

# Interpreting Sediment Transport Pathways: An Investigation of Hurricane Ike's Impact on Offatt's Bayou, Texas

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## Abstract

Hurricane Ike made landfall near Galveston, TX with a 3-4m storm surge, inundating the surrounding area. The purpose of this study was to determine the existence or absence of a sedimentary deposit produced by Hurricane Ike within Offatt's Bayou, a dredged estuarine embayment within Galveston Island. Sediment samples were retrieved from the area of study using gravity core and bottom-grab sampling devices. These samples were then analyzed for water-content, grain size, and  $^{210}\text{Pb}$  geochronology. A Teledyne Benthos C3D high-resolution side-scan sonar and bathymetric system was implemented to collect sonar data reflecting the bathymetry and surface sediment features and composition of the study area. A deposit of fine-grained sand was observed along the northeast shoreline of the bayou correlating with the wind direction of the prefrontal wall. Coarse sand, gravel, and debris deposits, sourced at the oyster reef located in the southwest corner of the bayou, were deposited in a northeasterly pattern reflecting the wind direction associated with the post frontal wall. High backscatter anomalies observed by the sonar survey confirmed the distribution pattern of the coarse grained sand and gravel deposition. Finer silt particles subject to longer periods of suspension were deposited in a pattern indicating influence by both the prefrontal and post frontal wall. The study highlights erosion patterns experienced