SURVEY OF SEAGRASS BEDS AT PLACEMENT AREAS 62 & 63, WEST BAY

CONTRACT NO. W912HY-10-C-0036

PREPARED BY:

BELAIRE ENVIRONMENTAL, INC.

PRINCIPAL INVESTIGATOR:

CHARLES E. BELAIRE

AUTHORS:

ANDREA N. BINION

ROYCE K. WILLIAMS

JUSTIN Z. GIESSEL

OUTLINE

INTRODUCTION

ENVIRONMENTAL SETTING

METHODOLOGY

PROJECT RESULTS

CONCLUSIONS

INTRODUCTION

- **Proposed**—Conduct seagrass survey to collect post-dredge disposal placement data
- **Location**—Between Gulf Intracoastal Waterway and West Bay in Galveston County, Texas
- **Purpose**—Map full extent of seagrass beds and dredge disposal areas and document the density, abundance, and frequency of seagrasses by species
- **Data**—Aid in determining effect of dredge material as well as migration
- **Conducted**—Charles Belaire, Royce Williams, Andrea Binion, Bobby Forbes, Zac Giessel, Dean Adamson, Rich Coan and Mike Walston collected data between January 9-15 and November 15-20, 2012

ENVIRONMENTAL SETTING

- To the west the mainland is undeveloped ranch land
- Receives runoff
- Bounded by San Luis Pass and Galveston Causeway
- Presence of seagrass beds indicate water quality of survey area is relatively good
- Most of these seagrass meadows grew along the barrier island edges

METHODOLOGY

- Braun-Blanquet rapid visual assessment technique
- At 20 meter intervals—Observe seagrass within 0.25 meter^2 quadrant
- Fourqueane analytical technique utilizing a post-hole digger of 3 separate grabs to obtain root samples every 10 meters
- Examine root stems & presence or absence of dredge material
- Collection of 52 sediment samples at PA 62 (January 2012 survey)
- Mapped seafloor elevation on 0.5 Ft contour (January 2012 survey)

PROJECT RESULTS

- Two seagrass species found (January & November 2012 Surveys)
  - Shoalgrass, *Halodule wrightii*
  - Clover grass, *Halophila englemannii*
- January 2012 survey of PA 62
  - Shoalgrass present in 75% of samples; clovergrass present in 13%
  - 194 ac of seagrass beds present within survey area
  - 57 ac area of dredge material
  - 74% of samples in area contained seagrass roots or rhizomes
  - Average dredge material depth of 0.75 ft

