# Borrow Area Management and Monitoring (BAMM) Program for Coastal Restoration in Louisiana

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*State of the Coast Conference*
***New Orleans, LA***
***19th March 2014***

committed to **our coast**

# Background

1. An important component of Louisiana Sediment Management Plan (LASMP)

2. As borrow areas (inland/nearshore, river and offshore) are not routinely monitored, BAMM is a first attempt to monitor and manage

3. BAMM will help us understand:
   - **Physical characteristics** such as "Infilling Rate", pit-slope gradient, and sediment transport regime
   - **Water quality** such as potential development of hypoxic conditions in the borrow areas and its relationship to dredge depth
   - **Environmental impacts** such as how borrow area design affects wave heights and energy of the surrounding environment

4. BAMM will also help us by providing a scientific basis to influence the numerous restrictions and/or regulations that govern the use of borrow areas

5. Management of borrow areas help optimize use of sediment for protection and restoration

# Land Loss vs. Accommodation

*Land loss (1932 -2010)
~4877 km² (~1883 mi²)

Accommodation
~2.9 BCM (~3.83 BCY)

**Moderate Scenario**
* Land loss (2010 -2060)
~1994 km² ( ~770 mi²)

Accommodation
~1.2 BCM (~1.7 BCY)

**Less Optimistic Scenario**
* Land loss (2010 -2060)
~4532 km² ( ~1750 mi²)

Accommodation
~2.7 BCM (~3.5 BCY)

* *Morton et al., 2010*

# SEDIMENT

**OCS Waters, State Waters, Coastal Zone**
**Lower Mississippi & Atchafalaya River**

## Sediment Borrow Area

### Borrow Area Management & Monitoring (BAMM)

- Optimal Utilization
- Location vs. project
- Location vs. pipeline
- Delineation of potential sand sources in OCS
- Infilling rate
- Slope Stability Issues
- Hypoxia

### Monitoring Programs

- Barrier Island Comprehensive Monitoring Program (BICM)
  - Bathymetric data
  - Sediment data
- Met-Oceanic Data - WAVCIS
- Eustatic Sea Level Rise
- Subsidence

### Sediment Evaluation

- Delta Sand Search Model (DSSM) : Protocol & Guideline of exploration
- Evaluation of potential areas
  - Offshore/State & Federal Waters
  - Lower Miss River
  - Atchafalaya River

### River Studies

- LCA Miss River Delta Mgmt Study
- Atchafalaya Basin Sed Mgmt Plan
- Others

### Sediment Data Management (LASARD)

- Protocol for standardization of data acquisition

## Regional Sediment Management

- Sediment Resources
- Sediment Budget
- Dredged sediment
- Diversions

## Policy/ Regulation

### Federal Resource Regulations

- Prioritization of allocation
- Federal Standard
- Environment Issues

### Pipeline/O&G Policies

- Notice to Leasees

### Sea Level Rise Policy

## Coordination w/Stakeholders

**State, Federal, NGO**

**LOUISIANA SEDIMENT MANAGEMENT PLAN** (LASMP)

# Introduction

**BAMM Tasks:**

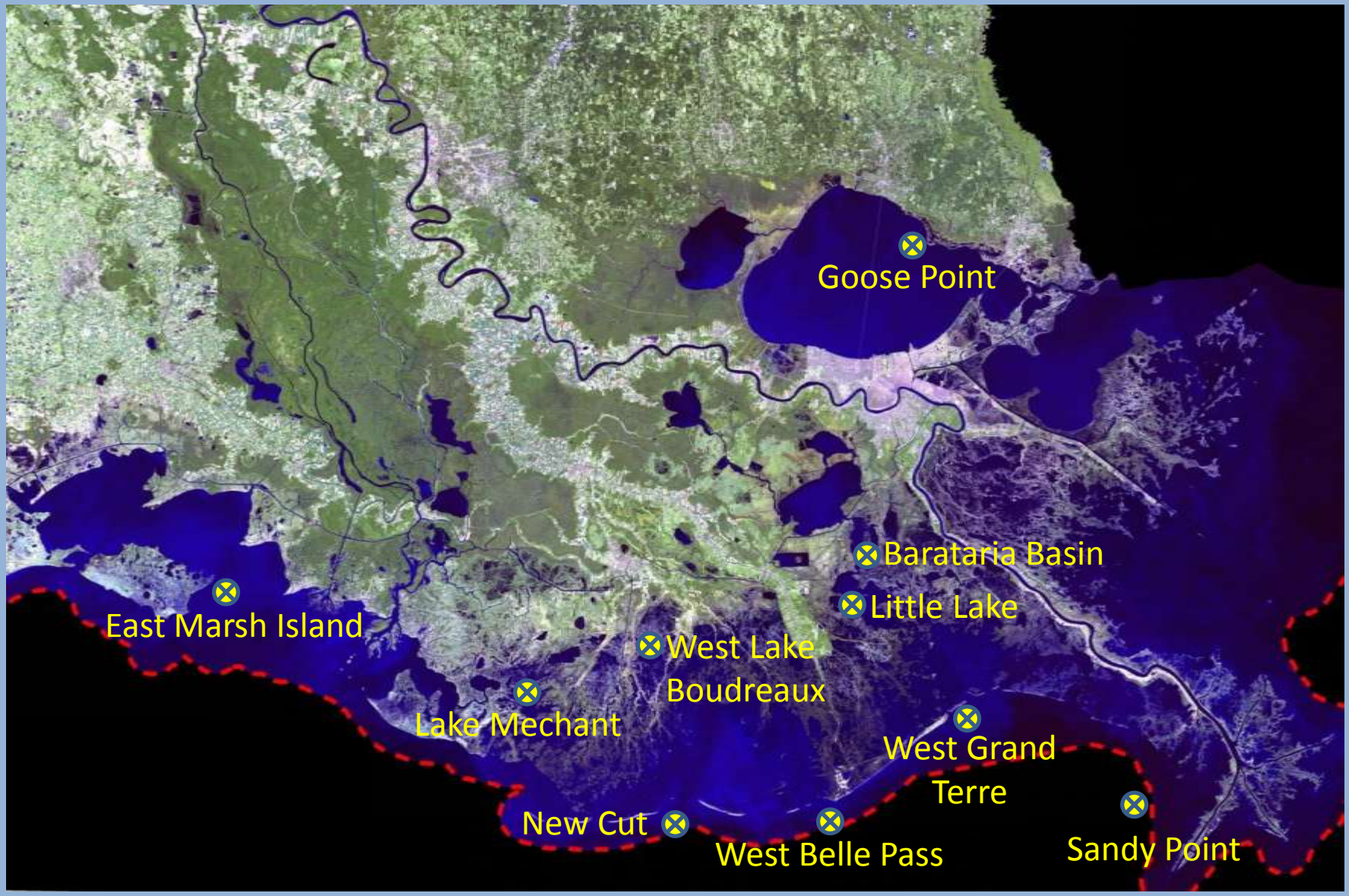
1. **Inventory** of existing nearshore, offshore and riverine borrow areas
2. **Physical characteristics**

   Geophysical and geotechnical data collection and analysis
   - Data collection within select borrow areas
   - Push Core collection to characterize sediment characteristics of select borrow areas
3. **Water quality**

   Hypoxia Monitoring to identify hypoxic conditions within select dredge areas
4. **Environmental impacts**

   Model Development
   - Evaluate physical impacts of select borrow areas (Delft3d, Delft3d-FLOW and SWAN)

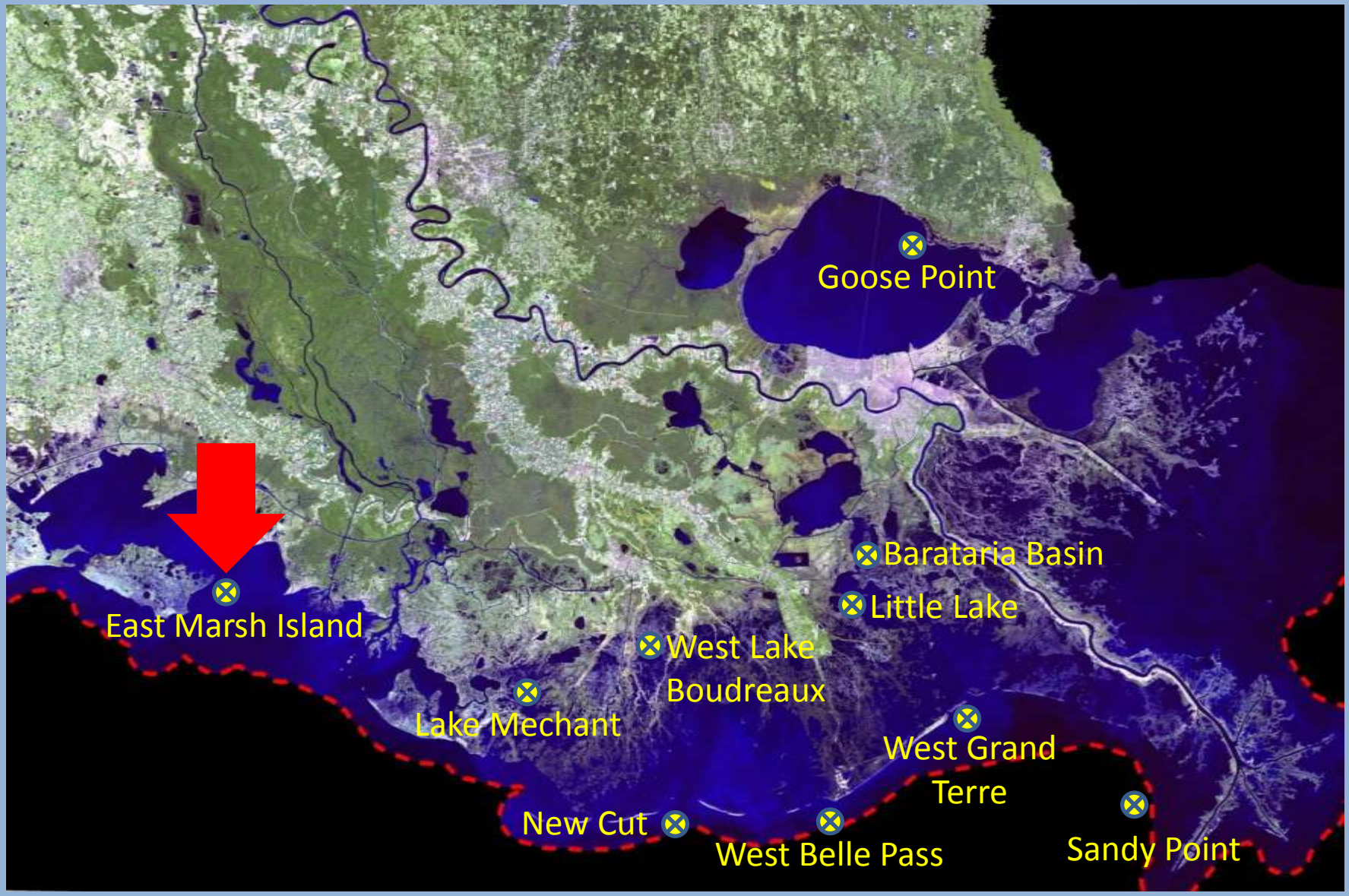
# Overview Map



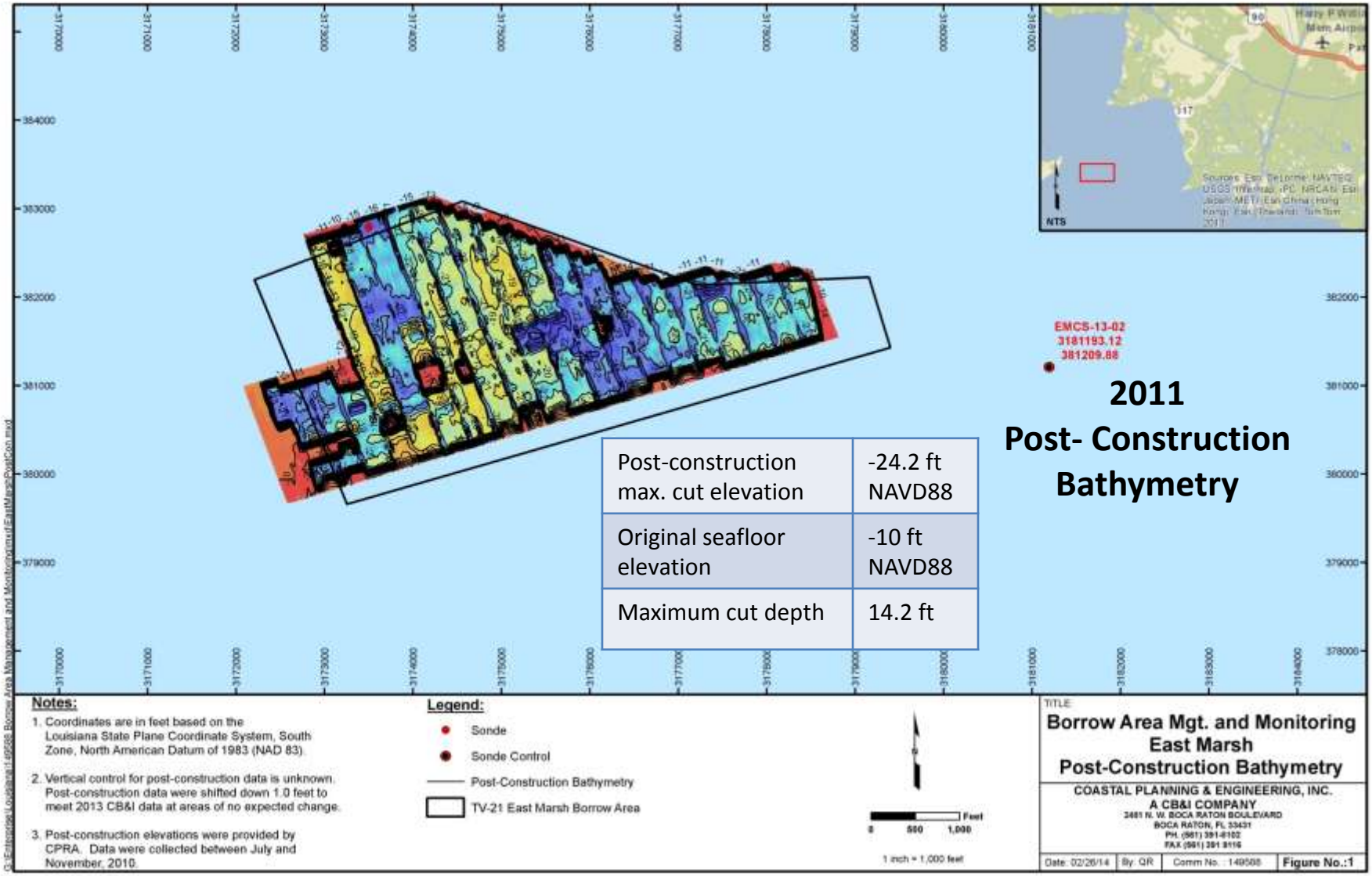
# BAMM- Summary Table

| Borrow Area | Location | Survey | Hypoxia | Push Core |
|---|---|---|---|---|
| East Marsh Island | Inland | ☑ | ☑ | |
| Lake Mechant | Inland | ☑ | ☑ | |
| West Lake Boudreaux | Inland | ☑ | | ☑ |
| Little Lake | Inland | ☑ | | ☑ |
| Goose Point | Inland | ☑ | ☑ | ☑ |
| Barataria Basin Landbridge BA1 | Inland | ☑ | | |
| Barataria Basin Landbridge BA2 | Inland | ☑ | ☑ | |
| Barataria Basin Landbridge BA3 | Inland | ☑ | | ☑ |
| New Cut | Offshore | ☑ | | |
| West Belle Pass Sand BA | Offshore | | | |
| West Belle Pass Marsh BA | Offshore | | ☑ | |
| West Grand Terre (WGT BA-C) | Offshore | ☑ | | |
| Sandy Point | Offshore | | ☑ | |