by developed coastal areas during brief periods of high energy associated with storm activity.

## Background

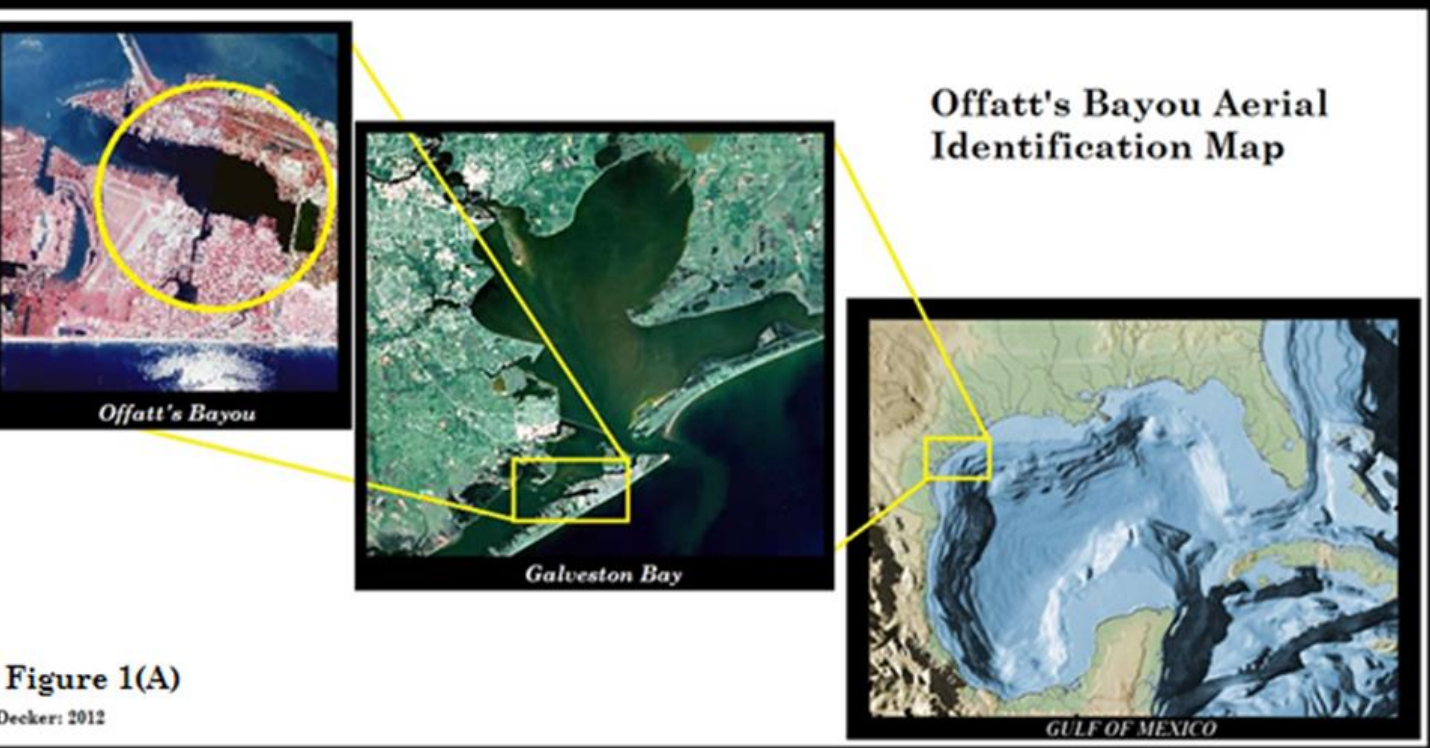
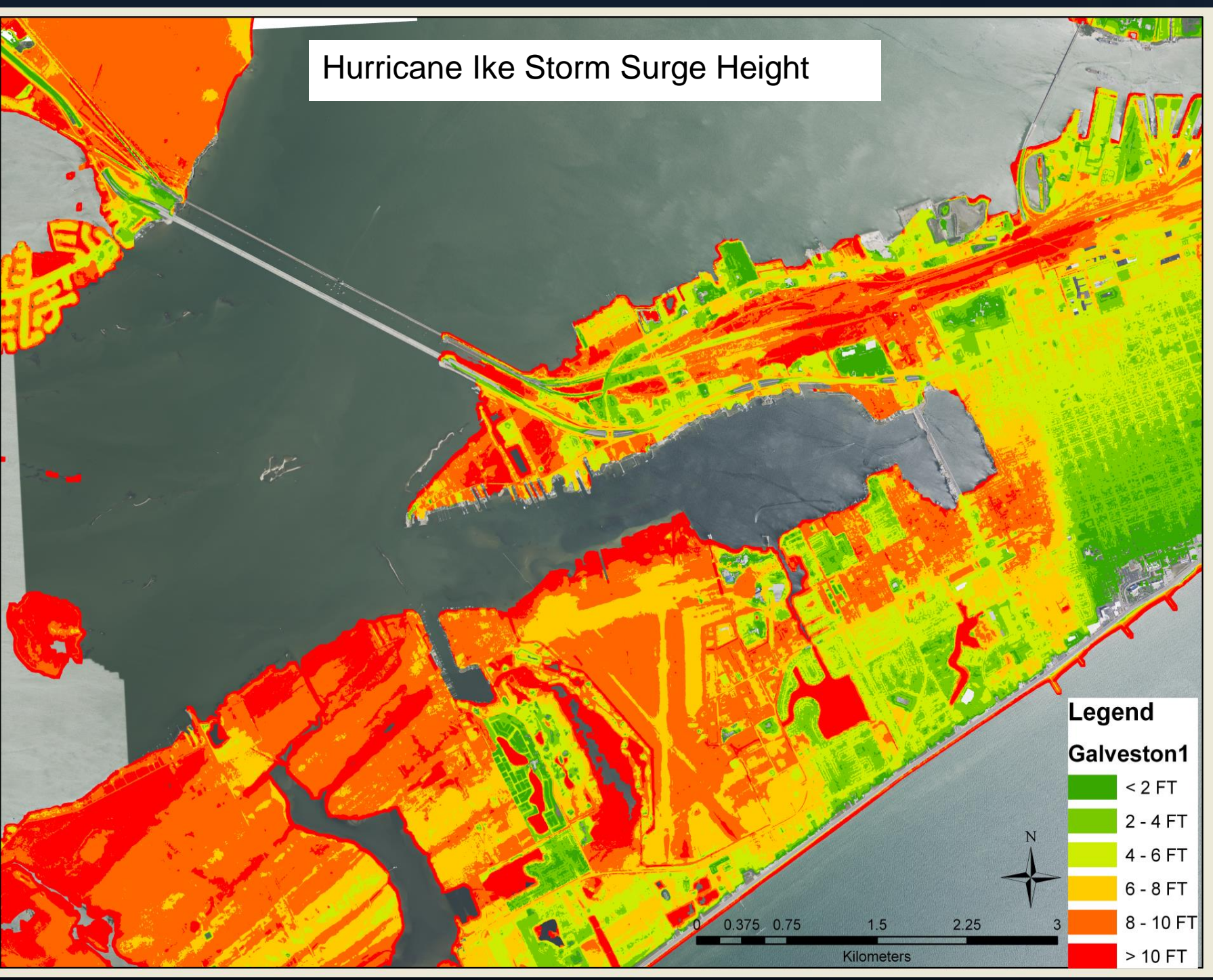
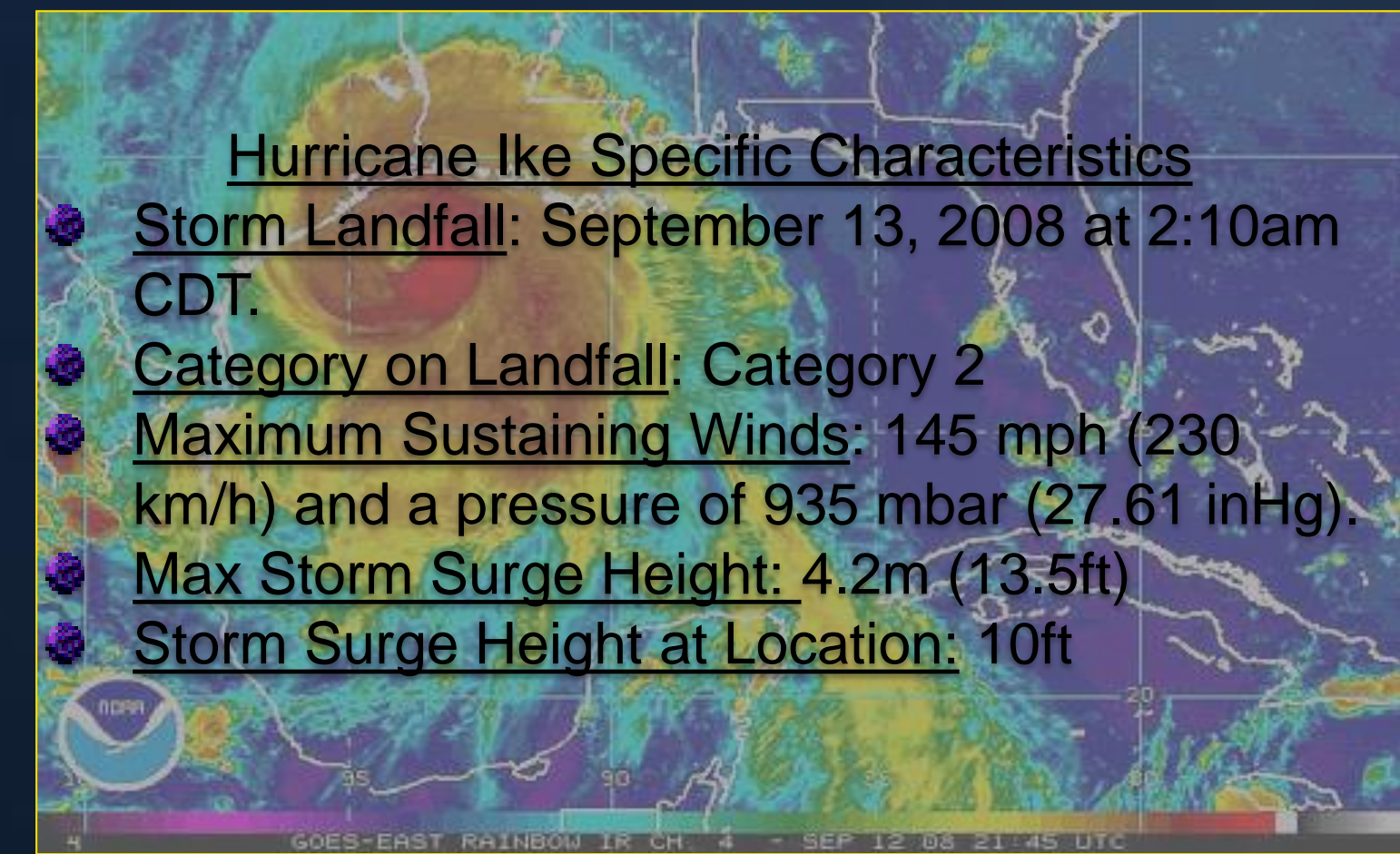


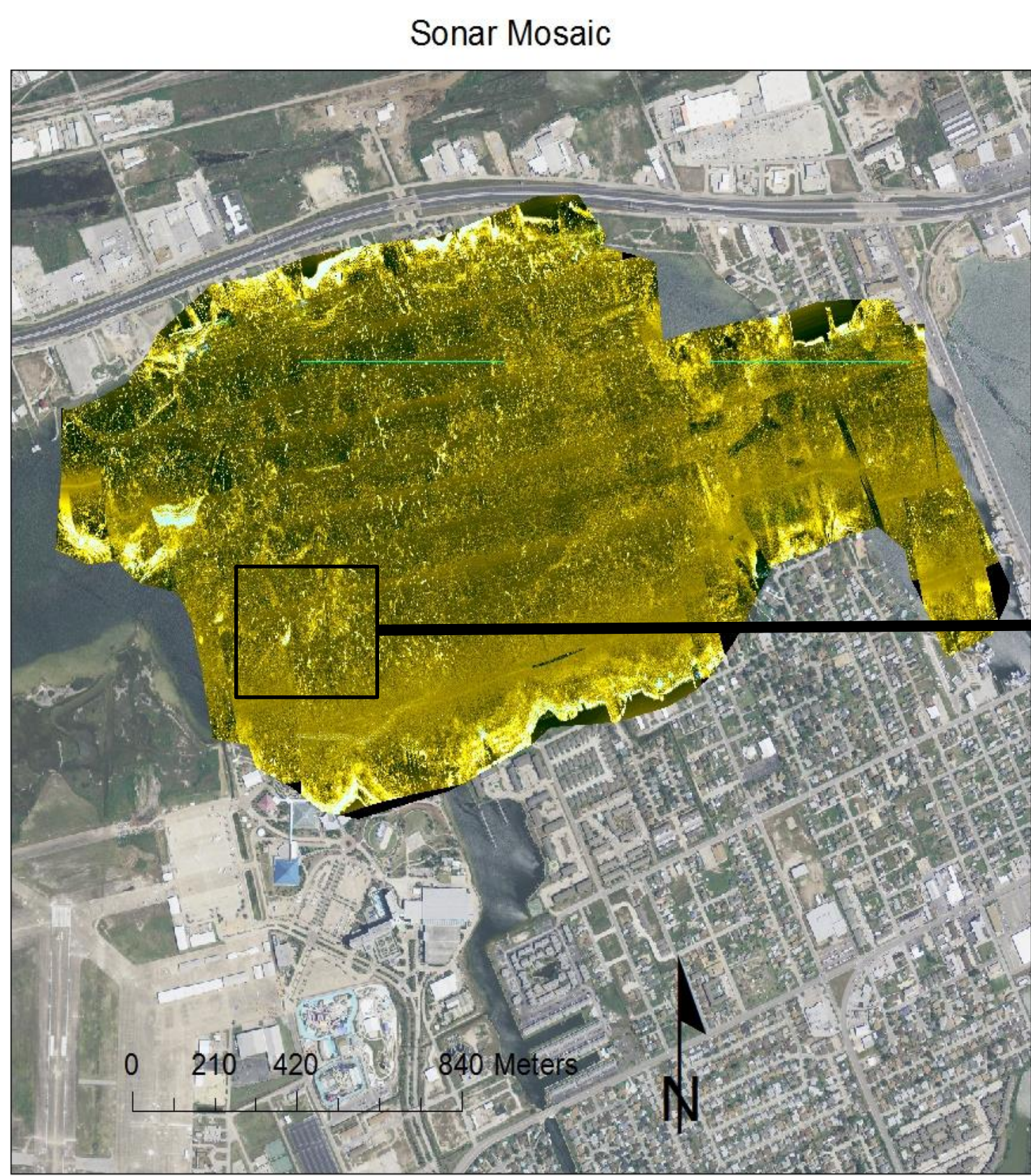
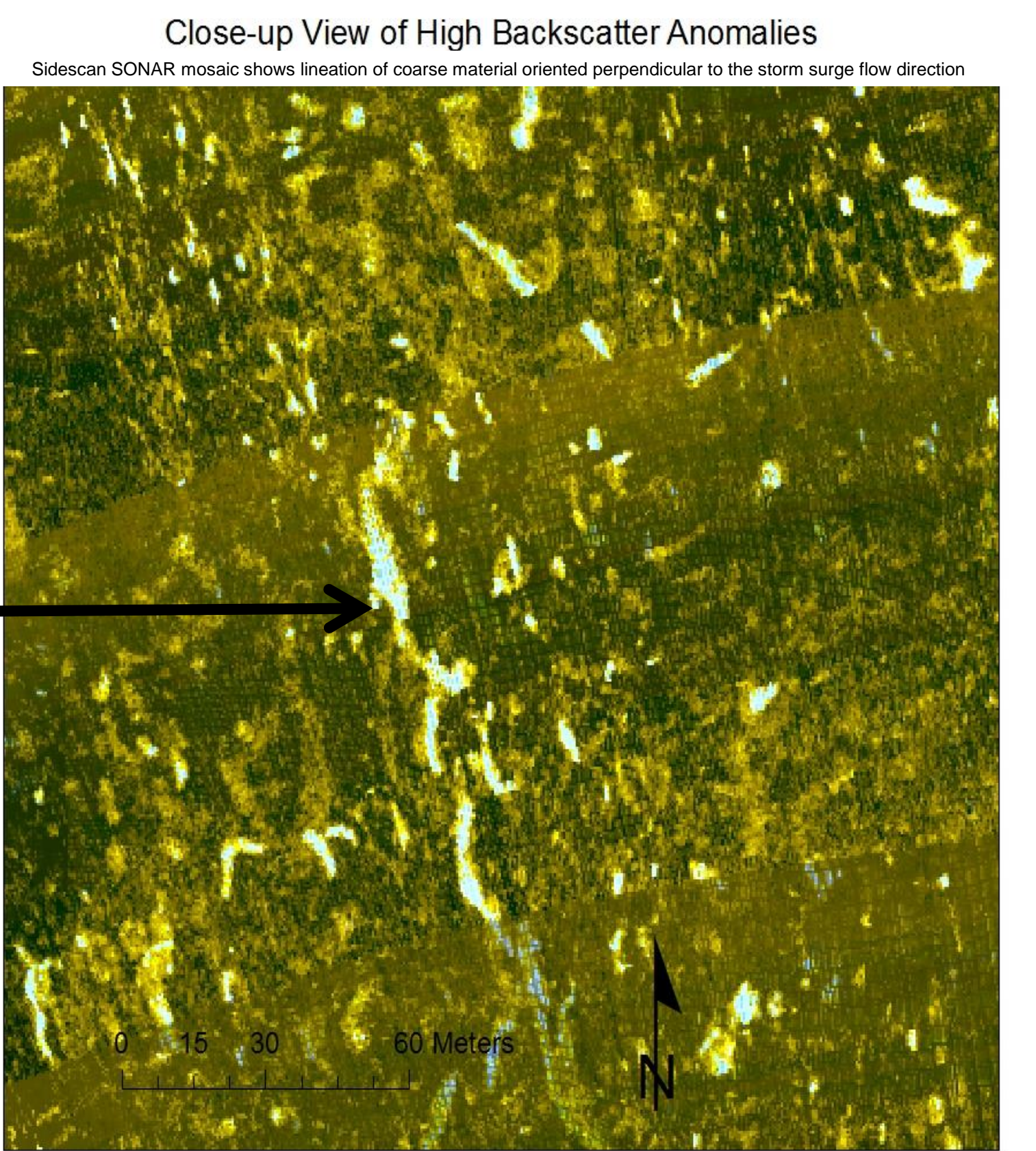
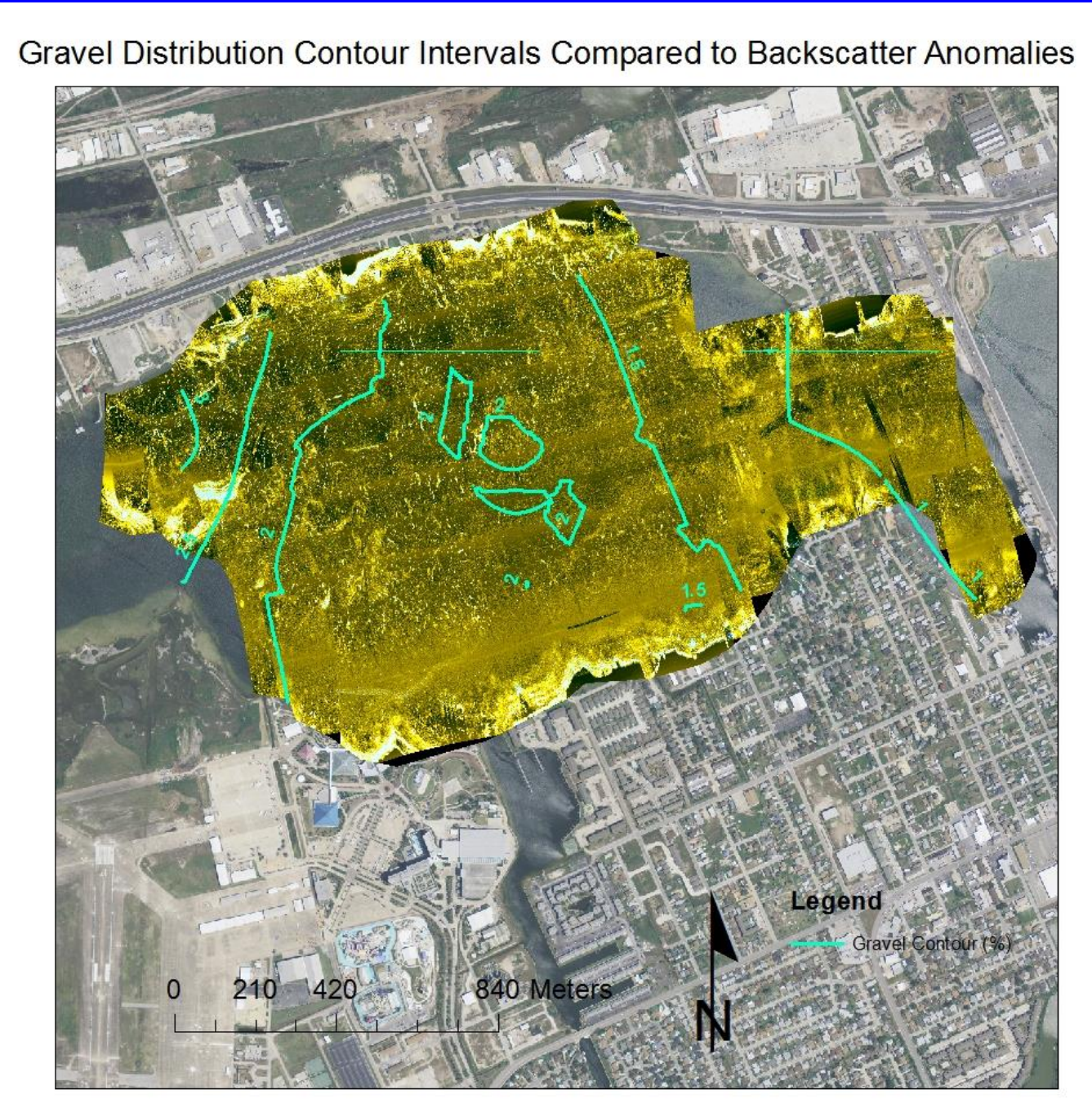
Figure 1(A)



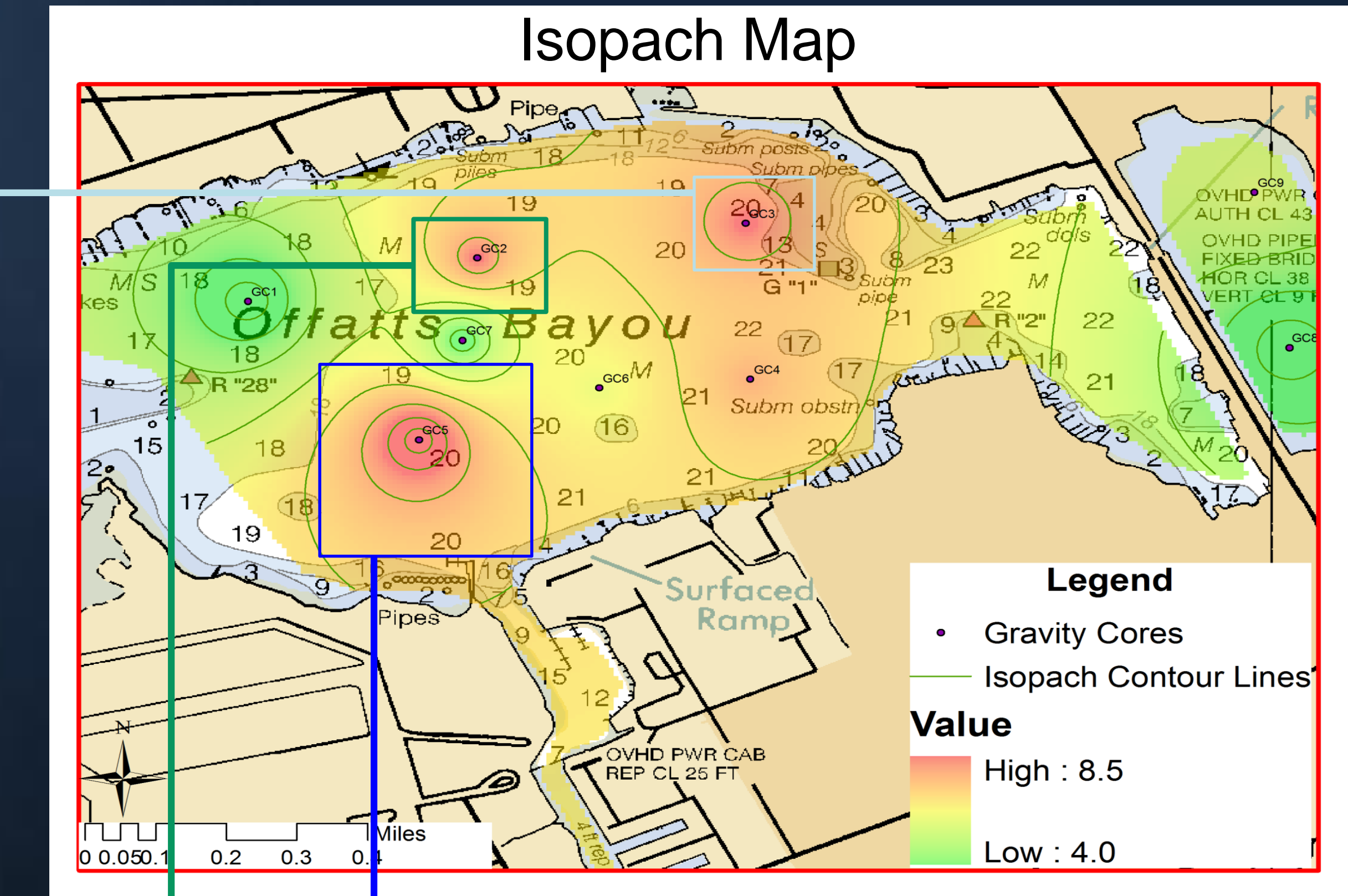
