OYSTER RESOURCES REPORT

FOR THE

BAY AQUATIC BENEFICIAL USE SITES
GALVESTON BAY, TEXAS

***Prepared for*:**

U.S. ARMY CORPS OF ENGINEERS, GALVESTON DISTRICT
2000 Fort Point Road
Galveston, Texas 77550

US Army Corps of Engineers

Prepared by:

LLOYD ENGINEERING, INC.
6565 West Loop Street, Suite 708
Bellaire, Texas 77401

January 2025

Table of Contents

Acronyms and Abbreviations

BABUS	Bay Aquatic Beneficial Use Sites
Cº	degrees Celsius
cm	centimeter
CPUE	catch per unit effort
EA	Environmental Assessment
ECIP	Expansion Channel Improvement Project
GNSS	global navigation satellite system
HSC	Houston Ship Channel
Hydrographic Consultants	Hydrographic Consultants Ltd.
KMZ	Keyhole Markup Language (zipped form)
LEI	Lloyd Engineering, Inc.
MCY	million cubic yards
mg/l	milligrams per liter
NMFS	National Marine Fisheries Service
oysters/ft^3	oysters per cubic foot
PA	placement area
psu	practical salinity unit
SAV	submerged aquatic vegetation
SSS	side-scan sonar
su	standard unit
TIFF	Tagged Image File Format
TPWD	Texas Parks and Wildlife Department
UAV	unmanned aerial vehicle
UHD	ultra-high definition
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VOH	viable oyster habitat

1.0 Introduction

The U.S. Army Corps of Engineers (USACE) Galveston District is proposing to construct the Bay Aquatic Beneficial Use Sites (BABUS) dredge material placement cells as part of the Houston Ship Channel (HSC) Expansion Channel Improvement Project (ECIP). Lloyd Engineering, Inc. (LEI) was contracted by USACE, via ANAMAR Environmental Consulting, to conduct an oyster resources survey within the proposed BABUS construction area (survey area) to support the preparation of an Environmental Assessment (EA) for the project. The survey area is located in upper Galveston Bay, east of the HSC (near channel station 40+000), southeast of Atkinson Island and north of the Mid Bay Placement Area (Blue Water Atoll). See Figure 1 for a map showing the location of the BABUS project survey area. The BABUS is intended to be utilized as beneficial use dredged material placement areas (DMPAs) for operation and maintenance dredged material from the HSC. The survey area for the BABUS is approximately 5,485 acres. A vicinity map of the proposed site layout for BABUS is provided in Figure 1.

The purpose of this survey is to determine the presence and distribution of eastern oysters (*Crassostrea virginica*), oyster reefs, and submerged aquatic vegetation (SAV) including seagrasses, within the survey area.

Eastern Oyster (*Crassostrea virginica*)

Eastern oysters are a sessile bivalve mollusks that occur in coastal areas of the Gulf of Mexico, where they occur in shallow bays, mud flats, and offshore sandy bars (Stanley and Sellers 1986). Oysters grow well on a variety of substrates, ranging from rocky bottoms to some types of mud. The presence and growth of oysters are closely correlated with salinity and other abiotic variables.

Oysters spawn from March through November in the northern Gulf of Mexico (Bulter 1954). Peak spawning season in Texas is between May and early June (Stanley and Sellers 1986). Spawning is triggered mostly by temperature when it rises above 20 degrees Celsius (Cº) for normal spawn and above 25ºC for mass spawning (Pattillo et al. 1997).

Eggs hatch six hours after fertilization, and oyster larvae remain in the water column as meroplankton for two to three weeks after hatching (Patillo et al. 1997). Settling or attachment to substrate was observed to take place in Galveston Bay about two months after spawning when the larvae were approximately 0.2 millimeters in length (Hopkins 1931).

Upon settling or attachment, the sessile juveniles are referred to as spat. Spat-fall along the Gulf coast typically occurs from March to mid-November (Hopkins 1931, Gunter 1955). In the Gulf, sexual maturity of oysters may occur as soon as four weeks after attachment (Menzel 1955), but maturation typically occurs at 18 to 24 months (Quast et al.1988).

Growth rates of mature oysters can vary greatly depending on conditions. Some mature oysters have been documented to grow at a rate of 50 millimeters per year (Bulter 1954). Gunter (1951) provides growth rates of 60 millimeters in the first year, 90 millimeters in the second year, and 115 millimeters in the third year. Based on these growth rates, it is possible for an oyster to reach the harvestable size of 3 inches (76.2 millimeters) within two years.

Oysters play a critical ecological role within marine and estuarine ecosystems of the Texas coast. They provide many environmental services such as acting as filters by removing detritus and other particulates

from the water column, providing habitat for a wide range of fish and other marine organisms, and acting as a sediment-stabilizing agent to help prevent the erosion of shorelines.

Seagrass (Submerged Aquatic Vegetation)

Seagrasses and other SAV are marine flowering plants found in many aquatic ecosystems. Five species of seagrass occur along the Texas coast: shoal grass (*Halodule wrightii),* turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), star grass (*Halophila engelmannii*), and widgeon grass (*Ruppia maritima*). Each of these species anchor themselves to the sediment with rhizomes that extend horizontally below the sediment surface, with the maximum height of seagrasses above the sediment surface typically around 50 centimeters (cm). Sediment must therefore be stable enough for seagrass to establish their rhizomes and exist in a water depth and clarity where sufficient sunlight can reach the sediment surface for photosynthesis. Thus, areas with low wave action and predominantly sandy sediment are prime habitat for seagrasses in Texas.

Seagrasses play a critical ecological role within the estuarine ecosystems of the Texas coast. They provide sediment stabilization for a natural erosion control measure as well as food and habitat for a wide range of fish and other marine organisms, including some threatened and endangered species of sea turtles and manatees.

2.0 Methods

The oyster resources survey methodology was completed in two phases. Phase 1 involved the use of side-scan sonar (SSS) in accordance with the Texas Parks and Wildlife Department's (TPWD's) protocols, to identify anomalies on the bay floor throughout the survey area which could be characterized as potential oyster or seagrass habitat. In addition to the survey area, TPWD protocols require a buffer of 500 feet around detected oyster resources to be surveyed for potential direct or indirect impacts from turbidity and sedimentation due to the placement and/or excavation of dredged material during construction (pers. comm., Clarkson 2022); with all 5,485 acres of the BABUS project surveyed in Phases 1 and 2, this criterion is met. Prior to conducting the SSS survey, LEI obtained older SSS data from 2018 that was collected for past projects that only covered a portion of the entire survey area. Although these surveys did not meet TPWD standards for oyster resource SSS surveys due to lack of complete coverage/overlap, these data were used to reduce the overall area needed to be surveyed to meet the TPWD standards. See Figure 3 in Appendix A for a map showing the areas within the survey area where new SSS data was collected. Phase 2 included the investigation of the anomalies that were identified during Phase 1 via physical probing and sampling to characterize and classify each anomaly into one of four categories described in the TPWD oyster survey protocols (pers. comm., Clarkson 2022): mud, scattered shell (brown habitat), buried shell (black habitat), and consolidated shell (viable oyster habitat [VOH]). The following sections describe the methods implemented in Phase 1 and Phase 2 of the oyster resources survey.

2.1 Phase 1

During Phase 1 of the oyster resources survey, Etrac, Inc (Etrac), on behalf of LEI, conducted a remote-sensing sonar survey within the survey area and buffer zone. During December 20–28, 2023, and October 4–11, 2024, Etrac used an Edgetech 4125i 900 Hz sonar towfish with Hypack Discovery 2023 data acquisition software to acquire high-resolution, geo-rectified imagery of the bay floor within the survey area.

The SSS was towed alongside a survey boat while driving along parallel transects spaced approximately 34 meters apart to ensure 100 percent coverage of the survey area. The SSS data was collected at a frequency range of 400–500 kHz, and the horizontal resolution of the SSS data was sufficient (<1 m) to precisely distinguish hard bottom signatures from sediment. Data collection was conducted only during ideal weather conditions that included no rainfall and wave heights less than 1.5 feet. The survey vessel speed was kept at or below 4.5 knots (8.3 km/hour) to maintain the accuracy and integrity of the data being collected. See Figure 2 in Appendix A for the survey plan of the BABUS with the new transects that were followed; these transects were deemed 'ETRAC Survey Transects 2023 & 2024' in Figure 2 and 'ETRAC Survey 2023 & 2024' in Figure 3 of Appendix A, respectively.

Although the use of SSS surveys has been proven to be an extremely effective method for remote-sensing oyster shell and reefs, TPWD has determined that SSS is not adequately effective for detecting seagrass habitat. Therefore, the survey crews were instructed to watch for signs of seagrass habitat throughout the survey area. Signs of seagrass habitat may include sighting seagrass on the bay floor if water conditions allow, floating mats or pieces of uprooted seagrass observed during Ponar drops or dredge tows, and changes in the color of the bay bottom substrate.

SSS imagery collected in 2018 by Texas A&M University-Galveston was used in a portion of the survey area using similar methods as described above. These 2018 SSS imagery were deemed 'Texas A&M Survey Transects 2018' in Figure 2 and 'Texas A&M Survey 2018' in Figure 3 of Appendix A, respectively. These data were combined seamlessly into the SSS mosaic along with the 2023 and 2024 transect data amounting to 100% coverage of the survey area, thus fulfilling TWPD SSS data criteria.

Sub-meter positioning of the survey boat was accomplished using an Applanix POS/MV with RTK corrections and Hypack navigation software running on a laptop computer. The captain used the positioning software to help guide the survey boat along the established transects. A geo-referenced digital drawing of the survey area was utilized as a real-time moving map display for the navigation software. Raw sonar data was recorded by Hypack software.

Upon completion of the field data acquisition, a mosaic sonar image was created using OIC CleanSweep software to form a composite image of the bay floor. The mosaic was exported as georeferenced TIFF files and provided to LEI for analysis and use for verification and characterization efforts during Phase 2. Refer to Figure 3 in Appendix A for a map showing the composite SSS mosaic image.

2.2 Phase 2

LEI ecologists conducted an oyster resources verifications survey during April 4, October 29, and November 12, 2024, within the survey area. The verifications survey was conducted according to the protocols described in the Oyster Resource Survey Plan approved by TPWD for this project. LEI ecologists conducted the oyster resources verifications survey under a TPWD Scientific Research Permit (SPR-0421-049) as required for sampling oysters within Texas waters. Refer to Appendix D for scanned copies of notes collected during all field efforts.

The boundaries of the preliminary hard bottom anomalies, observed in Phase 1, were refined by poling along the boundary of each anomaly and mapping the revised boundaries as needed. During this process, field ecologists navigated to each anomaly and inspected it using a 20-foot-long aluminum sounding pole equipped with a density gauging point on one end and a 3-inch sounding disk on the other. The sounding

pole was deployed approximately every 10 feet across each anomaly to ensure appropriate sampling point density.

In addition to the hard bottom anomalies, several field sample points were selected throughout the survey area to verify soft bottom readings on the SSS data. At these locations, a Ponar sediment sampler was deployed to sample a small section of the sediment surface. The Ponar was also used in instances where no hard substrate was felt with the sounding pole to confirm the substrate type.

Anomalies that were confirmed to be hard bottom were further characterized using an oyster dredge that was towed at least once across each anomaly and a representative sample of the substrate material was obtained. Each dredge tow was recorded using an Applanix POS/MV GNSS system, and Hypack 2023 Discovery data acquisition software. The oyster dredge consisted of a steel frame with a 0.25-inch wire mesh collection basket anchored behind a row of steel digging teeth. The dredge measured about 41 cm wide, 25 cm long, and 24 cm tall (1.35 feet wide by 0.82 feet long by 0.79 feet tall). The wire mesh basket allowed for the collection of hard objects such as shell, shell hash, and associated reef species.

At the completion of each dredge tow, the dredge was retrieved and the contents were photo-documented, described, and classified. When oysters were collected in the dredge, all whole individuals were enumerated. Oysters were considered 'live' if they were fully intact and tightly closed. Oysters were considered 'dead' if the shell was fully intact with the two valves connected at the umbo (hinge point of an oyster shell) but were slightly open to completely open. Whole shells that were either connected by only a single valve or were broken or fragmented were not enumerated as individuals and were classified as oyster shell. Any shell or man-made hard object larger than 1.5 by 2.5 inches was considered potential oyster substrate for recruitment (pers. comm., Robinson 2006).

Catch-per-unit-effort (CPUE) was calculated for each dredge tow by dividing the total numbers of live oysters collected by the volume (feet^3) of substrate sampled along each dredge transect. The volume of each dredge tow sample was determined by calculating the product of the length of the transect (feet), the width of the oyster dredge (1.35 feet), and the height of the oyster dredge (0.79 feet). These calculations provided an index of abundance for each oyster dredge transect. Below is the formula used in calculating CPUE for dredge tows:

$$\text{CPUE for Dredge Tows} = \frac{(\#\ Live\ Oysters\ Collected)}{Transect\ Length(ft) x\ 1.35\ ft\ x\ 0.79\ ft}$$

After calculating a CPUE value for each dredge tow (58 total transects), a mean CPUE was calculated across all transects in the survey area to produce a representative value for all oyster reefs in the BABUS (Table 3). At the end of Phase 2, the data collected in the field and the CPUE values for each dredge tow were used to classify each potential hard bottom area into one of TPWD's four categories listed above.

3.0 Results

The results and findings from Phase 1 and Phase 2 of the oyster resources survey are described below.

3.1 Phase 1

Results of the SSS survey during December 2023 and October 2024 identified a total of 67 substrate anomaly signatures characteristic of potential oyster habitat. SSS signatures indicate substrate within the survey boundaries consisted mostly of soft silt to soft silty clay. Table 1 in Appendix B summarizes all the anomalies observed in the SSS collected during Phase 1 and their characterization following completion of Phase 2. Refer to Figure 3 in Appendix A depicting the SSS imagery and the identified substrate anomalies.

The survey crews did not observe any signs of seagrasses, or other SAV, throughout the survey. It was noted that the water depth and clarity throughout most of the survey area was not conducive to the establishment and growth of seagrass due to the water depth and insufficient sunlight penetration to the sediment surface. This finding of no habitat aligned with TPWD's Public Seagrass Viewer (https://tpwd.maps.arcgis.com/apps/webappviewer/index.html?id=af7ff35381144b97b38fe553f2e7b562), which indicates a complete lack of seagrass habitat across Galveston Bay.

3.2 Phase 2

The areas classified and confirmed as consolidated oyster reefs exhibited distinct SSS signatures and in many cases were positioned within areas of increased elevations in relation to the surrounding bay bottom. Refer to Appendix C for site photographs showing the contents from each dredge tow and/or Ponar sample and Figures 4 & 5 in Appendix A for figures depicting the location of the identified oyster resources within the survey area. Refer to Appendix B for all associated tables and data from Phase 2.

Within the survey area, 34 areas, totaling approximately 64.305 acres, were determined to be exposed, consolidated shell (VOH) and 14 areas totaling 23.893 acres of scattered shell (brown habitat), were identified. Out of the 58 oyster dredge tows conducted, 47 (81%) produced live oysters with the remaining 11 dredge tows (19%) producing no live oysters. The range in size of VOH was 0.044–38.946 acres, with a mean VOH reef size of 1.904 acres (Table 2 in Appendix B). Two points (SB-17 & SB-19) detected from the results of the SSS in October 2024, while initially predicted to be soft bottom substrate from a lack of visibility on the composited SSS mosaic image, were found to contain relatively large quantities of buried shell (black habitat). This led LEI ecologists to tow the oyster dredge over 10-acre areas for both SB-17 and SB-19 and use the aluminum sounding pole to delineate the approximate location of hard bottom substrate; both locations were subsequently determined to be brown habitat. See Table 3 in Appendix B for a detailed log of the total number of oyster shells and live oysters recovered from each oyster dredge tow.

Most associated reef organisms observed during the surveys were competitors or obligate species. Hooked mussels and barnacles were dominant reef-associated species observed during the survey. However, several species of crabs, polychaete worms, and gobies were also observed. LEI field ecologists observed very few predators (e.g., boring sponges) in the survey area as well as any indication of oyster drills, however, several shells were observed with holes bored through them. This suggests the potential of historically present predators within the survey area.

LEI ecologists further found no evidence of seagrasses or other SAV within the survey area during Phase 2. This was indicated by the absence of vegetation in all the Ponar samples over soft-bottom locations and dredge tows over hard-bottom locations. Refer to Appendix C for site photographs showing the lack of vegetation during sampling efforts. Since no signs of seagrass habitat were observed across both Phases of the survey area, it was determined no further investigations were necessary.

4.0 Conclusions

LEI conducted an oyster and seagrass resources survey over an approximately 5,485-acre survey area as part of the proposed BABUS project. The survey was designed to determine the presence or absence of oyster resources and/or seagrass habitat within the BABUS survey area. A combined total of 88.198 acres of oyster resources were identified within the survey area, consisting of 23.893 acres of brown habitat and 64.305 acres of VOH (Table 1 in Appendix B). The CPUE of oyster dredge tows within the survey area ranged from 0.000 to 0.3161 live oysters/foot^3 with an overall mean CPUE of 0.0469 live oysters/foot^3. VOH reefs ranged in size from 0.044 acres to 38.946 acres, with a mean VOH reef size of 1.904 acres. No evidence was found for any seagrasses or SAV in the survey area during either phase of the survey effort.

Potential oyster resources that occurred in the survey area were present over soft to moderately soft silt and silty clay. Based on the conditions observed during field investigations, sizable portions of the survey area are viable and active oyster habitat with the potential to grow and expand beyond their current areas. However, no portions of the survey area contain active seagrass habitat or exhibit a clear potential for seagrass, or SAV, to grow in the future based on the results of this survey.

5.0 References

Bulter, P.A. 1954. Summary of our knowledge of the oyster in the Gulf of Mexico. *Fishery Bulletin* 55(89):479-489.

Clarkson, E. 2022. Program Director, Ecosystem Resources Program, Coastal Fisheries Division, Texas Parks and Wildlife Department. Personal communication with Brett Selensky. March 23, 2022.

Gunter, G. 1951. The West Indian Tree Oyster on the Louisiana Coast and Notes on Growth of the Three Gulf Coast Oysters. *Science* 113:516-517.

Gunter, G. 1955. Mortality of oysters and abundance of certain associates as related to salinity. *Ecology* 36(4):601-605.

Hopkins, A.E. 1931. Factors Influencing the Spawning and Setting of Oysters in Galveston Bay, Texas. *Bulletin of the Bureau of Fisheries* 47:57-83.

Menzel, R. W. 1955. Some phases of the biology of *Ostrea equestris* Life History and a comparison with *Crassostrea virginica* (Gmelin). *Institute of Marine Science*. The University of Texas 4:70-153.

Pattillo, M.E., T.E. Czapla, D.M. Nelson, and M.E. Monaco. 1997. *Distribution and Abundance of Fishes and Invertebrates in Gulf of Mexico Estuaries, Volume II: Data Summaries*. ELMR Rep. No. 11. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD.

Quast, W. D., M. A. Johns, D. E. Pitts, Jr., and G. C. Clark. 1988. *Texas Oyster Fishery Management Plan*. Texas Parks and Wildlife Department, Austin, Texas.

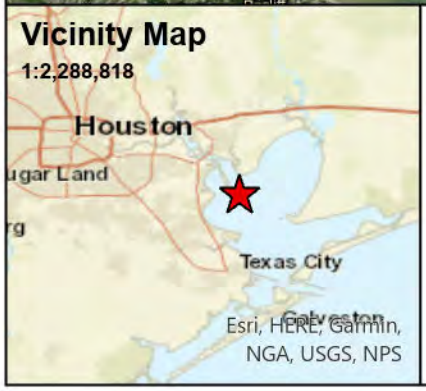
Ray, S. 2005. Professor (Emeritus), Department of Marine Biology Texas A&M University, Galveston, Texas. Personal communication with Marty Heaney. March 3, 2005.

Robinson, L. 2006. TPWD Upper Coast Regional Director. Personal communication with Marisa Weber (PBS&J Houston). June 26, 2006.

Stanley, J.G., and M.A. Sellers. 1986. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Gulf of Mexico), American Oyster*. U.S. Fish & Wildlife Service Biological Report 82(11.64). U.S. Army Corps of Engineers, TR EL-82-4.

Appendix A

Project Figures



Legend

BABUS Survey Area (5,485 acres)

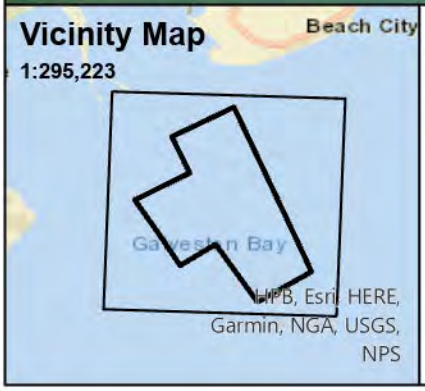
Houston Ship Channel North

N

0 3,000 6,000 12,000 Feet

Figure 1:
Site Vicinity Map
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	LOYD ENGINEERING, INC.
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	



Legend

- BABUS Survey Area
- Texas A&M Survey Transects 2018
- ETRAC Survey Transects 2023 & 2024

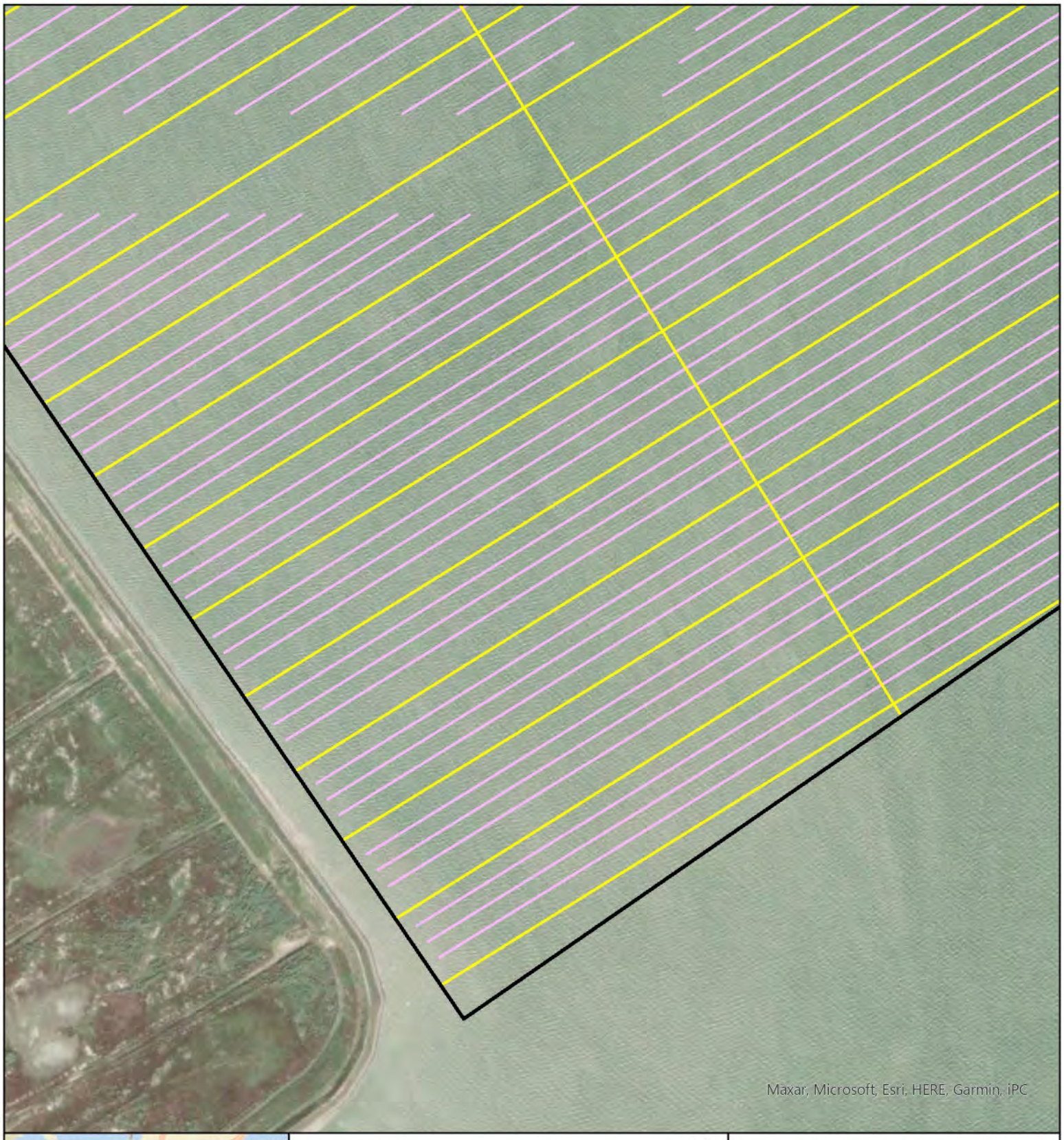
N

0 1,250 2,500 5,000 Feet

Figure 2:
Survey Plan (Transects)
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

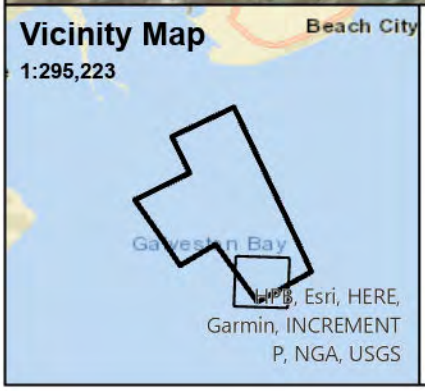
Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.