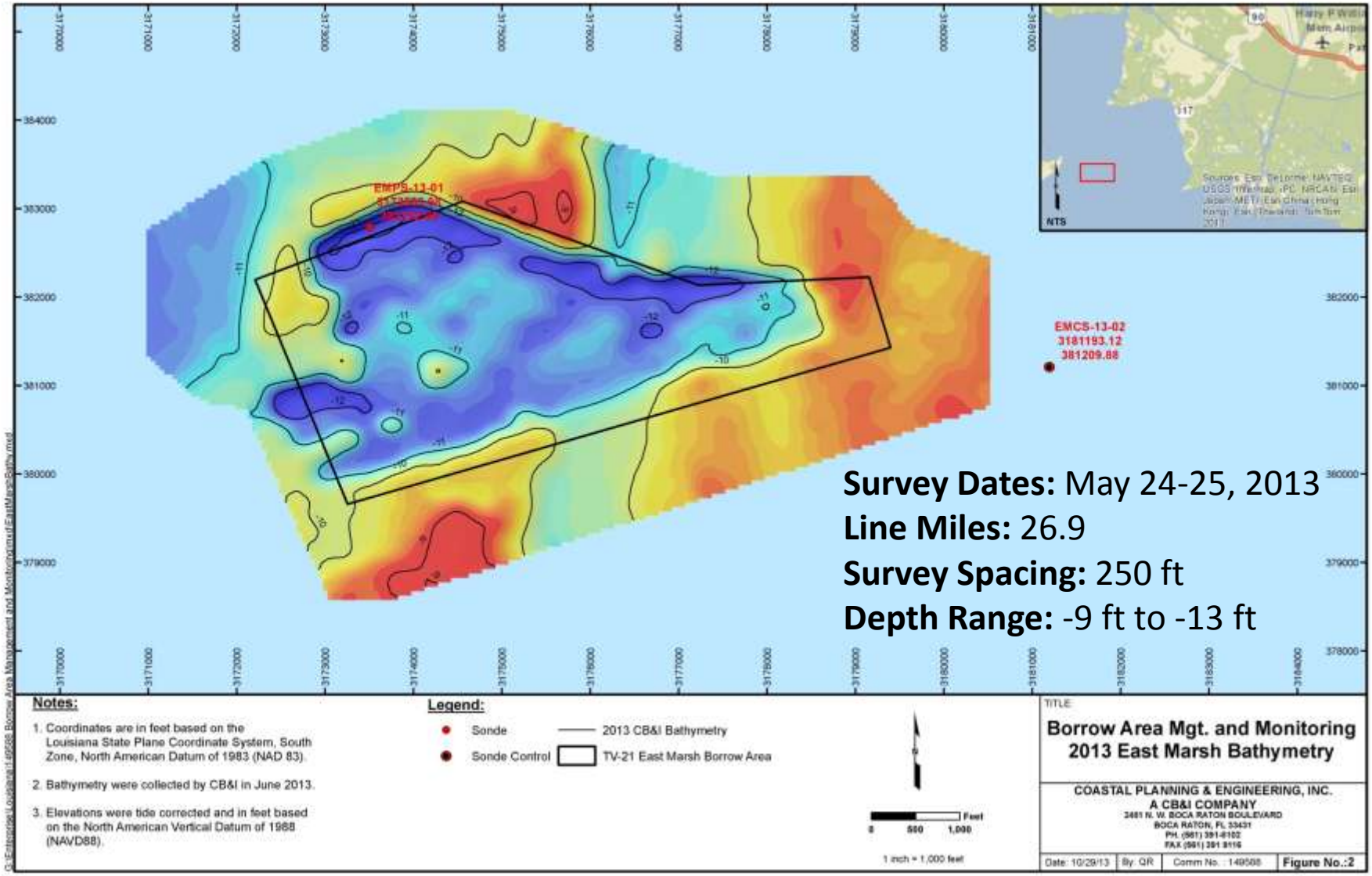
# East Marsh Island



# East Marsh Island-Post Construction Bathymetry

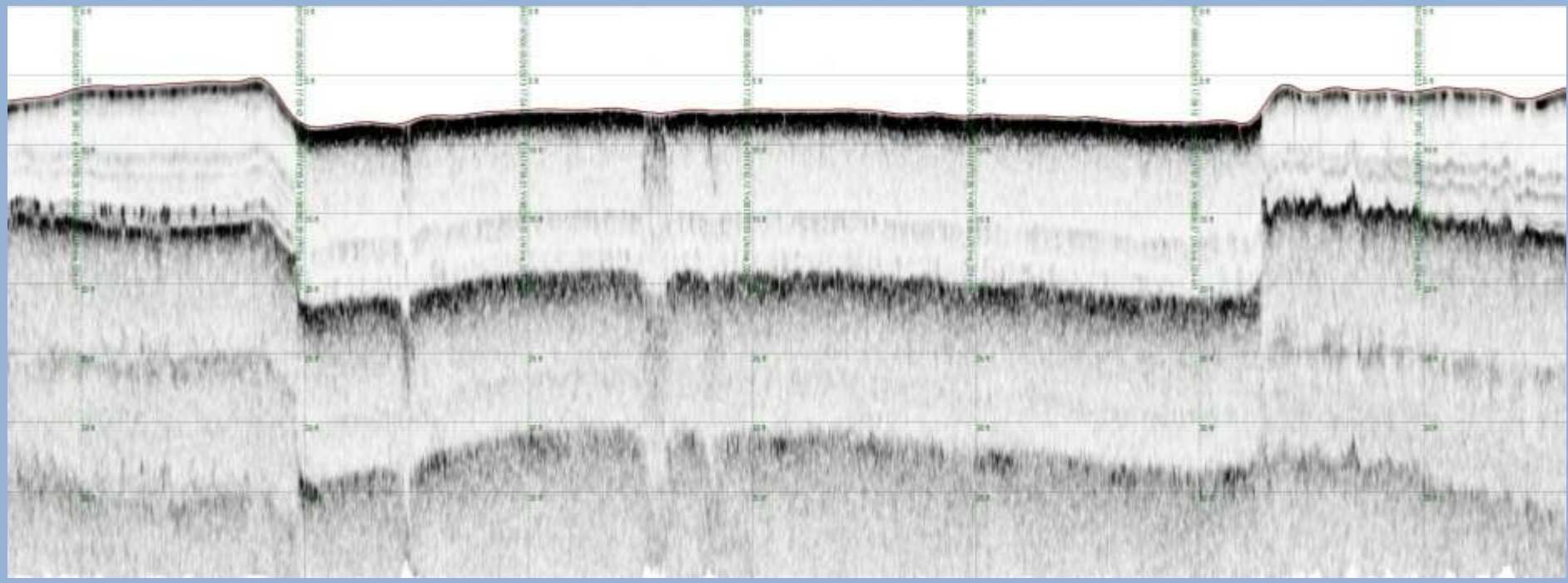


# East Marsh Island-2013 BAMM Bathymetry



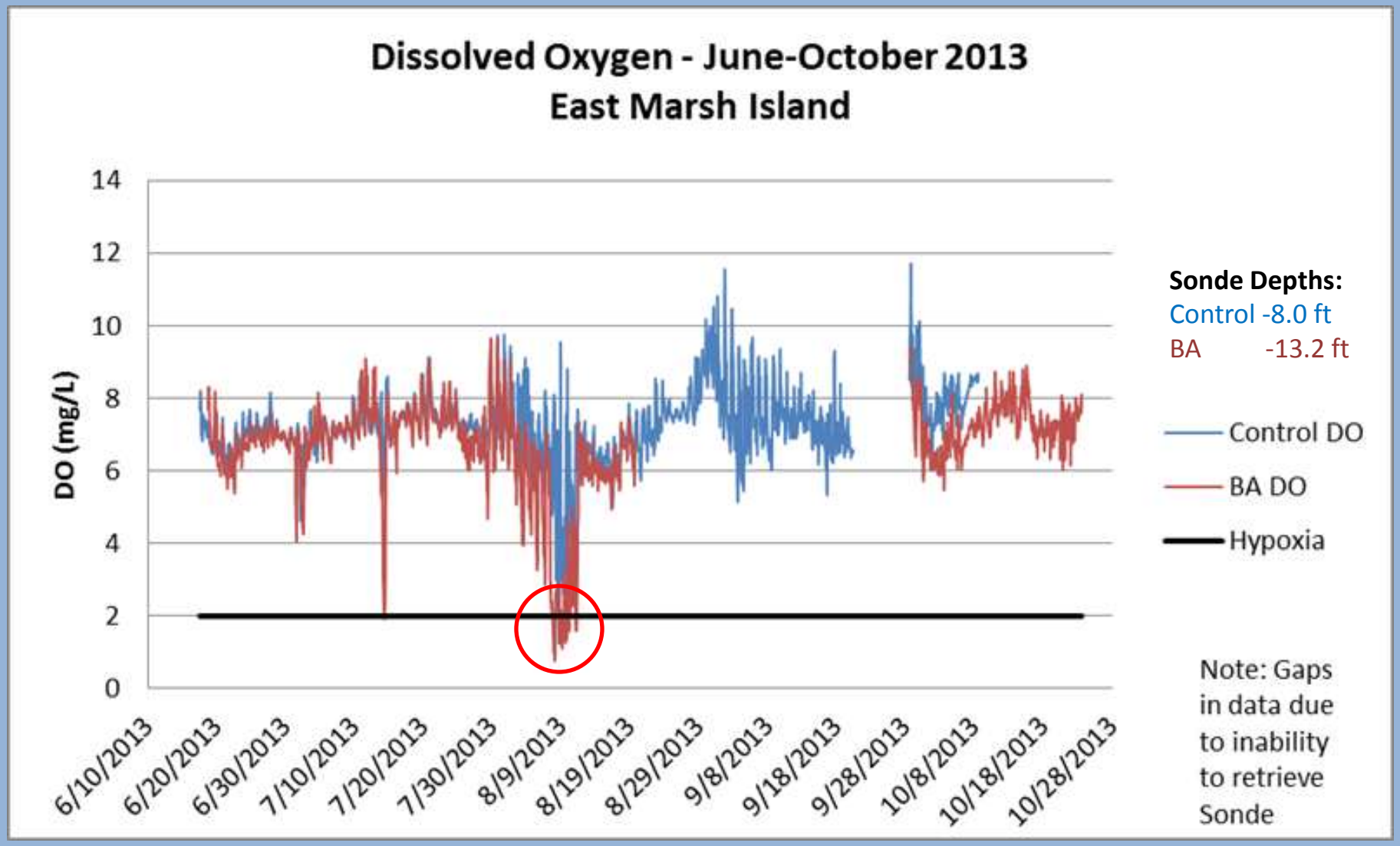
# East Marsh Island-Difference Map

# East Marsh Island-Infilling

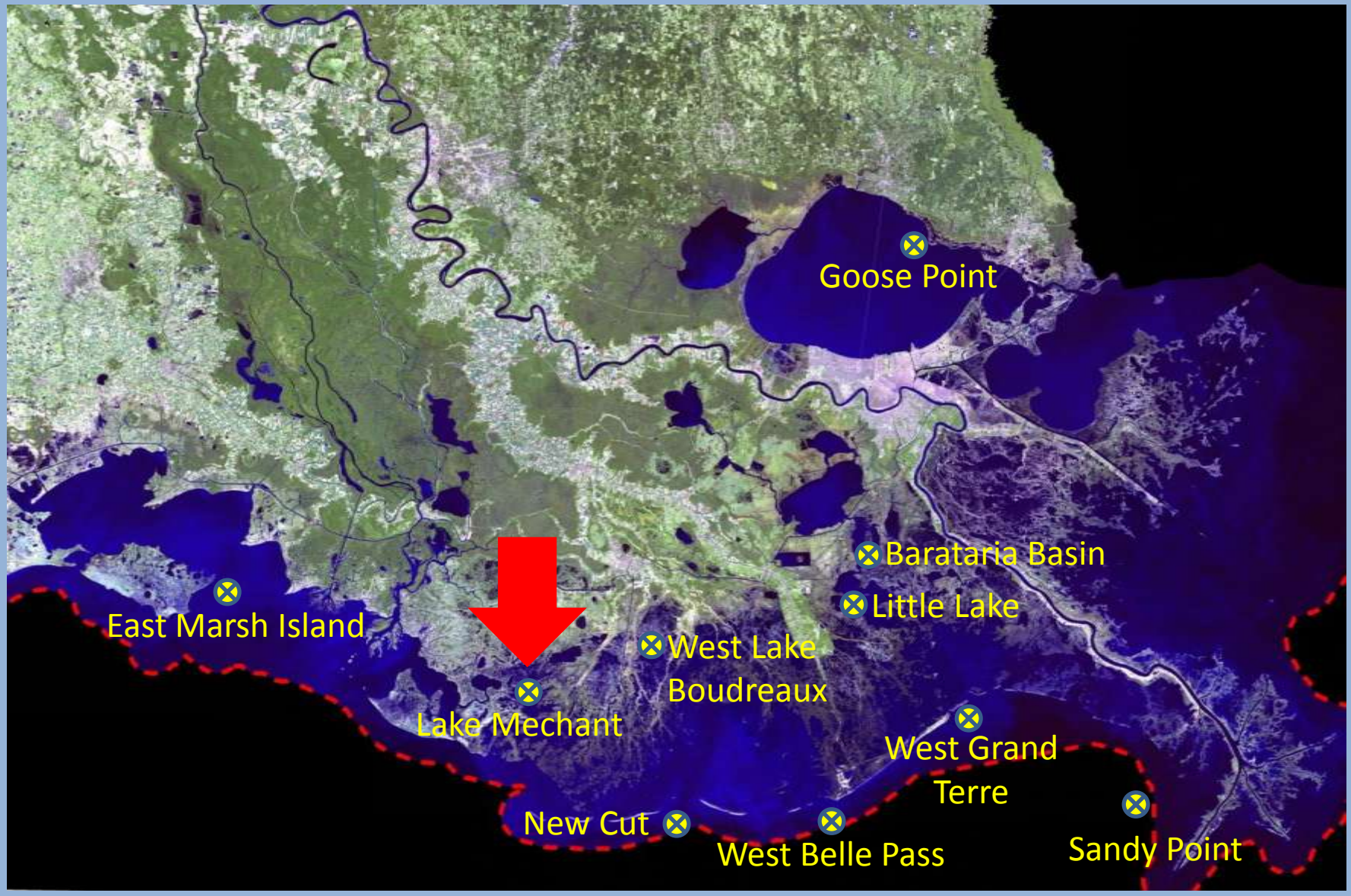


| Task | Details |
|---|---|
| Infilling | • Approximately 2,986,000 cubic yards<br>• 7.0 ft on average<br>• Range: 0-12.7 ft<br>• 3.5 feet/year |