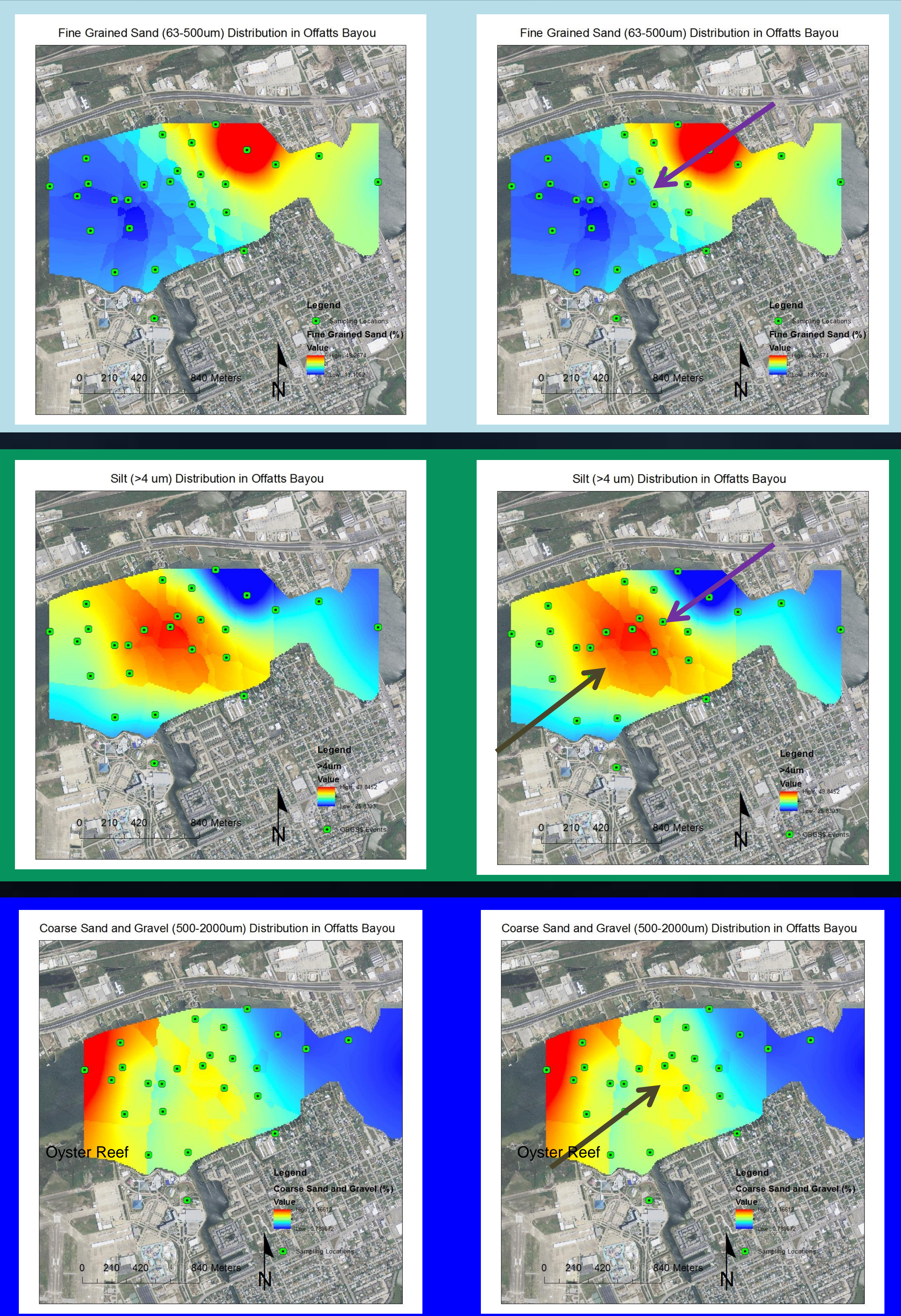
## Methodology

- Gravity-Core and Bottom Grab Sampling
- CD3, Sidescan Sonar, Sonarwiz for building sonar mosaic
- Malvern Grain Size Analyzer for determining sediment grain size distribution.
- GIS : ArcMap 10 for spatial analysis and developing graphic representation of sediment distribution

## Results



Pre-frontal Wall Wind Direction  
Post-frontal Wall Wind Direction



## Conclusions

- Isopach map (Gay et al, 2012) shows three significant deposits with varying dominant grain sizes
- Fine grain sand sourced from the northeastern shore extends southwest in accordance with the direction of the prefrontal wall.
- Silt was concentrated in the deeper, central parts of the bayou due to it's slower fall velocity (relative to sand) and derived by both the prefrontal and post frontal surges.
- Coarse sand, gravel (shell) and debris spread from the oyster reef in southwest corner of Offatts Bayou into the deeper area in the center. Winnowing also revealed other coarse grain sediment deposits, confirmed by the high backscatter anomalies observed in the sonar mosaic.

## Acknowledgements

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