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TIDAL FRINGE WETLAND FUNCTIONAL ASSESSMENT
BOSTCO SHORELINE PROTECTION PROJECT
USACE PERMIT NO. SWG-2011-00011
HARRIS COUNTY, TEXAS

Prepared for:

Battleground Oil Specialty Terminal Company LLC
300 Beltway Boulevard
Pasadena, Texas 77503

Prepared by:

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Bellaire, Texas 77401

May 2023

Table of Contents

Tables

Appendixes

Acronyms and Abbreviations

BOSTCO	Battleground Oil Specialty Terminal Company LLC
CWA	Clean Water Act
EPA	U.S. Environmental Protection Agency
FCI	functional capacity index
FCU	functional capacity unit
GNSS	global navigation satellite system
iHGM	Interim Hydrogeomorphic Approach for Assessing Wetland Functions
LEI	Lloyd Engineering, Inc.
Project	Shoreline Protection Project
RHA	Rivers and Harbors Act
SWG	Southwestern Division Galveston
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WAA	wetland assessment area
WOUS	water(s) of the United States

1.0 Introduction

This report presents the results of a functional wetland assessment conducted by Lloyd Engineering, Inc. (LEI) on behalf of Battleground Oil Specialty Terminal Company LLC (BOSTCO) for the proposed Shoreline Protection Project (Project). The proposed project is located near La Porte, Texas approximately 2.45 miles northeast of the intersection of Highway 225 and Miller Cut Off Road. Refer to Appendix A, Figure 1 for a vicinity map depicting the location of the Project. LEI ecologist conducted functional wetland assessments during the week of April 8, 2023 within an approximate 1-acre permanent impact area associated with the Project. Refer to Appendix A, Figure 2 for an aerial overview map of the 1-acre Project permanent impact area. The proposed project is positioned within the U.S. Army Corps of Engineers (USACE) Galveston District and is located on the U.S. Geological Survey (USGS) (2022) La Porte, Texas 7.5-minute series topographic quadrangle maps (Appendix A, Figure 3).

During this investigation, LEI ecologists performed functional wetland assessments using the USACE Southwestern Division Galveston (SWG) District Interim Hydrogeomorphic (iHGM) Approach for Assessing Wetland Functions within potentially jurisdictional wetlands considered waters of the United States (WOUS) subject to USACE and U.S. Environmental Protection Agency (EPA) jurisdiction under Section 404 of the Clean Water Act (CWA) and/or Section 10 of the Rivers and Harbors Act (RHA).

2.0 Background

BOSTCO is submitting a permit modification request to USACE Permit No. SWG-2011-00011 for the placement of clean rip-rap fill material for the purpose of shoreline stabilization. As such, LEI conducted a wetland delineation within an approximate 2-acre survey area in September 2022 to describe the most current site conditions that accurately represent the location and extent of any potential jurisdictional WOUS, including wetlands. The location and extent of potentially jurisdictional wetlands identified during the September 2022 wetland delineation serves as the basis for the functional wetland assessment and results presented herein. Only those wetlands identified within the 1-acre Project permanent impact area were analyzed as part of this functional wetland assessment.

3.0 Methodology

The USACE SWG iHGM methodology was utilized for this functional wetland assessment. The iHGM model assesses the functional condition of a specific wetland referenced to data collected from wetlands across a range of physical conditions. It utilizes a wetland classification system based on geomorphic position and hydrologic characteristics, to group wetlands into seven different wetland classes, as defined by Brinson (1993): (1) Depressional, (2) Riverine, (3) Mineral Flats, (4) Organic Flats, (5) Tidal Fringe, (6) Lacustrine Fringe, and (7) Slopes. This functional wetland assessment followed USACE Galveston District's iHGM approach for tidal fringe wetlands, which is detailed further in Section 3.1.

During this investigation, LEI ecologists performed evaluations at wetland assessment areas (WAA), which are defined by USACE as a wetland area that is physically continuous and homogenous in relation to the iHGM criteria used to define regional wetland subclasses (Smith et al., 1995).

3.1 Interim Hydrogeomorphic Model Assessment

Each iHGM model consists of a suite of quantifiable variables used to evaluate the functional capacity of a wetland at the respective WAA point. Based on the Cowardin, et al. (1979) wetland vegetation community classification system, the Tidal Fringe iHGM was utilized for analysis (USACE, 2010). The Tidal Fringe iHGM model utilizes a unique set of eight variables. Below are the variables and associated descriptions utilize for the Tidal Fringe iHGM model.