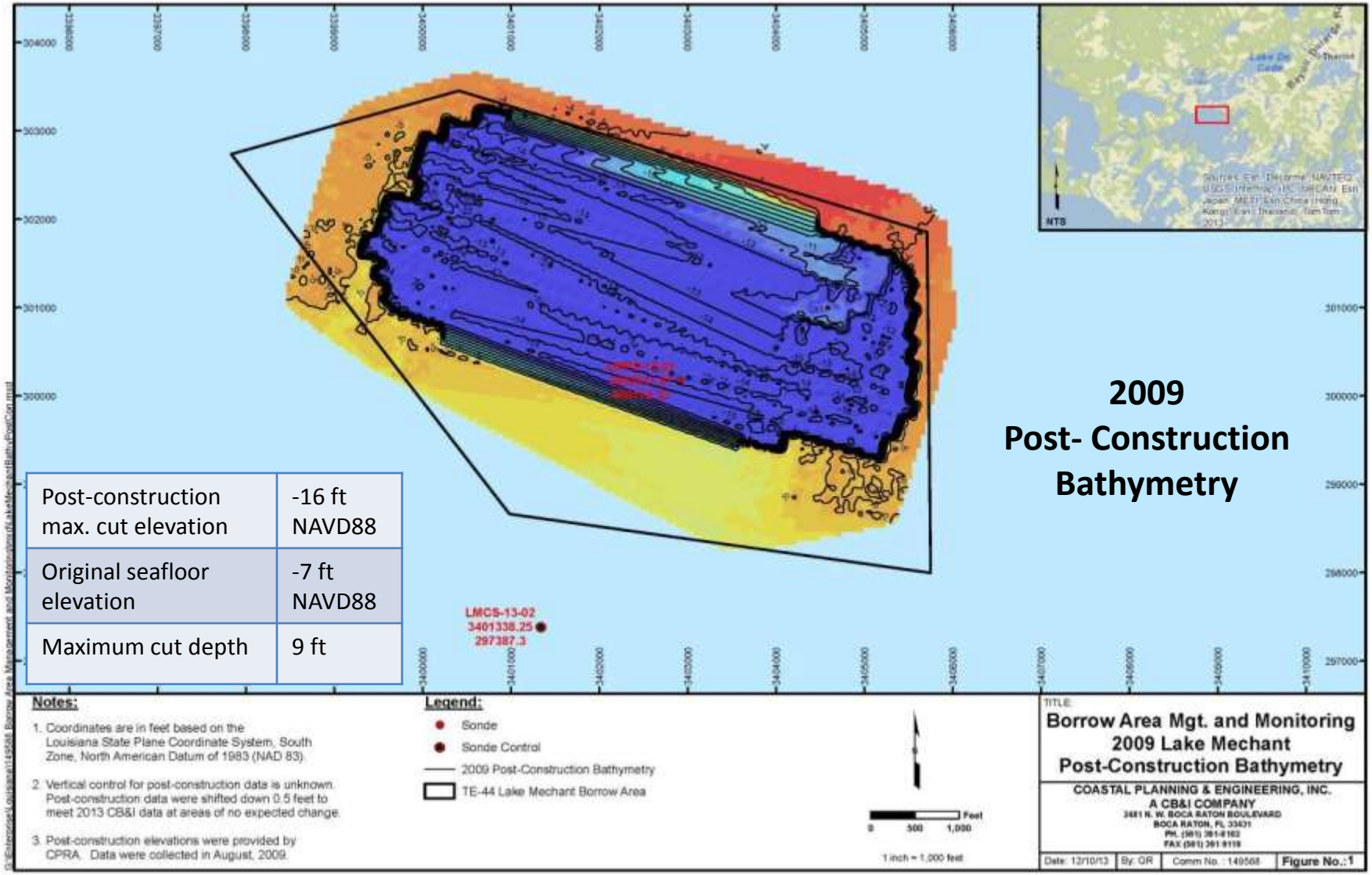
# East Marsh Island-Hypoxia



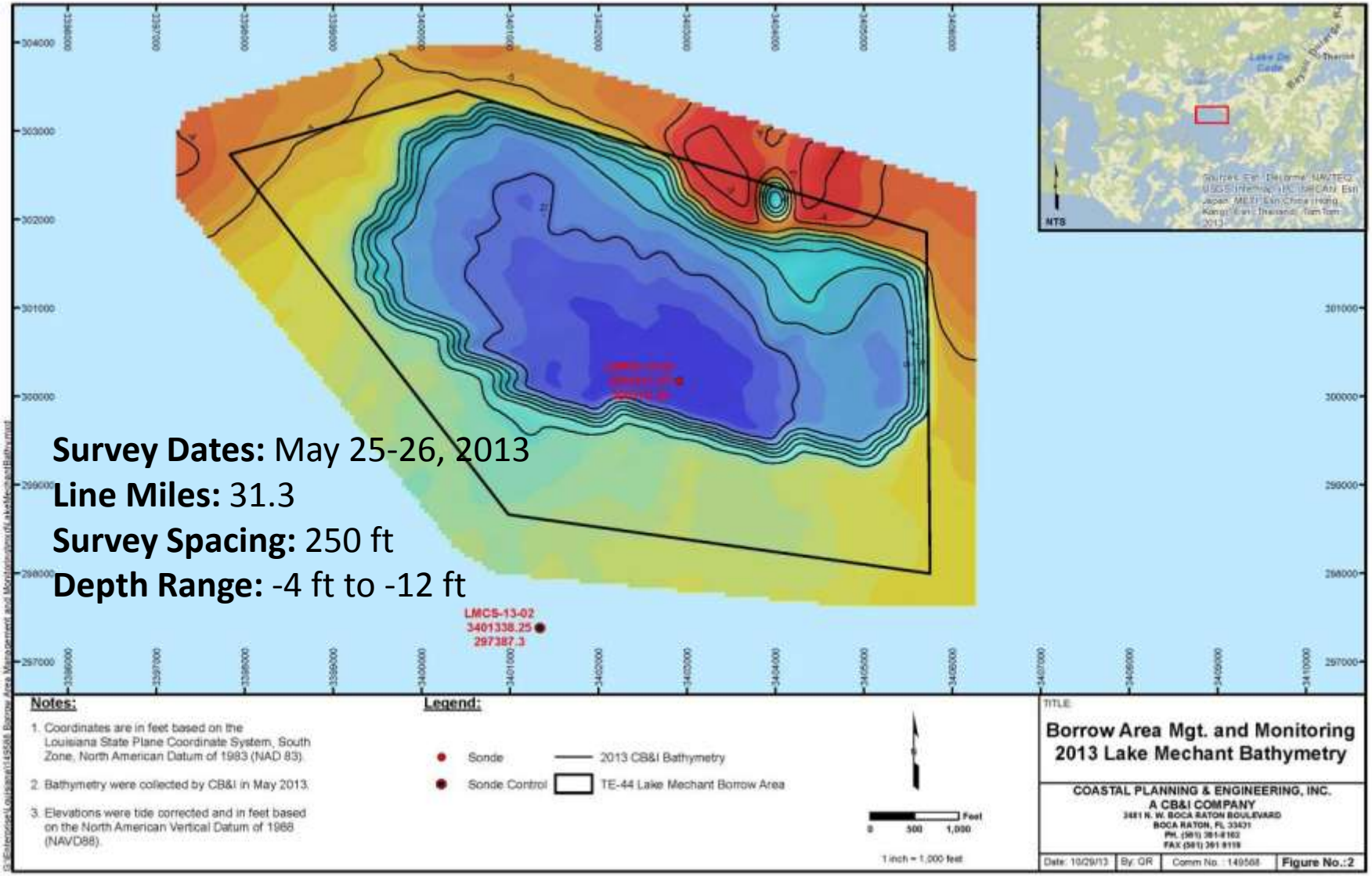
# Lake Mechant



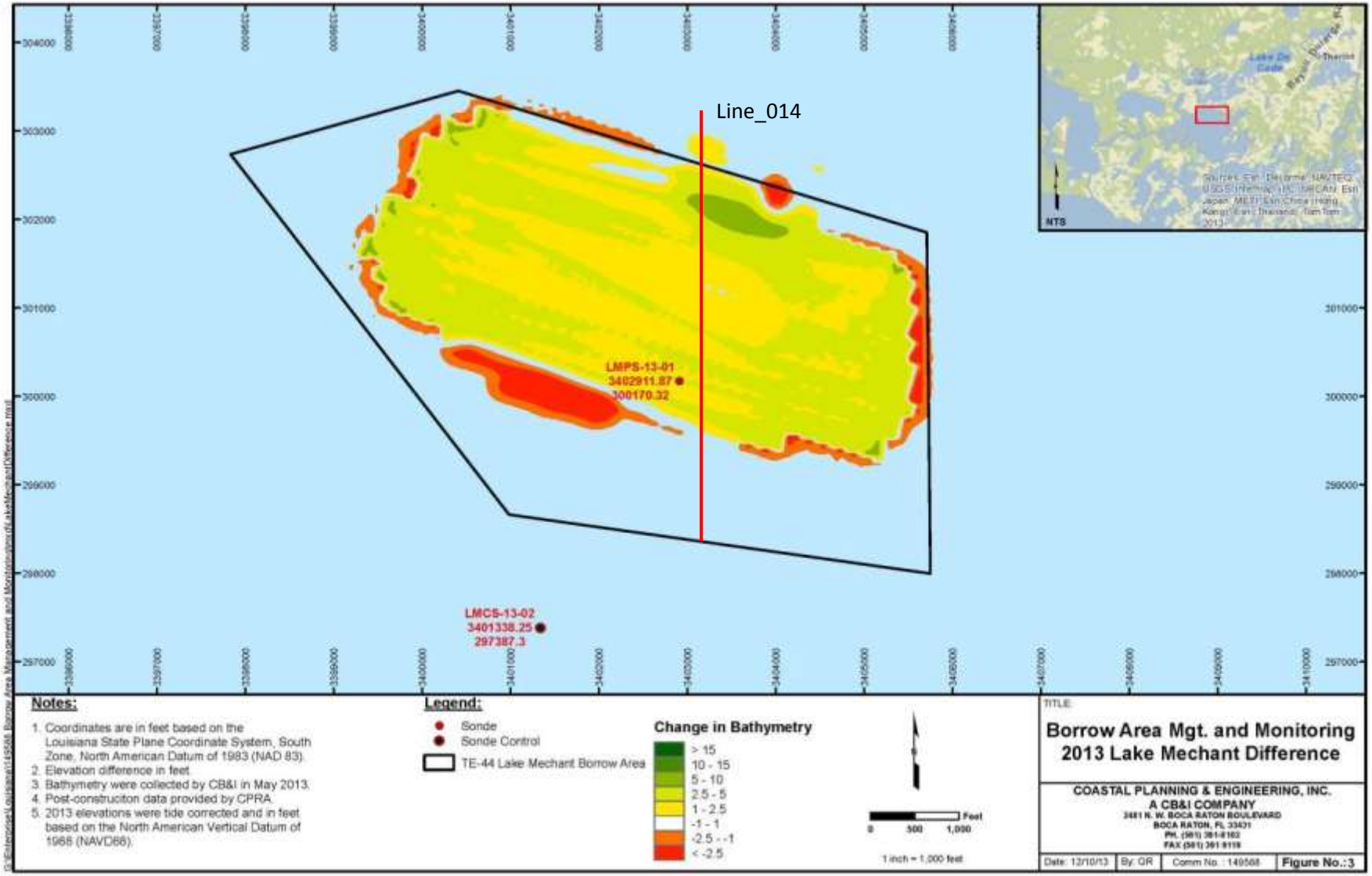
# Lake Mechant-Post Construction Bathymetry



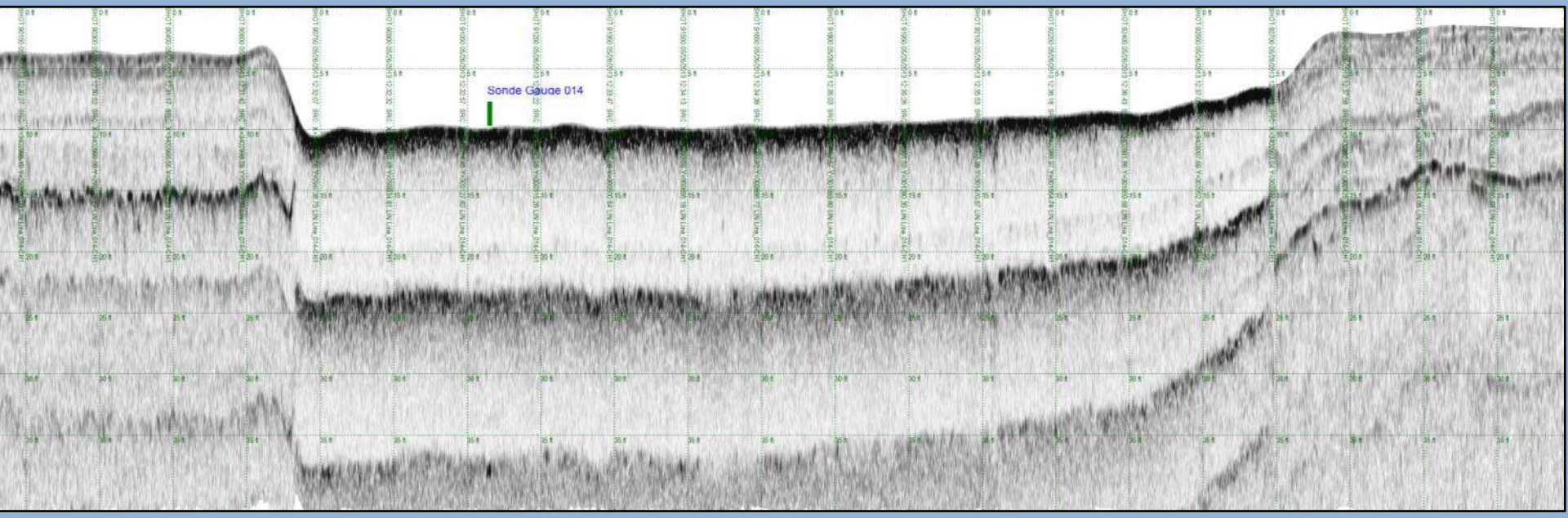
# Lake Mechant-2013 BAMM Bathymetry



# Lake Mechant-Difference Map

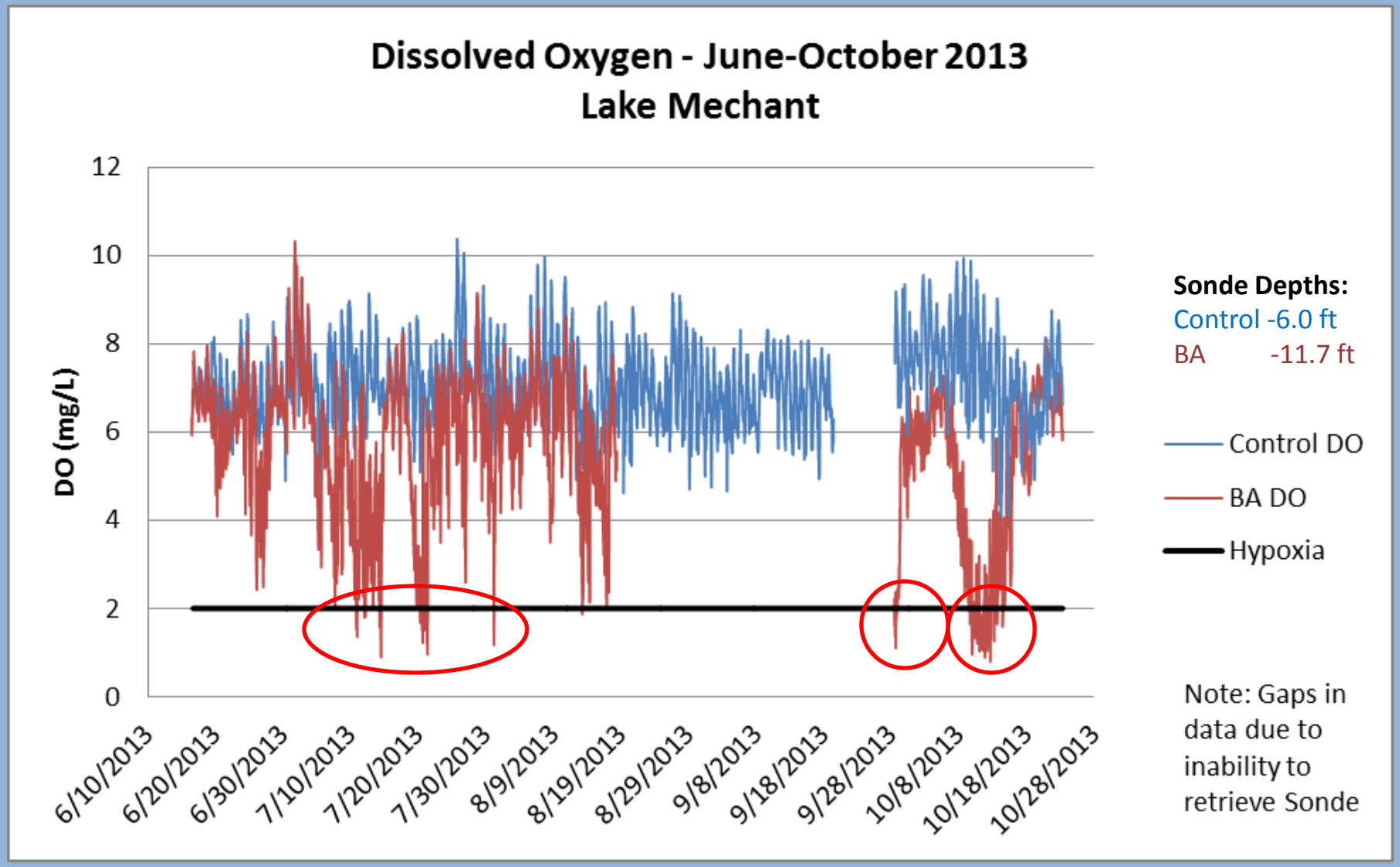


# Lake Mechant-Infilling

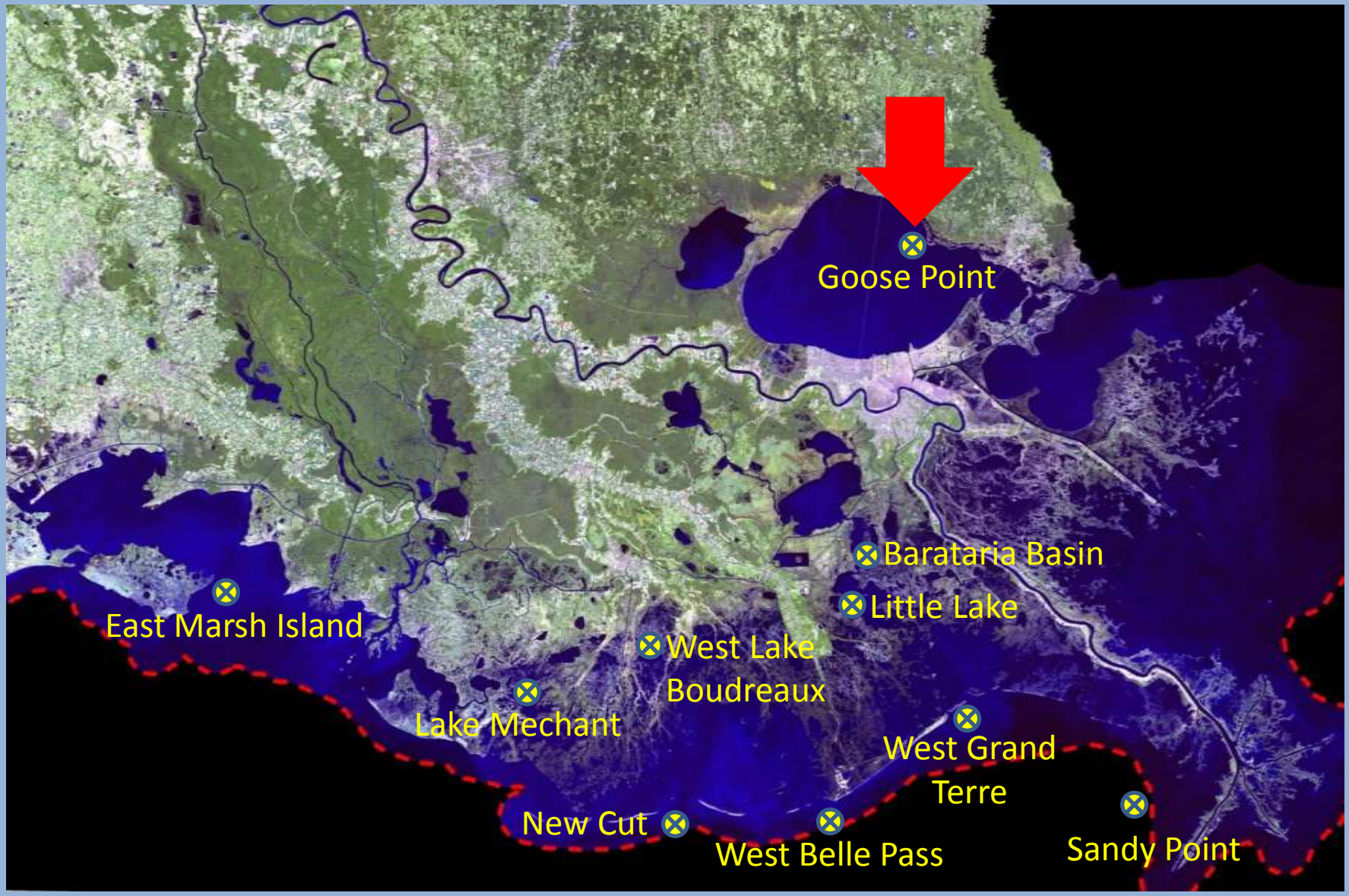



| Task | Details |
|---|---|
| Infilling | • Approximately 1,222,000 cubic yards<br>• 1.3 ft on average<br>• Range: 0-7.4 ft<br>• 0.3 feet/year |

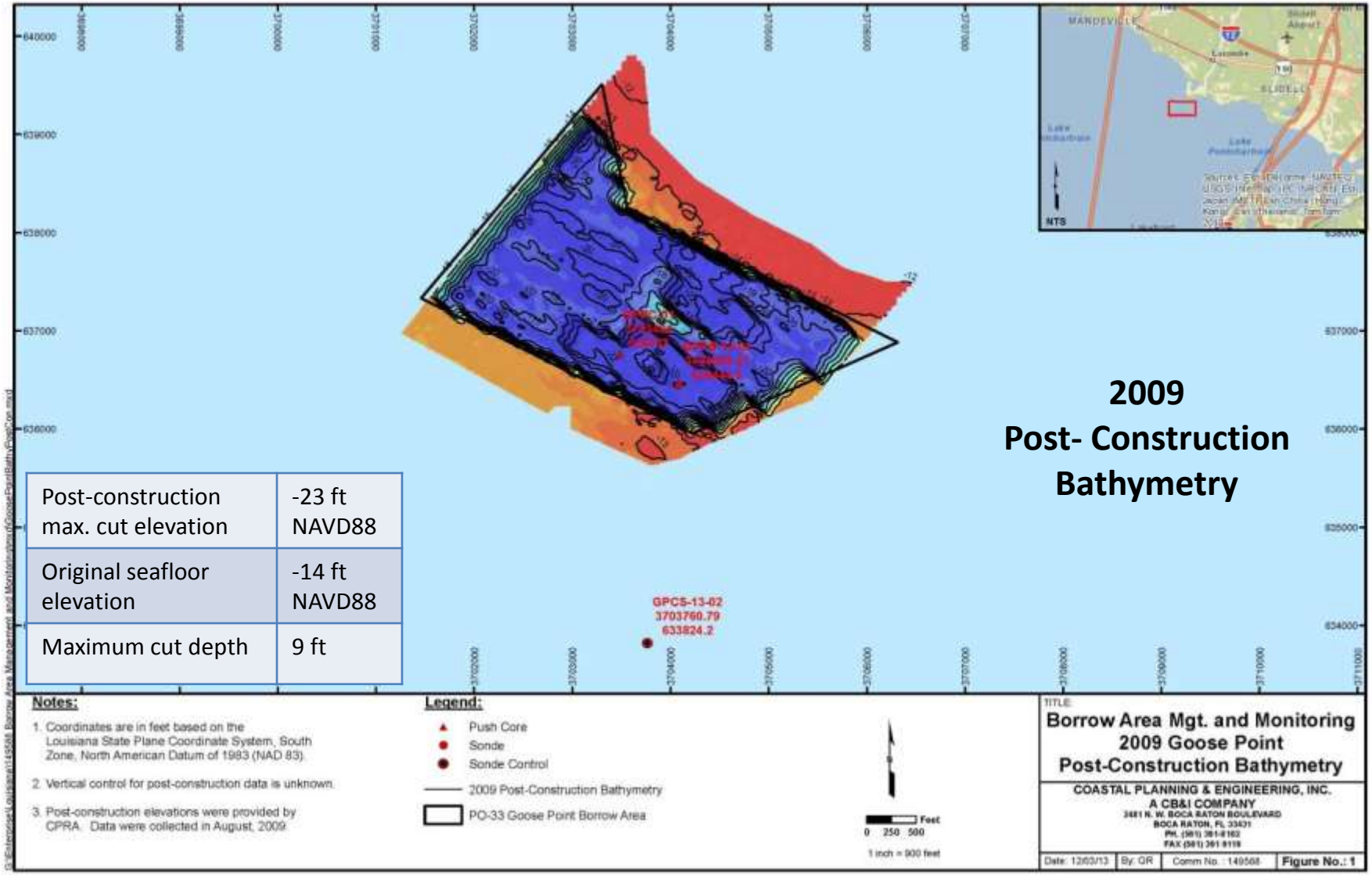
# Lake Mechant-Hypoxia



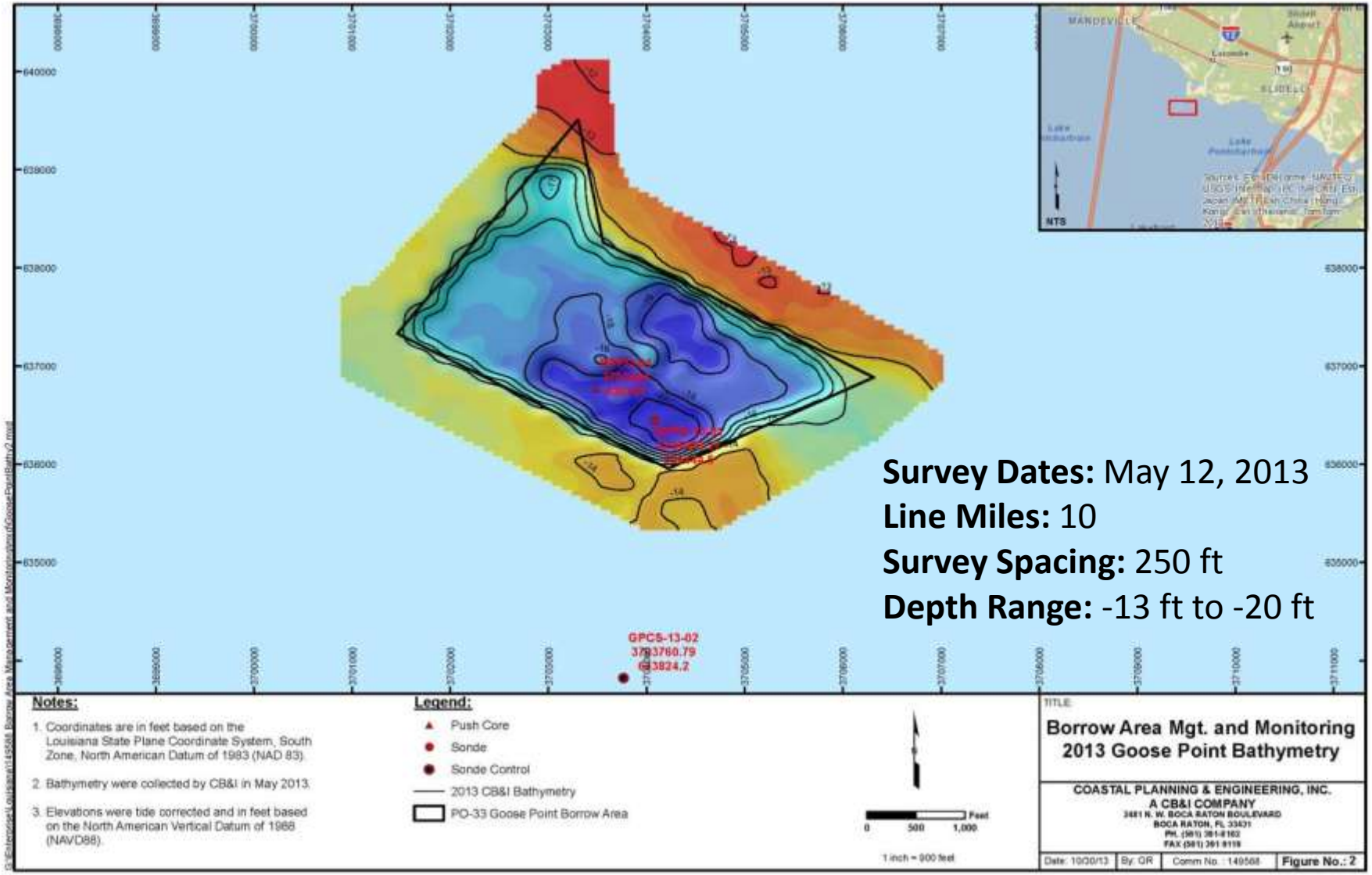
# Goose Point


Goose Point
Barataria Basin
Little Lake
East Marsh Island
West Lake
Boudreaux
Lake Mechant
West Grand
Terre
New Cut
West Belle Pass
Sandy Point

