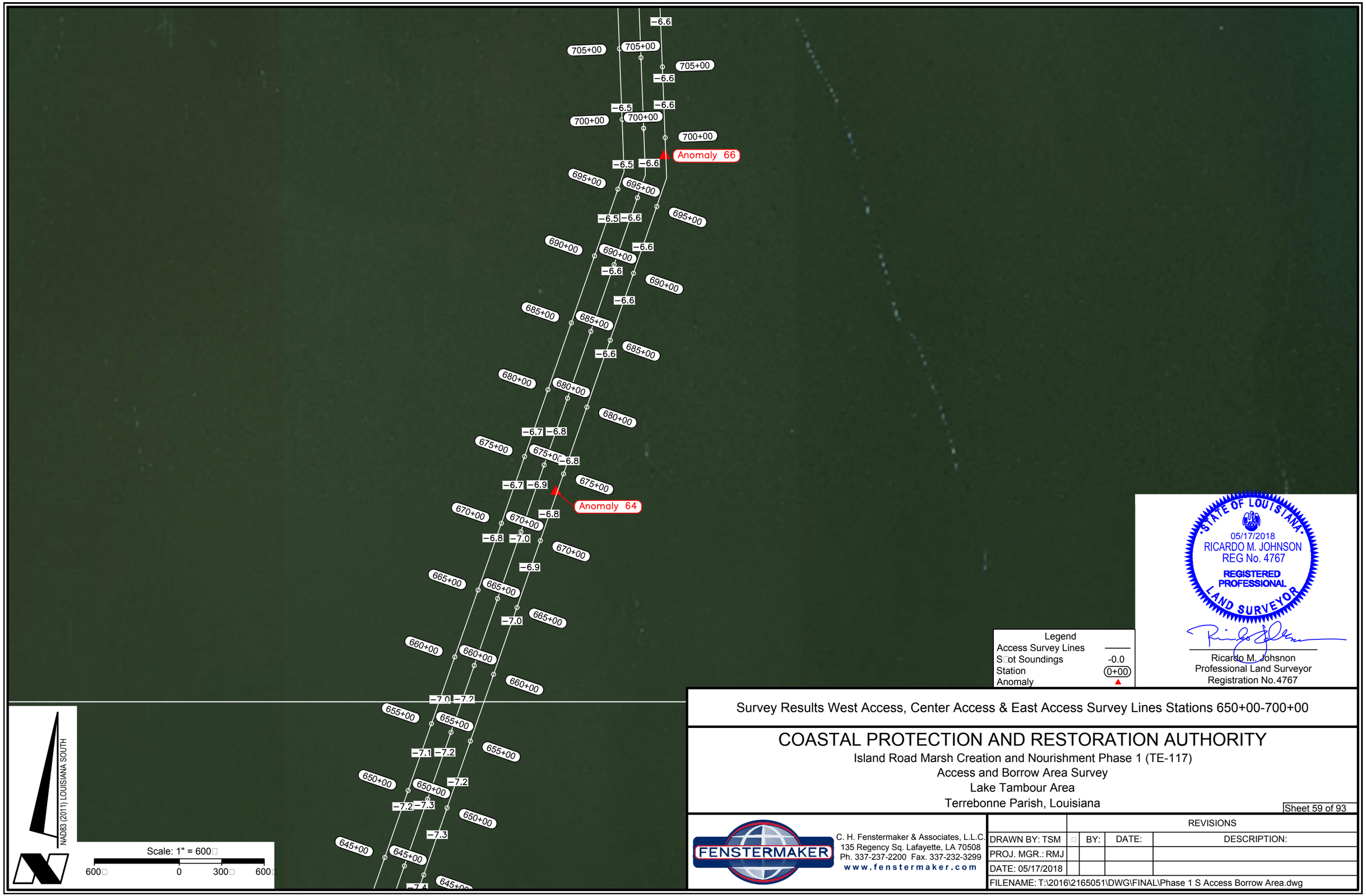
DATE: 05/17/2018				

FILENAME: T:\2016\2165051\DWG\FINAL\Phase 1 S Access Borrow Area.dwg



Survey Results West Access, Center Access & East Access Survey Lines Stations 650+00-700+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
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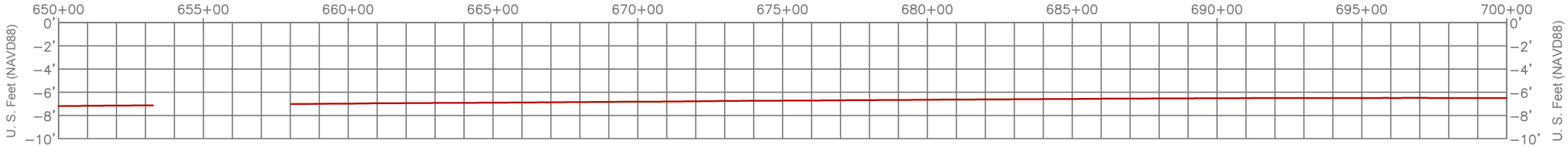
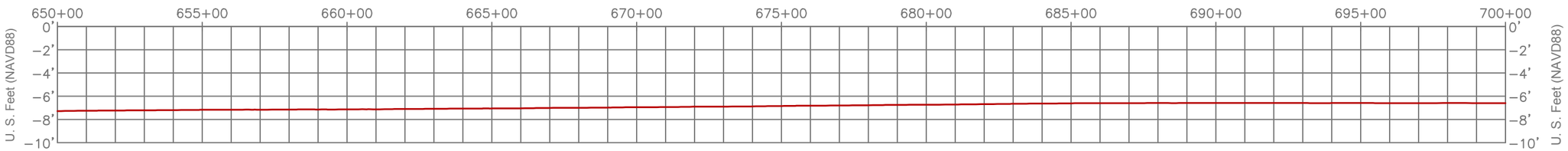
PROJ. MGR.: RMJ				
DATE: 05/17/2018				

FILENAME: T:\2016\2165051\DWG\FINAL\Phase 1 S Access Borrow Area.dwg

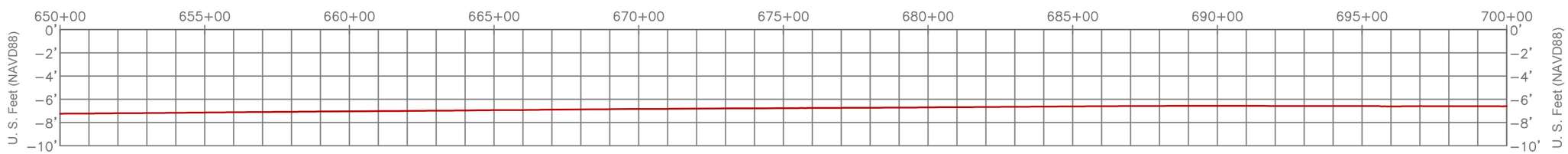
West Access Survey Line Stations 650+00-700+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 650+00-700+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 650+00-700+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Magnetometer Readings						
Anomaly No.	Northing	Easting	Gamma	Duration	Ty□e	Comment
Anomaly 64	284,563	3,546,212	85.5	229.3	Mono□ole	Nothing Found
Anomaly 66	286,937	3,546,981	75.9	239.9	Com□lex	Nothing Found

Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results Profiles for Stations 650+00-700+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 60 of 93

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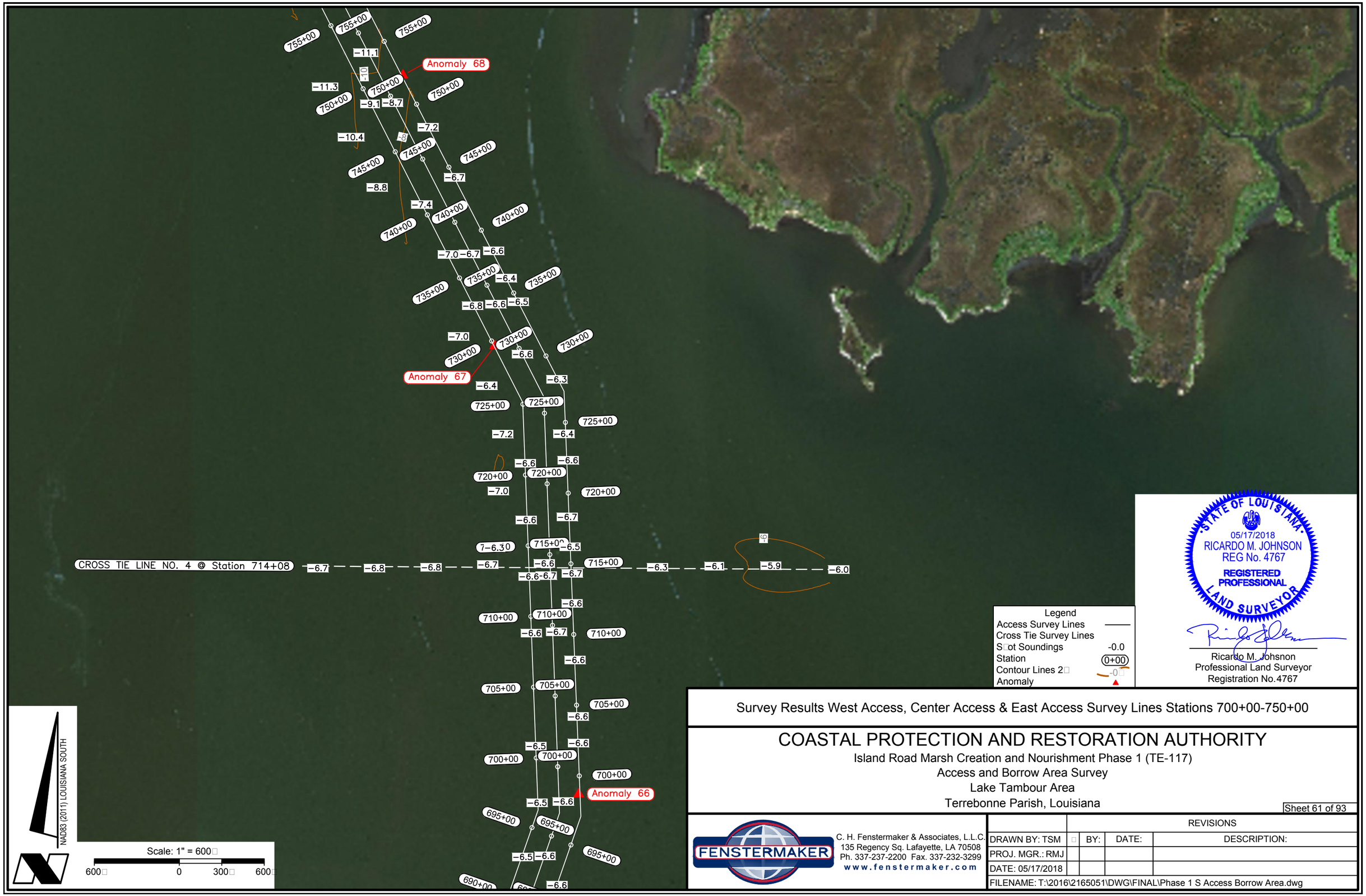

Survey Results West Access, Center Access & East Access Survey Lines Stations 700+00-750+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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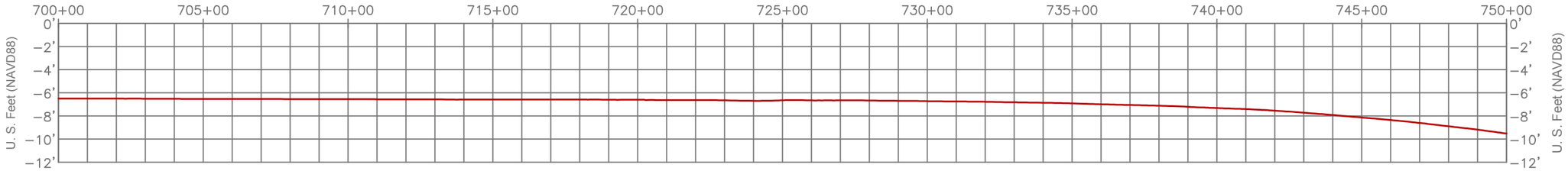
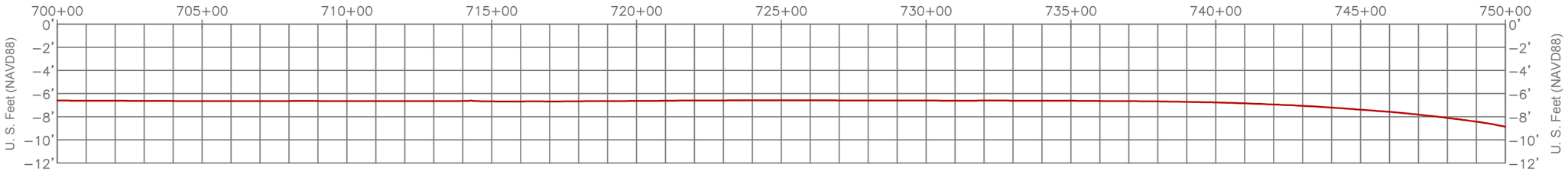
DATE: 05/17/2018			

FILENAME: T:\2016\2165051\DWG\FINAL\Phase 1 S Access Borrow Area.dwg

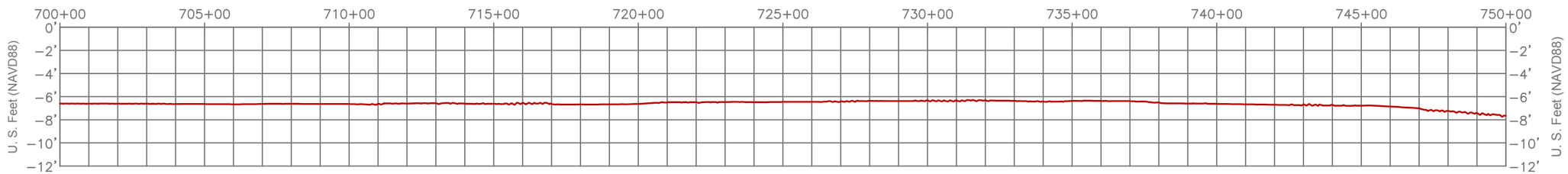
West Access Survey Line Stations 700+00-750+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 700+00-750+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



East Access Survey Line Stations 700+00-750+00
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Magnetometer Readings

Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 66	286,937	3,546,981	75.9	239.9	Complex	Nothing Found
Anomaly 67	290,103	3,546,387	75.2	74.6	Dipole	Nothing Found
Anomaly 68	292,016	3,545,739	57.2	127.6	Dipole	Nothing Found

Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Survey Results Profiles for Stations 700+00-750+00 & Magnetometer Readings

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 62 of 93

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DATE: 05/17/2018			

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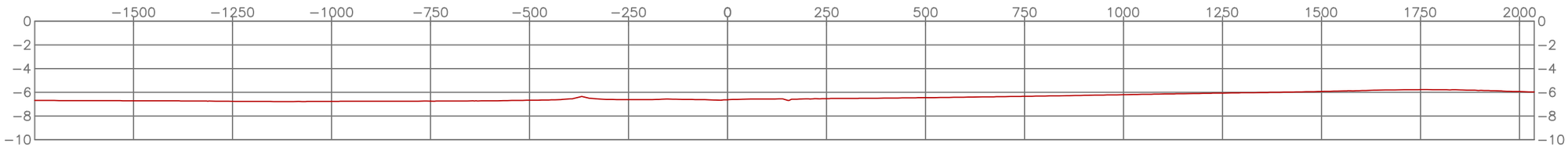
Cross Tie Line No. 4 At Station 714+08
Horizontal Scale 1" = 400
Vertical Scale 1" = 13
←West Distance In U. S. Feet East→



Legend
Water Bottoms

Survey Results Profiles for Cross Tie Line No. 3

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 63 of 93

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

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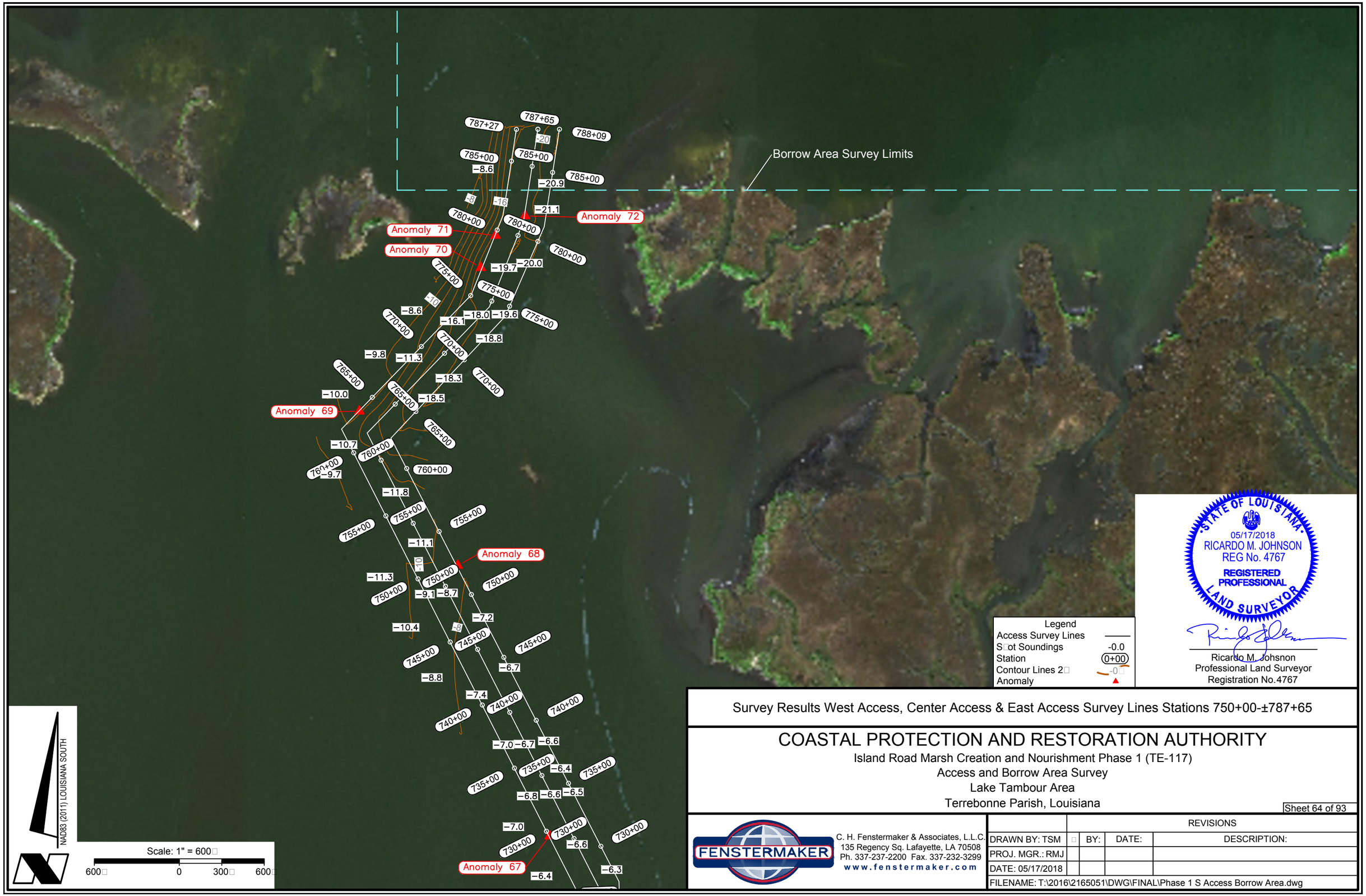

Legend

Access Survey Lines	
Spot Soundings	-0.0
Station	0+00
Contour Lines 2	-0
Anomaly	▲

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results West Access, Center Access & East Access Survey Lines Stations 750+00-±787+65

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 64 of 93

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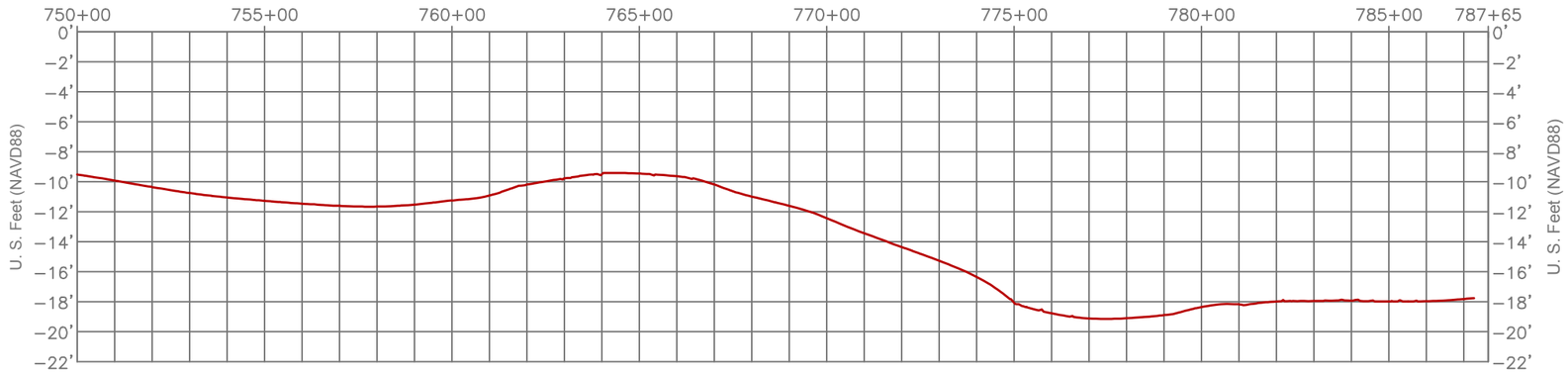
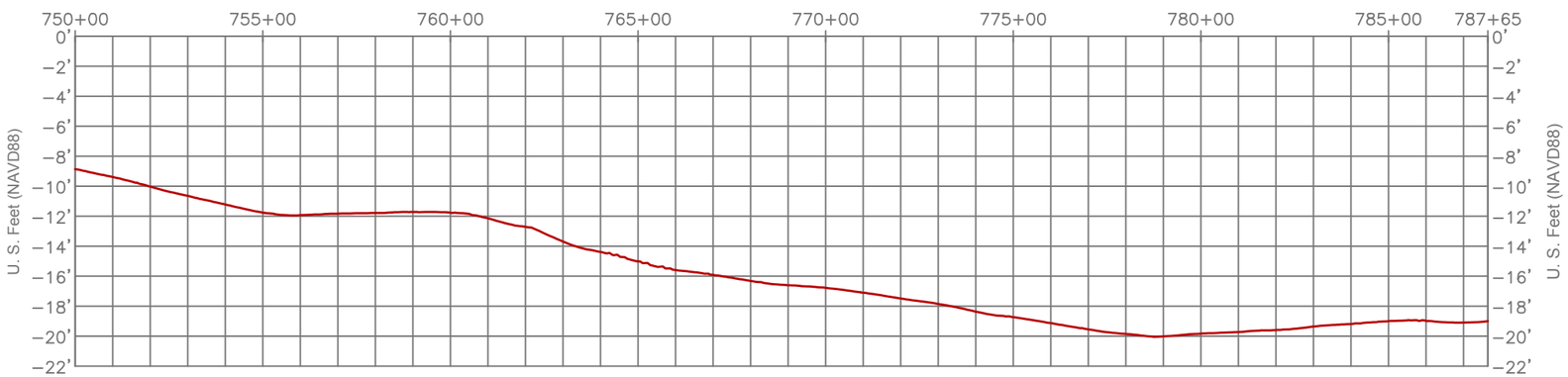
FILENAME: T:\2016\2165051\DWG\FINAL\Phase 1 S Access Borrow Area.dwg

West Access Survey Line Stations 750+00-787+65
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Center Access Survey Line Stations 750+00-787+65
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results Profiles for Stations 750+00-±787+65

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 65 of 93

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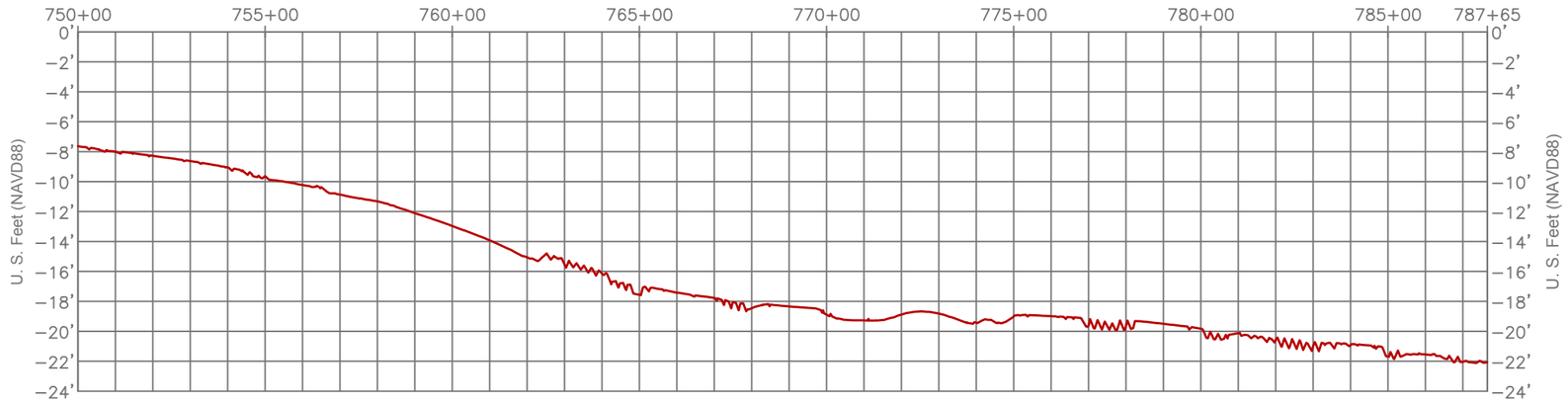
FILENAME: T:\2016\2165051\DWG\FINAL\Phase 1 S Access Borrow Area.dwg

East Access Survey Line Stations 750+00-787+65
Horizontal Scale 1"=400'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Magnetometer Readings						
Anomaly No.	Northing	Easting	Gamma	Duration	Type	Comment
Anomaly 67	290,103	3,546,387	75.2	74.6	Dipole	Nothing Found
Anomaly 68	292,016	3,545,739	57.2	127.6	Dipole	Nothing Found
Anomaly 69	293,106	3,545,044	20.9	76.6	Dipole	20.9
Anomaly 70	294,120	3,545,901	827.9	190.2	Dipole	827.9
Anomaly 71	294,347	3,546,006	114.1	153.6	Monopole	114.1
Anomaly 72	294,485	3,546,215	51.2	47.5	Monopole	51.2

Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
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REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

Survey Results Profiles for Stations 750+00-±787+65

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase 1 (TE-117)
Access and Borrow Area Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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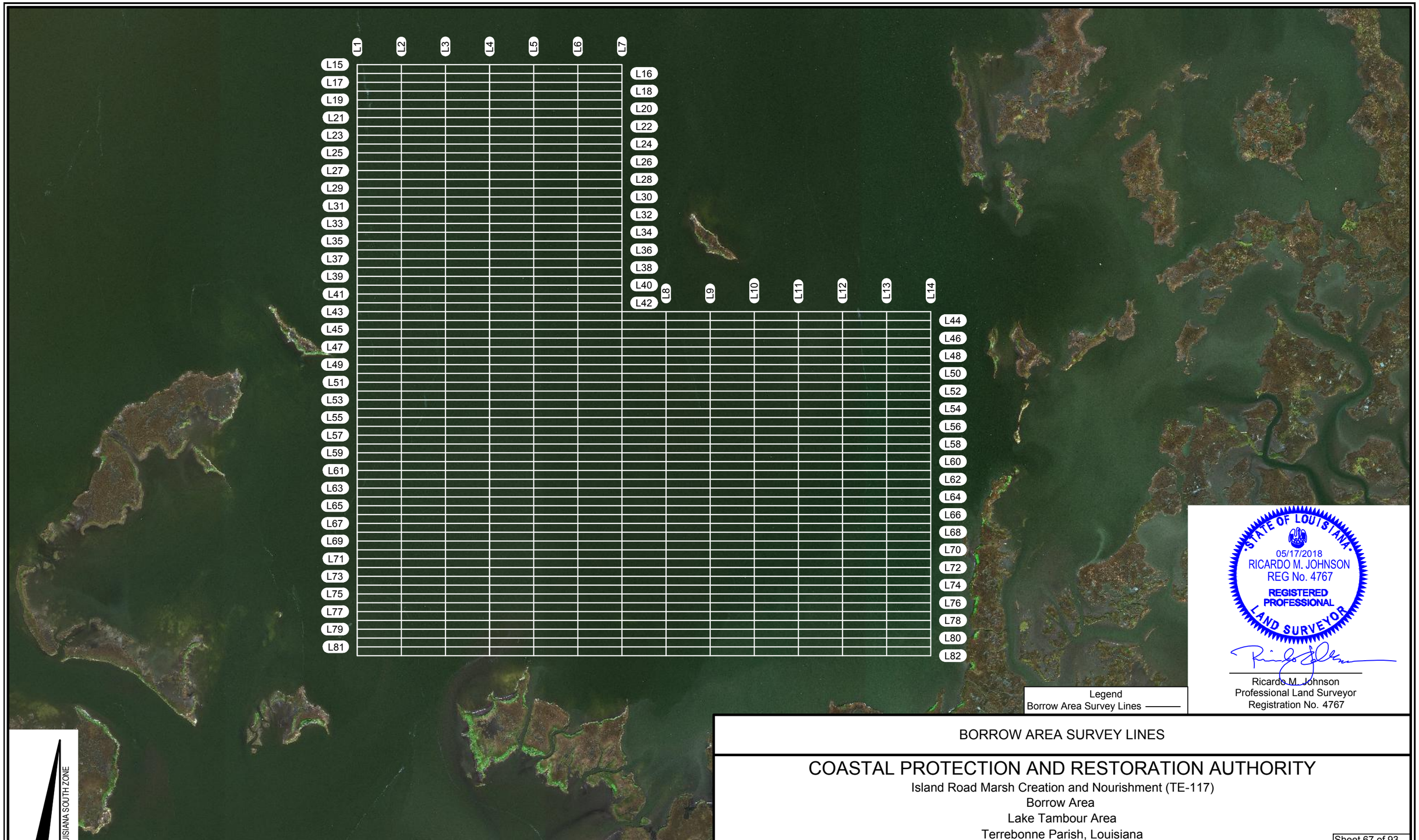

BORROW AREA SURVEY LINES

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 67 of 93

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FILENAME: T:\2016\2165051\DWG\BORROW AREA\Ad Borrow Area Com Rev 020618.dwg

Borrow Area North-South Survey Line Table			
Segment No.	P. O. B.	P. O. E.	Distance
L1	301,862.31 3,545,729.00	295,162.31 3,545,729.00	6,700.00
L2	301,862.31 3,546,229.00	295,162.31 3,546,229.00	6,700.00
L3	301,862.31 3,546,729.00	295,162.31 3,546,729.00	6,700.00
L4	301,862.31 3,547,229.00	295,162.31 3,547,229.00	6,700.00
L5	301,862.31 3,547,729.00	295,162.31 3,547,729.00	6,700.00
L6	301,862.31 3,548,229.00	295,162.31 3,548,229.00	6,700.00
L7	301,862.31 3,548,729.00	295,162.31 3,548,729.00	6,700.00
L8	299,062.31 3,549,229.00	295,162.31 3,549,229.00	3,900.00
L9	299,062.31 3,549,729.00	295,162.31 3,549,729.00	3,900.00
L10	299,062.31 3,550,229.00	295,162.31 3,550,229.00	3,900.00
L11	299,062.31 3,550,729.00	295,162.31 3,550,729.00	3,900.00
L12	299,062.31 3,551,229.00	295,162.31 3,551,229.00	3,900.00
L13	299,062.31 3,551,729.00	295,162.31 3,551,729.00	3,900.00
L14	299,062.31 3,552,229.00	295,162.31 3,552,229.00	3,900.00

Borrow Area East-West Survey Line Table			
Segment No.	P.O.B.	P.O.E.	Distance
L15	301,862.31 3,548,729.00	301,862.31 3,545,729.00	3,000.00
L16	301,762.31 3,548,729.00	301,762.31 3,545,729.00	3,000.00
L17	301,662.31 3,548,729.00	301,662.31 3,545,729.00	3,000.00
L18	301,562.31 3,548,729.00	301,562.31 3,545,729.00	3,000.00
L19	301,462.31 3,548,729.00	301,462.31 3,545,729.00	3,000.00
L20	301,362.31 3,548,729.00	301,362.31 3,545,729.00	3,000.00
L21	301,262.31 3,548,729.00	301,262.31 3,545,729.00	3,000.00
L22	301,162.31 3,548,729.00	301,162.31 3,545,729.00	3,000.00
L23	301,062.31 3,548,729.00	301,062.31 3,545,729.00	3,000.00
L24	300,962.31 3,548,729.00	300,962.31 3,545,729.00	3,000.00
L25	300,862.31 3,548,729.00	300,862.31 3,545,729.00	3,000.00
L26	300,762.31 3,548,729.00	300,762.31 3,545,729.00	3,000.00
L27	300,662.31 3,548,729.00	300,662.31 3,545,729.00	3,000.00
L28	300,562.31 3,548,729.00	300,562.31 3,545,729.00	3,000.00
L29	300,462.31 3,548,729.00	300,462.31 3,545,729.00	3,000.00
L30	300,362.31 3,548,729.00	300,362.31 3,545,729.00	3,000.00
L31	300,262.31 3,548,729.00	300,262.31 3,545,729.00	3,000.00
L32	300,162.31 3,548,729.00	300,162.31 3,545,729.00	3,000.00

Borrow Area East-West Survey Line Table			
Segment No.	P.O.B.	P.O.E.	Distance
L33	300,062.31 3,548,729.00	300,062.31 3,545,729.00	3,000.00
L34	299,962.31 3,548,729.00	299,962.31 3,545,729.00	3,000.00
L35	299,862.31 3,548,729.00	299,862.31 3,545,729.00	3,000.00
L36	299,762.31 3,548,729.00	299,762.31 3,545,729.00	3,000.00
L37	299,662.31 3,548,729.00	299,662.31 3,545,729.00	3,000.00
L38	299,562.31 3,548,729.00	299,562.31 3,545,729.00	3,000.00
L39	299,462.31 3,548,729.00	299,462.31 3,545,729.00	3,000.00
L40	299,362.31 3,548,729.00	299,362.31 3,545,729.00	3,000.00
L41	299,262.31 3,548,729.00	299,262.31 3,545,729.00	3,000.00
L42	299,162.31 3,548,729.00	299,162.31 3,545,729.00	3,000.00
L43	299,062.31 3,549,062.11	299,062.31 3,545,729.00	3,333.11
L44	298,962.31 3,552,229.00	298,962.31 3,545,729.00	6,500.00
L45	298,862.31 3,552,229.00	298,862.31 3,545,729.00	6,500.00
L46	298,762.31 3,552,229.00	298,762.31 3,545,729.00	6,500.00
L47	298,662.31 3,552,229.00	298,662.31 3,545,729.00	6,500.00
L48	298,562.31 3,552,229.00	298,562.31 3,545,729.00	6,500.00
L49	298,462.31 3,552,229.00	298,462.31 3,545,729.00	6,500.00
L50	298,362.31 3,552,229.00	298,362.31 3,545,729.00	6,500.00

Borrow Area East-West Survey Line Table			
Segment No.	P.O.B.	P.O.E.	Distance
L51	298,262.31 3,552,229.00	298,262.31 3,545,729.00	6,500.00
L52	298,162.31 3,552,229.00	298,162.31 3,545,729.00	6,500.00
L53	298,062.31 3,552,229.00	298,062.31 3,545,729.00	6,500.00
L54	297,962.31 3,552,229.00	297,962.31 3,545,729.00	6,500.00
L55	297,862.31 3,552,229.00	297,862.31 3,545,729.00	6,500.00
L56	297,762.31 3,552,229.00	297,762.31 3,545,729.00	6,500.00
L57	297,662.31 3,552,229.00	297,662.31 3,545,729.00	6,500.00
L58	297,562.31 3,552,229.00	297,562.31 3,545,729.00	6,500.00
L59	297,462.31 3,552,229.00	297,462.31 3,545,729.00	6,500.00
L60	297,362.31 3,552,229.00	297,362.31 3,545,729.00	6,500.00
L61	297,262.31 3,552,229.00	297,262.31 3,545,729.00	6,500.00
L62	297,162.31 3,552,229.00	297,162.31 3,545,729.00	6,500.00
L63	297,062.31 3,552,229.00	297,062.31 3,545,729.00	6,500.00
L64	296,962.31 3,552,229.00	296,962.31 3,545,729.00	6,500.00
L65	296,862.31 3,552,229.00	296,862.31 3,545,729.00	6,500.00
L66	296,762.31 3,552,229.00	296,762.31 3,545,729.00	6,500.00
L67	296,662.31 3,552,229.00	296,662.31 3,545,729.00	6,500.00
L68	296,562.31 3,552,229.00	296,562.31 3,545,729.00	6,500.00

Borrow Area East-West Survey Line Table			
Segment No.	P.O.B.	P.O.E.	Distance
L69	296,462.31 3,552,229.00	296,462.31 3,545,729.00	6,500.00
L70	296,362.31 3,552,229.00	296,362.31 3,545,729.00	6,500.00
L71	296,262.31 3,552,229.00	296,262.31 3,545,729.00	6,500.00
L72	296,162.31 3,552,229.00	296,162.31 3,545,729.00	6,500.00
L73	296,062.31 3,552,229.00	296,062.31 3,545,729.00	6,500.00
L74	295,962.31 3,552,229.00	295,962.31 3,545,729.00	6,500.00
L75	295,862.31 3,552,229.00	295,862.31 3,545,729.00	6,500.00
L76	295,762.31 3,552,229.00	295,762.31 3,545,729.00	6,500.00
L77	295,662.31 3,552,229.00	295,662.31 3,545,729.00	6,500.00
L78	295,562.31 3,552,229.00	295,562.31 3,545,729.00	6,500.00
L79	295,462.31 3,552,229.00	295,462.31 3,545,729.00	6,500.00
L80	295,362.31 3,552,229.00	295,362.31 3,545,729.00	6,500.00
L81	295,262.31 3,552,229.00	295,262.31 3,545,729.00	6,500.00
L82	295,162.31 3,552,229.00	295,162.31 3,545,729.00	6,500.00

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

BORROW AREA SURVEY LINE TABLE

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
Terrebonne Parish, Louisiana

FENSTERMAKER
C. H. Fenstermaker & Associates, L.L.C.
135 Regency Sq. Lafayette, LA 70508
Ph. 337-237-2200 Fax. 337-232-3299
www.fenstermaker.com

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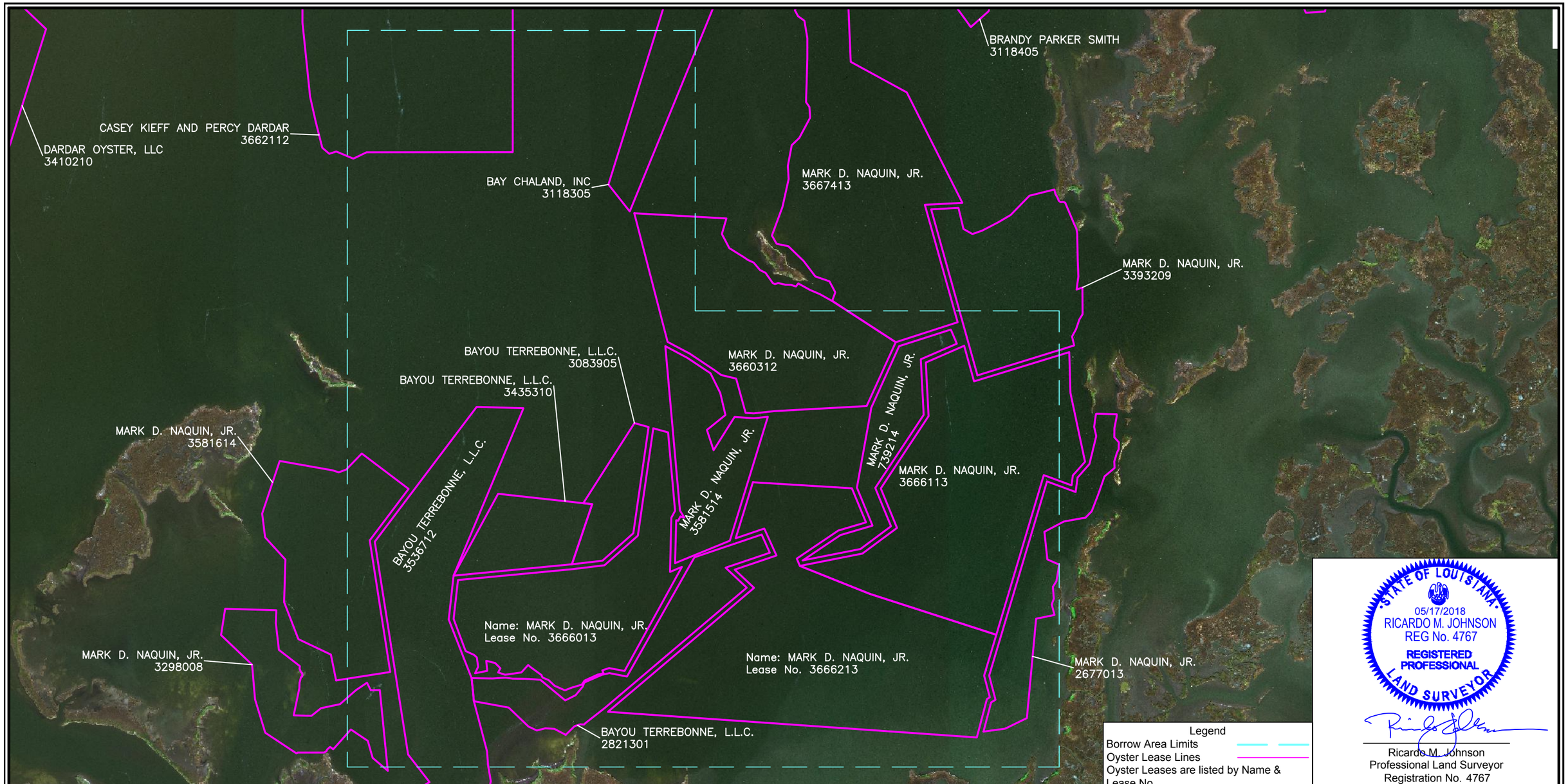
PROJ. MGR.: DA			
DATE: 05/17/2018			
FILENAME: T:\2016\2165051\DWG\FINAL\Borrow Area.dwg			



Legend

Borrow Area Limits

Oyster Lease Lines

Oyster Leases are listed by Name & Lease No.

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Note Concerning The Information On Oyster Leases & Oyster Data.

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NAD XX ZONE XX

Scale: 1" = 1000□

1,000□ 0 500□ 1,000□

Oyster Leases Within Borrow Area

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)

Borrow Area

Lake Tambour Area

Terrebonne Parish, Louisiana

Sheet 69 of 93

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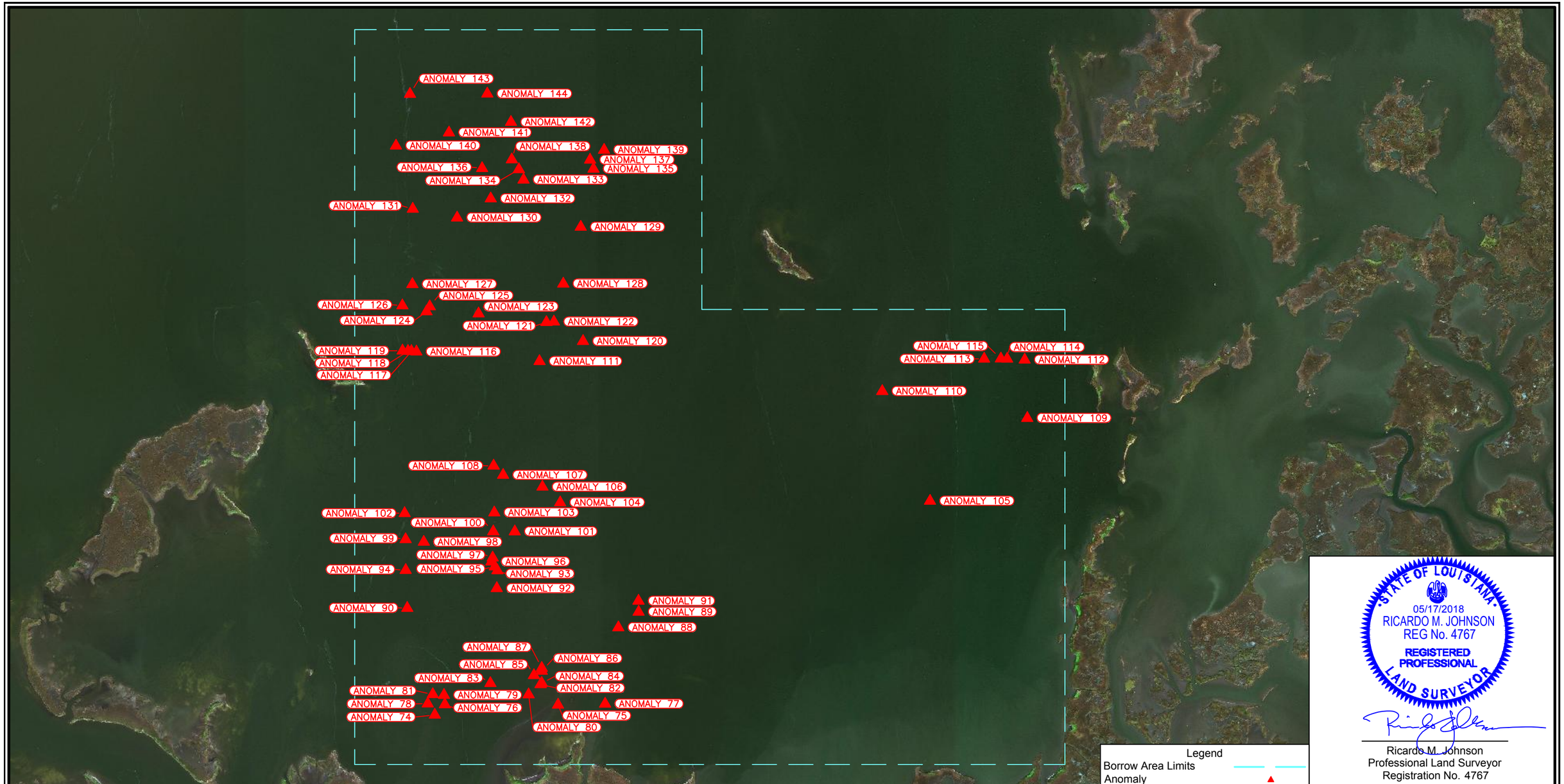
PROJ. MGR.: DA				
DATE: 05/17/2018				

FILENAME: T:\2016\2165051\DWG\BORROW AREA\Ad□Borrow Area Com Rev 020618.dwg



STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
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NAD XX ZONE XX

Scale: 1" = 1000□

1,000□ 0 500□ 1,000□

Anomalies Within Borrow Area

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 70 of 93

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135 Regency Sq. Lafayette, LA 70508
Ph. 337-237-2200 Fax. 337-232-3299
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PROJ. MGR.: DA				
DATE: 05/17/2018				

FILENAME: T:\2016\2165051\DWG\BORROW AREA\Ad□ Borrow Area Com Rev 020618.dwg

Point Table

Anomaly No.	Northing	Easting	Gamma	Duration	Ty□e	Comments
Anomaly 74	295,176.35□	3,546,134.30□	483.4	195.3	483.4	Anomaly Found 16□Water
Anomaly 75	295,280.03□	3,547,401.71□	49.4	57.3	49.4	Nothing Found
Anomaly 76	295,282.65□	3,546,237.74□	66.7	137.9	66.7	Anomaly Found 16□Water
Anomaly 77	295,289.20□	3,547,885.70□	110.6	50.4	110.6	Nothing Found
Anomaly 78	295,291.00□	3,546,061.91□	233.8	211.7	233.8	Anomaly Found 16□Water
Anomaly 79	295,379.54□	3,546,228.50□	77.5	63.1	77.5	Anomaly Found 16□Water
Anomaly 80	295,385.09□	3,547,099.15□	327.5	261.1	327.5	Nothing Found
Anomaly 81	295,388.14□	3,546,113.71□	404.1	104.5	404.1	Anomaly Found 16□Water
Anomaly 82	295,489.21□	3,547,222.21□	51.6	56.8	51.6	Nothing Found
Anomaly 83	295,501.28□	3,546,706.23□	571.2	129.5	571.2	Oyster Bed
Anomaly 84	295,503.32□	3,547,233.94□	227.5	145.5	227.5	Oyster Bed
Anomaly 85	295,582.58□	3,547,153.79□	1830.1	90.6	1830.1	Oyster Bed
Anomaly 86	295,627.54□	3,547,234.89□	3410.1	78.7	3410.1	Oyster Bed
Anomaly 87	295,657.72□	3,547,234.37□	52.4	49.1	52.4	Oyster Bed
Anomaly 88	296,074.87□	3,548,021.91□	190.1	73.2	190.1	Nothing Found
Anomaly 89	296,234.89□	3,548,229.86□	224.3	50	224.3	Nothing Found
Anomaly 90	296,274.88□	3,545,851.06□	240.5	184.5	240.5	Crab Tra□
Anomaly 91	296,347.79□	3,548,229.07□	95	120.1	95	Nothing Found
Anomaly 92	296,477.43□	3,546,772.04□	287.9	341.1	287.9	Nothing Found
Anomaly 93	296,660.68□	3,546,777.71□	471.6	184.7	471.6	Nothing Found
Anomaly 94	296,664.99□	3,545,834.95□	657	83.9	657	Nothing Found
Anomaly 95	296,701.50□	3,546,752.03□	422	129.3	422	Anomaly Found
Anomaly 96	296,751.41□	3,546,717.33□	1177.5	162.4	1177.5	Nothing Found
Anomaly 97	296,793.77□	3,546,729.75□	334.5	142.1	334.5	Nothing Found

Point Table

Anomaly No.	Northing	Easting	Gamma	Duration	Ty□e	Comments
Anomaly 98	296,953.81□	3,546,020.98□	1702.8	21.2	1702.8	Nothing Found
Anomaly 99	296,981.48□	3,545,834.77□	239.9	40.3	239.9	Nothing Found
Anomaly 100	297,061.29□	3,546,735.51□	382.2	72.5	382.2	Crab Tra□s
Anomaly 101	297,061.55□	3,546,956.59□	344.1	120.6	344.1	Crab Tra□s
Anomaly 102	297,249.70□	3,545,824.39□	79.5	33.2	79.5	Nothing Found
Anomaly 103	297,256.62□	3,546,746.18□	797.7	111	797.7	Crab Tra□s
Anomaly 104	297,360.16□	3,547,423.45□	243.5	171.5	243.5	Signal Only
Anomaly 105	297,375.84□	3,551,226.63□	134.4	57.8	134.4	Oyster Bed
Anomaly 106	297,520.71□	3,547,240.90□	74.2	74.8	74.2	Signal Only
Anomaly 107	297,642.53□	3,546,836.79□	8683.3	90.6	8683.3	Anomaly Found Ob□ect on Sea Floor
Anomaly 108	297,737.36□	3,546,739.19□	155.9	206.1	155.9	Anomaly Found Ob□ect on Sea Floor
Anomaly 109	298,228.08□	3,552,226.82□	65.3	87.7	65.3	Nothing Found
Anomaly 110	298,504.74□	3,550,735.65□	274.2	45.8	274.2	Oyster Bed
Anomaly 111	298,812.78□	3,547,211.39□	408.1	44	408.1	Nothing Found
Anomaly 112	298,827.90□	3,552,199.93□	1629.5	38.2	1629.5	Nothing Found
Anomaly 113	298,837.22□	3,551,783.43□	2917.6	164.6	2917.6	Nothing Found
Anomaly 114	298,838.20□	3,552,020.12□	1726.9	40.9	1726.9	Nothing Found
Anomaly 115	298,838.92□	3,551,955.18□	1361.3	55.7	1361.3	Nothing Found
Anomaly 116	298,910.89□	3,545,945.26□	799.3	51.5	799.3	Crab Tra□s
Anomaly 117	298,915.35□	3,545,894.00□	1213.2	50	1213.2	Crab Tra□s
Anomaly 118	298,917.93□	3,545,859.30□	827.9	50.3	827.9	Crab Tra□s
Anomaly 119	298,920.40□	3,545,802.63□	2901	12.9	2901	Crab Tra□s
Anomaly 120	299,019.00□	3,547,658.35□	49.8	56.4	49.8	Nothing Found
Anomaly 121	299,215.16□	3,547,282.14□	75	42	75	Crab Tra□s