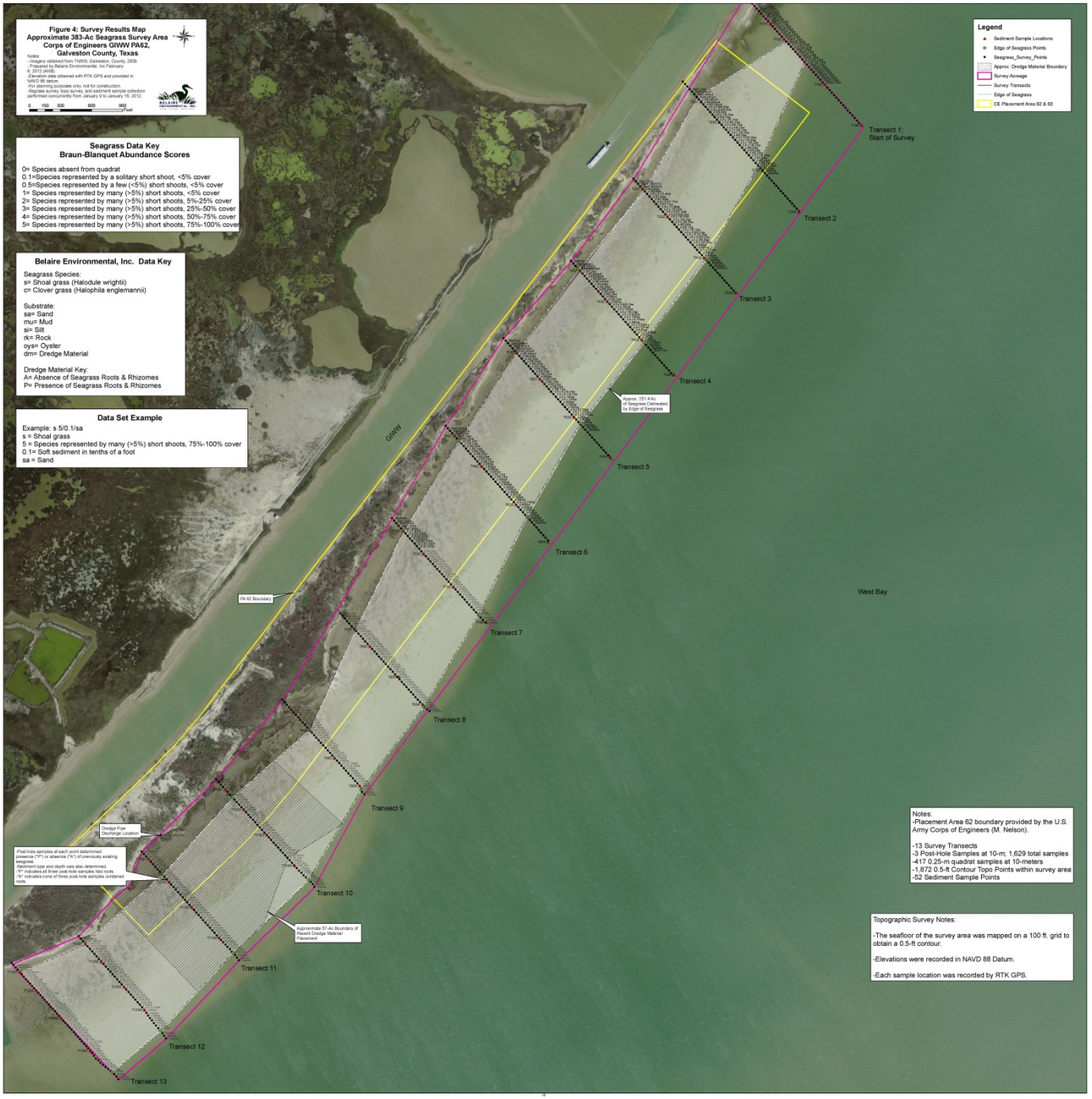
Figure 4: Survey Results Map
Approximate 383-Ac Seagrass Survey Area
Corps of Engineers GIWW PA62,
Galveston County, Texas
Notes:
- Imagery obtained from TNRIS, Galveston, County, 2009.
- Prepared by Belaire Environmental, Inc February 6, 2012 (JNR).
- All data was obtained with RTK GPS and provided in NAVD 88 datum.
-For planning purposes only; not for construction.
-Seagrass survey, topo survey, and sediment sample collection performed concurrently from January 9 to January 16, 2012.
0 150 300 600 900 Feet
BELAIRE ENVIRONMENTAL, INC.
Seagrass Data Key
Braun-Blanquet Abundance Scores
0= Species absent from quadrat
0.1=Species represented by a solitary short shoot, <5% cover
0.5=Species represented by a few (<5%) short shoots, <5% cover
1= Species represented by many (>5%) short shoots, <5% cover
2= Species represented by many (>5%) short shoots, 5%-25% cover
3= Species represented by many (>5%) short shoots, 25%-50% cover
4= Species represented by many (>5%) short shoots, 50%-75% cover
5= Species represented by many (>5%) short shoots, 75%-100% cover
Belaire Environmental, Inc. Data Key
Seagrass Species:
s= Shoal grass (Halodule wrightii)
c= Clover grass (Halophila englemannii)
Substrate:
sa= Sand
mu= Mud
si= Silt
rk= Rock
oys= Oyster
dm= Dredge Material
Dredge Material Key:
A= Absence of Seagrass Roots & Rhizomes
P= Presence of Seagrass Roots & Rhizomes
Data Set Example
Example: s 5/0.1/sa
s = Shoal grass
5 = Species represented by many (>5%) short shoots, 75%-100% cover
0.1= Soft sediment in tenths of a foot
sa = Sand
Legend
Sediment Sample Locations
Edge of Seagrass Points
Seagrass_Survey_Points
Approx. Dredge Material Boundary
Survey Acreage
Survey Transects
Edge of Seagrass
CE Placement Area 62 & 63
Transect 1: Start of Survey
Transect 2
Transect 3
Transect 4
Approx. 291.4 Ac of Seagrass Delineated by Edge of Seagrass
Transect 5
Transect 6
GIWW
PA 62 Boundary
West Bay
Transect 7
Transect 8
Transect 9
Dredge Pipe Discharge Location
-Post-hole samples at each point determined presence ("P") or absence ("A") of previously existing seagrass.
-Sediment type and depth was also determined.
-"P" indicates all three post-hole samples had roots.
-"A" indicates none of three post-hole samples contained roots.
Transect 10
Approximate 57-Ac Boundary of Recent Dredge Material Placement
Transect 11
Transect 12
Transect 13
Notes:
-Placement Area 62 boundary provided by the U.S. Army Corps of Engineers (M. Nelson).
-13 Survey Transects
-3 Post-Hole Samples at 10-m; 1,629 total samples
-417 0.25-m quadrat samples at 10-meters
-1,872 0.5-ft Contour Topo Points within survey area
-52 Sediment Sample Points
Topographic Survey Notes:
-The seafloor of the survey area was mapped on a 100 ft. grid to obtain a 0.5-ft contour.
-Elevations were recorded in NAVD 88 Datum.
-Each sample location was recorded by RTK GPS.