Variables Collected for Tidal Fringe iHGM Models

- V_{edge} The amount of marsh-water meters/hectare.
- V_{hydro} Site hydroperiod or degree of hydrological modifications.
- V_{nhc} Number of nekton habitat types present within 150 feet of the edge of the WAA.
- $V_{typical}$ Proportion of the site that is covered by vegetation typical of the regional subclass.
- V_{slope} Distance to water greater than or equal to 6 feet deep.
- V_{width} Average marsh width.
- V_{rough} Manning's roughness coefficient ($n_{base} + n_{topo} + n_{veg}$ = manning's end).
- V_{soil} Predominant soil texture.

Variables are quantified using subindices ranging from 0.00 to 1.00 based on the conditions observed at each WAA. At each WAA sampling plot, detailed site-specific information was collected and recorded on iHGM data sheets. For site-specific details, refer to the information recorded on the iHGM data sheets provided in Appendix B. At the time of the assessment, the WAA locations were digitally georeferenced using a Trimble Geo 7X global navigation satellite system (GNSS) with sub-meter accuracy. Refer to the project figures provided in Appendix A for a depiction of the location of WAAs.

Once the above-mentioned model variables were tabulated, the functional capacity index (FCI) of each WAA was determined by using a suite of specific variables for calculations. The FCI represents an index of the ability of a wetland to perform specific functions at the observed state. The output of the FCI score ranges from 0.00 to 1.00, with an index of 1.00 indicating a wetland performs a function at the highest sustainable capacity. Once FCIs were computed for each WAA, the FCI value was multiplied by the size of

the wetland, in acres, to establish the amount of functional capacity units (FCU) contained within each wetland. The total amount of FCUs contained within the project area was calculated by adding the FCUs measured for each of the identified wetlands.

FCI x Acreage = FCU

4.0 Project Impact iHGM Assessment Areas

Based on the results of the wetland delineation and proposed project layout, a total of two wetlands are proposed to be impacted as a result of the proposed project, both of which were classified as intertidal, estuarine emergent wetlands. Both wetlands were evaluated at individual WAA's using the Tidal Fringe iHGM model. The following sections provide details of the wetlands evaluated as a result of this functional wetland assessment.

4.1 Emergent Wetland

A total of two emergent wetlands were assessed within the proposed 1-acre Project permanent impact area. Typical vegetation found within these emergent wetlands primarily consisted of maiden cane (*Panicum hemitomon*), southern dewberry (*Rubus* trivialis), annual seepweed (*Suaeda linearis*), and saltmarsh false foxglove (*Agalinis maritima*). All emergent wetlands were evaluated using the USACE Tidal Fringe iHGM model. Refer to Appendix B and Appendix C for iHGM data sheets and representative photographs, respectively.

5.0 Results

LEI used the Tidal Fringe iHGM models in combination with data collected during field investigations to estimate the FCI values for all identified wetlands within the 1-acre Project permanent impact area. As a result, a total of two emergent wetlands and four scrub shrub wetlands were assessed. The Tidal Fringe iHGM data sheets for each WAA are provided in Appendix B. The iHGM FCI and FCU values calculated for each WAA and associated wetlands are provided in Table 5-1.

As a result of the CDMPA Project, a total of 0.13 acres of wetlands are proposed to be permanently impacted, all of which are classified as emergent wetlands. Based on the results of the functional wetland assessment conducted (Table 5-1), a total of 0.11 biota FCUs, 0.13 botanical FCUs, 0.07 physical FCUs, and 0.13 chemical FCUs were calculated for the proposed 0.13 acres of permanent wetland impacts.

Table 5-1
iHGM Functional Capacity Indices and Units

WAA ID	Wetland ID[1]	Wetland Classification	Acreage[1]	Biota		Botanical		Physical		Chemical	
				FCI	FCU	FCI	FCU	FCI	FCU	FCI	FCU
Tidal Fringe iHGM Model											
WAA 1	EM 001	Emergent Wetland	0.11	0.86	0.10	1.00	0.11	0.56	0.06	1.00	0.11
WAA 2	EM 002	Emergent Wetland	0.02	0.86	0.01	1.00	0.02	0.56	0.01	1.00	0.02
TOTALS		**Total Wetland Acreage**	**0.13**	**Total FCU Biota:**	**0.11**	**Total FCU Botanical:**	**0.13**	**Total FCU Physical:**	**0.07**	**Total FCU Chemical:**	**0.13**

1. Wetland ID and Wetland Acreage is based on the wetland delineation conducted concurrent to the functional wetland assessment.