Point Table

Anomaly No.	Northing	Easting	Gamma	Duration	Ty□e	Comments
Anomaly 122	299,219.00□	3,547,359.78□	151.3	46.4	151.3	Crab Tra□s
Anomaly 123	299,302.86□	3,546,584.53□	146.6	56.5	146.6	Nothing Found
Anomaly 124	299,324.27□	3,546,049.27□	109.7	41.7	109.7	Nothing Found
Anomaly 125	299,375.48□	3,546,083.00□	59.6	52.5	59.6	Nothing Found
Anomaly 126	299,386.56□	3,545,801.40□	91.8	52.8	91.8	Crab Tra□s
Anomaly 127	299,604.62□	3,545,904.12□	97.3	52.2	97.3	Nothing Found
Anomaly 128	299,610.10□	3,547,455.61□	61.6	119.6	61.6	Nothing Found
Anomaly 129	300,193.87□	3,547,635.32□	45.8	77.3	45.8	Nothing Found
Anomaly 130	300,290.02□	3,546,363.40□	81.5	76.5	81.5	Nothing Found
Anomaly 131	300,379.10□	3,545,907.64□	101.1	50.3	101.1	Crab Tra□s
Anomaly 132	300,485.92□	3,546,709.71□	48.8	52.1	48.8	Crab Tra□s
Anomaly 133	300,679.62□	3,547,046.76□	51.5	69.5	51.5	Nothing Found
Anomaly 134	300,786.48□	3,546,998.79□	65.7	51.9	65.7	Nothing Found
Anomaly 135	300,791.51□	3,547,765.97□	247.4	80.8	247.4	Nothing Found
Anomaly 136	300,798.10□	3,546,621.01□	116.6	29.6	116.6	Crab Tra□s
Anomaly 137	300,884.02□	3,547,731.22□	91.7	104	91.7	Nothing Found
Anomaly 138	300,887.57□	3,546,926.13□	84.5	53	84.5	Nothing Found
Anomaly 139	300,986.37□	3,547,875.16□	129.3	45.4	129.3	Nothing Found
Anomaly 140	301,029.67□	3,545,735.38□	240.8	82.5	240.8	Crab Tra□s
Anomaly 141	301,164.57□	3,546,280.30□	158.1	68.8	158.1	Nothing Found
Anomaly 142	301,271.97□	3,546,918.03□	109.4	53.2	109.4	Crab Tra□s
Anomaly 143	301,561.65□	3,545,879.52□	70.7	72.1	70.7	Nothing Found
Anomaly 144	301,563.50□	3,546,674.70□	355.8	45.2	355.8	Nothing Found

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Anomaly Tables for Borrow Area

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
Terrebonne Parish, Louisiana

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FILENAME: T:\2016\2165051\DWG\FINAL\Borrow Area.dwg

Legend	
Cross Section Lines For Profiles	
Station For Cross Section Lines	00+00
Offline Distance	
+ Right of Line South	+000
- Left of Line North	-000
Reference For Offline Distance	

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
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LAND SURVEYOR

Ricardo M. Johnson
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Borrow Area Survey Results Cross Section Lines (Sheets 73-93)

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 72 of 93

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Ph. 337-237-2200 Fax. 337-232-3299
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Vertical Scale = 10
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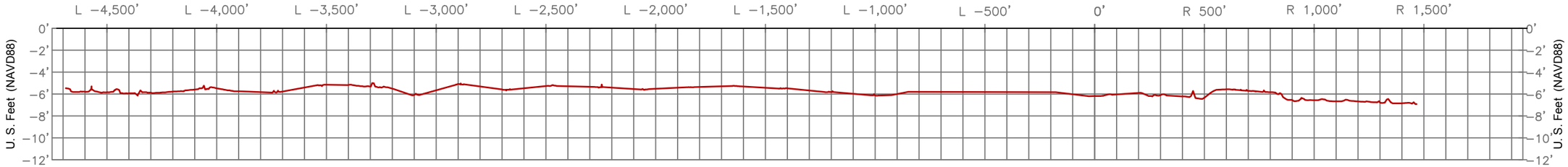

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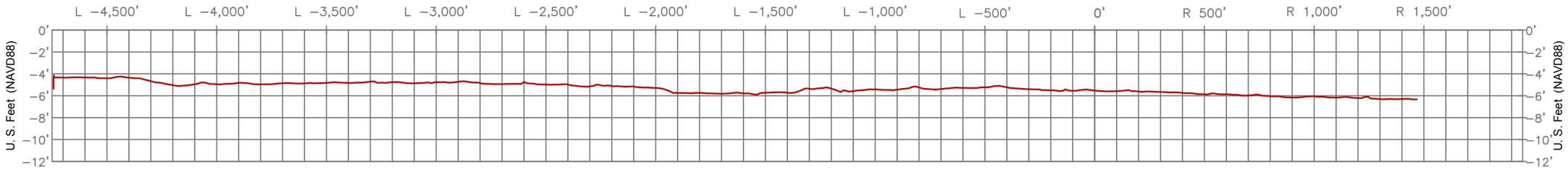

Cross Section STA. 2+00
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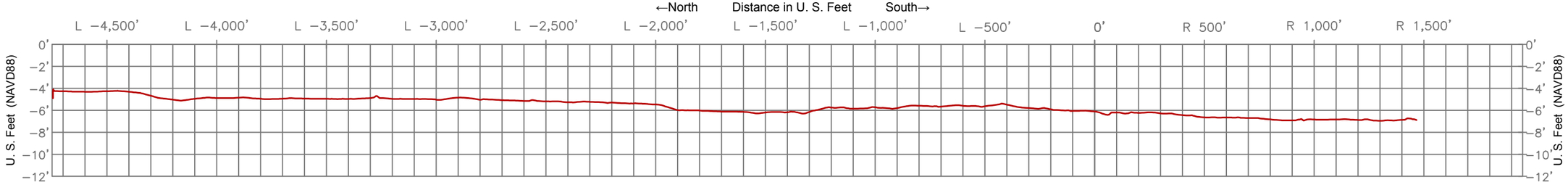
Vertical Scale = 10
←North Distance in U. S. Feet South→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 0+00-2+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 73 of 93

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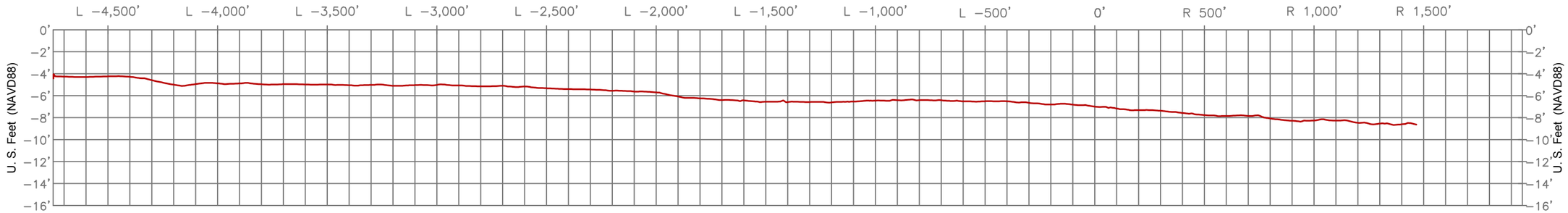
DATE: 05/17/2018			

FILENAME: T:\2016\2165051\DWG\FINAL\Borrow Area.dwg

Cross Section STA. 3+00
Horizontal Scale = 500
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 4+00
Horizontal Scale = 500
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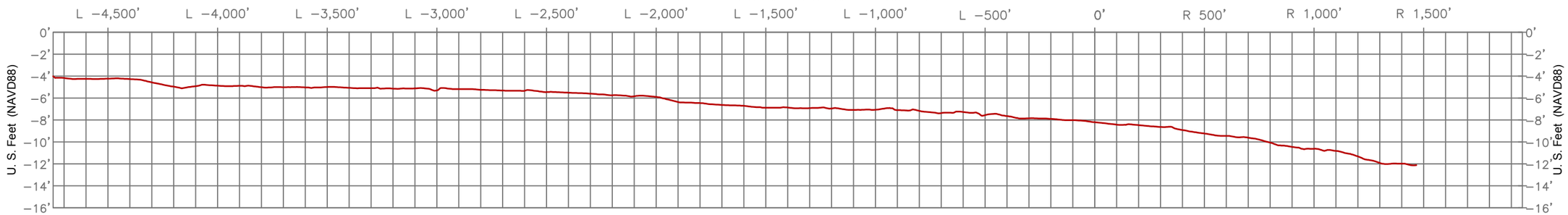
←North Distance in U. S. Feet South→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 3+00-4+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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Cross Section STA. 5+00
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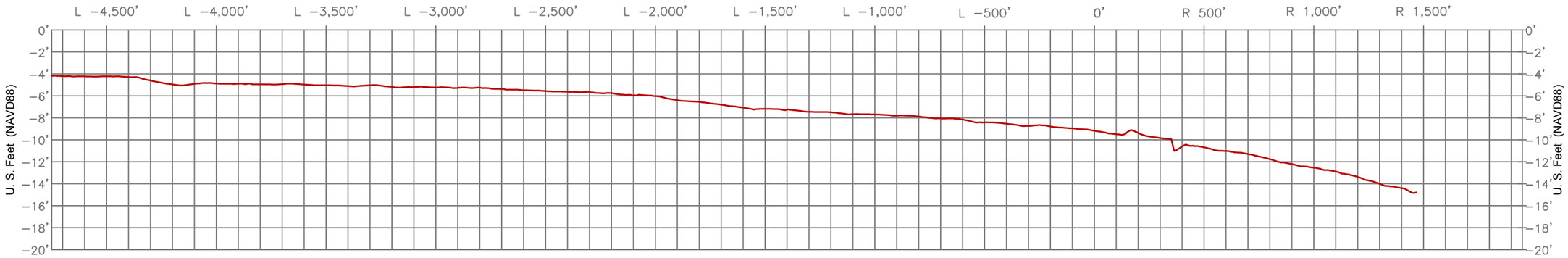
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 6+00
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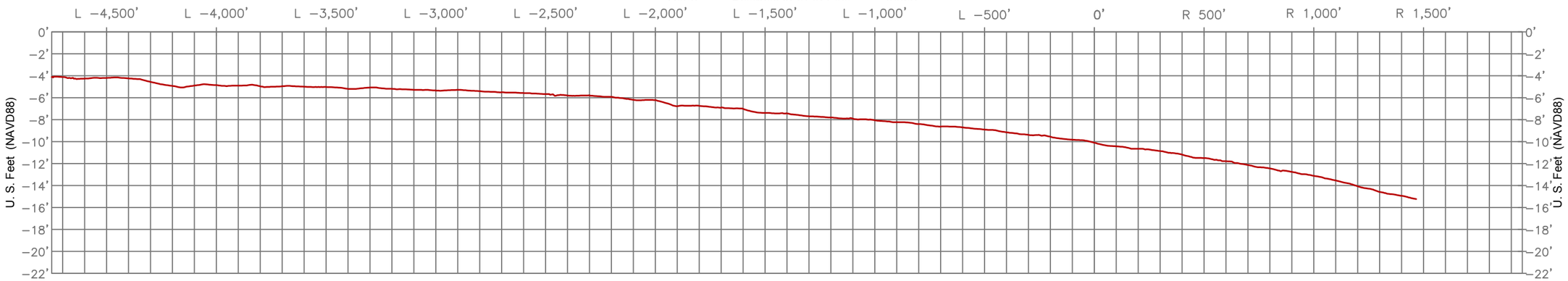
Vertical Scale = 10
←North Distance in U. S. Feet South→



Legend
Water Bottoms

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05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 5+00-6+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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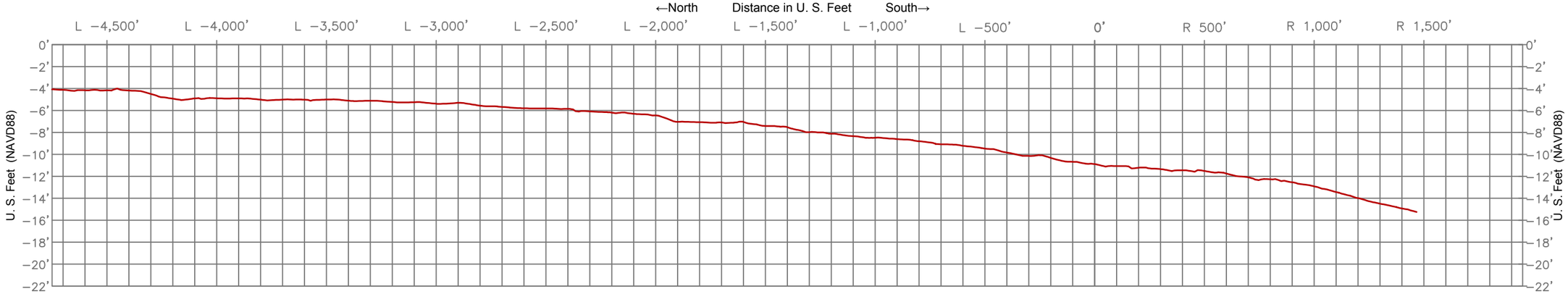
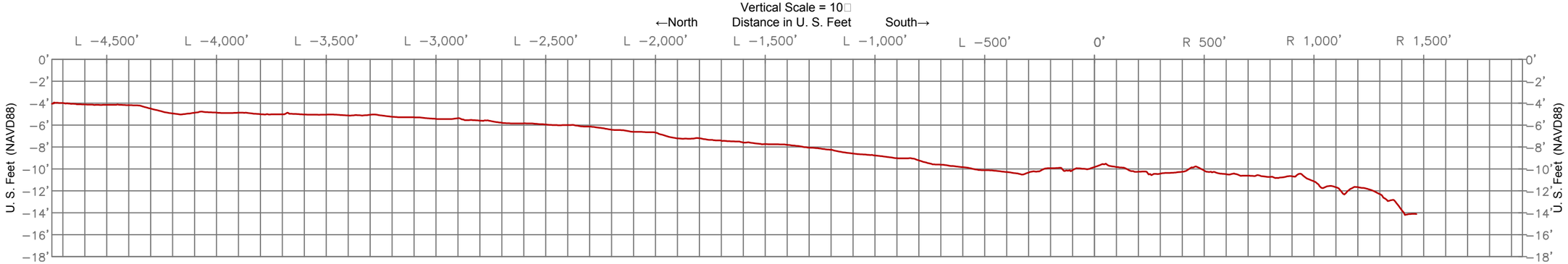
Cross Section □ STA. 7+00
Horizontal Scale = 500□
Vertical Scale = 10□



Cross Section □ STA. 8+00
Horizontal Scale = 500□
Vertical Scale = 10□



Legend
Water Bottoms

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05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 7+00-8+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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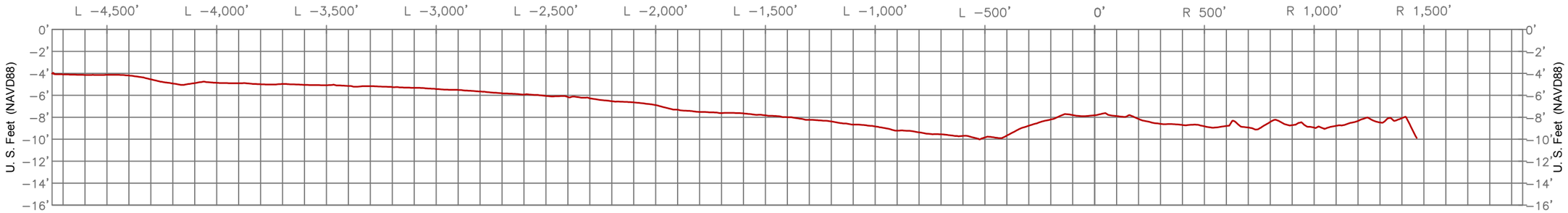
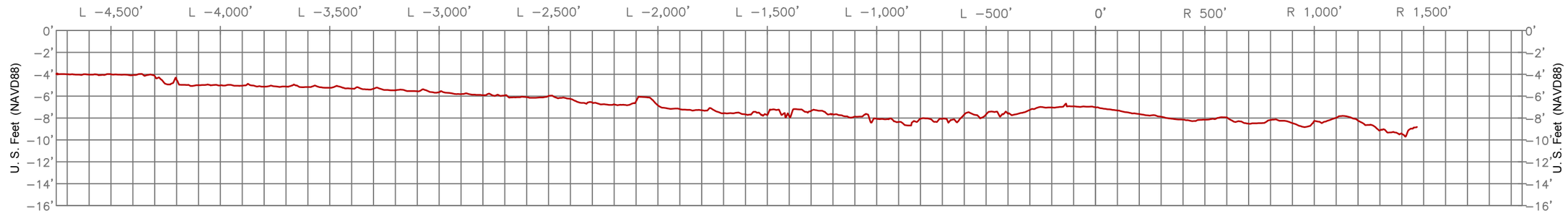
Cross Section STA. 9+00
Horizontal Scale = 500
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 10+00
Horizontal Scale = 500
Vertical Scale = 10
←North Distance in U. S. Feet South→



Legend
Water Bottoms

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05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
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Registration No. 4767

Profile Views For Borrow Area At Stations 9+00-10+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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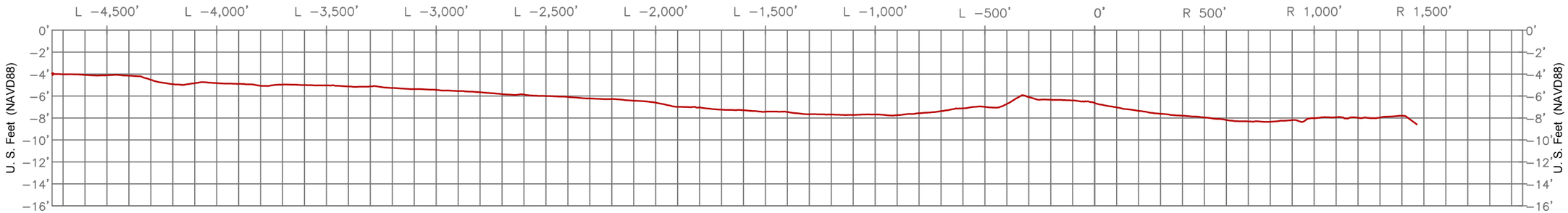
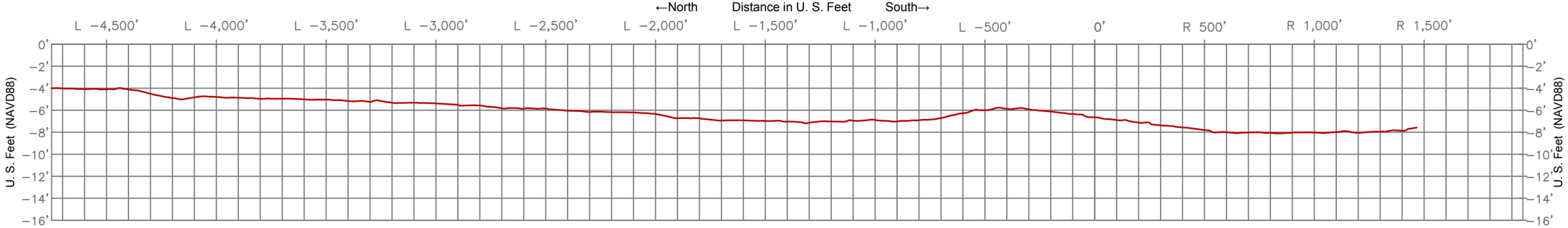
Cross Section STA. 11+00
Horizontal Scale = 500
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 12+00
Horizontal Scale = 500
Vertical Scale = 10
←North Distance in U. S. Feet South→



Legend
Water Bottoms

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05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 11+00-12+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
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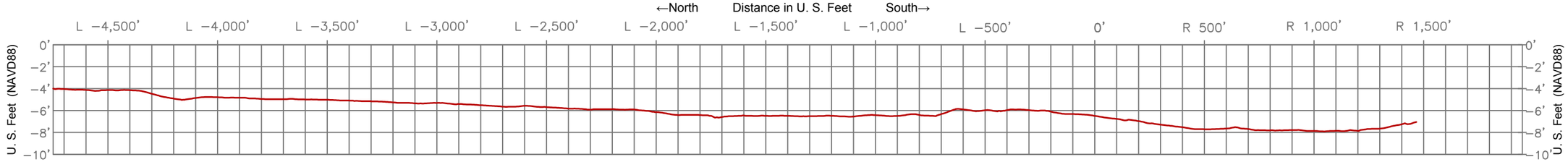
Cross Section STA. 13+00
Horizontal Scale = 500
Vertical Scale = 10



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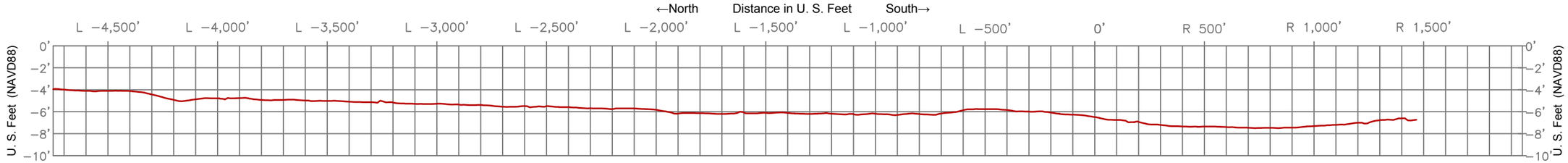
Horizontal Scale = 500
Vertical Scale = 10



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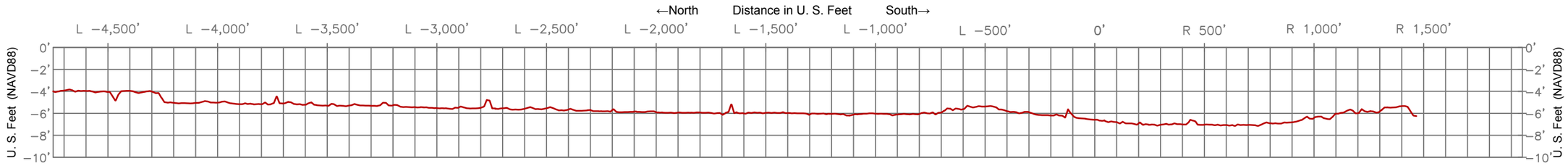
Vertical Scale = 10



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 13+00-15+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
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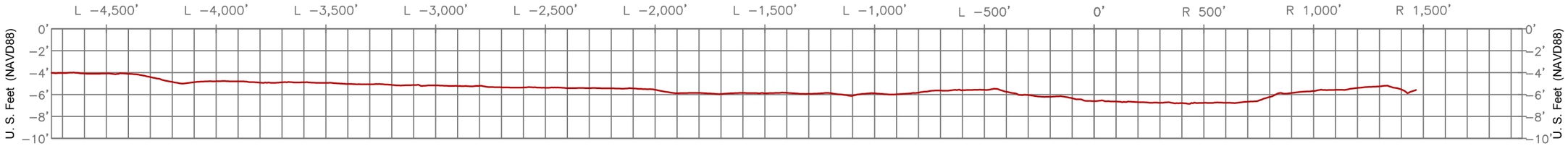
Cross Section STA. 16+00
Horizontal Scale = 500
Vertical Scale = 10
←North Distance in U. S. Feet South→



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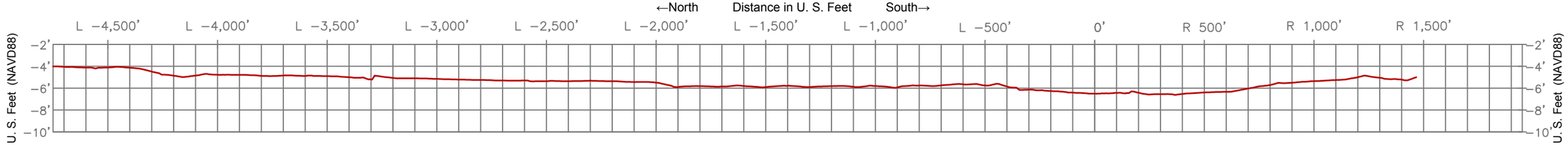
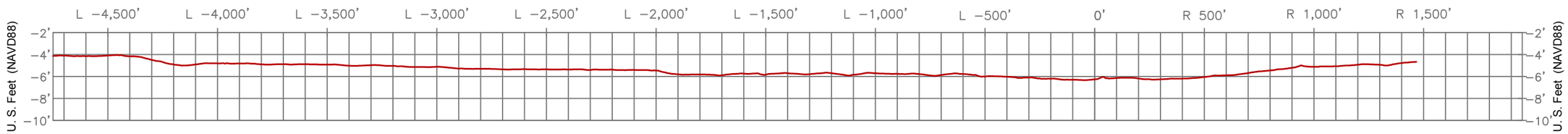
Horizontal Scale = 500
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 18+00
Horizontal Scale = 500
Vertical Scale = 10
←North Distance in U. S. Feet South→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 16+00-18+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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Lake Tambour Area
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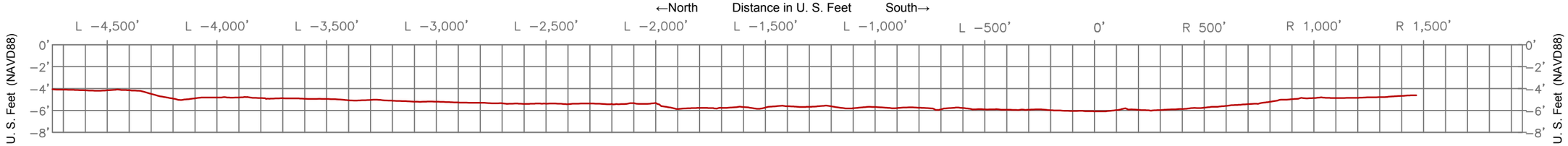
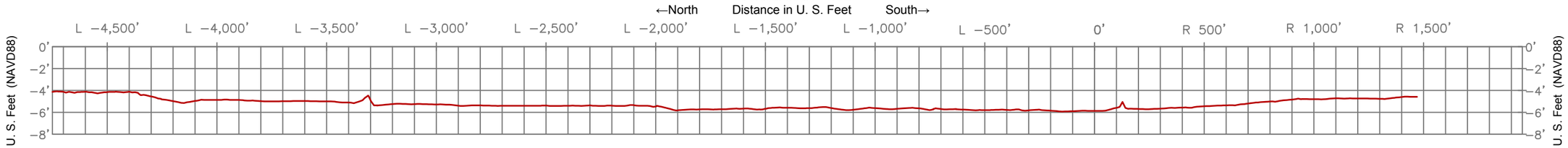
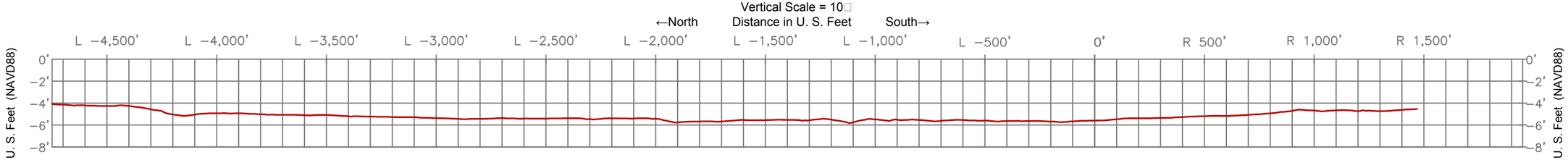
Cross Section □ STA. 19+00
Horizontal Scale = 500□
Vertical Scale = 10□



Cross Section □ STA. 20+00
Horizontal Scale = 500□
Vertical Scale = 10□



Cross Section □ STA. 21+00
Horizontal Scale = 500□
Vertical Scale = 10□



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
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REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 19+00-21+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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Lake Tambour Area
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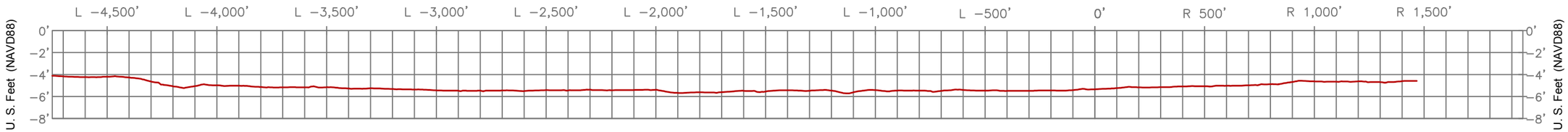
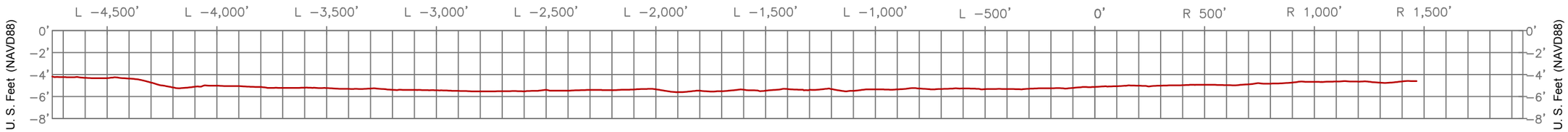
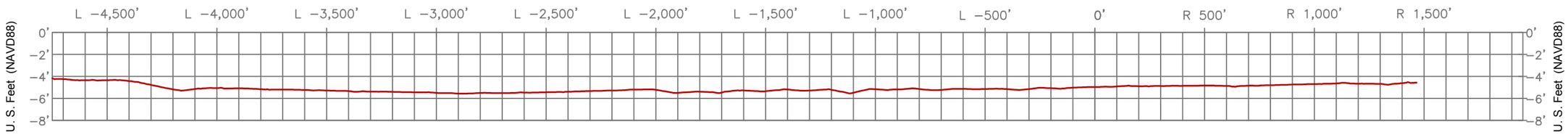
Cross Section STA. 22+00
Horizontal Scale = 500
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 23+00
Horizontal Scale = 500
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 24+00
Horizontal Scale = 500
Vertical Scale = 10
←North Distance in U. S. Feet South→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
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REGISTERED PROFESSIONAL LAND SURVEYOR

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Registration No. 4767

Profile Views For Borrow Area At Stations 22+00-24+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
Terrebonne Parish, Louisiana

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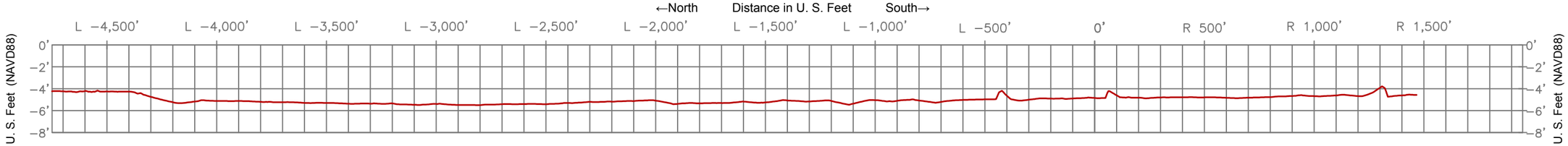
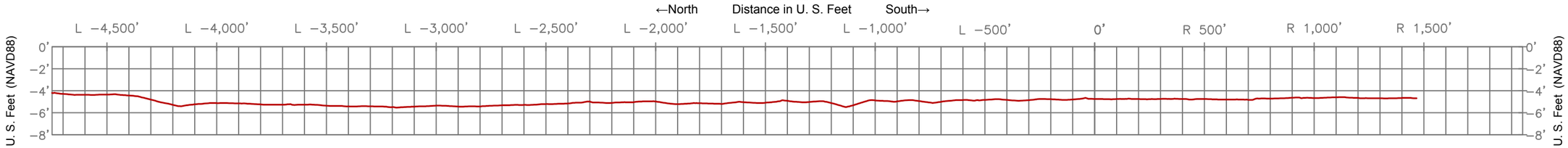
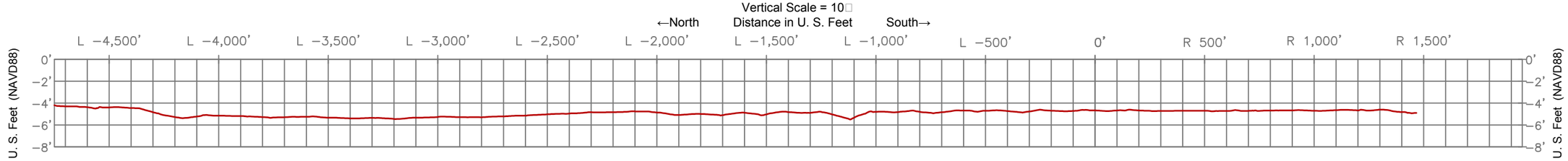
Cross Section STA. 25+00
Horizontal Scale = 500
Vertical Scale = 10



Cross Section STA. 26+00
Horizontal Scale = 500
Vertical Scale = 10



Cross Section STA. 27+00
Horizontal Scale = 500
Vertical Scale = 10



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
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Profile Views For Borrow Area At Stations 25+00-27+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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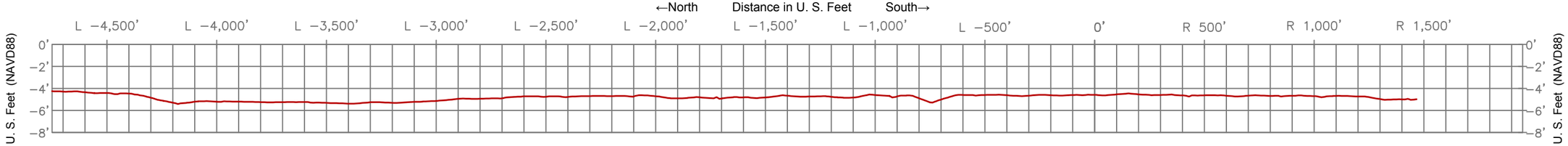
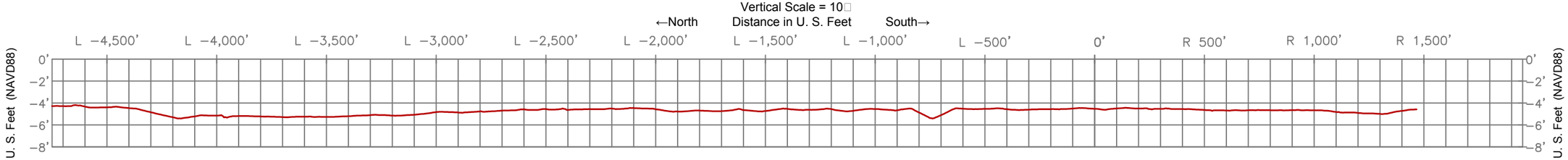
Cross Section □ STA. 28+00
Horizontal Scale = 500□
Vertical Scale = 10□



Cross Section □ STA. 29+00
Horizontal Scale = 500□
Vertical Scale = 10□



Legend
Water Bottoms

STATE OF LOUISIANA
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Profile Views For Borrow Area At Stations 28+00-29+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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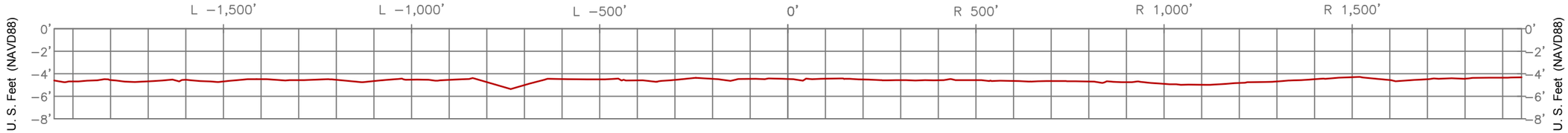
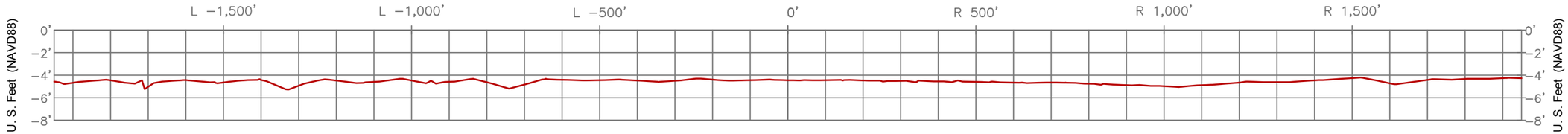
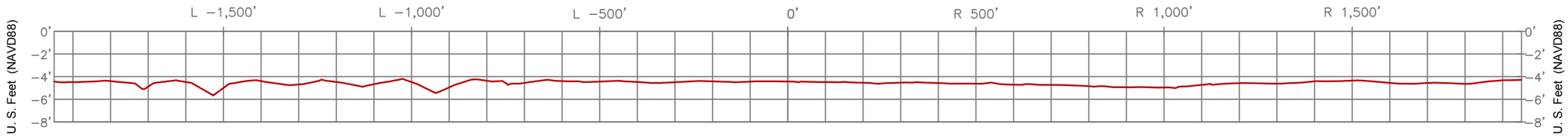
Cross Section STA. 30+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



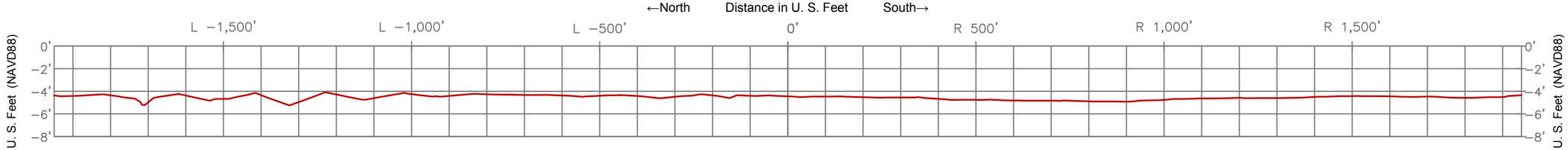
Cross Section STA. 31+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 32+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 33+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 30+00-33+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
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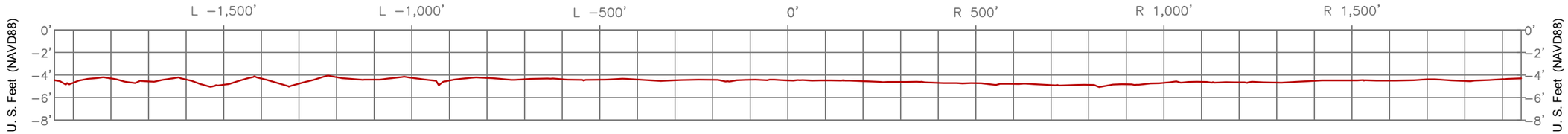
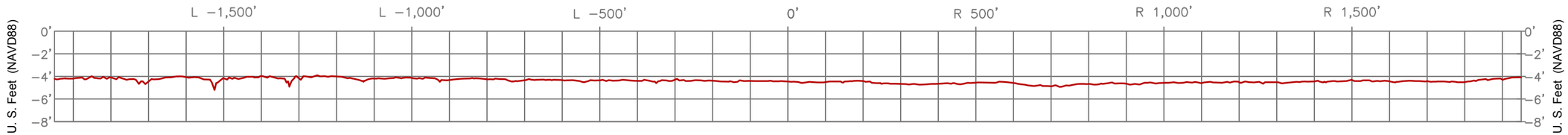
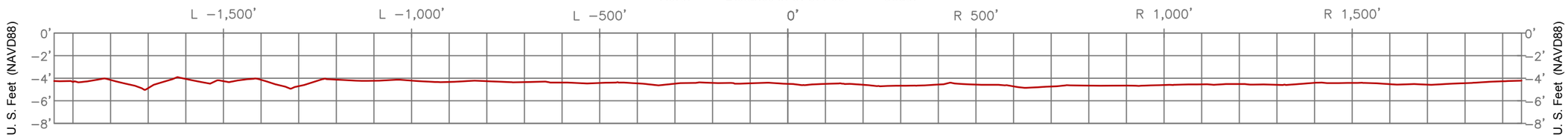
Cross Section STA. 34+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



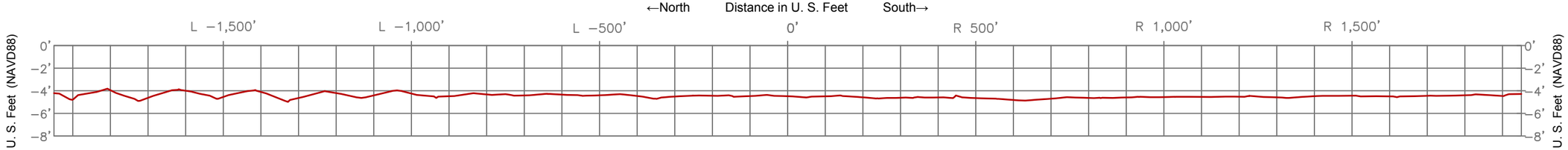
Cross Section STA. 35+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 36+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 37+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 34+00-37+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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Lake Tambour Area
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PROJ. MGR.: DA				
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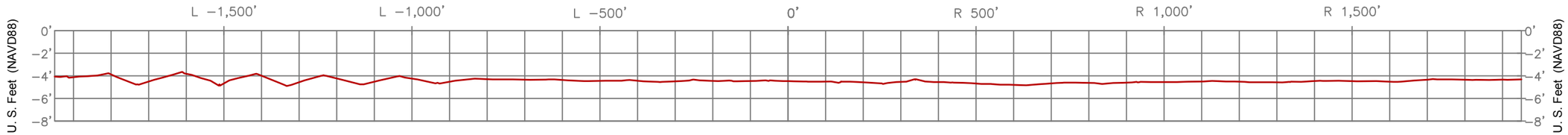
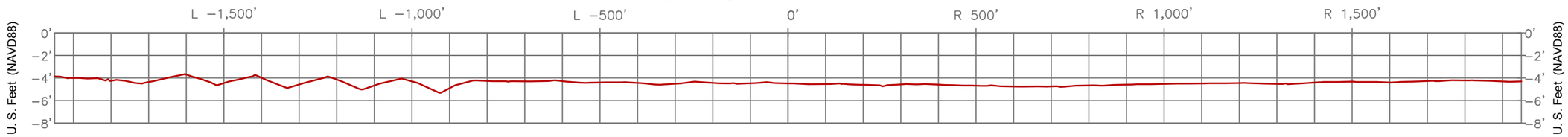
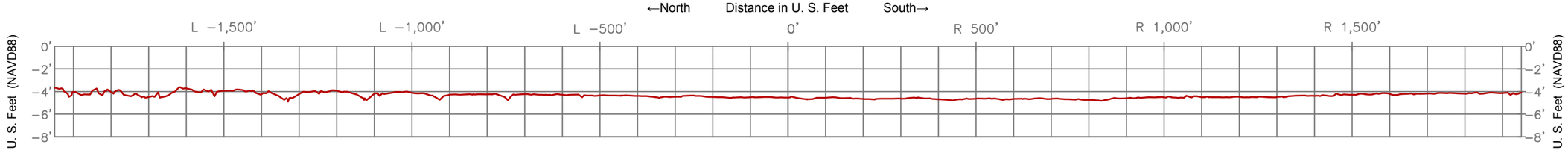
Cross Section STA. 38+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



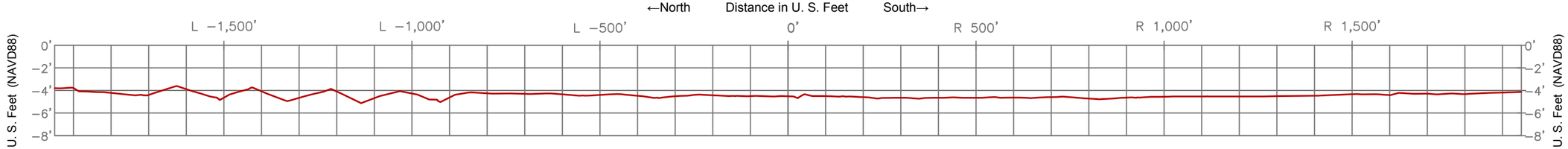
Cross Section STA. 39+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 40+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 41+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 38+00-41+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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Terrebonne Parish, Louisiana

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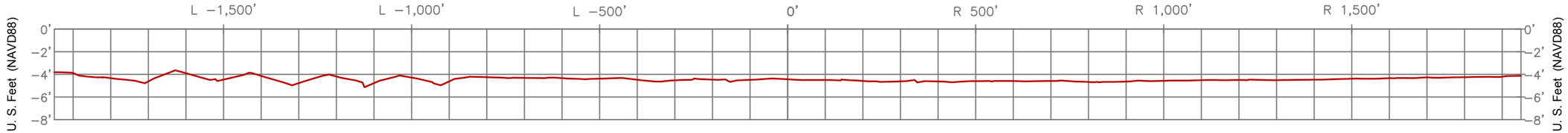
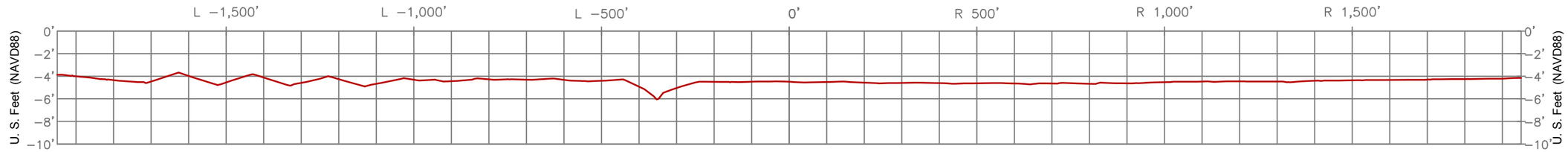
Cross Section STA. 42+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 43+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 44+00
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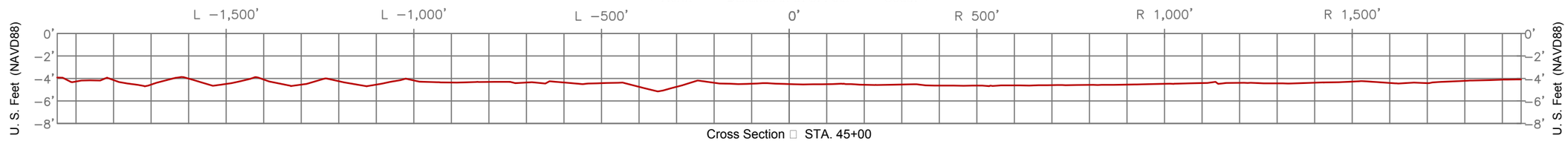
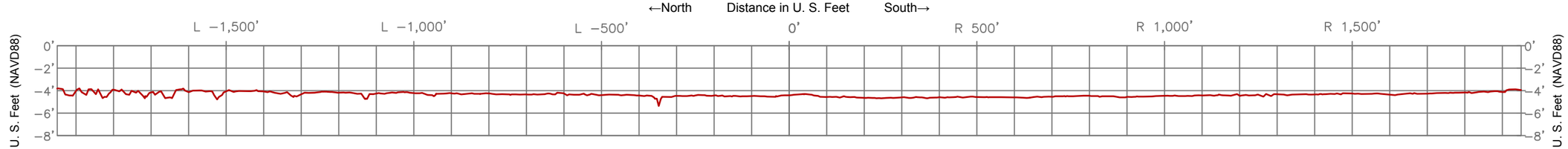
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 45+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 42+00-45+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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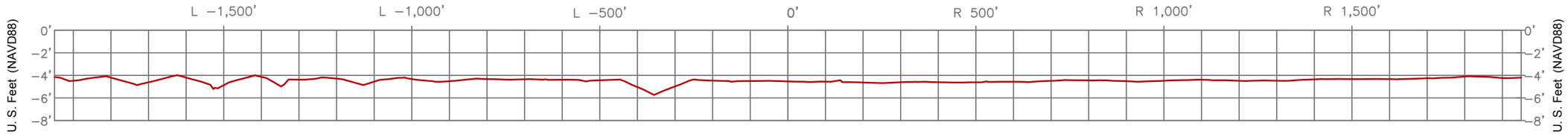
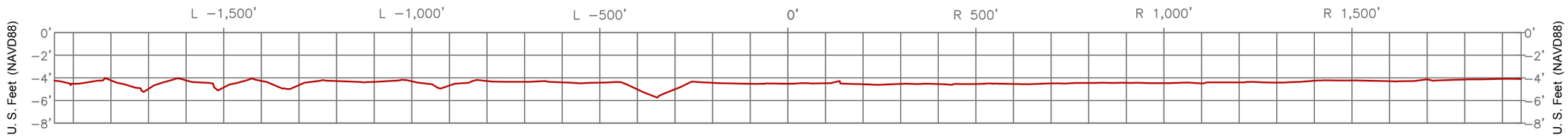
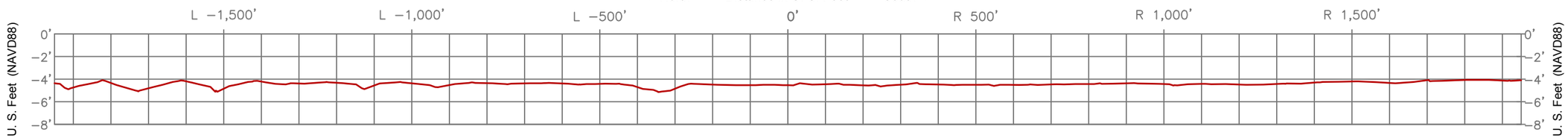
Cross Section STA. 46+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



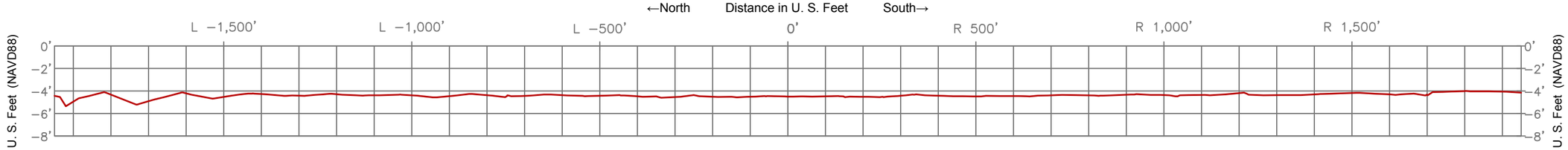
Cross Section STA. 47+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 48+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 49+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 46+00-49+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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Lake Tambour Area
Terrebonne Parish, Louisiana

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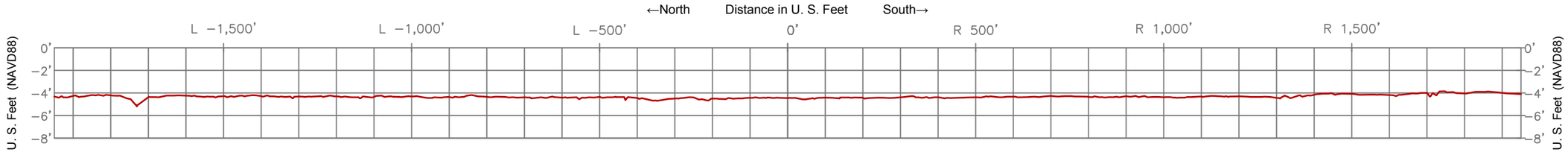
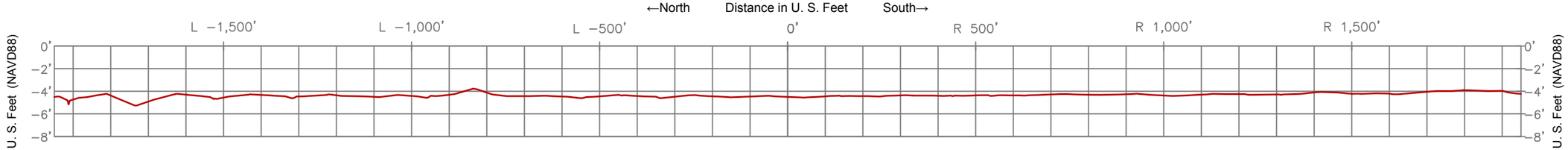
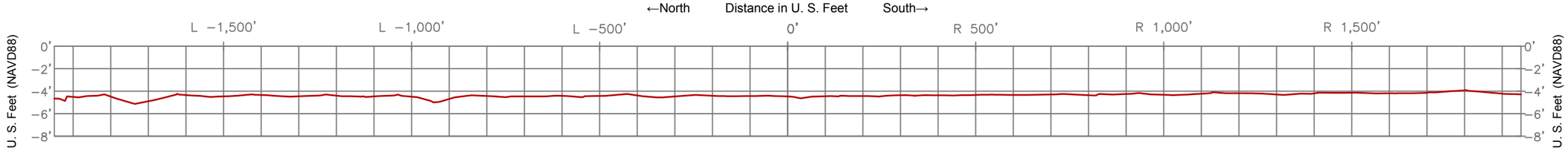
Cross Section □ STA. 50+00
Horizontal Scale = 300□
Vertical Scale = 10□