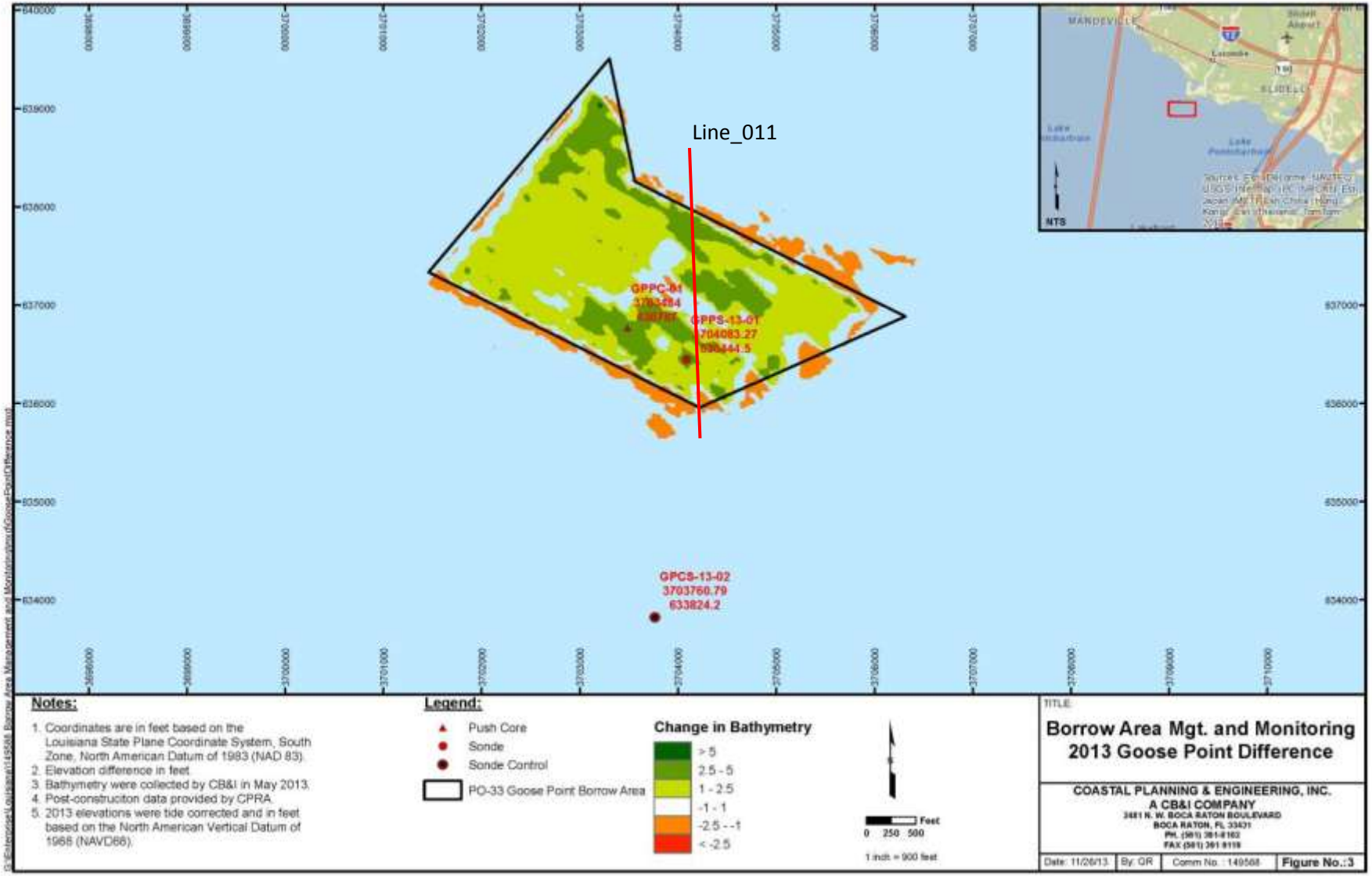
# Goose Point-Post Construction Bathymetry



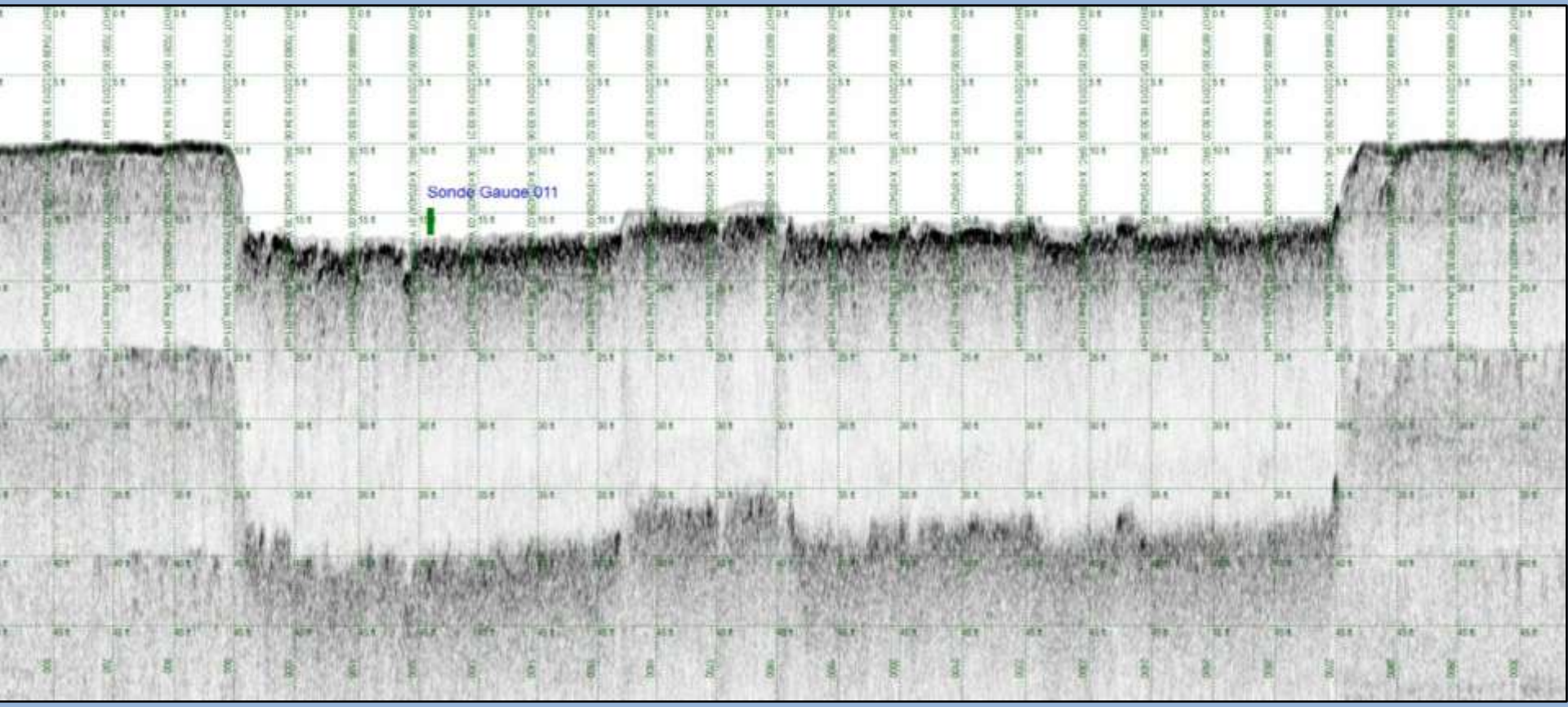
# Goose Point-2013 BAMM Bathymetry



# Goose Point-Difference Map

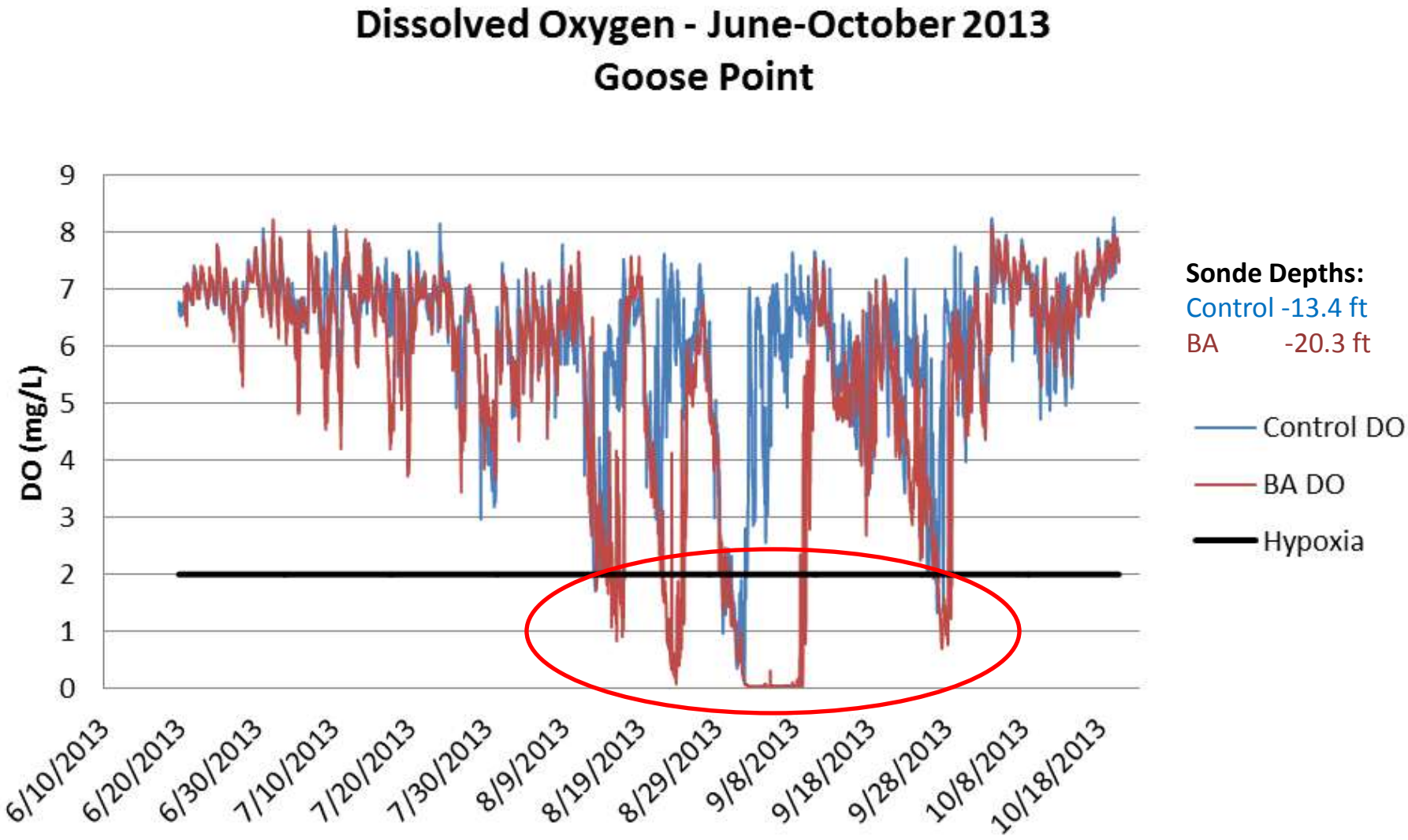


# Goose Point-Infilling




| Task | Details |
|---|---|
| Infilling | • Approximately 401,000 cubic yards<br>• 1.6 ft on average<br>• Range: 0-5.3 ft<br>• 0.3 ft/year |

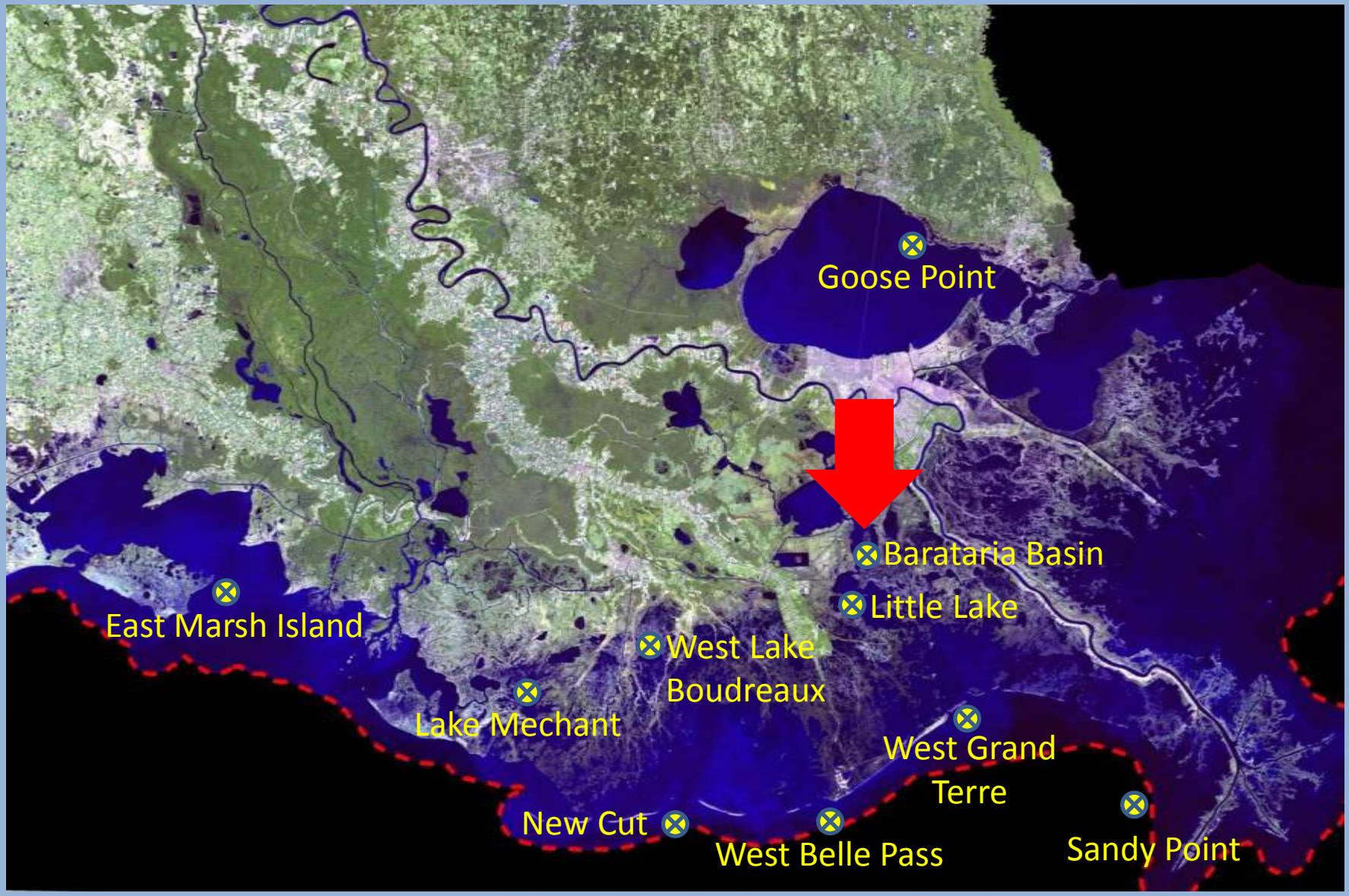
# Goose Point-Hypoxia



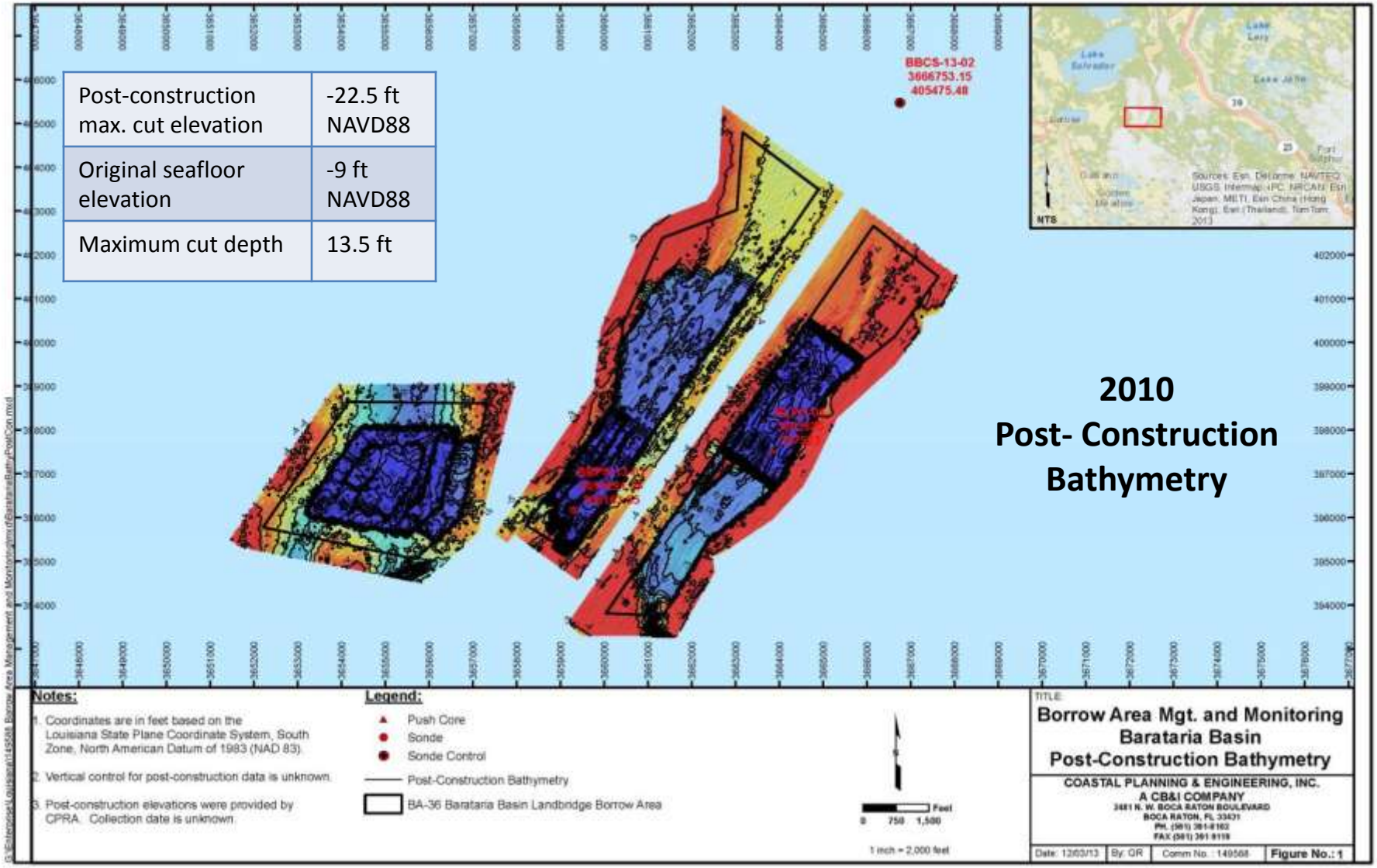
# Goose Point-Push Cores

| Task | Details |
|---|---|
| Push Cores | • Collected July 21, 2013<br>• Penetrated 4.6 ft and recovered 3.3 ft of material<br>• Three layers of material were identified<br>• 0.0-2.8 ft: mostly very dark gray clay (5Y-3/1)<br>• 2.9-3.1 ft: dark gray clay (5Y-4/1) with little organics<br>• 3.1-3.3 ft: grey clay (5Y-6/1) |