6.0 References

Brinson, M. M. 1993. A hydrogeomorphic classification for wetlands, Technical Report WRP-DE-4, U.S. Army Corp of Engineers Engineer Waterways Experiment Station, Vicksburg, MS.

Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. FWS/OBS-79/31, December 1979. Reprinted 1992. U.S. Department of the Interior Fish and Wildlife Service Office of Biological Services, Washington, D.C. 20240. Available online: https://www.fws.gov/wetlands/Documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States.pdf.

R. D. Smith, A. Ammann, C. Bartoldus, and M. M. Brinson. 1995. An Approach for Assessing Wetland Functions Using Hydrogeomorphic Classification, Reference Wetlands, and Functional Indices. Technical Report WRP-DE-9, October 1995. U.S. Army Corp of Engineers Engineer Waterways Experiment Station, Vicksburg, MS.

U.S. Army Corps of Engineers: Southwest Galveston District. 2010c. SWG Tidal Fringe HGM Interm (March 1, 2020). Available at http://http://www.swg.usace.army.mil/Portals/26/docs/regulatory/functional%20Assessment/SWG TidalFringeiHGM.pdf.

U.S. Geological Survey. 1975. Corpus Christi, Texas, 7.5-minute Series Topographic Map. http://ngmdb.usgs.gov/ngmdb/ngmdb_home.html. Accessed May 2020.

Appendix A

Project Figures

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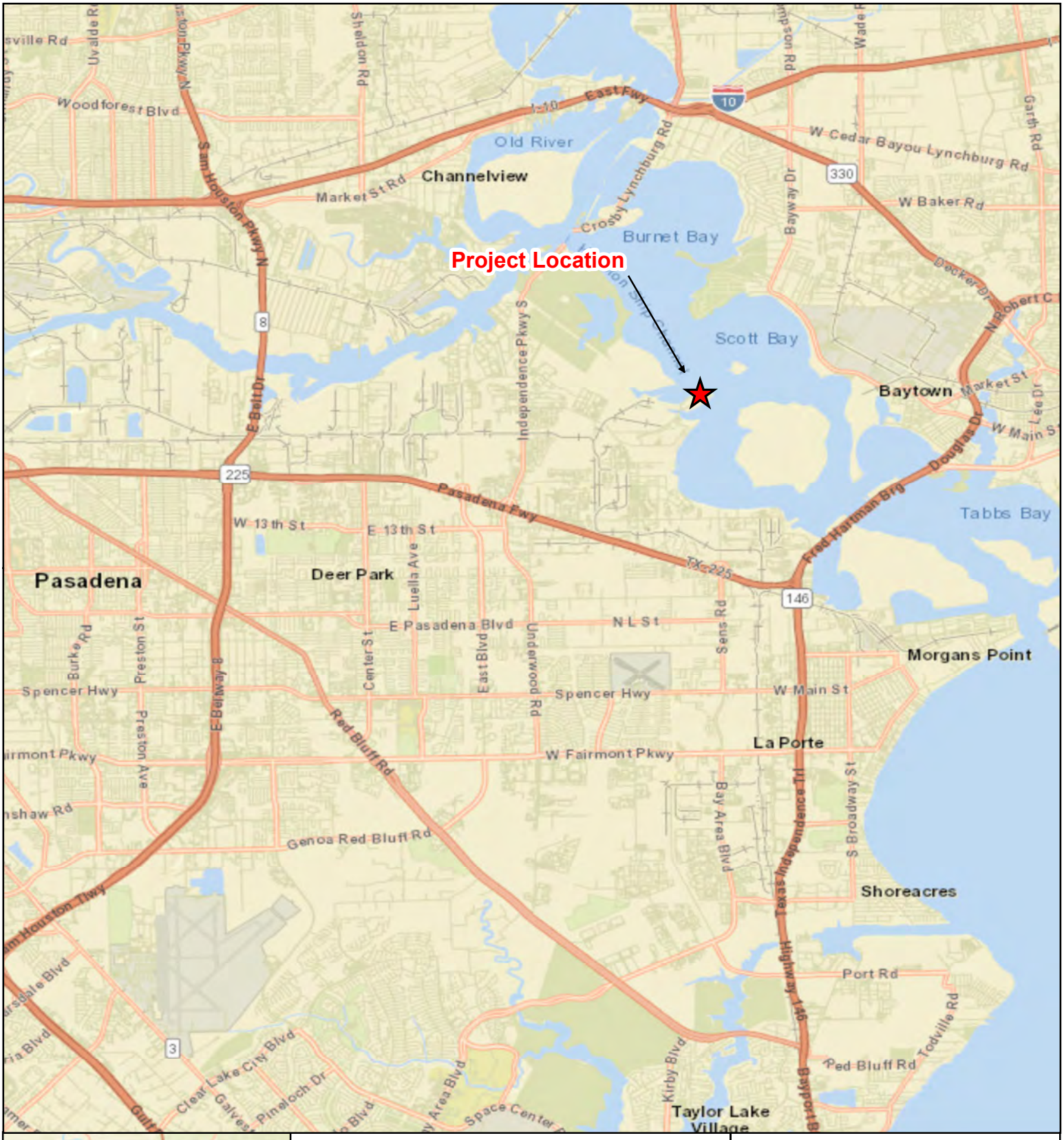
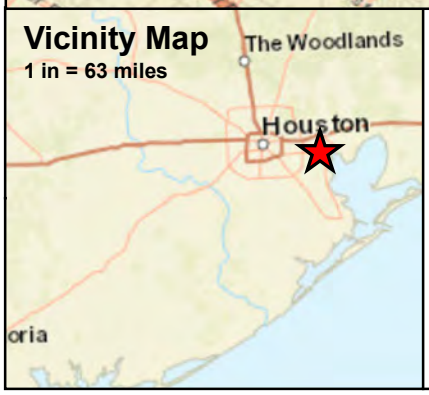