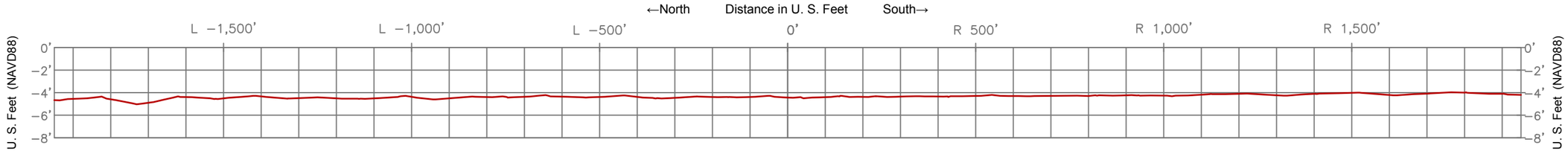
Cross Section □ STA. 51+00
Horizontal Scale = 300□
Vertical Scale = 10□



Cross Section □ STA. 52+00
Horizontal Scale = 300□
Vertical Scale = 10□



Cross Section □ STA. 53+00
Horizontal Scale = 300□
Vertical Scale = 10□



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 50+00-53+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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Lake Tambour Area
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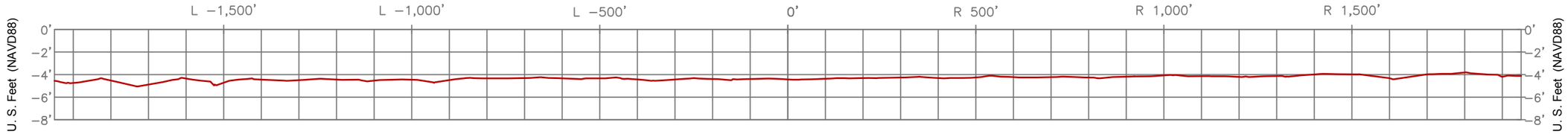
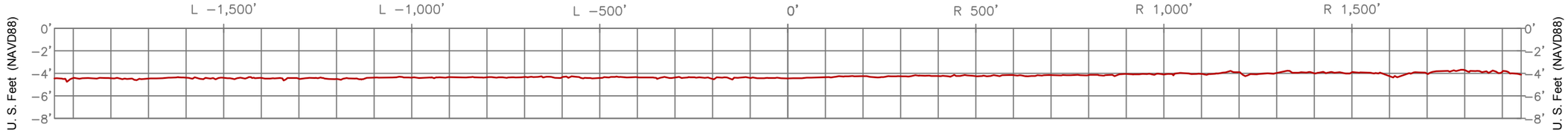
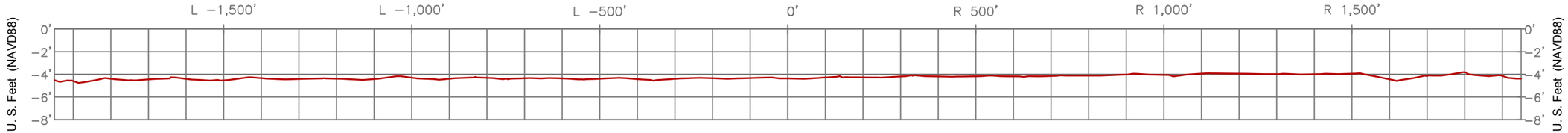
Cross Section STA. 54+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



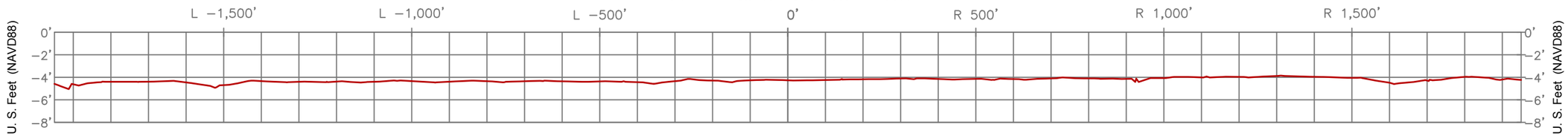
Cross Section STA. 55+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 56+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 57+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4767

Profile Views For Borrow Area At Stations 54+00-57+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
Borrow Area
Lake Tambour Area
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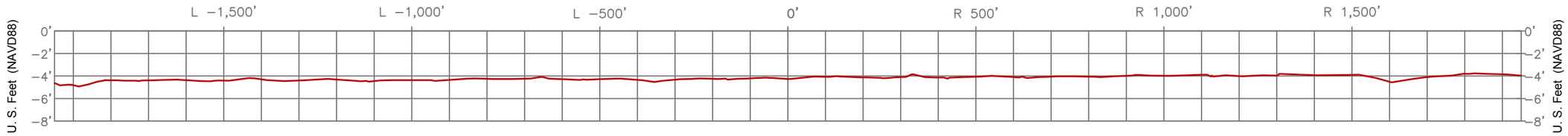
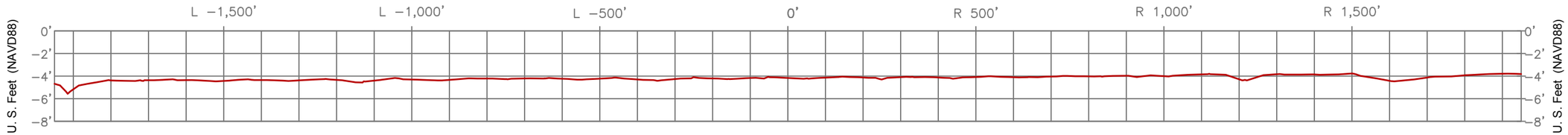
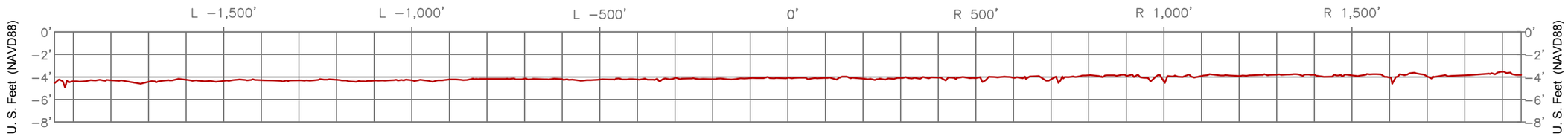
Cross Section STA. 58+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



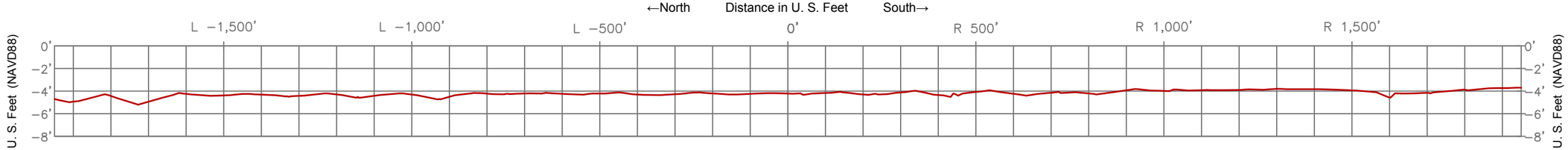
Cross Section STA. 59+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 60+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 61+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
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REGISTERED PROFESSIONAL LAND SURVEYOR

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Profile Views For Borrow Area At Stations 58+00-61+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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Lake Tambour Area
Terrebonne Parish, Louisiana

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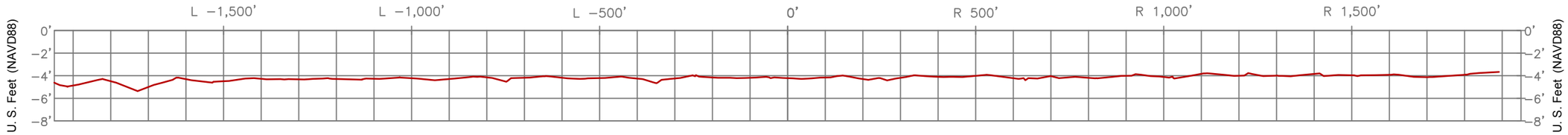
Cross Section STA. 62+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 63+00
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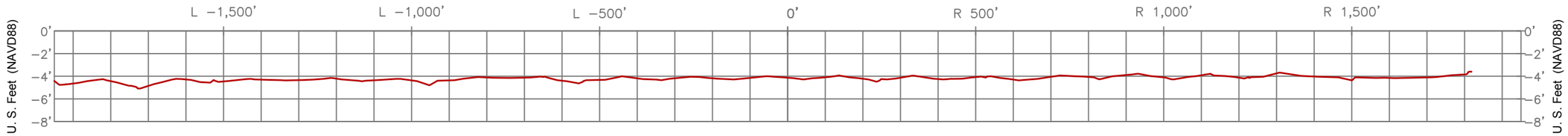
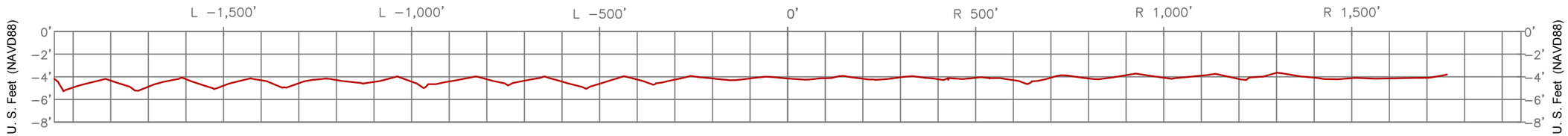
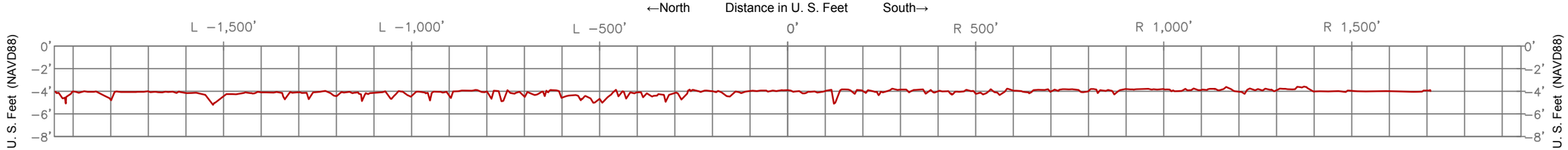
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 64+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Cross Section STA. 65+00
Horizontal Scale = 300
Vertical Scale = 10
←North Distance in U. S. Feet South→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
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REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
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Profile Views For Borrow Area At Stations 62+00-65+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment (TE-117)
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Lake Tambour Area
Terrebonne Parish, Louisiana

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2.3) TE-117 Phase 2 Conveyance Corridor and North Access Maps

STATE OF LOUISIANA
COASTAL PROTECTION AND RESTORATION AUTHORITY

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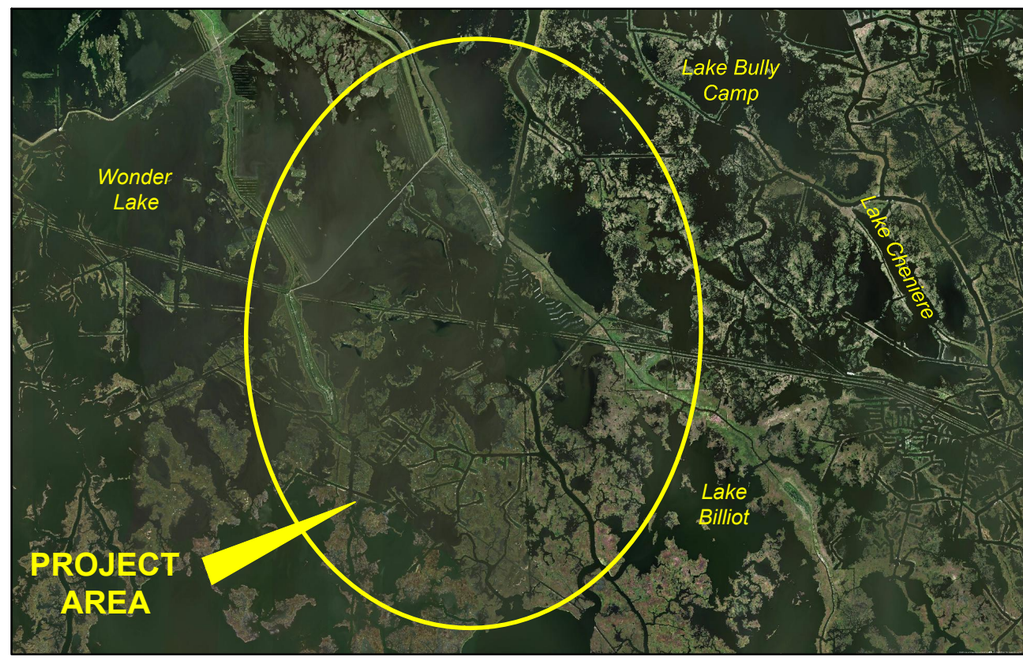
CONVEYANCE CORRIDOR & NORTHERN ACCESS SURVEY
IN SUPPORT OF:
ISLAND ROAD MARSH CREATION AND NOURISHMENT PHASE II
TE-117
TERREBONNE PARISH, LOUISIANA

INDE□ TO SHEETS

SHEET NO.	DESCRIPTION
1	Title Sheet
2	Project Overview
3	Sheet Index for Conveyance Corridor Survey
4	Sheet Index for North Access Survey
5	Project Control
6 - 10	Conveyance Corridor Survey Lines
11 - 13	Conveyance Corridor Survey Line and Coordinate Tables
14 - 16	Conveyance Corridor Cross Tie Survey Lines
17	Conveyance Corridor Cross Tie Survey Line and Coordinate Tables
18 - 19	Oyster Leases Within the Conveyance Corridor Area
20 - 47	Conveyance Corridor Survey Results
48 - 49	Oyster Leases Within the North Access Area
50 - 53	North Access Survey Lines
54	North Access Survey Line and Coordinate Table
55 - 70	North Access Survey Results



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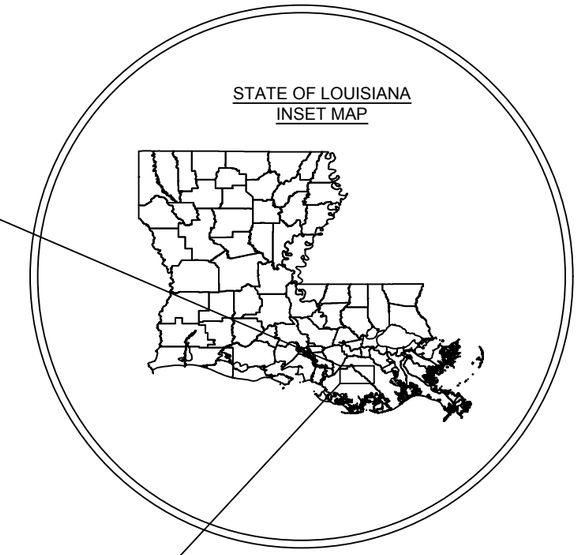

GENERAL NOTE:

1 REFER TO LDNR CONTRACT NO. 2503-15-11□La. Gov Doc. 4400005546.

2 PLANE COORDINATES SHOWN HEREON ARE IN US SURVEY FEET AND ARE RELATIVE TO THE NORTH AMERICAN DATUM OF 1983 (2011) BASED ON THE STATE PLANE COORDINATE SYSTEM FOR LOUISIANA SOUTH □ONE. (1702).

3 ELEVATIONS ARE IN FEET AND TENTHS AND REFER TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88) Geoid 12B.

4 TOPOGRAPHIC AND HYDROGRAPHIC POSITIONS OBTAINED USING A COMBINATION OF GULFNET VIRTUAL REAL TIME NETWOR□ (VRS) AND REAL TIME □INEMATIC (RT□).

5 THE ACCESS AND CONVEYANCE CORRIDOR WAS PERFORMED BY C.H. FENSTERMA□ER & ASSOCIATES, L.L.C. IN JANUARY AND FEBRUARY 2017.

6 THE INFORMATION DEPICTED ON THIS MAP REPRESENTS THE RESULTS OF SURVEYS MADE ON THE DATE INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS E□ISTING AT THE TIME.

7 REFER TO C.H. FENSTERMA□ER & ASSOCIATES, L.L.C. SURVEY REPORT PREPARED ON 05/15/2018.

8 AERIAL IMAGERY: EARTHSTAR GEOGRAPHICS, YEAR OF DATA AC□UISITION PRIMARILY YEARS 2014 AND 2015 A FEW SCENES FROM 2013 htt□://www.teracolor.net/datas□ecs.html

NAD 83 HARN LOUISIANA SOUTH

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No.4767

TITLE SHEET

COASTAL PROTECTION AND RESTORATION AUTHORITY
Northern Access & Conveyance Corridor
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 1 of 70

FENSTERMAKER
C. H. Fenstermaker & Associates, L.L.C.
135 Regency Sq. Lafayette, LA 70508
Ph. 337-237-2200 Fax. 337-232-3299
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NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 5,000

5,000 0 2,500 5,000

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Project OverView Conveyance Corridor and North Access

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 2 of 70

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Conveyance Corridor Survey Lines

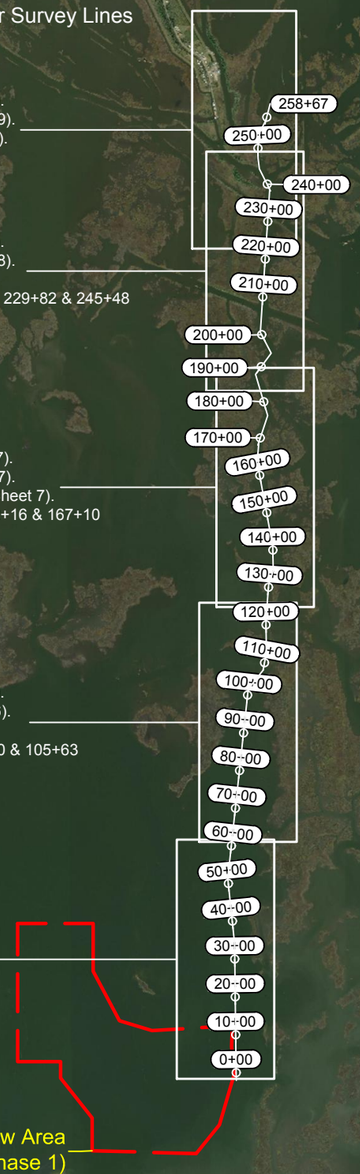
Sheet 10: Conveyance Corridor Survey Lines:
West Line Stations 247+79-259+27 (Continued from Sheet 9).
Center Line Stations 247+30-258+67 (Continued from Sheet 9).
East Line Stations 1247+47-258+76 (Continued from Sheet 9).
Sheet 16: Cross Tie Lines Stations 258+33
Sheet 19: Oyster Leases

Sheet 9: Conveyance Corridor Survey Lines:
West Line Stations 188+52-247+79 (Continued from Sheet 8).
Center Line Stations 187+59-247+30 (Continued from Sheet 8).
East Line Stations 187+54-247+47(Continued from Sheet 8).
Sheet 16: Cross Tie Lines Stations 182+97, 200+48, 215+15, 229+82 & 245+48
Sheet 19: Oyster Leases

Sheet 8: Conveyance Corridor Survey Lines
West Line Stations 122+127-188+52 (Continued from Sheet 7).
Center Line Stations 121+35-187+59 (Continued from Sheet 7).
East Access Line Stations 121+00-187+54 (Continued from Sheet 7).
Sheet 14 &15: Cross Tie Lines Stations 121+56, 135+79, 152+16 & 167+10
Sheet 18 & 19: Oyster Leases

Sheet 7: Conveyance Corridor Survey Lines
West Line Stations 51+71-122+127 (Continued from Sheet 6).
Center Line Stations 51+36-121+35 (Continued from Sheet 6).
East Line Stations 51+14-121+00 (Continued from Sheet 6).
Sheet 14 & 15: Cross Tie Lines Stations 60+07, 75+23, 90+00 & 105+63
Sheet 18: Oyster Leases

Sheet 6: Conveyance Corridor Survey Lines
West Line Stations 0+00-51+71.
Center Line Stations 0+00-51+36.
East Line Stations 0+00-51+14.
Sheet 14: Cross Tie Lines Stations 14+91,29+81 & 44+98
Sheet 18: Oyster Leases



Conveyance Corridor Survey Results

Sheet 44: Survey Results, S□ot Water Bottom Elevations, To□o & Contour Lines for West Line, Center Line & East Line Stations 240+00-260+00, Cross Tie Lines at Stations 229+82, 245+48 & 258+33.
Sheet 45: Magnetometer Anomalies, To□o & Contour Lines for, West Line, Center Line & East Line Stations 240+00-260+00, Cross Tie Lines at Stations 229+82, 245+48 & 258+33.
Sheet 46:Water Bottom Profiles for West Line, Center Line & East Line Stations 240+00-260+00.
Sheet 47: Water Bottom Profiles for Cross Tie Lines at Stations 229+82 (Sheet 43), 245+48 & 258+33. Magnetometer Results for Stations 240+00-260+00.

Sheet 40: Survey Results, S□ot Water Bottom Elevations, To□o & Contour Lines for West Line, Center Line & East Line Stations 200+00-240+00, Cross Tie Lines at Stations 200+78, 215+15 & 229+82.
Sheet 41: Magnetometer Anomalies, To□o & Contour Lines for West Line, Center Line & East Line Stations 200+00-240+00, Cross Tie Lines at Stations 200+48, 215+15 & 229+82.
Sheet 42: Water Bottom Profiles for West Line, Center Line & East Line Stations 200+00-240+00.
Sheet 43: Water Bottom Profiles for Cross Tie Lines at Stations 200+48 (Sheet 39), 215+15 & 229+82, Magnetometer Results for Stations 200+00-240+00.

Sheet 36: Survey Results, S□ot Water Bottom Elevations, To□o & Contour Lines for West Line, Center Line & East Line Stations 160+00-200+00, Cross Tie Lines at Stations 167+10, 182+97 & 200+48.
Sheet 37: Magnetometer Anomalies, To□o & Contour Lines for West Line, Center Line & East Line Stations 160+00-200+00, Cross Tie Lines at Stations 167+10, 182+97 & 200+48.
Sheet 38: Water Bottom Profiles for West Line, Center Line & East Line Stations 160+00-200+00.
Sheet 39: Water Bottom Profiles for Cross Tie Lines at Stations 167+10, 182+97 & 200+48, Magnetometer Results for Stations 167+10, 182+97 & 200+48.

Sheet 32: Survey Results, S□ot Water Bottom Elevations, To□o & Contour Lines for West Line, Center Line & East Line Stations 120+00-160+00, Cross Tie Lines at Stations 121+56, 135+79 & 152+16.
Sheet 33: Magnetometer Anomalies, To□o & Contour Lines for West Line, Center Line & East Line Stations 120+00-160+00, Cross Tie Lines at Stations 121+56, 135+79 & 152+16.
Sheet 34: Water Bottom Profiles for West Line, Center Line & East Line Stations 120+00-160+00.
Sheet 35: Water Bottom Profiles for Cross Tie Lines at Stations 121+56 (Sheet 31), 135+79 & 152+16,Magnetometer Results for Stations 120+00-160+00.

Sheet 28: Survey Results, S□ot Water Bottom Elevations, To□o & Contour Lines for, West Line, Center Line & East Line Stations 80+00-120+00, Cross Tie Lines at Stations 90+00, 105+63 & 121+56.
Sheet 29: Magnetometer Anomalies, To□o & Contour Lines for West Line, Center Line & East Line Stations 80+00+120+00, Cross Tie Lines at Stations 90+00, 105+63 & 121+56.
Sheet 30: Water Bottom Profiles for West Line, Center Line & East Line Stations 80+00-120+00.
Sheet 31: Water Bottom Profiles for Cross Tie Lines at Stations 90+00, 105+63 & 121+56, Magnetometer Results for Stations 80+00-120+00.

Sheet 24: Survey Results, S□ot Water Bottom Elevations, To□o & Contour Lines for:West Line, Center Line & East Line Stations 40+00-80+00, Cross Tie Lines at Stations 44+98, 60+07 & 75+23.
Sheet 25: Magnetometer Anomalies, To□o & Contour Lines for West Line, Center Line & East Line Stations 40+00-80+00, Cross Tie Lines at Stations 44+98, 60+07 & 75+23.
Sheet 26: Water Bottom Profiles for West Line, Center Line & East Line Stations 40+00-80+00.
Sheet 27: Water Bottom Profiles for Cross Tie Lines at Stations 44+98, 60+07 & 75+23, Magnetometer Results for Stations 40+00-80+00.

Sheet 20: Survey Results: S□ot Water Bottom Elevations, To□o & Contour Lines for: West Line, Center Line & East Line Stations 0+00-40+00, Cross Tie Lines at Stations 14+91 & 29+81.
Sheet 21: Magnetometer Anomalies, To□o & Contour Lines for:West Line, Center Line & East Line Stations 0+00-40+00.
Cross Tie Lines at Stations 14+91 & 29+81.
Sheet 22: Water Bottom Profiles for West Line, Center Line & East Line Stations 0+00-40+00.
Sheet 23: Water Bottom Profiles for Cross Tie Lines at Stations 14+91 & 29+81, Magnetometer Results for Stations 0+00-40+00

Legend
Conveyance Corridor
Borrow Area (Phase 1)

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 4,000□
4,000□ 0 2,000□ 4,000□

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Index to Sheets: Survey Lines & Survey Results Conveyance Corridor

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 3 of 70

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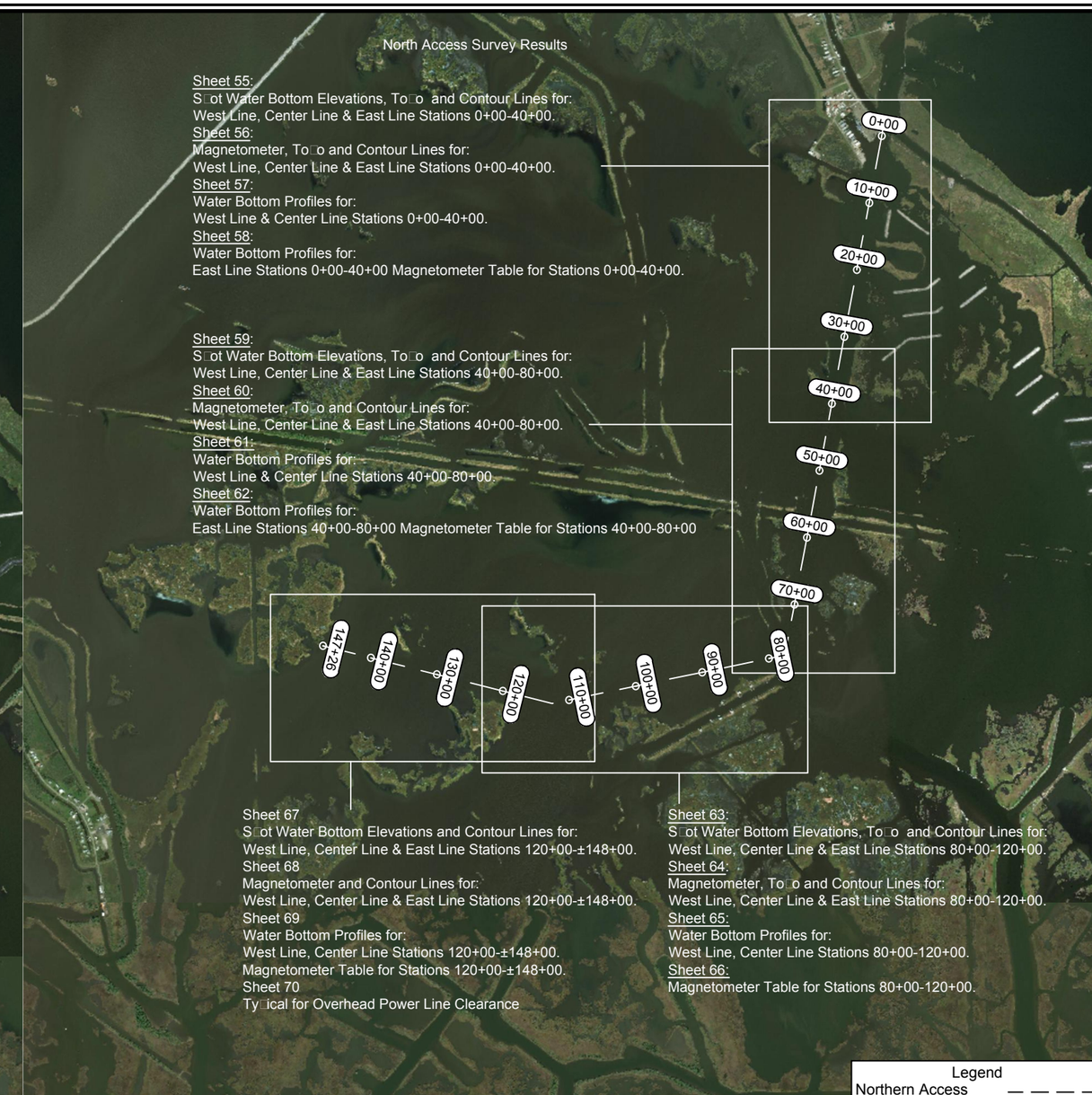
Sheet 5:
Pro ect Control
Sheet 50:
West Access Survey Line Stations 0+00-77+16
(Continued on Sheet 51).
Center Access Survey Line Stations
0+00-75+58 (Continued on Sheet 51).
East Access Survey Line Stations 0+00-77+75
(Continued on sheet 51).

Sheet 48 & 49:
Oyster Leases
Sheet 51:
West Access Survey Line Stations
0+00-77+16 (Continued from Sheet 50).
Center Access Survey Line Stations
0+00-75+58 (Continued from Sheet 50).
East Access Survey Line Stations
0+00-77+75 (Continued from Sheet 50).

Sheet 48 & 49:
Oyster Leases
Sheet 53:
West Access Survey Line Stations 111+58-146+18.
Center Access Survey Line Stations 12+52-147+26.
East Access Survey Line Stations 13+34-148+22.
Sheet 54:
North Access Survey Line Tables for West Line, Center Line & East Line.

Sheet 48 & 49:
Oyster Leases
Sheet 52:
West Access Survey Line Stations 77+16-111+58.
Center Access Survey Line Stations 75+58-12+52.
East Access Survey Line Stations 77+75-13+34.



Sheet 55:
S ot Water Bottom Elevations, To o and Contour Lines for:
West Line, Center Line & East Line Stations 0+00-40+00.
Sheet 56:
Magnetometer, To o and Contour Lines for:
West Line, Center Line & East Line Stations 0+00-40+00.
Sheet 57:
Water Bottom Profiles for:
West Line & Center Line Stations 0+00-40+00.
Sheet 58:
Water Bottom Profiles for:
East Line Stations 0+00-40+00 Magnetometer Table for Stations 0+00-40+00.

Sheet 59:
S ot Water Bottom Elevations, To o and Contour Lines for:
West Line, Center Line & East Line Stations 40+00-80+00.
Sheet 60:
Magnetometer, To o and Contour Lines for:
West Line, Center Line & East Line Stations 40+00-80+00.
Sheet 61:
Water Bottom Profiles for:
West Line & Center Line Stations 40+00-80+00.
Sheet 62:
Water Bottom Profiles for:
East Line Stations 40+00-80+00 Magnetometer Table for Stations 40+00-80+00

Sheet 67
S ot Water Bottom Elevations and Contour Lines for:
West Line, Center Line & East Line Stations 120+00-±148+00.
Sheet 68
Magnetometer and Contour Lines for:
West Line, Center Line & East Line Stations 120+00-±148+00.
Sheet 69
Water Bottom Profiles for:
West Line, Center Line Stations 120+00-±148+00.
Magnetometer Table for Stations 120+00-±148+00.
Sheet 70
Ty ical for Overhead Power Line Clearance

Sheet 63:
S ot Water Bottom Elevations, To o and Contour Lines for:
West Line, Center Line & East Line Stations 80+00-120+00.
Sheet 64:
Magnetometer, To o and Contour Lines for:
West Line, Center Line & East Line Stations 80+00-120+00.
Sheet 65:
Water Bottom Profiles for:
West Line, Center Line Stations 80+00-120+00.
Sheet 66:
Magnetometer Table for Stations 80+00-120+00.

Legend
Northern Access — — — —

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 3000

3,000 0 1,500 3,000

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Index to Sheets: Survey Lines & Survey Results North Access

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 4 of 70

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135 Regency Sq. Lafayette, LA 70508
Ph. 337-237-2200 Fax. 337-232-3299
www.fenstermaker.com

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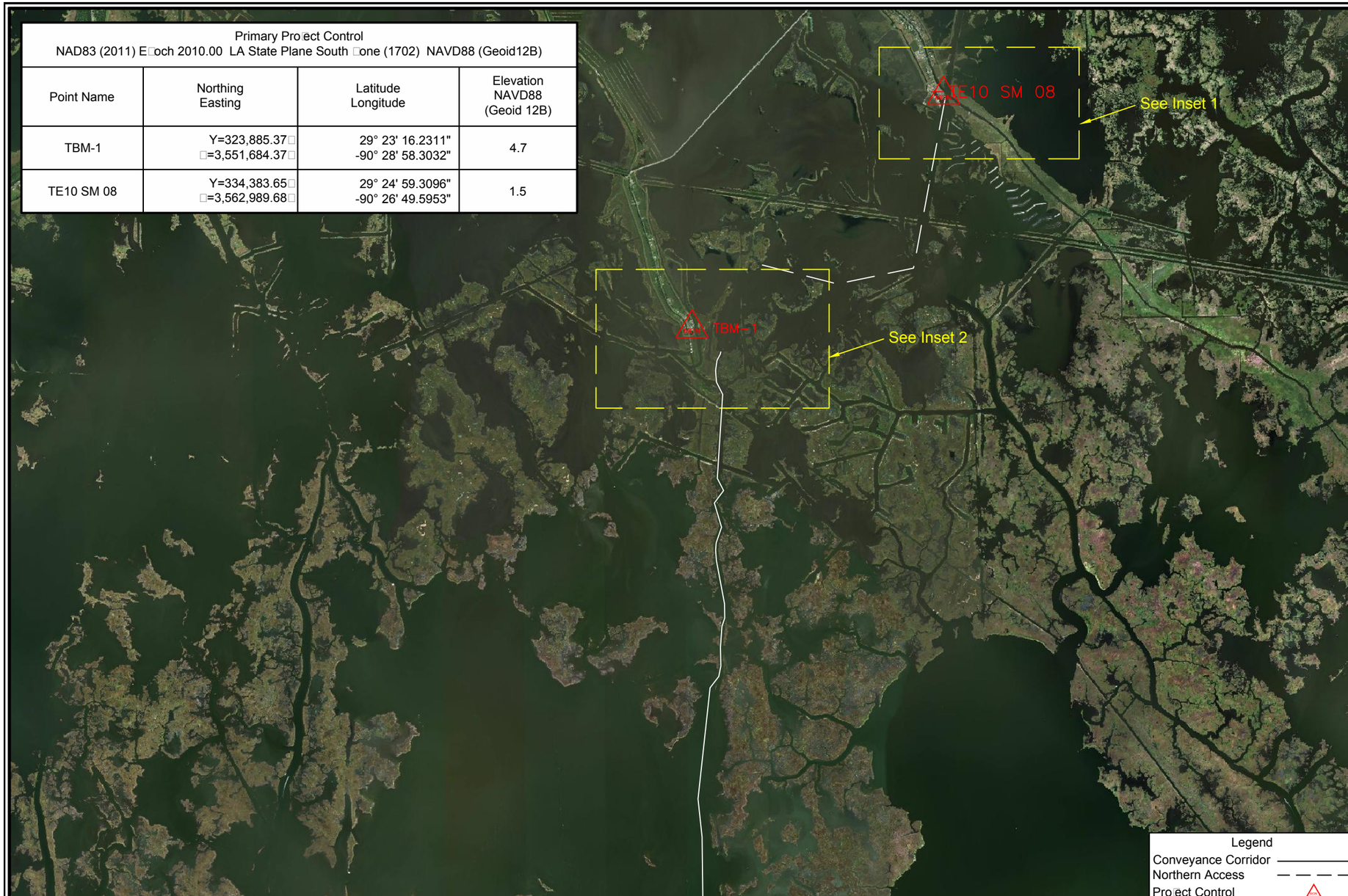
Primary Pro ect Control
NAD83 (2011) E och 2010.00 LA State Plane South one (1702) NAVD88 (Geoid12B)

Point Name	Northing Easting	Latitude Longitude	Elevation NAVD88 (Geoid 12B)
TBM-1	Y=323,885.37 =3,551,684.37	29° 23' 16.2311" -90° 28' 58.3032"	4.7
TE10 SM 08	Y=334,383.65 =3,562,989.68	29° 24' 59.3096" -90° 26' 49.5953"	1.5



From the Junction of Hwy 24 with Hwy 55, travel South on Hwy 55 for 4.25 mi to a Junction with Hwy 665. Turn left on Hwy 665 and travel South for 9.93 miles and the station is on the left. The station is a 2 inch disk in concrete.

Scale 1" = 500

Inset 1

Isle de Jean Charles Marina and the station is on the left. The station is a 80d Nail set in the Southeast corner of the arking lot, a roximately 51 feet Southwest from the Southwest corner of the Marina and 70 feet West from the South end of a bulkhead.

Scale 1" = 500

Inset 2

Legend
Conveyance Corridor
Northern Access
Pro ect Control

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 5,000
5,000 0 2,500 5,000

STATE OF LOUISIANA
05/17/2018
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PROJECT CONTROL

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
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Sheet 5 of 70

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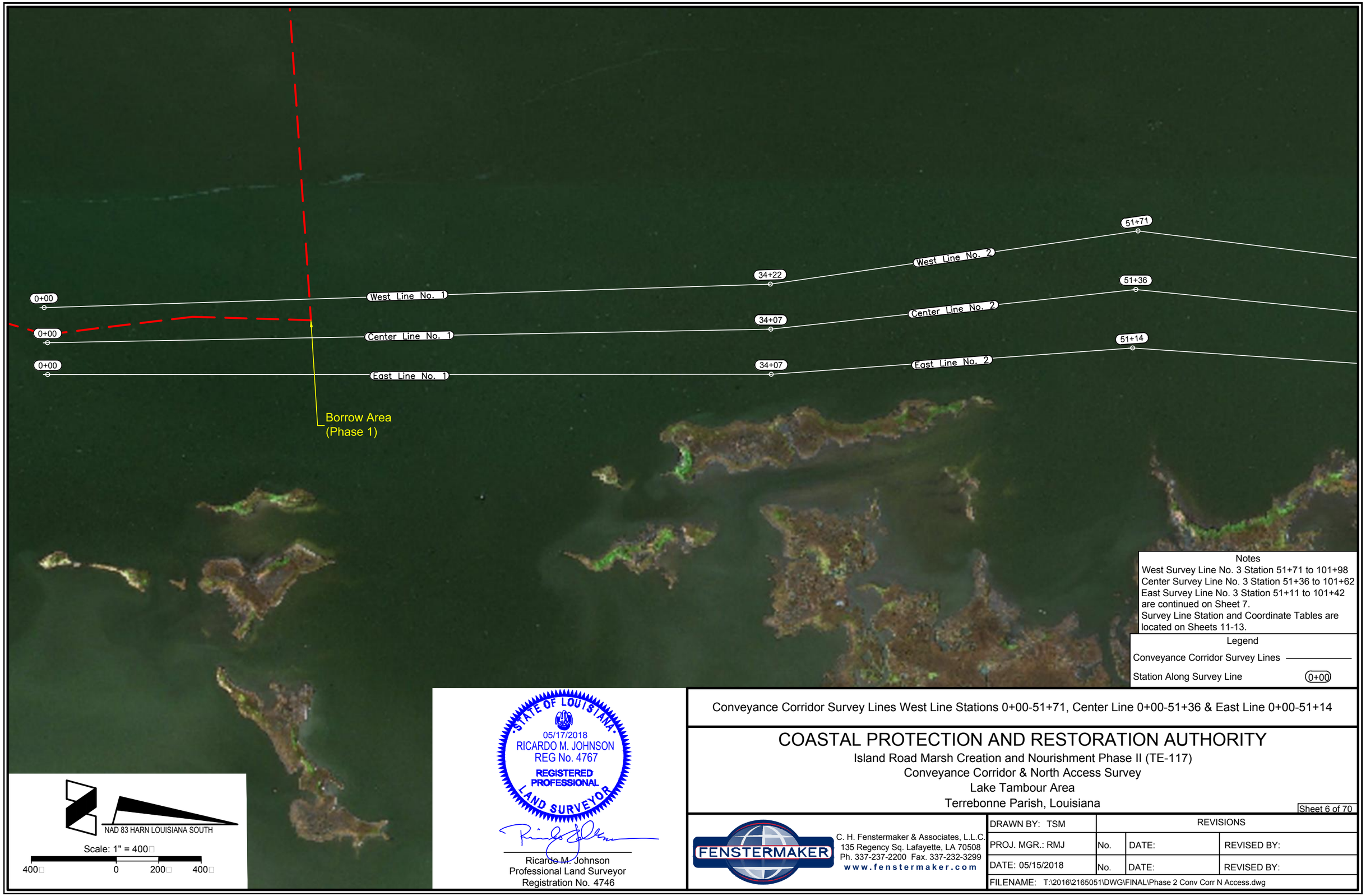

Notes

West Survey Line No. 3 Station 51+71 to 101+98
Center Survey Line No. 3 Station 51+36 to 101+62
East Survey Line No. 3 Station 51+11 to 101+42
are continued on Sheet 7.
Survey Line Station and Coordinate Tables are located on Sheets 11-13.

Legend

Conveyance Corridor Survey Lines

Station Along Survey Line (0+00)

Conveyance Corridor Survey Lines West Line Stations 0+00-51+71, Center Line 0+00-51+36 & East Line 0+00-51+14

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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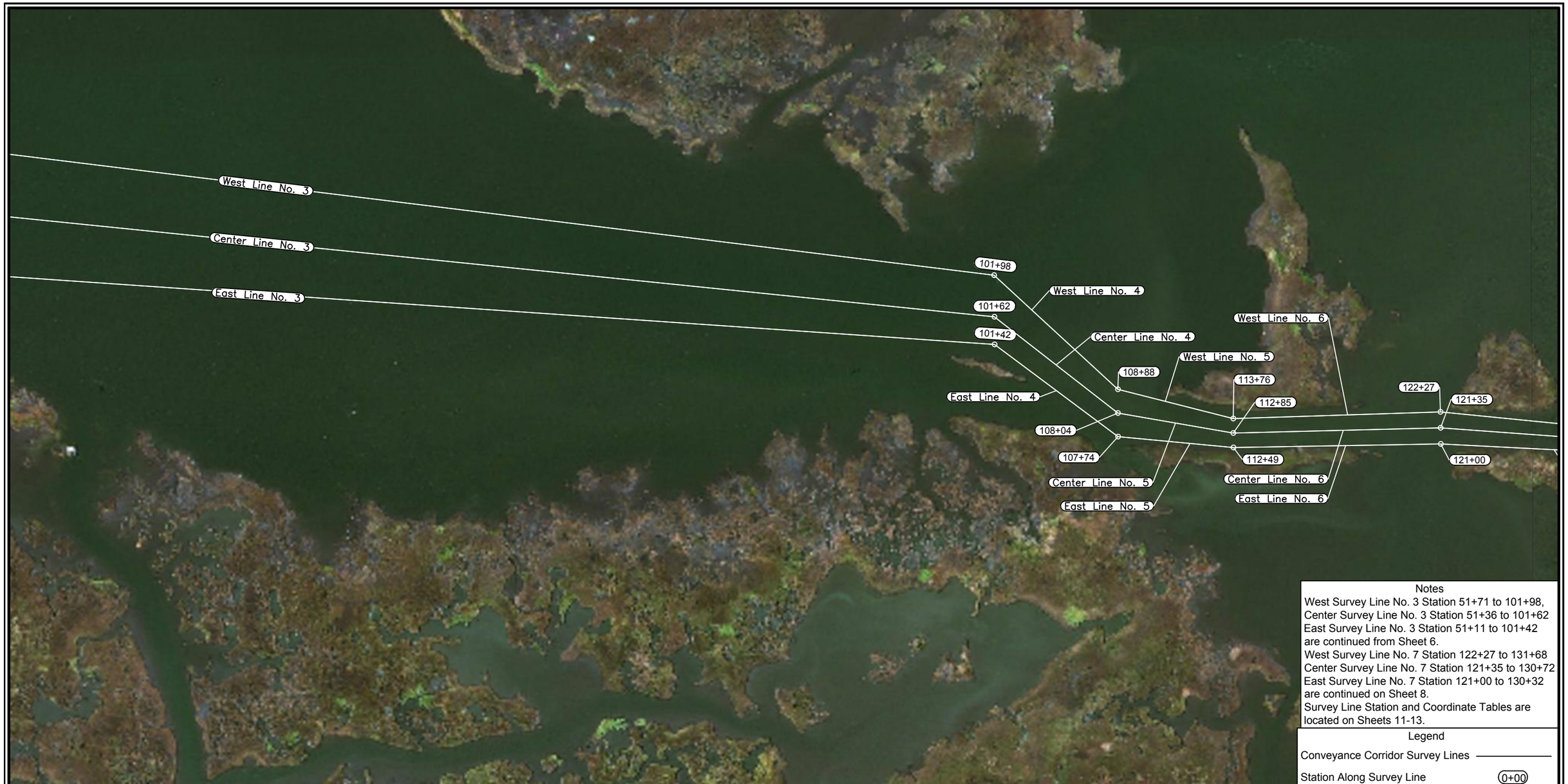

Notes

West Survey Line No. 3 Station 51+71 to 101+98,
Center Survey Line No. 3 Station 51+36 to 101+62
East Survey Line No. 3 Station 51+11 to 101+42
are continued from Sheet 6.
West Survey Line No. 7 Station 122+27 to 131+68
Center Survey Line No. 7 Station 121+35 to 130+72
East Survey Line No. 7 Station 121+00 to 130+32
are continued on Sheet 8.
Survey Line Station and Coordinate Tables are located on Sheets 11-13.

Legend

Conveyance Corridor Survey Lines

Station Along Survey Line (0+00)

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 400

400 0 200 400

STATE OF LOUISIANA
05/17/2018
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Registration No. 4746

Conveyance Corridor Survey Lines West Line Stations 51+71-122+27, Center Line 51+36-121+35 & East Line 51+14-121+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
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Lake Tambour Area
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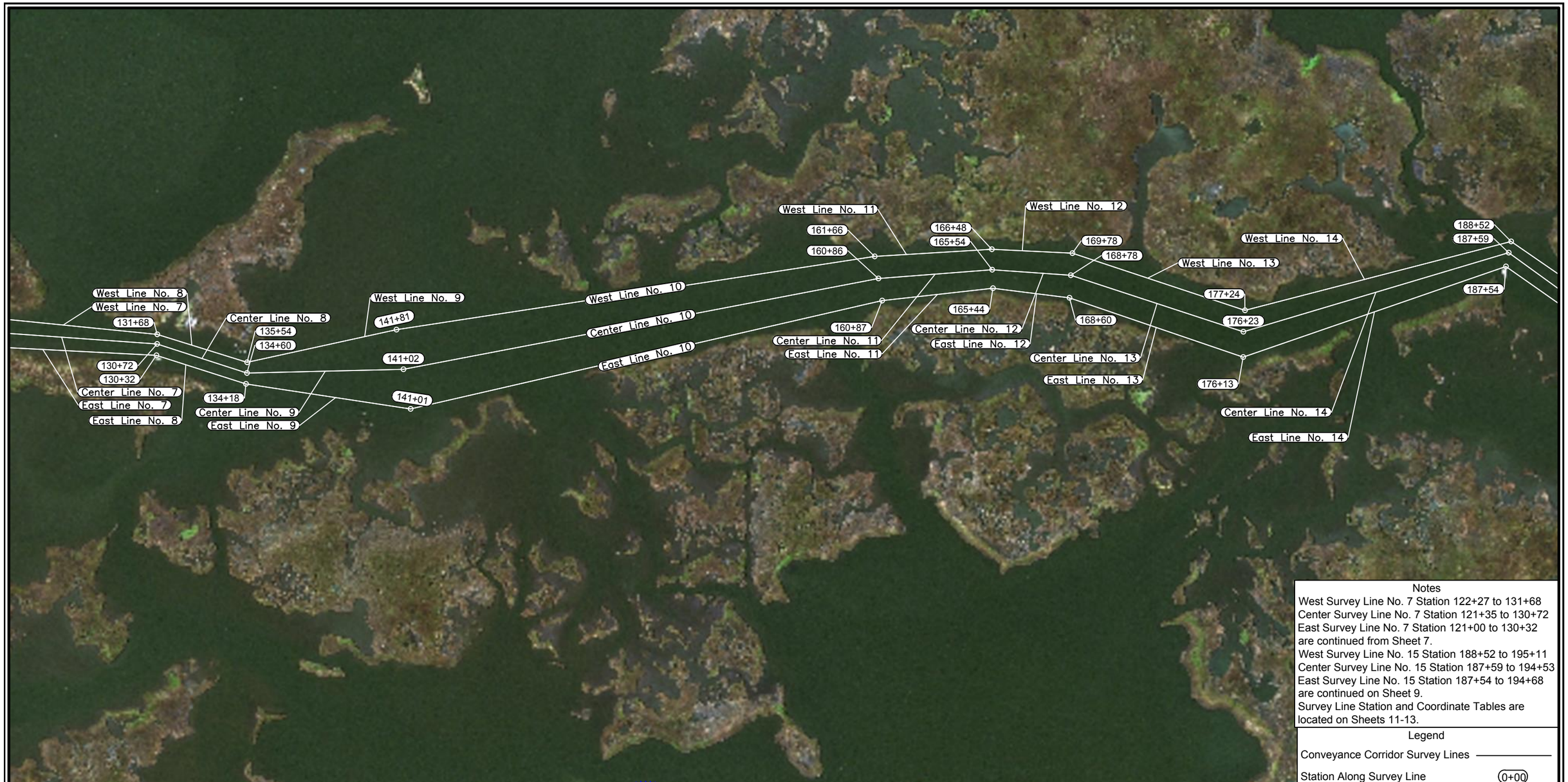

Notes

West Survey Line No. 7 Station 122+27 to 131+68
Center Survey Line No. 7 Station 121+35 to 130+72
East Survey Line No. 7 Station 121+00 to 130+32
are continued from Sheet 7.
West Survey Line No. 15 Station 188+52 to 195+11
Center Survey Line No. 15 Station 187+59 to 194+53
East Survey Line No. 15 Station 187+54 to 194+68
are continued on Sheet 9.
Survey Line Station and Coordinate Tables are located on Sheets 11-13.