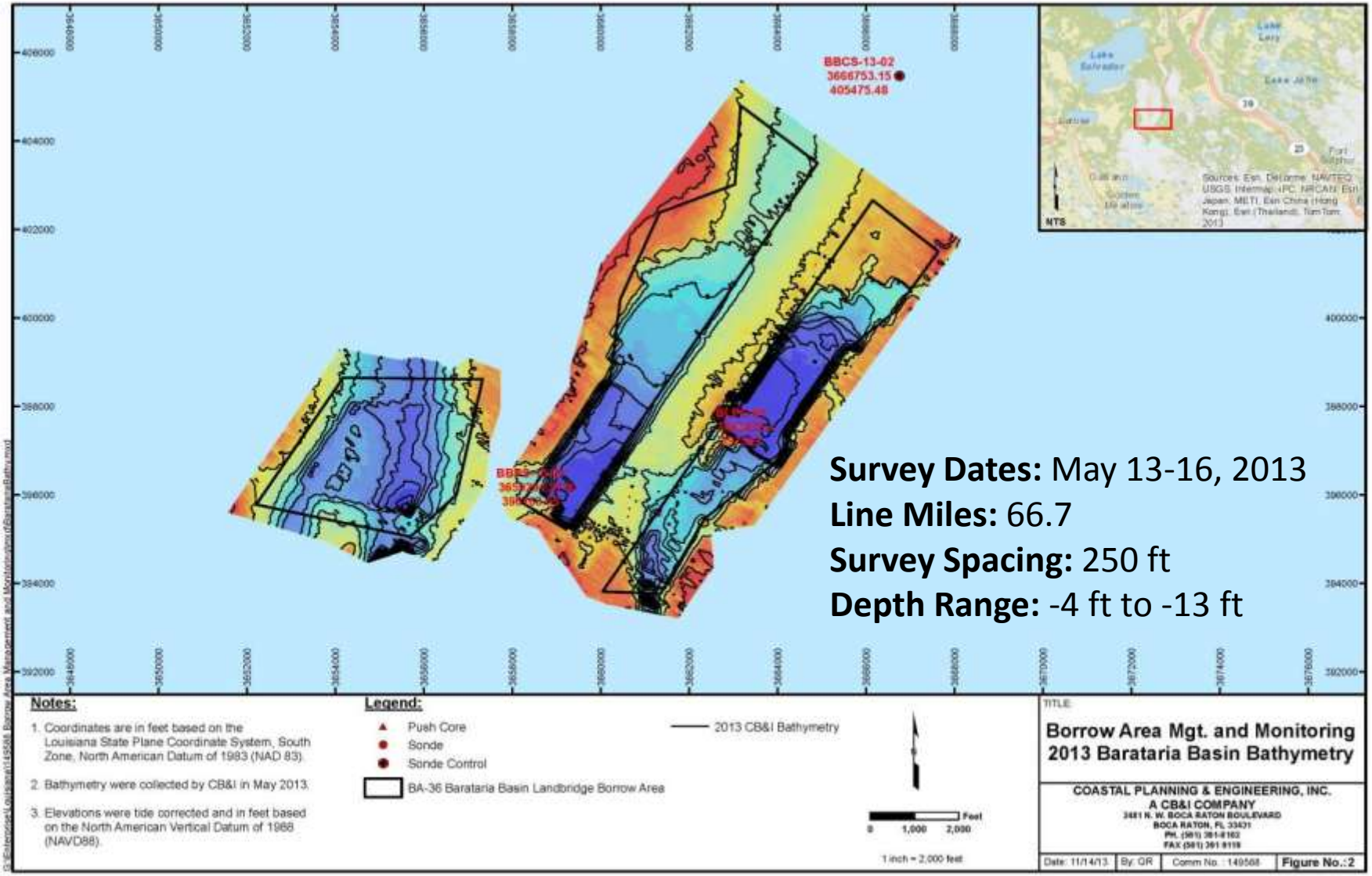

# Barataria Basin Landbridge



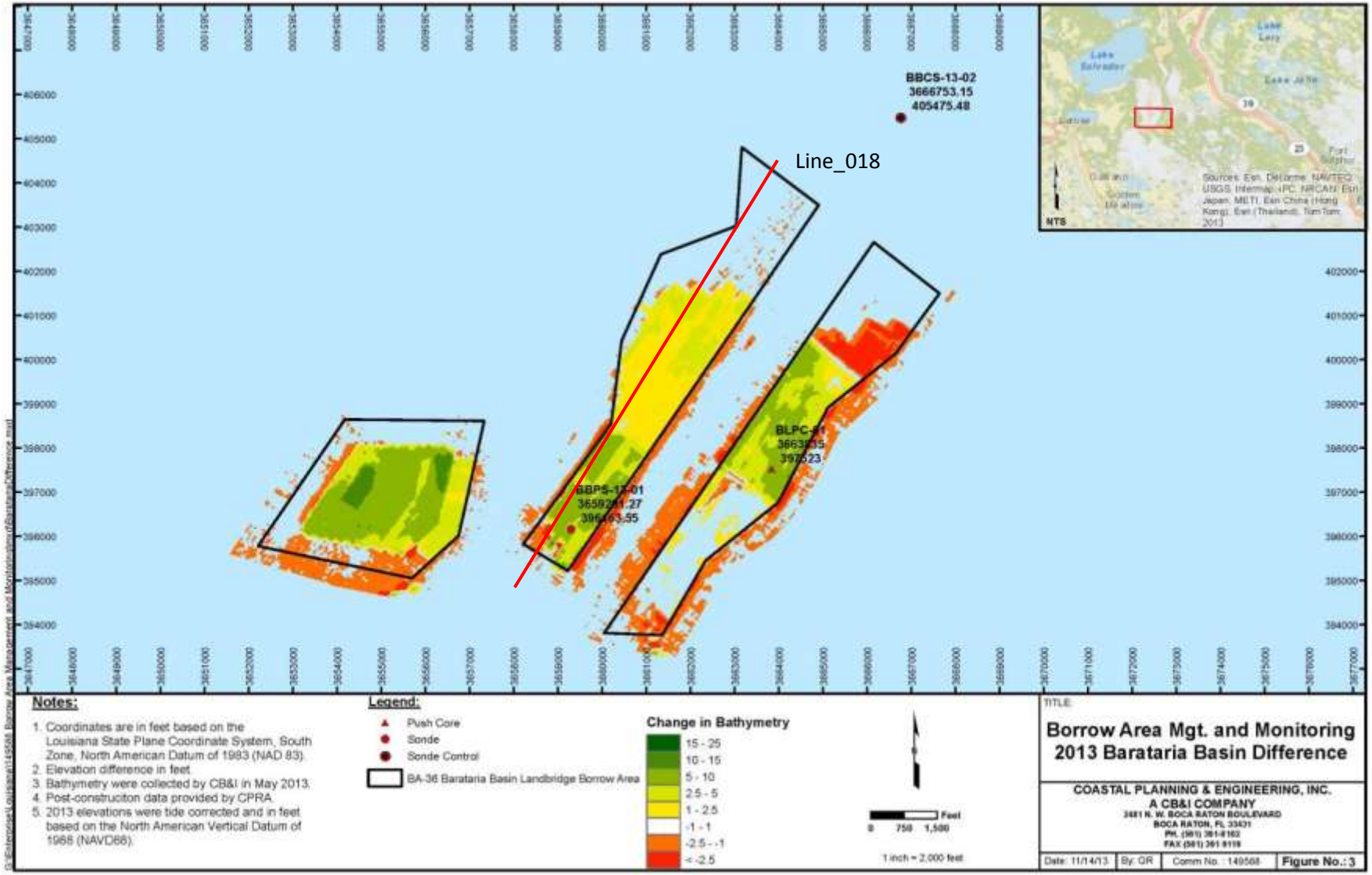
# Barataria-Post Construction Bathymetry



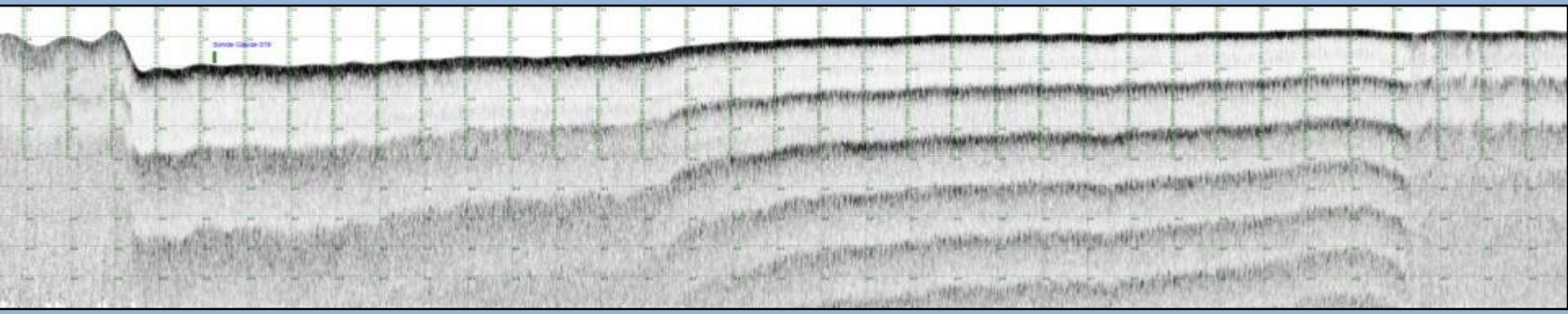
# Barataria-2013 BAMM Bathymetry



# Barataria-Difference Map

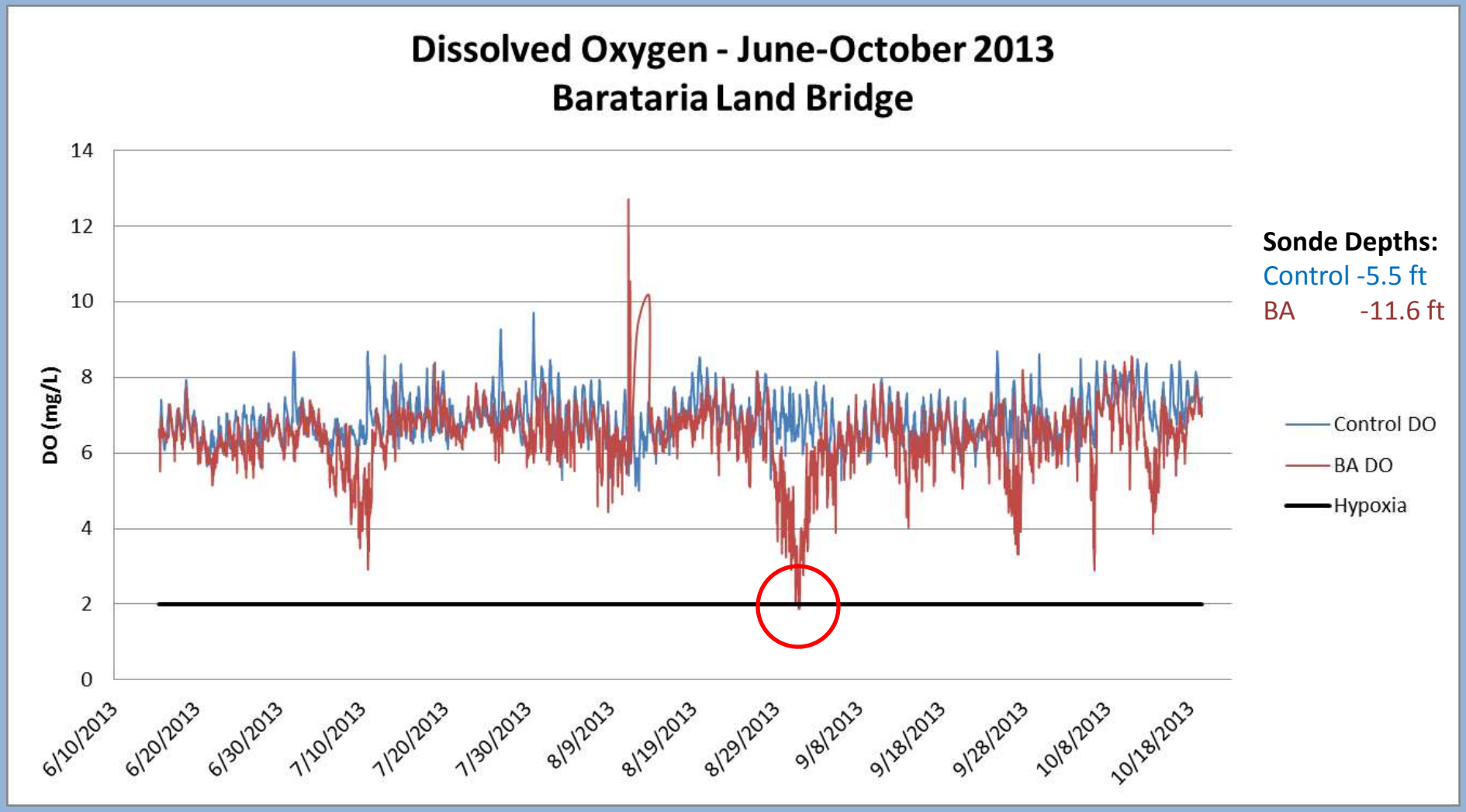


# Barataria Basin Landbridge-Infilling



| Task | Details |
|---|---|
| Infilling | • Approximately 3,248,000 cubic yards<br>• 2 ft on average<br>• Range: 0-13.7 ft<br>• 0.7 ft/year |