Vicinity Map
1 in = 63 miles



Legend

Project Site Location

N

0 1.25 2.5 5 Miles

Figure 1:
Site Vicinity Map
BOSTCO Shoreline Protection
Funtional Wetland Assessment
BOSTCO LLC
Harris County, Texas

Date: May 09, 2023	LLOYD ENGINEERING, INC.
Prepared By: BS	
Prepared For: BOSTCO	
Project: WDR	

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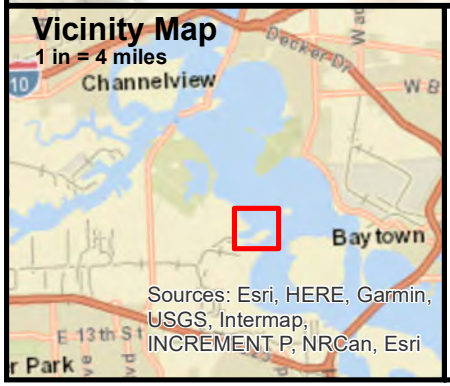
Vicinity Map
1 in = 4 miles



Legend

Permanent Impact Area

N

0 65 130 260 Feet

Figure 2:
Aerial Site Map

BOSTCO Shoreline Protection
Wetland Delineation Report
BOSTCO LLC
Harris County, Texas

Date: May 09, 2023	
Prepared By: BCS	
Prepared For: BOSTCO	
Project: Shoreline Protection 2022	

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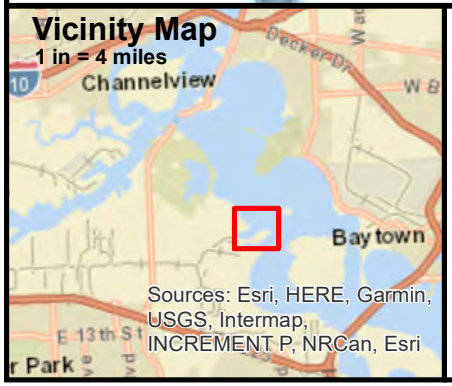

Legend

Permanent Impact Area

N

0 130 260 520 Feet

Figure 3:
USGS Topographic Map

BOSTCO Shoreline Protection
Functional Wetlands Assessment
BOSTCO LLC
Harris County, Texas

Date: May 09, 2023	
Prepared By: BCS	
Prepared For: BOSTCO	
Project: Shoreline Protection 2022	

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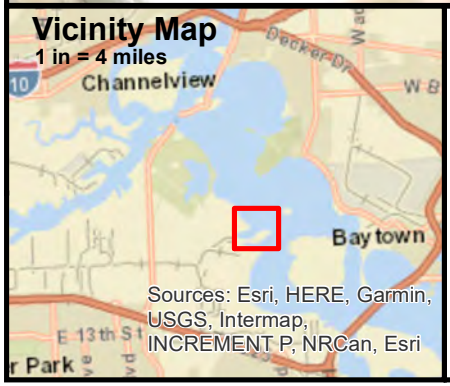