Legend

Conveyance Corridor Survey Lines

Station Along Survey Line (0+00)

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 400

400 0 200 400

STATE OF LOUISIANA
05/17/2018
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Conveyance Corridor Survey Lines West Line Stations 122+27-188+52, Center Line 121+35-187+59 & East Line 121+00-187+54

COASTAL PROTECTION AND RESTORATION AUTHORITY

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Sheet 8 of 70

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Notes

West Survey Line No. 20 Station 247+79 to 250+51
Center Survey Line No. 20 Station 247+30 to 250+01
East Survey Line No. 20 Station 247+47 to 250+16
are continued on Sheet 10.
Survey Line Station and Coordinate Tables are located on Sheets 11-13.

Legend

Conveyance Corridor Survey Lines

Station Along Survey Line (0+00)

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 400

400 0 200 400

STATE OF LOUISIANA
05/17/2018
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Conveyance Corridor Survey Lines West Line Stations 188+52-247+79, Center Line 187+59-247+30 & East Line 187+54-247+47

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 9 of 70

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135 Regency Sq. Lafayette, LA 70508
Ph. 337-237-2200 Fax. 337-232-3299
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Notes:
Survey Line Station and Coordinate Tables are located on Sheets 11-13.

Legend

Conveyance Corridor Survey Lines

Station Along Survey Line (0+00)

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 400

400 0 200 400

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Conveyance Corridor Survey Lines West Line Stations 247+79-259+27, Center Line 247+30-258+67 & East Line 247+47-258+76

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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Conveyance Corridor West Survey Line Coordinate Table				
Line No.	P.O.B.	P.O.E.	Line Length	Line Bearing
West Line No. 1	0+00.00 Y=297,579.61 X=3,552,010.93	34+21.61 Y=301,000.03 X=3,551,920.46	3,421.61'	N01° 30' 54"W
West Line No. 2	34+21.61 Y=301,000.03 X=3,551,920.46	51+70.82 Y=302,732.67 X=3,551,680.27	1,749.21'	N07° 53' 32"W
West Line No. 3	51+70.82 Y=302,732.67 X=3,551,680.27	101+97.59 Y=307,718.25 X=3,552,322.42	5,026.76'	N07° 20' 22"E
West Line No. 4	101+97.59 Y=307,718.25 X=3,552,322.42	108+87.98 Y=308,222.95 X=3,552,793.49	690.39'	N43° 01' 34"E
West Line No. 5	108+87.98 Y=308,222.95 X=3,552,793.49	113+76.30 Y=308,695.64 X=3,552,916.09	488.32'	N14° 32' 22"E
West Line No. 6	113+76.30 Y=308,695.64 X=3,552,916.09	122+27.15 Y=309,546.19 X=3,552,893.53	850.85'	N01° 31' 08"W
West Line No. 7	122+27.15 Y=309,546.19 X=3,552,893.53	131+67.66 Y=310,481.48 X=3,552,992.46	940.51'	N06° 02' 15"E
West Line No. 8	131+67.66 Y=310,481.48 X=3,552,992.46	135+53.59 Y=310,849.30 X=3,553,109.32	385.93'	N17° 37' 34"E
West Line No. 9	135+53.59 Y=310,849.30 X=3,553,109.32	141+80.52 Y=311,462.58 X=3,552,979.25	626.93'	N11° 58' 25"W
West Line No. 10	141+80.52 Y=311,462.58 X=3,552,979.25	161+65.56 Y=313,426.40 X=3,552,689.73	1,985.04'	N08° 23' 12"W
West Line No. 11	161+65.56 Y=313,426.40 X=3,552,689.73	166+47.57 Y=313,907.71 X=3,552,663.67	482.01'	N03° 05' 57"W
West Line No. 12	166+47.57 Y=313,907.71 X=3,552,663.67	169+78.16 Y=314,237.80 X=3,552,681.77	330.59'	N03° 08' 22"E

Conveyance Corridor West Survey Line Coordinate Table				
Line No.	P.O.B.	P.O.E.	Line Length	Line Bearing
West Line No. 13	169+78.16 Y=314,237.80 X=3,552,681.77	177+23.98 Y=314,944.35 X=3,552,920.60	745.82'	N18° 40' 33"E
West Line No. 14	177+23.98 Y=314,944.35 X=3,552,920.60	188+52.34 Y=316,038.32 X=3,552,644.16	1,128.36'	N14° 10' 52"W
West Line No. 15	188+52.34 Y=316,038.32 X=3,552,644.16	195+10.91 Y=316,578.38 X=3,553,021.05	658.56'	N34° 54' 34"E
West Line No. 16	195+10.91 Y=316,578.38 X=3,553,021.05	201+30.28 Y=317,127.26 X=3,552,734.06	619.38'	N27° 36' 12"W
West Line No. 17	201+30.28 Y=317,127.26 X=3,552,734.06	239+05.17 Y=320,894.07 X=3,552,980.83	3,774.89'	N03° 44' 54"E
West Line No. 18	239+05.17 Y=320,894.07 X=3,552,980.83	245+05.44 Y=321,448.14 X=3,552,749.88	600.27'	N22° 37' 42"W
West Line No. 19	245+05.44 Y=321,448.14 X=3,552,749.88	247+79.27 Y=321,720.10 X=3,552,717.94	273.83'	N06° 41' 53"W
West Line No. 20	247+79.27 Y=321,720.10 X=3,552,717.94	250+51.27 Y=321,991.88 X=3,552,707.10	272.00'	N02° 17' 05"W
West Line No. 21	250+51.27 Y=321,991.88 X=3,552,707.10	254+88.88 Y=322,427.40 X=3,552,749.79	437.61'	N05° 35' 57"E
West Line No. 22	254+88.88 Y=322,427.40 X=3,552,749.79	258+15.22 Y=322,716.33 X=3,552,901.51	326.34'	N27° 42' 15"E
West Line No. 23	258+15.22 Y=322,716.33 X=3,552,901.51	259+26.81 Y=322,820.01 X=3,552,942.76	111.59'	N21° 41' 39"E

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Conveyence Corridor West Survey Line Table

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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Conveyance Corridor Center Survey Line Coordinate Table				
Line No.	P.O.B.	P.O.E.	Line Length	Line Bearing
Center Line No. 1	0+00.00 Y=297,594.41 X=3,552,176.77	34+06.58 Y=301,000.71 X=3,552,133.09	3,406.58'	N00° 44' 05"W
Center Line No. 2	34+06.58 Y=301,000.71 X=3,552,133.09	51+35.70 Y=302,720.74 X=3,551,956.09	1,729.11'	N05° 52' 31"W
Center Line No. 3	51+35.70 Y=302,720.74 X=3,551,956.09	101+61.94 Y=307,718.25 X=3,552,492.84	5,026.25'	N06° 07' 49"E
Center Line No. 4	101+61.94 Y=307,718.25 X=3,552,492.84	108+04.38 Y=308,222.95 X=3,552,890.32	642.43'	N38° 13' 20"E
Center Line No. 5	108+04.38 Y=308,222.95 X=3,552,890.32	112+84.67 Y=308,695.64 X=3,552,975.48	480.29'	N10° 12' 46"E
Center Line No. 6	112+84.67 Y=308,695.64 X=3,552,975.48	121+35.38 Y=309,546.19 X=3,552,959.13	850.71'	N01° 06' 03"W
Center Line No. 7	121+35.38 Y=309,546.19 X=3,552,959.13	130+72.30 Y=310,480.25 X=3,553,032.30	936.92'	N04° 28' 44"E
Center Line No. 8	130+72.30 Y=310,480.25 X=3,553,032.30	134+59.93 Y=310,848.37 X=3,553,153.73	387.64'	N18° 15' 22"E
Center Line No. 9	134+59.93 Y=310,848.37 X=3,553,153.73	141+02.38 Y=311,490.71 X=3,553,141.93	642.45'	N01° 03' 10"W
Center Line No. 10	141+02.38 Y=311,490.71 X=3,553,141.93	160+86.22 Y=313,441.38 X=3,552,780.66	1,983.84'	N10° 29' 33"W
Center Line No. 11	160+86.22 Y=313,441.38 X=3,552,780.66	165+54.07 Y=313,908.06 X=3,552,747.68	467.85'	N04° 02' 31"W
Center Line No. 12	165+54.07 Y=313,908.06 X=3,552,747.68	168+77.68 Y=314,230.77 X=3,552,771.88	323.61'	N04° 17' 23"E

Conveyance Corridor Center Survey Line Coordinate Table				
Line No.	P.O.B.	P.O.E.	Line Length	Line Bearing
Center Line No. 13	168+77.68 Y=314,230.77 X=3,552,771.88	176+22.59 Y=314,937.26 X=3,553,008.02	744.91'	N18° 28' 53"E
Center Line No. 14	176+22.59 Y=314,937.26 X=3,553,008.02	187+58.73 Y=316,027.96 X=3,552,689.91	1,136.14'	N16° 15' 35"W
Center Line No. 15	187+58.73 Y=316,027.96 X=3,552,689.91	194+52.71 Y=316,587.95 X=3,553,099.79	693.98'	N36° 12' 08"E
Center Line No. 16	194+52.71 Y=316,587.95 X=3,553,099.79	200+66.88 Y=317,133.78 X=3,552,818.22	614.18'	N27° 17' 15"W
Center Line No. 17	200+66.88 Y=317,133.78 X=3,552,818.22	238+48.42 Y=320,907.46 X=3,553,061.93	3,781.54'	N03° 41' 42"E
Center Line No. 18	238+48.42 Y=320,907.46 X=3,553,061.93	244+57.97 Y=321,452.80 X=3,552,789.61	609.55'	N26° 32' 08"W
Center Line No. 19	244+57.97 Y=321,452.80 X=3,552,789.61	247+30.26 Y=321,723.23 X=3,552,757.85	272.29'	N06° 41' 53"W
Center Line No. 20	247+30.26 Y=321,723.23 X=3,552,757.85	250+00.72 Y=321,993.47 X=3,552,747.07	270.46'	N02° 17' 05"W
Center Line No. 21	250+00.72 Y=321,993.47 X=3,552,747.07	254+37.52 Y=322,426.67 X=3,552,803.03	436.80'	N07° 21' 42"E
Center Line No. 22	254+37.52 Y=322,426.67 X=3,552,803.03	257+65.42 Y=322,716.33 X=3,552,956.72	327.90'	N27° 57' 00"E
Center Line No. 23	257+65.42 Y=322,716.33 X=3,552,956.72	258+66.99 Y=322,815.09 X=3,552,980.42	101.57'	N13° 29' 31"E

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Conveyence Corridor Center Survey Line Table

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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Conveyance Corridor East Survey Line Coordinate Table				
Line No.	P.O.B.	P.O.E.	Line Length	Line Bearing
East Line No. 1	0+00.00 Y=297,594.41 X=3,552,326.77	34+07.04 Y=301,001.39 X=3,552,345.71	3,407.04'	N00° 19' 07"E
East Line No. 2	34+07.04 Y=301,001.39 X=3,552,345.71	51+13.71 Y=302,704.23 X=3,552,231.30	1,706.67'	N03° 50' 37"W
East Line No. 3	51+13.71 Y=302,704.23 X=3,552,231.30	101+41.74 Y=307,718.25 X=3,552,606.45	5,028.03'	N04° 16' 44"E
East Line No. 4	101+41.74 Y=307,718.25 X=3,552,606.45	107+73.93 Y=308,222.95 X=3,552,987.14	632.18'	N37° 01' 37"E
East Line No. 5	107+73.93 Y=308,222.95 X=3,552,987.14	112+49.01 Y=308,695.64 X=3,553,034.87	475.09'	N05° 45' 55"E
East Line No. 6	112+49.01 Y=308,695.64 X=3,553,034.87	120+99.63 Y=309,546.19 X=3,553,024.73	850.62'	N00° 40' 57"W
East Line No. 7	120+99.63 Y=309,546.19 X=3,553,024.73	130+32.45 Y=310,477.47 X=3,553,078.39	932.82'	N03° 17' 51"E
East Line No. 8	130+32.45 Y=310,477.47 X=3,553,078.39	134+18.44 Y=310,844.34 X=3,553,198.37	385.99'	N18° 06' 34"E
East Line No. 9	134+18.44 Y=310,844.34 X=3,553,198.37	141+01.26 Y=311,518.84 X=3,553,304.60	682.82'	N08° 57' 02"E
East Line No. 10	141+01.26 Y=311,518.84 X=3,553,304.60	160+86.57 Y=313,456.36 X=3,552,871.59	1,985.31'	N12° 35' 53"W
East Line No. 11	160+86.57 Y=313,456.36 X=3,552,871.59	165+43.68 Y=313,910.94 X=3,552,823.62	457.11'	N06° 01' 26"W
East Line No. 12	165+43.68 Y=313,910.94 X=3,552,823.62	168+60.48 Y=314,225.05 X=3,552,864.79	316.80'	N07° 28' 03"E

Conveyance Corridor East Survey Line Coordinate Table				
Line No.	P.O.B.	P.O.E.	Line Length	Line Bearing
East Line No. 13	168+60.48 Y=314,225.05 X=3,552,864.79	176+12.99 Y=314,935.78 X=3,553,112.05	752.51'	N19° 10' 58"E
East Line No. 14	176+12.99 Y=314,935.78 X=3,553,112.05	187+53.66 Y=316,016.45 X=3,552,746.98	1,140.67'	N18° 39' 57"W
East Line No. 15	187+53.66 Y=316,016.45 X=3,552,746.98	194+67.57 Y=316,599.06 X=3,553,159.58	713.91'	N35° 18' 20"E
East Line No. 16	194+67.57 Y=316,599.06 X=3,553,159.58	200+66.82 Y=317,140.31 X=3,552,902.38	599.25'	N25° 25' 00"W
East Line No. 17	200+66.82 Y=317,140.31 X=3,552,902.38	238+55.11 Y=320,920.95 X=3,553,143.02	3,788.29'	N03° 38' 31"E
East Line No. 18	238+55.11 Y=320,920.95 X=3,553,143.02	244+76.60 Y=321,457.47 X=3,552,829.33	621.49'	N30° 18' 49"W
East Line No. 19	244+76.60 Y=321,457.47 X=3,552,829.33	247+47.35 Y=321,726.37 X=3,552,797.75	270.75'	N06° 41' 53"W
East Line No. 20	247+47.35 Y=321,726.37 X=3,552,797.75	250+16.26 Y=321,995.07 X=3,552,787.03	268.91'	N02° 17' 05"W
East Line No. 21	250+16.26 Y=321,995.07 X=3,552,787.03	254+52.66 Y=322,425.94 X=3,552,856.28	436.40'	N09° 07' 46"E
East Line No. 22	254+52.66 Y=322,425.94 X=3,552,856.28	257+82.14 Y=322,716.33 X=3,553,011.94	329.48'	N28° 11' 36"E
East Line No. 23	257+82.14 Y=322,716.33 X=3,553,011.94	258+76.14 Y=322,810.08 X=3,553,018.78	94.00'	N04° 10' 36"E

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RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Conveyence Corridor East Survey Line Table

COASTAL PROTECTION AND RESTORATION AUTHORITY

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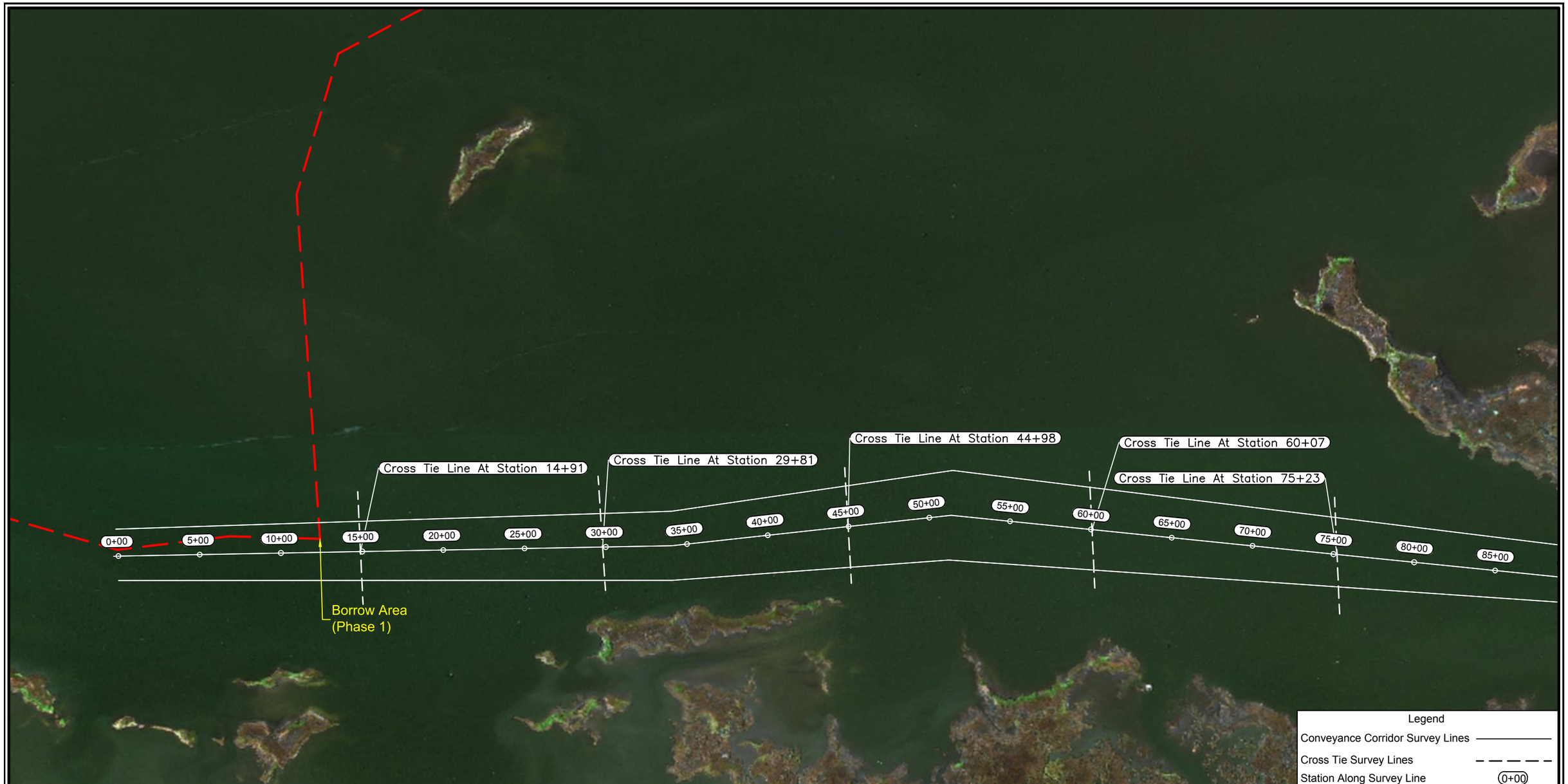

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 600

600 0 300 600

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REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Conveyance Corridor Cross Tie Survey Lines at Stations 14+91, 29+81, 44+98, 60+07 & 75+23

COASTAL PROTECTION AND RESTORATION AUTHORITY

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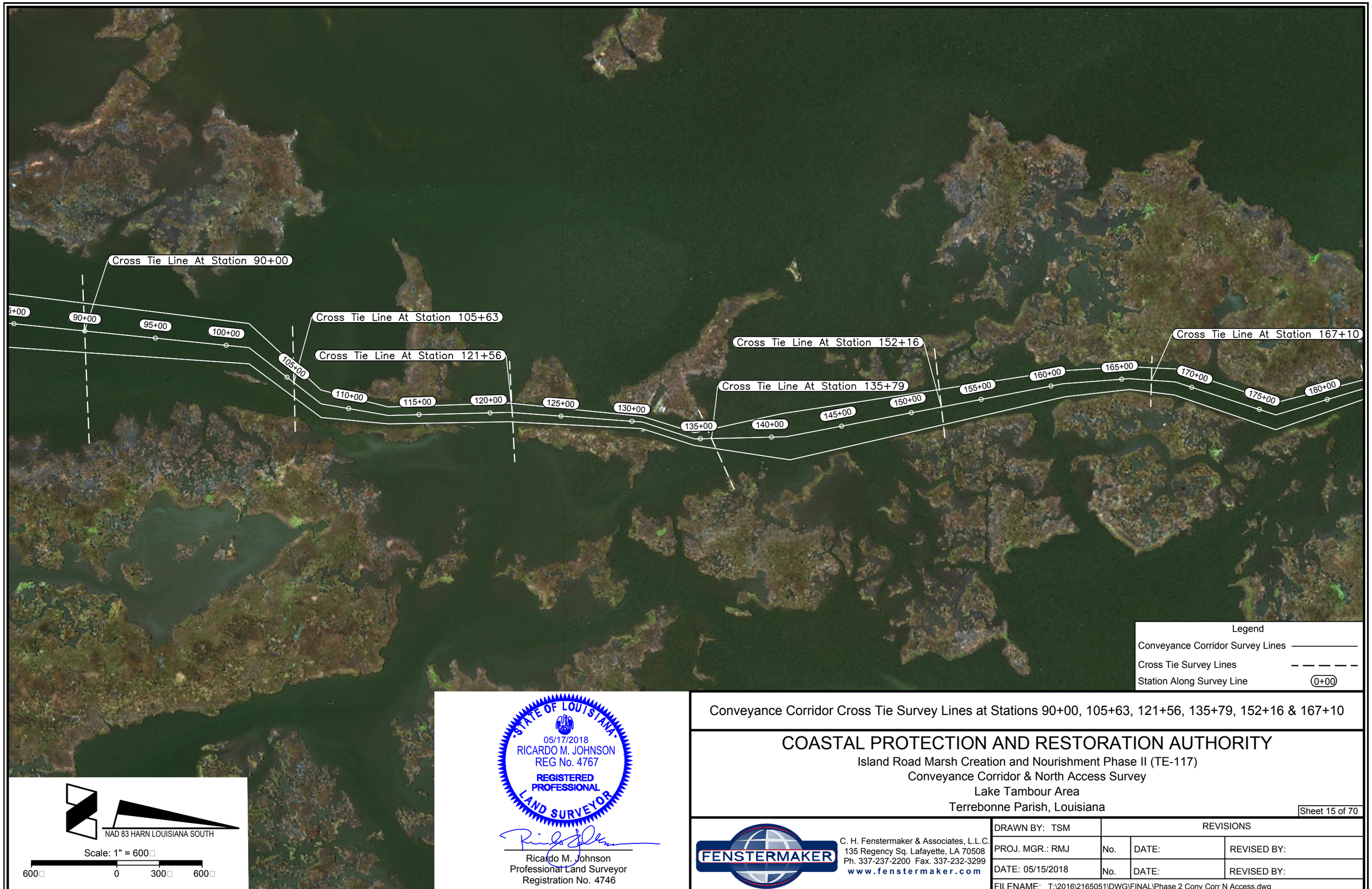

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LAND SURVEYOR

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Conveyance Corridor Cross Tie Survey Lines at Stations 90+00, 105+63, 121+56, 135+79, 152+16 & 167+10

COASTAL PROTECTION AND RESTORATION AUTHORITY

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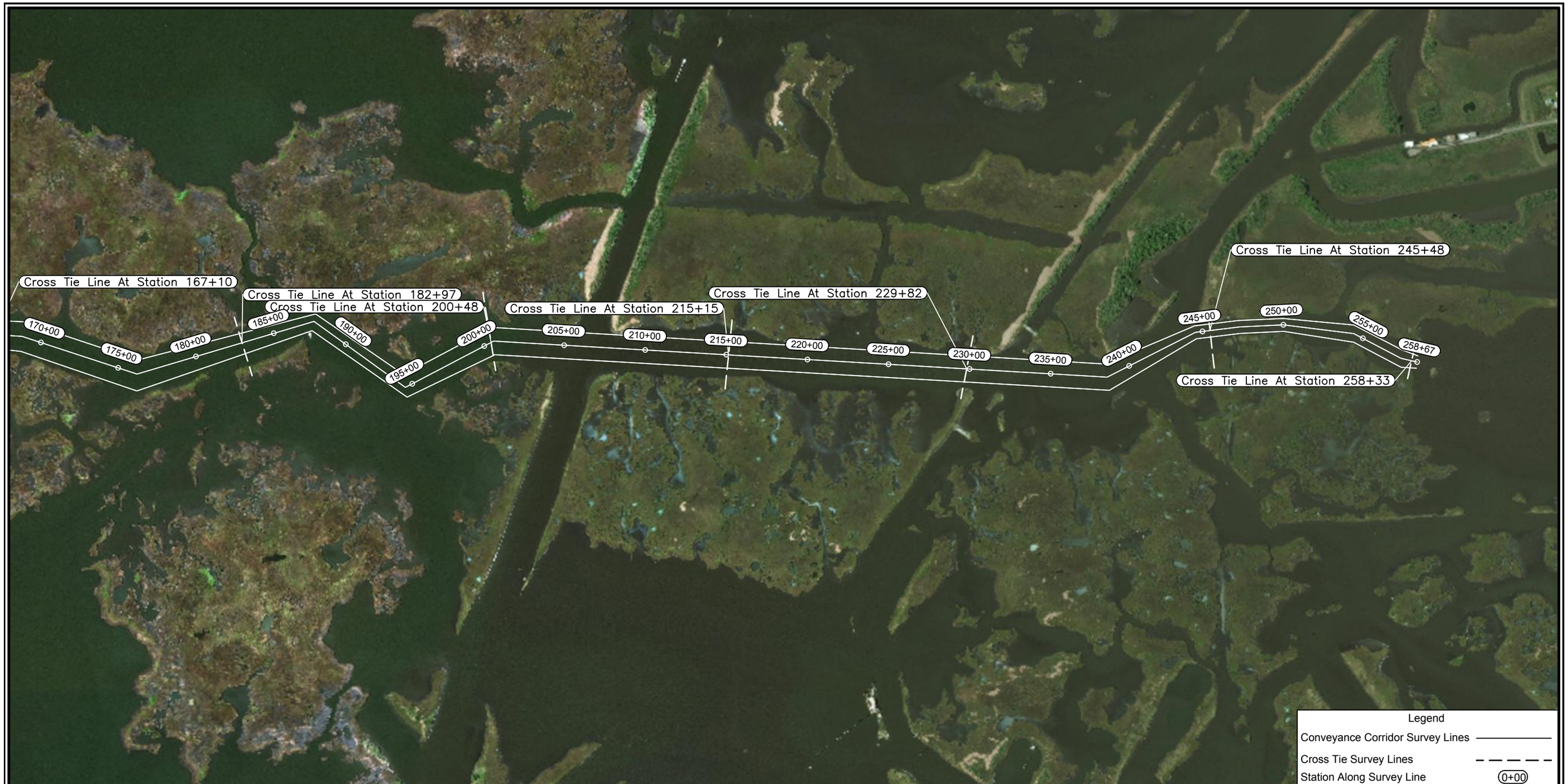

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 600□

600□ 0 300□ 600□

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Cross Tie Lines Coordinate Table				
Cross Tie Line At Station	P.O.B.	P.O.E.	Distance	Bearing
14+91	299,098.45 3,552,482.16	299,069.78 3,551,789.00	693.75	S87° 37' 54"W
29+81	300,590.99 3,552,405.09	300,549.82 3,551,702.88	703.42	S86° 38' 42"W
44+98	302,105.01 3,552,371.06	302,067.35 3,551,656.90	715.15	S86° 58' 55"W
60+07	303,572.31 3,551,689.91	303,602.26 3,552,408.40	719.12	N87° 36' 47"E
75+23	305,108.00 3,552,575.99	305,081.23 3,551,859.43	717.06	S87° 51' 38"W
90+00	306,549.27 3,551,976.03	306,590.44 3,553,157.80	1,182.49	N88° 00' 17"E
105+63	308,025.77 3,552,343.28	308,040.22 3,553,083.58	740.44	N88° 52' 56"E
121+56	309,550.64 3,552,601.18	309,582.73 3,553,305.59	705.14	N87° 23' 30"E
135+79	311,123.86 3,553,506.51	310,879.22 3,552,952.00	606.07	S66° 11' 38"W
152+16	312,539.29 3,552,528.96	312,609.18 3,553,152.48	627.43	N83° 36' 17"E
167+10	314,069.20 3,552,590.05	314,057.54 3,552,944.06	354.20	S88° 06' 53"E
182+97	315,538.47 3,552,662.35	315,645.27 3,553,021.99	375.16	N73° 27' 34"E
200+48	317,068.90 3,552,519.75	317,144.32 3,552,998.99	485.14	N81° 03' 23"E
215+15	318,601.46 3,552,696.22	318,556.08 3,553,120.41	426.62	S83° 53' 35"E
229+82	320,006.41 3,553,189.04	320,083.60 3,552,803.60	393.09	N78° 40' 34"W
245+48	321,532.41 3,552,691.20	321,566.38 3,553,010.52	321.12	N83° 55' 35"E
258+33	322,805.93 3,552,864.73	322,756.63 3,553,082.54	223.33	S77° 14' 50"E

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05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Conveyence Corridor Cross Tie Survey Line Tables

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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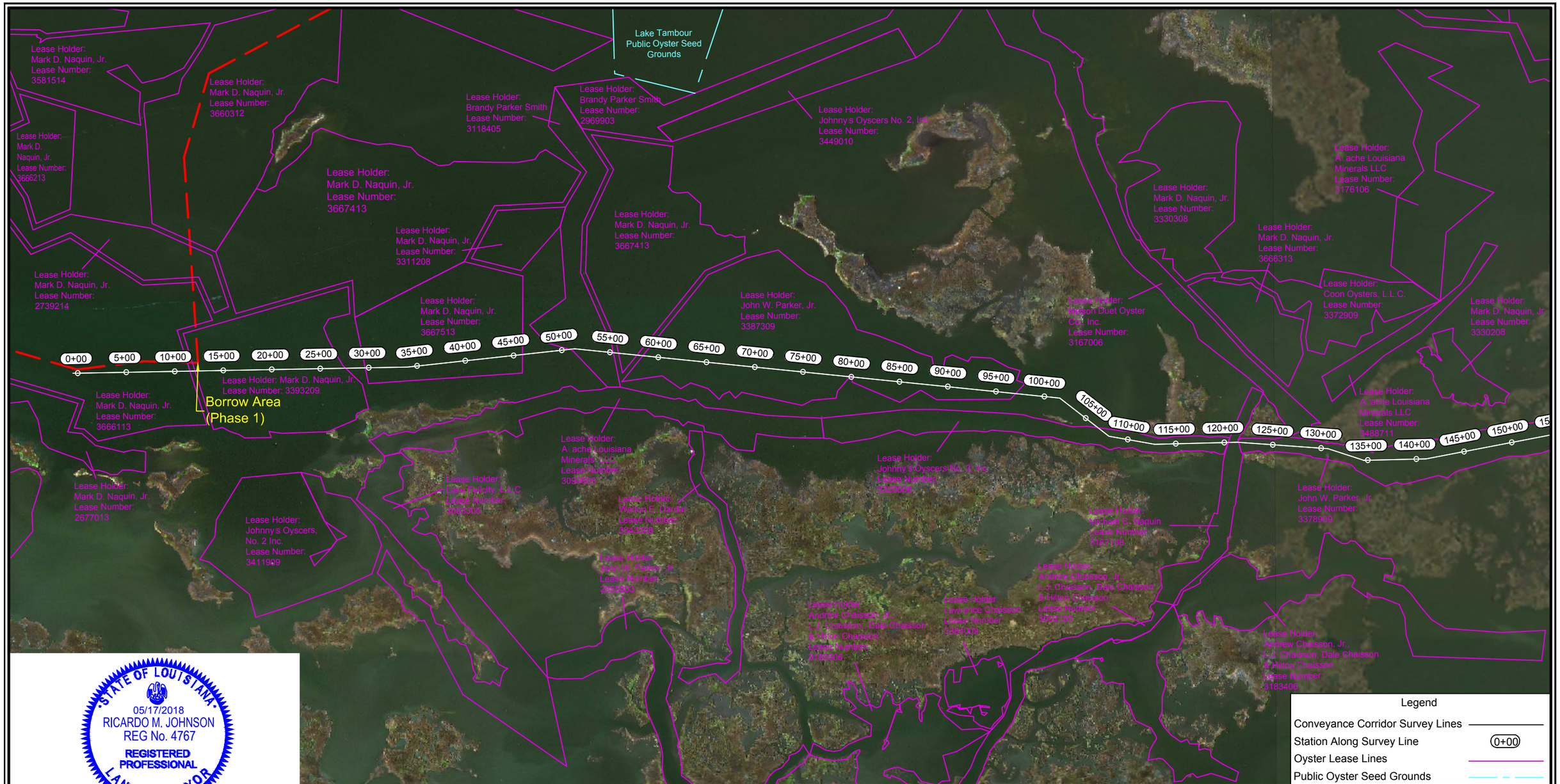

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Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 1000□

1000□ 0 500□ 1000□

Legend

Conveyance Corridor Survey Lines	
Station Along Survey Line	0+00
Oyster Lease Lines	
Public Oyster Seed Grounds	

Note Concerning The Information On Oyster Leases & Oyster Data.
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Oyster Leases Within Conveyance Corridor Area

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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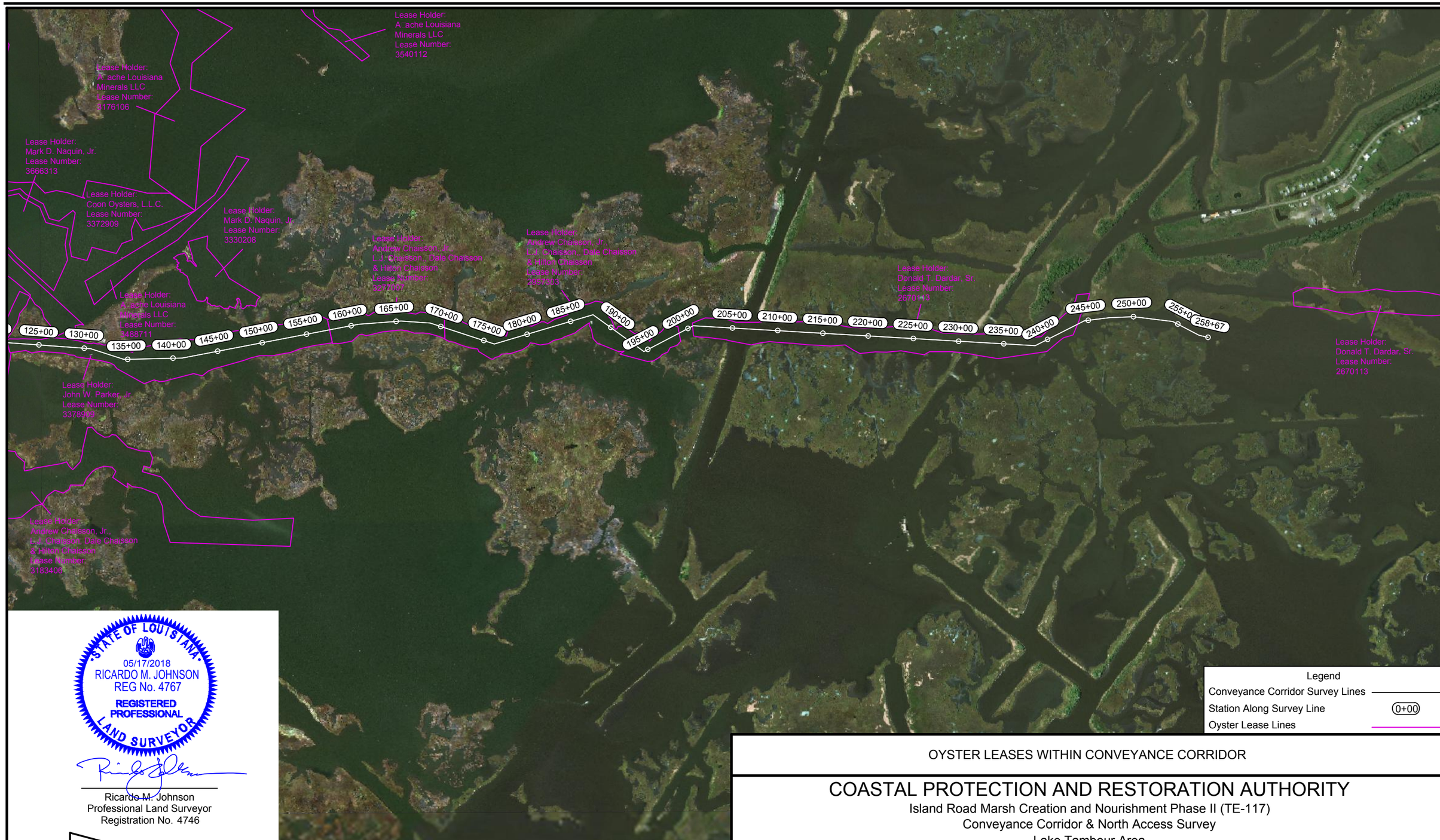

Legend

Conveyance Corridor Survey Lines	
Station Along Survey Line	0+00
Oyster Lease Lines	

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NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 1000□

1000□ 0 500□ 1000□

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OYSTER LEASES WITHIN CONVEYANCE CORRIDOR

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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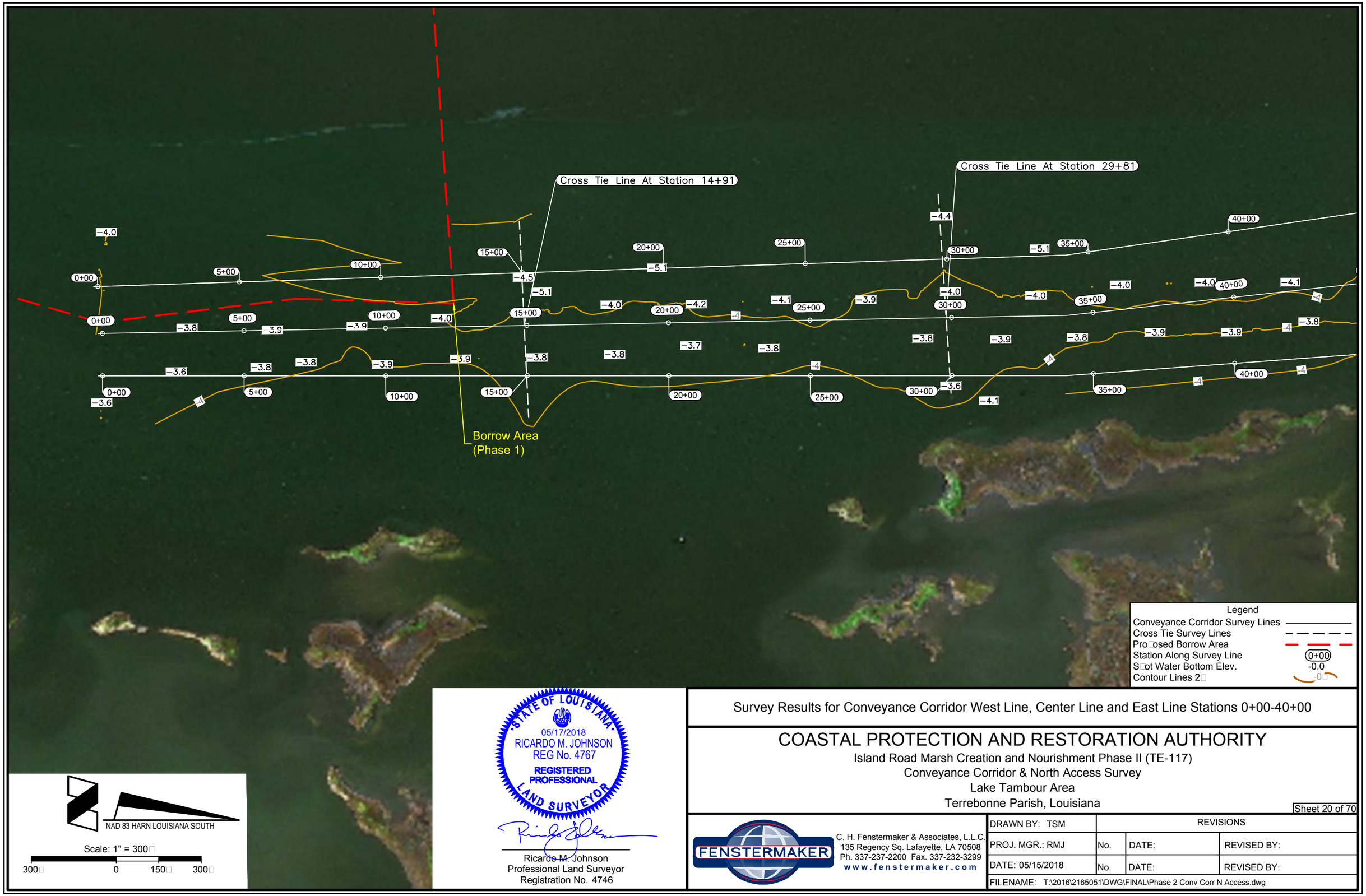

Survey Results for Conveyance Corridor West Line, Center Line and East Line Stations 0+00-40+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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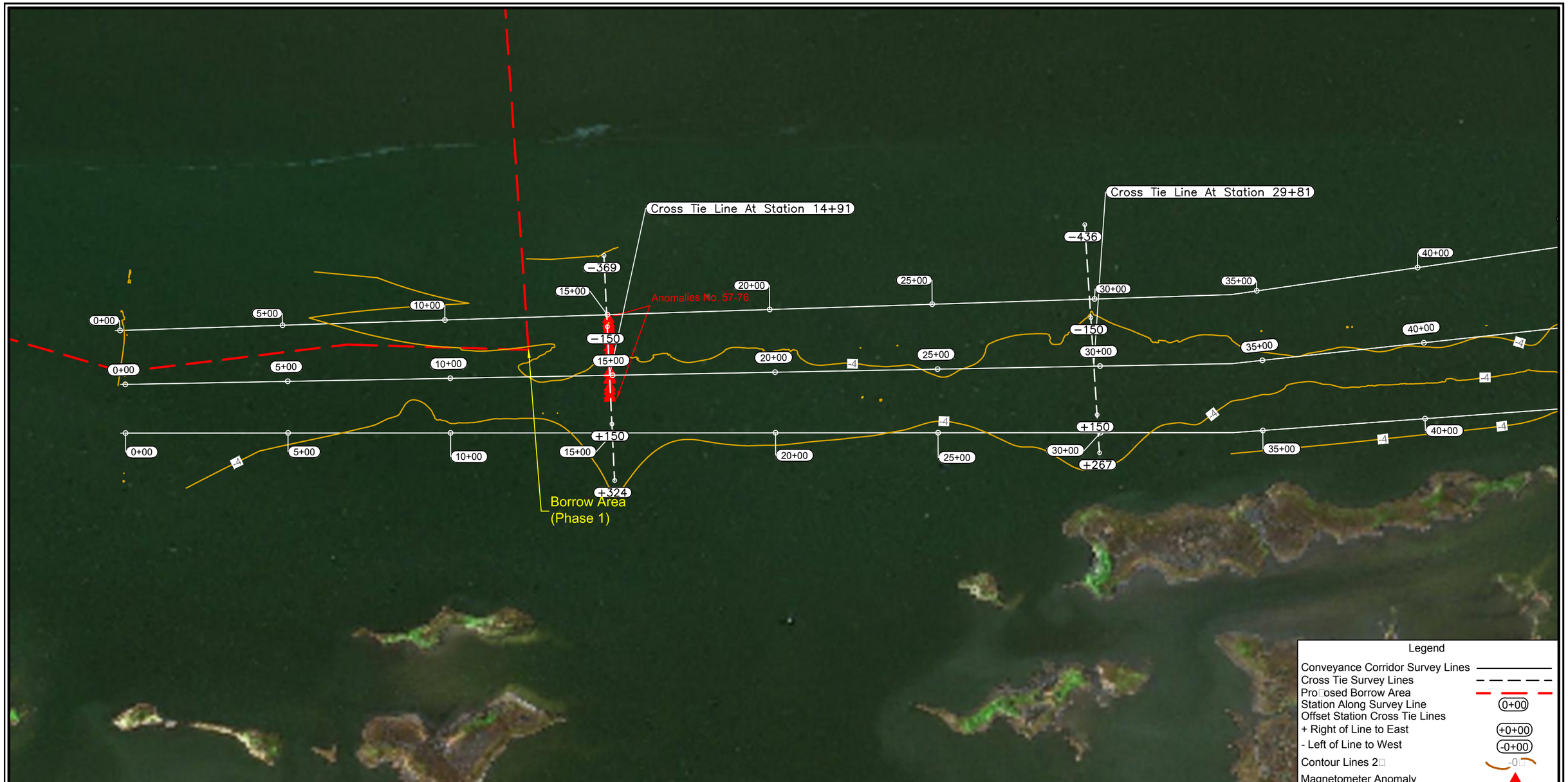

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300

300 0 150 300

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Magnetometer Results For Stations 0+00-40+00
Cross Tie Lines at Station 14+91 & 29+81

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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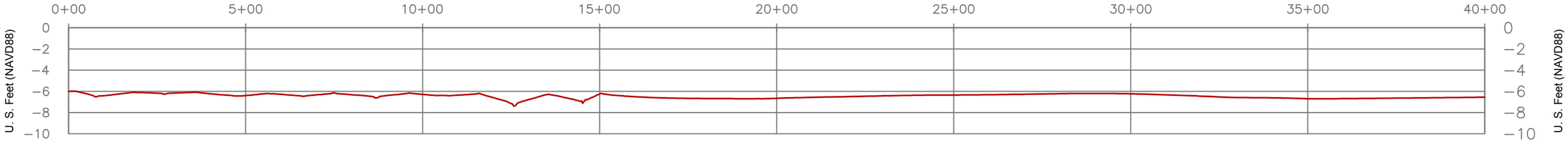
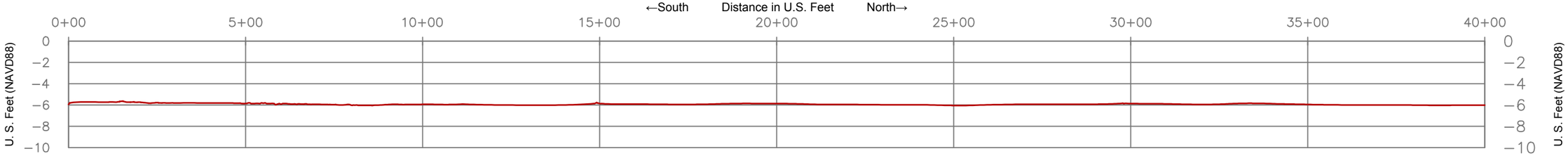
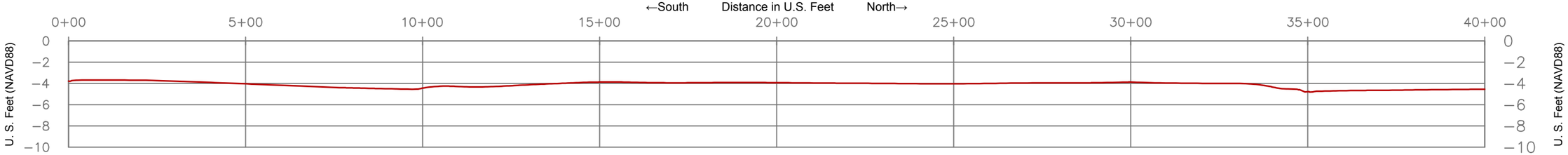
Conveyance Corridor West Survey Line Stations 0+00-40+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Conveyance Corridor Center Survey Line Stations 0+00-40+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Conveyance Corridor East Survey Line Stations 0+00-40+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Legend
Water Bottoms

STATE OF LOUISIANA
05/17/2018
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REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results Profiles For Conveyance Corridor West Line, Center Line and East Line Stations 0+00-40+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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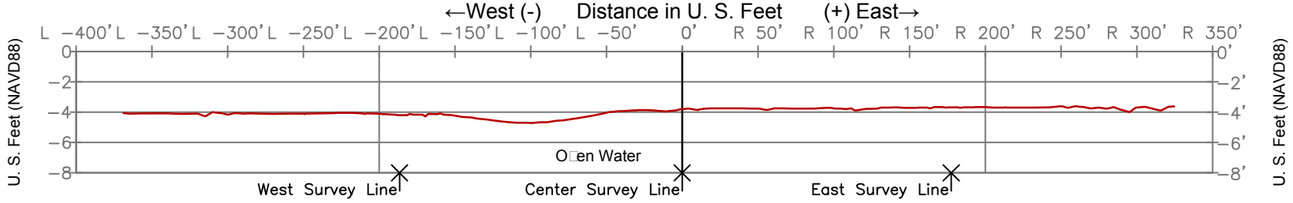
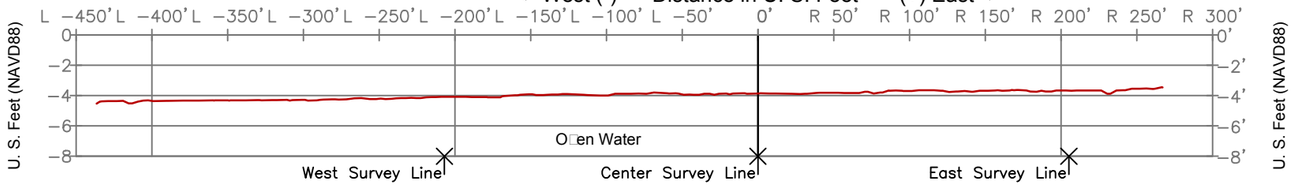
Cross Tie Line At 14+91 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10
←West (-) Distance in U. S. Feet (+) East→



Cross Tie Line At 29+81 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10
←West (-) Distance in U. S. Feet (+) East→



MagnetometerTable

Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN57	939.5	6	DIPOLE	299,085'	3,552,228'	NOTHING FOUND
AN58	1611.8	13.6	MONOPOLE	299,085'	3,552,221'	NOTHING FOUND
AN59	1861	6.7	MONOPOLE	299,086'	3,552,206'	NOTHING FOUND
AN60	447	21.8	COMPLEX	299,086'	3,552,194'	NOTHING FOUND
AN61	462.8	3.8	MONOPOLE	299,086'	3,552,172'	NOTHING FOUND
AN62	374.5	1.5	MONOPOLE	299,086'	3,552,167'	NOTHING FOUND
AN63	245.6	3.8	MONOPOLE	299,086'	3,552,152'	NOTHING FOUND
AN64	125.1	3.8	MONOPOLE	299,086'	3,552,148'	NOTHING FOUND
AN65	461.8	42.4	COMPLEX	299,086'	3,552,112'	NOTHING FOUND
AN66	867.6	3.8	MONOPOLE	299,086'	3,552,087'	NOTHING FOUND
AN67	586.5	28.7	COMPLEX	299,085'	3,552,072'	NOTHING FOUND
AN68	1108.9	3.8	MONOPOLE	299,085'	3,552,053'	NOTHING FOUND
AN69	548.8	12.8	COMPLEX	299,085'	3,552,043'	NOTHING FOUND
AN70	1307.9	4.5	COMPLEX	299,084'	3,552,033'	NOTHING FOUND
AN71	1404	8.3	MONOPOLE	299,084'	3,552,026'	NOTHING FOUND
AN72	607	8.3	COMPLEX	299,084'	3,552,018'	NOTHING FOUND
AN73	1567.5	7.6	MONOPOLE	299,084'	3,552,010'	NOTHING FOUND
AN74	1359	4.5	COMPLEX	299,083'	3,552,003'	NOTHING FOUND
AN75	1842.1	12.2	MONOPOLE	299,083'	3,551,997'	NOTHING FOUND
AN76	2216.4	6.1	DIPOLE	299,082'	3,551,984'	NOTHING FOUND

Legend
Water Bottoms
Survey Lines X

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Magnetometer Table For Stations 0+00 to 40+00
Profiles of Cross Tie Lines At Stations 14+91 & 29+81