PA 62

- Surveyed Nov. 2012
- 1,500 post hole samples
- Along 13 transects
- Average depth of 0.44 ft of previously placed dredge material
- Average buried seagrass root depth of 0.86 ft

Placement Area (PA) 62:	**Acres**
Seagrass Impacts: (North Area)	40.47
South Area	37.55
Total Impacts:	**78.02**
Dredge Material Areas: (North Area)	47.59
South Area	42.83
Total DMA:	**90.42**
Seagrass Recolonization in DM:	1.73
Post-Construction Total Area of Live Seagrass (acreage outside of DM impact areas):	**173.28**

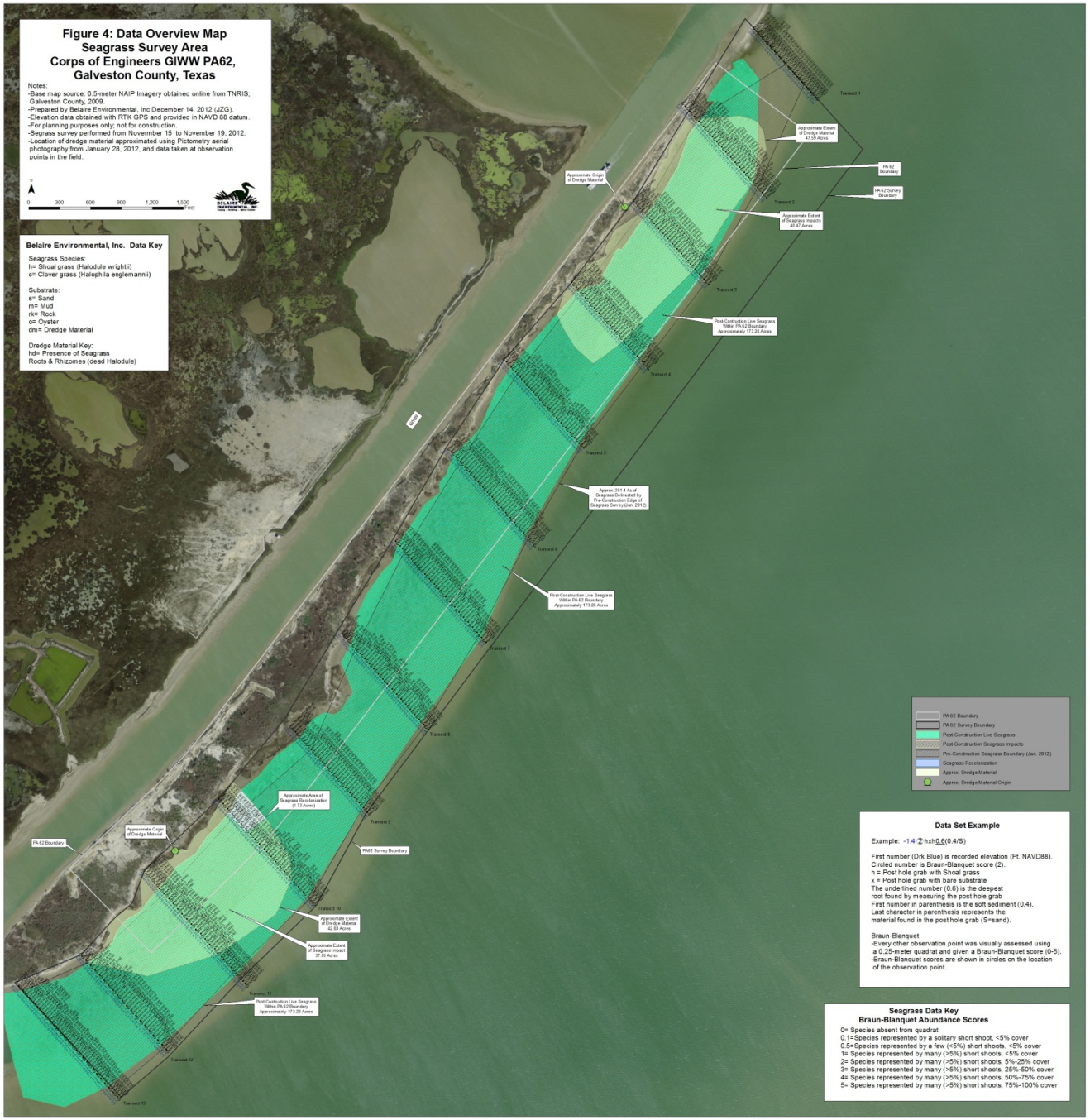
Figure 4: Data Overview Map
Seagrass Survey Area
Corps of Engineers GIWW PA62,
Galveston County, Texas
Notes:
-Base map source: 0.5-meter NAIP Imagery obtained online from TNRIS; Galveston County, 2009.
-Prepared by Belaire Environmental, Inc December 14, 2012 (JZG).
-Elevation data obtained with RTK GPS and provided in NAVD 88 datum.
-For planning purposes only; not for construction.
-Segrass survey performed from November 15 to November 19, 2012.
-Location of dredge material approximated using Pictometry aerial photography from January 28, 2012, and data taken at observation points in the field.
0 300 600 900 1,200 1,500 Feet
BELAIRE ENVIRONMENTAL, INC.
Belaire Environmental, Inc. Data Key
Seagrass Species:
h= Shoal grass (Halodule wrightii)
c= Clover grass (Halophila englemannii)
Substrate:
s= Sand
m= Mud
rk= Rock
o= Oyster
dm= Dredge Material
Dredge Material Key:
hd= Presence of Seagrass Roots & Rhizomes (dead Halodule)
Transect 1
Approximate Extent of Dredge Material 47.59 Acres
PA 62 Boundary
PA 62 Survey Boundary
Approximate Origin of Dredge Material
Transect 2
Approximate Extent of Seagrass Impacts 40.47 Acres
Transect 3
Post-Construction Live Seagrass Within PA 62 Boundary Approximately 173.28 Acres