Vicinity Map

1:295,223



Legend

- BABUS Survey Area
- Texas A&M Survey Transects 2018
- ETRAC Survey Transects 2023 & 2024

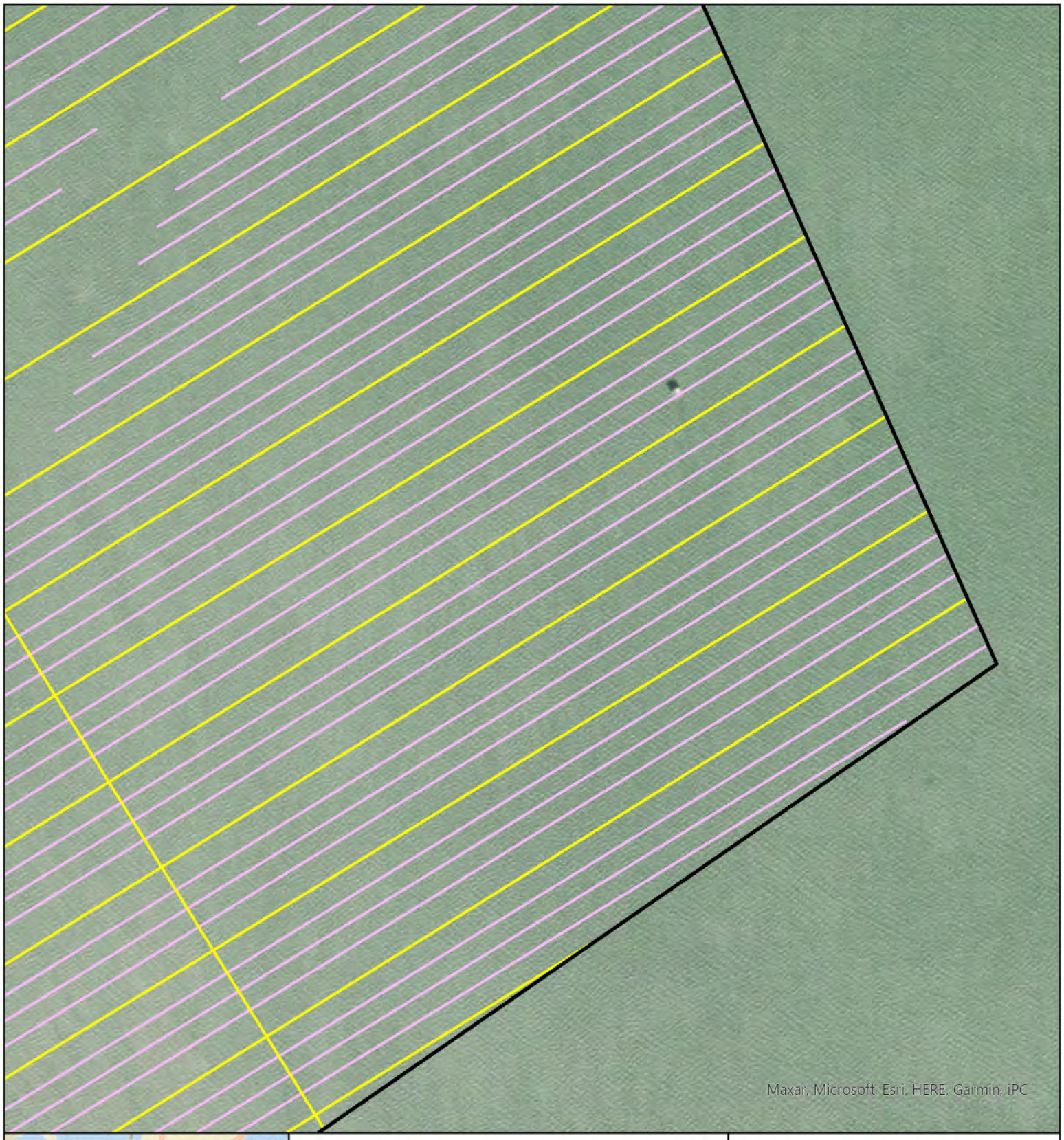
N

0 300 600 1,200 Feet

Figure 2:
Survey Plan (Transects)
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

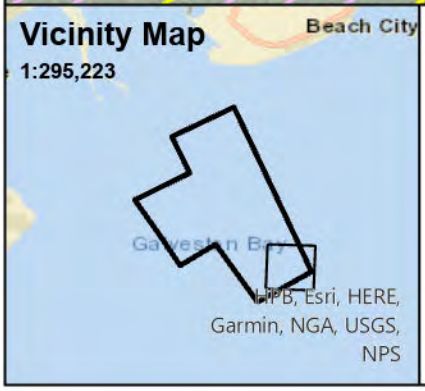
Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.



Vicinity Map

1:295,223



Legend

- BABUS Survey Area
- Texas A&M Survey Transects 2018
- ETRAC Survey Transects 2023 & 2024

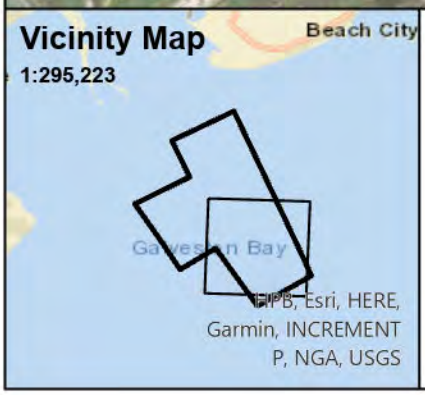
N

0 265 530 1,060 Feet

Figure 2:
Survey Plan (Transects)
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.



Legend

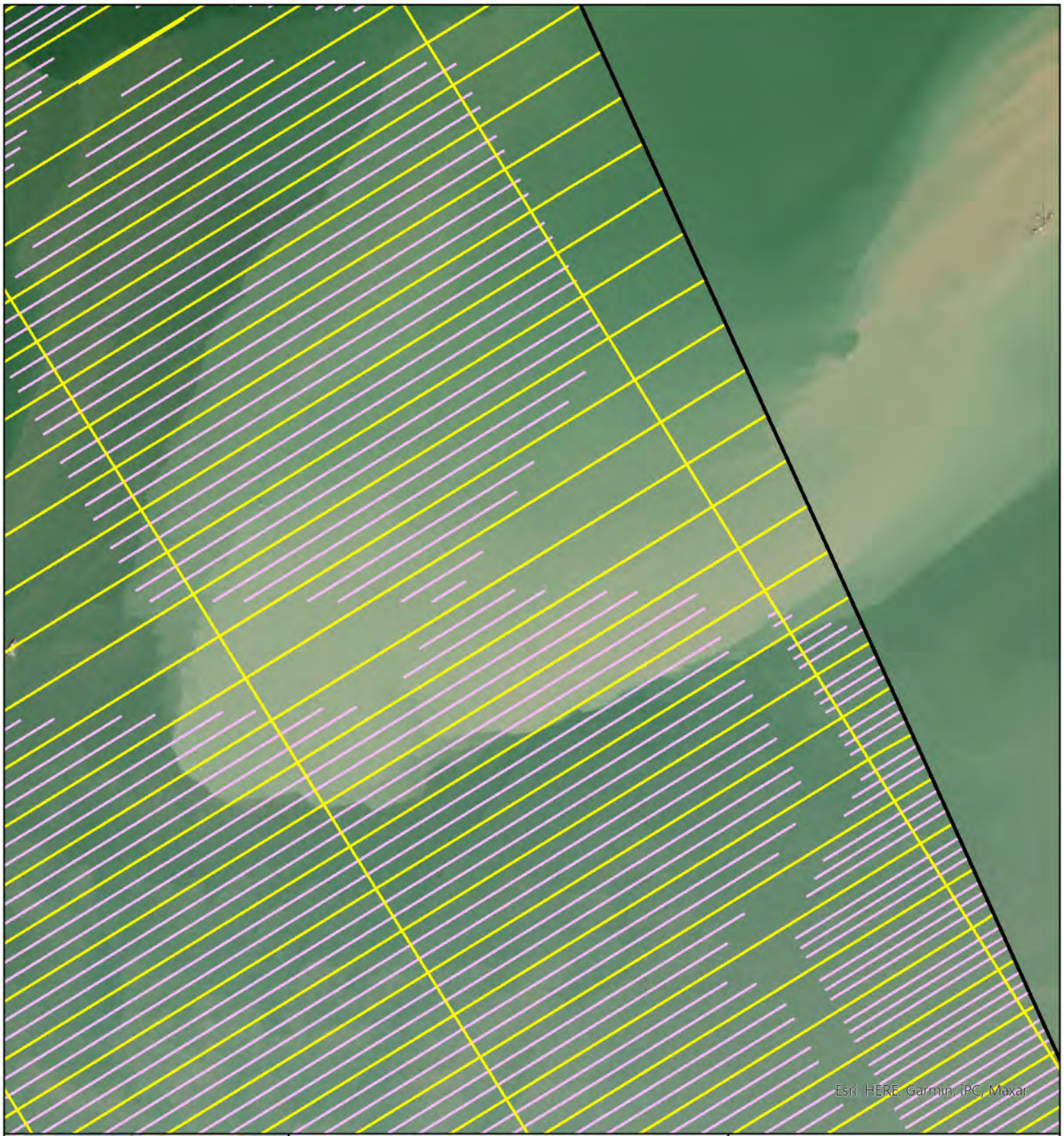
- BABUS Survey Area
- Texas A&M Survey Transects 2018
- ETRAC Survey Transects 2023 & 2024

N

0 500 1,000 2,000 Feet

Figure 2:
Survey Plan (Transects)
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	LLOYD ENGINEERING, INC.
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	



Vicinity Map

1:295,223

Legend

- BABUS Survey Area
- Texas A&M Survey Transects 2018
- ETRAC Survey Transects 2023 & 2024

N

0 500 1,000 2,000 Feet

Figure 2:
Survey Plan (Transects)
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.

Vicinity Map

1:295,223

Legend

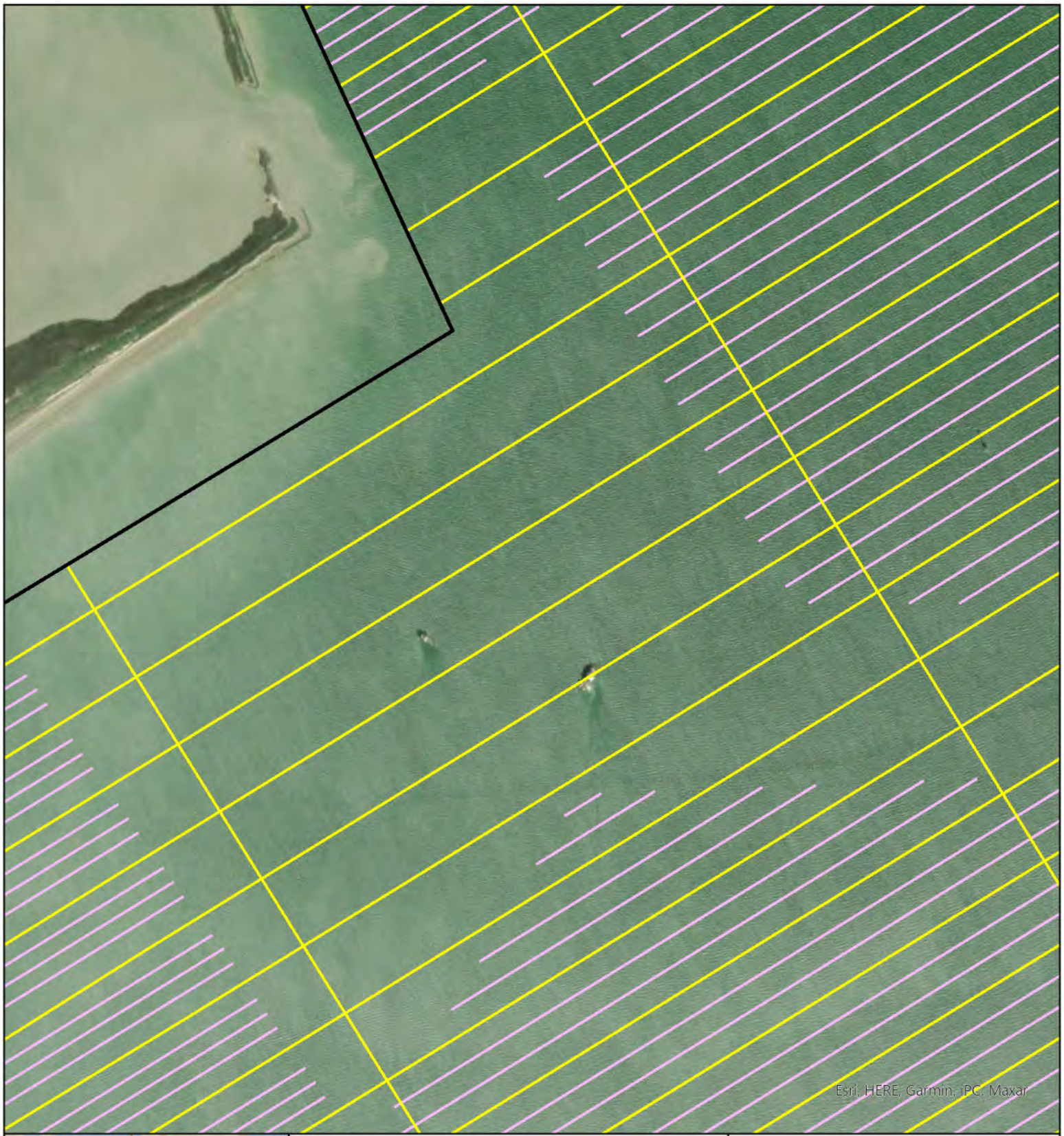
- BABUS Survey Area
- Texas A&M Survey Transects 2018
- ETRAC Survey Transects 2023 & 2024

N

0 500 1,000 2,000 Feet

Figure 2:
Survey Plan (Transects)
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	LOYD ENGINEERING, INC.
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	



Legend

- BABUS Survey Area
- Texas A&M Survey Transects 2018
- ETRAC Survey Transects 2023 & 2024

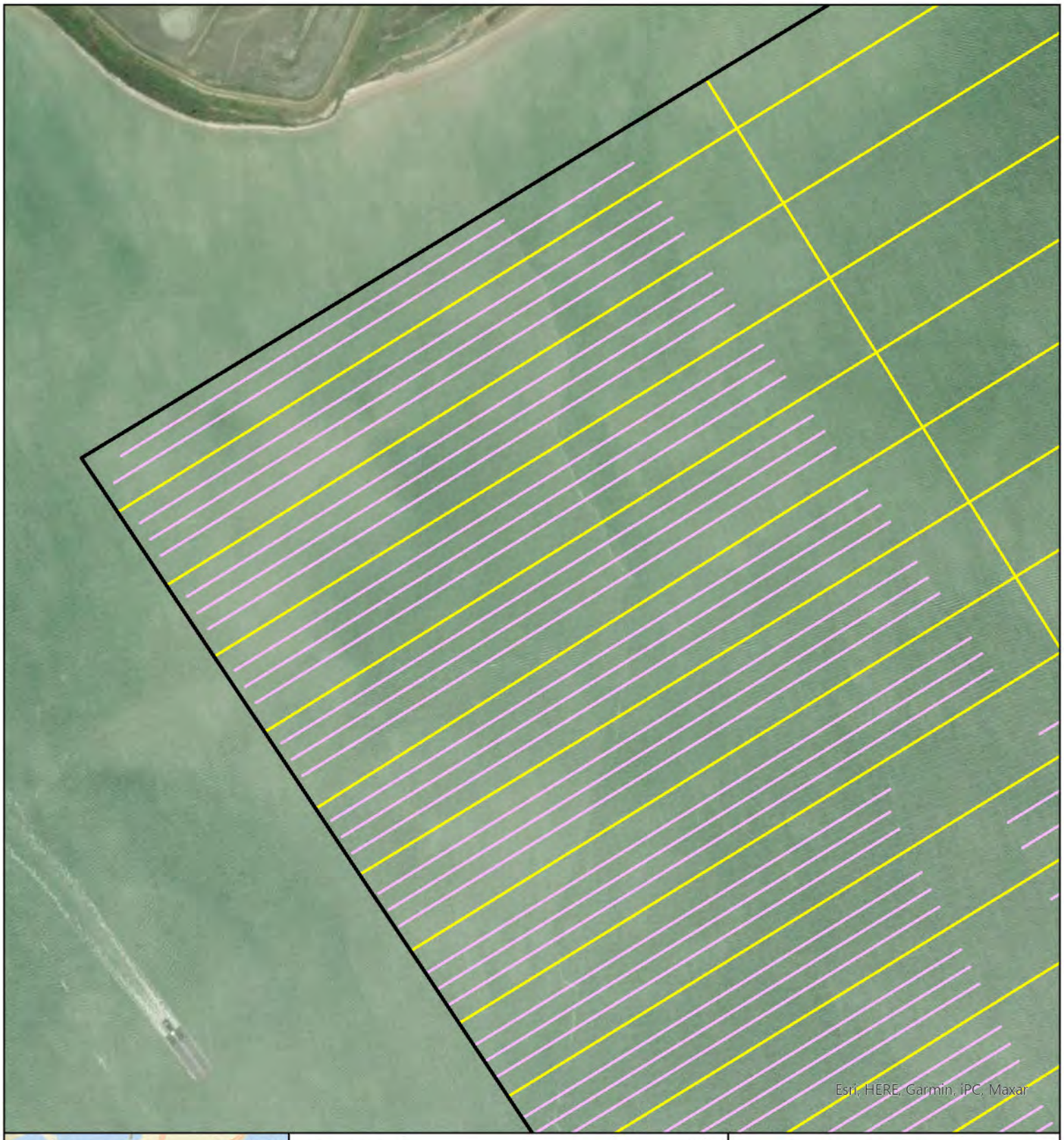
N

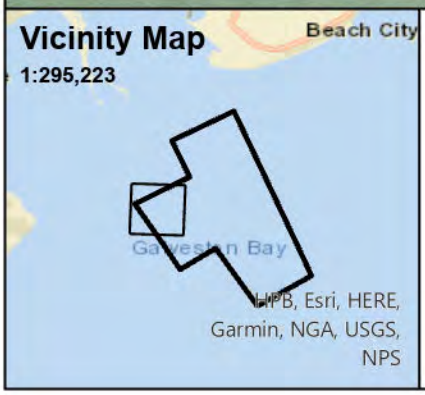
0 330 660 1,320 Feet

Figure 2:
Survey Plan (Transects)
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.





Legend

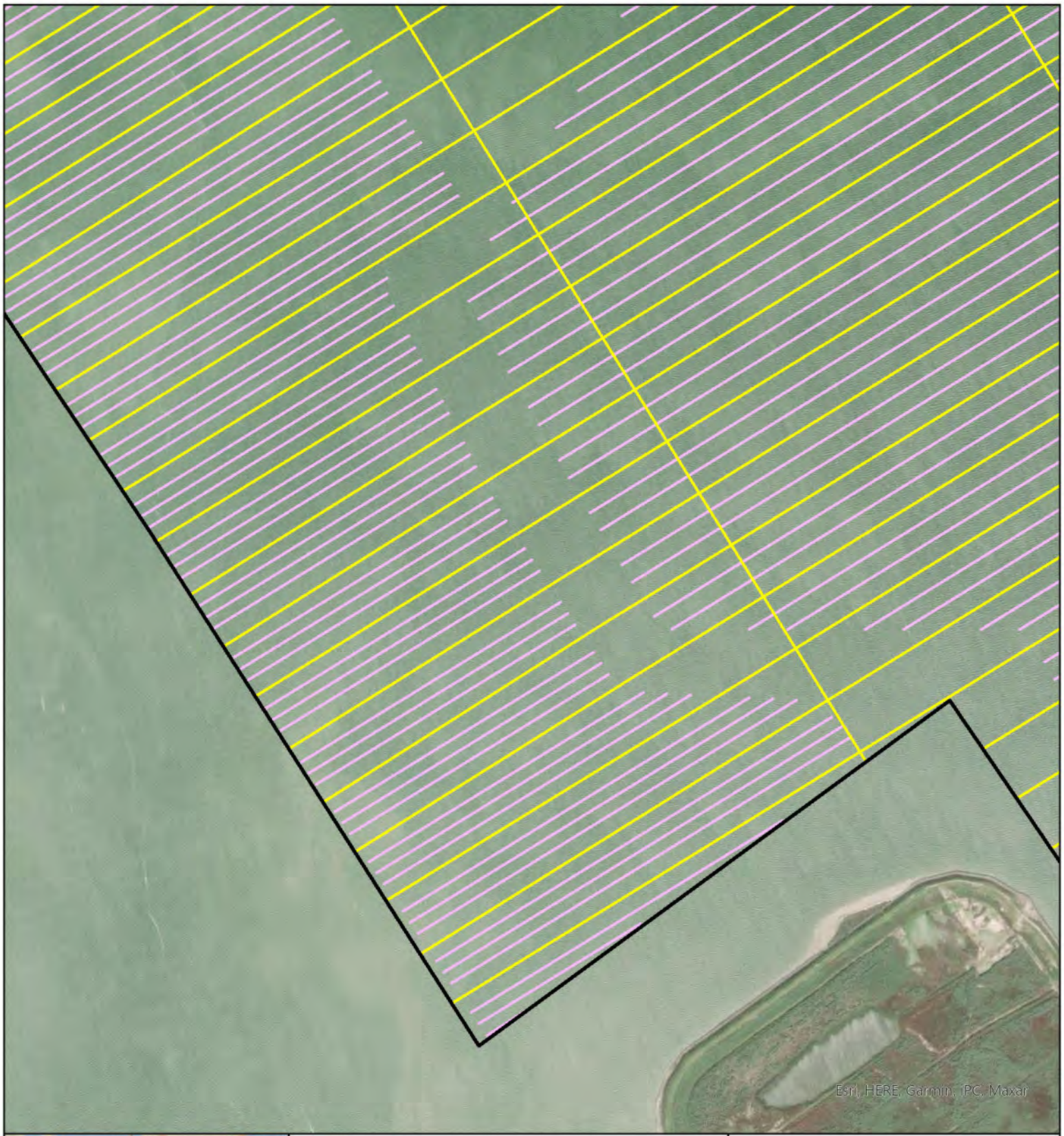
- BABUS Survey Area
- Texas A&M Survey Transects 2018
- ETRAC Survey Transects 2023 & 2024

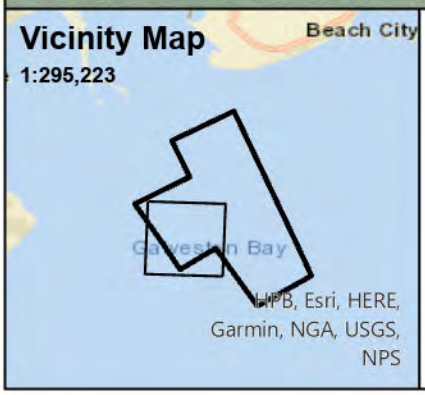
N

0 300 600 1,200 Feet

Figure 2:
Survey Plan (Transects)
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	LLOYD ENGINEERING, INC.
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	





Legend

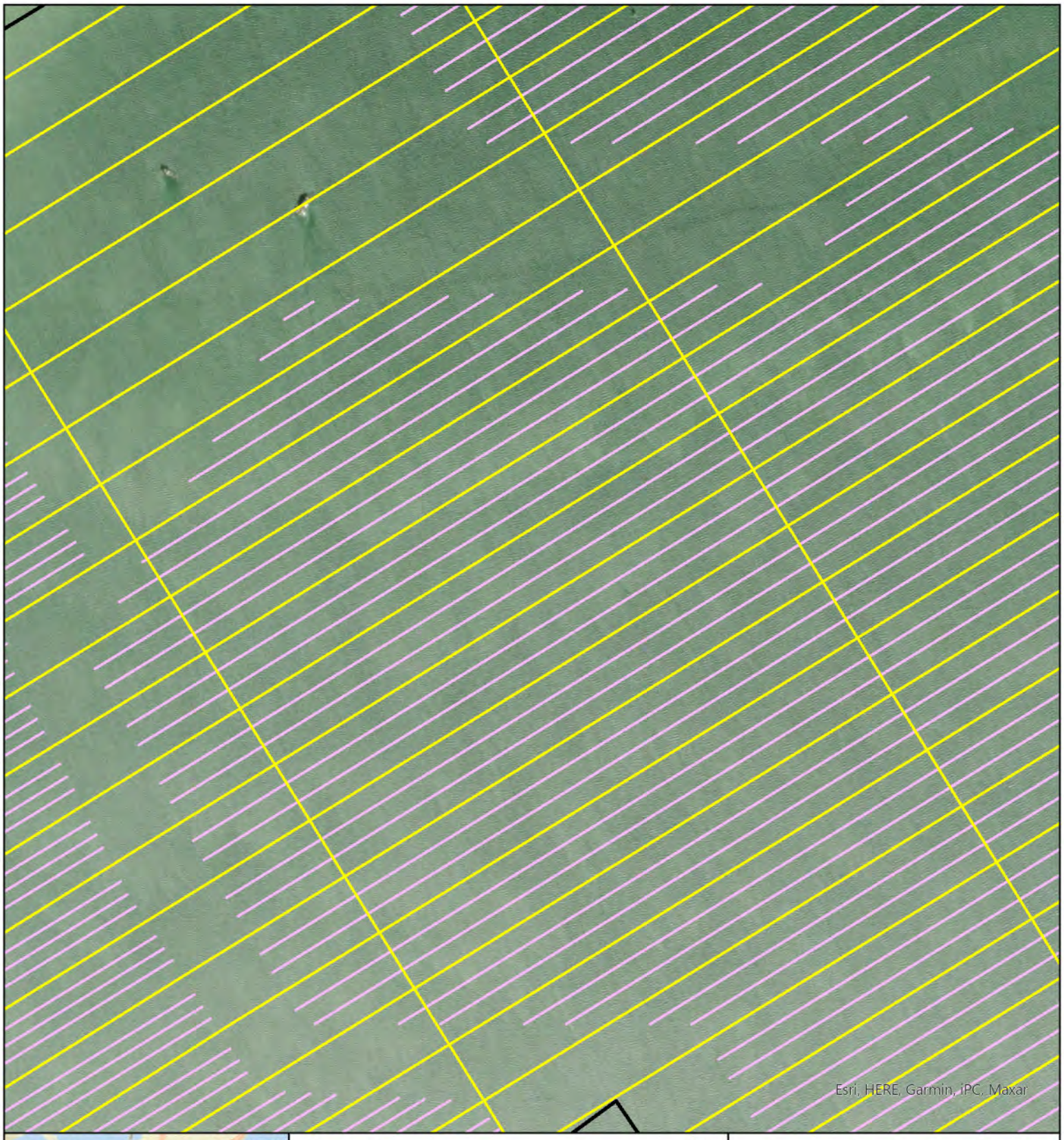
- BABUS Survey Area
- Texas A&M Survey Transects 2018
- ETRAC Survey Transects 2023 & 2024

N

0 430 860 1,720 Feet

Figure 2:
Survey Plan (Transects)
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	LOYD ENGINEERING, INC.
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	



Vicinity Map

1:295,223

Legend

- BABUS Survey Area
- Texas A&M Survey Transects 2018
- ETRAC Survey Transects 2023 & 2024

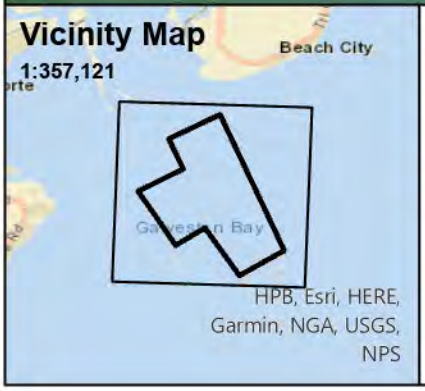
N

0 400 800 1,600 Feet

Figure 2:
Survey Plan (Transects)
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.



Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Texas A&M Survey 2018

ETRAC Survey 2023

ETRAC Survey 2024

N

0 1,250 2,500 5,000 Feet

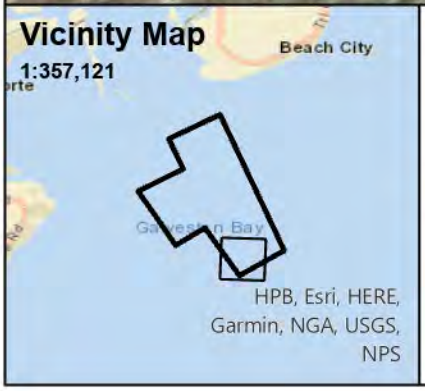
Figure 3:
Side Scan Sonar Data
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.

Vicinity Map

1:357,121



Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Texas A&M Survey 2018

ETRAC Survey 2023

ETRAC Survey 2024

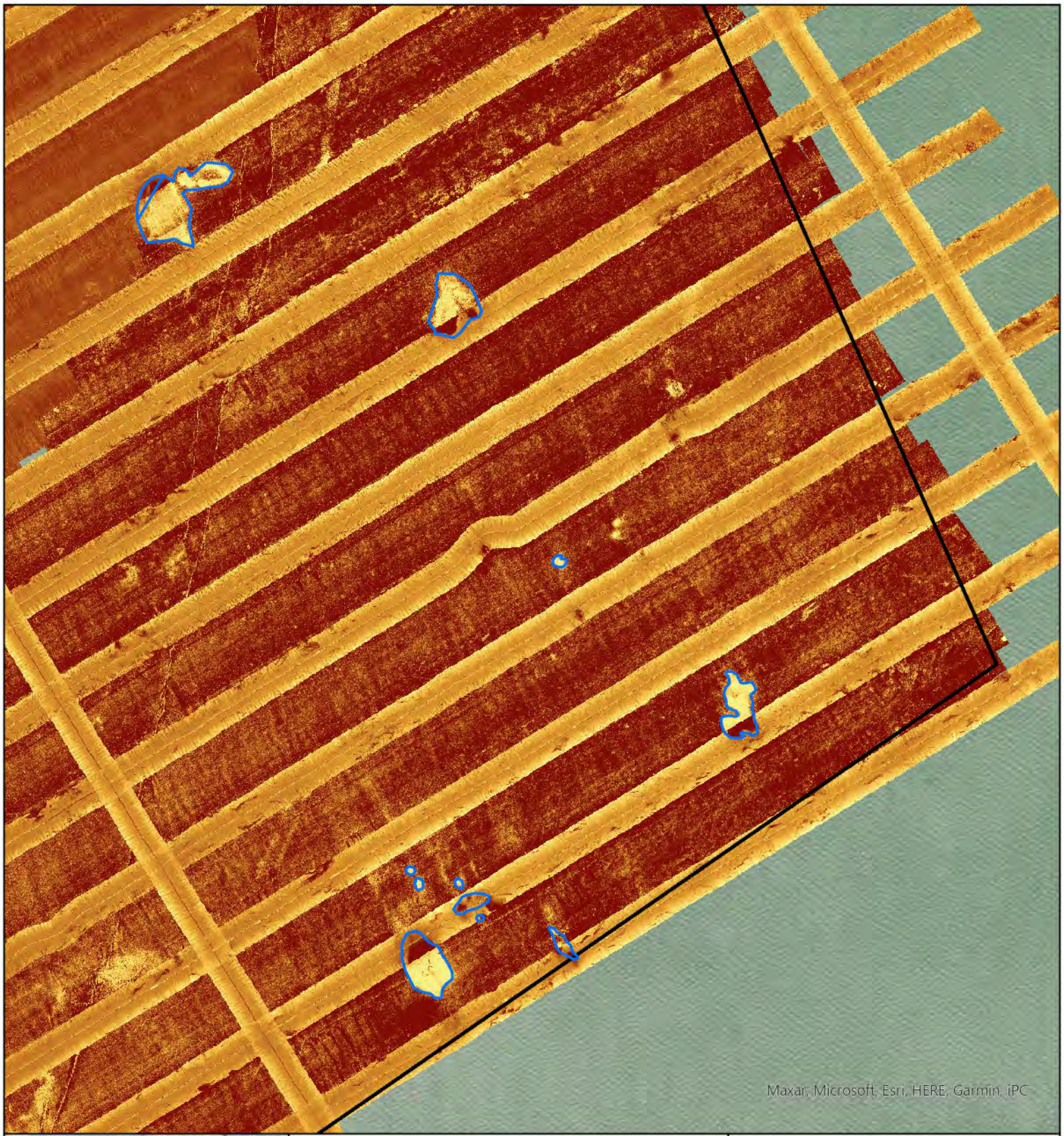
N

0 300 600 1,200 Feet

Figure 3:
Side Scan Sonar Data
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

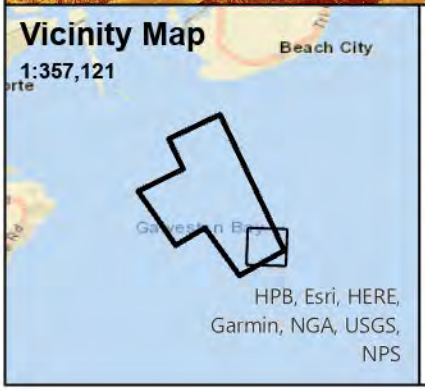
Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LLOYD ENGINEERING, INC.



Vicinity Map

1:357,121



Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Texas A&M Survey 2018

ETRAC Survey 2023

ETRAC Survey 2024

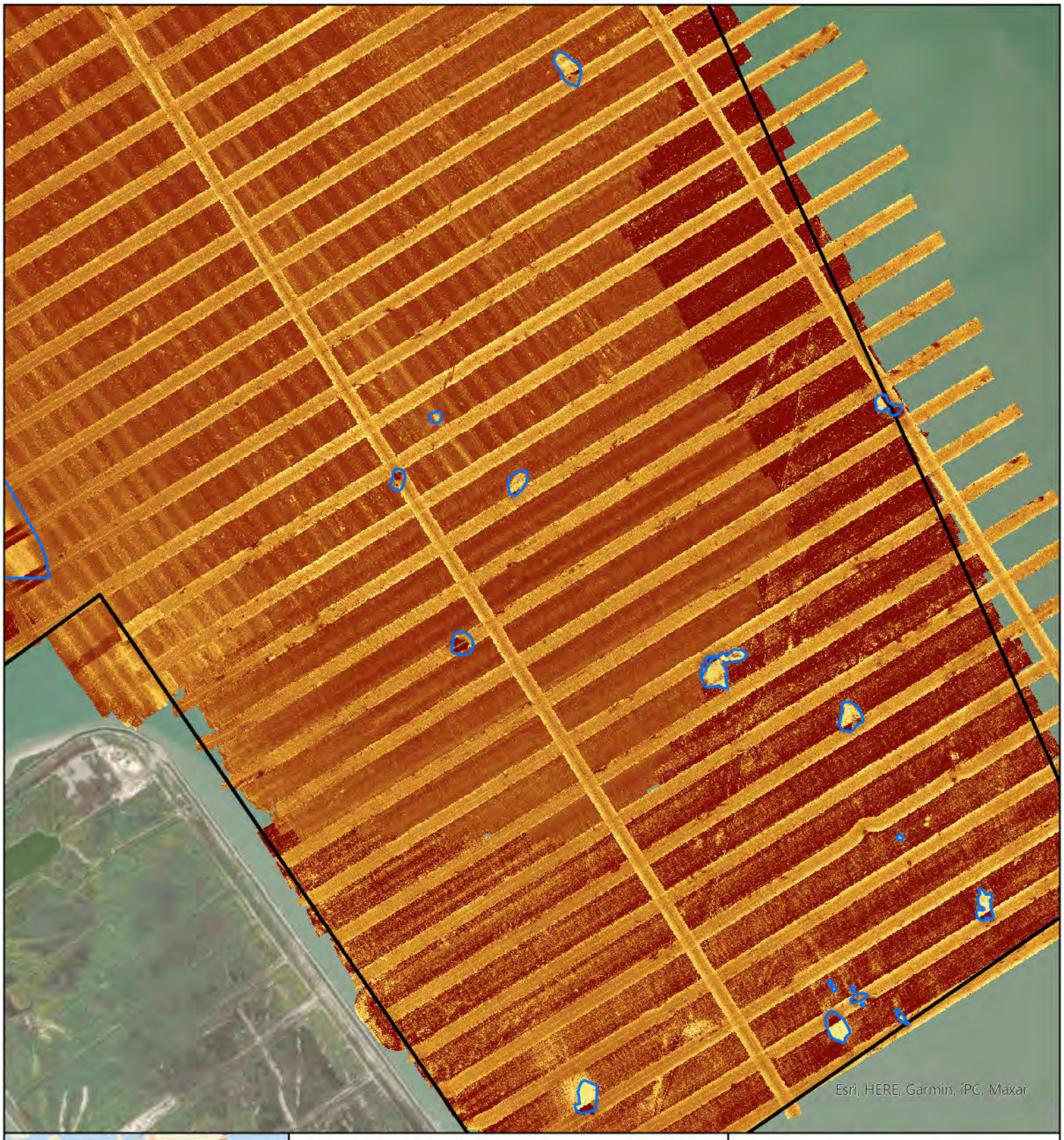
N

0 265 530 1,060 Feet

Figure 3:
Side Scan Sonar Data
Bay Aquatic Beneficial Use Site
(BABUS)
USACE
Galveston Bay, Texas

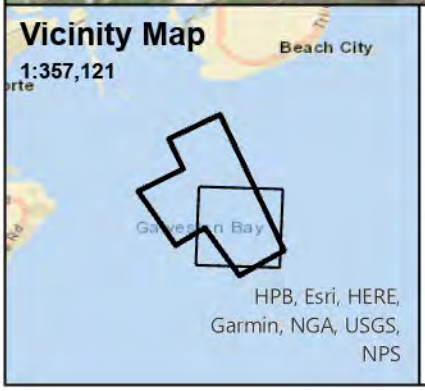
Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.



Vicinity Map

1:357,121



Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Texas A&M Survey 2018

ETRAC Survey 2023

ETRAC Survey 2024

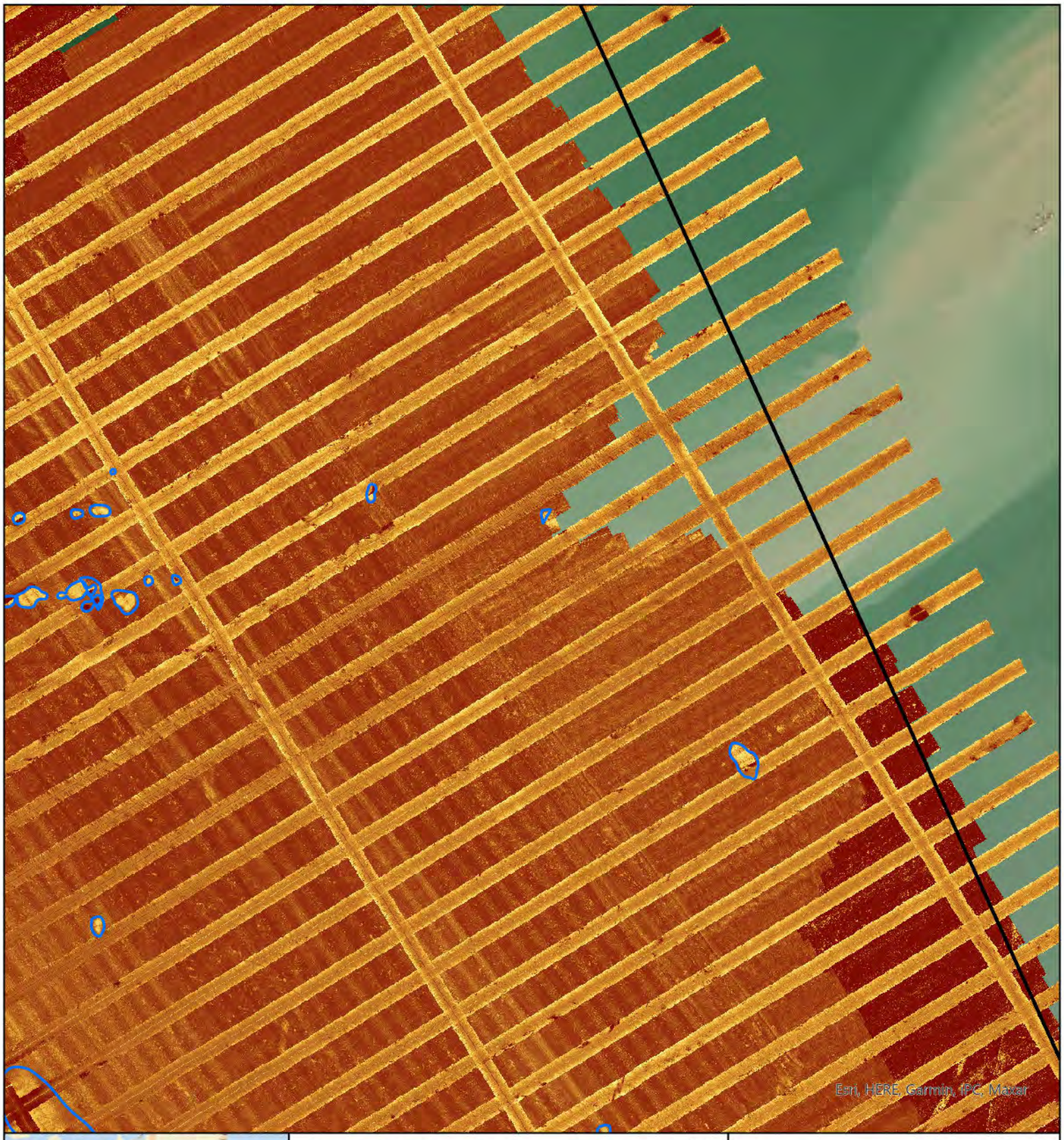
N

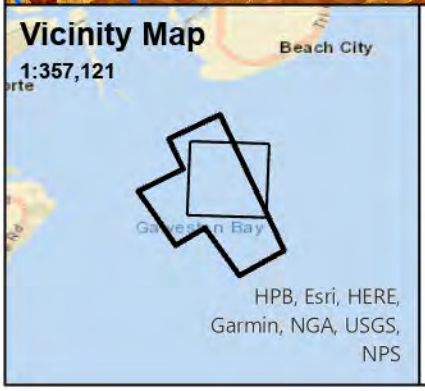
0 500 1,000 2,000 Feet

Figure 3:
Side Scan Sonar Data
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.





Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Texas A&M Survey 2018

ETRAC Survey 2023

ETRAC Survey 2024

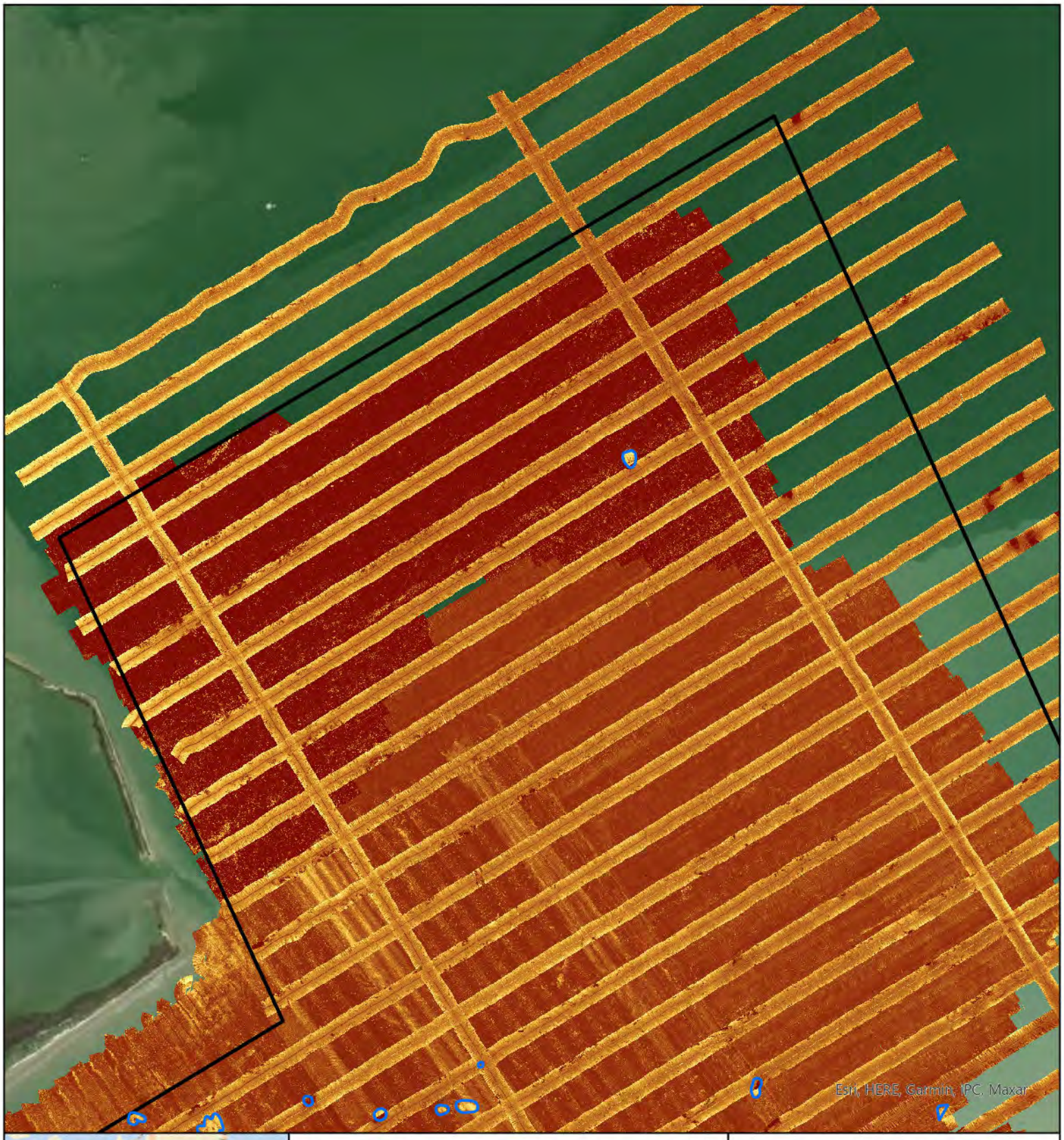
N

0 500 1,000 2,000 Feet

Figure 3:
Side Scan Sonar Data
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.



Vicinity Map

1:357,121

Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Texas A&M Survey 2018

ETRAC Survey 2023

ETRAC Survey 2024

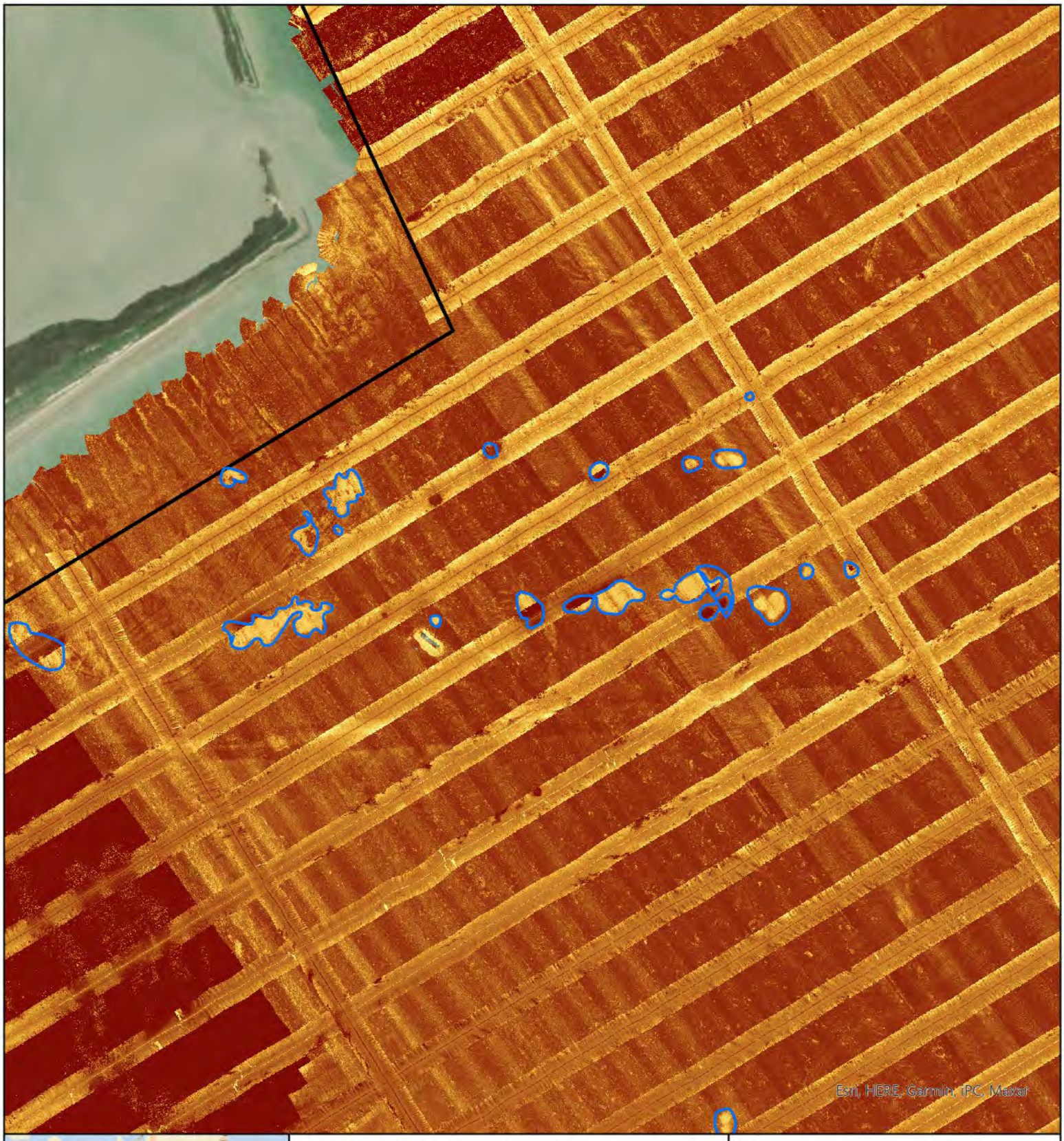
N

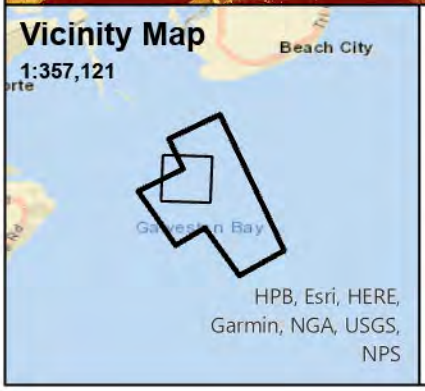
0 500 1,000 2,000 Feet

Figure 3:
Side Scan Sonar Data
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.





Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Texas A&M Survey 2018

ETRAC Survey 2023

ETRAC Survey 2024

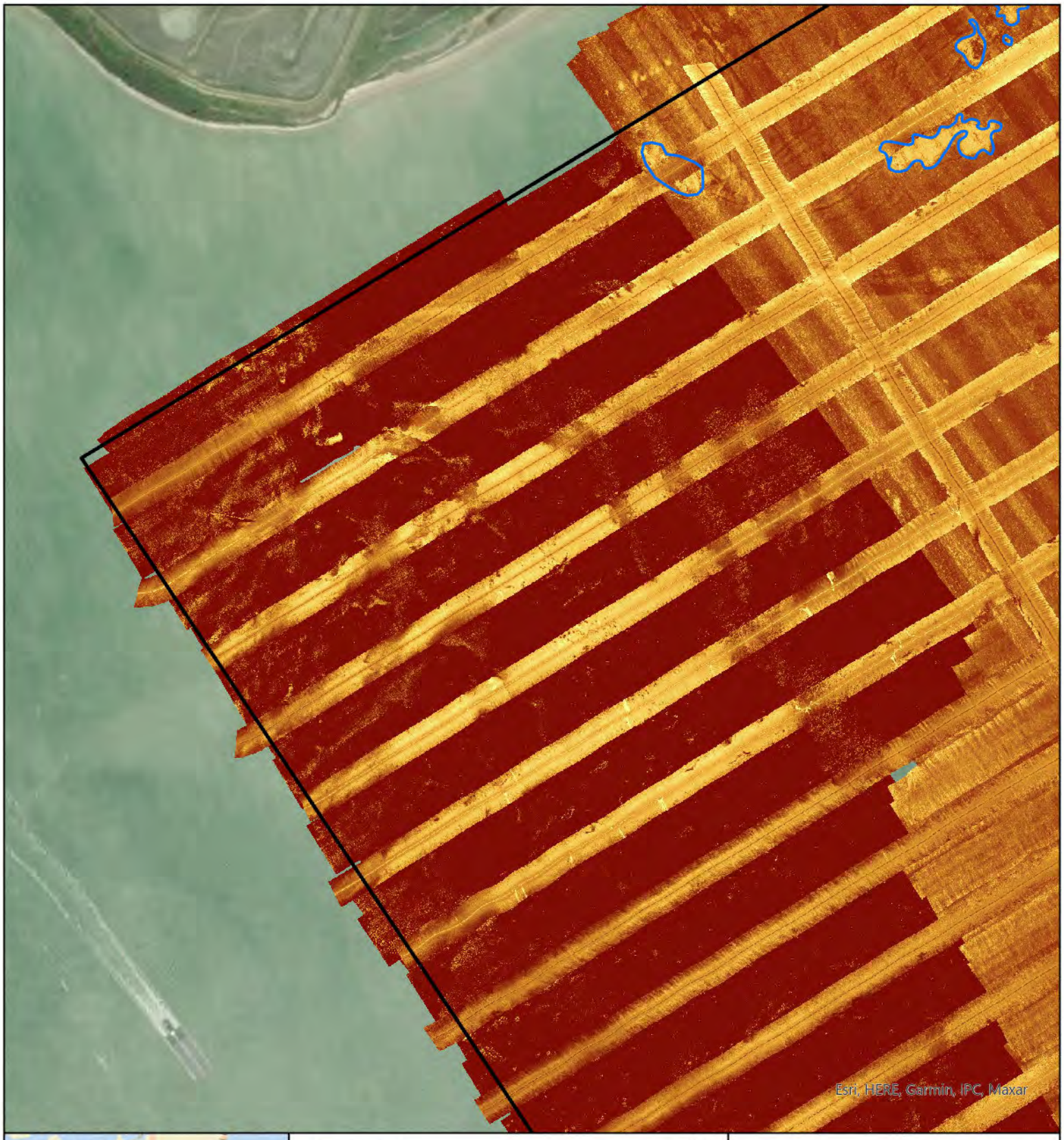
N

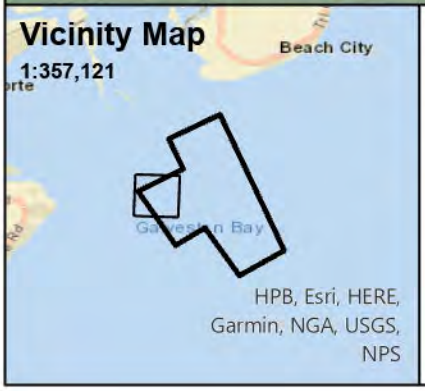
0 330 660 1,320 Feet

Figure 3:
Side Scan Sonar Data
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.





Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Texas A&M Survey 2018

ETRAC Survey 2023

ETRAC Survey 2024

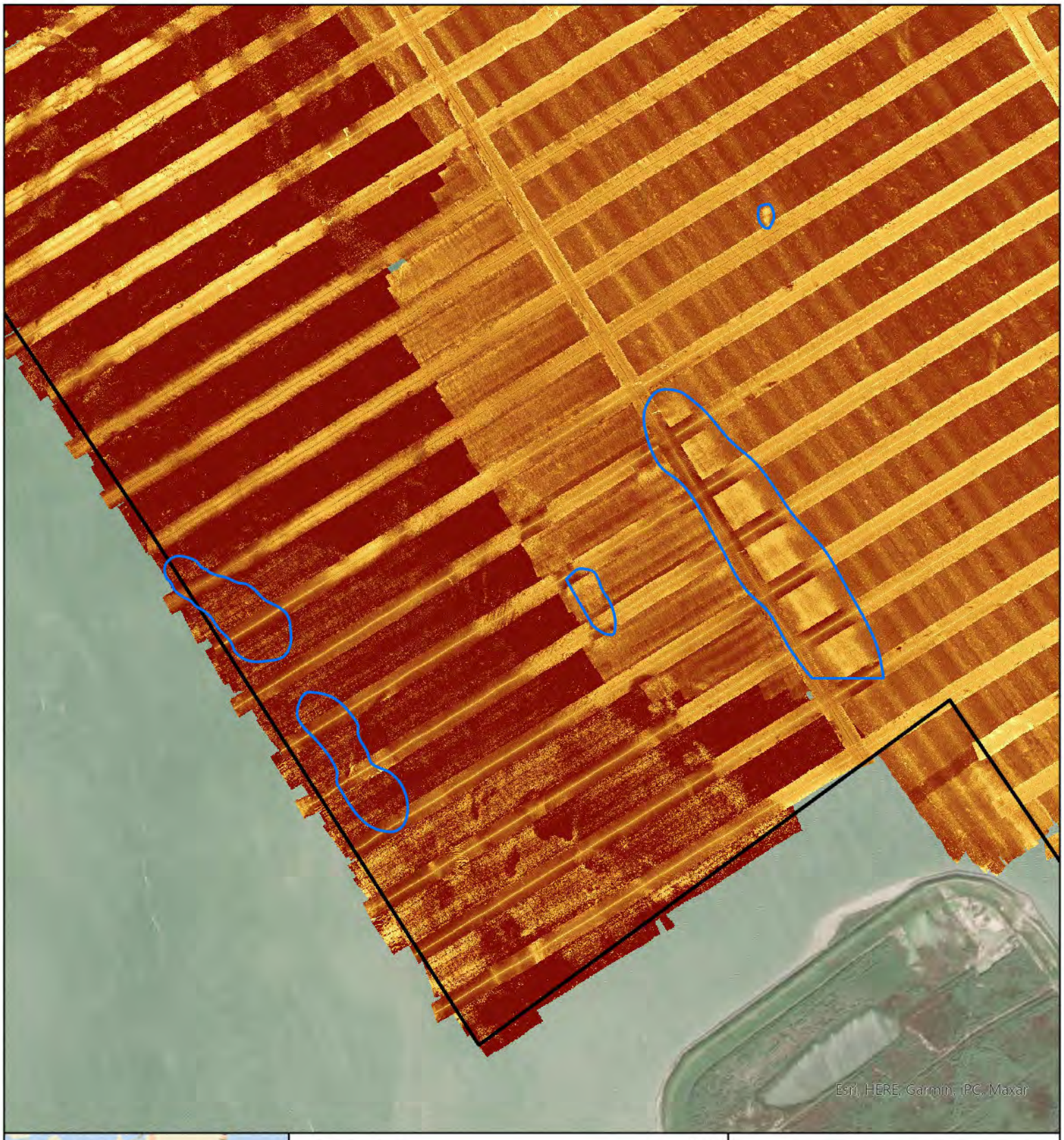
N

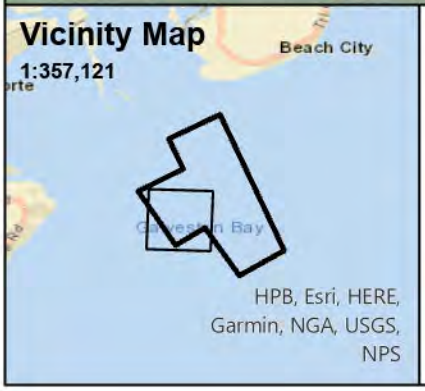
0 300 600 1,200 Feet

Figure 3:
Side Scan Sonar Data
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LLOYD ENGINEERING, INC.





Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Texas A&M Survey 2018

ETRAC Survey 2023

ETRAC Survey 2024

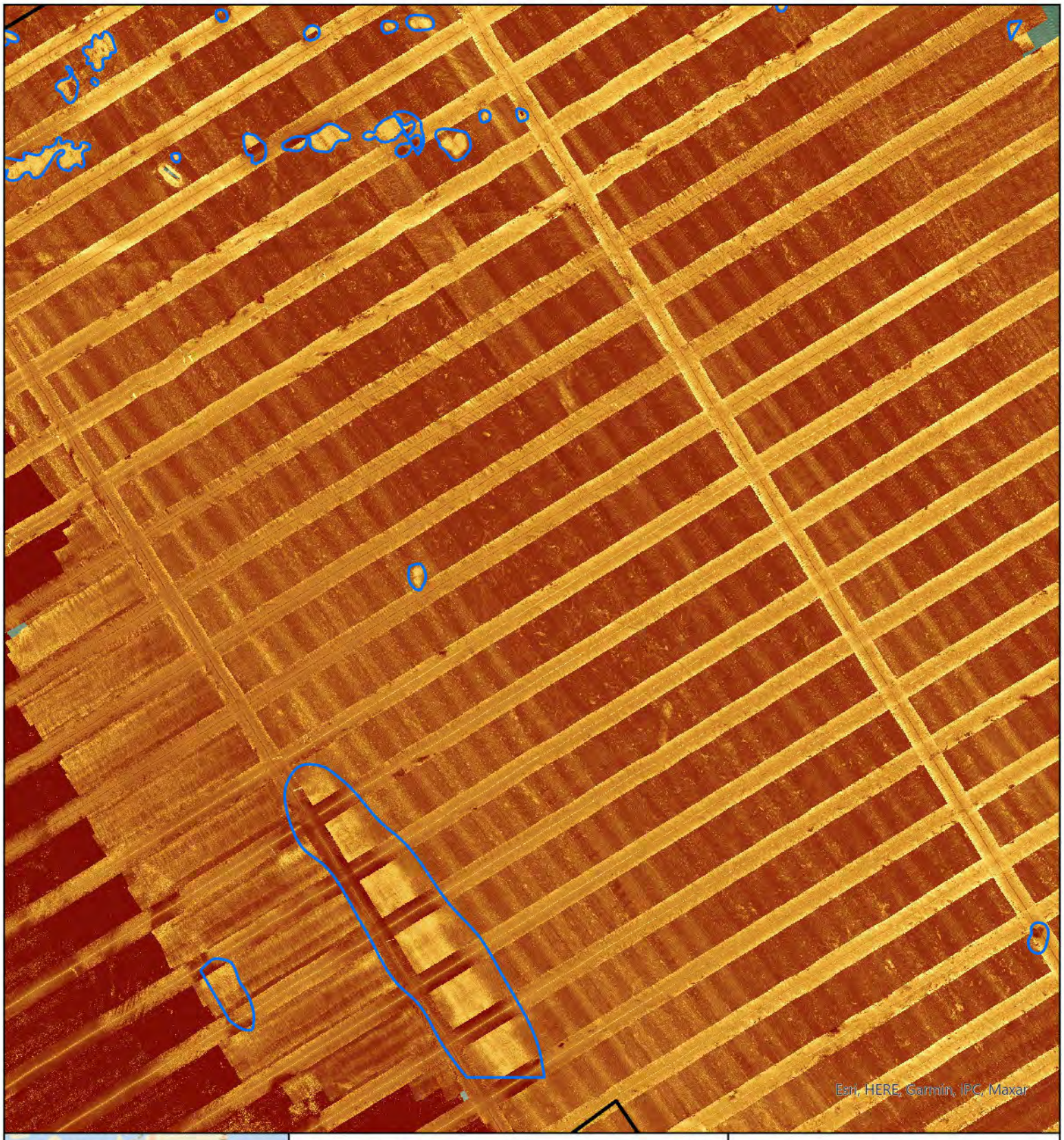
N

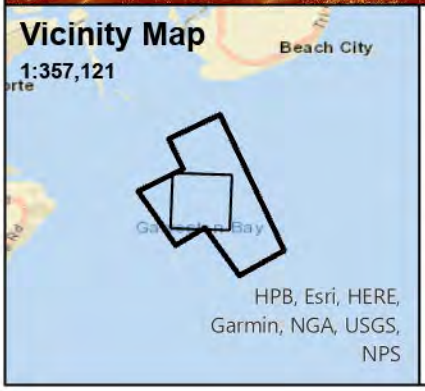
0 430 860 1,720 Feet

Figure 3:
Side Scan Sonar Data
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LLOYD ENGINEERING, INC.





Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Texas A&M Survey 2018

ETRAC Survey 2023

ETRAC Survey 2024

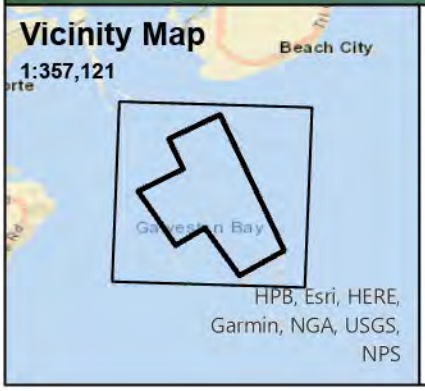
N

0 400 800 1,600 Feet

Figure 3:
Side Scan Sonar Data
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LLOYD ENGINEERING, INC.



Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Hard Bottom Targets (Dredge Tow Transects)

Soft Bottom Targets (Ponar Drops)

N

0 1,500 3,000 6,000 Feet

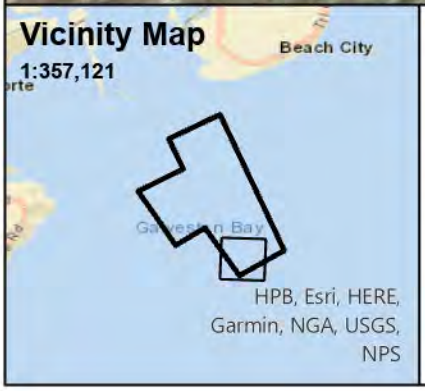
Figure 4:
Hard & Soft Bottom Sampling Locations
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.

Vicinity Map

1:357,121



Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Hard Bottom Targets (Dredge Tow Transects)

Soft Bottom Targets (Ponar Drops)

N

0 410 820 1,640 Feet

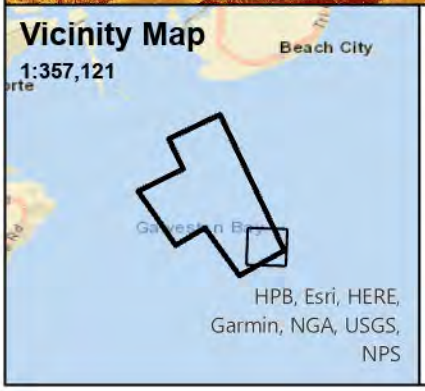
Figure 4:
Hard & Soft Bottom Sampling Locations
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LLOYD ENGINEERING, INC.

Vicinity Map

1:357,121



Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Hard Bottom Targets (Dredge Tow Transects)

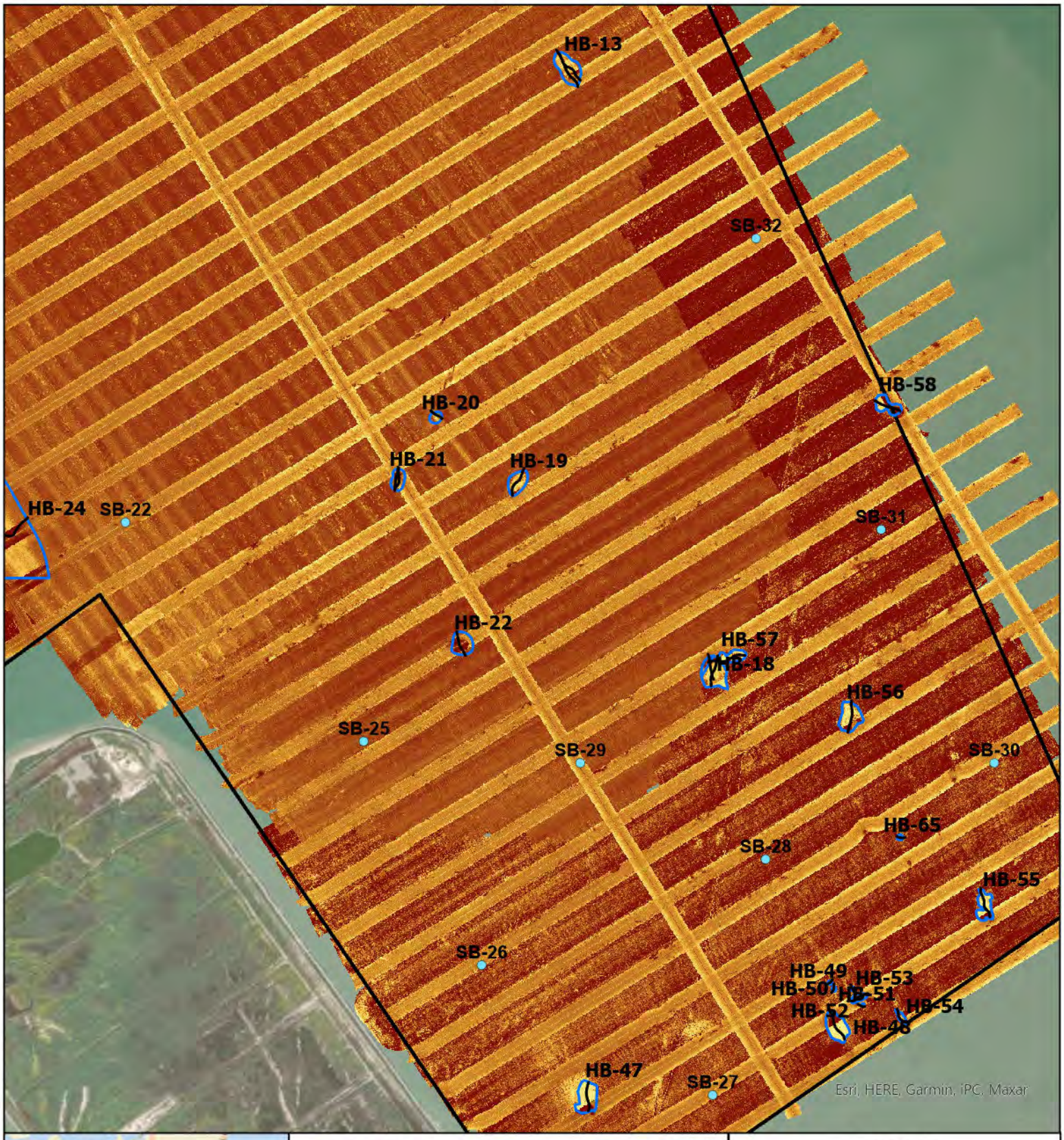
Soft Bottom Targets (Ponar Drops)

N

0 362.5 725 1,450 Feet

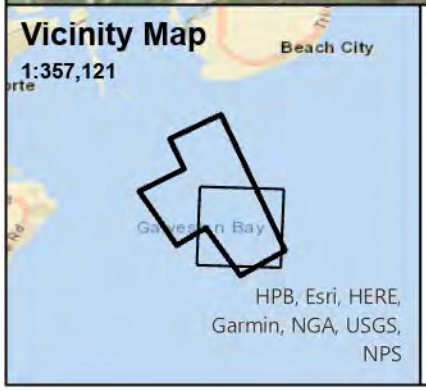
Figure 4:
Hard & Soft Bottom Sampling Locations
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	LOYD ENGINEERING, INC.
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	



Vicinity Map

1:357,121



Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Hard Bottom Targets (Dredge Tow Transects)

Soft Bottom Targets (Ponar Drops)

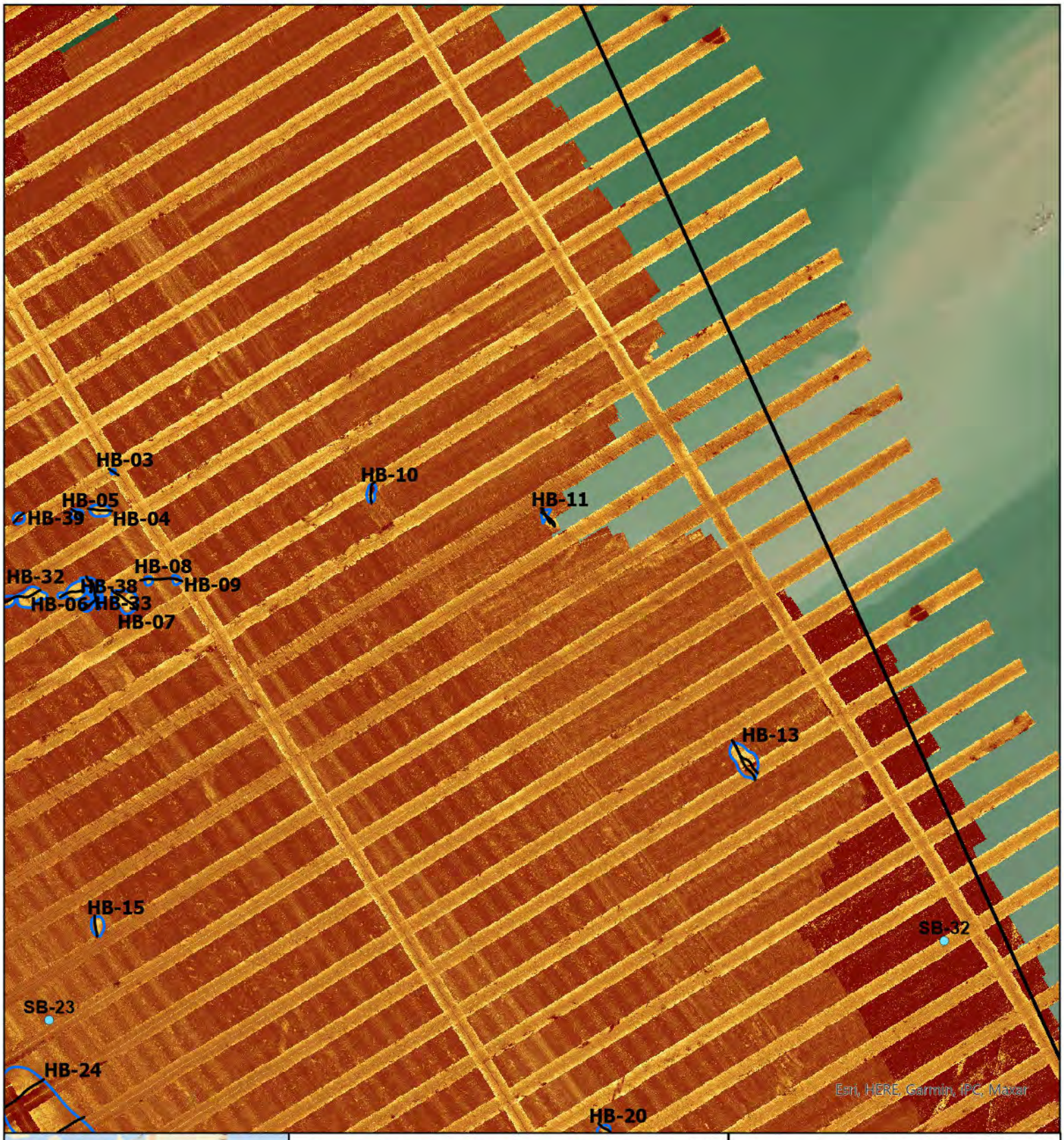
0 500 1,000 2,000 Feet

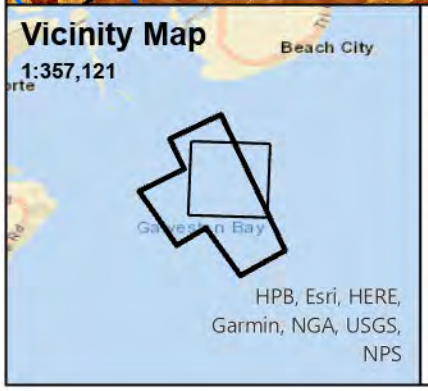
N

Figure 4:
Hard & Soft Bottom Sampling Locations
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LLOYD ENGINEERING, INC.





Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Hard Bottom Targets (Dredge Tow Transects)

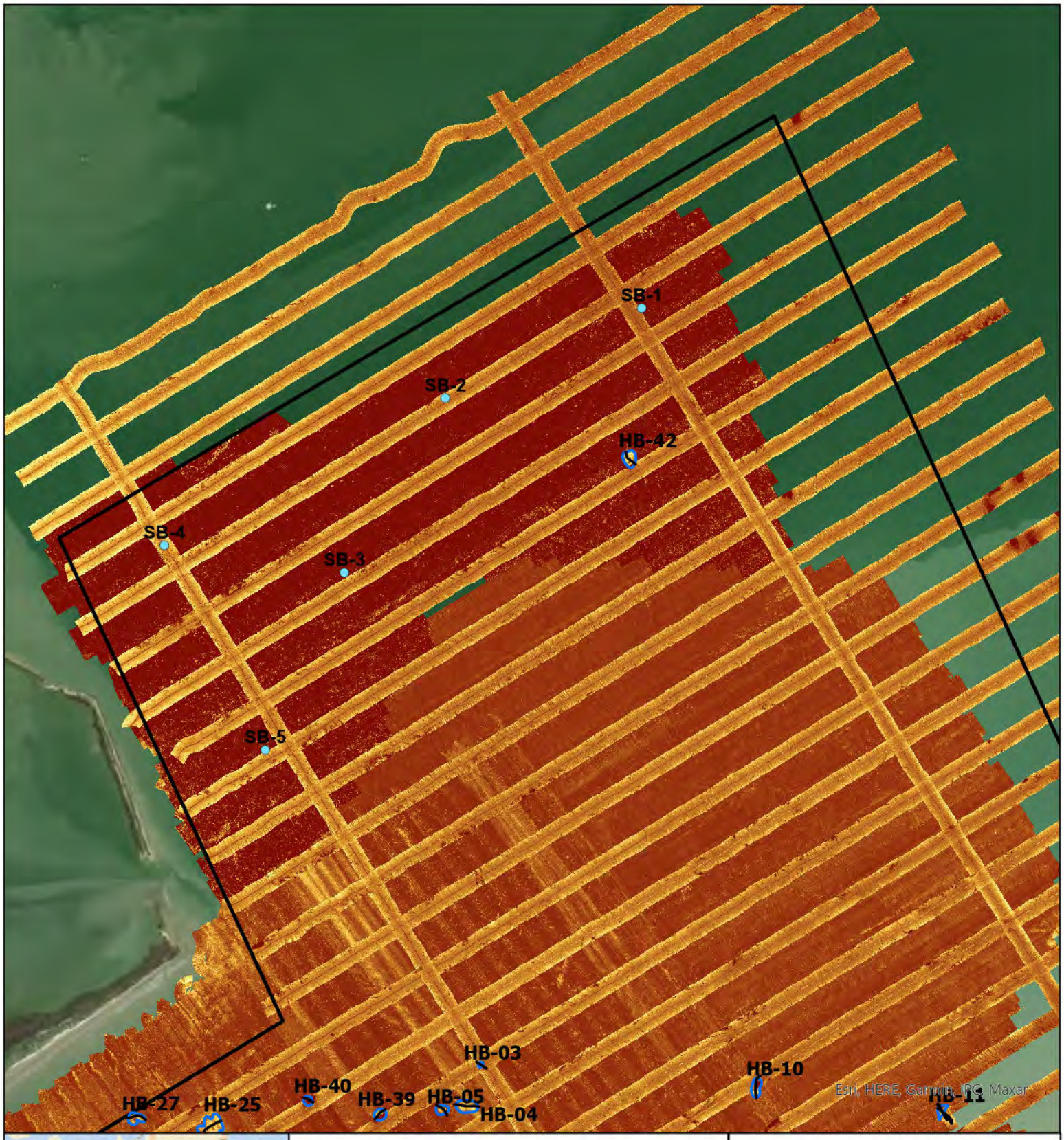
Soft Bottom Targets (Ponar Drops)

0 500 1,000 2,000 Feet

N

Figure 4:
Hard & Soft Bottom Sampling Locations
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	LLOYD ENGINEERING, INC.
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	



Vicinity Map

1:357,121

Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Hard Bottom Targets (Dredge Tow Transects)

Soft Bottom Targets (Ponar Drops)

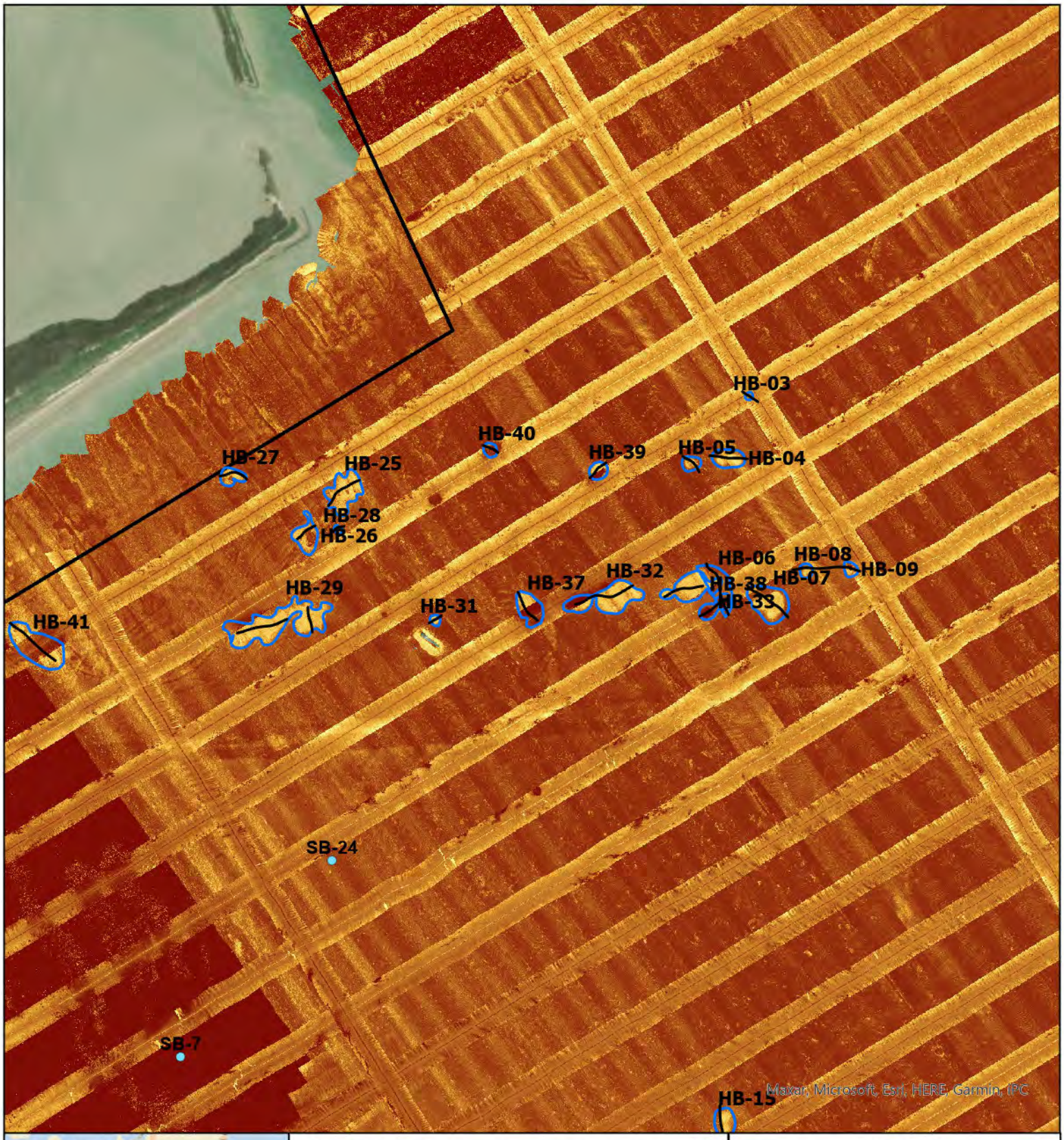
N

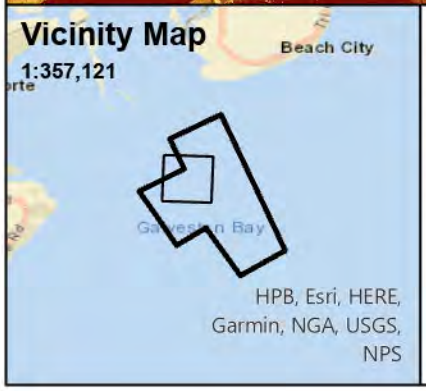
0 500 1,000 2,000 Feet

Figure 4:
Hard & Soft Bottom Sampling Locations
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.





Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Hard Bottom Targets (Dredge Tow Transects)

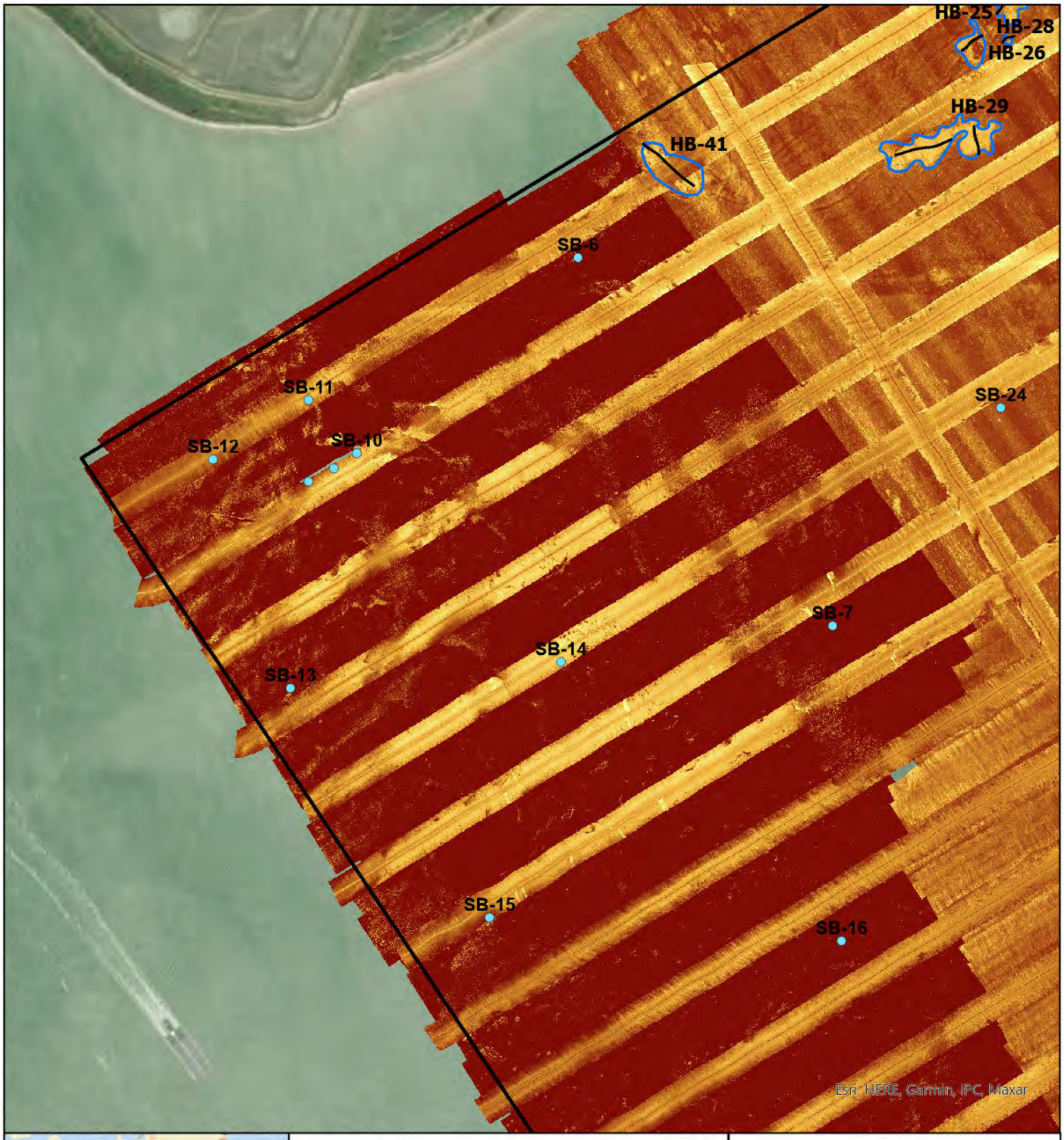
Soft Bottom Targets (Ponar Drops)

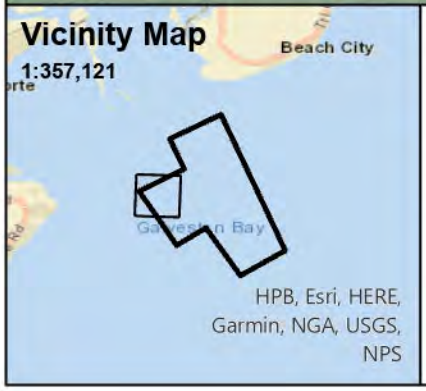
N

0 455 910 1,820 Feet

Figure 4:
Hard & Soft Bottom Sampling Locations
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	LLOYD ENGINEERING, INC.
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	





Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Hard Bottom Targets (Dredge Tow Transects)

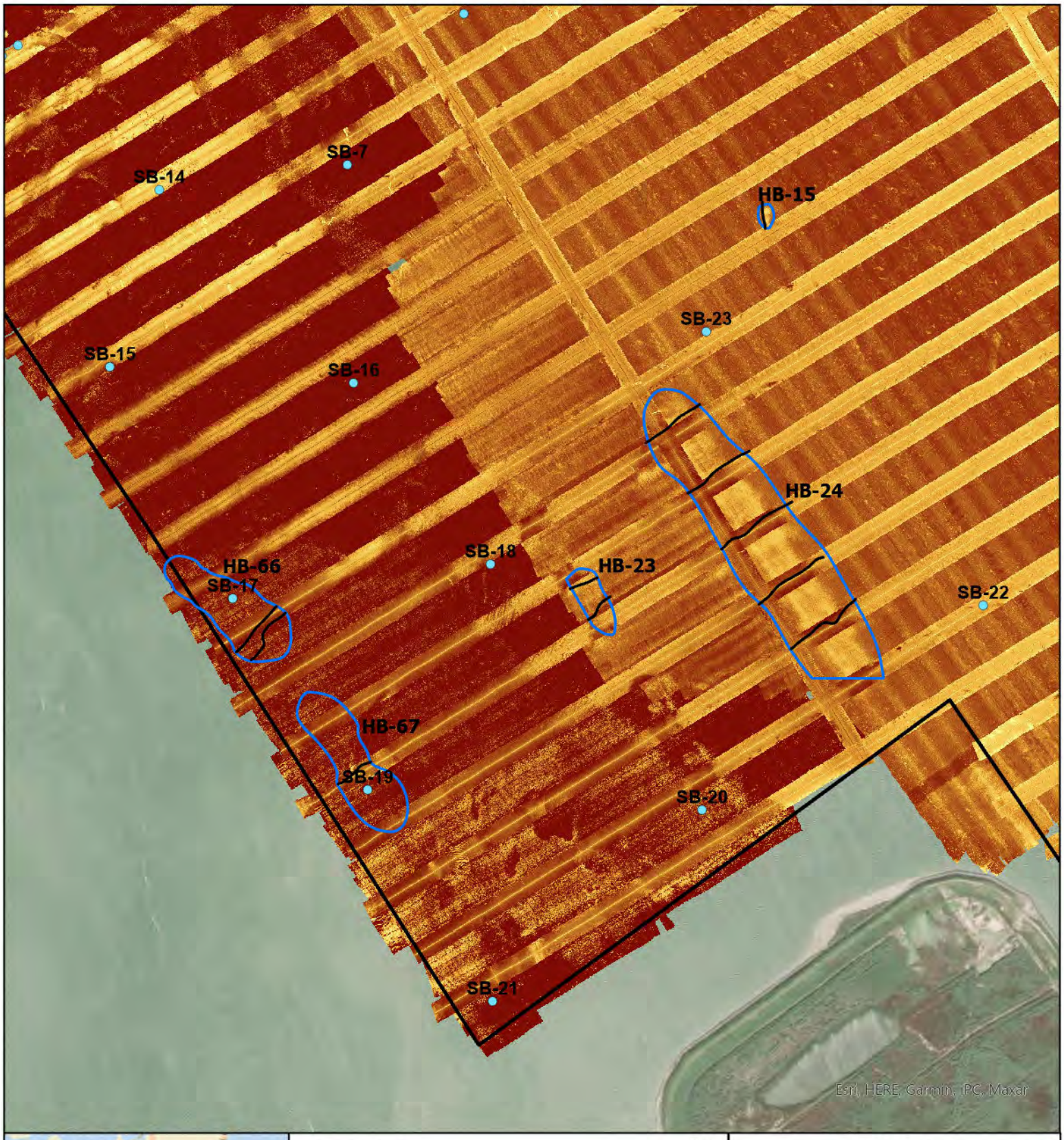
Soft Bottom Targets (Ponar Drops)

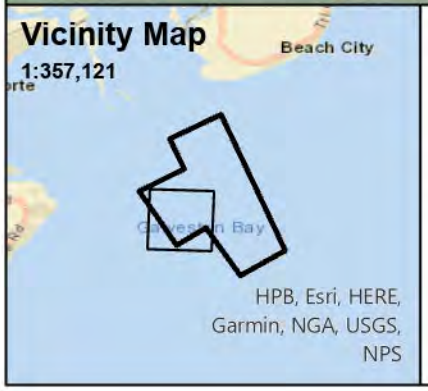
N

0 410 820 1,640 Feet

Figure 4:
Hard & Soft Bottom Sampling Locations
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	LLOYD ENGINEERING, INC.
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	





Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Hard Bottom Targets (Dredge Tow Transects)

Soft Bottom Targets (Ponar Drops)

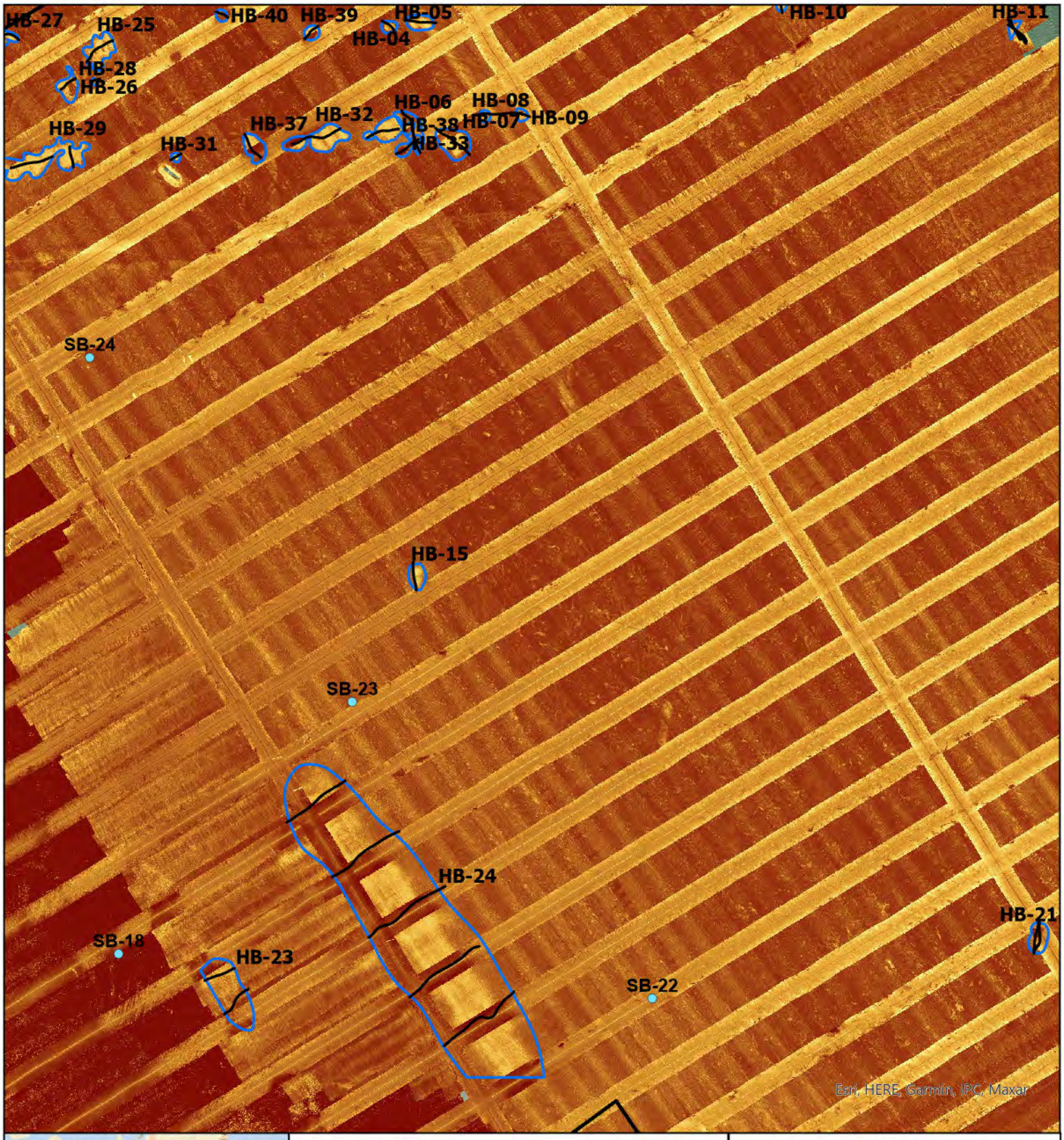
N

0 500 1,000 2,000 Feet

Figure 4:
Hard & Soft Bottom Sampling Locations
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

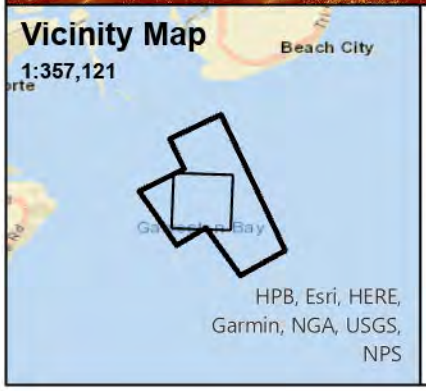
Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LLOYD ENGINEERING, INC.