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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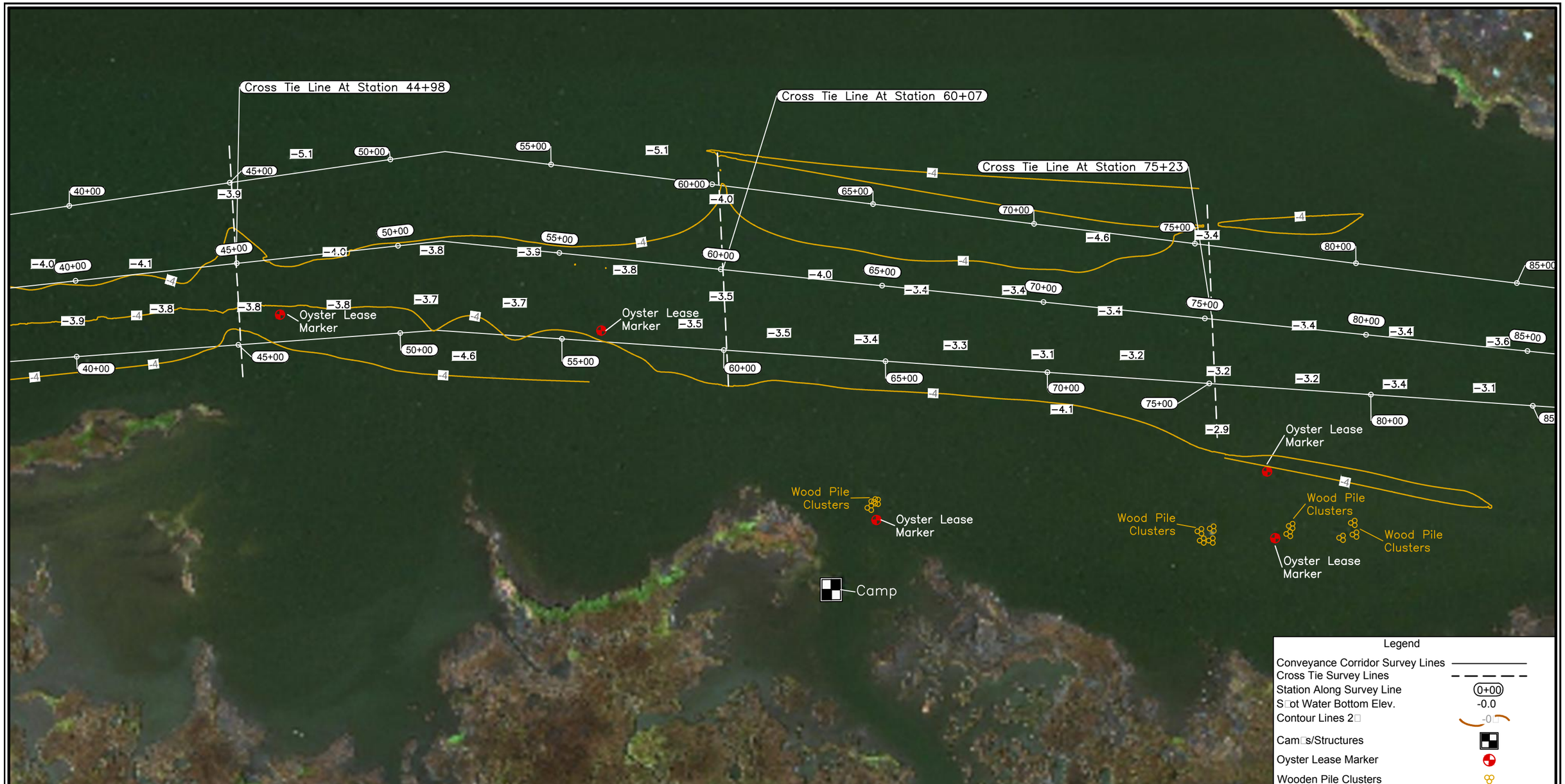

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300

300 0 150 300

STATE OF LOUISIANA
05/17/2018
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Survey Results for Conveyance Corridor West Line, Center Line and East Line Stations 40+00-80+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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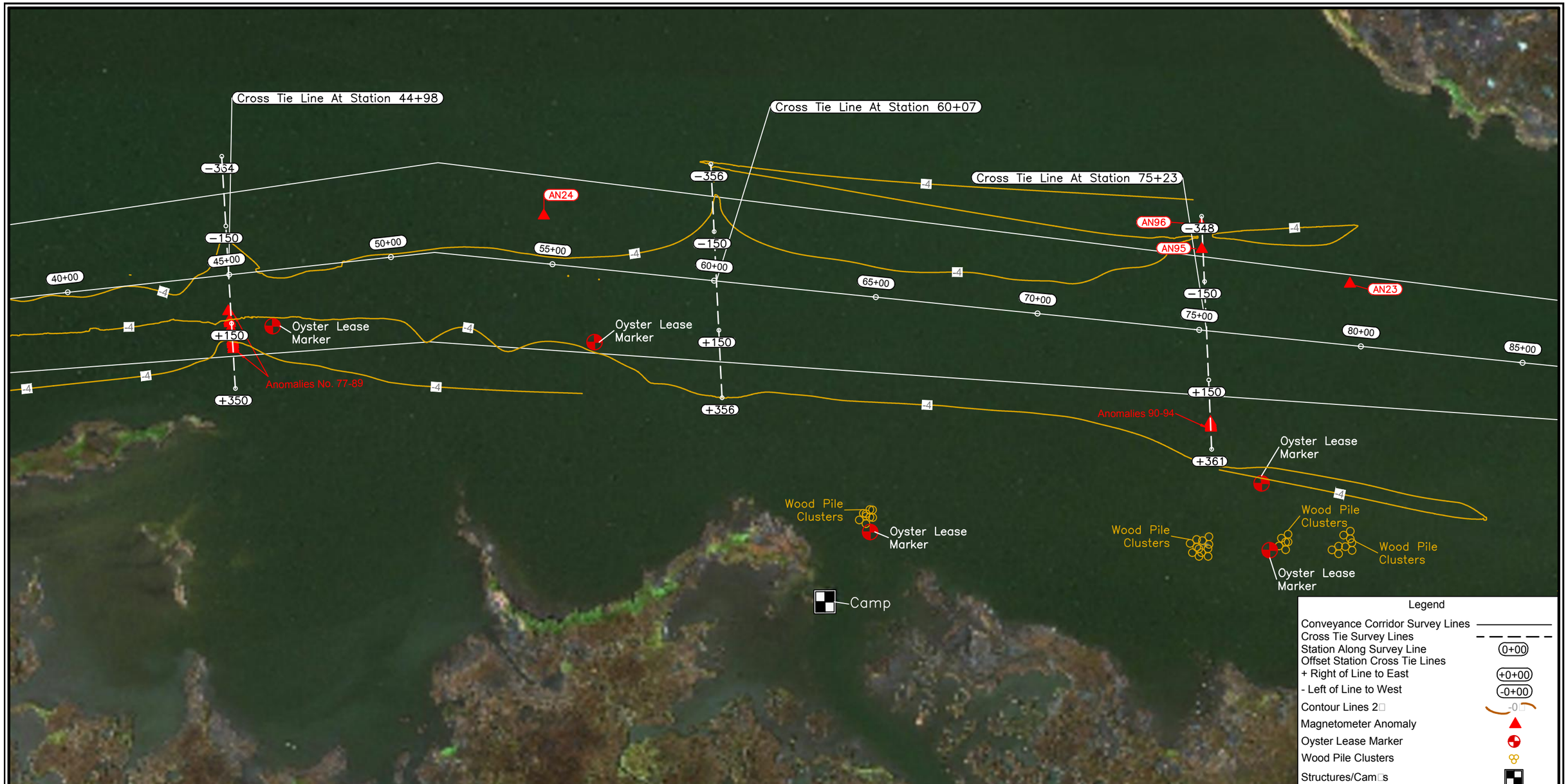

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300

300 0 150 300

STATE OF LOUISIANA
05/17/2018
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Magnetometer Results and Topo For Stations 40+00-80+00
Offset Stations for Cross Tie Lines at Station 44+98, 60+07 & 75+23

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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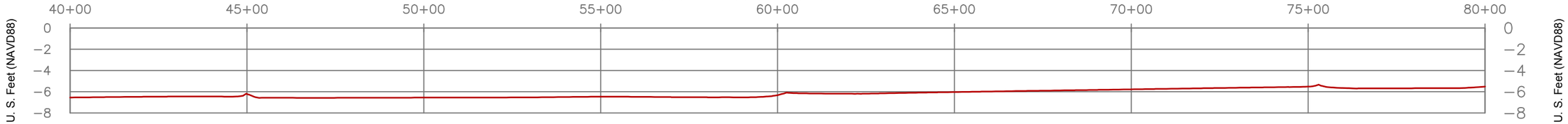
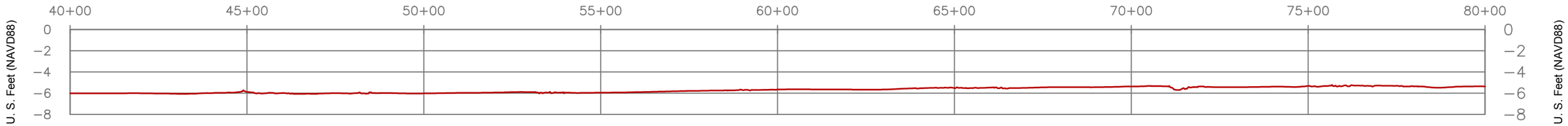
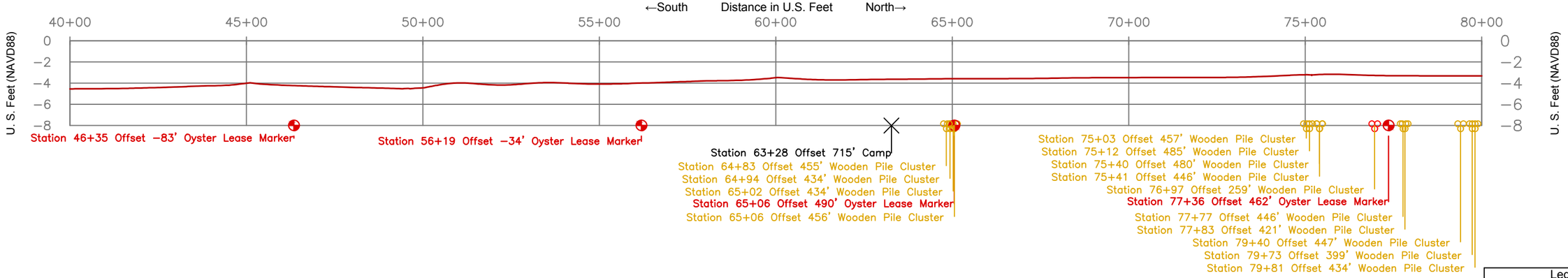
Conveyance Corridor West Survey Line Stations 40+00-80+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Conveyance Corridor Center Survey Line Stations 40+00-80+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Conveyance Corridor East Survey Line Stations 40+00-80+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Legend
Water Bottoms
Oyster Lease Marker
Wood Pile Clusters
Structures/Cam s

STATE OF LOUISIANA
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RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

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Professional Land Surveyor
Registration No. 4746

Survey Results Profiles For Conveyance Corridor West Line, Center Line and East Line Stations 40+00-80+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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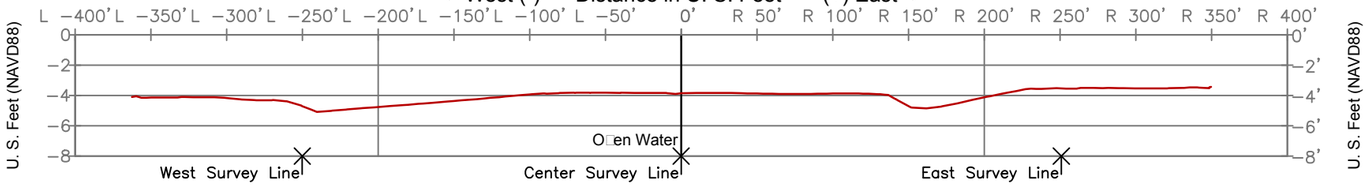
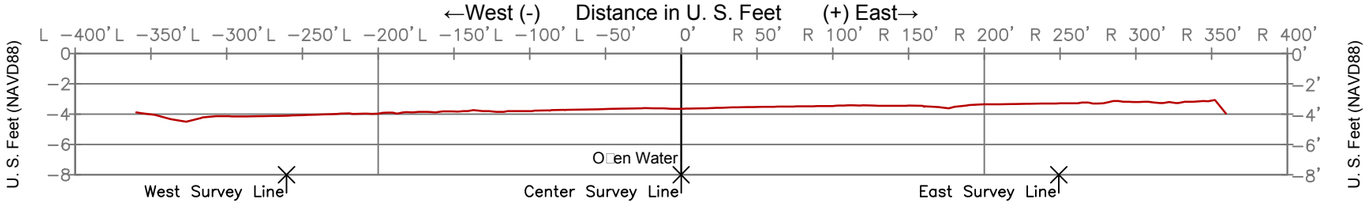
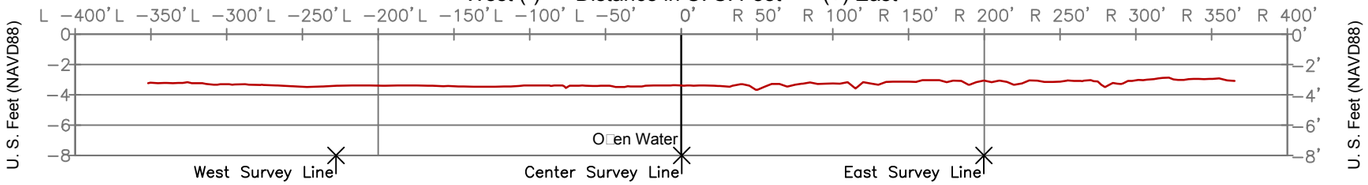
Cross Tie Line At 44+98 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10
←West (-) Distance in U. S. Feet (+) East→



Cross Tie Line At 60+07 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10
←West (-) Distance in U. S. Feet (+) East→



Cross Tie Line At 75+23 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10
←West (-) Distance in U. S. Feet (+) East→



MagnetometerTable

Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN23	106.1	194.4	DIPOLE	305,537'	3,552,070'	NOTHING FOUND
AN24	236.1	50	DIPOLE	303,057'	3,551,845'	NOTHING FOUND
AN77	634.9	2.8	MONOPOLE	302,100'	3,552,250'	NOTHING FOUND
AN78	2037.4	5.3	MONOPOLE	302,099'	3,552,236'	NOTHING FOUND
AN79	1524.3	6.6	MONOPOLE	302,100'	3,552,245'	NOTHING FOUND
AN80	1666.6	3.2	MONOPOLE	302,099'	3,552,234'	NOTHING FOUND
AN81	379.7	2.6	MONOPOLE	302,098'	3,552,230'	NOTHING FOUND
AN82	333.6	3	MONOPOLE	302,098'	3,552,225'	NOTHING FOUND
AN83	109.1	2	COMPLEX	302,098'	3,552,228'	NOTHING FOUND
AN84	158	2	MONOPOLE	302,097'	3,552,222'	NOTHING FOUND
AN85	134.2	2	COMPLEX	302,092'	3,552,187'	NOTHING FOUND
AN86	274.3	6.9	COMPLEX	302,090'	3,552,171'	NOTHING FOUND
AN87	308.7	3.1	MONOPOLE	302,089'	3,552,166'	NOTHING FOUND
AN88	1829.1	17.4	MONOPOLE	302,088'	3,552,162'	NOTHING FOUND
AN89	1533.9	17.7	COMPLEX	302,085'	3,552,134'	NOTHING FOUND
AN90	132.9	2.3	MONOPOLE	305,106'	3,552,510'	NOTHING FOUND
AN91	171.4	2.3	MONOPOLE	305,106'	3,552,507'	NOTHING FOUND
AN92	298.4	5.3	COMPLEX	305,106'	3,552,504'	NOTHING FOUND
AN93	400.5	2.3	MONOPOLE	305,105'	3,552,499'	NOTHING FOUND
AN94	2245.7	531.9	COMPLEX	305,105'	3,552,493'	NOTHING FOUND
AN95	1891	45.7	COMPLEX	305,081'	3,551,960'	NOTHING FOUND
AN96	1201.1	36.9	COMPLEX	305,081'	3,551,885'	NOTHING FOUND

Legend
Water Bottoms
Survey Lines X

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Magnetometer Table For Stations 40+00 to 80+00
Profiles of Cross Tie Lines At Stations 44+98, 60+07 & 75+23

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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No.	DATE:	REVISED BY:

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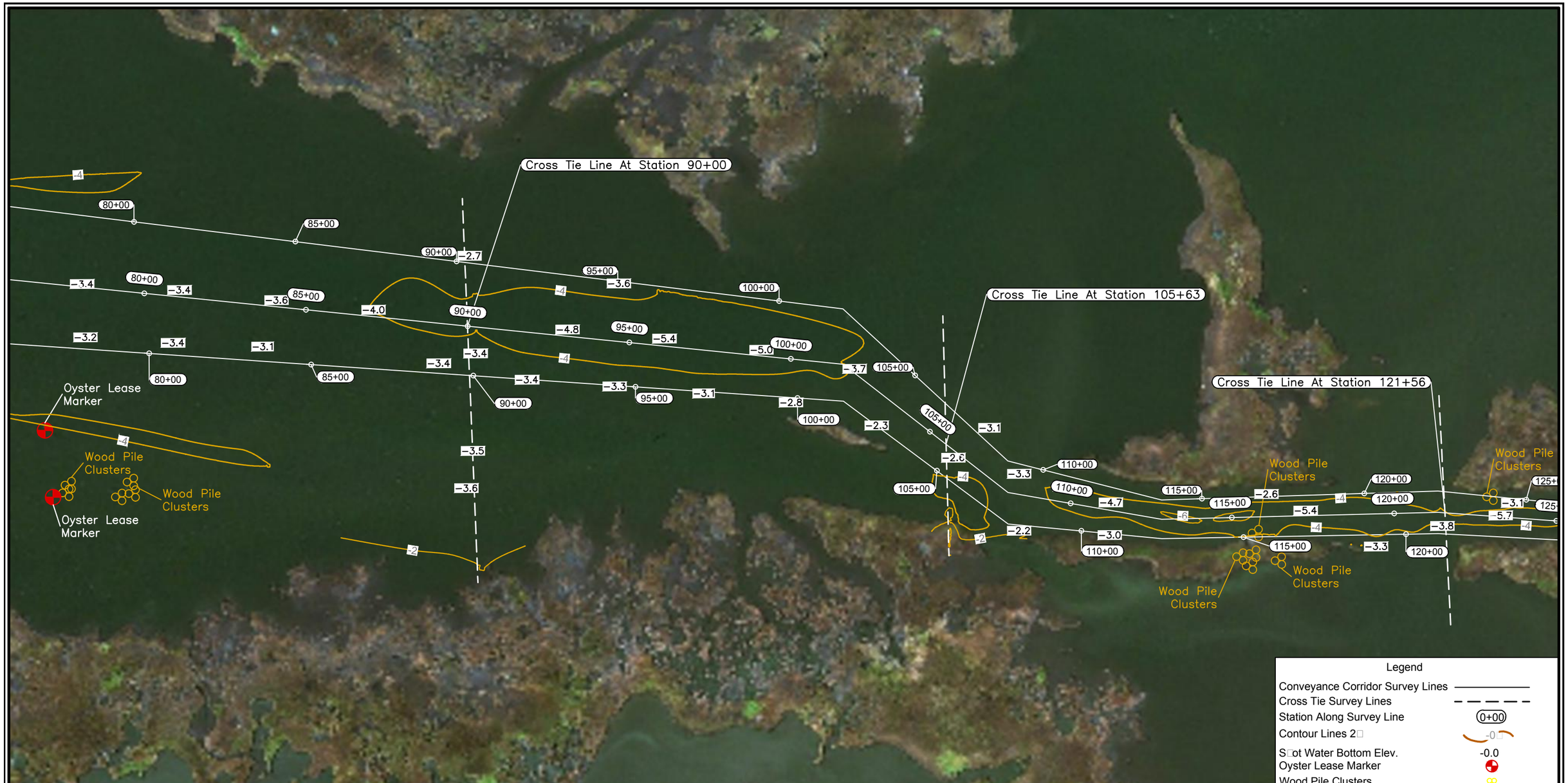

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300

300 0 150 300

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results for Conveyance Corridor West Line, Center Line and East Line Stations 80+00-120+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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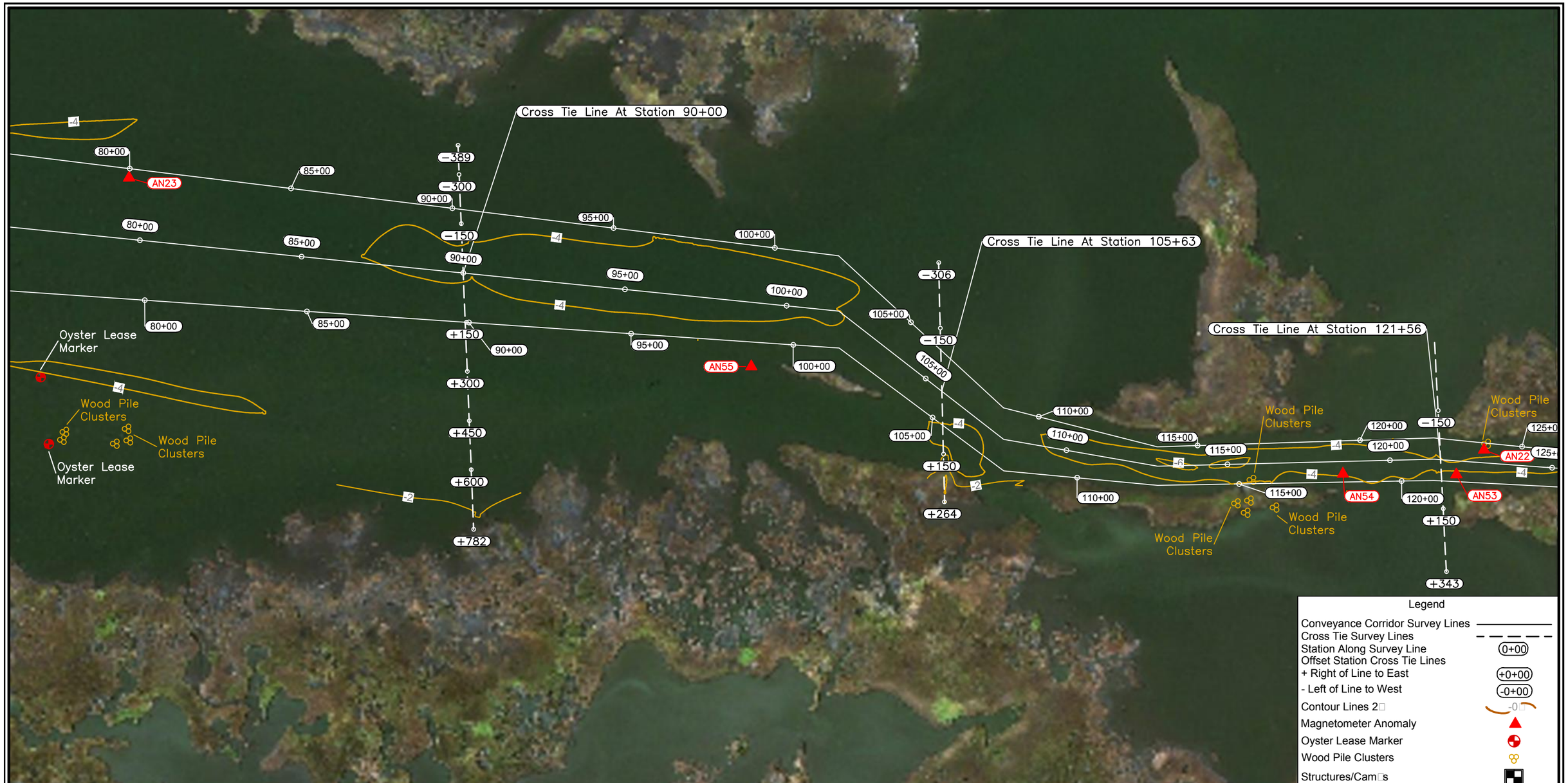

Legend

Conveyance Corridor Survey Lines	
Cross Tie Survey Lines	
Station Along Survey Line	0+00
Offset Station Cross Tie Lines	
+ Right of Line to East	+0+00
- Left of Line to West	-0+00
Contour Lines 2	-0
Magnetometer Anomaly	
Oyster Lease Marker	
Wood Pile Clusters	
Structures/Cam s	

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300

300 0 150 300

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
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REGISTERED PROFESSIONAL
LAND SURVEYOR

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Professional Land Surveyor
Registration No. 4746

Magnetometer Results and To o For Stations 80+00-120+00
Offset Stations for Cross Tie Lines at Station 90+00, 105+63 & 121+56

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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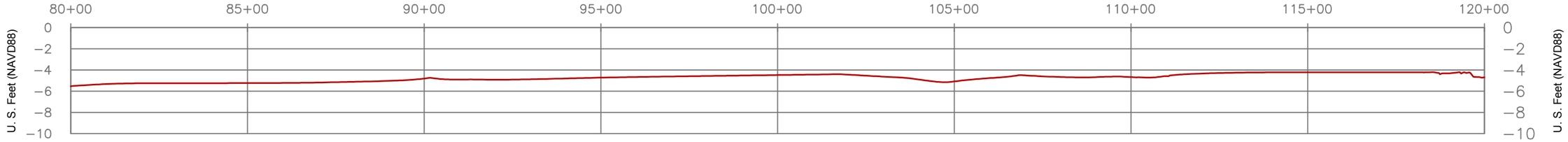
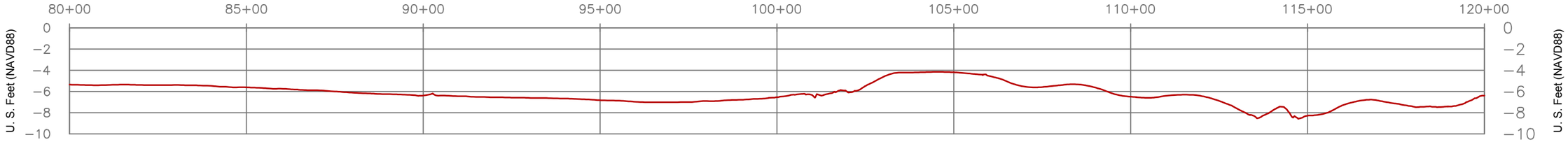
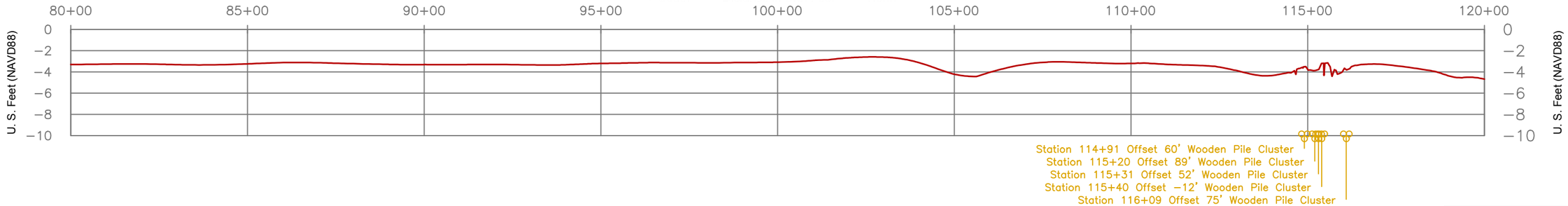
Conveyance Corridor West Survey Line Stations 80+00-120+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Conveyance Corridor Center Survey Line Stations 80+00-120+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Conveyance Corridor East Survey Line Stations 80+00-120+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Legend
Water Bottoms
Wood Pile Clusters

STATE OF LOUISIANA
05/17/2018
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REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results Profiles For Conveyance Corridor West Line, Center Line and East Line Stations 80+00-120+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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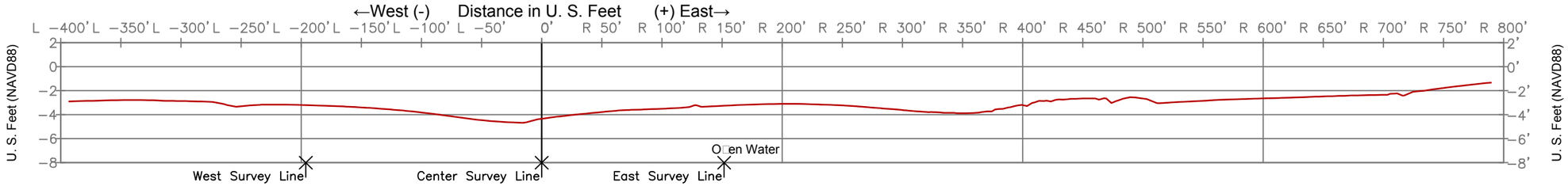
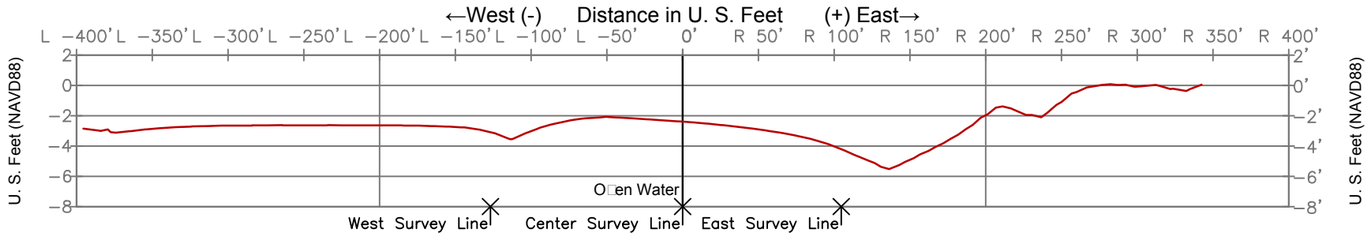
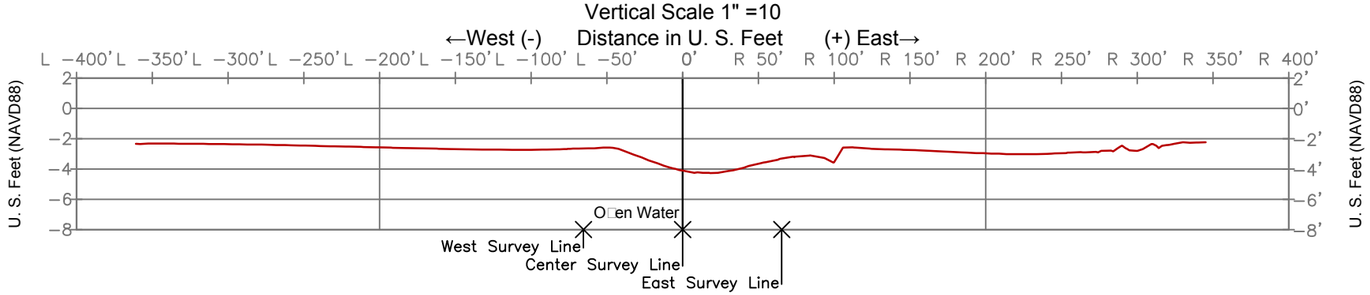
Cross Tie Line At 90+00 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10



Cross Tie Line At 105+63 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10



Cross Tie Line At 121+56 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10



Magnetometer Table						
Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN22	120	146.8	MONOPOLE	309,701'	3,552,931'	NOTHING FOUND
AN23	106.1	194.4	DIPOLE	305,537'	3,552,070'	NOTHING FOUND
AN53	215.1	83.9	DIPOLE	309,615'	3,553,007'	NOTHING FOUND
AN54	108.9	171.1	MONOPOLE	309,266'	3,553,003'	NOTHING FOUND
AN55	505.1	41.2	DIPOLE	307,448'	3,552,662'	NOTHING FOUND

Legend
Water Bottoms
Survey Lines X

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Magnetometer Table For Stations 80+00 to 120+00
Profiles of Cross Tie Lines At Stations 90+00, 105+63 and 121+56

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300

300 0 150 300

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results for Conveyance Corridor West Line, Center Line and East Line Stations 120+00-160+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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Legend

Conveyance Corridor Survey Lines	
Cross Tie Survey Lines	
Station Along Survey Line	0+00
Offset Station Cross Tie Lines	
+ Right of Line to East	+0+00
- Left of Line to West	-0+00
Contour Lines 2□	-0□
Magnetometer Anomaly	
Wood Pile Clusters	
Structures/Cam□s	

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300□

300□ 0 150□ 300□

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Magnetometer Results and To□o For Stations 120+00-160+00
Offset Stations for Cross Tie Lines at Station 121+56, 135+79 and 152+16

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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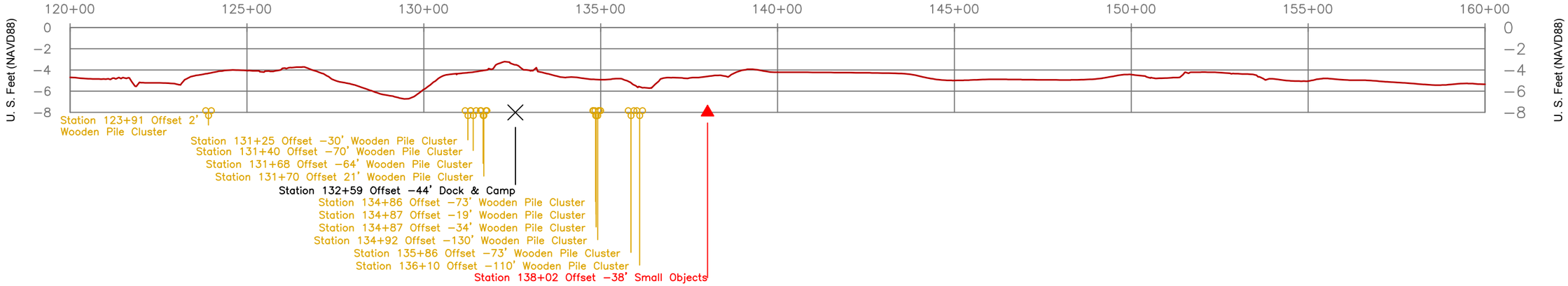
Conveyance Corridor West Survey Line Stations 120+00-160+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Conveyance Corridor Center Survey Line Stations 120+00-160+00
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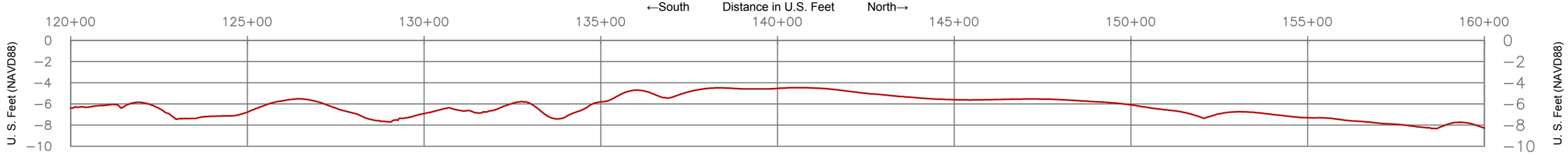
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Conveyance Corridor East Survey Line Stations 120+00-160+00
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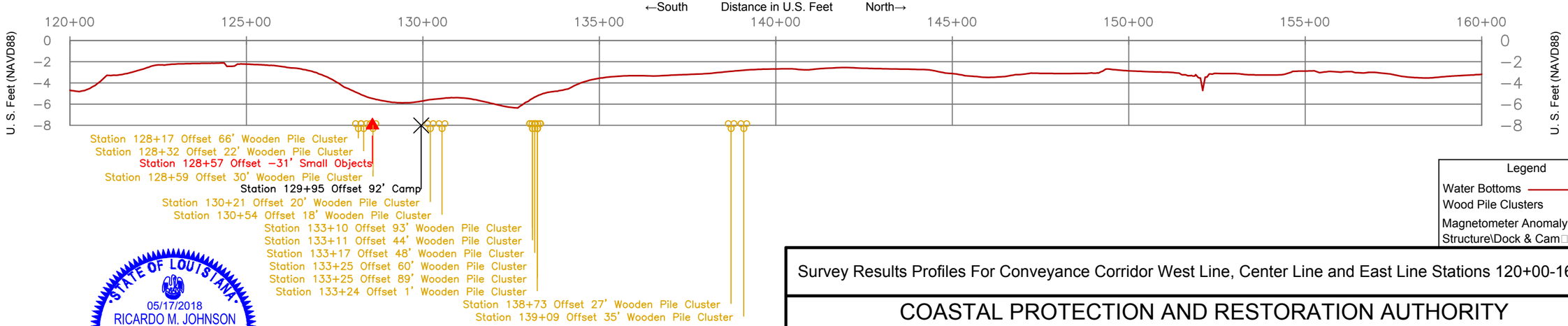
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Legend
- Water Bottoms
- Wood Pile Clusters
- Magnetometer Anomaly
- Structure\Dock & Cam

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results Profiles For Conveyance Corridor West Line, Center Line and East Line Stations 120+00-160+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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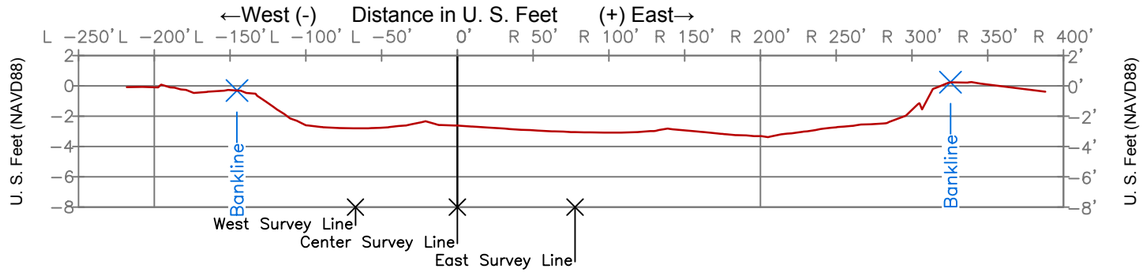
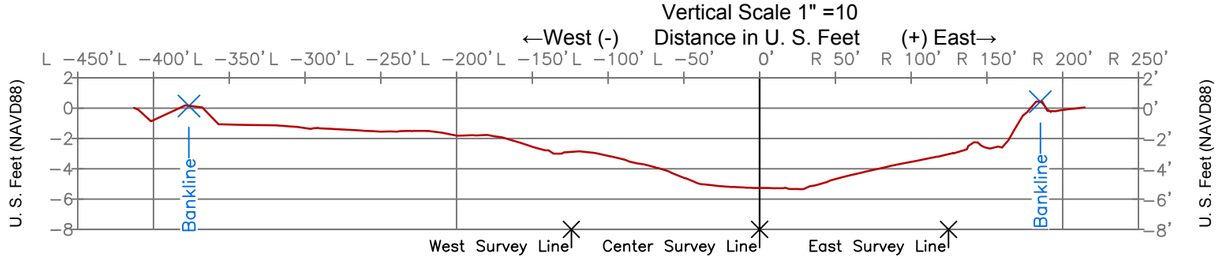
Cross Tie Line At 121+56
Shown on Previous Sheet No. 31

Cross Tie Line At 135+79 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10



Cross Tie Line At 152+16 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10



Magnetometer Table						
Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN18	111	59.5	COMPLEX	311,860'	3,552,851'	NOTHING FOUND
AN19	94.9	109	DIPOLE	311,170'	3,553,016'	NOTHING FOUND
AN20	77.8	252.2	COMPLEX	310,728'	3,553,063'	NOTHING FOUND
AN21	342.6	193.7	COMPLEX	310,303'	3,552,986'	LOTS OF DEBRIS
AN22	120	146.8	MONOPOLE	309,701'	3,552,931'	NOTHING FOUND
AN25	677.1	86.7	MONOPOLE	310,438'	3,553,043'	LOTS OF DEBRIS
AN26	103.6	87.5	COMPLEX	310,525'	3,553,065'	LOTS OF DEBRIS
AN49	148.7	64.1	MONOPOLE	313,327'	3,552,879'	NOTHING FOUND
AN50	73.9	73.5	DIPOLE	311,569'	3,553,168'	NOTHING FOUND
AN51	110.6	63.9	MONOPOLE	310,952'	3,553,182'	NOTHING FOUND
AN52	2978.2	216.3	DIPOLE	310,236'	3,553,051'	LOTS OF DEBRIS
AN53	215.1	83.9	DIPOLE	309,615'	3,553,007'	NOTHING FOUND
AN54	108.9	171.1	MONOPOLE	309,266'	3,553,003'	NOTHING FOUND
AN97	378.3	6.4	COMPLEX	311,084'	3,553,233'	NOTHING FOUND
AN98	1748.5	53.7	MONOPOLE	311,083'	3,553,228'	NOTHING FOUND
AN99	424.9	11	COMPLEX	311,074'	3,553,174'	NOTHING FOUND
AN100	595.2	12.7	COMPLEX	311,073'	3,553,162'	NOTHING FOUND
AN101	691.6	9.2	COMPLEX	311,072'	3,553,147'	NOTHING FOUND
AN102	1116.9	5.8	COMPLEX	311,072'	3,553,140'	NOTHING FOUND
AN103	249.9	6.6	COMPLEX	311,059'	3,552,985'	NOTHING FOUND
AN104	3494.6	18.6	DIPOLE	311,059'	3,552,979'	NOTHING FOUND
AN105	193.4	3.7	COMPLEX	311,060'	3,552,961'	NOTHING FOUND
AN106	1820.4	19.4	COMPLEX	312,586'	3,552,964'	NOTHING FOUND
AN107	1855.9	27.2	COMPLEX	312,572'	3,552,870'	NOTHING FOUND
AN108	1870.9	79.4	COMPLEX	312,568'	3,552,845'	NOTHING FOUND
AN109	188.6	5	COMPLEX	312,554'	3,552,769'	NOTHING FOUND
AN110	257.2	3.2	COMPLEX	312,553'	3,552,763'	NOTHING FOUND
AN111	275.1	4	MONOPOLE	312,553'	3,552,761'	NOTHING FOUND
AN112	1533.7	19.8	COMPLEX	312,553'	3,552,742'	NOTHING FOUND
AN113	696.8	1.5	MONOPOLE	312,553'	3,552,740'	NOTHING FOUND
AN114	292.4	7.4	COMPLEX	312,554'	3,552,736'	NOTHING FOUND

Legend	
Water Bottoms	
Survey Lines	X
Bankline	X

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Magnetometer Table For Stations 120+00 to 160+00
Profiles of Cross Tie Lines At Stations 135+79 & 152+16 (121+56 Sheet 31)

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300

300 0 150 300

STATE OF LOUISIANA
05/17/2018
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Survey Results for Conveyance Corridor West Line, Center Line and East Line Stations 160+00-200+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

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NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300

300 0 150 300

STATE OF LOUISIANA
05/17/2018
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Magnetometer Results and To o For Stations 160+00-200+00
Offset Stations for Cross Tie Lines at Station 167+10, 182+97 and 200+48

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
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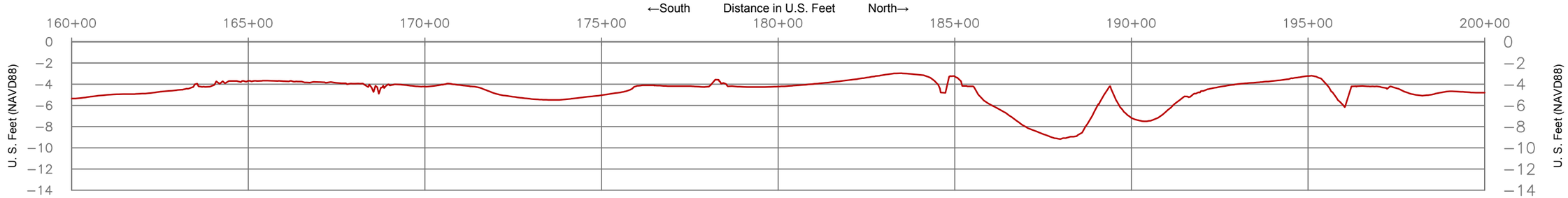
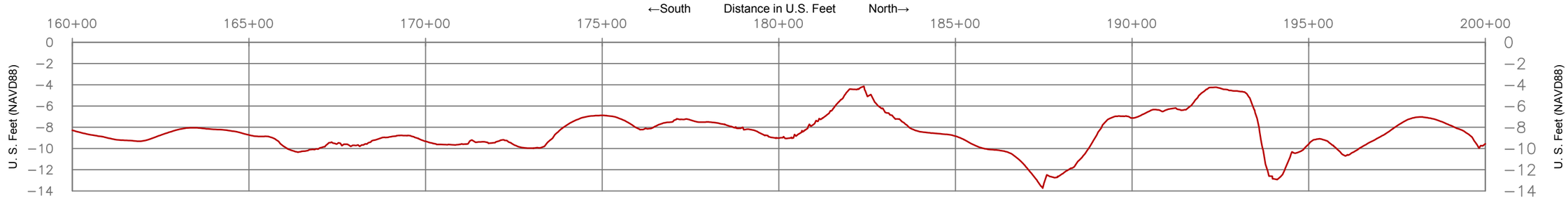
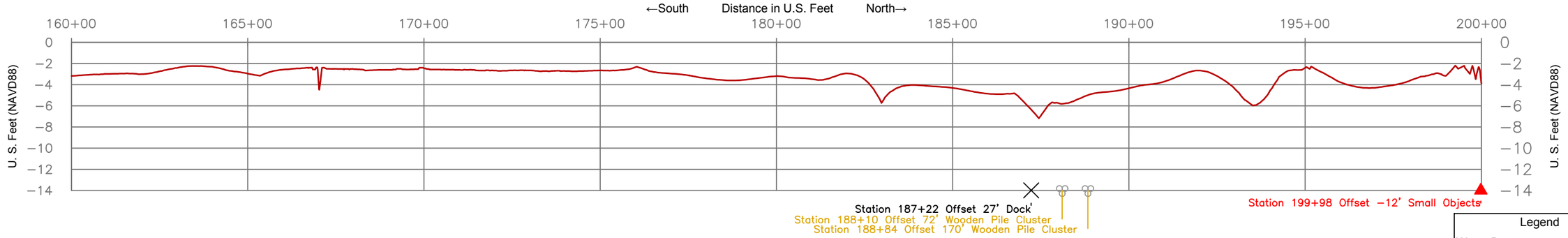
Conveyance Corridor West Survey Line Stations 160+00-200+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'



Conveyance Corridor Center Survey Line Stations 160+00-200+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'



Conveyance Corridor East Survey Line Stations 160+00-200+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'



Legend
- Water Bottoms
- Wood Pile Clusters
- Magnetometer Anomaly
- Structures/Dock

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results Profiles For Conveyance Corridor West Line, Center Line and East Line Stations 160+00-200+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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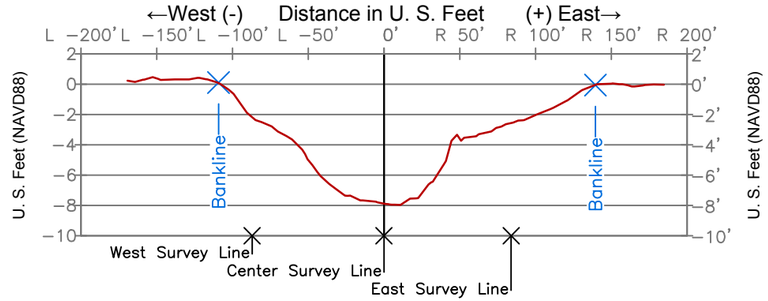
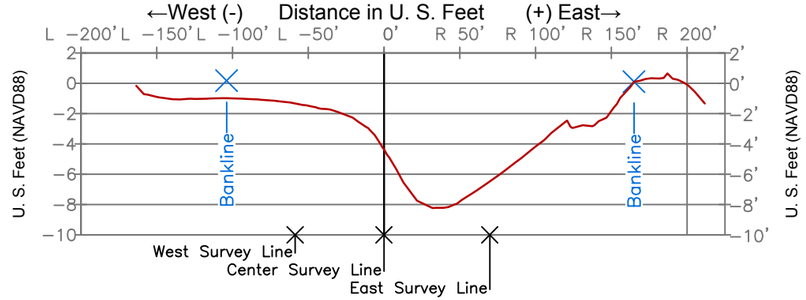
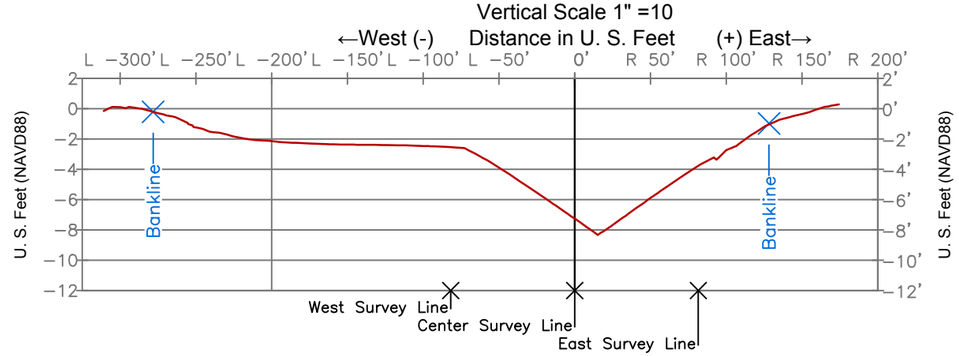
Cross Tie Line At 167+10 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10



Cross Tie Line At 182+97 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10



Cross Tie Line At 200+48 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10



MagnetometerTable						
Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN13	52.1	22.4	MONOPOLE	317,370'	3,552,743'	NOTHING FOUND
AN14	472.9	119.4	COMPLEX	315,713'	3,552,707'	NOTHING FOUND
AN15	67.9	37	MONOPOLE	315,526'	3,552,795'	NOTHING FOUND
AN16	168.9	51.3	COMPLEX	315,214'	3,552,863'	NOTHING FOUND
AN17	352.1	71.8	COMPLEX	314,874'	3,552,890'	NOTHING FOUND
AN27	223.8	86.1	MONOPOLE	313,760'	3,552,776'	NOTHING FOUND
AN28	1139.6	101.2	DIPOLE	315,975'	3,552,704'	BUTTERFLY NET DOCK
AN44	353.7	97.6	MONOPOLE	317,596'	3,552,921'	NOTHING FOUND
AN45	67.8	65.8	MONOPOLE	317,390'	3,552,903'	NOTHING FOUND
AN46	926.4	149.9	MONOPOLE	316,084'	3,552,810'	BUTTERFLY NET DOCK
AN47	164.3	163.1	MONOPOLE	315,948'	3,552,752'	BUTTERFLY NET DOCK
AN48	97.2	68.7	MONOPOLE	314,245'	3,552,850'	NOTHING FOUND
AN49	148.7	64.1	MONOPOLE	313,327'	3,552,879'	NOTHING FOUND
AN115	1929.2	50.3	COMPLEX	315,588'	3,552,860'	NOTHING FOUND
AN116	454.1	0.9	DIPOLE	315,575'	3,552,778'	NOTHING FOUND
AN117	1355	11.5	COMPLEX	317,056'	3,552,851'	ANOMALY
AN118	1853.8	18.2	COMPLEX	317,056'	3,552,769'	ANOMALY

Legend
Water Bottoms
Survey Lines X
Bankline X

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Magnetometer Table For Stations 160+00 to 200+00
Profiles of Cross Tie Lines At Stations 167+10, 182+97 and 200+48

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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No.	DATE:	REVISED BY:

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NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300

300 0 150 300

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results for Conveyance Corridor West Line, Center Line and East Line Stations 200+00-240+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
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NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300

300 0 150 300

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

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Professional Land Surveyor
Registration No. 4746

Magnetometer Results and To o For Stations 200+00-240+00
Offset Stations for Cross Tie Lines at Station 200+48, 215+15 and 229+82