Transect 4
GIWW
Transect 5
Approx. 251.4 Ac of Seagrass Delineated by Pre-Construction Edge of Seagrass Survey (Jan. 2012)
Transect 6
Post-Construction Live Seagrass Within PA 62 Boundary Approximately 173.28 Acres
Transect 7
Transect 8
Approximate Area of Seagrass Transplanters (1.73 Acres)
Transect 9
Approximate Origin of Dredge Material
PA62 Boundary
PA62 Survey Boundary
Transect 10
Approximate Extent of Dredge Material 42.03 Acres
Approximate Extent of Seagrass Impact 37.56 Acres
Transect 11
Post-Construction Live Seagrass Within PA 62 Boundary Approximately 173.28 Acres
Transect 12
Transect 13
PA 62 Boundary
PA 62 Survey Boundary
Post-Construction Live Seagrass
Post-Construction Seagrass Impacts
Pre-Construction Seagrass Boundary (Jan. 2012)
Seagrass Recolonization
Approx. Dredge Material
Approx. Dredge Material Origin
Data Set Example
Example: -1.4 (2) hxh0.6(0.4/S)
First number (Drk Blue) is recorded elevation (Ft. NAVD88).
Circled number is Braun-Blanquet score (2).
h = Post hole grab with Shoal grass
x = Post hole grab with bare substrate
The underlined number (0.6) is the deepest root found by measuring the post hole grab
First number in parenthesis is the soft sediment (0.4).
Last character in parenthesis represents the material found in the post hole grab (S=sand).
Braun-Blanquet
-Every other observation point was visually assessed using a 0.25-meter quadrat and given a Braun-Blanquet score (0-5).
-Braun-Blanquet scores are shown in circles on the location of the observation point.
Seagrass Data Key
Braun-Blanquet Abundance Scores
0= Species absent from quadrat
0.1=Species represented by a solitary short shoot, <5% cover
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Elevation Ranges