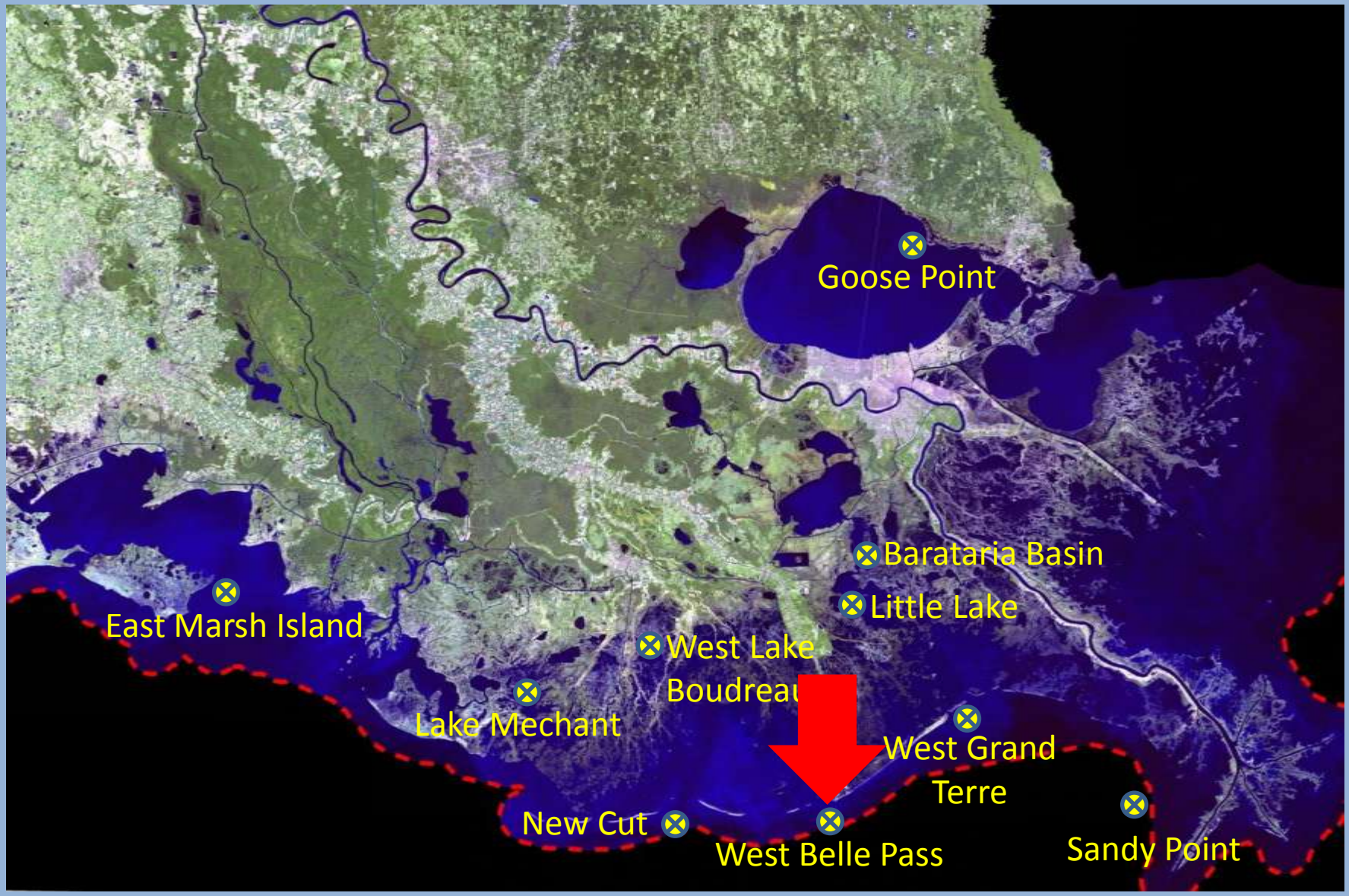
# Barataria Basin Landbridge-Hypoxia



# Barataria Basin Landbridge-Push Cores

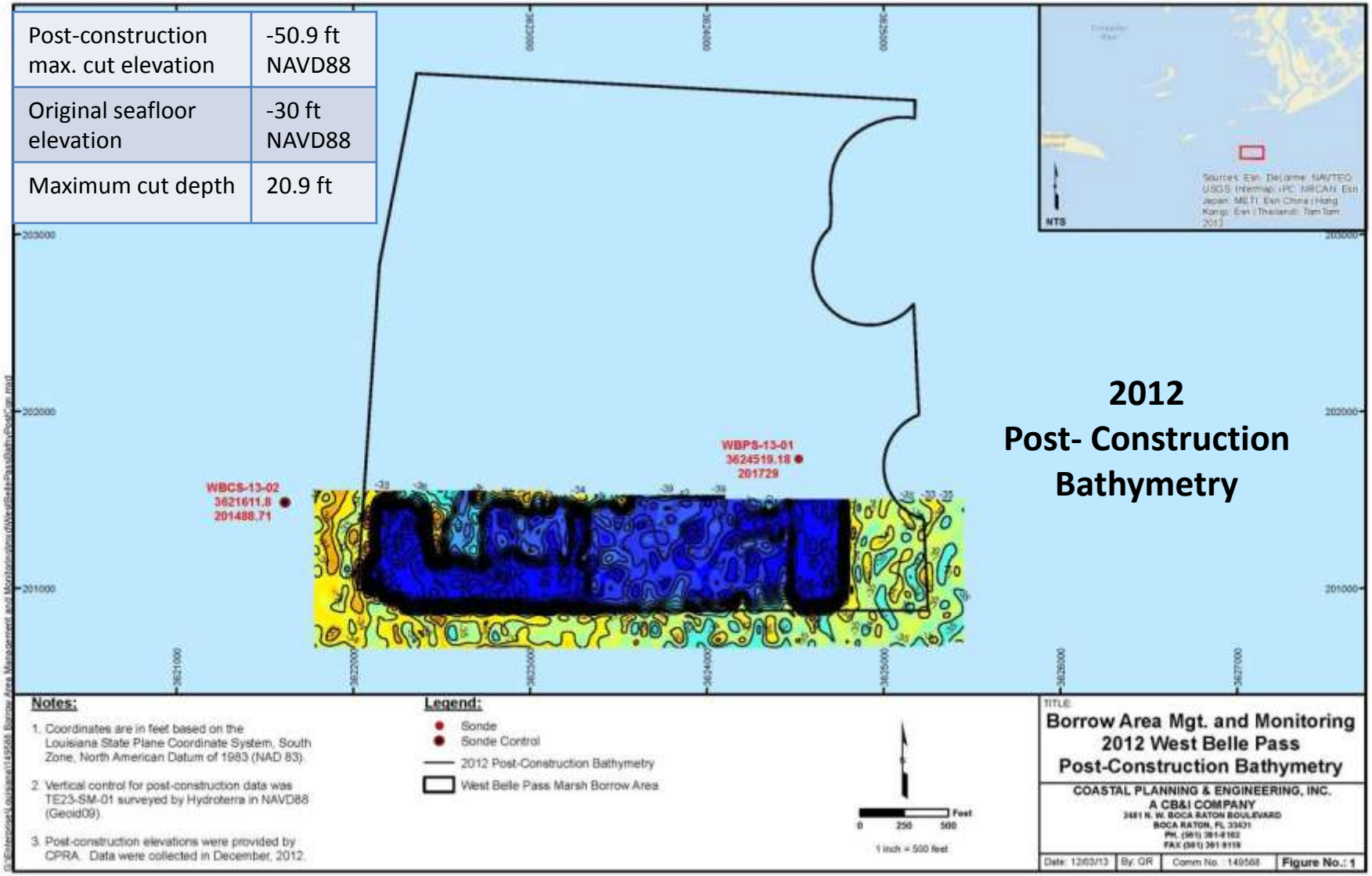
| Task | Details |
|---|---|
| Push Cores | • Collected July 17, 2013<br>• Penetrated 5.0 ft and recovered 2.8 ft of material<br>• Field vane shear test indicated the material to be very soft clay<br>• One layer identified as very soft and very dark grey clay (5Y-3/1) with little organics |


# West Belle Pass

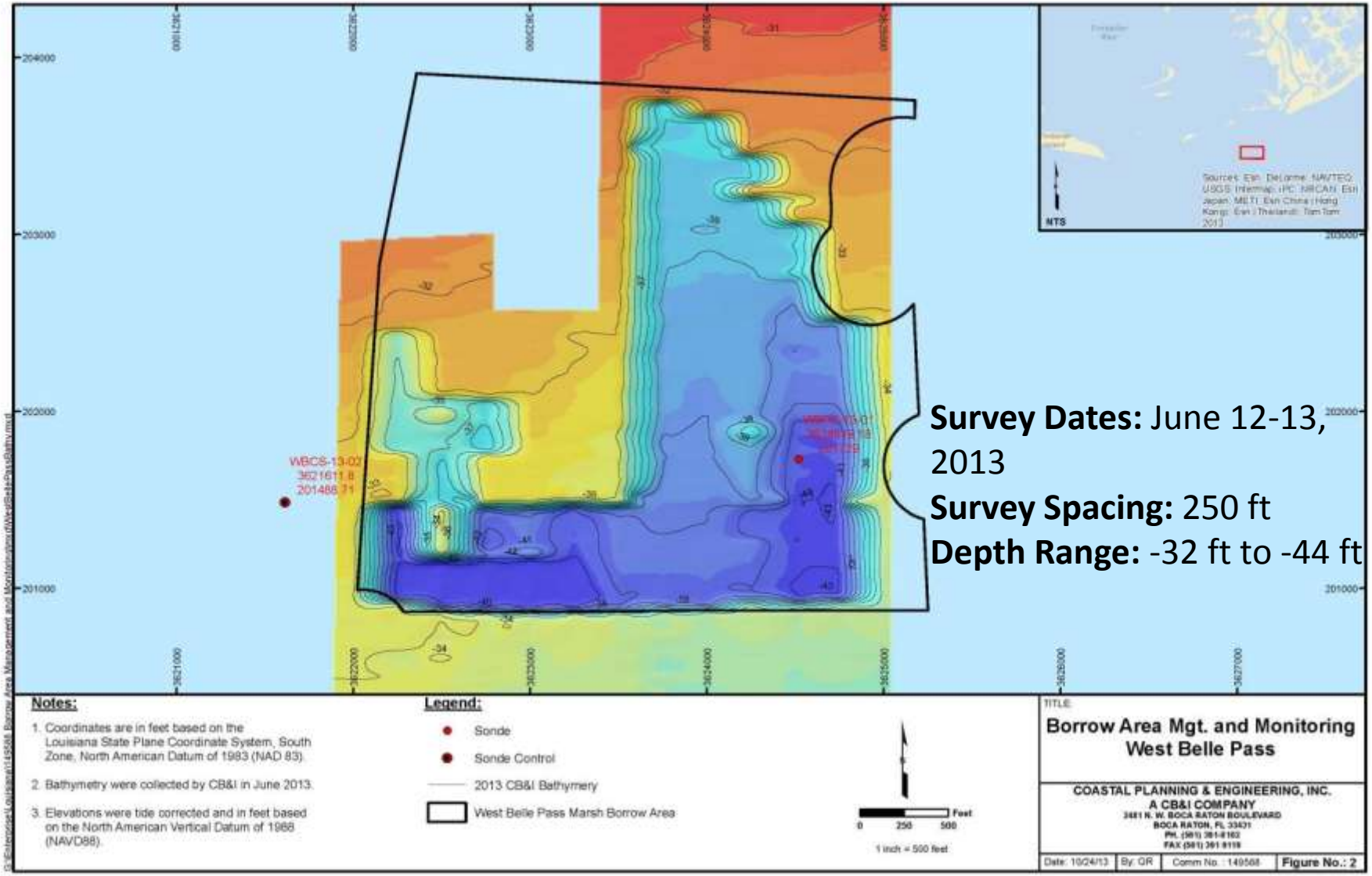


# West Belle Pass-Post Construction Bathymetry

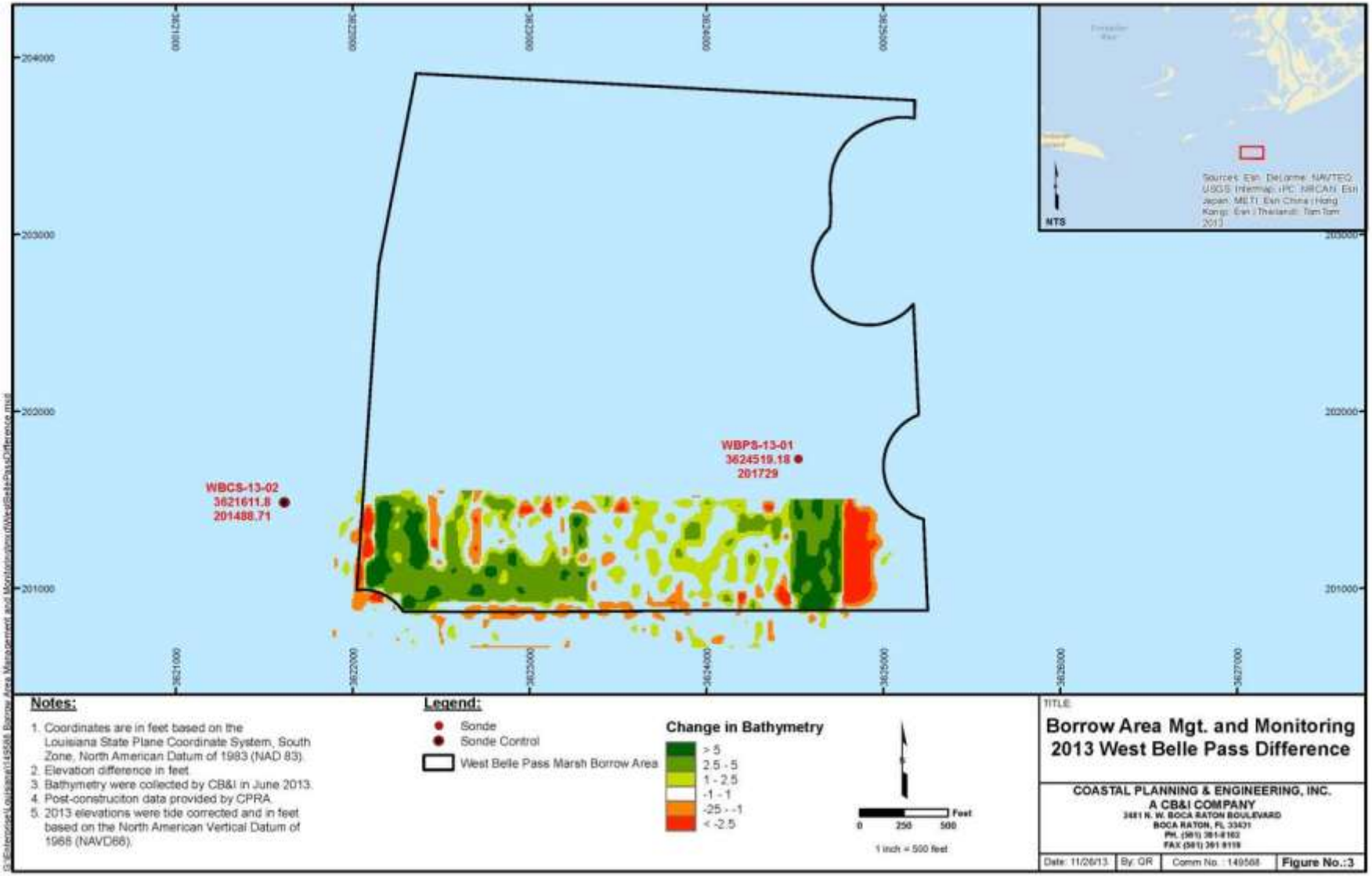
| | |
|---|---|
| Post-construction max. cut elevation | -50.9 ft NAVD88 |
| Original seafloor elevation | -30 ft NAVD88 |
| Maximum cut depth | 20.9 ft |