Vicinity Map

1:357,121



Legend

BABUS Survey Area

Phase 1 & 2 Hard Bottom Habitats

Hard Bottom Targets (Dredge Tow Transects)

Soft Bottom Targets (Ponar Drops)

N

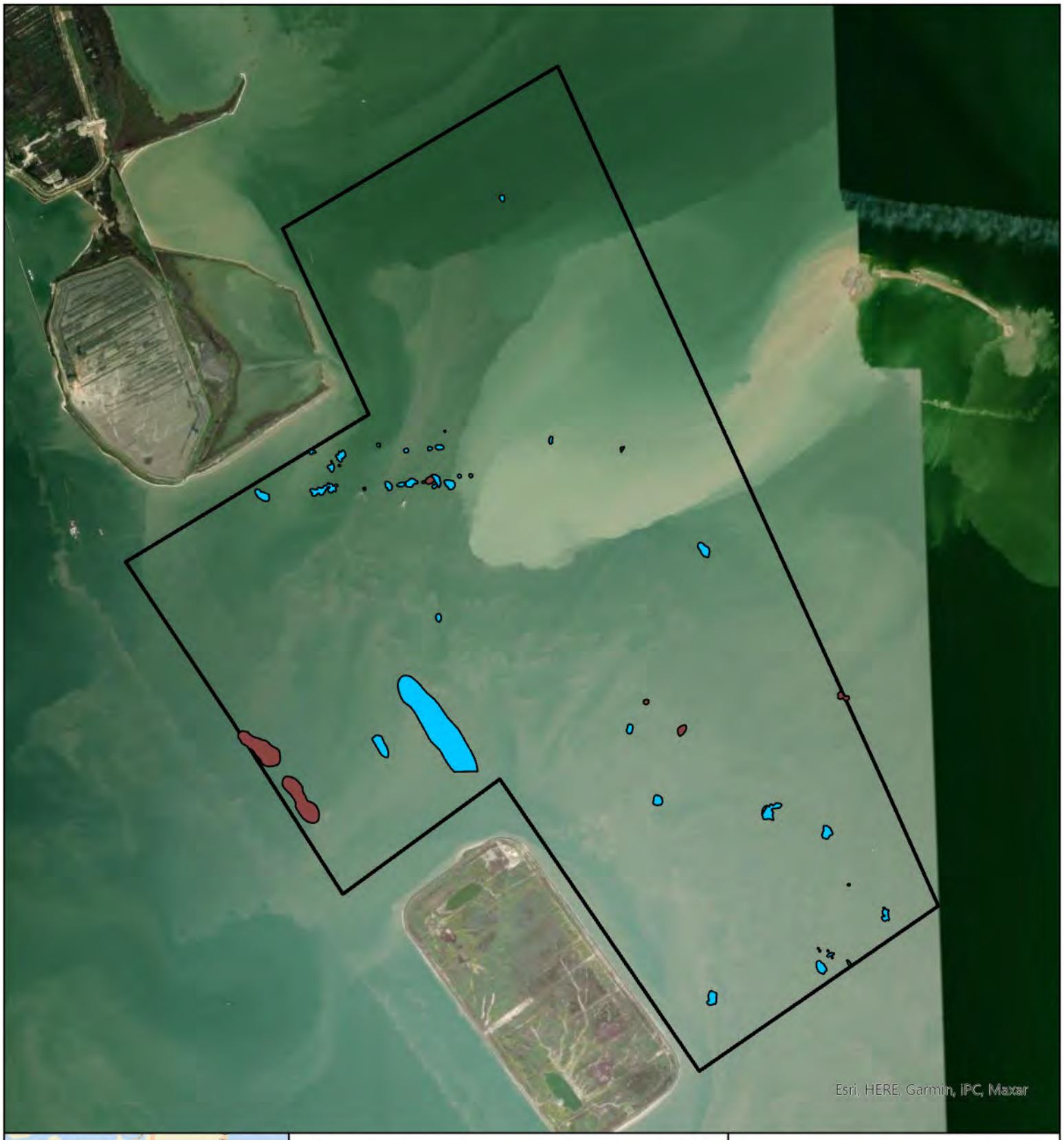
0 500 1,000 2,000 Feet

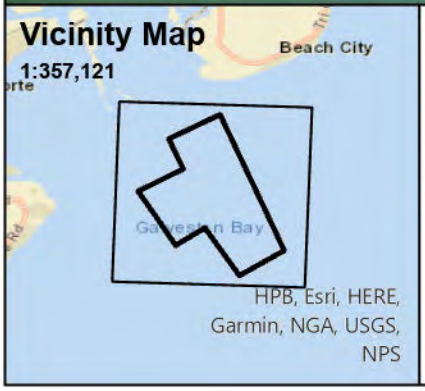
Figure 4:
Hard & Soft Bottom Sampling Locations

Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LLOYD ENGINEERING, INC.





Legend

- BABUS Survey Area
- Brown Habitat (23.893 acres)
- Viable Oyster Habitat/VOH (64.305 acres)

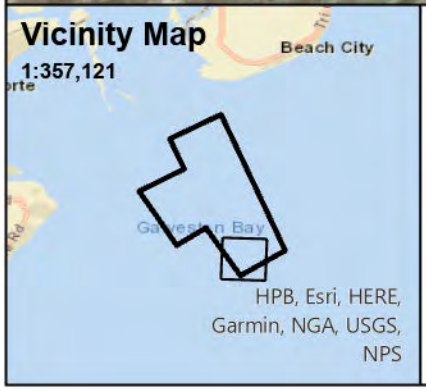
N

0 1,250 2,500 5,000 Feet

Figure 5:
Final Habitat Classification Map
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.



Legend

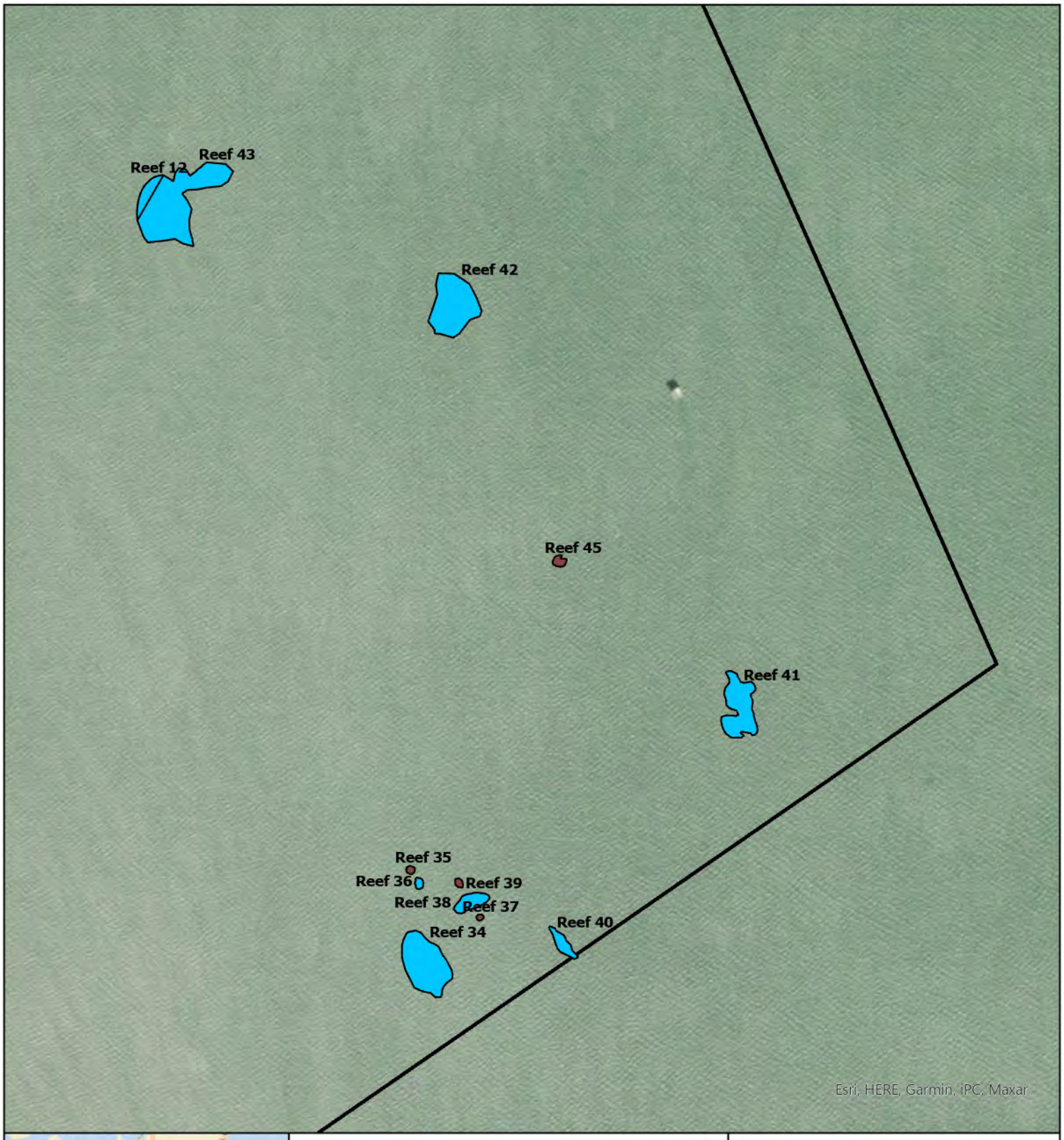
- BABUS Survey Area
- Brown Habitat
- Viable Oyster Habitat/VOH

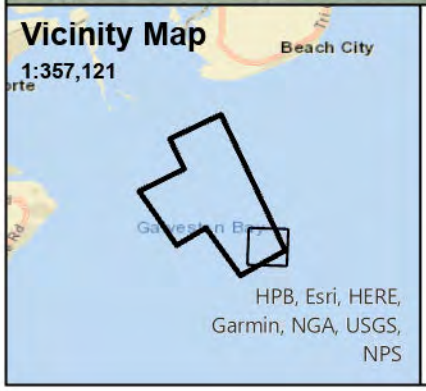
N

0 300 600 1,200 Feet

Figure 5:
Final Habitat Classification Map
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	LLOYD ENGINEERING, INC.
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	





Legend

- BABUS Survey Area
- Brown Habitat
- Viable Oyster Habitat/VOH

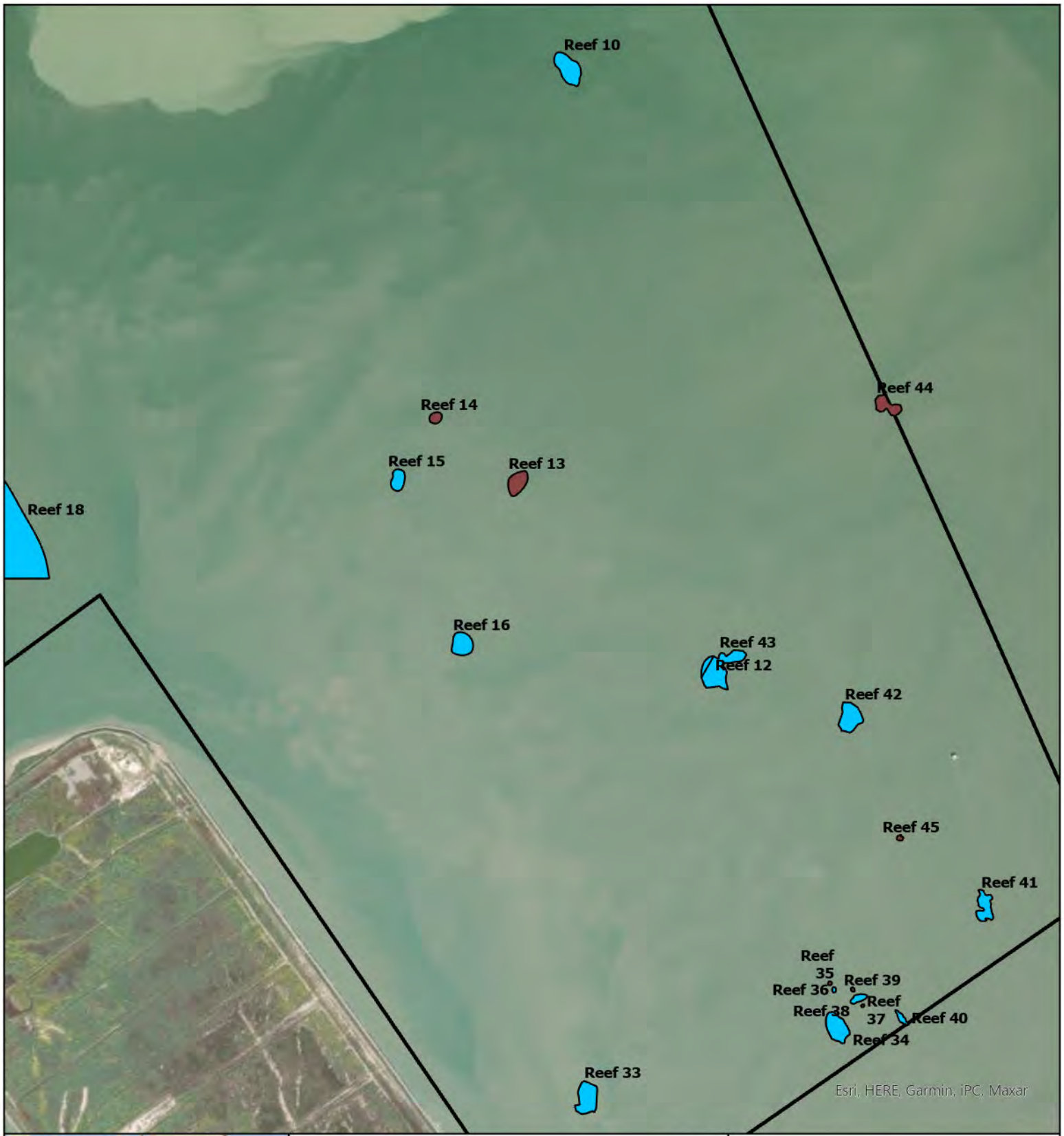
N

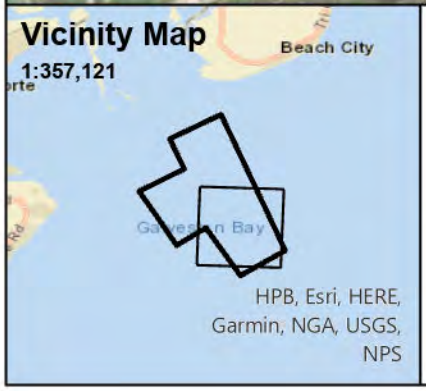
0 265 530 1,060 Feet

Figure 5:
Final Habitat Classification Map
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.





Legend

- BABUS Survey Area
- Brown Habitat
- Viable Oyster Habitat/VOH

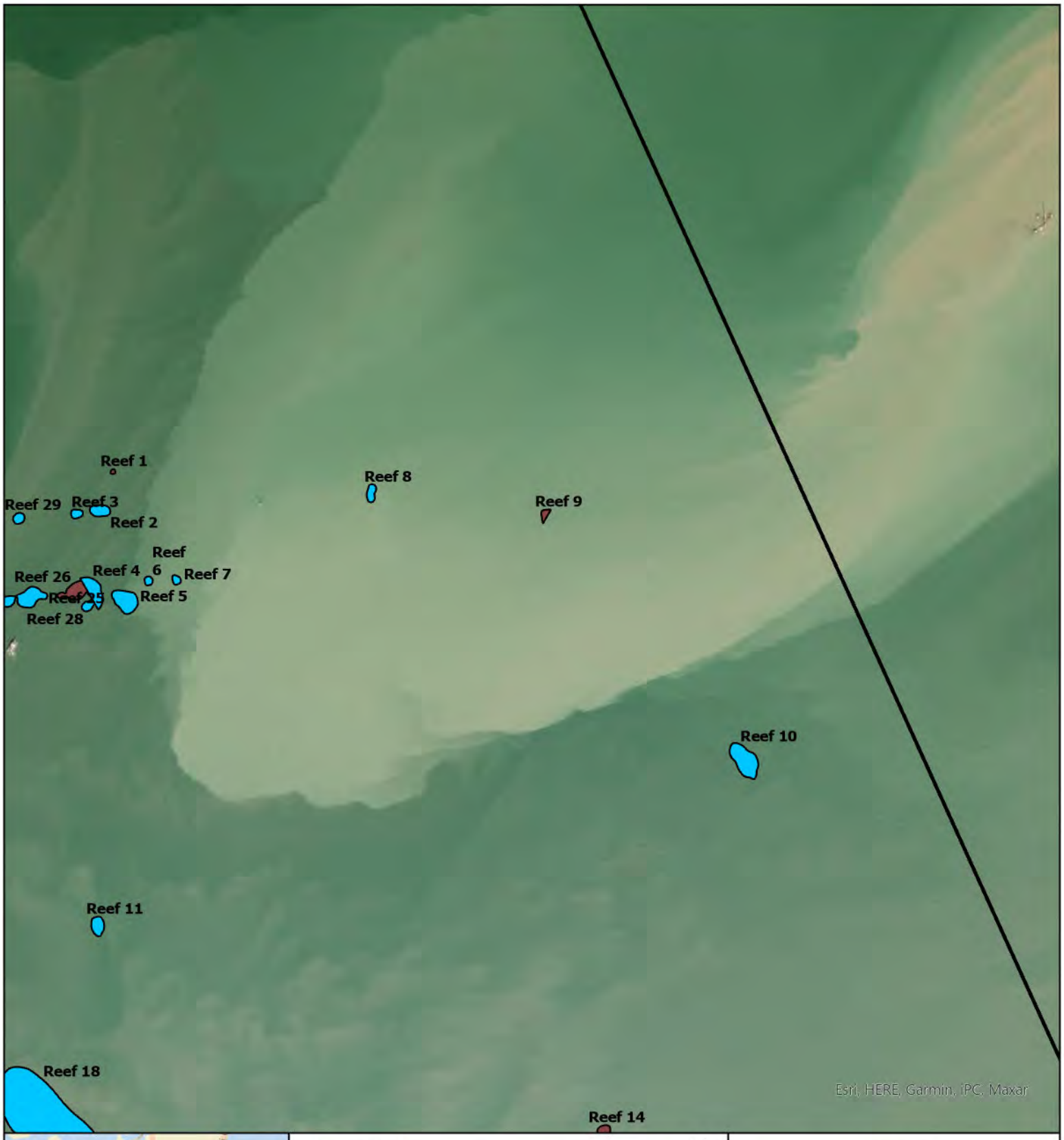
N

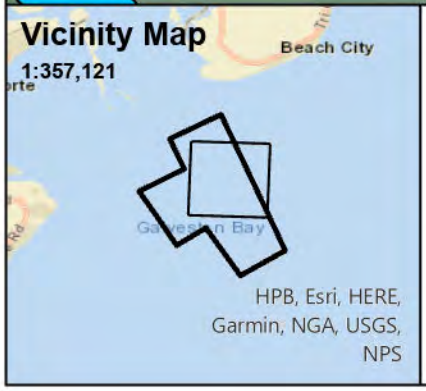
0 500 1,000 2,000 Feet

Figure 5:
Final Habitat Classification Map
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.





Legend

- BABUS Survey Area
- Brown Habitat
- Viable Oyster Habitat/VOH

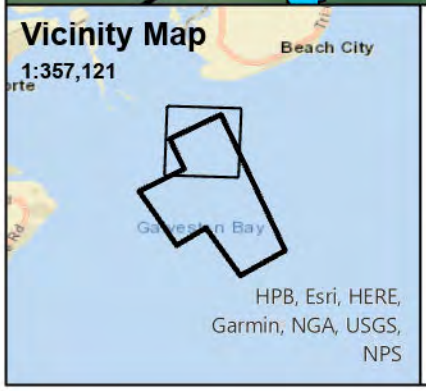
N

0 500 1,000 2,000 Feet

Figure 5:
Final Habitat Classification Map
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.



Legend

- BABUS Survey Area
- Brown Habitat
- Viable Oyster Habitat/VOH

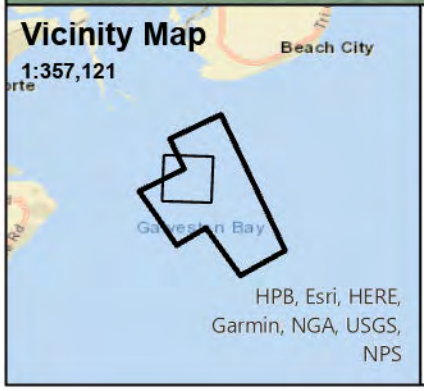
N

0 500 1,000 2,000 Feet

Figure 5:
Final Habitat Classification Map
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LOYD ENGINEERING, INC.



Legend

- BABUS Survey Area
- Brown Habitat
- Viable Oyster Habitat/VOH

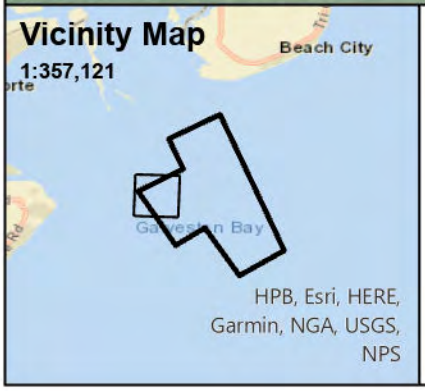
N

0 330 660 1,320 Feet

Figure 5:
Final Habitat Classification Map
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LLOYD ENGINEERING, INC.