PA 62

- Overall Elevations: -3.668 Ft to +8.189 Ft (NAVD88)
- Shoalgrass: -2.723 Ft to +0.368 Ft
- Clovergrass: -2.169 Ft to -0.24 Ft

PA 63

- Overall Elevations: -3.612 Ft to +3.369 Ft (NAVD88)
- Shoalgrass: -2.348 Ft to +0.545 Ft
- Clovergrass: -1.514 Ft to -0.584 Ft

PA 63

- Surveyed Nov. 2012
- 1,218 post hole samples
- Along 9 transects
- Average depth of 0.85 ft of previously placed dredge material
- Average buried seagrass root depth of 0.99 ft

Placement Area (PA) 63:	
Seagrass Impacts:	**Acres**
East Survey Area	27.33
Mid-Survey Area	16.57
West Survey Area	48.04
Total Impacts:	**91.94**
Dredge Material Areas:	
East Survey Area	40.69
Mid-Survey Area	27.27
West Survey Area	47.59
Total DMA:	**115.55**
Seagrass Recolonization in DM:	1.89
Post-Construction Total Area of Live Seagrass (acreage outside of DM impact areas):	**150.35**

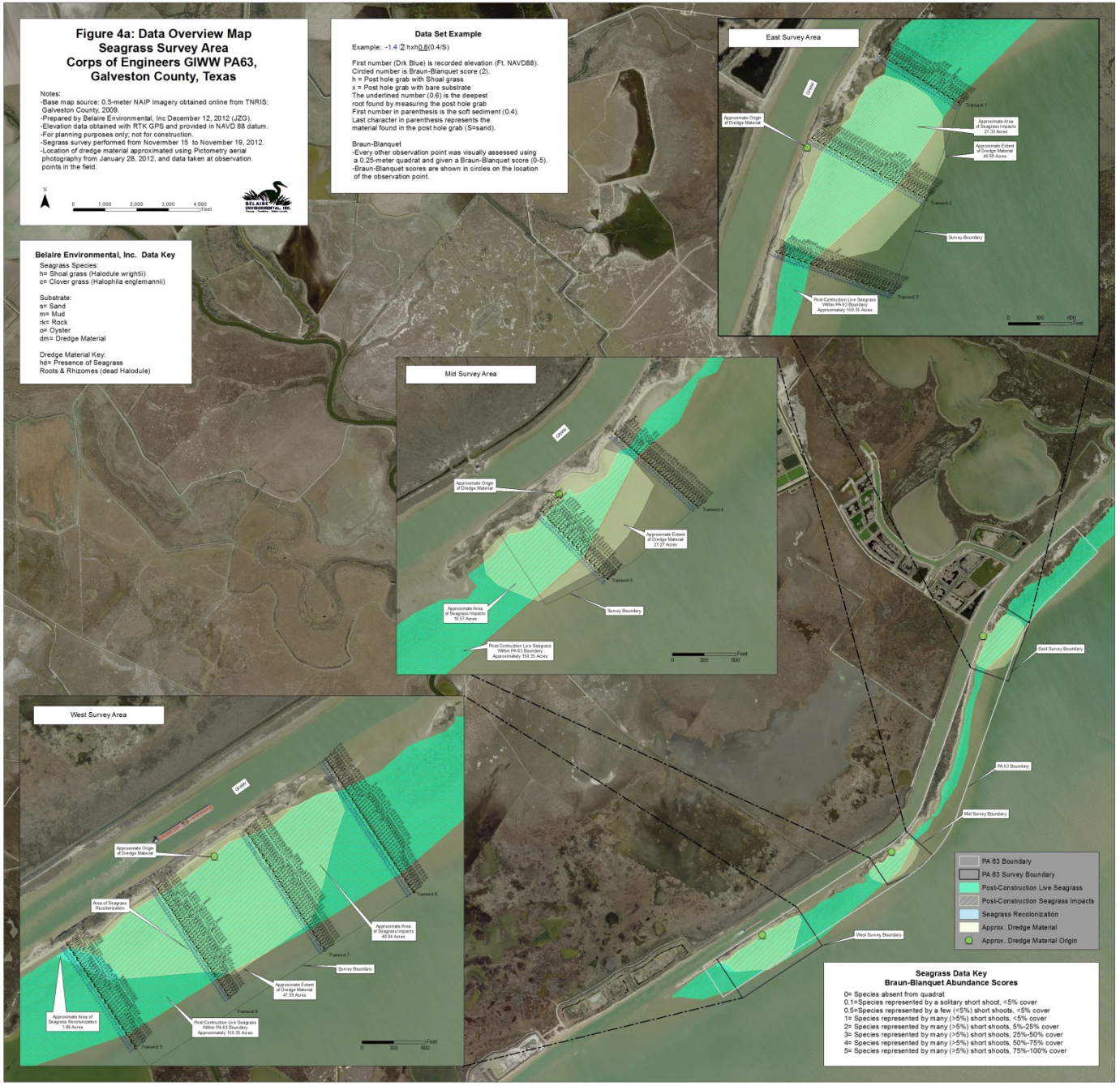
Figure 4a: Data Overview Map
Seagrass Survey Area
Corps of Engineers GIWW PA63,
Galveston County, Texas
Notes:
-Base map source: 0.5-meter NAIP imagery obtained online from TNRIS; Galveston County, 2009.
-Prepared by Belaire Environmental, Inc December 12, 2012 (JZG).
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-Location of dredge material approximated using Pictometry aerial photography from January 28, 2012, and data taken at observation points in the field.
N
0 1,000 2,000 3,000 4,000 Feet
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Dredge Material Key:
hd= Presence of Seagrass Roots & Rhizomes (dead Halodule)
East Survey Area
GIWW
Approximate Origin of Dredge Material
Approximate Area of Seagrass Impacts 27.33 Acres
Approximate Extent of Dredge Material 46.69 Acres
Transect 1
Transect 2
Transect 3
Survey Boundary
Post-Contruction Live Seagrass Within PA 63 Boundary Approximately 150.35 Acres
0 300 600 Feet
Mid Survey Area
GIWW
Approximate Origin of Dredge Material
Approximate Extent of Dredge Material 27.27 Acres
Approximate Area of Seagrass Impacts 16.57 Acres
Transect 4
Transect 5
Survey Boundary
Post-Contruction Live Seagrass Within PA 63 Boundary Approximately 150.35 Acres
Feet
0 300 600
West Survey Area
GIWW
Approximate Origin of Dredge Material
Area of Seagrass Recolonization
Approximate Area of Seagrass Impacts 48.04 Acres
Approximate Extent of Dredge Material 47.59 Acres
Approximate Area of Seagrass Recolonization 1.88 Acres
Transect 6
Transect 7
Transect 8
Transect 9
Survey Boundary
Post-Contruction Live Seagrass Within PA 63 Boundary Approximately 150.35 Acres
Feet
0 300 600
East Survey Boundary
PA 63 Boundary
Mid Survey Boundary
West Survey Boundary
PA 63 Boundary
PA 63 Survey Boundary
Post-Construction Live Seagrass
Post-Construction Seagrass Impacts
Seagrass Recolonization
Approx. Dredge Material
Approx. Dredge Material Origin
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5= Species represented by many (>5%) short shoots, 75%-100% cover