Legend

- WAA
- Permanent Impact Area
- Emergent Wetlands
- Open Water

N

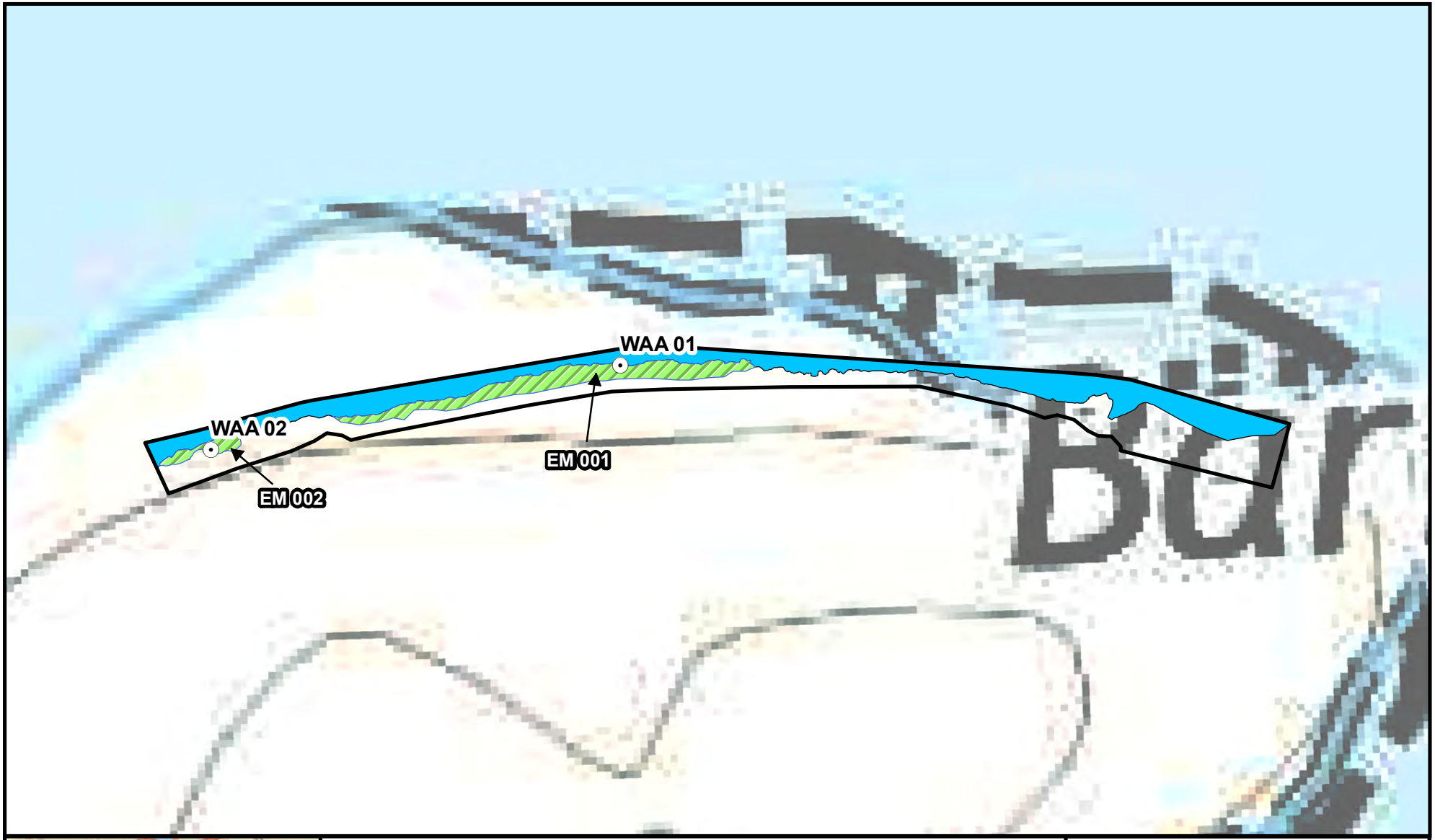
0 65 130 260 Feet

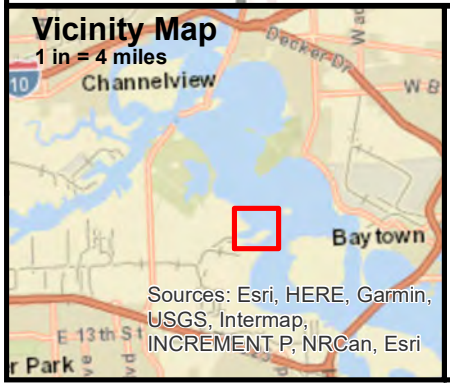
Figure 4:
Aerial Based WAA Map

BOSTCO Shoreline Protection
Functional Wetlands Assessment
BOSTCO LLC
Harris County, Texas