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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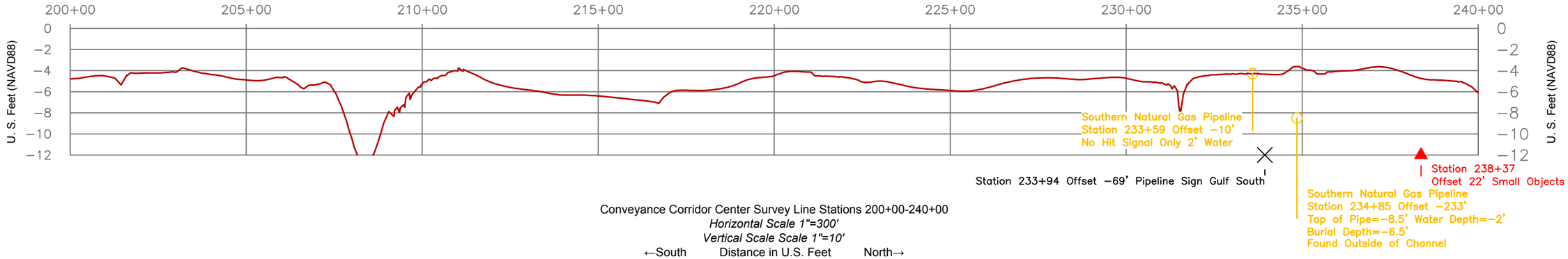
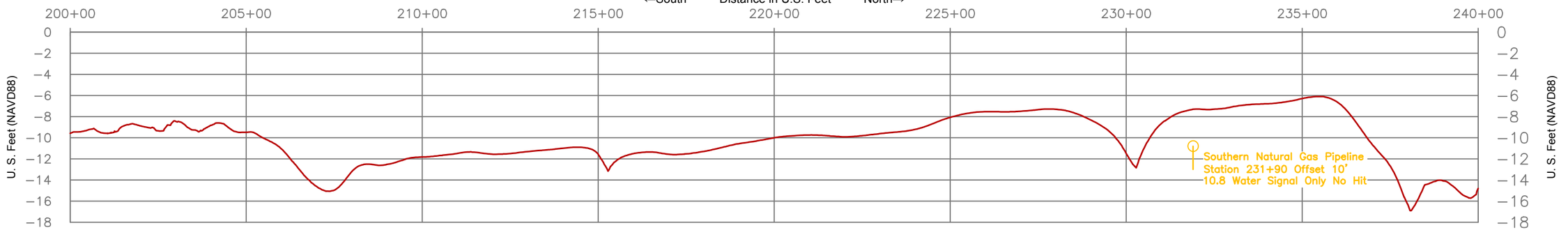
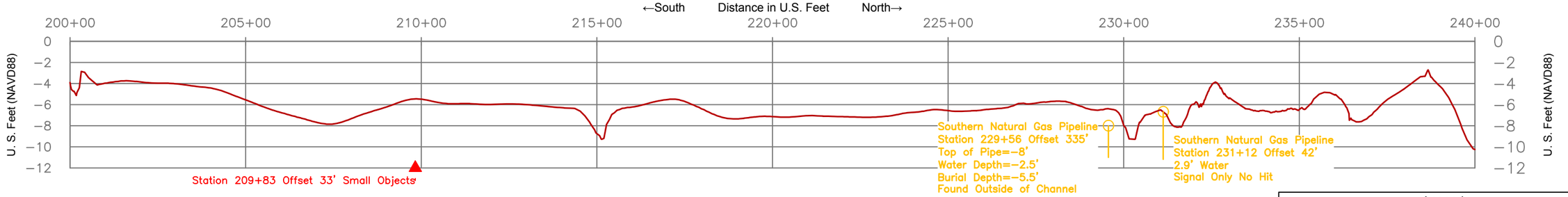
Conveyance Corridor West Survey Line Stations 200+00-240+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Conveyance Corridor Center Survey Line Stations 200+00-240+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Conveyance Corridor East Survey Line Stations 200+00-240+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'
←South Distance in U.S. Feet North→



Legend

Water Bottoms		Magnetometer Anomaly	▲
Pipeline Gulf South	○	Structures/Sign	□

STATE OF LOUISIANA
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RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results Profiles For Conveyance Corridor West Line, Center Line and East Line Stations 200+00-240+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
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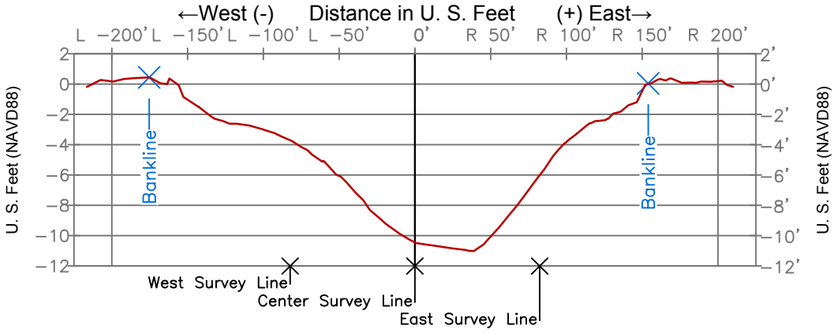
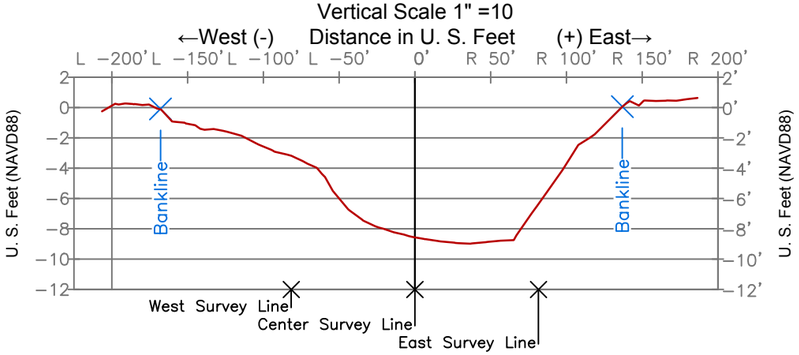
Cross Tie Line At Station 200+48
Shown on Sheet 39

Cross Tie Line At 215+15 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10



Cross Tie Line At 229+82 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10



Magnetometer Table						
Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN2	1001.2	76.2	DIPOLE	321,076'	3,552,905'	NOTHING FOUND
AN3	1353.1	66.7	DIPOLE	321,002'	3,552,939'	NOTHING FOUND
AN4	151.7	64.1	COMPLEX	320,943'	3,552,961'	NOTHING FOUND
AN5	805	45.1	DIPOLE	320,844'	3,553,000'	NOTHING FOUND
AN6	965.7	47.8	MONOPOLE	320,808'	3,553,001'	NOTHING FOUND
AN7	74.8	44.1	MONOPOLE	320,748'	3,552,995'	NOTHING FOUND
AN8	299.7	70.8	MONOPOLE	320,245'	3,552,945'	PIPELINE TOO DEEP TO HIT IN CANAL
AN9	60.6	52.3	MONOPOLE	320,194'	3,552,940'	PIPELINE TOO DEEP TO HIT IN CANAL
AN10	93.8	36.7	MONOPOLE	319,640'	3,552,875'	NOTHING FOUND
AN11	107.5	35	DIPOLE	319,226'	3,552,863'	NOTHING FOUND
AN12	2646	112.9	DIPOLE	318,631'	3,552,798'	NOTHING FOUND
AN13	52.1	22.4	MONOPOLE	317,370'	3,552,743'	NOTHING FOUND
AN29	106	92.3	DIPOLE	318,526'	3,552,939'	NOTHING FOUND
AN30	444.7	152.8	MONOPOLE	320,294'	3,553,107'	PIPELINE TOO DEEP TO HIT IN CANAL
AN31	115	158.7	COMPLEX	320,850'	3,553,088'	NOTHING FOUND
AN32	228.8	247	COMPLEX	321,144'	3,552,949'	NOTHING FOUND
AN37	103.9	157.9	COMPLEX	320,979'	3,553,103'	NOTHING FOUND
AN38	5958.1	182.2	COMPLEX	320,826'	3,553,149'	NOTHING FOUND
AN39	294.5	115.7	MONOPOLE	320,129'	3,553,094'	PIPELINE TOO DEEP TO HIT IN CANAL
AN40	563.8	131.3	COMPLEX	319,984'	3,553,088'	PIPELINE TOO DEEP TO HIT IN CANAL
AN41	84.8	79.2	MONOPOLE	319,617'	3,553,095'	NOTHING FOUND
AN42	981.6	65.8	DIPOLE	318,936'	3,553,025'	NOTHING FOUND
AN43	57.2	98.3	MONOPOLE	318,635'	3,553,004'	NOTHING FOUND
AN44	353.7	97.6	MONOPOLE	317,596'	3,552,921'	NOTHING FOUND
AN45	67.8	65.8	MONOPOLE	317,390'	3,552,903'	NOTHING FOUND
AN117	1355	11.5	COMPLEX	317,056'	3,552,851'	ANOMALY
AN118	1853.8	18.2	COMPLEX	317,056'	3,552,769'	ANOMALY
AN119	1884.5	40.5	COMPLEX	318,580'	3,552,848'	NOTHING FOUND
AN120	1548.4	10.2	COMPLEX	318,568'	3,552,812'	NOTHING FOUND
AN121	690.5	25.6	MONOPOLE	320,098'	3,553,056'	PIPELINE TOO DEEP TO HIT IN CANAL

Legend	
Water Bottoms	
Survey Lines	X
Bankline	X

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Magnetometer Table For Stations 200+00 to 240+00
Profiles of Cross Tie Lines At Stations 200+48 (Sheet 39), 215+15 & 229+82

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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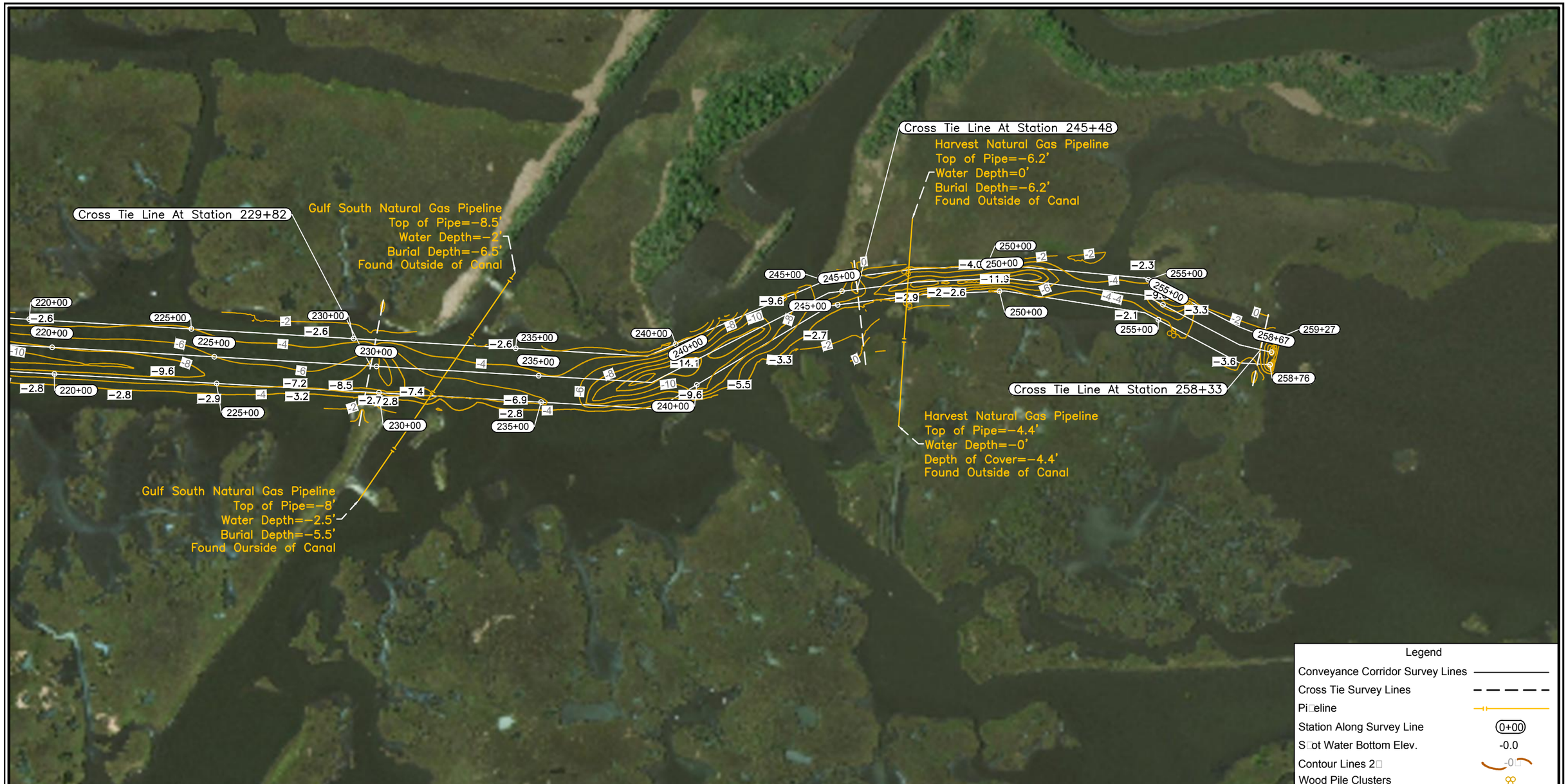

Legend

Conveyance Corridor Survey Lines	
Cross Tie Survey Lines	
Pi□eline	
Station Along Survey Line	0+00
S□ot Water Bottom Elev.	-0.0
Contour Lines 2□	-0□
Wood Pile Clusters	

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300□

300□ 0 150□ 300□

STATE OF LOUISIANA
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RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results for Conveyance Corridor West Line, Center Line and East Line Stations 240+00-260+00
Cross Tie Lines at Station 245+48 and 258+33

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
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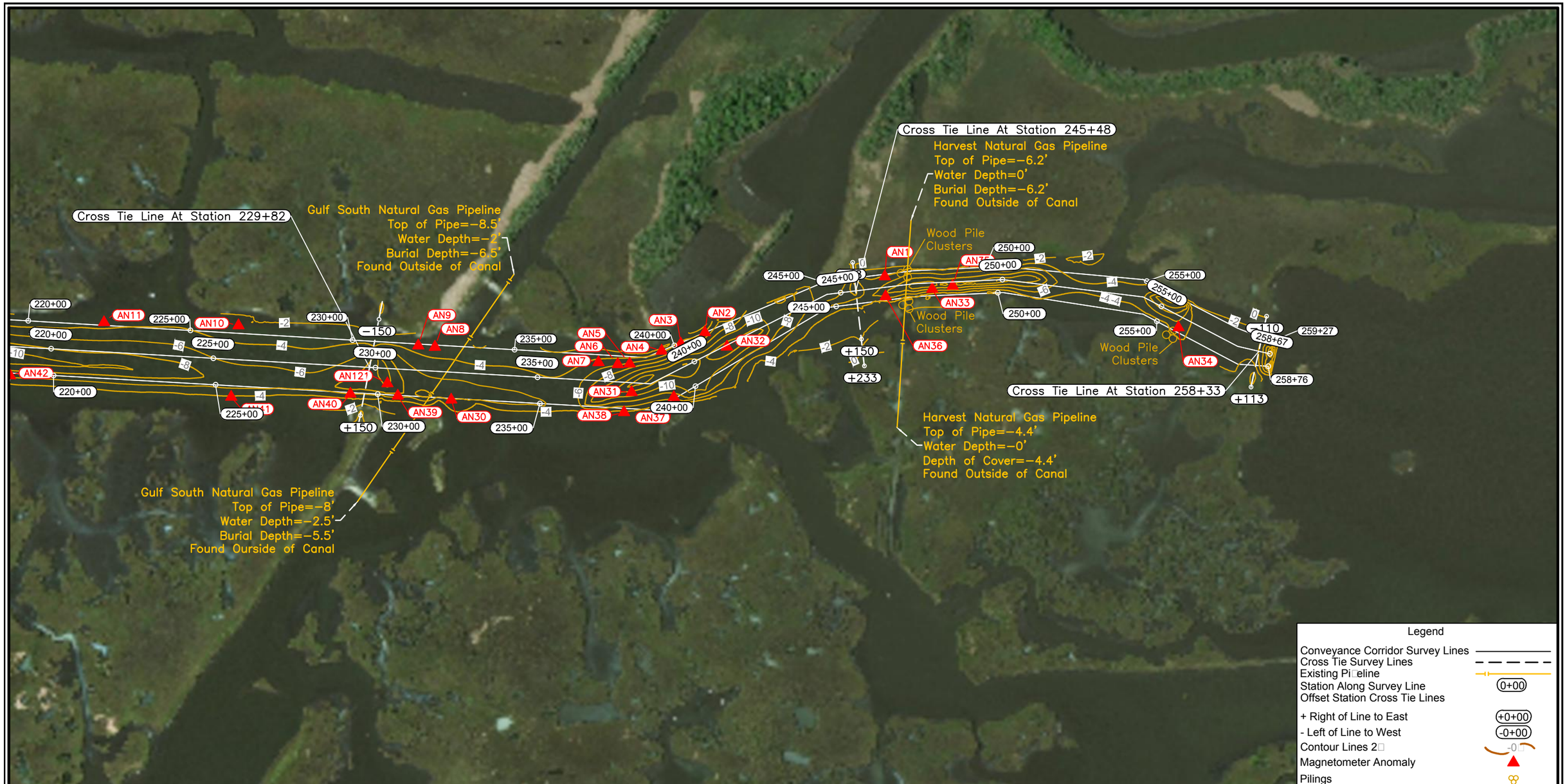

Legend

Conveyance Corridor Survey Lines	
Cross Tie Survey Lines	
Existing Pi□eline	
Station Along Survey Line	0+00
Offset Station Cross Tie Lines	
+ Right of Line to East	+0+00
- Left of Line to West	-0+00
Contour Lines 2□	-0□
Magnetometer Anomaly	
Pilings	

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300□

300□ 0 150□ 300□

STATE OF LOUISIANA
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LAND SURVEYOR

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Magnetometer Results and To□o For Stations 240+00-260+00
Offset Stations for Cross Tie Lines at Station 245+48 and 258+33

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
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Lake Tambour Area
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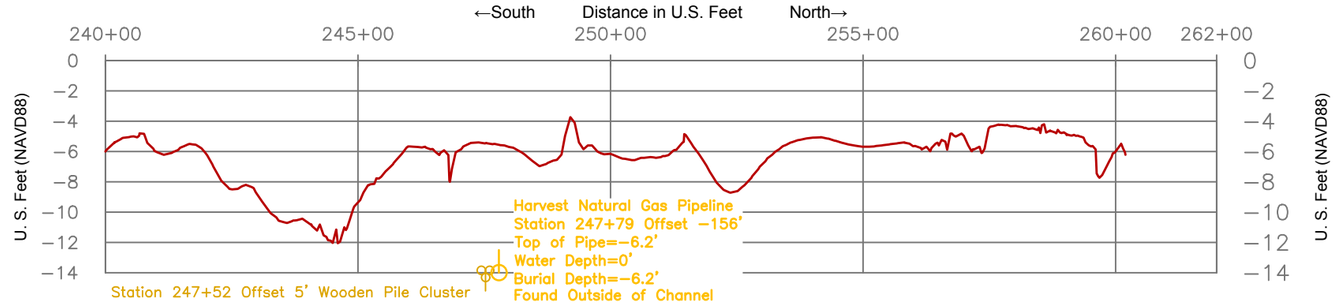
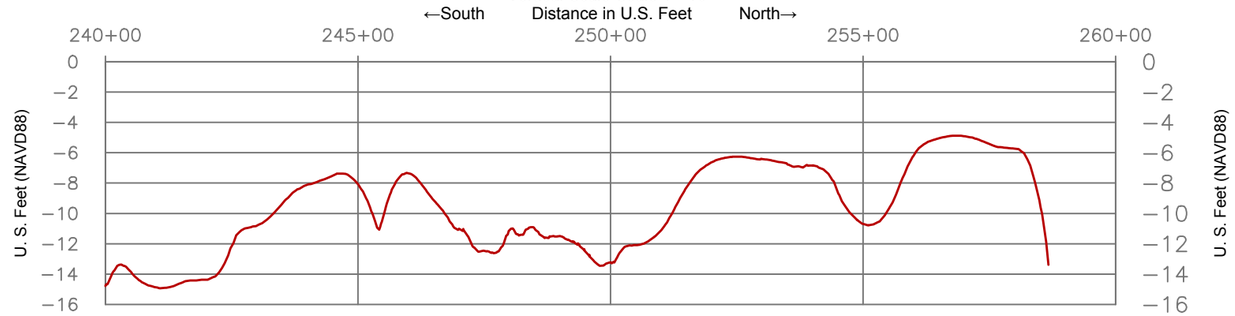
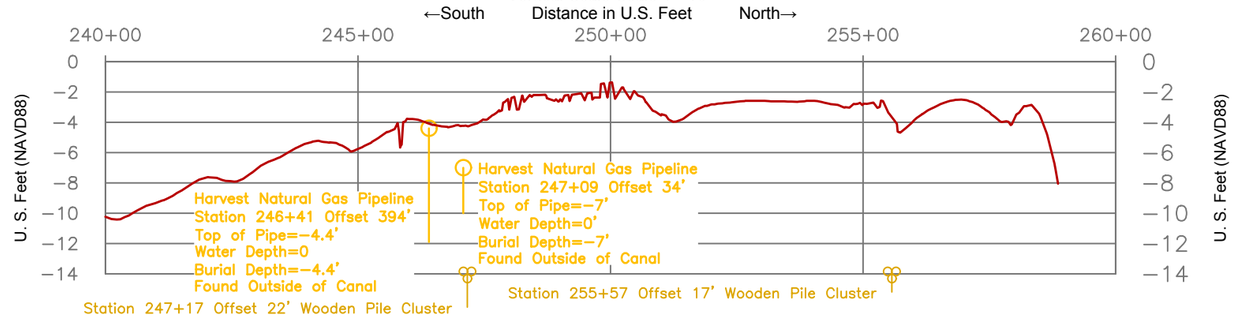
Conveyance Corridor West Survey Line Stations 240+00-262+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'



Conveyance Corridor Center Survey Line Stations 240+00-260+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'



Conveyance Corridor East Survey Line Stations 240+00-260+00
Horizontal Scale 1"=300'
Vertical Scale Scale 1"=10'



Legend
Water Bottoms
Pi eline Harvest NG
Wood Pile Clusters

STATE OF LOUISIANA
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REGISTERED PROFESSIONAL LAND SURVEYOR

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Survey Results Profiles For Conveyance Corridor West Line, Center Line and East Line Stations 240+00-260+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

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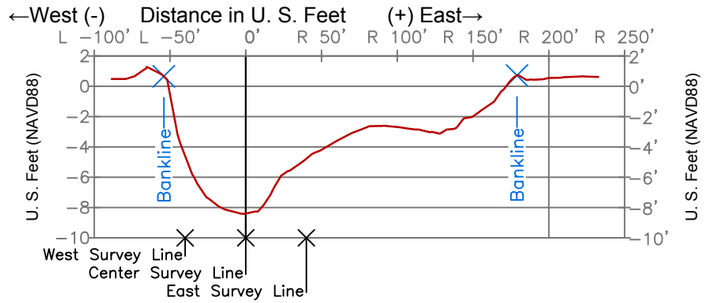
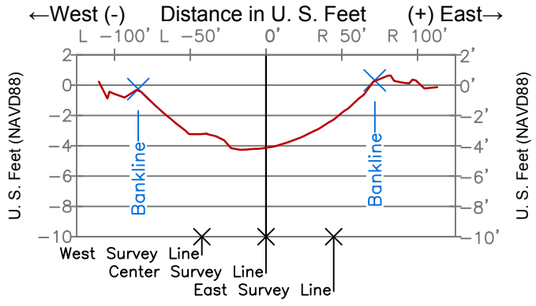
Cross Tie Line At Station 229+82
Shown on Sheet 43

Cross Tie Line At 245+48 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10



Cross Tie Line At 258+33 Conveyance Corridor Center Survey Line
Horizontal Scale 1" =100
Vertical Scale 1" =10



MagnetometerTable						
Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN1	449	124	DIPOLE	321,631'	3,552,736'	HARVEST GAS PIPELINE 9.8' COVER
AN2	1001.2	76.2	DIPOLE	321,076'	3,552,905'	NOTHING FOUND
AN3	1353.1	66.7	DIPOLE	321,002'	3,552,939'	NOTHING FOUND
AN4	151.7	64.1	COMPLEX	320,943'	3,552,961'	NOTHING FOUND
AN5	805	45.1	DIPOLE	320,844'	3,553,000'	NOTHING FOUND
AN6	965.7	47.8	MONOPOLE	320,808'	3,553,001'	NOTHING FOUND
AN7	74.8	44.1	MONOPOLE	320,748'	3,552,995'	NOTHING FOUND
AN8	299.7	70.8	MONOPOLE	320,245'	3,552,945'	PIPELINE TOO DEEP TO HIT IN CANAL
AN9	60.6	52.3	MONOPOLE	320,194'	3,552,940'	PIPELINE TOO DEEP TO HIT IN CANAL
AN30	444.7	152.8	MONOPOLE	320,294'	3,553,107'	PIPELINE TOO DEEP TO HIT IN CANAL
AN31	115	158.7	COMPLEX	320,850'	3,553,088'	NOTHING FOUND
AN32	228.8	247	COMPLEX	321,144'	3,552,949'	NOTHING FOUND
AN33	2938.1	175.6	DIPOLE	321,777'	3,552,775'	NOTHING FOUND
AN34	70.9	105.3	DIPOLE	322,534'	3,552,898'	NOTHING FOUND
AN35	212.6	120.2	MONOPOLE	321,840'	3,552,766'	NOTHING FOUND
AN36	2302.4	193.5	DIPOLE	321,633'	3,552,797'	HARVEST GAS PIPELINE 9.8' COVER
AN37	103.9	157.9	COMPLEX	320,979'	3,553,103'	NOTHING FOUND
AN38	5958.1	182.2	COMPLEX	320,826'	3,553,149'	NOTHING FOUND
AN39	294.5	115.7	MONOPOLE	320,129'	3,553,094'	PIPELINE TOO DEEP TO HIT IN CANAL
AN40	563.8	131.3	COMPLEX	319,984'	3,553,088'	PIPELINE TOO DEEP TO HIT IN CANAL
AN121	690.5	25.6	MONOPOLE	320,098'	3,553,056'	PIPELINE TOO DEEP TO HIT IN CANAL

Legend
Water Bottoms
Survey Lines X
Bankline X

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Magnetometer Table For Stations 240+00 to 260+00
Profiles of Cross Tie Lines At Stations 229+82 (Sheet 43) 245+48 and 258+33

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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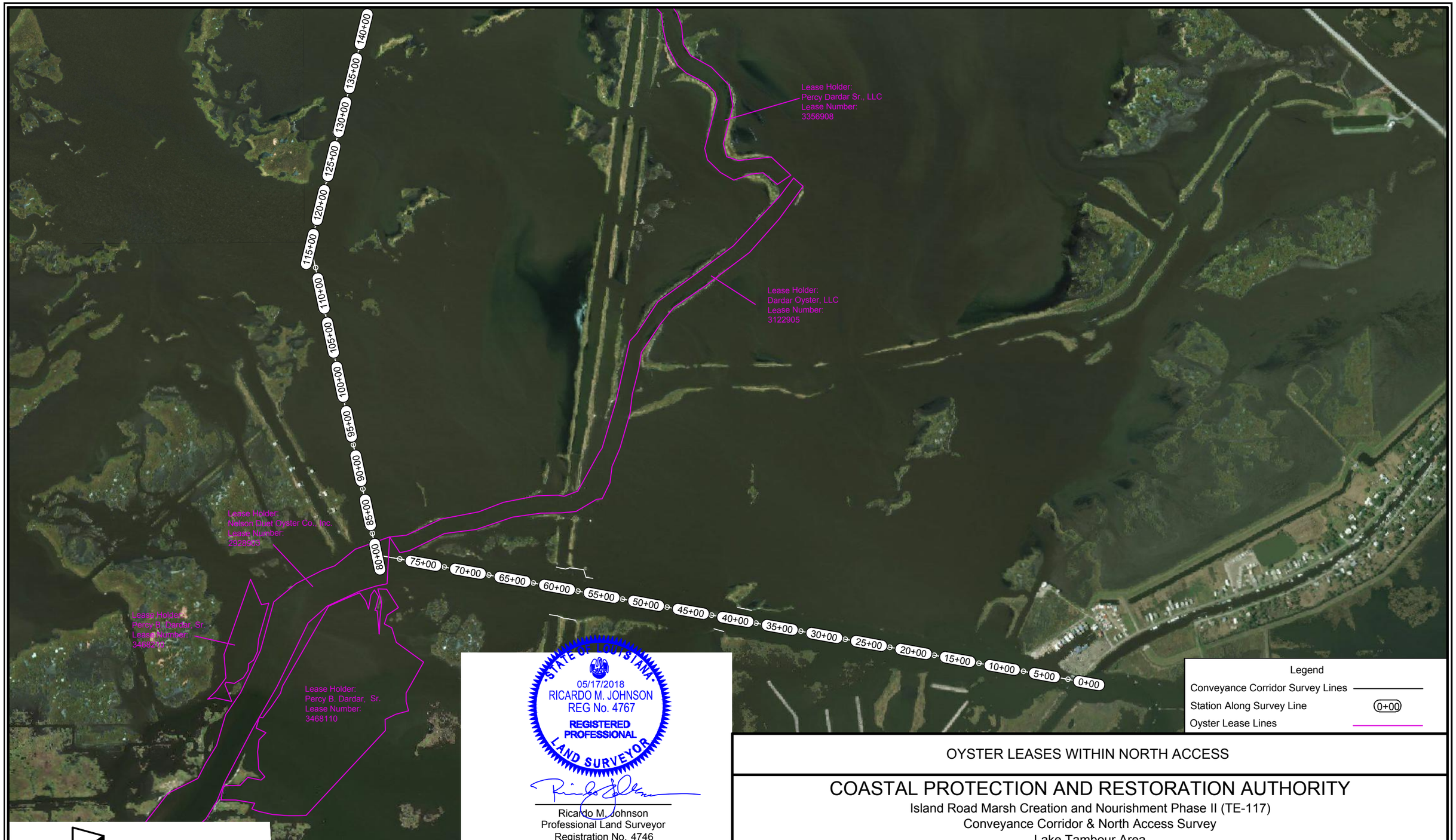

Legend

Conveyance Corridor Survey Lines

Station Along Survey Line (0+00)

Oyster Lease Lines

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REG No. 4767
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Professional Land Surveyor
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NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 1000□

1000□ 0 500□ 1000□

Note Concerning The Information On Oyster Leases & Oyster Data.

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OYSTER LEASES WITHIN NORTH ACCESS

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
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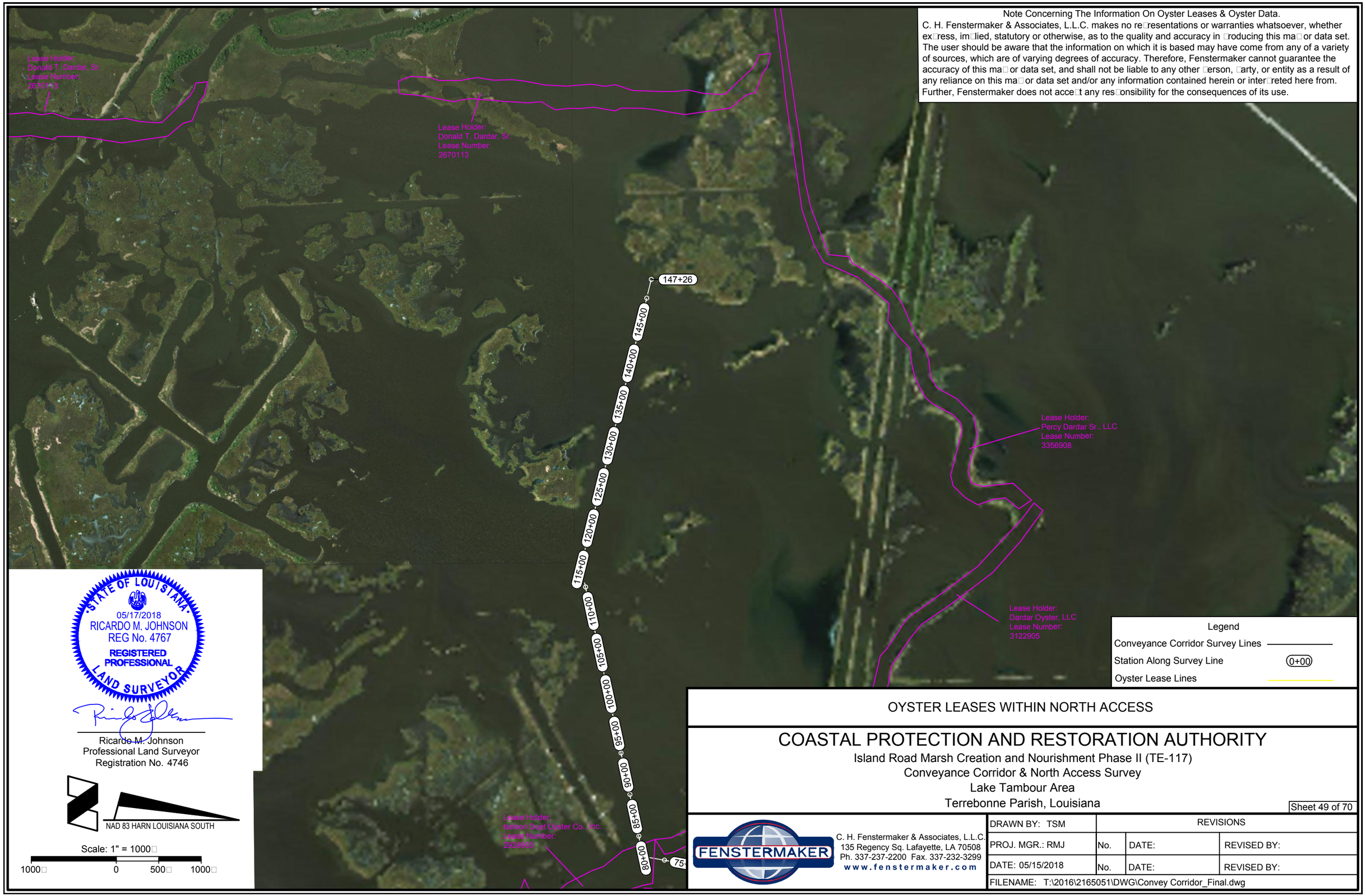

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OYSTER LEASES WITHIN NORTH ACCESS

COASTAL PROTECTION AND RESTORATION AUTHORITY

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Conveyance Corridor & North Access Survey
Lake Tambour Area
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Notes

West Survey Line No. 1 Station 0+00 to 77+16
Center Survey Line No. 1 Station 0+00 to 75+56
East Survey Line No. 3 Station 0+00 to 77+75
Continued on Sheet 51
Survey Line Station and Coordinate Tables are on Sheets 54.

Legend

North Access Survey Lines
Station Along Survey Line (0+00)

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REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
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Northern Access Survey Lines West Line Stations 0+00-77+16, Center Line 0+00-75+56 East Line 0+00-77+75

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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Notes
Continued From Sheet 50:
West Survey Line No. 1 Station 0+00 to 77+16
Center Survey Line No. 1 Station 0+00 to 75+56
East Survey Line No. 3 Station 0+00 to 77+75
Survey Line Station and Coordinate Tables are on Sheets 54.

Legend
Conveyance Corridor Survey Lines
Station Along Survey Line (0+00)

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Ricardo M. Johnson
Professional Land Surveyor
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Northern Access Survey Lines West Line Stations 0+00-77+16, Center Line 0+00-75+56 East Line 0+00-77+75

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
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Legend

Conveyance Corridor Survey Lines

Station Along Survey Line (0+00)

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 500

500 0 250 500

STATE OF LOUISIANA
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LAND SURVEYOR

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Registration No. 4746

Northern Access Survey Lines West Line Stations 77+16-111+58, Center Line 77+56-112+52, East Line 77+75-113+34

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
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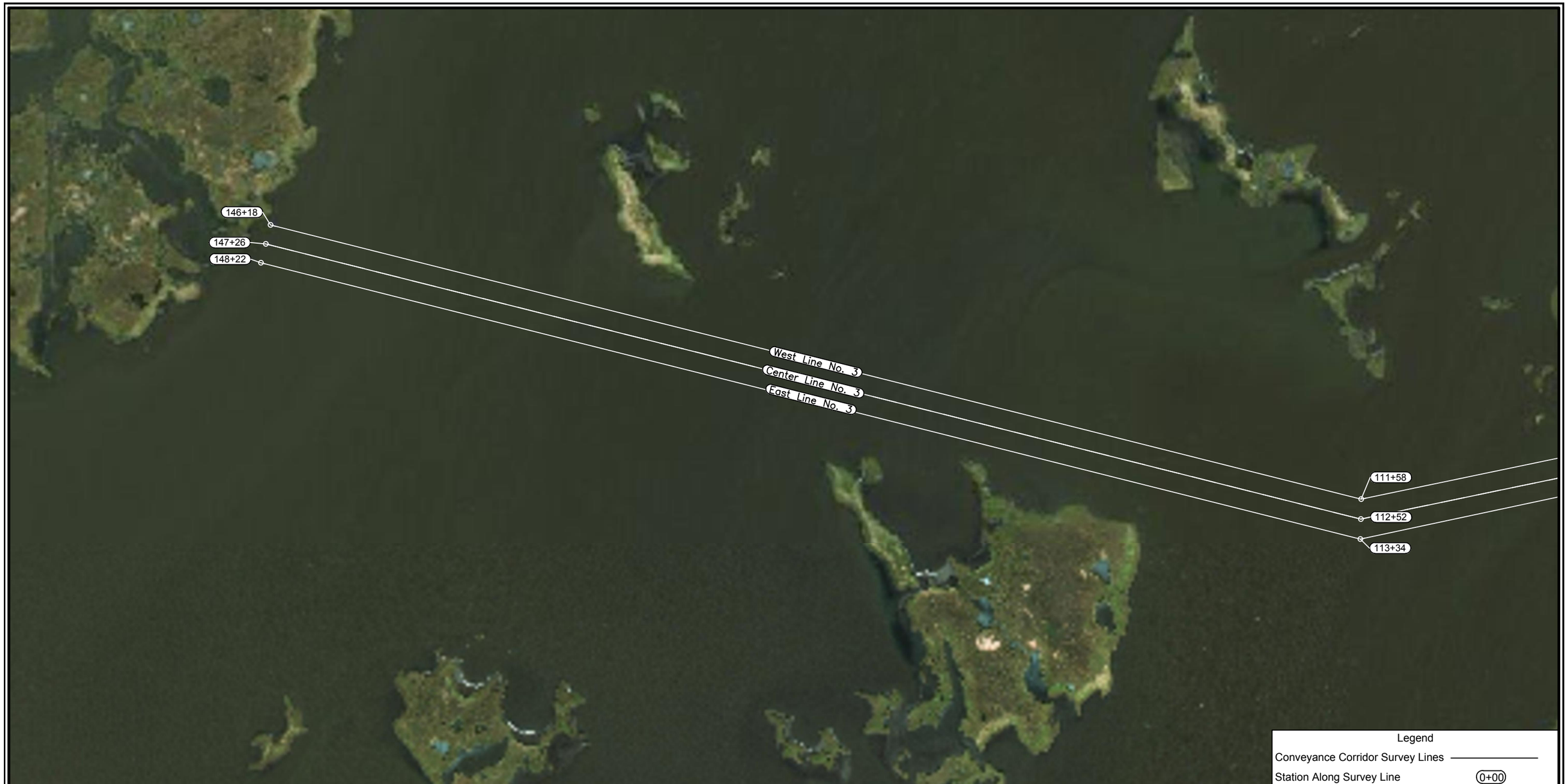

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 500

500 0 250 500

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RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Northern Access Survey Lines West Line Stations 111+58-146+18, Center Line 112+52-147+26, East Line 113+34-148+22

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
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North Access West Survey Line Coordinate Table				
Line No.	Beginning Station	Ending Station	Line Length	Line Bearing
West Line No. 1	0+00.00 Y=334,218.57 X=3,563,011.67	77+15.50 Y=326,635.59 X=3,561,587.83	7,715.50'	S10° 38' 04"W
West Line No. 2	77+15.50 Y=326,635.59 X=3,561,587.83	111+57.73 Y=325,936.13 X=3,558,217.42	3,442.22'	S78° 16' 33"W
West Line No. 3	111+57.73 Y=325,936.13 X=3,558,217.42	146+18.33 Y=326,779.80 X=3,554,861.23	3,460.60'	N75° 53' 22"W

North Access Center Survey Line Coordinate Table				
Line No.	Beginning Station	Ending Station	Line Length	Line Bearing
Center Line No. 1	0+00.00 Y=334,209.88 X=3,563,058.74	77+55.83 Y=326,585.02 X=3,561,639.45	7,755.83'	S10° 32' 40"W
Center Line No. 2	77+55.83 Y=326,585.02 X=3,561,639.45	112+52.08 Y=325,874.59 X=3,558,216.14	3,496.25'	S78° 16' 33"W
Center Line No. 3	112+52.08 Y=325,874.59 X=3,558,216.14	147+26.44 Y=326,721.62 X=3,554,846.60	3,474.36'	N75° 53' 22"W

North Access East Survey Line Coordinate Table				
Line No.	Beginning Station	Ending Station	Line Length	Line Bearing
East Line No. 1	0+00.00 Y=334,201.09 X=3,563,106.36	77+75.38 Y=326,554.90 X=3,561,694.87	7,775.38'	S10° 27' 33"W
East Line No. 2	77+75.38 Y=326,554.90 X=3,561,694.87	113+33.59 Y=325,813.05 X=3,558,214.85	3,558.21'	S77° 57' 58"W
East Line No. 3	113+33.59 Y=325,813.05 X=3,558,214.85	148+21.71 Y=326,663.43 X=3,554,831.98	3,488.12'	N75° 53' 22"W

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RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

North Access Survey Line Tables

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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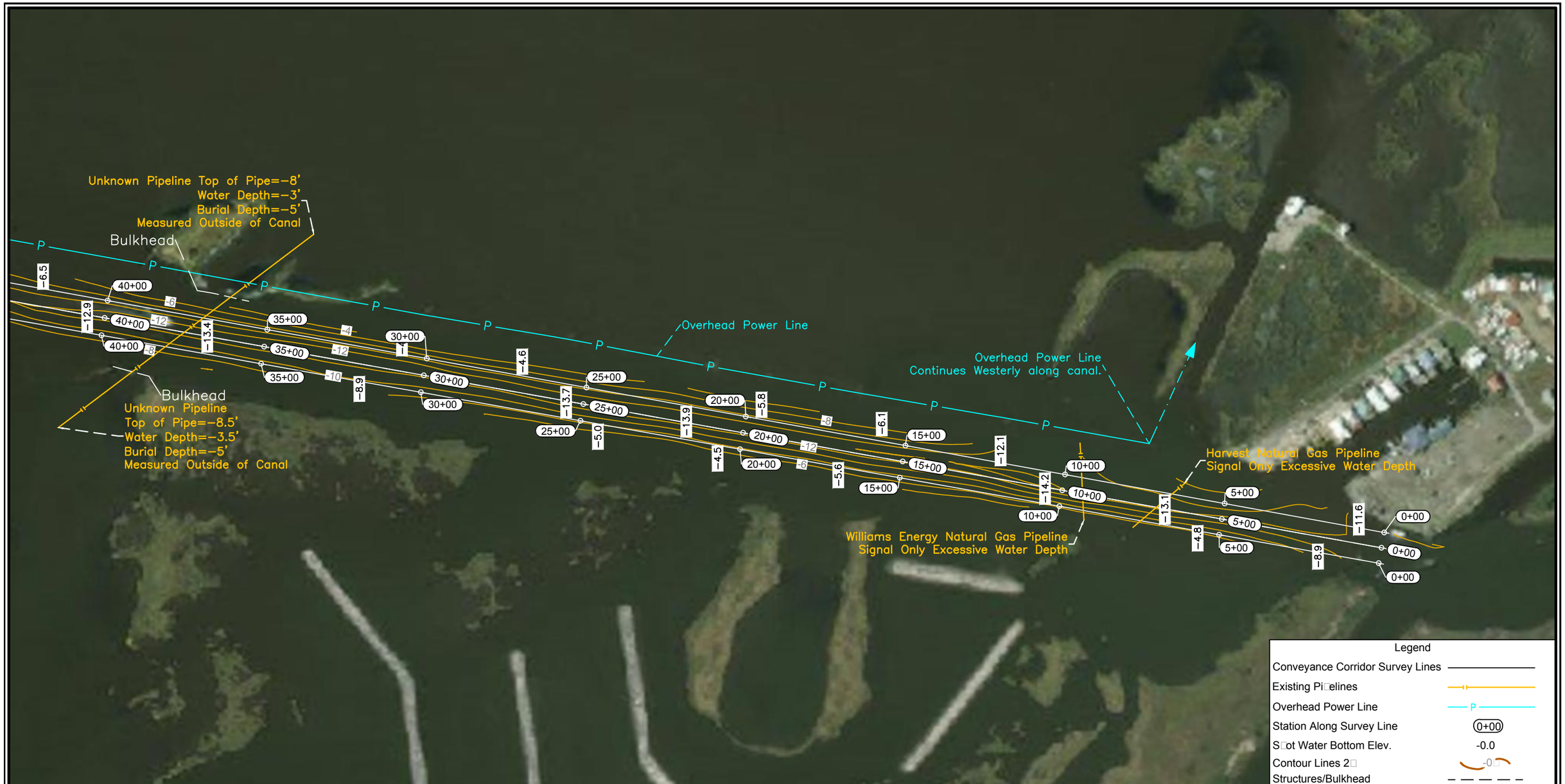

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300

300 0 150 300

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REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results for North Access West Line, Center Line and East Line Stations 0+00-40+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
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Lake Tambour Area
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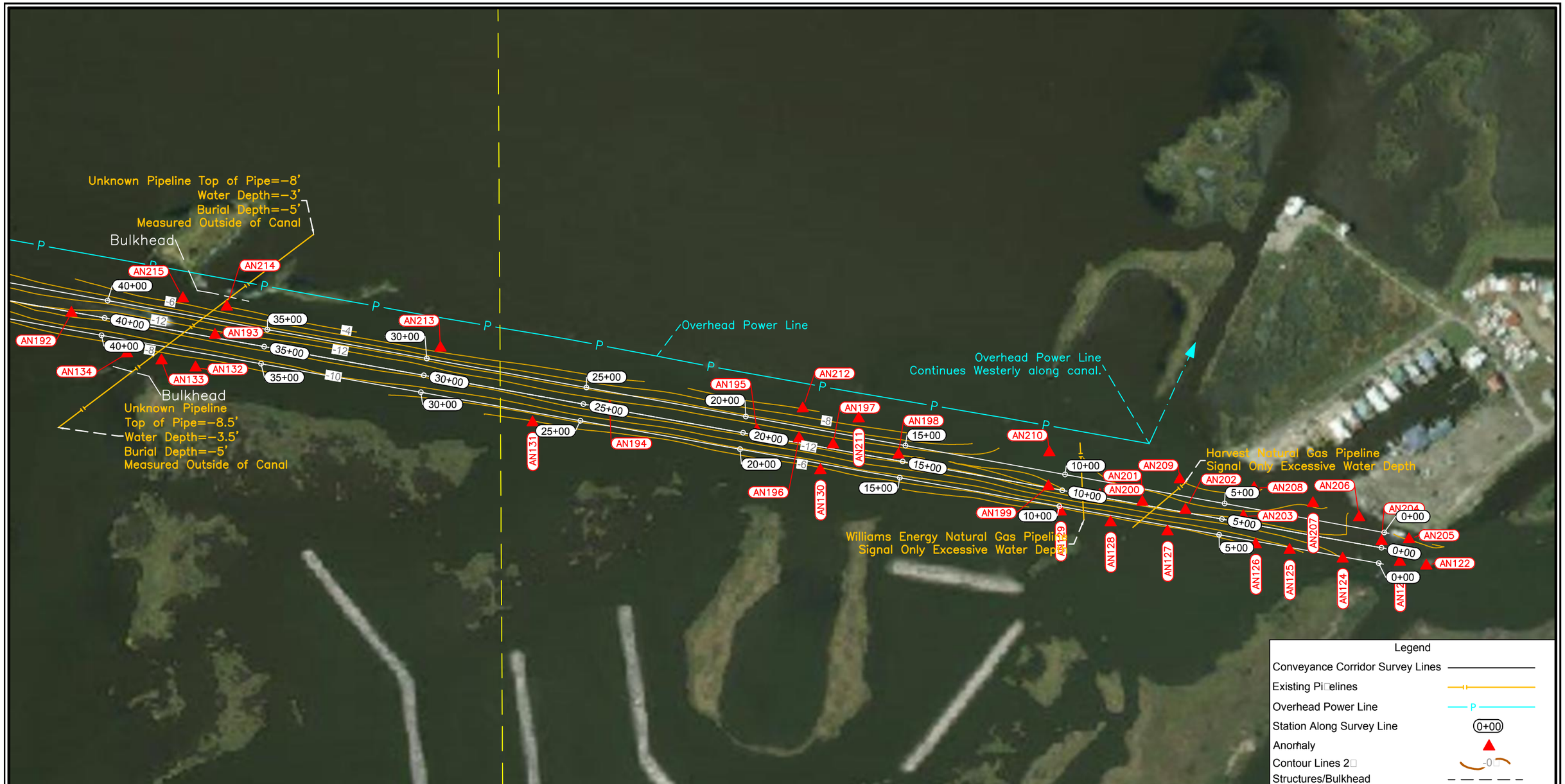

NAD 83 HARN LOUISIANA SOUTH

300 0 150 300

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REG No. 4767
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Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results for Magnetometer and To o For Stations 0+00-40+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

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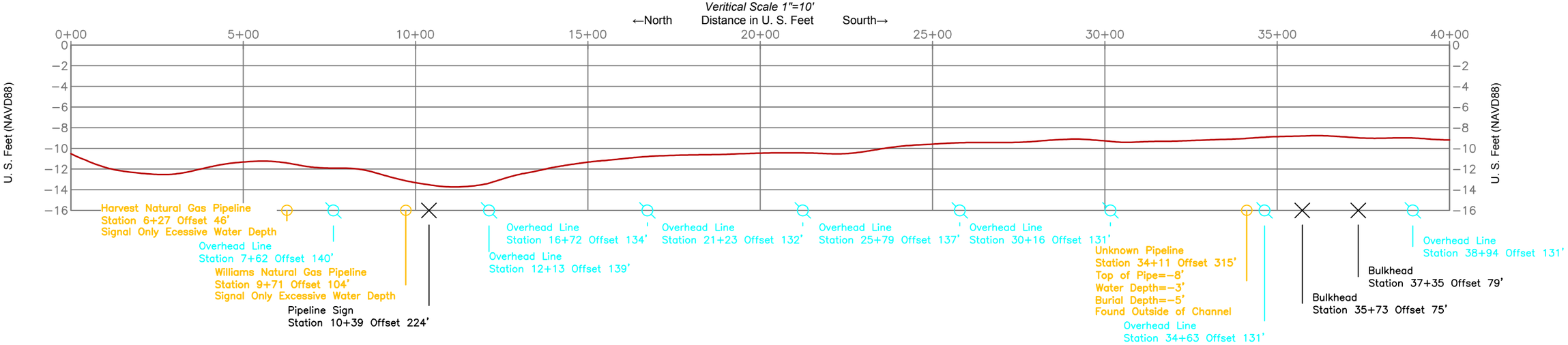
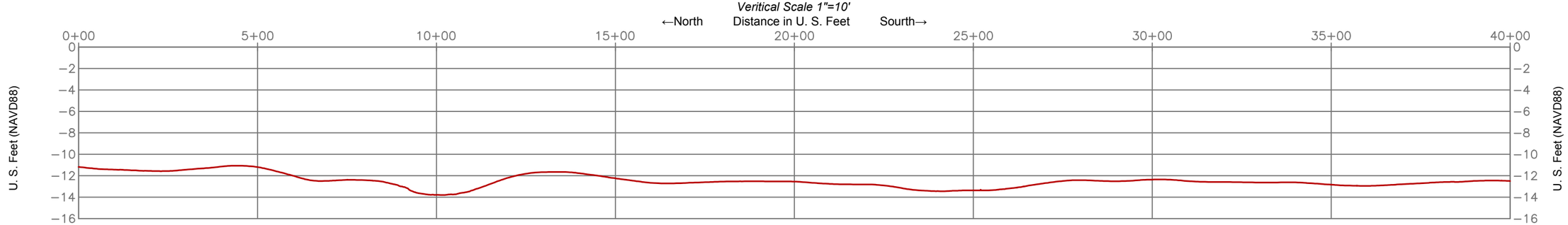
North Access West Survey Line Stations 0+00 - 40+00
Horizontal Scale 1"=300'
Veritical Scale 1"=10'