SUBSTRATE

- Throughout PA 62 and PA 63 the natural bay bottom consisted of a hard sand substrate
- Dredge material throughout both placement areas was primarily sandy clay
- The outer fringes of the disposal areas contained a soft, silty mud

BEI'S ANALYSIS

Historical Seagrass Distribution

	Approximate Seagrass Area	
Image Date	**PA 62 (Ac)**	**PA 63 (Ac)**
August 2005	68.2-71.6	13.1-23.8
January 2006	30.0-100.7	2.4-4.6
April 2008	108.8-121.5	101.0-128.7
January 2009	123.5-133.8	155.5
January 2010	111.3-114.4	116.0

CONCLUSIONS

- APPROXIMATELY 78.02 ACRES OF SEAGRASS BEDS WERE BURIED AS A RESULT OF THE PLACEMENT OF APPROXIMATELY 90.42 ACRES OF DREDGE MATERIAL IN PA62
- A 1.73 ACRE AREA OF SHOALGRASS BED IN PA 62 HAS BEGUN RECOLONIZING ATOP DREDGE MATERIAL SINCE THE PLACEMENT OF MATERIAL IN 2011-2012
- APPROXIMATELY 91.9 ACRES OF SEAGRASS BEDS WERE BURIED AS A RESULT OF THE PLACEMENT OF APPROXIMATELY 115.6 ACRES OF DREDGE MATERIAL IN PA62
- A 1.86ACRE AREA OF SHOALGRASS BED IN PA 62 HAS BEGUN RECOLONIZING ATOP DREDGE MATERIAL SINCE THE PLACEMENT OF MATERIAL IN 2011-2012
- THE SEAGRASS BEDS SURROUNDING ALL OF THE DREDGE DISPOSAL AREAS APPEAR TO BE HEALTHY AND THRIVING
- THE FIVE DREDGE DISPOSAL AREAS DELINEATED BY BEI APPEAR TO HAVE SETTLED AND ARE APPARENTLY NO LONGER IMPACTING ADJACENT SEAGRASS BEDS
- THE RESULTS OF THIS SURVEY SUGGEST THAT SEAGRASS MAY BE AT LEAST TEMPORARILY IMPACTED BY THE PLACEMENT OF DREDGE MATERIAL BUT MAY RECOVER TO SOME DEGREE