Date: May 09, 2023	
Prepared By: BCS	
Prepared For: BOSTCO	
Project: Shoreline Protection 2022	

LLOYD ENGINEERING, INC.





Legend

- Permanent Impact Area
- Wetland Assessment Area
- Emergent Wetlands
- Open Water

N

0 75 150 300 Feet

Figure 5:
Topographic Based WAA Map

BOSTCO Shoreline Protection
Functional Wetlands Assessment
BOSTCO LLC
Harris County, Texas

Date: May 10, 2023	
Prepared By: BCS	
Prepared For: BOSTCO	
Project: Shoreline Protection 2022	

LLOYD ENGINEERING, INC.

Appendix B

iHGM Datasheets

Impacts Tidal Fringe iHGM Calculations

Functional Capacity Index (FCI):

Biota:

= **((V_edge + 2 V_hydro + 0.5 V_nhc/3.5) + V_typical)/2**

Botanical

= **V_typical**

Physical

= **(V_slope + V_width + V_rough + V_soil + V_hydro)/5**

Chemical

= **(V_typical x V_hydro) / 0.5**

Functional Capacity Units (FCU):

= **FCI** * **wetland acres** per WAA

TOTAL	FCU
Biota	0.11
Botanical	0.13
Physical	0.07
Chemical	0.13

Total Acreage:	0.44

Feature ID **EM 001**

WAA 1	0.11 acres		
V_edge:	0.40	Biota	
V_hydro:	1.00	FCI:	0.86
V_nhc:	0.30		
V_typical:	1.00	Botanical	
V_slope:	0.10	FCI:	1.00
V_width:	0.10		
V_rough:	0.60	Physical	
V_soil:	1.00	FCI:	0.56
		Chemical	
		FCI:	1.00

WAA 1	FCU
Biota	0.09
Botanical	0.11
Physical	0.06
Chemical	0.11

Feature ID **EM 002**

WAA 2	0.02 acres		
V_edge:	0.40	Biota	
V_hydro:	1.00	FCI:	0.86
V_nhc:	0.30		
V_typical:	1.00	Botanical	
V_slope:	0.10	FCI:	1.00
V_width:	0.10		
V_rough:	0.60	Physical	
V_soil:	1.00	FCI:	0.56
		Chemical	
		FCI:	1.00

WAA 5	FCU
Biota	0.02
Botanical	0.02
Physical	0.01
Chemical	0.02

Appendix C

Representative Photographs

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BOSTCO Shoreline Protection Project
Functional Wetland Assessment
Representative Photographs

Photo 1: Representative photo of EM 001, and emergent wetland located within the permanent impact area. View facing south.

Photo 2: Representative photo of EM 001, and emergent wetland located within the permanent impact area. View facing west.

BOSTCO Shoreline Protection Project
Functional Wetland Assessment
Representative Photographs

Photo 3: Representative photo EM 001, and emergent wetland located within the permanent impact area. View facing north.

Photo 5: Representative photo of EM 002, an emergent wetland located within the permanent impact area. View facing west.

Attachment D
GCPWMB Credit Availability

Gulf Coastal Plains MB EEM													
		TOTAL IMPACTS				Service Area Multiplier	FCUs REQUIRED FROM GCPMB						
HUC	Feature Type	Biota	Botanical	Physical	Chemical		Biota	Botanical	Physical	Chemical	Total Number of Wetland FCUs	Price per FCU*	Cost of Wetland FCUs
	EEM	0.10	0.13	0.07	0.13	1.5	0.15	0.20	0.11	0.20			
	Total						*0.15*	*0.20*	*0.12*	*0.20*			
						Total FCUs Required from GCPMB	**0.2**	**0.2**	**0.2**	**0.2**	**0.80**		
						Mitigation cost						**$77,000**	**$61,600**

*Price valid through 8-21-2023
**FCU Credits Subject to Availability

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