Legend

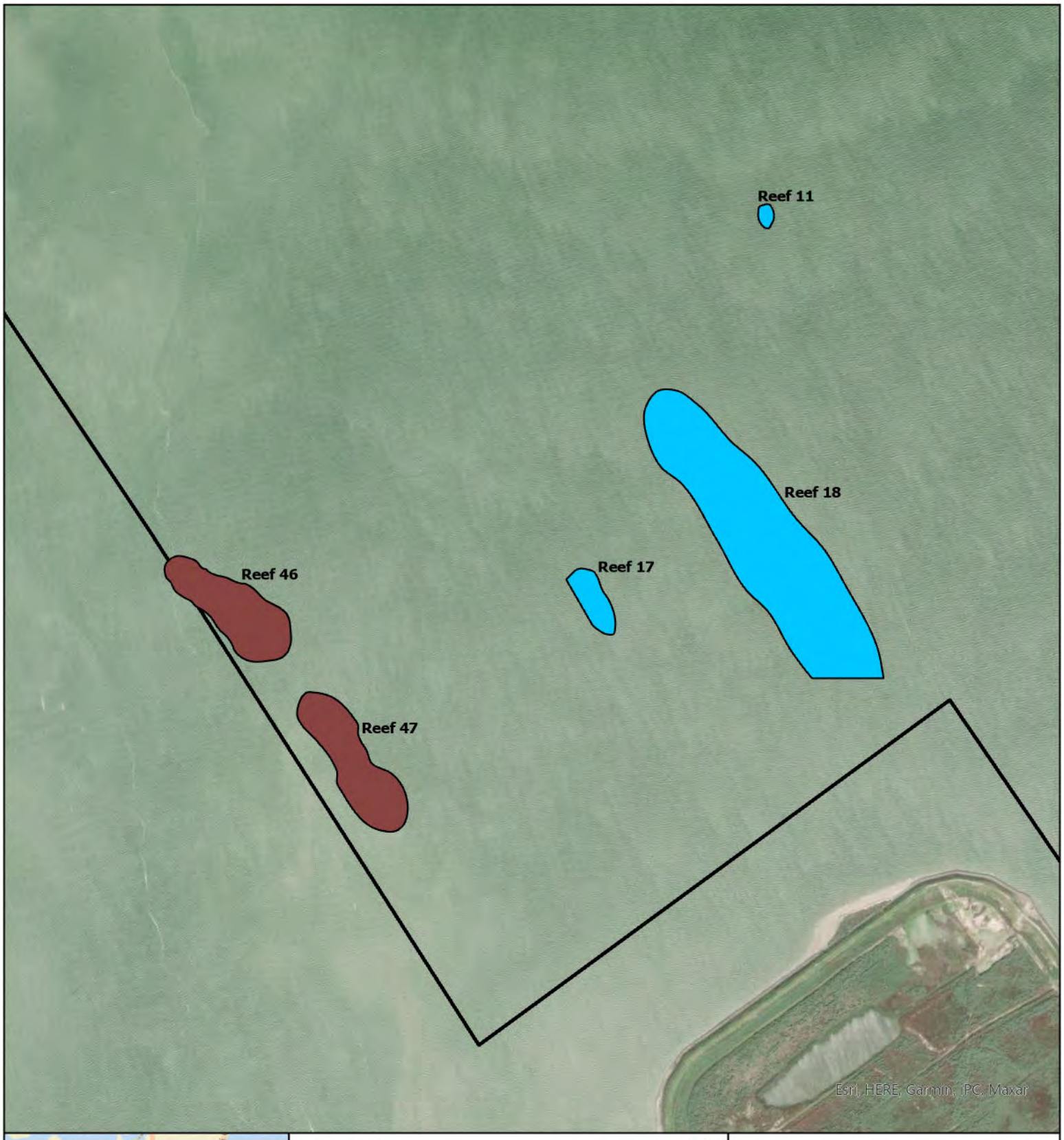
- BABUS Survey Area
- Brown Habitat
- Viable Oyster Habitat/VOH

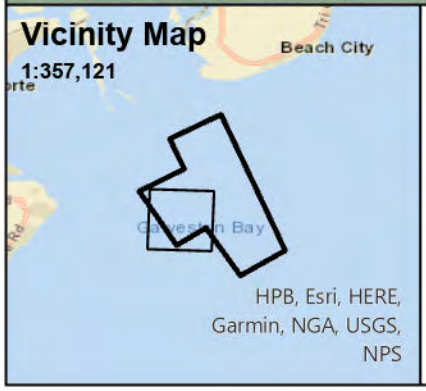
N

0 300 600 1,200 Feet

Figure 5:
Final Habitat Classification Map
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	LLOYD ENGINEERING, INC.
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	





Legend

- BABUS Survey Area
- Brown Habitat
- Viable Oyster Habitat/VOH

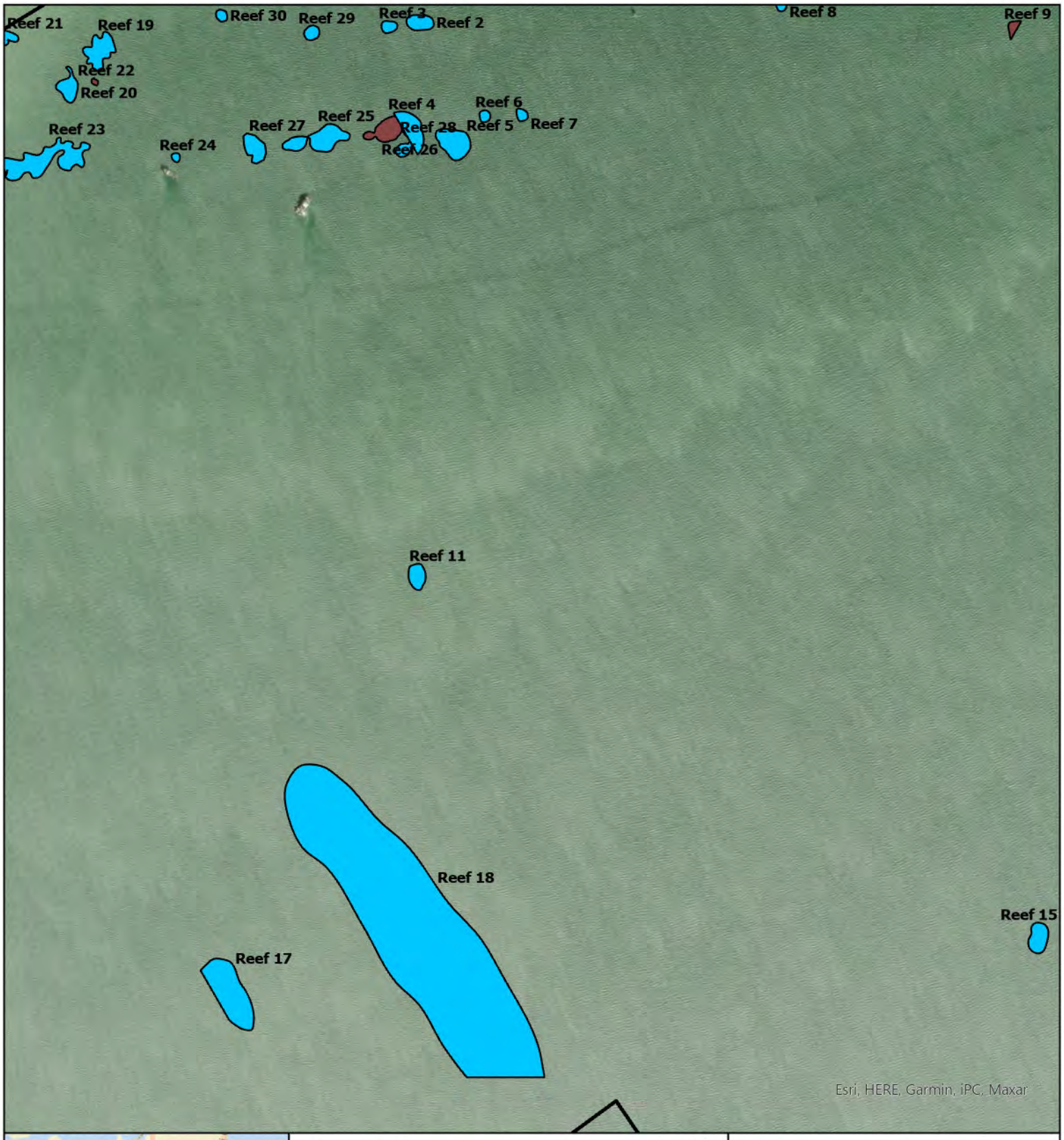
N

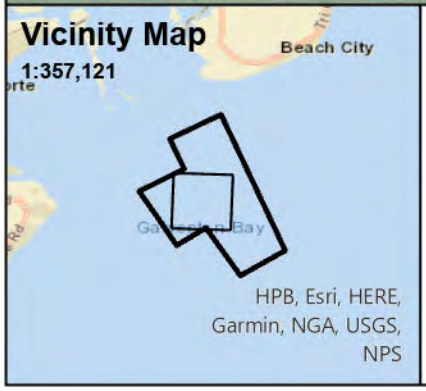
0 430 860 1,720 Feet

Figure 5:
Final Habitat Classification Map
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LLOYD ENGINEERING, INC.





Legend

- BABUS Survey Area
- Brown Habitat
- Viable Oyster Habitat/VOH

N

0 400 800 1,600 Feet

Figure 5:
Final Habitat Classification Map
Bay Aquatic Beneficial Use Site (BABUS)
USACE
Galveston Bay, Texas

Date: Jan 08, 2025	
Prepared By: DJM	
Prepared For: USACE	
Project: BABUS	

LLOYD ENGINEERING, INC.

Appendix B

Oyster Habitat Tables

Table 1
Acreage of SSS Anomalies Identified Within the BABUS Survey Area

Identified SSS Anomalies (Suspected Hard Bottom)	Reef Characterization After Field Verification	Acreage
HB-01	Mud	0.484
HB-02	Mud	1.045
HB-03	Scattered Shell (Brown)	0.203
HB-04	Consolidated Shell (VOH)	0.043
HB-05	Consolidated Shell (VOH)	0.203
HB-06	Consolidated Shell (VOH)	0.847
HB-07	Consolidated Shell (VOH)	1.03
HB-08	Consolidated Shell (VOH)	0.137
HB-09	Consolidated Shell (VOH)	0.148
HB-10	Consolidated Shell (VOH)	0.299
HB-11	Scattered Shell (Brown)	0.16
HB-12	Mud	1.199
HB-13	Consolidated Shell (VOH)	1.5
HB-14	Mud	1.046
HB-15	Consolidated Shell (VOH)	0.464
HB-16	Mud	0.942
HB-17	Mud	0.963
HB-18	Consolidated Shell (VOH)	0.235
HB-19	Scattered Shell (Brown)	0.914
HB-20	Scattered Shell (Brown)	0.296
HB-21	Consolidated Shell (VOH)	0.627
HB-22	Consolidated Shell (VOH)	1.049
HB-23	Consolidated Shell (VOH)	2.683
HB-24	Consolidated Shell (VOH)	38.946
HB-25	Consolidated Shell (VOH)	0.937
HB-26	Consolidated Shell (VOH)	0.542
HB-27	Consolidated Shell (VOH)	0.296
HB-28	Scattered Shell (Brown)	0.043
HB-29	Consolidated Shell (VOH)	2.22
HB-30	Oil Well	0.501
HB-31	Consolidated Shell (VOH)	0.08
HB-32	Consolidated Shell (VOH)	1.289
HB-33	Scattered Shell (Brown)	0.944
HB-34	Mud	0.116
HB-35	Mud	0.113
HB-36	Mud	0.114
HB-37	Consolidated Shell (VOH)	0.605
HB-38	Consolidated Shell (VOH)	0.37
HB-39	Consolidated Shell (VOH)	0.232
HB-40	Consolidated Shell (VOH)	0.14
HB-41	Consolidated Shell (VOH)	1.419
HB-42	Consolidated Shell (VOH)	0.352
HB-43	Mud	1.301
HB-44	Mud	0.069
HB-45	Mud	0.104
HB-46	Mud	0.043
HB-47	Consolidated Shell (VOH)	1.417
HB-48	Consolidated Shell (VOH)	1.284
HB-49	Scattered Shell (Brown)	0.032
HB-50	Consolidated Shell (VOH)	0.044
HB-51	Scattered Shell (Brown)	0.02
HB-52	Consolidated Shell (VOH)	0.262
HB-53	Scattered Shell (Brown)	0.034
HB-54	Consolidated Shell (VOH)	0.195

Table 1

Acreage of SSS Anomalies Identified Within the BABUS Survey Area

HB-55	Consolidated Shell (VOH)	0.927
HB-56	Consolidated Shell (VOH)	1.33
HB-57	Consolidated Shell (VOH)	2.153
HB-58	Scattered Shell (Brown)	0.794
HB-59	Mud	1.906
HB-60	Mud	0.235
HB-61	Mud	0.284
HB-62	Mud	0.169
HB-63	Mud	0.083
HB-64	Mud	0.056
HB-65	Scattered Shell (Brown)	0.067
HB-66 (SB-17)	Scattered Shell (Brown)	10.046
HB-67 (SB-19)	Scattered Shell (Brown)	10.34
Scattered Shell/Brown Habitat (acres)		**23.893**
Consolidated Shell/VOH (acres)		**64.305**
TOTAL OYSTER REEF (acres)		**88.198**

Table 2
Acreage of Oyster Resources Identified Within the BABUS Survey Area

Identified Oyster Reefs	Habitat-ID	Reef Characterization	Acreage
Reef 1	HB-03	Scattered Shell (Brown)	0.043
Reef 2	HB-04	Consolidated Shell (VOH)	0.459
Reef 3	HB-05	Consolidated Shell (VOH)	0.203
Reef 4	HB-06	Consolidated Shell (VOH)	0.847
Reef 5	HB-07	Consolidated Shell (VOH)	1.03
Reef 6	HB-08	Consolidated Shell (VOH)	0.137
Reef 7	HB-09	Consolidated Shell (VOH)	0.148
Reef 8	HB-10	Consolidated Shell (VOH)	0.299
Reef 9	HB-11	Scattered Shell (Brown)	0.16
Reef 10	HB-13	Consolidated Shell (VOH)	1.5
Reef 11	HB-15	Consolidated Shell (VOH)	0.464
Reef 12	HB-18	Consolidated Shell (VOH)	0.235
Reef 13	HB-19	Scattered Shell (Brown)	0.914
Reef 14	HB-20	Scattered Shell (Brown)	0.296
Reef 15	HB-21	Consolidated Shell (VOH)	0.627
Reef 16	HB-22	Consolidated Shell (VOH)	1.049
Reef 17	HB-23	Consolidated Shell (VOH)	2.683
Reef 18	HB-24	Consolidated Shell (VOH)	38.946
Reef 19	HB-25	Consolidated Shell (VOH)	0.937
Reef 20	HB-26	Consolidated Shell (VOH)	0.542
Reef 21	HB-27	Consolidated Shell (VOH)	0.296
Reef 22	HB-28	Scattered Shell (Brown)	0.043
Reef 23	HB-29	Consolidated Shell (VOH)	2.22
Reef 24	HB-31	Consolidated Shell (VOH)	0.08
Reef 25	HB-32	Consolidated Shell (VOH)	1.289
Reef 26	HB-33	Scattered Shell (Brown)	0.944
Reef 27	HB-37	Consolidated Shell (VOH)	0.605
Reef 28	HB-38	Consolidated Shell (VOH)	0.37
Reef 29	HB-39	Consolidated Shell (VOH)	0.232
Reef 30	HB-40	Consolidated Shell (VOH)	0.14
Reef 31	HB-41	Consolidated Shell (VOH)	1.419
Reef 32	HB-42	Consolidated Shell (VOH)	0.352
Reef 33	HB-47	Consolidated Shell (VOH)	1.417
Reef 34	HB-48	Consolidated Shell (VOH)	1.284
Reef 35	HB-49	Scattered Shell (Brown)	0.032
Reef 36	HB-50	Consolidated Shell (VOH)	0.044
Reef 37	HB-51	Scattered Shell (Brown)	0.02
Reef 38	HB-52	Consolidated Shell (VOH)	0.262
Reef 39	HB-53	Scattered Shell (Brown)	0.034
Reef 40	HB-54	Consolidated Shell (VOH)	0.195
Reef 41	HB-55	Consolidated Shell (VOH)	0.927
Reef 42	HB-56	Consolidated Shell (VOH)	1.33
Reef 43	HB-57	Consolidated Shell (VOH)	2.153
Reef 44	HB-58	Scattered Shell (Brown)	0.794
Reef 45	HB-65	Scattered Shell (Brown)	0.067
Reef 46	HB-66 (SB-17)	Scattered Shell (Brown)	10.046
Reef 47	HB-67 (SB-19)	Scattered Shell (Brown)	10.34
Scattered Shell/Brown Habitat (acres)			**23.893**
Consolidated Shell/VOH (acres)			**64.305**
Mean Scattered/Brown Reef Size (acres)			**1.826**
Mean Consolidated/VOH Reef Size (acres)			**1.904**

Table 3

Catch-per-Unit-Effort of Live Oysters Collected in Dredge Tows Within the BABUS Survey Area

Dredge Tow No.	Reef ID	Grab Type	Transect Length (ft)	Total Live Oyster	Total Dead Oyster	CPUE
DT-01	Reef 1	Dredge	120	0	4	0.0000
DT-02	Reef 2	Dredge	244.44	3	0	0.0115
DT-03	Reef 3	Dredge	151.05	7	32	0.0435
DT-04	Reef 4	Dredge	367.26	6	14	0.0153
DT-05	Reef 5	Dredge	335.22	6	11	0.0168
DT-06	Reef 6,7	Dredge	433.03	2	15	0.0043
DT-07	Reef 8	Dredge	235.77	9	20	0.0358
DT-08	Reef 9	Dredge	180.93	0	4	0.0000
DT-09	Reef 9	Dredge	222.63	0	0	0.0000
DT-10	Reef 9	Dredge	208.17	0	4	0.0000
DT-11	Reef 10	Dredge	473.83	0	0	0.0000
DT-12	Reef 10	Dredge	418.16	4	12	0.0090
DT-13	Reef 11	Dredge	221.79	14	36	0.0592
DT-14	Reef 12	Dredge	283.55	7	9	0.0231
DT-15	Reef 13	Dredge	343.72	1	9	0.0027
DT-16	Reef 14	Dredge	156.04	0	0	0.0000
DT-17	Reef 15	Dredge	246.19	1	0	0.0038
DT-18	Reef 15	Dredge	264.24	14	20	0.0497
DT-19	Reef 16	Dredge	283.71	9	20	0.0297
DT-20	Reef 17	Dredge	273.74	3	14	0.0103
DT-21	Reef 17	Dredge	246.34	18	85	0.0685
DT-22	Reef 18	Dredge	548.26	11	27	0.0188
DT-23	Reef 18	Dredge	622.62	17	35	0.0256
DT-24	Reef 18	Dredge	712.06	25	45	0.0329
DT-25	Reef 18	Dredge	665.24	36	62	0.0507
DT-26	Reef 18	Dredge	702.47	14	49	0.0187
DT-27	Reef 19	Dredge	267.76	7	22	0.0245
DT-28	Reef 20	Dredge	145.98	19	16	0.1220
DT-29	Reef 21	Dredge	191.28	7	32	0.0343
DT-30	Reef 22	Dredge	81.04	0	5	0.0000
DT-31	Reef 23	Dredge	332.48	24	110	0.0677
DT-32	Reef 23	Dredge	163.49	0	3	0.0000
DT-33	Reef 24	Dredge	94.92	32	27	0.3161
DT-34	Reef 25	Dredge	398.94	33	57	0.0776
DT-35	Reef 26	Dredge	260.44	5	7	0.0180
DT-36	Reef 27	Dredge	226.46	17	17	0.0704
DT-37	Reef 28	Dredge	205.74	15	15	0.0684
DT-38	Reef 29	Dredge	144.49	22	57	0.1428
DT-39	Reef 30	Dredge	109.20	18	39	0.1546
DT-40	Reef 31	Dredge	377.04	24	80	0.0597
DT-41	Reef 32	Dredge	162.50	28	40	0.1616
DT-42	Reef 33	Dredge	324.44	17	86	0.0491
DT-43	Reef 34	Dredge	357.62	0	17	0.0000
DT-44	Reef 35	Dredge	74.95	0	11	0.0000
DT-45	Reef 36	Dredge	106.65	5	17	0.0440
DT-46	Reef 37	Dredge	88.88	3	16	0.0316
DT-47	Reef 38	Dredge	248.47	15	39	0.0566
DT-48	Reef 39	Dredge	93.91	9	12	0.0899
DT-49	Reef 40	Dredge	226.76	31	18	0.1282
DT-50	Reef 41	Dredge	344.16	15	31	0.0409
DT-51	Reef 42	Dredge	354.06	16	31	0.0424
DT-52	Reef 43	Dredge	422.63	20	45	0.0444
DT-53	Reef 43	Dredge	343.12	50	48	0.1366
DT-54	Reef 44	Dredge	303.61	2	5	0.0062
DT-55	Reef 45	Dredge	103.01	10	12	0.0910
DT-56	Reef 46	Dredge	531.41	0	0	0.0000
DT-57	Reef 46	Dredge	505.75	20	8	0.0371
DT-58	Reef 47	Dredge	336.02	26	40	0.0726
Total Live Oyster				**697**		
Total Dead Oyster				**1490**		
MEAN CPUE				**0.0469**		

Appendix C

Photo Log

Oyster Resources Survey
Bay Aquatic Beneficial Use Sites
Site Photographs

Photo 1: Viable Oyster Habitat found in HB-04.

Photo 2: Viable Oyster Habitat found in HB-05.

LLOYD ENGINEERING, INC.

Photo 3: Viable Oyster Habitat found in HB-06.

Photo 4: Viable Oyster Habitat found in HB-07.

Photo 5: Viable Oyster Habitat found in HB-08 & HB-09.

Photo 6: Viable Oyster Habitat found in HB-10.

Photo 7: Viable Oyster Habitat found in HB-13.

Photo 8: Viable Oyster Habitat found in HB-15.

Photo 9: Viable Oyster Habitat found in HB-18.

Photo 10: Viable Oyster Habitat found in HB-21.

Photo 11: Viable Oyster Habitat found in HB-22.

Photo 12: Viable Oyster Habitat found in HB-23.

Photo 13: Viable Oyster Habitat found in HB-24. 1 of 4 buckets filled after multiple dredges at location.

Photo 14: Viable Oyster Habitat found in HB-25.

Photo 15: Viable Oyster Habitat found in HB-26.

Photo 16: Viable Oyster Habitat found in HB-27.

Photo 17: Viable Oyster Habitat found in HB-29.

Photo 18: Viable Oyster Habitat found in HB-31.

Photo 19: Viable Oyster Habitat found in HB-32.

Photo 20: Viable Oyster Habitat found in HB-37.

Photo 21: Viable Oyster Habitat found in HB-38.

Photo 22: Viable Oyster Habitat found in HB-39.

Photo 23: Viable Oyster Habitat found in HB-40.

Photo 24: Viable Oyster Habitat found in HB-41.

Photo 25: Viable Oyster Habitat found in HB-42.

Photo 26: Viable Oyster Habitat found in HB-47.

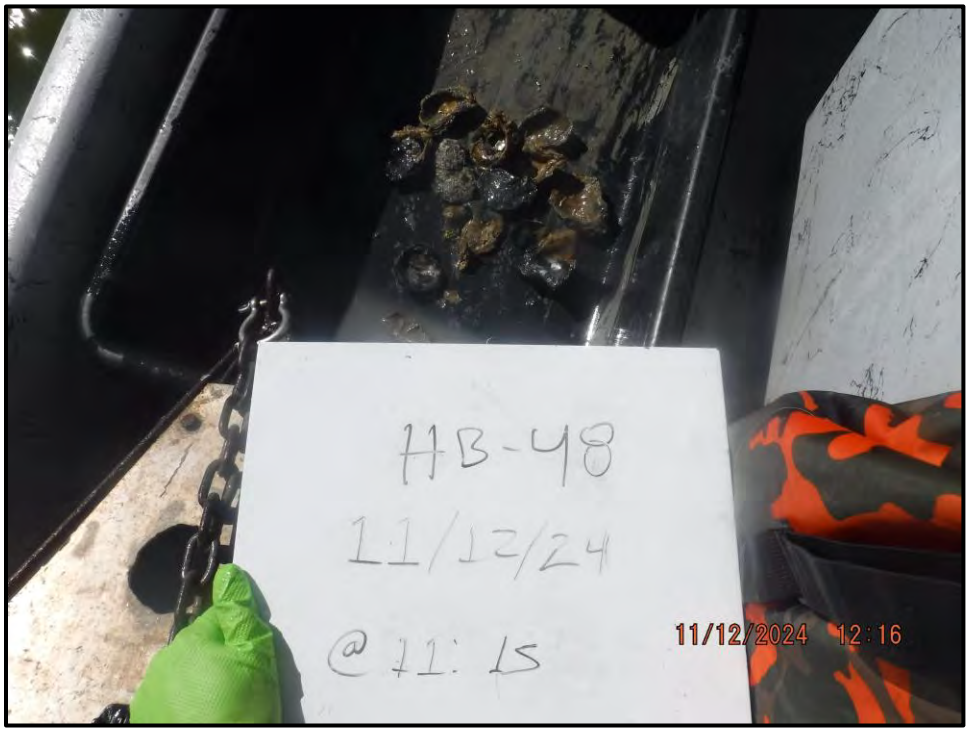


Photo 27: Viable Oyster Habitat found in HB-48.

Photo 28: Viable Oyster Habitat found in HB-50.

Photo 29: Viable Oyster Habitat found in HB-52.

Photo 30: Viable Oyster Habitat found in HB-55.

Photo 31: Viable Oyster Habitat found in HB-56.

Photo 32: Viable Oyster Habitat found in HB-57.

Photo 33: Viable Oyster Habitat found in HB-54.

Photo 34: Brown Oyster Habitat (scattered shell) found in HB-03.

Photo 35: Brown Oyster Habitat (scattered shell) found in HB-11.

Photo 36: Brown Oyster Habitat (scattered shell) found in HB-19.

Photo 37: Aluminum pole detected clear hardbottom substrate in HB-20, with ponar only grabbing mud with shell hash. Classified as Brown Oyster Habitat (scattered shell).

Photo 38: Brown Oyster Habitat (scattered shell) found in HB-28.

Photo 39: Brown Oyster Habitat (scattered shell) found in HB-33.

Photo 40: Brown Oyster Habitat (scattered shell) found in HB-49.

Photo 41: Brown Oyster Habitat (scattered shell) found in HB-51.

Photo 42: Brown Oyster Habitat (scattered shell) found in HB-53.

Photo 43: Brown Oyster Habitat (scattered shell) found in HB-58.

Photo 44: Brown Oyster Habitat (scattered shell) found in HB-65.

Photo 45: Brown Oyster Habitat (scattered shell) found in an originally suspected soft-bottom location, SB-17. Renamed HB-66 in Appendix B.

Photo 46: Brown Oyster Habitat (scattered shell) found in an originally suspected soft-bottom location, SB-19. Renamed HB-67 in Appendix B.

Photo 47: Mud found in an originally suspected hard-bottom location, HB-01.

Photo 48: Mud found in an originally suspected hard-bottom location, HB-02.

Photo 49: Mud found in an originally suspected hard-bottom location, HB-12.

Photo 50: Mud found in an originally suspected hard-bottom location, HB-14.

Photo 51: Mud found in an originally suspected hard-bottom location, HB-16.

Photo 52: Mud found in an originally suspected hard-bottom location, HB-17.

Photo 53: Mud found in an originally suspected hard-bottom location, HB-34.

Photo 54: Mud found in an originally suspected hard-bottom location, HB-35.

Photo 55: Mud found in an originally suspected hard-bottom location, HB-36.

Photo 56: Mud found in an originally suspected hard-bottom location, HB-43.

Photo 57: Mud found in an originally suspected hard-bottom location, HB-45.

Photo 58: Mud found in an originally suspected hard-bottom location, HB-46.

Photo 59: Mud found in an originally suspected hard-bottom location, HB-59.

Photo 60: Mud found in an originally suspected hard-bottom location, HB-60.

Photo 61: Mud found in an originally suspected hard-bottom location, HB-61.

Photo 62: Mud found in an originally suspected hard-bottom location, HB-62.

Photo 63: Mud found in an originally suspected hard-bottom location, HB-63.