North Access Center Survey Line Stations 0+00 - 40+00
Horizontal Scale 1"=300'
Veritical Scale 1"=10'



Legend	
Water Bottoms	
Pi□elines	
Overhead Power Line	
Structures/Sign/Bulkhead	

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REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results Profiles For North Access West Line & Center Line Stations 00+00-40+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

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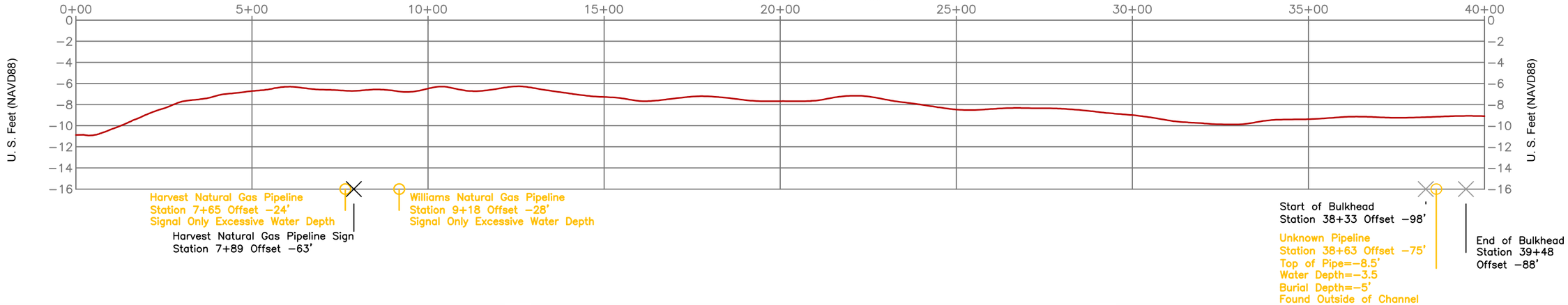
North Access East Survey Line Stations 0+00 - 40+00

Horizontal Scale 1"=300'

Veritical Scale 1"=10'

←North Distance in U. S. Feet Sourth→



Magnetometer Table

Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN122	1696.6	13.4	MONOPOLE	334,348'	3,563,115'	HIGH BOAT TRAFFIC NOTHING FOUND
AN123	269.3	44.5	MONOPOLE	334,267'	3,563,103'	HIGH BOAT TRAFFIC NOTHING FOUND
AN124	5531	215.8	COMPLEX	334,090'	3,563,092'	HIGH BOAT TRAFFIC NOTHING FOUND
AN125	2828.1	41.4	MONOPOLE	333,927'	3,563,064'	HIGH BOAT TRAFFIC NOTHING FOUND
AN126	89.3	18.9	MONOPOLE	333,822'	3,563,047'	HIGH BOAT TRAFFIC NOTHING FOUND
AN127	267.1	71.7	MONOPOLE	333,551'	3,563,005'	PIPELINES FOUND
AN128	484	86.9	COMPLEX	333,376'	3,562,976'	PIPELINES FOUND
AN129	993.5	35.8	MONOPOLE	333,222'	3,562,942'	PIPELINES FOUND
AN130	1966.3	135.5	DIPOLE	332,482'	3,562,810'	CRAB TRAPS
AN131	2473.3	87.1	DIPOLE	331,595'	3,562,657'	CRAB TRAPS
AN132	130.4	33	DIPOLE	330,557'	3,562,482'	PIPELINE FOUND
AN133	573.9	32.8	DIPOLE	330,452'	3,562,459'	PIPELINE FOUND
AN134	321.1	124.1	DIPOLE	330,346'	3,562,437'	PIPELINE FOUND
AN192	55.6	52	MONOPOLE	330,176'	3,562,311'	NOTHING FOUND
AN193	368.9	183	MONOPOLE	330,618'	3,562,382'	PIPELINE FOUND

Magnetometer Table

Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN194	83.1	71.3	MONOPOLE	331,833'	3,562,611'	CRAB TRAPS
AN195	107	106.1	DIPOLE	332,287'	3,562,686'	CRAB TRAPS
AN196	91.6	71.9	MONOPOLE	332,416'	3,562,711'	CRAB TRAPS
AN197	1136.3	73.1	MONOPOLE	332,521'	3,562,731'	CRAB TRAPS
AN198	103.1	73.8	DIPOLE	332,723'	3,562,763'	CRAB TRAPS
AN199	340.1	86.2	DIPOLE	333,184'	3,562,864'	PIPELINES FOUND
AN200	110.2	183.9	MONOPOLE	333,343'	3,562,891'	PIPELINES FOUND
AN201	53.1	75.2	MONOPOLE	333,474'	3,562,914'	PIPELINES FOUND
AN202	324.9	141.7	COMPLEX	333,606'	3,562,939'	PIPELINES FOUND
AN203	972.5	94.1	MONOPOLE	333,785'	3,562,960'	HIGH BOAT TRAFFIC NOTHING FOUND
AN204	3212.7	303.2	COMPLEX	334,211'	3,563,039'	HIGH BOAT TRAFFIC NOTHING FOUND
AN205	517.9	107.1	COMPLEX	334,295'	3,563,034'	HIGH BOAT TRAFFIC NOTHING FOUND
AN206	496.2	127.6	COMPLEX	334,142'	3,562,965'	HIGH BOAT TRAFFIC NOTHING FOUND
AN207	1819.2	167.4	COMPLEX	334,000'	3,562,921'	HIGH BOAT TRAFFIC NOTHING FOUND
AN208	396.7	170.8	MONOPOLE	333,819'	3,562,873'	HIGH BOAT TRAFFIC NOTHING FOUND

Magnetometer Table

Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN209	569.8	162.4	DIPOLE	333,590'	3,562,844'	PIPELINES FOUND
AN210	59.9	133.5	DIPOLE	333,188'	3,562,759'	PIPELINES FOUND
AN211	96	60.1	MONOPOLE	332,601'	3,562,651'	CRAB TRAPS
AN212	86.5	99.8	DIPOLE	332,429'	3,562,619'	CRAB TRAPS
AN213	82.7	58	DIPOLE	331,313'	3,562,425'	CRAB TRAPS
AN214	104.8	60.5	DIPOLE	330,655'	3,562,295'	PIPELINE FOUND
AN215	80	197.7	COMPLEX	330,520'	3,562,269'	PIPELINE FOUND

Legend

Water Bottoms

Pi□elines

Structures/Sign/Bulkhead □

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey and Magnetometer Results Profiles For North Access East Line Stations 00+00-40+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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135 Regency Sq. Lafayette, LA 70508
Ph. 337-237-2200 Fax. 337-232-3299
www.fenstermaker.com

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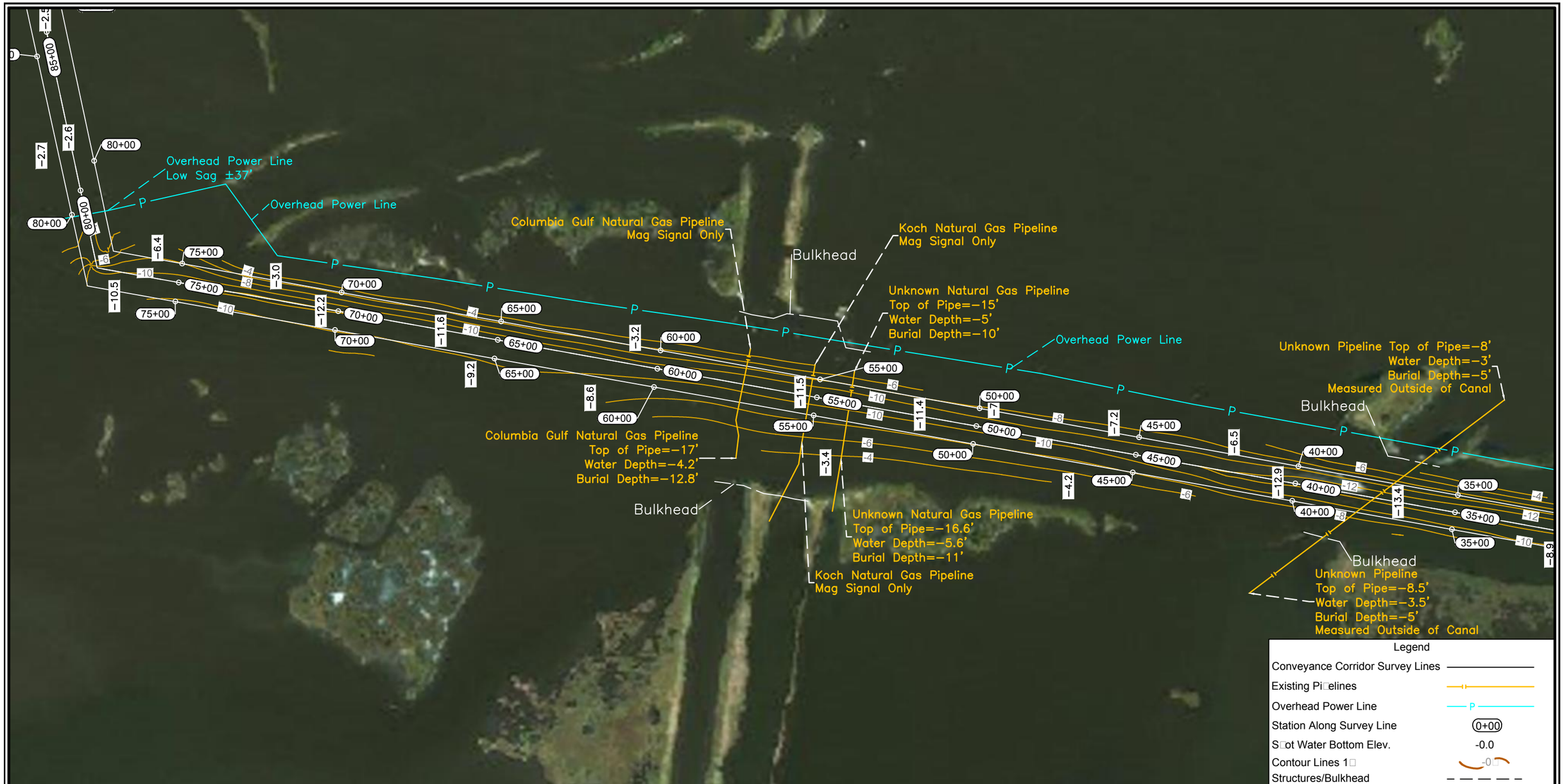

Legend

Conveyance Corridor Survey Lines	
Existing Pi□elines	
Overhead Power Line	P
Station Along Survey Line	0+00
S□ot Water Bottom Elev.	-0.0
Contour Lines 1□	-0□
Structures/Bulkhead	

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300□

300□ 0 150□ 300□

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results for North Access West Line, Center Line and East Line Stations 40+00-80+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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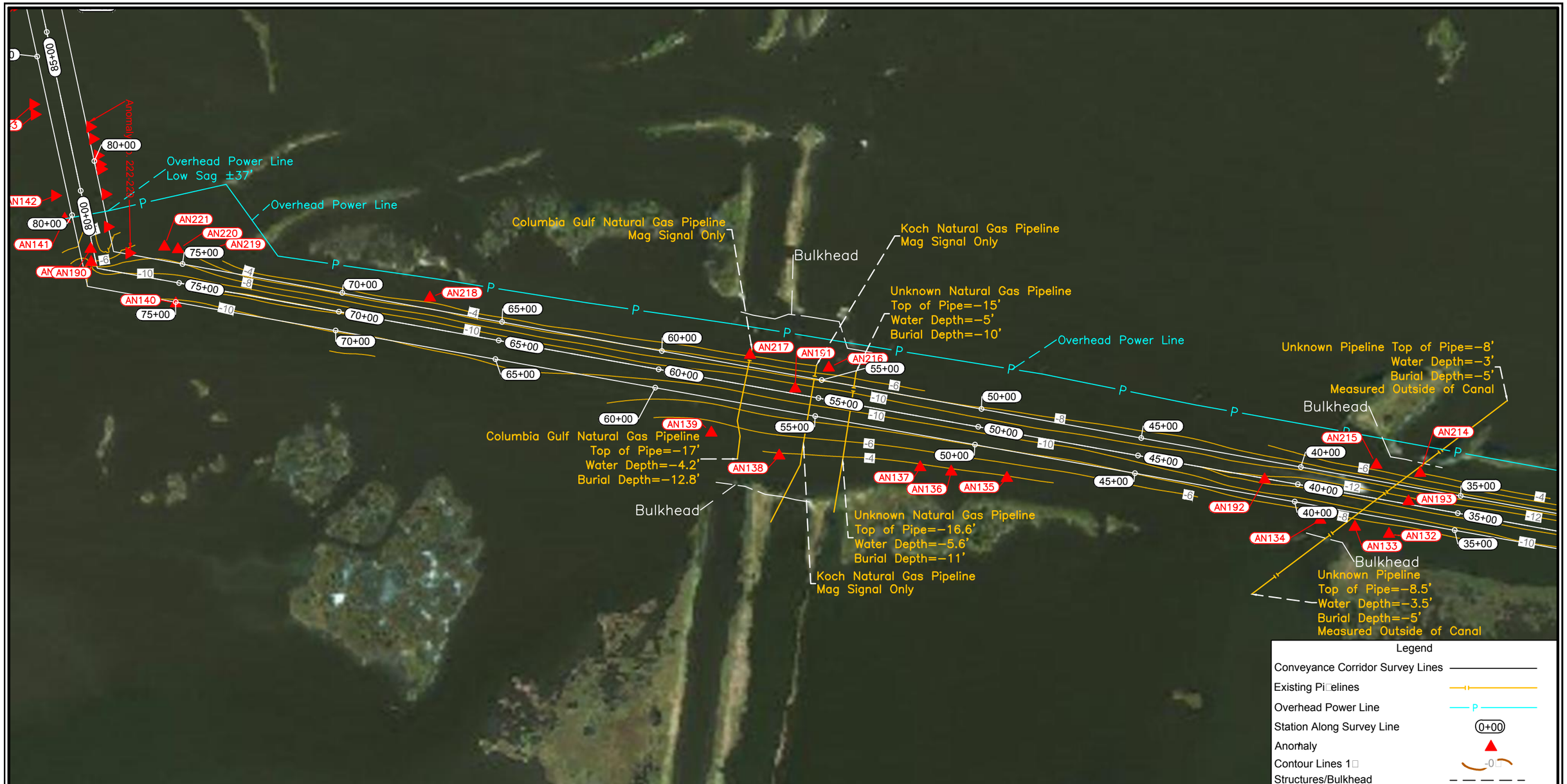

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 300

300 0 150 300

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results for Magnetometer & Topo For Stations 40+00-80+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 60 of 70

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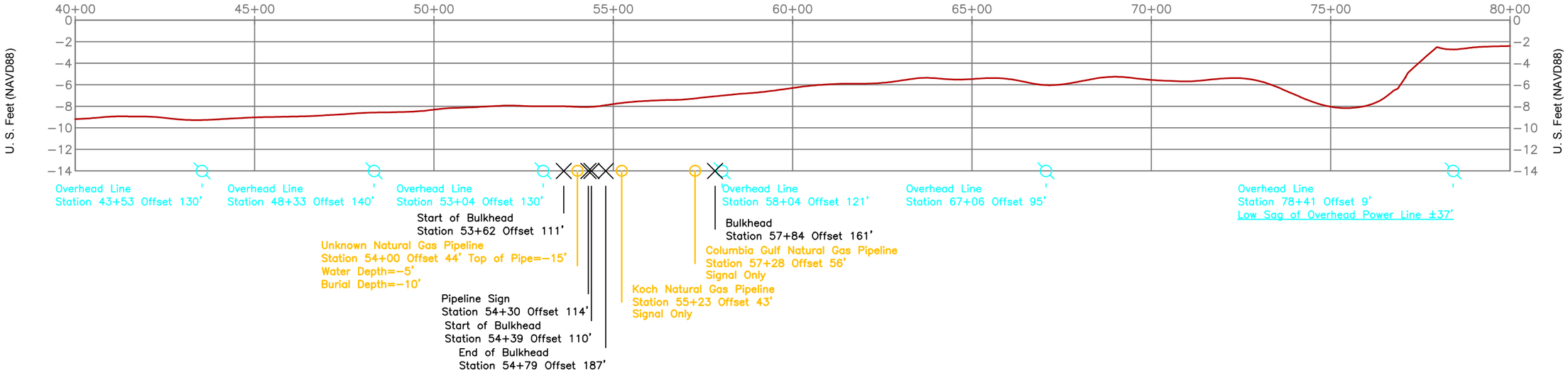
North Access West Survey Line Stations 40+00 - 80+00

Horizontal Scale 1"=300'

Veritical Scale 1"=10'

←North Distance in U. S. Feet Sourth→

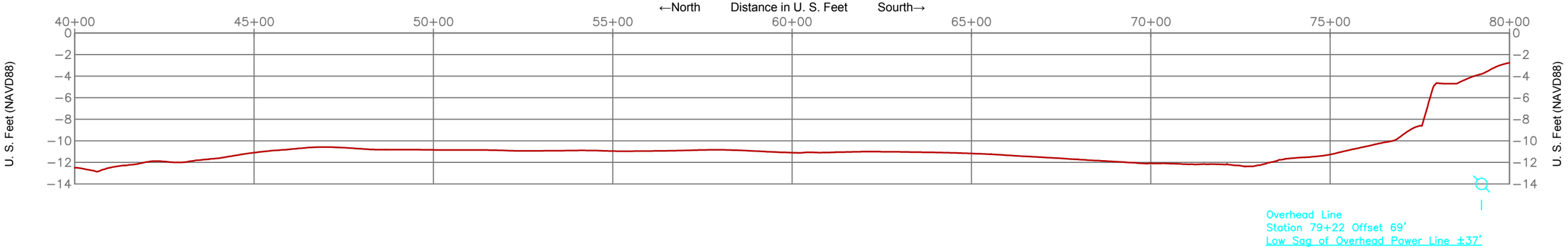


North Access Center Survey Line Stations 40+00 - 80+00

Horizontal Scale 1"=300'

Veritical Scale 1"=10'

←North Distance in U. S. Feet Sourth→



Legend	
Water Bottoms	
Pipelines	
Overhead Power Line	
Structures/Sign/Bulkhead	

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results Profiles For North Access West Line & Center Line Stations 40+00-80+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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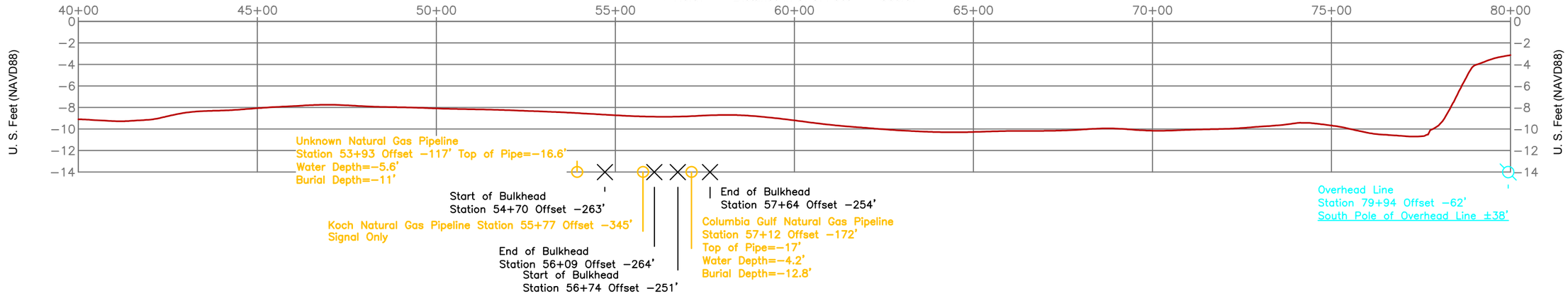
North Access East Survey Line Stations 40+00 - 80+00

Horizontal Scale 1"=300'

Veritical Scale 1"=10'

←North Distance in U. S. Feet Sourth→



MagnetometerTable						
Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN132	130.4	33	DIPOLE	330,557'	3,562,482'	PIPELINE FOUND
AN133	573.9	32.8	DIPOLE	330,452'	3,562,459'	PIPELINE FOUND
AN134	321.1	124.1	DIPOLE	330,346'	3,562,437'	PIPELINE FOUND
AN135	185.1	40.4	DIPOLE	329,382'	3,562,302'	CRAB TRAPS
AN136	498.6	41.7	DIPOLE	329,211'	3,562,282'	CRAB TRAPS
AN137	329.4	36.7	DIPOLE	329,115'	3,562,268'	CRAB TRAPS
AN138	665.1	323.9	COMPLEX	328,682'	3,562,229'	PIPELINES FOUND
AN139	1722	139.9	MONOPOLE	328,473'	3,562,157'	PIPELINES FOUND
AN140	87.9	78.6	DIPOLE	326,826'	3,561,749'	NOTHING FOUND
AN141	2490.5	44.8	DIPOLE	326,486'	3,561,487'	CRAB TRAPS
AN142	1988.2	85.4	COMPLEX	326,456'	3,561,415'	CRAB TRAPS
AN143	842	27.9	COMPLEX	326,395'	3,561,164'	CRAB TRAPS

MagnetometerTable						
Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN144	2309	117.6	COMPLEX	326,391'	3,561,133'	CRAB TRAPS
AN189	434.1	21.3	DIPOLE	326,565'	3,561,580'	CRAB TRAPS
AN190	251.8	20	MONOPOLE	326,567'	3,561,621'	CRAB TRAPS
AN191	1456.9	808.5	COMPLEX	328,732'	3,562,023'	PIPELINES FOUND
AN192	55.6	52	MONOPOLE	330,176'	3,562,311'	NOTHING FOUND
AN193	368.9	183	MONOPOLE	330,618'	3,562,382'	PIPELINE FOUND
AN214	104.8	60.5	DIPOLE	330,655'	3,562,295'	PIPELINE FOUND
AN215	80	197.7	COMPLEX	330,520'	3,562,269'	PIPELINE FOUND
AN216	708.3	110.7	COMPLEX	328,836'	3,561,959'	PIPELINES FOUND
AN217	2057.1	484.5	COMPLEX	328,593'	3,561,918'	PIPELINES FOUND
AN218	1195.4	55.9	COMPLEX	327,609'	3,561,736'	NOTHING FOUND
AN219	229.8	42.7	MONOPOLE	326,894'	3,561,596'	NOTHING FOUND

MagnetometerTable						
Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN220	70	36.4	DIPOLE	326,834'	3,561,583'	NOTHING FOUND
AN221	101.8	62.8	MONOPOLE	326,792'	3,561,574'	NOTHING FOUND
AN222	98.6	40.3	MONOPOLE	326,684'	3,561,593'	CRAB TRAPS
AN223	2398.7	24	COMPLEX	326,618'	3,561,512'	CRAB TRAPS
AN224	6577.5	36.6	COMPLEX	326,611'	3,561,411'	CRAB TRAPS
AN225	320	4.9	COMPLEX	326,598'	3,561,334'	CRAB TRAPS
AN226	461	9.4	COMPLEX	326,595'	3,561,320'	CRAB TRAPS
AN227	1739.2	71.9	MONOPOLE	326,588'	3,561,292'	CRAB TRAPS
AN228	665.8	32	COMPLEX	326,574'	3,561,241'	CRAB TRAPS
AN229	1829.1	26.3	COMPLEX	326,565'	3,561,204'	CRAB TRAPS

Legend

Water Bottoms

Pi□elines

Overhead Power Line

Structures/Sign/Bulkhead □

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey & Magnetometer Results Profiles For North Access East Line Stations 40+00-80+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)

Conveyance Corridor & North Access Survey

Lake Tambour Area

Terrebonne Parish, Louisiana

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135 Regency Sq. Lafayette, LA 70508
Ph. 337-237-2200 Fax. 337-232-3299
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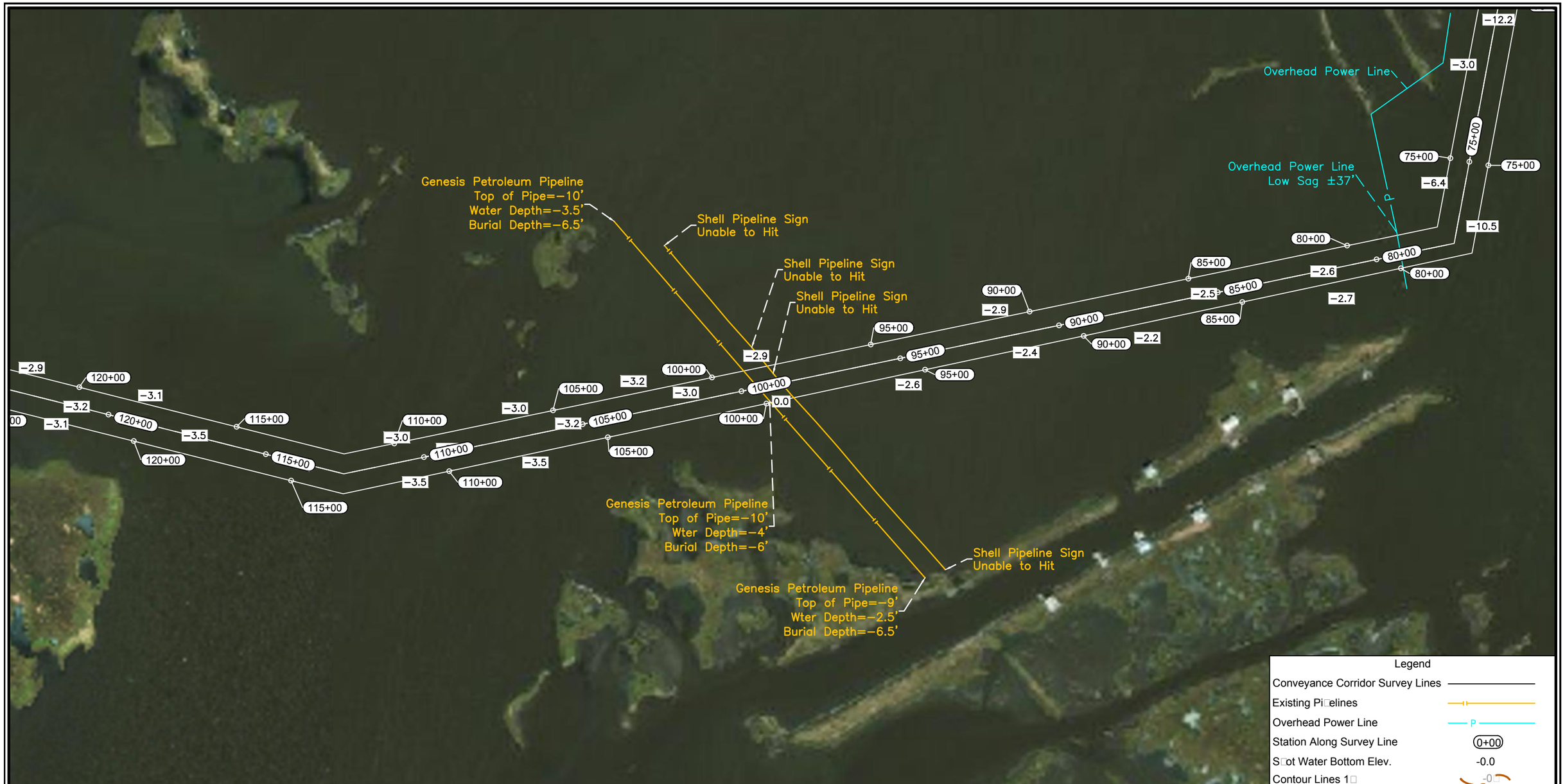

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 500

500 0 250 500

STATE OF LOUISIANA
05/17/2018
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REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results for North Access West Line, Center Line and East Line Stations 80+00-120+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
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Sheet 63 of 70

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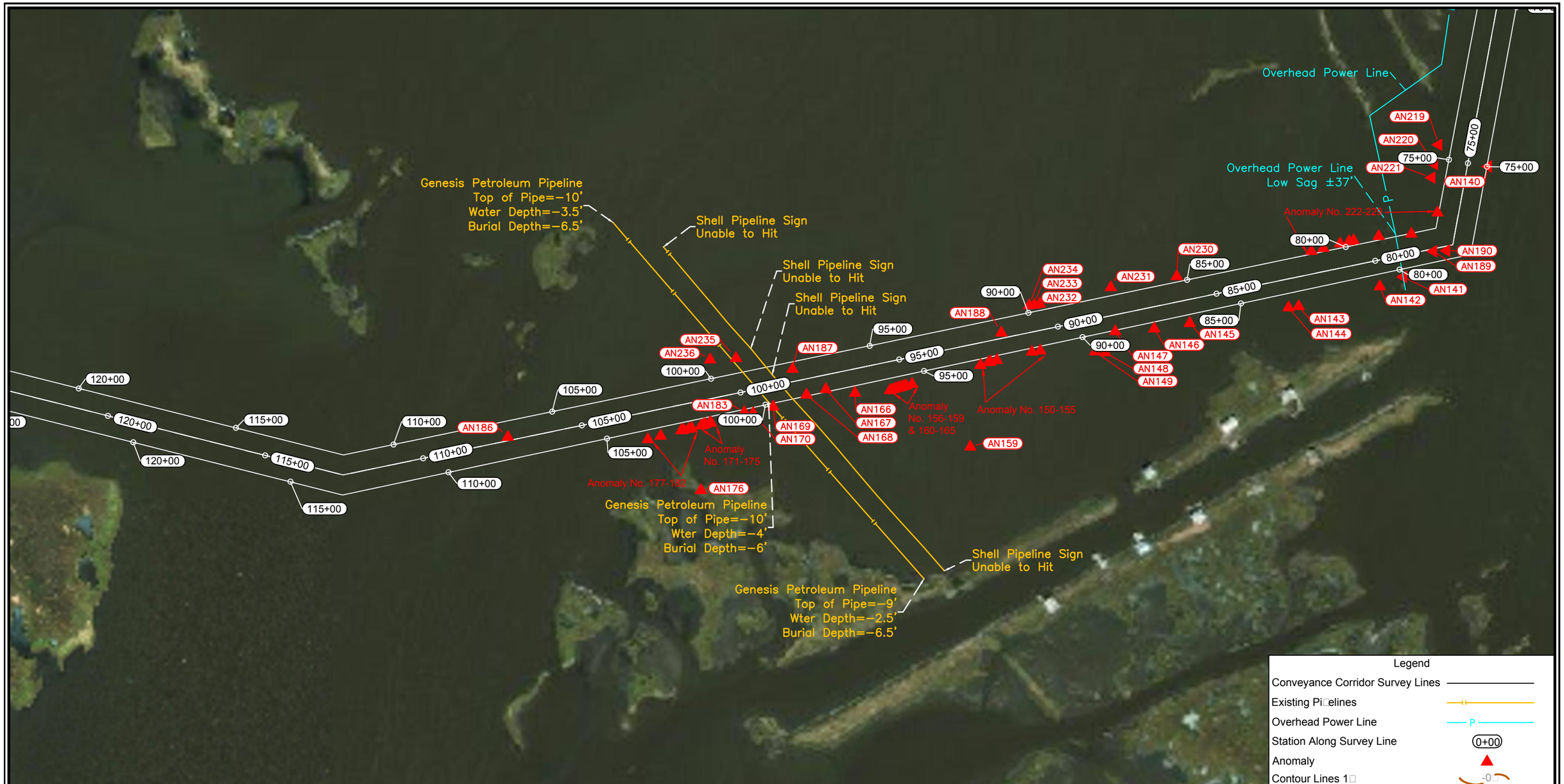

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results for Magnetometer & To□o For Stations 80+00-120+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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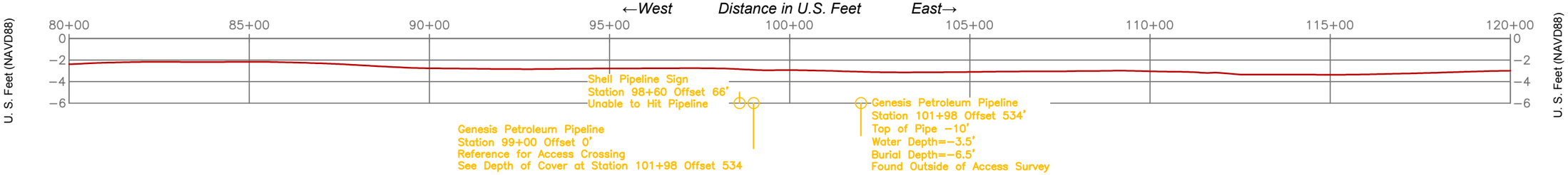
North Access West Survey Line Stations 80+00 - 120+00

Horizontal Scale 1"=300'

Vertical Scale 1"=10'

←West *Distance in U.S. Feet* *East→*

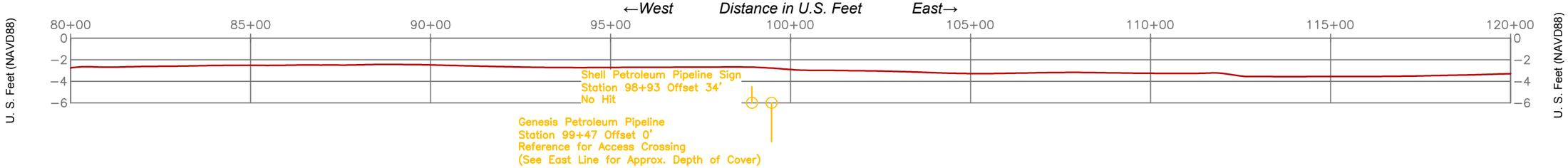


North Access Center Survey Line Stations 80+00 - 120+00

Horizontal Scale 1"=300'

Vertical Scale 1"=10'

←West *Distance in U.S. Feet* *East→*

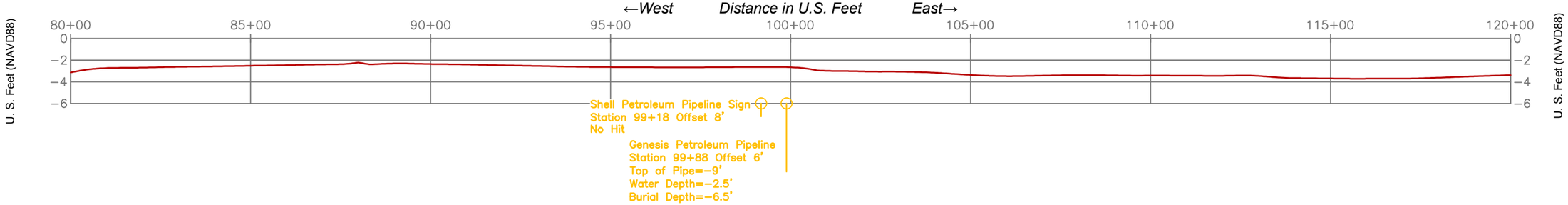


North Access East Survey Line Stations 80+00 - 120+00

Horizontal Scale 1"=300'

Vertical Scale 1"=10'

←West *Distance in U.S. Feet* *East→*



Legend	
Water Bottoms	
Pipelines	

STATE OF LOUISIANA
05/17/2018
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Survey Results Profiles For North Access West Line, Center Line & East Line Stations 80+00-120+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
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Lake Tambour Area
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Magnetometer Table						
Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN140	87.9	78.6	DIPOLE	326,826'	3,561,749'	NOTHING FOUND
AN141	2490.5	44.8	DIPOLE	326,486'	3,561,487'	CRAB TRAPS
AN142	1988.2	85.4	COMPLEX	326,456'	3,561,415'	CRAB TRAPS
AN143	842	27.9	COMPLEX	326,395'	3,561,164'	CRAB TRAPS
AN144	2309	117.6	COMPLEX	326,391'	3,561,133'	CRAB TRAPS
AN145	1930	268.3	COMPLEX	326,343'	3,560,828'	CRAB TRAPS
AN146	2279.7	174.4	COMPLEX	326,326'	3,560,719'	CRAB TRAPS
AN147	2080.6	44	COMPLEX	326,318'	3,560,599'	CRAB TRAPS
AN148	1983	25.3	COMPLEX	326,252'	3,560,568'	CRAB TRAPS
AN149	1804.6	33.3	COMPLEX	326,255'	3,560,536'	CRAB TRAPS
AN150	1807.7	12.9	COMPLEX	326,258'	3,560,367'	CRAB TRAPS
AN151	1611.7	104	COMPLEX	326,254'	3,560,341'	CRAB TRAPS
AN152	2001.9	29	COMPLEX	326,229'	3,560,233'	CRAB TRAPS
AN153	79.4	4.7	MONOPOLE	326,223'	3,560,214'	CRAB TRAPS
AN154	169.5	3.3	MONOPOLE	326,222'	3,560,208'	CRAB TRAPS
AN155	276.8	8.5	COMPLEX	326,213'	3,560,183'	CRAB TRAPS
AN156	2071.6	97.1	COMPLEX	326,155'	3,559,972'	CRAB TRAPS
AN157	191.8	5.5	COMPLEX	326,150'	3,559,953'	CRAB TRAPS
AN158	198.3	4.9	COMPLEX	326,149'	3,559,947'	CRAB TRAPS
AN159	263.6	5.9	COMPLEX	325,962'	3,560,151'	CRAB TRAPS
AN160	293.8	8	COMPLEX	326,147'	3,559,940'	CRAB TRAPS
AN161	331.6	8.5	COMPLEX	326,144'	3,559,933'	CRAB TRAPS
AN162	344.5	4.7	COMPLEX	326,143'	3,559,927'	CRAB TRAPS

Magnetometer Table						
Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN163	266.2	8.3	COMPLEX	326,140'	3,559,919'	CRAB TRAPS
AN164	134.6	3.6	MONOPOLE	326,138'	3,559,911'	CRAB TRAPS
AN165	438.9	9.6	COMPLEX	326,135'	3,559,904'	CRAB TRAPS
AN166	1550.8	15.1	COMPLEX	326,127'	3,559,796'	CRAB TRAPS
AN167	657.6	21.1	MONOPOLE	326,139'	3,559,706'	CRAB TRAPS
AN168	1286.7	56.6	COMPLEX	326,122'	3,559,646'	CRAB TRAPS
AN169	1104.4	52	MONOPOLE	326,085'	3,559,543'	PIPELINES FOUND
AN170	1726.1	55.3	MONOPOLE	326,065'	3,559,482'	PIPELINES FOUND
AN171	355	3.8	DIPOLE	326,036'	3,559,351'	NOTHING FOUND MULTIPLE CRAB TRAPS IN AREA
AN172	1138.6	10	DIPOLE	326,035'	3,559,347'	NOTHING FOUND MULTIPLE CRAB TRAPS IN AREA
AN173	123.5	4.9	COMPLEX	326,031'	3,559,334'	NOTHING FOUND MULTIPLE CRAB TRAPS IN AREA
AN174	435.2	5.5	COMPLEX	326,029'	3,559,329'	NOTHING FOUND MULTIPLE CRAB TRAPS IN AREA
AN175	449	2.5	MONOPOLE	326,027'	3,559,321'	NOTHING FOUND MULTIPLE CRAB TRAPS IN AREA
AN176	1406.9	22.8	MONOPOLE	325,827'	3,559,321'	NOTHING FOUND
AN177	589.4	10	COMPLEX	326,019'	3,559,292'	NOTHING FOUND MULTIPLE CRAB TRAPS IN AREA
AN178	1520.6	9.5	COMPLEX	326,016'	3,559,283'	NOTHING FOUND MULTIPLE CRAB TRAPS IN AREA
AN179	1580.9	5.1	MONOPOLE	326,013'	3,559,267'	NOTHING FOUND MULTIPLE CRAB TRAPS IN AREA
AN180	570.9	8.3	COMPLEX	326,012'	3,559,260'	NOTHING FOUND MULTIPLE CRAB TRAPS IN AREA
AN181	1839.6	88.2	COMPLEX	325,995'	3,559,196'	NOTHING FOUND MULTIPLE CRAB TRAPS IN AREA
AN182	1751.6	35.1	COMPLEX	325,985'	3,559,157'	NOTHING FOUND MULTIPLE CRAB TRAPS IN AREA
AN183	323.9	19.9	MONOPOLE	326,068'	3,559,454'	PIPELINES FOUND
AN186	423.1	36.2	DIPOLE	325,991'	3,558,725'	NOTHING FOUND
AN187	1843.3	104.3	COMPLEX	326,201'	3,559,603'	CRAB TRAPS

Magnetometer Table						
Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN188	59.7	12.6	MONOPOLE	326,313'	3,560,247'	CRAB TRAPS
AN189	434.1	21.3	DIPOLE	326,565'	3,561,580'	CRAB TRAPS
AN190	251.8	20	MONOPOLE	326,567'	3,561,621'	CRAB TRAPS
AN219	229.8	42.7	MONOPOLE	326,894'	3,561,596'	NOTHING FOUND
AN220	70	36.4	DIPOLE	326,834'	3,561,583'	NOTHING FOUND
AN221	101.8	62.8	MONOPOLE	326,792'	3,561,574'	NOTHING FOUND
AN222	98.6	40.3	MONOPOLE	326,684'	3,561,593'	CRAB TRAPS
AN223	2398.7	24	COMPLEX	326,618'	3,561,512'	CRAB TRAPS
AN224	6577.5	36.6	COMPLEX	326,611'	3,561,411'	CRAB TRAPS
AN225	320	4.9	COMPLEX	326,598'	3,561,334'	CRAB TRAPS
AN226	461	9.4	COMPLEX	326,595'	3,561,320'	CRAB TRAPS
AN227	1739.2	71.9	MONOPOLE	326,588'	3,561,292'	CRAB TRAPS
AN228	665.8	32	COMPLEX	326,574'	3,561,241'	CRAB TRAPS
AN229	1829.1	26.3	COMPLEX	326,565'	3,561,204'	CRAB TRAPS
AN230	2614.1	500.3	COMPLEX	326,487'	3,560,788'	CRAB TRAPS
AN231	2071.2	191.6	COMPLEX	326,454'	3,560,585'	CRAB TRAPS
AN232	125	2.1	MONOPOLE	326,402'	3,560,365'	CRAB TRAPS
AN233	922.8	3	MONOPOLE	326,399'	3,560,349'	CRAB TRAPS
AN234	670.9	3.5	DIPOLE	326,397'	3,560,332'	CRAB TRAPS
AN235	1091.3	66.2	MONOPOLE	326,235'	3,559,429'	PIPELINES FOUND
AN236	7064.1	116	MONOPOLE	326,230'	3,559,349'	PIPELINES FOUND

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Magnetometer Table For Stations 80+00 to 120+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 66 of 70

FENSTERMAKER
C. H. Fenstermaker & Associates, L.L.C.
135 Regency Sq. Lafayette, LA 70508
Ph. 337-237-2200 Fax. 337-232-3299
www.fenstermaker.com

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PROJ. MGR.: RMJ
DATE: 05/15/2018

REVISIONS		
No.	DATE:	REVISED BY:
No.	DATE:	REVISED BY:

FILENAME: T:\2016\2165051\DWG\FINAL\Phase 2 Conv Corr N Access.dwg

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 500

500 0 250 500

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results for North Access West Line, Center Line and East Line Stations 120+00-±148+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
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Lake Tambour Area
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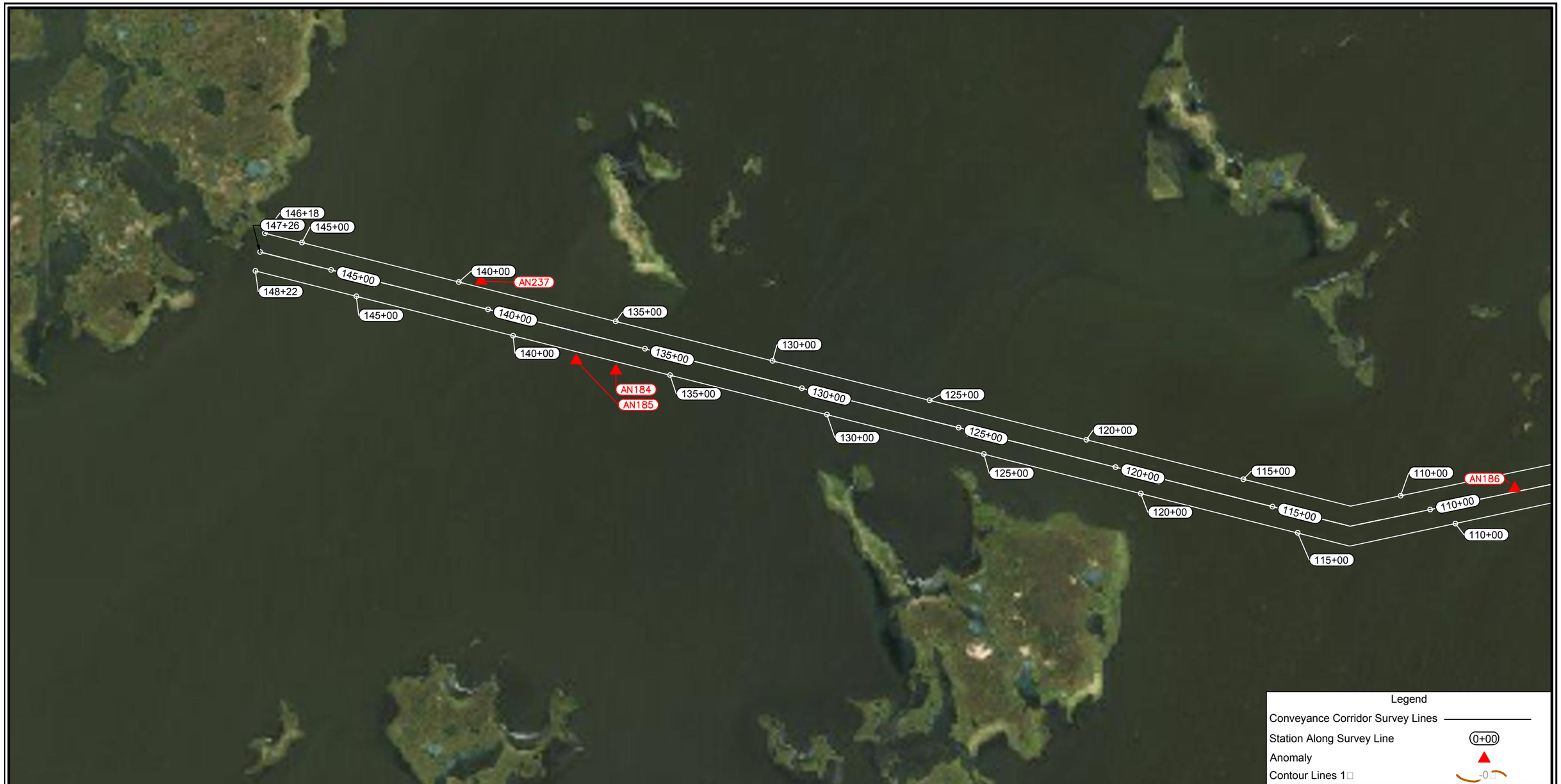
DATE: 05/15/2018	No.	DATE:	REVISED BY:
FILENAME: T:\2016\2165051\DWG\FINAL\Phase 2 Conv Corr N Access.dwg			



Legend

Conveyance Corridor Survey Lines

Station Along Survey Line (0+00)

Anomaly

Contour Lines 1

NAD 83 HARN LOUISIANA SOUTH

Scale: 1" = 500

500 0 250 500

STATE OF LOUISIANA
05/17/2018
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REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results for Magnetometer & Topo For Stations 120+00-±148+00

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

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C. H. Fenstermaker & Associates, L.L.C.
135 Regency Sq. Lafayette, LA 70508
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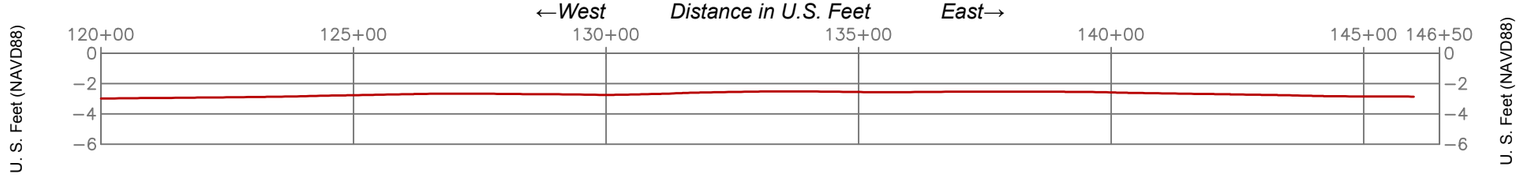
DATE: 05/15/2018	No.	DATE:	REVISED BY:
FILENAME: T:\2016\2165051\DWG\FINAL\Phase 2 Conv Corr N Access.dwg			

North Access West Survey Line Stations 120+00 - 146+18

Horizontal Scale 1"=300'

Vertical Scale 1"=10'

←West Distance in U.S. Feet East→

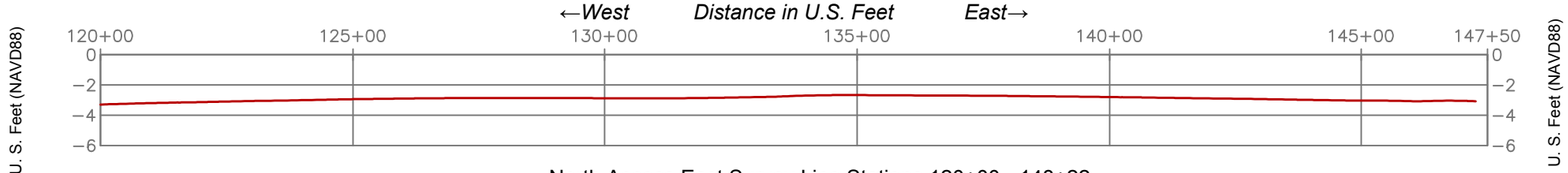


North Access Center Survey Line Stations 120+00 - 147+26

Horizontal Scale 1"=300'

Vertical Scale 1"=10'

←West Distance in U.S. Feet East→

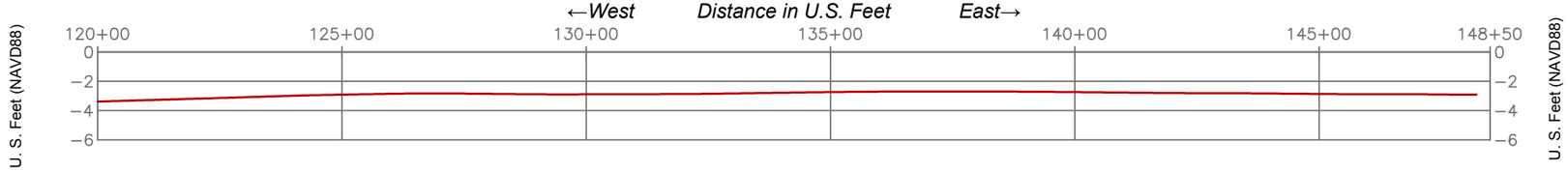


North Access East Survey Line Stations 120+00 - 148+22

Horizontal Scale 1"=300'

Vertical Scale 1"=10'

←West Distance in U.S. Feet East→



MagnetometerTable						
Anomaly No.	Gamma	Duration	Type	Northing	Easting	Comment
AN184	231	107	MONOPOLE	326,355'	3,555,947'	NOTHING FOUND
AN185	180.2	103.4	MONOPOLE	326,387'	3,555,824'	NOTHING FOUND
AN186	423.1	36.2	DIPOLE	325,991'	3,558,725'	NOTHING FOUND
AN237	327.9	69.7	DIPOLE	326,632'	3,555,530'	NOTHING FOUND

Legend

Water Bottoms

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

Survey Results Profiles For North Access West Line, Center Line & East Line Stations 120+00-±148+00 & Magnetometer

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)

Conveyance Corridor & North Access Survey

Lake Tambour Area

Terrebonne Parish, Louisiana

Sheet 69 of 70

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135 Regency Sq. Lafayette, LA 70508
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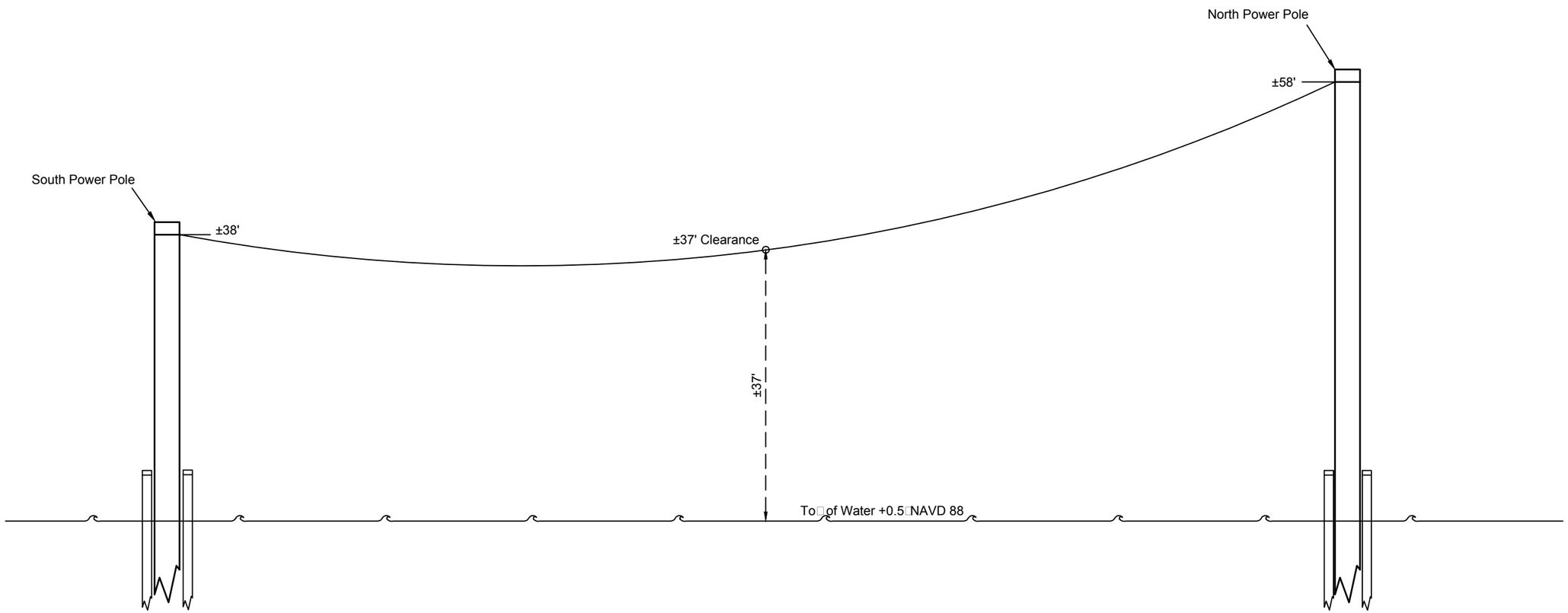
DATE: 05/15/2018	No.	DATE:	REVISED BY:
FILENAME: T:\2016\2165051\DWG\FINAL\Phase 2 Conv Corr N Access.dwg			



TYPICAL OVERHEAD POWERLINE CLEARANCE

NO SCALE

Note:
Power Line Clearance is based on the elevation of the ower line (38.3 NAVD88 Geoid 12-B) minus the to of water (0.5 NAVD88 Geoid 12-B) on the day surveyed 08/24/2017.