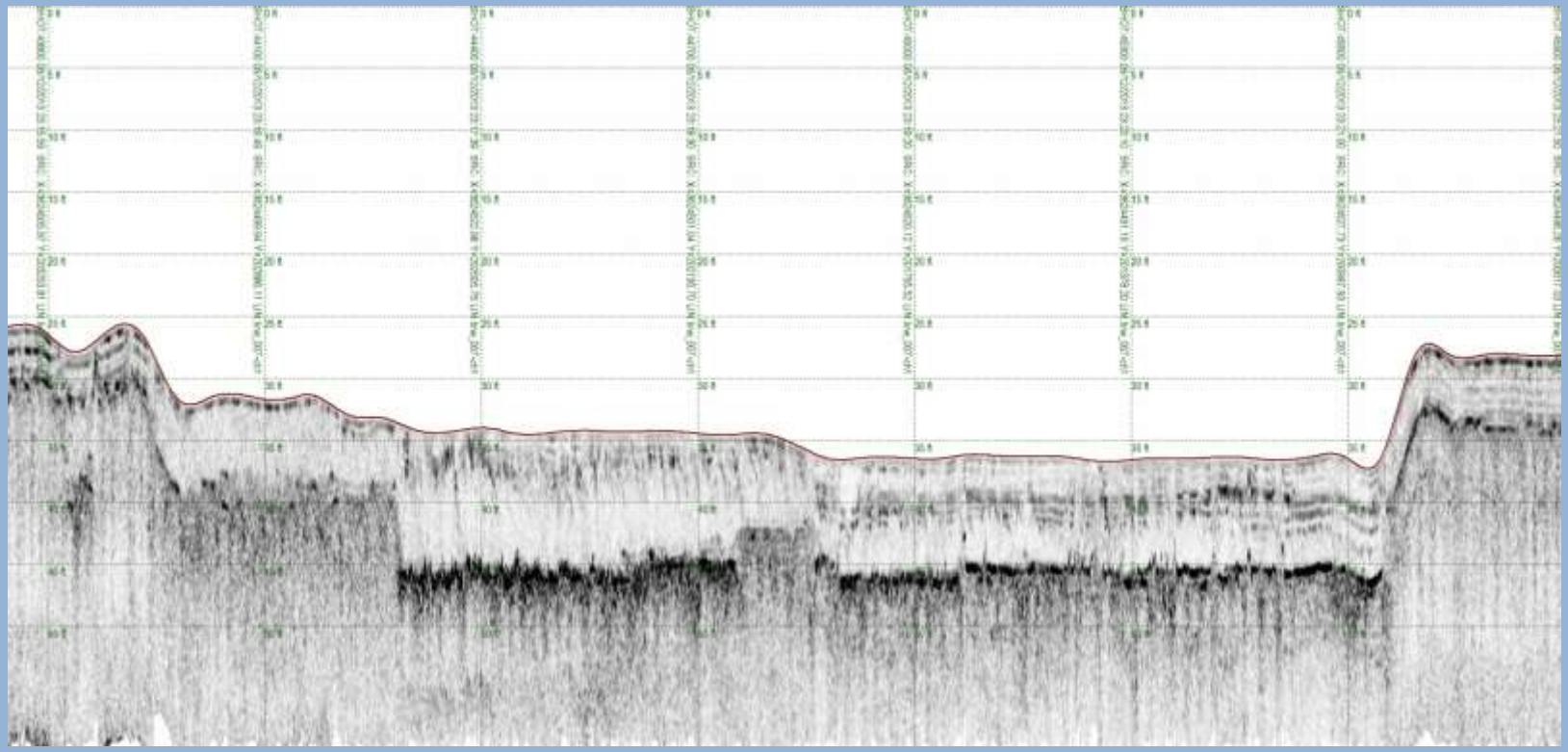
# West Belle Pass-2013 BAMM Bathymetry



# West Belle Pass-Difference Map

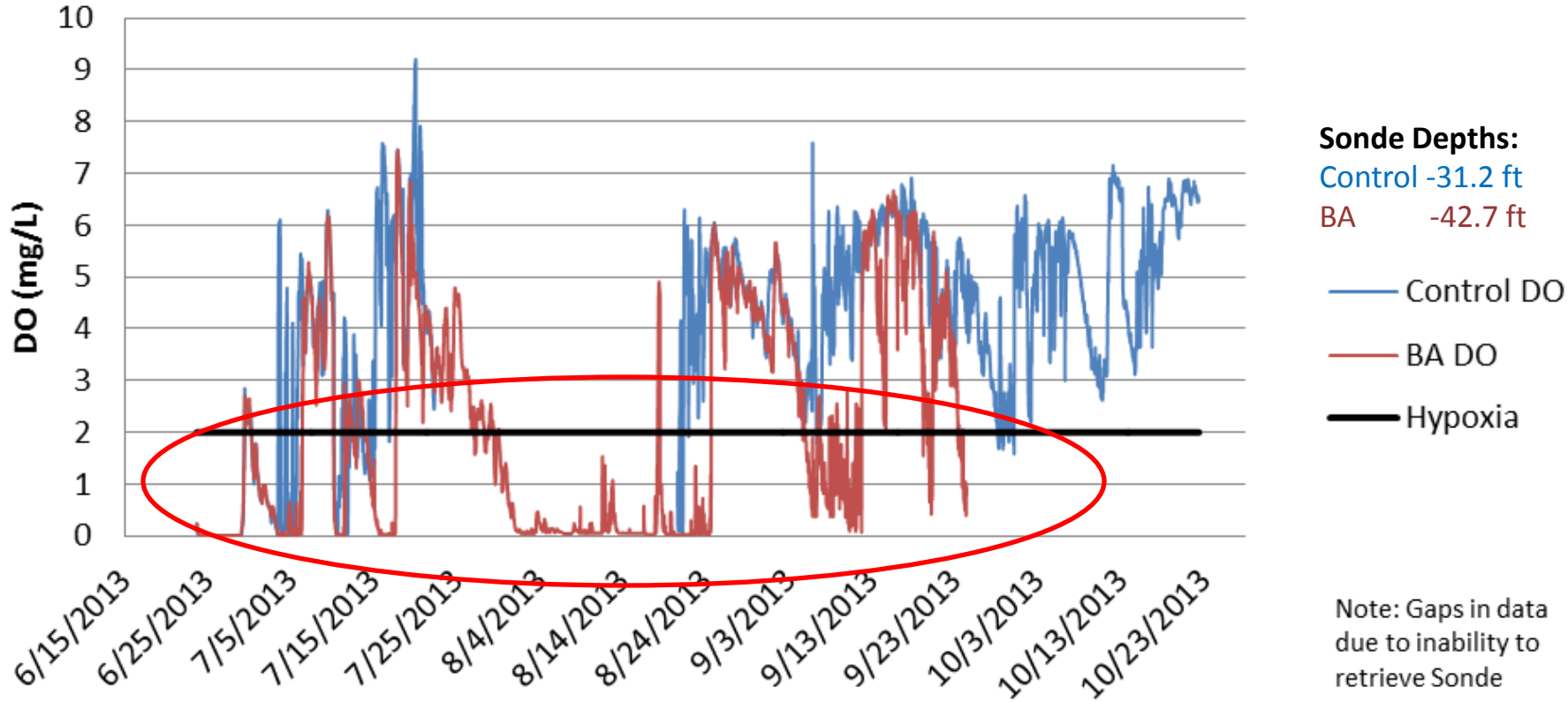


# West Belle Pass-Infilling

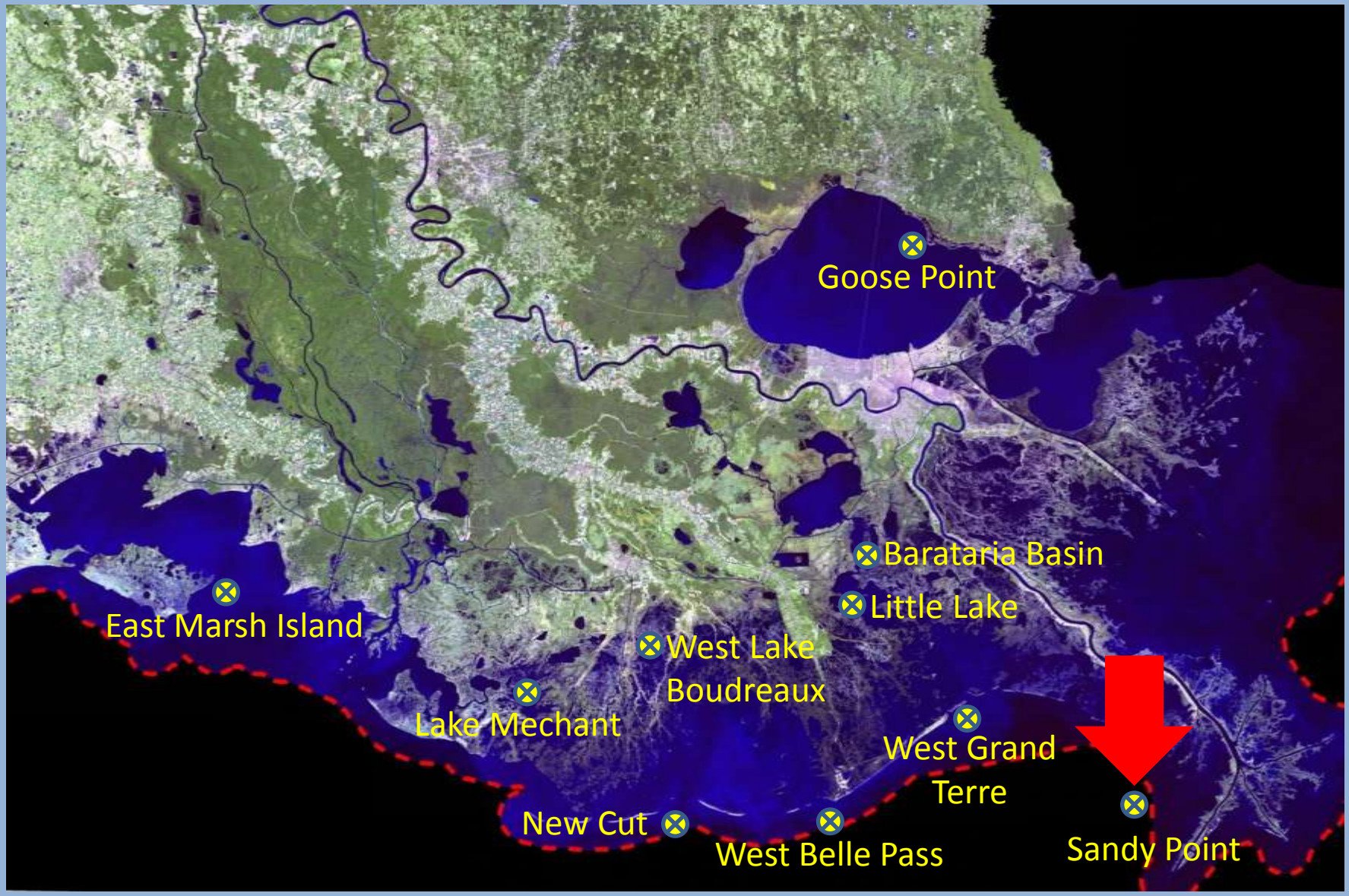


| Task | Details |
|---|---|
| Infilling | • Approximately 104,000 cubic yards<br>• 1.4 ft on average<br>• Range: 0-12.6 ft<br>• 1.4 ft/year |

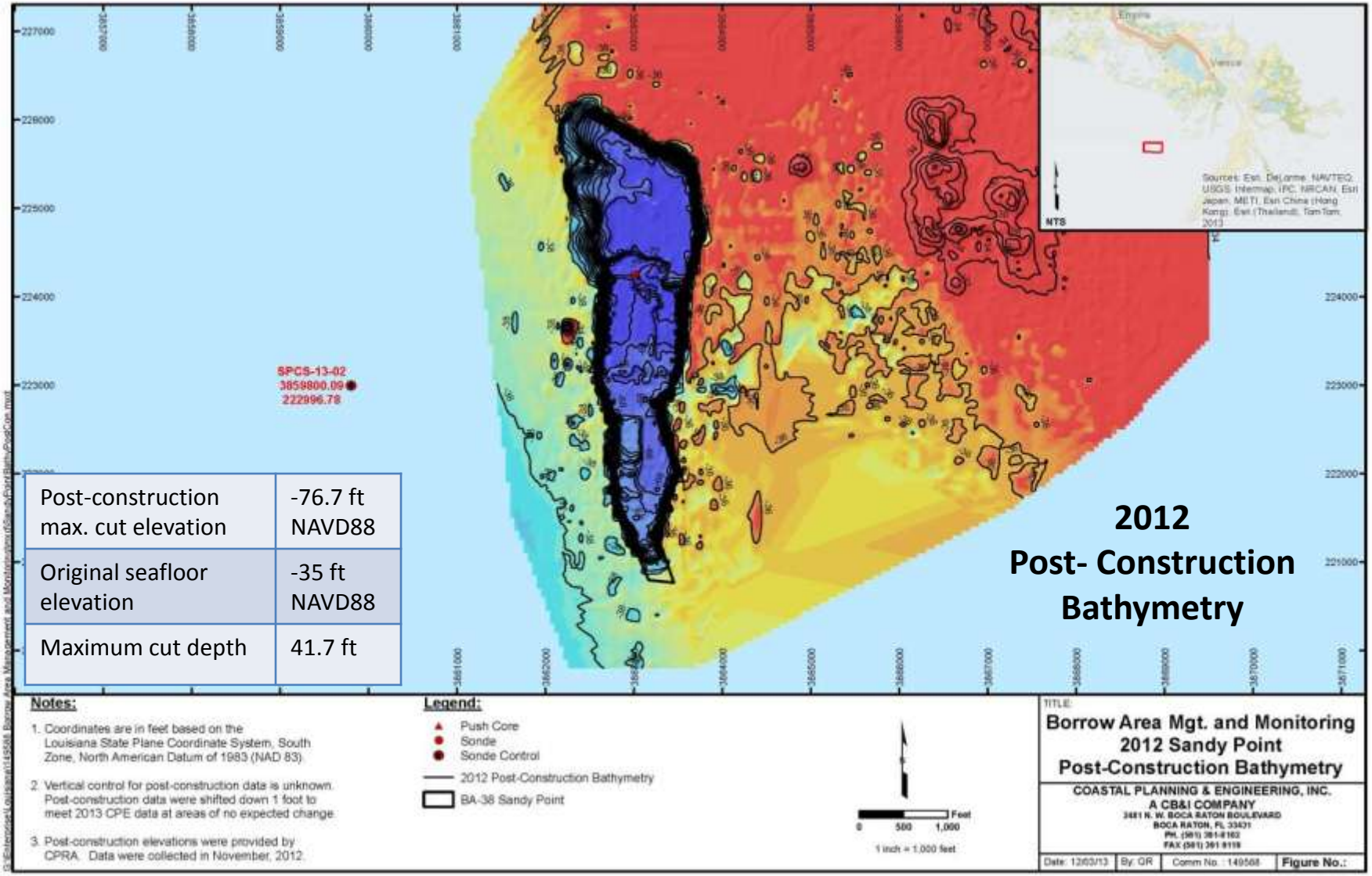
# West Belle Pass-Hypoxia



# Sandy Point

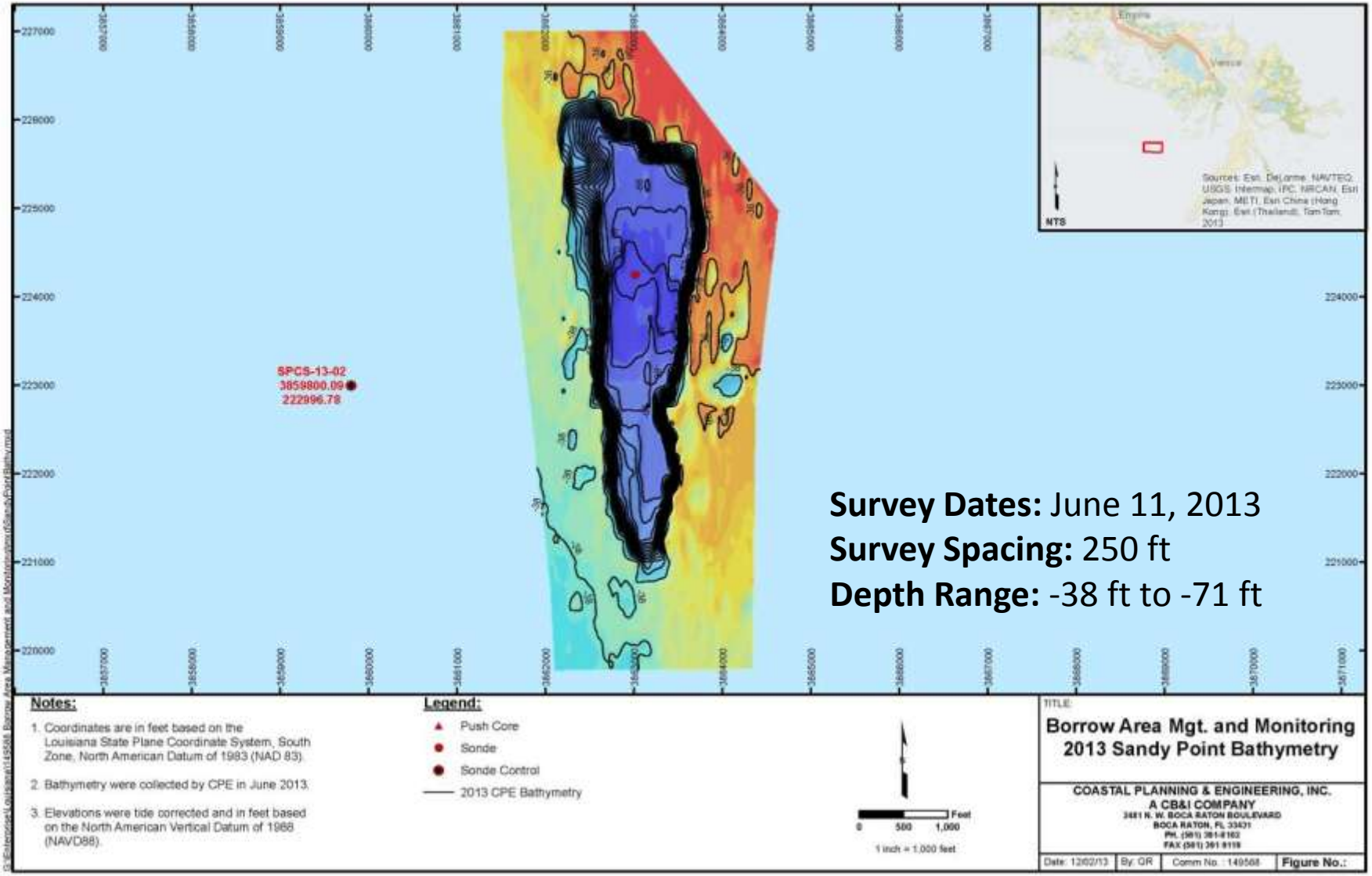

Goose Point
Barataria Basin
Little Lake
East Marsh Island
West Lake
Boudreaux
Lake Mechant
West Grand
Terre
New Cut
West Belle Pass
Sandy Point

# Sandy Point-Post Construction Bathymetry

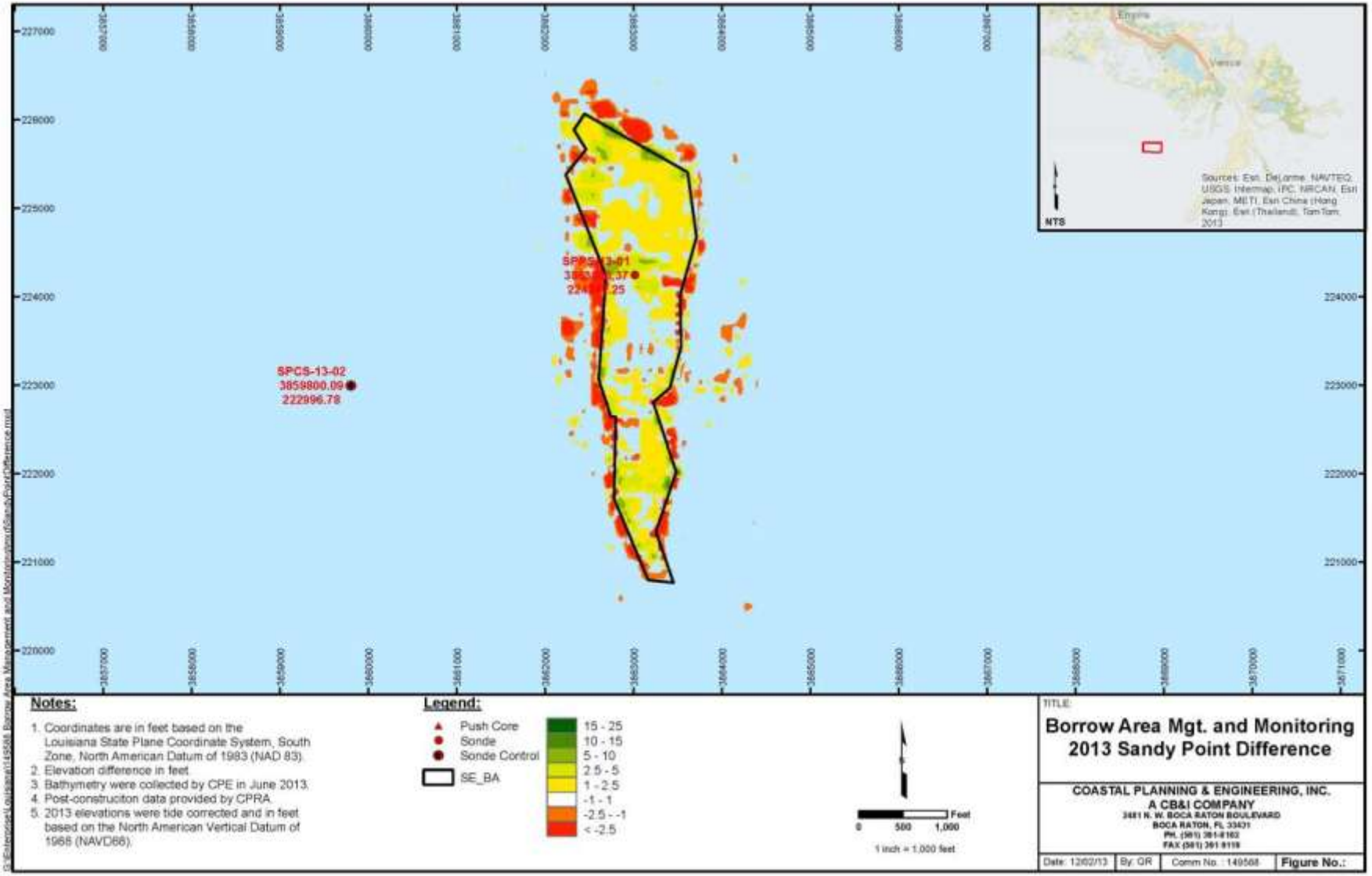



| | |
|---|---|
| Post-construction max. cut elevation | -76.7 ft NAVD88 |
| Original seafloor elevation | -35 ft NAVD88 |
| Maximum cut depth | 41.7 ft |