Photo 64: Mud found in an originally suspected hard-bottom location, HB-64.

Photo 65: Originally suspected hard-bottom location, HB-30, over abandoned oil well structures.

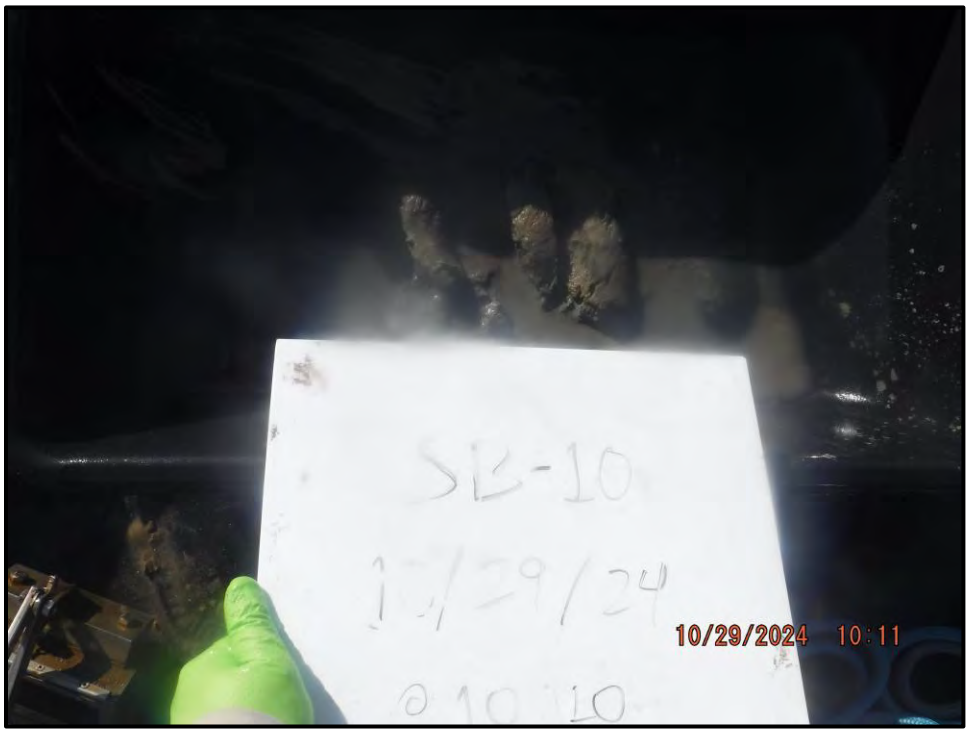


Photo 66: Silty clay found in SB-22. Reference Appendix A, Figure 4 for location of all soft-bottom ponar drops across the BABUS Survey Area.

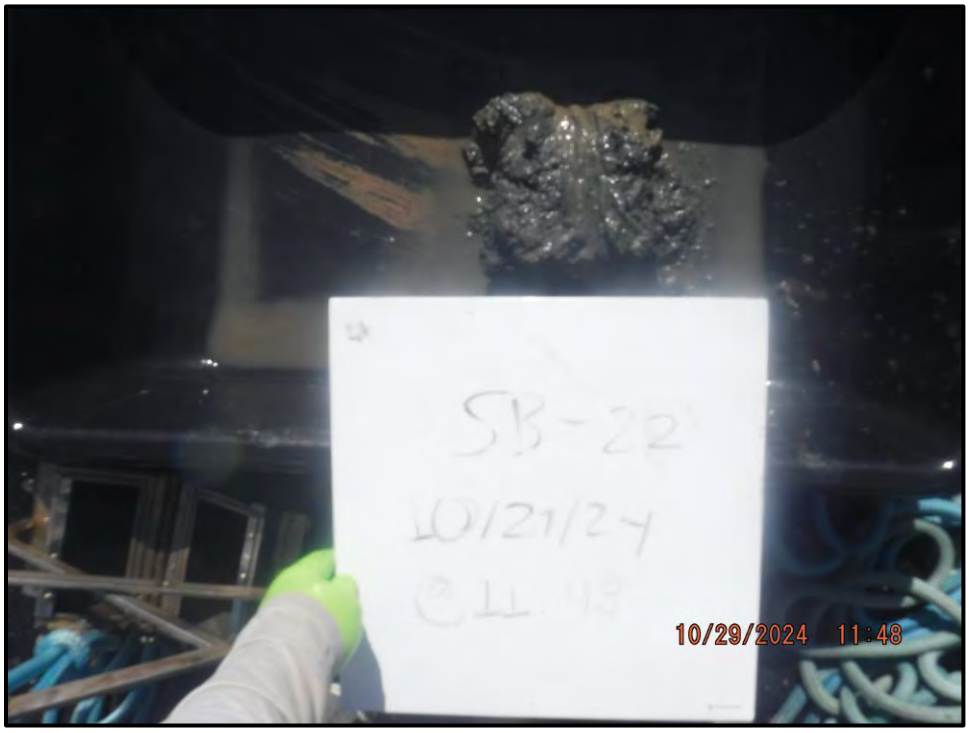


Photo 67: Silty clay with shell hash found in SB-22. Reference Appendix A, Figure 4 for location of all soft-bottom ponar drops across the BABUS Survey Area.

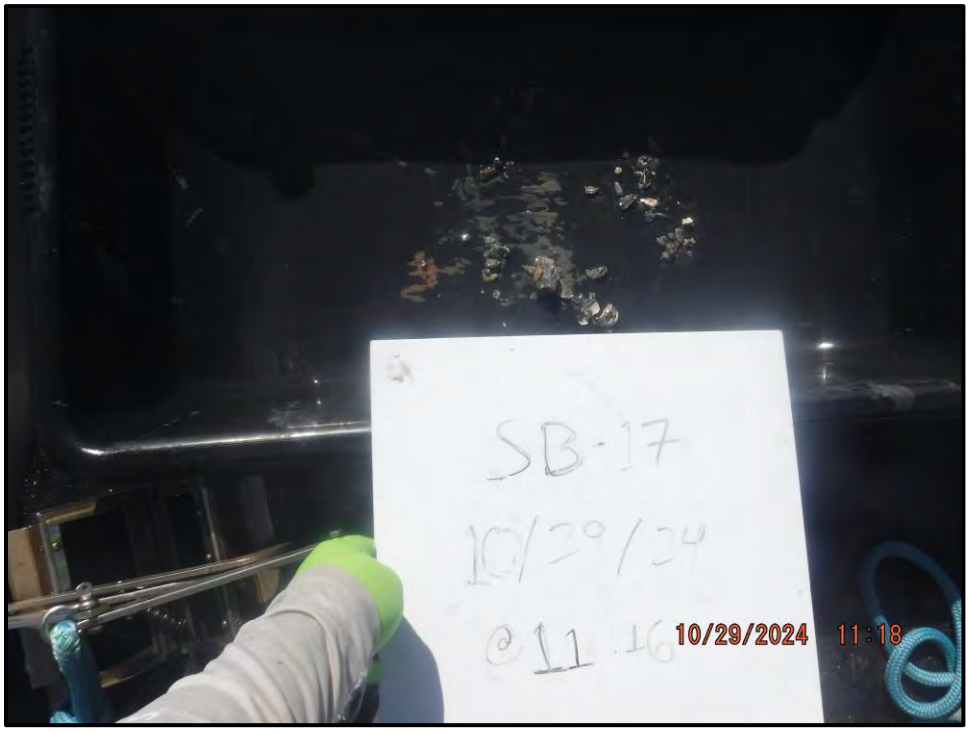


Photo 68: Buried shell fragments found in an originally suspected soft-bottom location, SB-17. Refer to Photo 45 above for the reclassified Brown Oyster Habitat (HB-66).

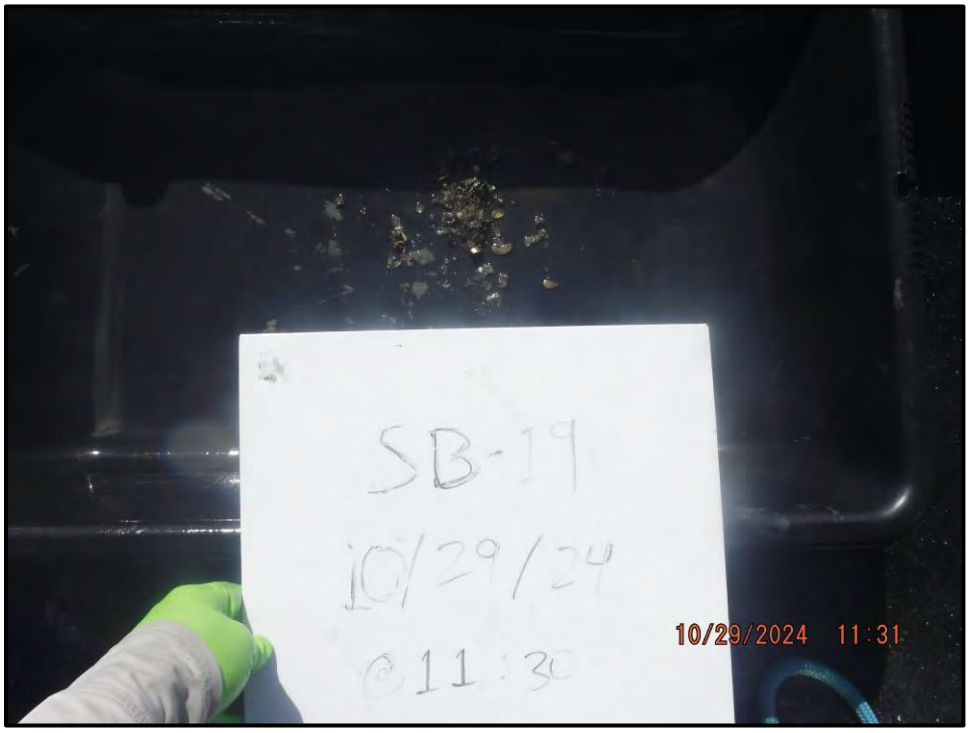


Photo 69: Buried shell fragments found in an originally suspected soft-bottom location, SB-19. Refer to Photo 46 above for the reclassified Brown Oyster Habitat (HB-67).

Appendix D

Field Data Sheets

BABUS: Oyster Survey

HB1) no hard bottom felt w/ sounding pole 09[illegible]05
- confirmed soft bottom w/ poner
- photo 001 - poner grab

SB1) poner grab confirmed soft bottom 0955
- photo 002 - poner grab

HB2) no hard bottom felt w/ sounding pole 0922
- confirmed soft bottom w/ poner
- photos 3, 4, 5 - 3 poner grabs

SB2) poner grab confirmed soft bottom 0932
- photo 6 - poner sample

HB3) confirmed hard bottom
- possible buried shell 0935
- dredge to confirm
- collected 4 market-size oysters (buried shell)
- photo 7

HB4) confirmed hard bottom - possible scattered shell 0946
HB5) - dredge to confirm Market
- HB5 dredge - approx 25 oyster shell halves & boxes
- photo 8
- HB4 dredge - 39 market sized oyster shells total & buried & alive
- photo 9 - 7 possible live oysters w/ live barnacles & hooked mussels & polychaets

Scale: 1 square = _____

HB36) possible scattered shell confirmed
- dredge to confirm
- 6 live oysters, 80 total live & dead - photo 18
- live barnacles & hooked mussels

HB37) assumed hard bottom - no poling
- dredge to confirm
- 6 potentially live oysters; 15 total live & dead - photo 11
- live crabs, barnacles, & hooked mussels

HB 828) assumed hard bottom - no poling conducted
- dredge to confirm - possible scattered shell
- 17 total shell halves, boxes, possibly 2 live organisms
- photo 12

HB10) poling confirmed hard bottom
- dredge to characterize - photo 13
- 29 total - market sized
- 9 possible live oysters, live barnacles & hooked mussels

HB11) poling confirmed hard bottom; consolidated
- dredge to characterize - photo 14
- Drag 1 - 4 dead shell halves, 2 large compressed sand chips
- photo 14
- Drag 2 - empty
- Drag 3 - 4 dead shells w/ mud
- possible compacted sand or substrate too fine for oyster basket

Scale: 1 square = _____

Rite in the Rain

SB3) ponar grab confirmed soft bottom - gray silt w/ some shell trash
- photo 15

HB12) no hard bottom felt w/ sounding pole
→ ponar grabs to confirm soft bottom
- grab 1 - soft silt : photo 16
- grab 2 - soft silt photo 17
- grab 3 - soft silt photo 18

HB13) confirmed hard bottom w/ sounding pole, potentially scattered
- dredge to confirm
- drag 1 - 2 Market shell halves - photo 19
- drag 2 - 116 total (halves & live), 4 potentially live oysters
- photo 20

SB14) ponar grab confirmed soft bottom - brown & gray silt
- photo 21

HB14) no hard bottom felt w/ sounding pole
→ ponar grabs to confirm soft bottom
- grab 1 - soft silt - photo 22
- grab 2 - soft silt - photo 23
- grab 3 - soft silt - photo 24

SB5) ponar grab confirmed soft bottom - brown & gray silt
- photo 25

HB15) sounding pole confirmed hard bottom
- dredge to confirm
- partially buried shell, 50 total, 14 alive oysters
- photo 26

Scale: 1 square = _____

SB6) ponar confirmed soft bottom - brown & gray silt
- photo 27

HB16) no hard bottom felt w/ sounding pole
- ponar grab to confirm soft bottom
- grab 1 ; small volume of soft gray silt ; photo 28
- grab 2 - soft brown & gray silt w/ sparse shell hash, photo 29
- grab 3 - soft brown & gray silt, photo 30

SB7) ponar confirmed soft bottom - brown & gray silt
- photo 31

SB8) ponar confirmed soft bottom - brown & gray silt
- photo 32

HB17) no hard bottom felt w/ sounding pole
- ponar grabs to confirm soft bottom
- grab 1 - soft gray & brown silt - photo 33
- grab 2 - soft gray & brown silt ; photo 34
- grab 3 - same as 2 ; photo 35

SB9) ponar confirmed soft bottom - brown & gray silt
- photo 36

HB18) sounding pole confirmed hard bottom
- dredge to confirm
- drag 1 - not buried, 16 total, 7 live oysters w/ barnacles
- photo 37

SB10) ponar confirmed soft bottom - brown & gray silt
- photo 38

Scale: 1 square = _____

Rite in the Rain

HB19) sounding pole confirmed hard bottom - possible scattered fine shell
- dredge to confirm ↑ partially buried
- drag 1 - 10 total, 1 live organism - photo 39

HB20) sounding pole confirmed hard bottom - possible scattered/buried shell
- dredge to confirm
- drag 1 - empty
- ponar grab 1 - soft gray & brown silt - photo 40

HB21) sounding pole confirmed hard bottom
- dredge to confirm
- drag 1 - 1 possibly live oyster - photo 41
- drag 2 - 34 total, 14 possibly live oysters w/ live barnacles & polychaetes; photo 42 (43?)

SB11) ponar confirmed soft bottom - brown & gray silt
- photo 44

HB22) sounding pole confirmed hard bottom - potentially scattered/buried
- drag 1 - 29 total; 9 live oysters - photo 45
- 1 live fish & 7 polychaete worms

SB12) ponar to confirm soft bottom - brown and gray sandy silt
- photo 46

HB23) sounding pole confirms hard bottom - potentially scattered/buried
- drags to confirm
- drag 1 - 17 total, 3 live oysters, 1 live crab; photo 47
- drag 2 - 103 total, 18 live oysters, live barnacles & hooked mussels
- live crabs, photo 48

Scale: 1 square = _____

HB24): assumed hard bottom
- dredge to confirm & hooked mussels. photo 49
- drag 1 - live barnacles, 38 total, 11 live oysters, all market
- drag 2 - 52 total, 17 live oysters, all market size
  - hooked mussels & barnacles: photo 50
- drag 3 - 1 perforated shell half (evidence of oyster drill?)
  70 total, 25 live oysters, all market size
  - hooked mussels & barnacles present + photo 51
- drag 4 - 1 live stone crab
  98 total, 96 live oysters, all market size
  + hooked mussels & barnacles present + photo 52
- drag 5 - 63 total, 14 live oysters, all market size
  - live barnacles & hooked mussels, photo 53

Scale: 1 square = _____

Rite in the Rain.

LLOYD ENGINEERING, INC.

OYSTER SURVEY DATA FORM

Project: BABUS
Loction:
Names: DANIEL MACKENZIE + TYLER ROBIN
Date: 10/29/24

Weather Conditions: Windy (10-15 SE)
Water Conditions: slightly choppy
Tide Conditions:

Station ID	Water Depth (ft)	Dredge, Probe or Grab	Time of Dredge (sec)	Length of Dredge (ft)	Substrate Compostion	Oyster Composition								Picture #
						% Live	% Dead	Number of Live Oysters by Size: Spat (<25mm) (<0.98")	Juvenile (26-50mm) (0.99-1.06")	Sub-Adult (51-75mm) (1.07-2.95")	Adult (>76mm) (>2.96")	Total Dead Oysters	Total Live Oysters	
SB1	10				silty clay w/shell hash									001
SB2	10				"		"							002
SB3	10				"		"							003
SB4	8				silty clay, no hash									004
SB5	9.5				silty clay w/shell hash									005
SB6	9.5				dark gray silt over light brown clay									006
SB11	7.5				brown sand w/shell hash									007
SB10	8.5				gray sandy clay									008
SB9	7.5				brown sand w/shell hash									009
SB8	6.5				"		"							010
SB12	7.5				sandy clay w/brown shell									011
SB13	10				gray silty clay w/buried shell									012
SB14	8.5				brown sand clay									013
SB7	7.5				brown silt over gray sandy clay									014
SB24	10.5				brown silt over gray silty clay w/hash									015
SB23	10.5				dark gray silty clay w/shell hash									016
SB16	10				brown silty sand w/shell hash									017
SB15	9.5				brown sand w/brown shell									018

OVERALL TOTALS	% Live	% Dead	Total Spat	Total Juvenile	Total Sub-Adult	Total Adult	Total Dead Oysters	Total Live Oysters

LLOYD ENGINEERING, INC.

OYSTER SURVEY DATA FORM

Project: BABUS
Loction:
Names: DANIEL MACKENZIE, TYLER KRENN
Date: 10/29/24

Weather Conditions: Windy (15-18 SE)
Water Conditions: Choppy
Tide Conditions:

Station ID	Water Depth (ft)	Dredge, Probe or Grab	Time of Dredge (sec)	Length of Dredge (ft)	Substrate Compostion	Oyster Composition								Picture #
						% Live	% Dead	Number of Live Oysters by Size: Spat (<25mm) (<0.98")	Juvenile (26-50mm) (0.99-1.06")	Sub-Adult (51-75mm) (1.07-2.95")	Adult (>76mm) (>2.96")	Total Dead Oysters	Total Live Oysters	
SB17	10				3 grabs, all shell									019
SB18	10.2				brown sand over gray silty clay w/buried shell									020
SB19	9.2		2 grabs		shell hash									021
SB21	12.5				gray silt over red-brown gravelly clay									022
SB20	10.5				gray silt w/buried shell over brown silty clay									023
SB22	11				gray silty clay									024
SB25	11				gray silty clay w/buried shell									025
SB29	12				brown silt over gray silty clay									029
SB26	11				"				"					026
SB27	11.5				"				"					028
SB28	12				"				"					029
SB30	12				gray silty clay									030
SB31	12				gray silty clay w/shell hash									031
SB32	12				brown silt over gray silt									032

OVERALL TOTALS	% Live	% Dead	Total Spat	Total Juvenile	Total Sub-Adult	Total Adult	Total Dead Oysters	Total Live Oysters

LLOYD ENGINEERING, INC.

OYSTER SURVEY DATA FORM

Project: BARUS
Loction:
Names: DANIEL MACKENZIE + TYLER KOEHN
Date: 11/12/24

Weather Conditions: Sunny
Water Conditions: Calm
Tide Conditions:

Station ID	Water Depth (ft)	Dredge, Probe or Grab	Time of Dredge (sec)	Post Length of Dredge (ft)	Substrate Compostion	Oyster Composition								Picture #
						% Live	% Dead	Number of Live Oysters by Size: Spat (<25mm) (<0.98")	Juvenile (26-50mm) (0.99-1.06")	Sub-Adult (51-75mm) (1.07-2.95")	Adult (>76mm) (>2.96")	Total Dead Oysters	Total Live Oysters	
SB17-A	10ft	dredge	2 drags			—						—	—	
SB17-B												8	20	0414
SB19	10	dredge			scattered reef							40	26	0415
SB20	10				soft							—	—	
HB43	10/	ponar			soft, maybe sand							—	—	0416
HB44	10.5	ponar			silt, soft → buried rangea shell							—	—	
HB45	10.6	Ponar			" "							—	—	0417, 41
HB46	11.	Ponar			" "							—	—	0419
HB47	12.	Dredge			dark gray silt							86	17	0420
HB59	12	Ponar			dark gray silty clay w/ash							—	—	0421
HB48	12.5	Dredge			silty clay							17	1	0422
												—	—	—
HB54	12.5	Dredge										16	31	0423
HB51	12	Dredge										16	3	0424
HB52	12	Dredge										39	15	0426
HB53	12	Dredge										12	9	0427
HB50	12.2	Dredge			lost sample							17	5	0428
HB49	12	Dredge										11		0429

OVERALL TOTALS	% Live	% Dead	Total Spat	Total Juvenile	Total Sub-Adult	Total Adult	Total Dead Oysters	Total Live Oysters

LLOYD ENGINEERING, INC.

OYSTER SURVEY DATA FORM

Project: BABWS
Loction:
Names: DANIEL M., TYLER C.
Date: ~~12~~ 11/12/24

Weather Conditions: SUNNY
Water Conditions: Moderate
Tide Conditions:

Station ID	Water Depth (ft)	Dredge, Probe or Grab	Time of Dredge (sec)	Length of Dredge (ft)	Substrate Compostion	Oyster Composition								Picture #
						% Live	% Dead	Number of Live Oysters by Size: Spat (<25mm) (<0.98")	Juvenile (26-50mm) (0.99-1.06")	Sub-Adult (51-75mm) (1.07-2.95")	Adult (>76mm) (>2.96")	Total Dead Oysters	Total Live Oysters	
HB55	12.5	Dredge										31	15	0430
~~HB56~~														
HB65	12	Dredge										12	10	0431
HB56	12	Dredge										31	16	0432
HBG2	12	Ponar			" "	shell hash						—	—	0435
HB63	12	Ponar			" "	shell hash						—	—	0434
HB64	12	Ponar			Silty clay dark, buried shell							—	—	0433
HB-57	12.5	Dredge										45	20	0437
HB-57	"	"										48	50	0438
HB-60	12	Ponar			Brown silt w/ shell hash							—	—	0439
HB-61	12	Ponar			Brown silty over dark gray silty clay w/ shell hash							—	—	0440
HB-58	12	Dredge										5	2	0441
HB-42	10.3	Dredge										40	28	0442
HB-39	9.5	Dredge										57	22	0443
HB-40	8.8	Dredge										39	18	0444
HB-25	9	Dredge										22	7	0445
HB-24	9	"										5	—	0446
HB-26	9.5	"										19	16	0447

OVERALL TOTALS	% Live	% Dead	Total Spat	Total Juvenile	Total Sub-Adult	Total Adult	Total Dead Oysters	Total Live Oysters

LLOYD ENGINEERING, INC.

OYSTER SURVEY DATA FORM

Project: BABUS
Loction:
Names: DM, TK
Date: 11/12/24

Weather Conditions: Sunny
Water Conditions: Calm
Tide Conditions:

Station ID	Water Depth (ft)	Dredge, Probe or Grab	Time of Dredge (sec)	Length of Dredge (ft)	Substrate Compostion	Oyster Composition								Picture #
						% Live	% Dead	Number of Live Oysters by Size: Spat (<25mm) (<0.98")	Juvenile (26-50mm) (0.99-1.06")	Sub-Adult (51-75mm) (1.07-2.95")	Adult (>76mm) (>2.96")	Total Dead Oysters	Total Live Oysters	
HB-27	8.5	Dredge			Buried in	silty clay						32	7	0448
HB-41	6.8	"										~~86~~ 80	24	0449
HB-29	9.3	"										110	24	0450
HB-29-2	"	"										~~3~~		0451
HB-30	—	OYL	Well	—	—	—	—	—	—	—	—	—	—	0453
HB-31	9.5	Dredge										27	32	0454
HB-37	9.5	"										17	17	0455
HB-32	10	"										57	33	0456
HB-33	10	"										7	5	0457
HB-38	9.5	"										15	15	0458
HB-34	~~8~~ 8.5	PONAR			Firm packed brown sand							—	—	0459, 60
HB-35	8	PONAR			"			"				—	—	0461
HB-36	8	PONAR			"			"				—	—	0462

OVERALL TOTALS	% Live	% Dead	Total Spat	Total Juvenile	Total Sub-Adult	Total Adult	Total Dead Oysters	Total Live Oysters