STATE OF LOUISIANA
05/17/2018
RICARDO M. JOHNSON
REG No. 4767
REGISTERED PROFESSIONAL
LAND SURVEYOR

Ricardo M. Johnson
Professional Land Surveyor
Registration No. 4746

UTILITY LINE CLEARANCE NORTH ACCESS

COASTAL PROTECTION AND RESTORATION AUTHORITY

Island Road Marsh Creation and Nourishment Phase II (TE-117)
Conveyance Corridor & North Access Survey
Lake Tambour Area
Terrebonne Parish, Louisiana

Sheet 70 of 70

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2.4) TE-117 Sub-Bottom Profiler Study

C.H. Fenstermaker & Associates, L.L.C.

SUBBOTTOM PROFILER STUDY

ISLAND ROAD MARSH CREATION PROJECT
TERREBONNE PARISH, LOUISIANA

SUBMITTED BY

OCEANEERING®

February 2017

Project No. 180363

Tony George
Geophysicist

DRAFT

TABLE OF CONTENTS

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1.2 Methodology 1
2.0 SUBBOTTOM INTERPRETATION 3
3.0 CONCLUSIONS 5
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Figure No. 2 Vicinity map 3
Figure No. 3 Subbottom profiler example showing seafloor channel in the southwestern Borrow Area. A reworked sedimentary unit overlies a layered stratigraphic unit. 4
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TABLE

Table No. 1 Personnel List 2

MAP ENCLOSURE (1” = 300’)

Subsurface Features Map (Sheet 1 of 1)

APPENDIX **A**
Equipment Descriptions
Survey Logs

APPENDIX **B**
Reduced Study Map (11” x 17”)

730 East Kaliste Saloom Road, Lafayette, LA 70508

1.0 EXECUTIVE SUMMARY

- C.H. Fenstermaker and Associates, Inc. contracted Oceaneering International, Inc. to provide Subbottom Profiler Study for a Coastal Restoration and Planning Authority Borrow Area for a marsh restoration project in Terrebonne Parish, Louisiana.

- The field operations were conducted January 21-23 and January 31-February 2 on the M/V *Hydro I*.

- The primary purpose of the survey was to determine the geologic and stratigraphic nature of the near-seabed soils.

- The survey crew collected the subbottom data using an EdgeTech 424 Subbottom Profiler.

- East-west primary tracklines were spaced at 30 meters and tie lines were spaced at 150 meters.

- The upper 10 feet of near-seafloor sediments are interpreted to primarily represent reworked unconsolidated soils comprising silts and clays.

- One subsurface channel buried 5 to 7 feet was identified and mapped across the east-central Borrow Area.

- The subbottom profiler recorded numerous high-amplitude events at and within 5 feet of the seabed which are interpreted as probable oyster beds.

- The geotechnical soil properties within the oyster bed and channel zones may differ from the bounding soil units.

- The seabed soils are eroded within a seafloor channel found in the southwestern corner of the Borrow Area.

730 East Kaliste Saloom Road, Lafayette, LA 70508

1.0 SCOPE OF WORK

Oceaneering International, Inc. (OII) was contracted by C.H. Fenstermaker and Associates, Inc. (CHF) to provide a shallow Subbottom Profiler Study for a Coastal Protection and Restoration Authority marsh creation project located in Terrebonne Parish, Louisiana (Figure Nos. 1 & 2, Regional and Vicinity Maps). This report details the subbottom data interpretation for the proposed Borrow Area for the Island Road Marsh Creation Project. Fenstermaker supplied the survey vessel and navigators for the project and collected hydrographic data.

The study results are provided in NAD83 in the Louisiana South projection and the horizontal scale of 1" = 300' on the Subsurface Features Map.

2.1 Survey Equipment

Positioning of the survey launch (M/V *Hydro I*) was performed using Real-Time Kinematic GPS with Hypack software implemented for vessel navigation and for generating an input navigation string for the geophysical data recording. An EdgeTech 424 Subbottom Profiler with a model 3100 Seismic Recording Unit was operated on all survey lines. A detailed equipment description from the manufacturer is included in Appendix A.

2.1 Methodology

The geophysical field operations were performed between January 23-26 and January 31 to February 2, 2017 aboard the 26-foot survey launch M/V *Hydro I.* Weather conditions were variable during the fieldwork data acquisition. On January 23, the crew mobilized to the work area, but found the sea conditions too rough to collect data. The weather conditions on January 26 forced the crew to return Lafayette, Louisiana. The crew resumed work on January 31 and was able to complete the data acquisition. Survey logs for the subbottom data collection are found in Appendix A.

Sixty-seven primary tracklines are oriented east-west across the proposed Borrow Area and spaced at 30 meters. Tie line spacing is 150 meters. A NEMA string was output from the navigation computer to the seismic recording system. The navigation data was recorded in the SEG-Y seismic data format.

The subbottom profiler was towed off a davit on the port side of the vessel. The towfish draft was 1.5 feet and the towfish was offset 18.65 feet from the navigation antenna.

The Edgetech 424 subbottom profiler data was recorded in standard SEG-Y format. The record length was set to 50 milliseconds and the ping rate was 20 Hz. Post-processing and interpretation was performed with Cheasapeake's Sonarwiz software. The source pulse was frequency modulated between 4 and 12 kHz.

Table No. 1 - Personnel List		
Personnel	**Company**	**Responsibilities**
Client Representative/Contact:		
Daniel J. Aucutt, PE	C.H. Fenstermaker	Project Manager
Tom Miller	C.H. Fenstermaker	Senior Survey Technician
Field Crew:		
Jim Wade	Oceaneering	SBP Operator
J. Broussard	C.H. Fenstermaker	Party Chief
M. Roy	C.H. Fenstermaker	Surveyor
Office Professionals:		
Tony George	Oceaneering	Geophysicist
Doug Pierrottie	Oceaneering	Senior Draftsperson

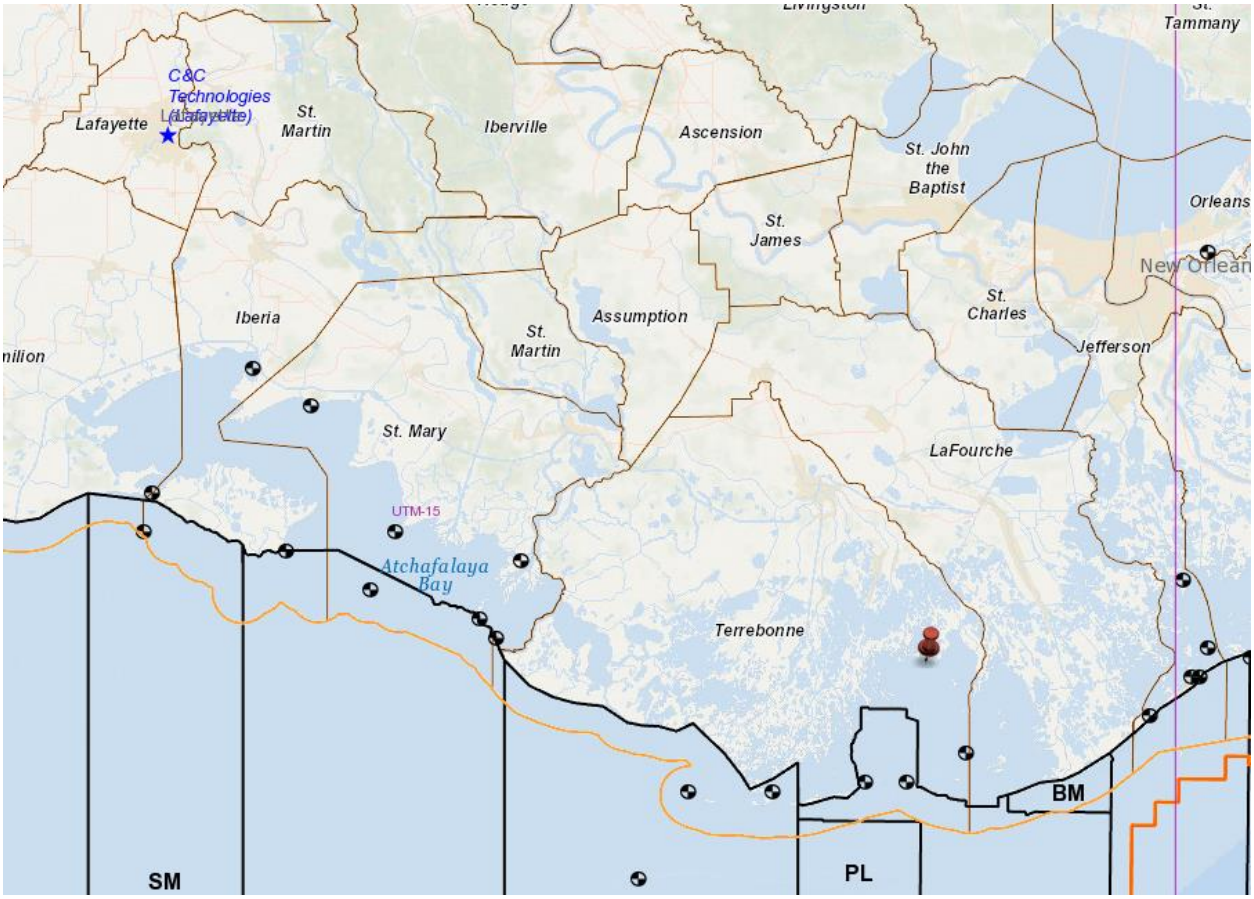

Figure No. 1 – Regional map showing location of survey area in Terrebonne Parish.

Figure No. 2 – Vicinity map showing the proposed Borrow Area location in Terrebonne Bay.

2.0 SUBBOTTOM INTERPRETATION

The study area is located on the inner shelf in a marsh environment of upper Terrebonne Bay estuary. The recorded water depths across the Borrow Area range from -3.5 to -22.0 feet NAVD 88 Geoid 12B. The deepest area exists in the southwest where a seabed channel exists (Figure No. 3). The channel shallows to the north-northeast across the western half of the survey area.

The uppermost sedimentary unit is characterized by reworked soils with little or no stratification present (Figure Nos. 3-5). The unit averages 10 feet in thickness. Below the uppermost reworked unit, a layered unit averaging 8 feet in thickness occurs. The uppermost soil unit in this shallow marine environment has been reworked by currents and waves predominately associated with storm events.

There are two subbottom feature types mapped across the Borrow Area. High amplitude reflecting zones buried 5 feet or less result in total attenuation of the seismic waves below the seismic event. These high amplitude events are interpreted as oyster beds (Figure No. 4). The zones appear mostly exposed at the seabed and become buried along the feature margins. Little or no acoustic energy passes through these zones and there is no stratification or resolution below the interface. The linear north to south orientation of the features suggests they may be associated with buried channels. Carbonate deposits associated with the oyster shells result in a very high acoustic impedance with the softer fine-grained sediments.

730 East Kaliste Saloom Road, Lafayette, LA 70508

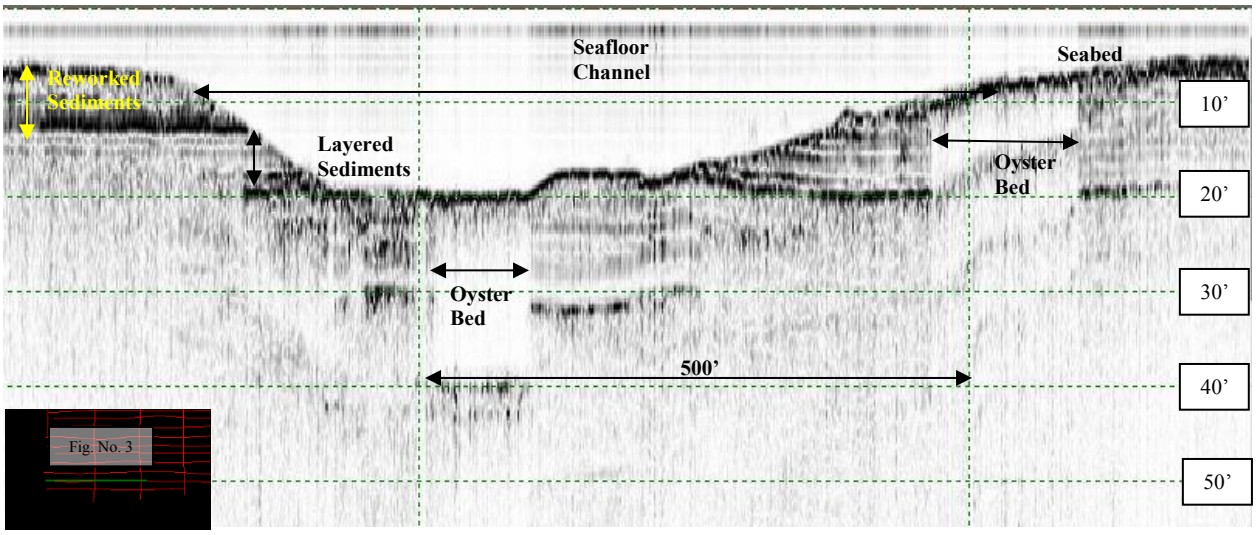

Figure No. 3 –Subbottom profiler example showing seafloor channel in the southwestern Borrow Area. A reworked sedimentary unit overlies a layered stratigraphic unit

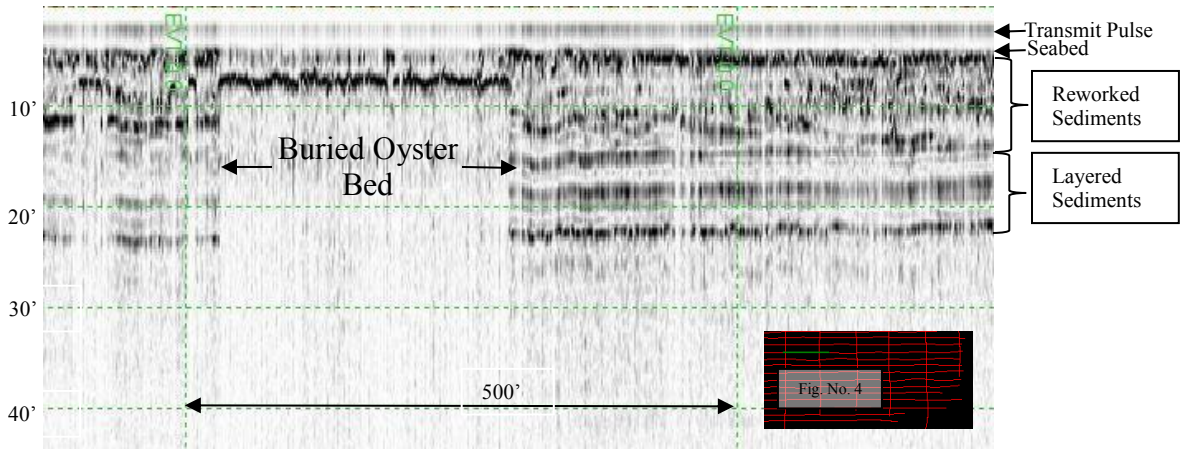

Figure No. 4 – Subbottom profile example of probable buried oyster bed, reworked and layered sediments in the Borrow Area.

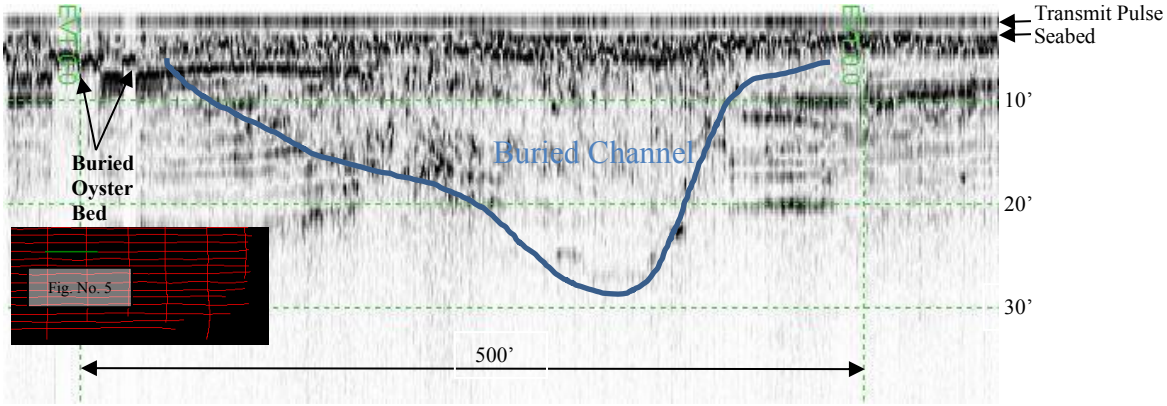

Figure No. 5 – Buried channel mapped across the east-central Borrow Area.

The other subbottom feature mapped is a channel which extends from north-northeast to south-southwest across the east-central Borrow Area (Figure No. 5). The channel thalweg downcuts 25 to 30 feet below the seabed. The channel is buried 5 to 7 feet below the seabed and averages 500 feet in width. There are some channel portions that are masked by the oyster bed signatures.

3.0 CONCLUSIONS

The subbottom profiler revealed two types of shallow subbottom features occurring across the proposed Borrow Area. High amplitude events within 5 feet of the seabed are interpreted as oyster beds. The shear strengths of the near-seabed sediments where the high amplitude events occur may differ from the surrounding fine grained sediment. One significant buried channel with thalwegs up to 25 to 30 foot in depth was mapped across the east-central Borrow Area.

The majority of the sediments imaged on the subbottom profiler are interpreted as soft silts and clays. More granular sediments may have infilled the buried channel. Granular sediments may be found in association with carbonate shells found in the oyster bed zones.

4.0 REFERENCES

Roberts, H.H., Wilson, C. and J. Supan. “Acoustic Surveying of Ultra-Shallow Water Bottoms (< 2.0 m) for Both Engineering and Environmental Applications”, Offshore Technology Conference Paper No. 12108, May, 2000.

Louisiana Department of Wildlife and Fisheries. “Sampling Protocol for Projects in Public Oyster Areas”. March 1, 2012.

Appendix A

Survey Logs
Subbottom Profiler Equipment Description

OCEANEERING GEOPHYSICAL LOG

Job Number	Client	Vessel	Geophysical Equipment:
180363	FENSTERMAKER	HYDRO I	EDGETECH SB 424

Date	Area		Job Description	Datum
1/23/17	LAKE BARRE		ISLAND ROAD MARSH CREATION	NAD83

Personnel	Page No.
J. WADE, J. BROUSSARD, M. ROY	01

Time	Heading	Fix. No.	Line No.	W.D.	Mag Ht	Mag C/O	Sonar C/O	SBP C/O	Streamer C/O	SOL	EOL	Remarks
0500												ARRIVE OFFICE
0535												MEET UP W/ CREW + TRAVEL
												TO HOUMA. VISITED 4 BOAT RAMPS
												BEFORE FINDING ONE WITH
												ENOUGH WATER TO LAUNCH
1125												LAUNCH BOAT
1225												TURN AROUND - TOO ROUGH TO WORK
1350												TRAILER BOAT
1400												SETTING UP + CHECKING GEAR +
												TROUBLESHOOTING GPS.
1600												EVERYTHING WORKING. TRAVEL
												TO HOTEL
1700												ARRIVE HOTEL + SECURE EQUIP
0600												NEW DAY
0715												ARRIVE RAMP
0745												LAUNCH BOAT
0825												TRANSIT TO WORK AREA
0925												ARRIVE WORK AREA SET UP ON
												NEW RTK POINT - UNABLE TO
												REACH BANK. SET CHECK-IN PT.
1215												PUT GEAR IN WATER - CALIBRATE
1245												TROUBLESHOOTING GPS/SBP

OCEANEERING GEOPHYSICAL LOG

Job Number	Client	Vessel	Geophysical Equipment:
180363	FENSTERMAKER	HYDRO 1	EDGETECH SBP 424
Date	**Area**		**Job Description** / **Datum**
1/24/17	LAKE BARRE		ISLAND ROAD MARSH RESTORATION / NAD83
Personnel			**Page No.**
J. WADE J. BROUSSARD M. ROY			02

Time	Heading	Fix. No.	Line No.	W.D.	Mag Ht	Mag C/O	Sonar C/O	SBP C/O	Streamer C/O	SOL	EOL	Remarks
1400												REPLACE BASE STATION BATTERY
												SBP RECEIVING GPS SIGNAL
												TROUBLESHOOTING GPS
1532	360	818	20	3.0						✓		SOL (LINE #20000)
1548	360	836	20	4.5							✓	
1551	180	837	19	4.6						✓		SOL (LINE #19000)
1615	180	861	19	3.2							✓	
1617												RETRIEVE GEAR
1750												TRANSIT TO RAMP
1758												ARRIVE RAMP
1730												BOAT ON TRAILER, TRAVEL TO HOTEL
												NEW DAY
0630												DEPART HOTEL
0715												ARRIVE RAMP LAUNCH BOAT
												TRANSIT TO SITE
0750												ARRIVE WORK AREA-SETUP BASE
0817												CHECK-IN
0850												BAR CHECK
0920	360	862	18		SBP IS 1.5' BELOW SURFACE					✓		(18000.2) NO DATA IN FILE
0937	360	879	18								✓	
0950	180	880	17							✓		
0954	180	894	17								✓	NO DATA

OCEANEERING GEOPHYSICAL LOG

Job Number	Client	Vessel	Geophysical Equipment:
180363	FENESTERMAKER	HYDROI	EDGETECH SBP 424
Date	**Area**		**Job Description** / **Datum**
1/25/17	LAKE BARRE		ISLAND ROAD MARSH RESTORATION / NAD 83
Personnel			**Page No.**
J. WADE J. BROUSSARD, M. ROY			03

Time	Heading	Fix. No.	Line No.	W.D.	Mag Ht	Mag C/O	Sonar C/O	SBP C/O	Streamer C/O	SOL	EOL	Remarks
1011	360	898	16	3.0						✓		SOL (LINE #16000)
1028	360	915	16	3.0							✓	
1030	180	916	15	4.5						✓		SOL (15000)
1046	180	932	15	3.5							✓	
1047	360	933	14	3.5								SOL (LINE #14000)
1103	360	949	14	4.5							✓	
1106	270	950	90	4.7						✓		SOL (LINE #90000)
1113	270	958	90	4.8							✓	
1115	090	959	~~8~~87	4.7						✓		SOL (LINE #87000)
1123	090	967	87	4.8							✓	
1124	270	968	89	4.8						✓		SOL (LINE #89000)
1132	270	976	89	4.8							✓	
1133	090	977	88	4.8						✓		SOL (LINE #88000)
1140	090	985	88	4.8							✓	CHANGE GPS BATTERY & ECHO PAPER
1150	270	986	86	4.8						✓		SOL (LINE #86000)
1157	270	993	86	4.7							✓	~~CHECK WATER SURFACE~~
1158	090	994	84	4.8						✓		SOL (LINE #84000)
1205	090	1001	84	4.7							✓	CHECK WATER SURFACE
1240		~~1002~~	~~82~~									HYPACK CRASHED - REBOOT
1240	~~0~~270	1002	82	4.8						✓		SOL (LINE #82000)
1247	270	1009	82	4.6							✓	
1248	090	1010	80	4.6						✓		SOL (LINE #80000)
1254	090	1017	80	4.7							✓	

OCEANEERING GEOPHYSICAL LOG

Job Number	Client	Vessel	Geophysical Equipment:
180363	FENESTERMAKER	HYDROI	EDGETECH SBP 424
Date 1/25/17	**Area** LAKE BARRE		**Job Description** ISLAND ROAD MARSH RESTORATION — **Datum** NAD83
Personnel J. WADE, J. BROUSSARD, M. ROY			**Page No.** 04

Time	Heading	Fix. No.	Line No.	W.D.	Mag Ht	Mag C/O	Sonar C/O	SBP C/O	Streamer C/O	SOL	EOL	Remarks
1256	270	1018	78	4.5						✓		SOL (LINE 78000)
1302	270	1025	78	4.5							✓	
1303	090	10~~33~~26	76	4.6						✓		SOL (LINE 76000)
1310	090	1033	76	4.6							✓	
1311	270	1034	74	4.5						✓		SOL (LINE 74000)
1318	270	1041	74	4.7							✓	
1319	090	1042	72	4.5						✓		SOL (LINE 72000)
1325	090	1049	72	4.5							✓	
1327	270	1050	70	4.3						✓		SOL (LINE 70000)
1333	270	1057	70	5.2							✓	
1334	090	1058	68	4.8						✓		SOL (LINE 68000)
1341	090	1065	68	4.4							✓	
1342	270	1066	66	4.3						✓		SOL (LINE 66000)
1348	270	1073	66	5.1							✓	
1349	090	1074	64	5.1						✓		SOL (LINE 64000)
1355	090	1081	64	4.4							✓	
1356	270	1082	62	4.5						✓		(SOL (LINE 62000)
1403	270	1089	62	5.2							✓	
1405	090	1090	63	5.1						✓		SOL (LINE 63000)
1406	090	1092	63	5.0							✓	HIT CRAB TRAP
1410	090	1093	63R	5.1						✓		SOL (63000) RERUN
1416	090	1100	63R	4.3							✓	
1417	270	1101	65	4.3						✓		SOL (65000)

OCEANEERING GEOPHYSICAL LOG

Job Number	Client	Vessel	Geophysical Equipment:
180363	FENESTERMAKER	HYDROI	EDGETECH SBP 4200
Date	**Area**		**Job Description** / **Datum**
1/25/17	LAKE BARRE		ISLAND ROAD MARSH CREATION / NAD 83
Personnel			**Page No.**
J. WADE, J. BROUSSARD, M. ROY			05

Time	Heading	Fix. No.	Line No.	W.D.	Mag Ht	Mag C/O	Sonar C/O	SBP C/O	Streamer C/O	SOL	EOL	Remarks
1424	270	1108	65	5.2							✓	
1425	090	1109	67	5.2						✓		SOL (LINE 67000)
1432	090	1116	67	4.4							✓	
1433	270	1117	69	4.5						✓		SOL (LINE 69000)
1439	270	1124	69	5.0							✓	
1441	090	1125	71	5.4						✓		SOL (LINE 71000)
1447	090	1132	71	4.8							✓	
1448	270	1133	73	4.6						✓		SOL (LINE 73000)
1454	270	1140	73	5.1							✓	
1455	090	1141	75	5.1						✓		SOL (LINE 75000)
1502	090	1148	75	5.2							✓	
1503	270	1149	77	4.7						✓		SOL (LINE 77000)
1510	270	1157	77	5.1							✓	
1511	090	1158	79	5.3						✓		SOL (LINE 79000)
1518	090	1165	79	5.3							✓	
1519	270	1166	81	5.4						✓		SOL (LINE 81000)
1527	270	1174	81	5.4							✓	
1528	090	1175	83	5.4						✓		SOL (LINE 83000)
1535	090	1183	83	5.6							✓	
1536	270	1184	85	5.6						✓		SOL (LINE 85000)
1543	270	1192	85	5.5							✓	PICKING UP GEAR & BASE STATION
1625												TRANSIT TO RAMP & TRAILER BOAT
												TRAVEL TO HOTEL

OCEANEERING GEOPHYSICAL LOG

Job Number	Client	Vessel	Geophysical Equipment:
180363	FENESTERMAKER	HYDRO I	EDGETECH 424 SBP
Date	**Area**		**Job Description** / **Datum**
1/26/17	LAKE BARRE		ISLAND ROAD MARSH RESTORATION / NAD83
Personnel			**Page No.**
J. WADE, J. BROUSSARD, M. ROY			06

Time	Heading	Fix. No.	Line No.	W.D.	Mag Ht	Mag C/O	Sonar C/O	SBP C/O	Streamer C/O	SOL	EOL	Remarks
0710												LAUNCH BOAT
0800												ARRIVE JOB SITE - VERY SHALLOW
												UNABLE TO SET UP BASE STATION
												STAND BY - WOW
0945												TAKING PICTURES OF ISLANDS
0950												TRANSIT TO DOCK
1030												ARRIVE DOCK & TRAILER BOAT
												TRAVEL TO LAFAYETTE
												NEW DAY 1/31/17
0810												ARRIVE RAMP - LAUNCH BOAT
0830												TRANSIT TO SITE
0900												ARRIVE WORK SITE - SET UP BASE
												& CHECK IN - DEPLOY EQUIPMENT
												BAR CHECK
1013	090	1193	61	4.5						✓		SOL (LINE 61000)
1020	090	1200	61	±3.0								±3 FT. WATER IN THIS AREA
1029	090	1209	61	4.0							✓	~~±3 FT. WATER IN THIS AREA~~
1030	270	1210	59	3.8						✓		SOL (LINE 59000)
1037	270	1217	59	±3.0								SHALLOW WATER IN THIS AREA
1047	270	1227	59	4.8							✓	
1049	090	1228	57	4.7						✓		SOL (LINE 57000)
1058	090	1237	57	±3.0								SHALLOW WATER IN THIS AREA

OCEANEERING GEOPHYSICAL LOG

Job Number	Client	Vessel	Geophysical Equipment:
180363	FENESTERMAKER	HYDRO I	EDGETECH 424 SBP
Date 1/31/17	**Area** LAKE BARRE		**Job Description** ISLAND ROAD MARSH RESTORATION — **Datum** NAD83
Personnel J. WADE, J. BROUSSARD, M. ROY			**Page No.** 07

Time	Heading	Fix. No.	Line No.	W.D.	Mag Ht	Mag C/O	Sonar C/O	SBP C/O	Streamer C/O	SOL	EOL	Remarks
1105	090	1244	57	4.6							✓	
1106	270	1245	55	4.6						✓		SOL (LINE 55000)
1110	270	1249	55	3.8								GPS BATTERY CHANGED
1112	270	1251	55	±3.0								SHALLOW IN THIS AREA
1122	270	1261	55	4.5							✓	
1123	090	1262	53	4.6						✓		SOL (LINE 53000)
1128	090	1267	53	3.8								BOAT WAKE
1132	090	1271	53	±3.0								SHALLOW IN THIS AREA
1138	090	1277	53	4.5							✓	
1139	270	1278	51	4.0						✓		SOL (51000)
1155	270	1294	51	4.3							✓	
1156	090	1295	49	4.8						✓		SOL (49000)
1211	090	1310	49	3.9							✓	
1212	270	1311	47	4.6						✓		SOL (LINE 47000)
1228	270	1327	47	4.5							✓	
1229	090	1328	45	4.8						✓		SOL (LINE 45000)
1244	090	1343	45	4.5							✓	
1245	270	1344	43	3.7						✓		SOL (LINE 43000)
1301	270	1360	43	4.8							✓	
1301	090	1361	41	5.1						✓		SOL (LINE 41000)
1316	090	1376	41	3.9							✓	
1317	270	1377	39	3.8						✓		SOL (LINE 39000)
1334	270	1394	39	5.1							✓	

OCEANEERING GEOPHYSICAL LOG

Job Number	Client	Vessel	Geophysical Equipment:
180363	FENESTERMAKER	HYDRO-I	EDGETECH 424 SBP
Date 1/31/17	**Area** LAKE BARRE		**Job Description** ISLAND ROAD MARSH RESTORATION — **Datum** NAD83
Personnel			**Page No.** 08

Time	Heading	Fix. No.	Line No.	W.D.	Mag Ht	Mag C/O	Sonar C/O	SBP C/O	Streamer C/O	SOL	EOL	Remarks
1335	090	1395	27	4.9						✓		SOL (LINE 37000)
1350	090	1410	37	3.6							✓	
1350	270	1411	35	4.1						✓		SOL (LINE 35000)
1409	270	1428	35	5.3							✓	
1408	090	1429	33	5.2						✓		SOL (LINE 33000)
1423	090	1444	33	3.6							✓	CHANGE GPS BATTERY
1429	270	1445	31	2.8						✓		SOL (LINE 31000)
1444	270	1462	31	5.7							✓	
1445	090	1463	29	5.8						✓		SOL (LINE 29000)
1500	090	1478	29	2.8							✓	
1501	270	1479	27	2.8						✓		SOL (LINE 27000)
1517	270	1496	27	5.8							✓	BAR CHECK
1525												PICKING UP GEAR
1600												CHECK-IN CRSME SM-19
												NO RADIO COMMS
1617												TRANSIT TO RAMP + TRAILER
												BOAT
1645												TRAVEL TO HOTEL
												NEW DAY 2/01/17
0700												ARRIVE RAMP + LAUNCH BOAT
												STANDBY FOR ARCHILOGIST - NO SHOW
0835												TRANSIT TO WORK AREA

OCEANEERING GEOPHYSICAL LOG

Job Number	Client	Vessel	Geophysical Equipment:
180353	FENESTERMAKER	HYDRO 1	EDGETECH 424 SBP
Date 2/01/17	**Area** LAKE BARRE		**Job Description** ISLAND ROAD MARSH RESTORATION — **Datum** NAD83
Personnel J. WADE, J. BROUSSARD, M. ROY			**Page No.** 09

Time	Heading	Fix. No.	Line No.	W.D.	Mag Ht	Mag C/O	Sonar C/O	SBP C/O	Streamer C/O	SOL	EOL	Remarks
0900												ARRIVE WORKSITE-SET UP
												BASE, DEPLOY GEAR + CHECK IN
0955												BAR-CHECK
1003	090	1497	25	4.5						✓		SOL (LINE 25000)
1018	090	1512	25	±2.8							✓	EOL TO SHALLOW (300' SHORT)
1020	270	1513	23	3.2						✓		SOL (LINE 23000) (250' SHORT)
1035	270	1528	23	5.5							✓	ADJUST FISH
1040	090	1529	21	5.5						✓		SOL (LINE 21000)
1043	090	1533	21	±2.8							✓	TOO SHALLOW - GOING AROUND ISLAND
1045	090	1534	21A	3.7						✓		~~TOO SHALLOW~~
1053	090	1543	21A	3.7							✓	(LINE 21A000)
1054	270	1544	22	3.5						✓		SOL (LINE 22000)
1107	270	1558	22	5.5							✓	
1109	090	1559	24	5.4						✓		SOL (LINE 24000)
1123	090	1574	24	3.7							✓	
1124	270	1575	26	3.7						✓		SOL (LINE 26000)
1140	270	1592	26	5.7							✓	
1141	090	1593	28	6.0						✓		SOL (LINE 28000)
1156	090	1609	28	3.2							✓	
1157	270	1610	30	3.3						✓		SOL (LINE 30000)
1212	270	1625	30	4.8							✓	
1213	090	1626	32	4.8						✓		SOL (LINE 32000)
1227	090	1639	32	3.6							✓	

OCEANEERING GEOPHYSICAL LOG

Job Number	Client	Vessel	Geophysical Equipment:
180363	FENESTERMAKER	HYDRO 1	EDGETECH 424 SBP

Date	Area		Job Description	Datum
02/01/17	LAKE BARRE		ISLAND ROAD MARSH RESTORATION	NAD 83

Personnel: J. WADE, J. BROUSSARD, M. ROY

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Time	Heading	Fix. No.	Line No.	W.D.	Mag Ht	Mag C/O	Sonar C/O	SBP C/O	Streamer C/O	SOL	EOL	Remarks
1228	270	1640	34	3.5						✓		SOL (LINE 34000)
1243	270	1656	34	5.1							✓	
1243	090	1657	36	5.2						✓		SOL (LINE 36000)
1248	090	1660	36	4.9								LOST GPS - CHANGE BATTERY
1257	090	1671	36	3.7							✓	
1258	270	1672	38	3.7						✓		SOL (LINE 38000)
1313	270	1687	38	5.2							✓	
1313	090	1688	40	4.8						✓		SOL (LINE 40000)
1327	090	1702	40	3.8							✓	
1328	270	1703	42	3.7						✓		SOL (LINE 42000)
1343	270	1719	42	4.8							✓	
1344	090	1720	44	4.5						✓		SOL (LINE 44000)
1359	090	1735	44	3.7							✓	
1400	270	1736	46	3.7						✓		SOL (LINE 46000)
1416	270	1753	46	4.8							✓	
1417	090	1754	48	5.0						✓		SOL (LINE 48000)
1432	090	1770	48	3.8							✓	
1433	270	1771	50	4.2						✓		SOL (LINE 50000)
1449	270	1788	50	4.6							✓	
1450	090	1789	52	5.0						✓		SOL (LINE 52000)
1505	090	1805	52	4.2							✓	
1506	270	1806	54	4.1						✓		SOL (LINE 54000)
1522	270	1823	54	4.8							✓	

OCEANEERING GEOPHYSICAL LOG

Job Number	Client	Vessel	Geophysical Equipment:
180363	FENESTERMAKER	HYDRO 1	EDGETECH 424 SBP
Date	**Area**		**Job Description** / **Datum**
2/01/17	LAKE BARRE		ISLAND ROAD MARSH RESTORATION / NAD83
Personnel			**Page No.** 11

Time	Heading	Fix. No.	Line No.	W.D.	Mag Ht	Mag C/O	Sonar C/O	SBP C/O	Streamer C/O	SOL	EOL	Remarks
1523	090	1824	56	5.2						✓		SOL (56000)
1539	090	1840	55	4.3							✓	
1540	270	1841	58	4.3						✓		SOL (58000)
1556	270	1858	58	5.3							✓	
1600												PICK UP GEAR & BASE STATION
1630												TRANSIT TO DOCK
1655												ARRIVE DOCK & TRAILER BOAT
												NEW DAY 2/02/17
0655												ARRIVE RAMP & LAUNCH BOAT
0715												TRANSIT TO WORK AREA
0725												ARRIVE WORK AREA, SET UP BASE
0735												DEPLOY EQUIPMENT, CHECK IN,
												BAR CHECK
0826	000	1859	17	3.0						✓		SOL (LINE 17000) RERUN
0842	000	1876	17	4.6							✓	
0846	270	1877	84	4.8						✓		SOL (LINE 84000) RERUN
0854	270	1885	84	4.8							✓	
0857	180	1886	18	4.1						✓		SOL (LINE 18000) RERUN
0912	180	1901	18	6.8							✓	
0917	090	1902	40	4.8						✓		SOL (LINE 40000) RERUN
0931	090	1916	40	3.4							✓	
0935	000	1917	7	± 2.8						✓		SOL (LINE 7000) SHALLOW, ± 700' SHORT

OCEANEERING GEOPHYSICAL LOG

Job Number	Client	Vessel	Geophysical Equipment:
180363	FENESTERMAKER	HYDRO I	EDGETECH 424 SBP
Date	**Area**		**Job Description** / **Datum**
2/02/17	LAKE BARRE		ISLAND ROAD MARSH RESTORATION / NAD83

Personnel: J. WADE, J. BROUSSARD, M. ROY

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Time	Heading	Fix. No.	Line No.	W.D.	Mag Ht	Mag C/O	Sonar C/O	SBP C/O	Streamer C/O	SOL	EOL	Remarks
0943	000	1925	7	3.6							✓	
0944	180	1926	8	3.8						✓		SOL (LINE 8000)
0954	180	1936	8	2.8							✓	
0955	000	1937	9	3.1						✓		SOL (LINE 9000) SHALLOW 150' SHORT
1004	000	1946	9	4.1							✓	
1005	180	1947	10	3.8						✓		SOL (LINE 10000)
1014	180	1956	10	3.1							✓	SHALLOW 220' SHORT
1015	000	1957	11	3.5						✓		SOL (LINE 11000) 200' SHORT
1023	000	1966	11	3.8							✓	
1025	180	1967	12	3.2						✓		SOL (LINE 12000)
1034	180	1976	12	3.6							✓	
1035	000	1977	13	3.6						✓		SOL (LINE 13000)
1043	000	1986	13	3.5							✓	
1051	090	1987	60	5.4						✓		SOL (LINE 60000)
1105	090	2001	60	3.5							✓	B.
1115												BAR CHECK, PICK UP BASE +
												RETRIEVE GEAR + DEMOB.
1155												CHECK CONTROL MON.
1215												PICK UP BASE STATION
1230												TRANSIT TO RAMP
1250												ARRIVE RAMP + TRAILER BOAT

3100

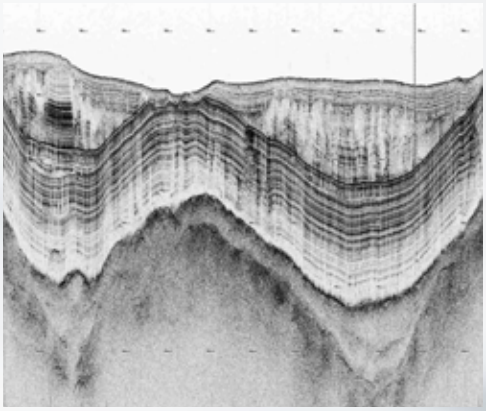
PORTABLE SUB-BOTTOM PROFILING SYSTEM

FEATURES

- Portable
- Low power requirement (runs on AC or DC)
- Choice of towfish depending on the application
- Pole mount option for shallow water surveys
- Easy to setup and operate

APPLICATIONS

- Geological Surveys
- Geohazard Surveys
- Buried Object Location
- Mining/Dredging Surveys
- Bridge/Shoreline Scour Surveys
- Pipeline and Cable Location



The 3100 is EdgeTech's portable version of their highly successful sub-bottom profiler product line. The system utilizes EdgeTech's Full Spectrum CHIRP technology which provides higher resolution imagery of the sub-bottom structure and greater penetration.

The 3100 is ideally suited for use in rivers, lakes, ponds and shallow water ocean applications up to 300m max depth. The system was designed for customers that require a portable system that can be used from smaller boats while not wanting to sacrifice image quality.

A 3100 system comes with a choice of two towfish; either the SB-424 or SB-216S. These towfish operate at different frequency ranges and selection between the two depends on the type of application. The 424 operates at 4-24 kHz and will provide slightly higher resolution but less penetration. The 216S operates at 2-16 kHz and provides slightly less resolution but greater penetration. Along with a towfish, the 3100 system comes with a portable splash-proof topside processor with laptop computer running EdgeTech's DISCOVER software for display of the sonar data. The system comes standard with a 35m tow cable with customer-specified lengths also available.

3100

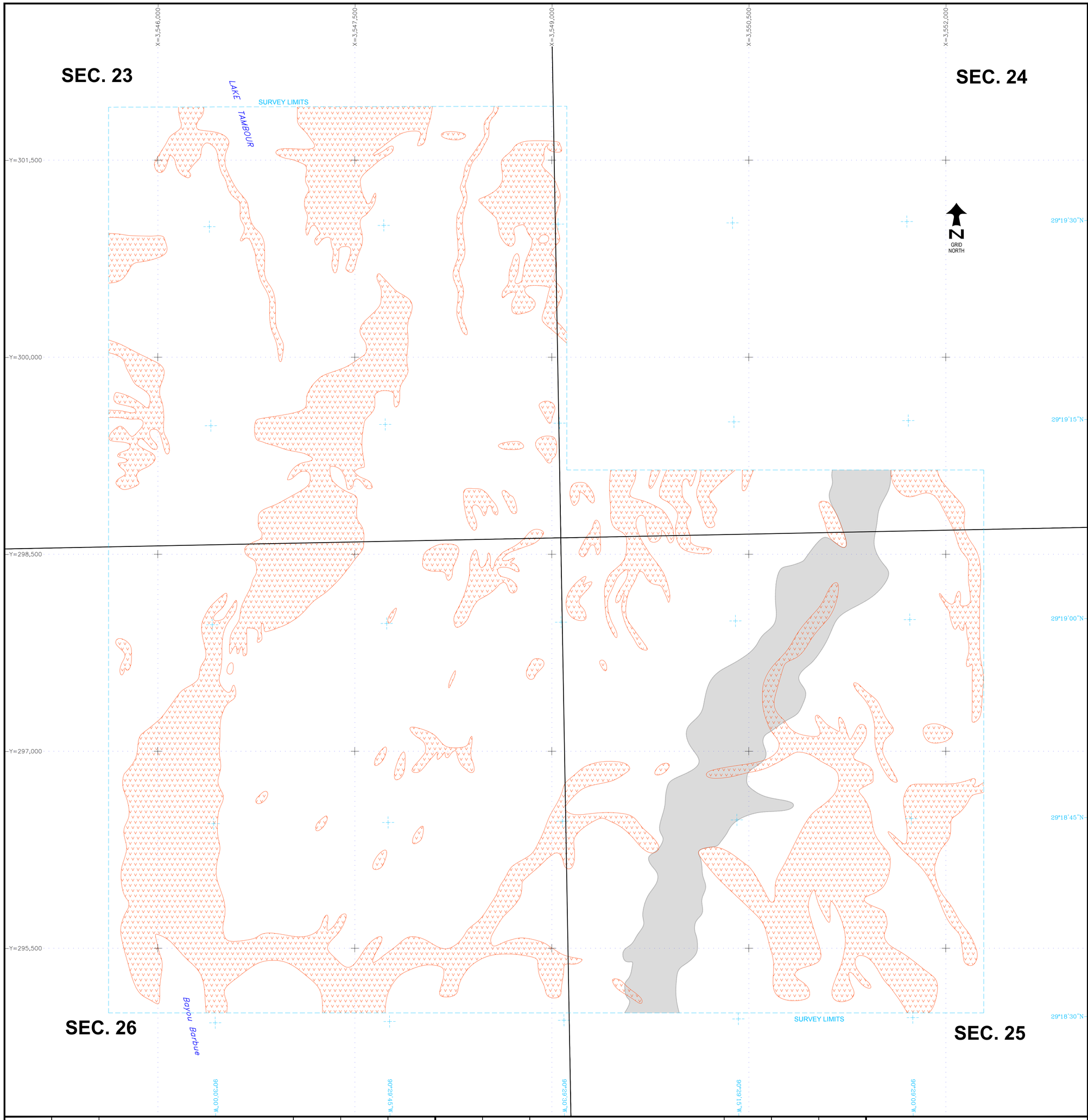
PORTABLE SUB-BOTTOM PROFILING SYSTEM

KEY SPECIFICATIONS

TOWFISH	SB- 216S	SB- 424
Frequency Range	2-16 kHz	4-24 kHz
Vertical Resolution (depends on pulse selected)	6-10 cm	4-8 cm
Penetration		
In coarse calcareous sand	6m	2m
In clay	80m	40m
Length	105 cm (41")	77 cm (30")
Width	67 cm (26")	50 cm (20")
Height	40 cm (16")	34 cm (13")
Weight in Air	76 kg (167 lbs.)	45 kg (100 lbs.)
Weight in Water	32 kg (70 lbs.)	18 kg (40 lbs.)
Max Depth Rating of Towfish	300 meters	
TOPSIDE PROCESSOR		
Hardware	Rugged, portable splashproof enclosure	
Operating System	Windows 7	
Display	Splashproof semi-rugged laptop	
Archive	DVD-R/W	
File Format	JSF, SEG-Y & XTF	
I/O	Ethernet	

SB-216S TOWFISH

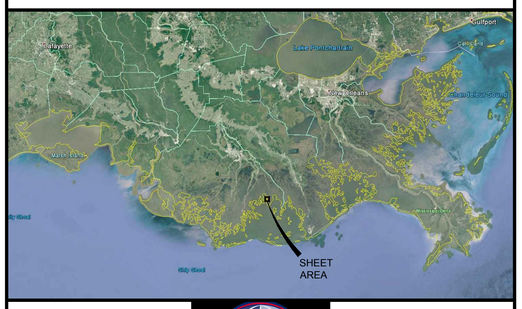
SB-424 TOWFISH



PLAN VIEW

	Subsurface channel buried 5-7 feet below seabed
	Probable oyster beds buried within 5 feet of seabed

NOTE: All field data acquired January 21-23 and January 31-February 2, 2017.
Survey vessel: M/V *Hydro I*



PRELIMINARY

FENSTERMAKER

SUBSURFACE FEATURES MAP

ISLAND ROAD MARSH CREATION PROJECT

LA□E TAMBOUR BORROW AREA

T20S, R19E, SECTIONS 23, 24, 25 & 26

TERREBONNE PARISH, LOUISIANA

300□ 0□ 300□ 600□
SCALE IN US SURVEY FEET

REVISION	DATE	DESCRIPTION	DRAWN	INTERP	CHEC□ED
A	Feb. 14, 2017	Preliminary issue with report	D. Pierrottie	T. George	T. George

ISSUE	DATE	DESCRIPTION	DRAWN	INTERP	CHEC□ED

GEODETIC DATUM: NAD 83
ELLIPSOID: GRS 80
GRID UNITS: US SURVEY FEET
PROJECTION: LAMBERT CONFORMAL CONIC
□ONE: LOUISIANA SOUTH SPCS
CENTRAL MERIDIAN: 91°20' W
FALSE EASTING: 3,280,833.33 FEET at C.M.
FALSE NORTHING: 0.00 FEET at 28° 30' N

PREPARED BY:

OCEANEERING®

OCEANEERING INTERNATIONAL, INC.
730 E. KALISTE SALOOM ROAD
LAFAYETTE, LA 70508
(337) 210-0000

JOB No. 180363 | DATE: Feb. 14, 2017
FILENAME: 180363.DWG

SHEET 1 of 1 | REV. A

35.5"x 31"
DATE: 02/14/2017 TIME: 16:06 FILENAME: Z:\180363\ACAD\180363.DWG