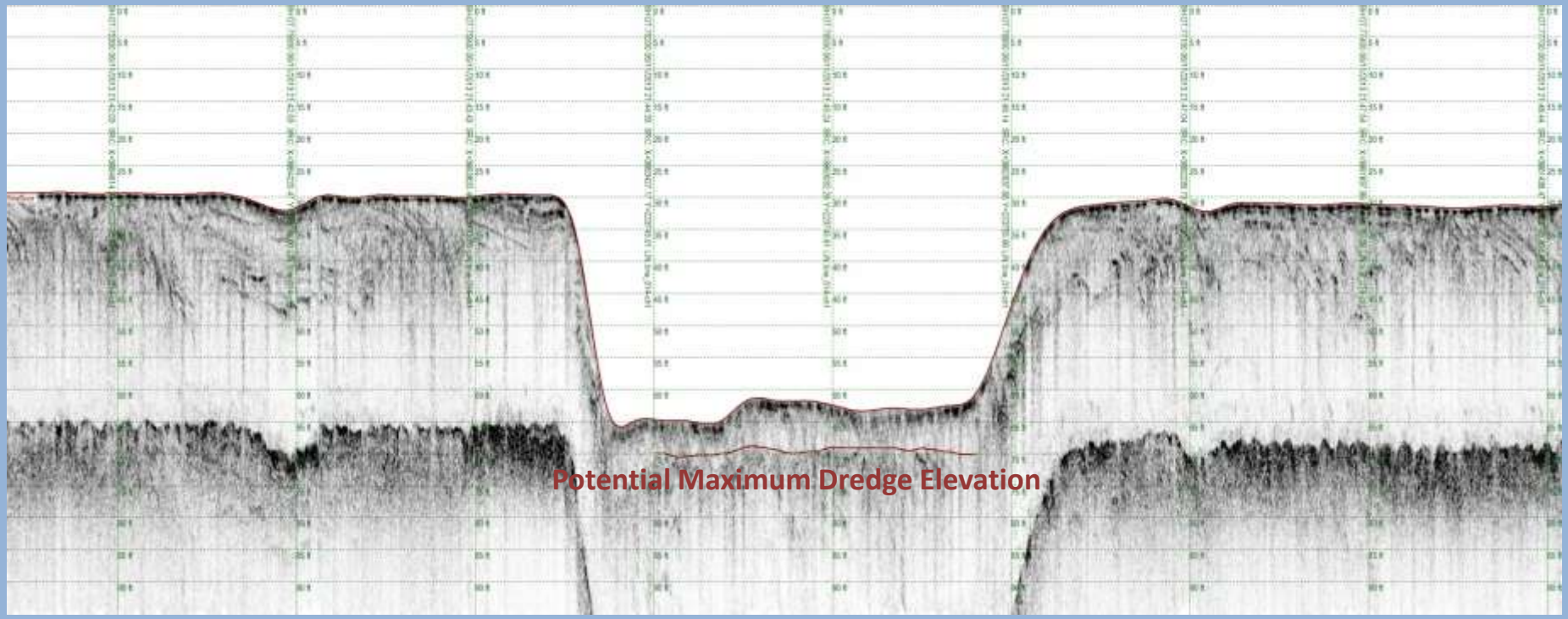
# Sandy Point-2013 BAMM Bathymetry



# Sandy Point-Difference Map

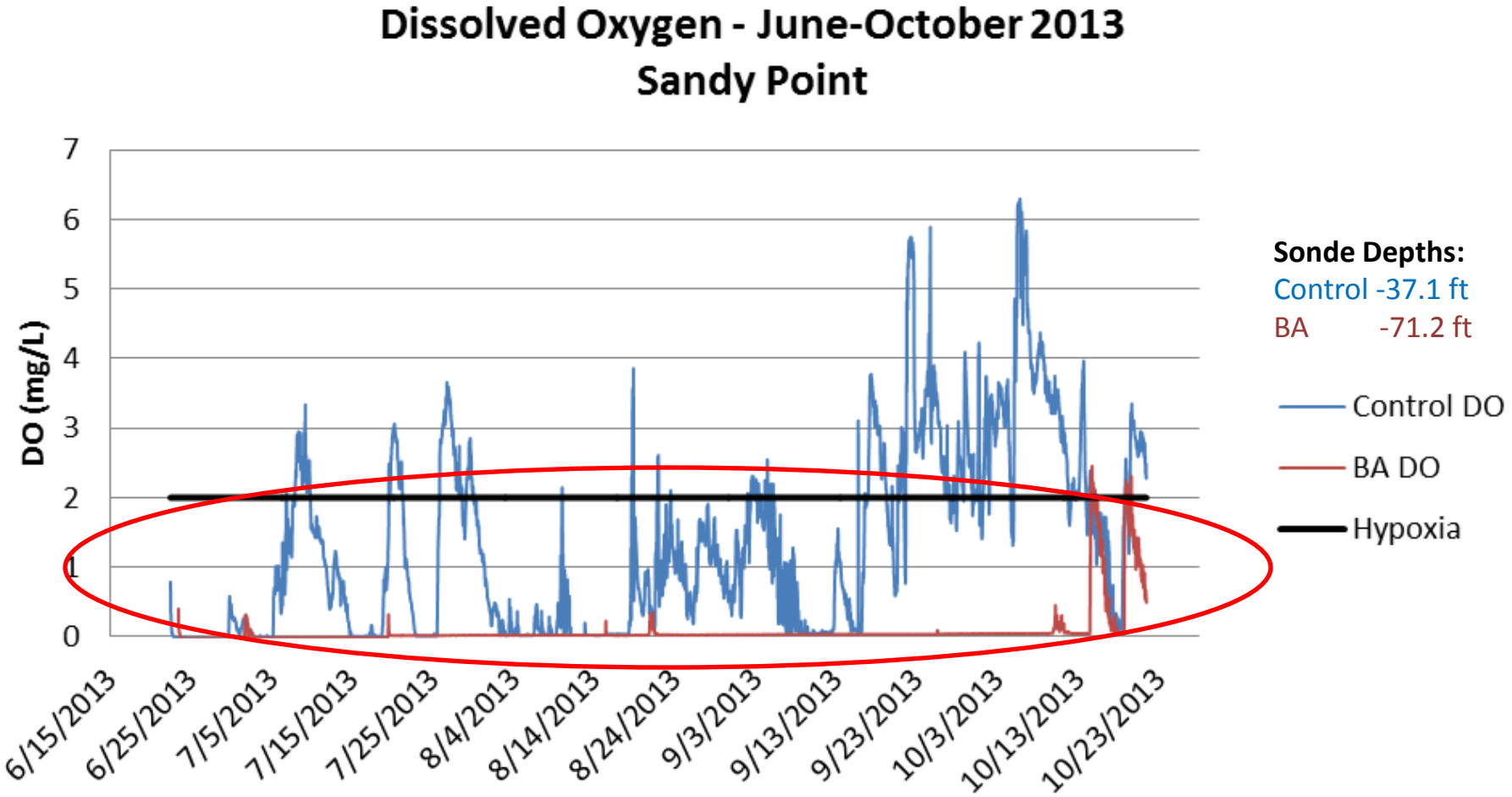


# Sandy Point-Infilling




| Task | Details |
|---|---|
| Infilling | • Approximately 201,000 cubic yards<br>• 1.4 ft on average<br>• Range: 0-12.5 ft<br>• 1.4 ft/year |

# Sandy Point-Hypoxia



# Preliminary Conclusions

**Physical Characteristics**

1. Infilling rate

| Location | Years Between Post-Construction Survey and CB&I Survey | Average Infill Thickness (ft) | Infilling Rate (ft/yr) |
|---|---|---|---|
| East Marsh Island | 2 | 7 | 3.5 |
| Lake Mechant | 4 | 1.3 | 0.3 |
| Goose Point | 5 | 1.6 | 0.3 |
| Barataria Landbridge | 3 | 2.0 | 0.7 |
| West Belle Pass | 1 | 1.4 | 1.4 |
| Sandy Point | 1 | 1.4 | 1.4 |

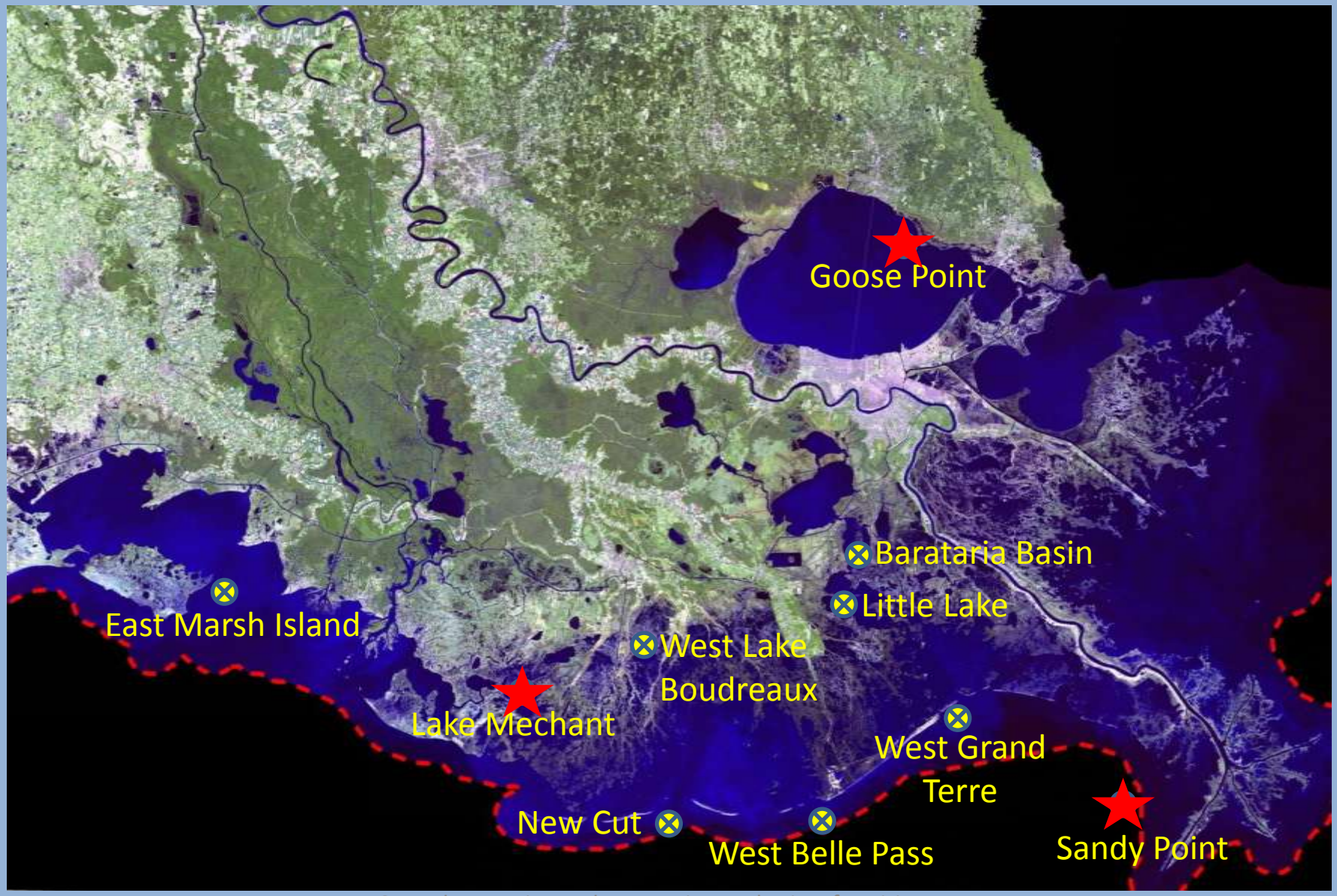
# Preliminary Conclusions

**Physical Characteristics**

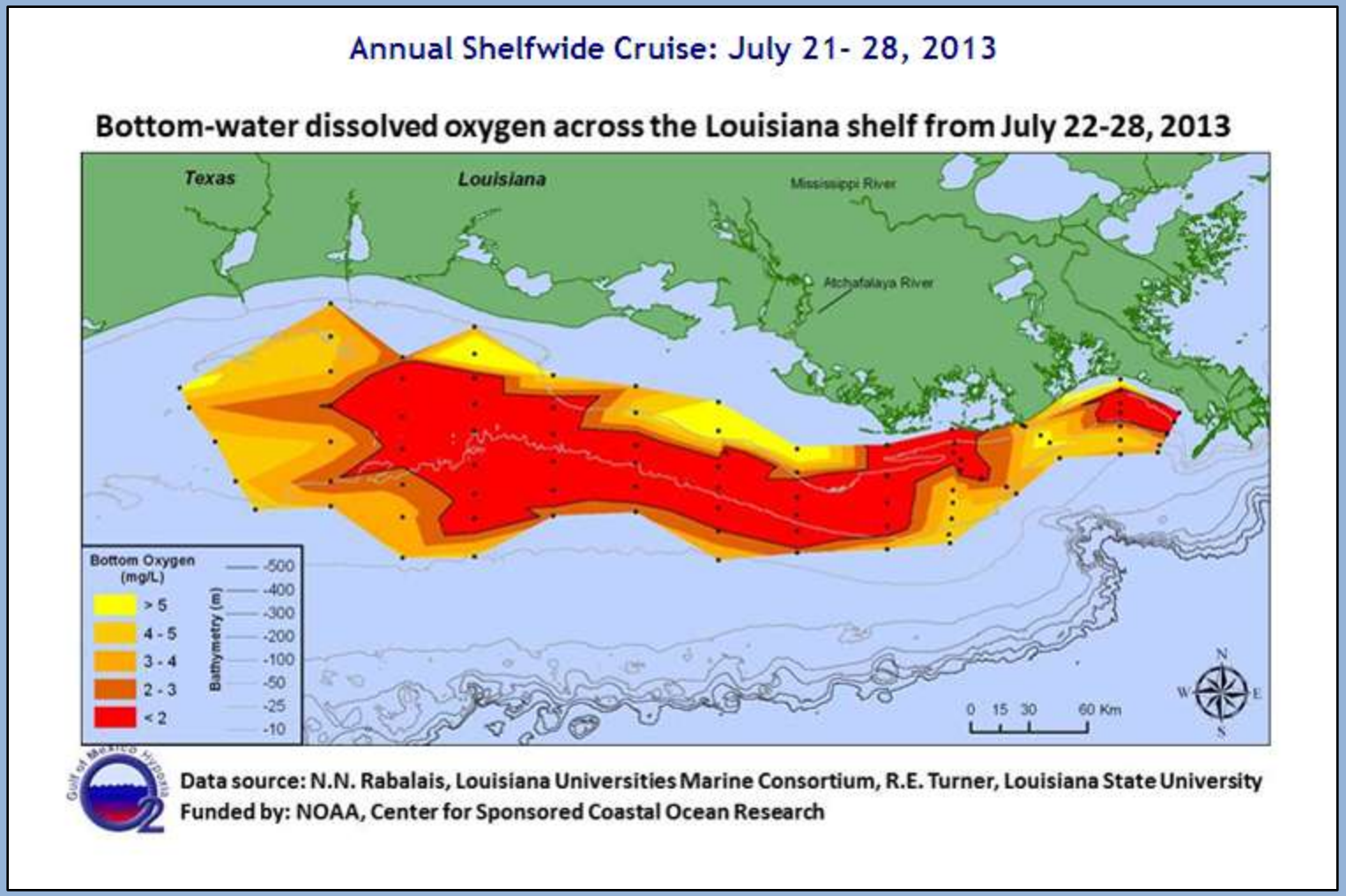
2. Sediment characteristics from push cores

| Borrow Area | Penetration (ft) | Recovery (ft) | Sediment Description |
|---|---|---|---|
| Barataria Basin Landbridge (BLPC-13-01) | 5.0 | 2.8 | Very soft, dark gray clay (5Y-3/1) with little organic material |
| Little Lake (LLPC-13-01) | 5.0 | 2.1 | Soft, dark gray clay (5Y-3/1) with little organic material |
| West Lake Boudreaux (LBPC-13-01) | 5.0 | 2.7 | Very soft, dark gray clay (5Y-3/1) with little organic material |
| Goose Point (GPPC-13-01) | 4.6 | 3.3 | From 0.0 ft to 2.98 ft the material was mostly a very soft, very dark gray (5Y-3/1) clay with little organics. From 2.9 ft to 3.1 ft, the material was very soft, dark gray clay (5Y-4/1) with little organics. From 3.1 ft to 3.3 ft, material was grey (5Y-6/1) clay. |

# Preliminary Conclusions



# Bottom-Water Dissolved Oxygen across Louisiana Shelf



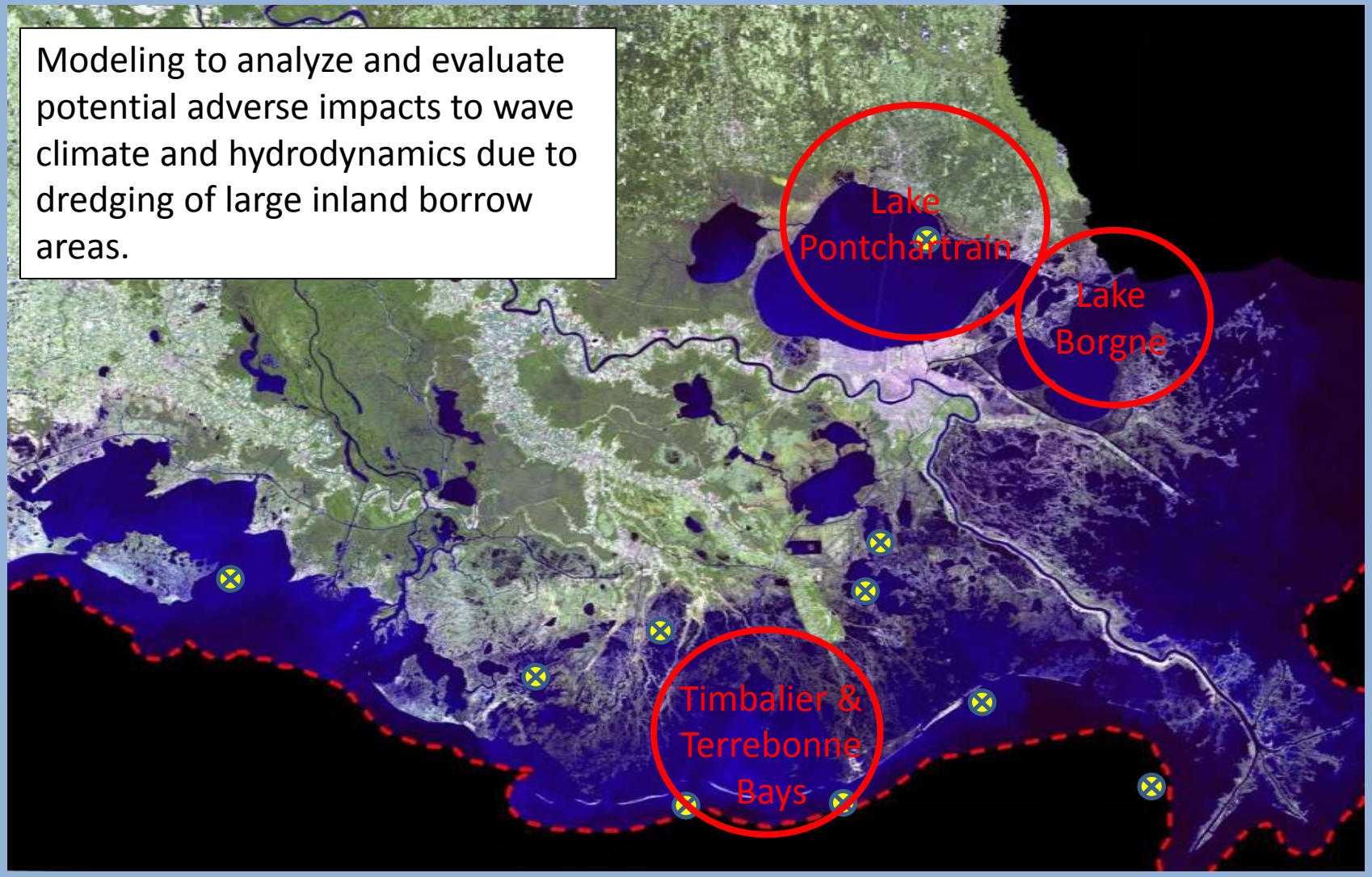
# Preliminary Conclusions

## Water Quality

1. Red stars represent areas where dredging may have some influence on DO levels. It is important however, to consider the size of these borrow areas relative to surrounding open water.
2. Nearshore/Lakes
    1. Lake Mechant-Where data was available, the change in bathymetry following dredging activities did decrease dissolved oxygen levels in the borrow area, but they only reached hypoxic levels for brief periods of time spread throughout the observation period.
    2. Goose Point-Based on the data collected during the observation period, hypoxia was likely caused by the dredging in the borrow area, but recovery did occur relatively quickly to levels similar to the control area.
    3. East Marsh Island-Insufficient information to conclude that the dredging in East Marsh Island had any effect on the existence, persistence, or degree of hypoxia in the borrow area, although where oxygen levels were decreased nearing hypoxic conditions, they were only measured briefly and recovered quickly to levels similar to the control area.
    4. Barataria Landbridge -The change in bathymetry following dredging activities did not influence the existence, persistence, or degree of hypoxia.
3. Offshore
    1. Sandy Point- dredging did increase hypoxia and anoxia in the borrow area, but the control area also exhibited significant and persistent occurrences of hypoxia. This area is also close to the larger Gulf hypoxic zone.
    2. West Belle Pass – It is difficult to say that the change in bathymetry following dredging activities did or did not influence the existence, persistence, or degree of hypoxia. This area is also close to the larger Gulf hypoxic zone.

# Preliminary Conclusions

**Environmental impacts** - ongoing



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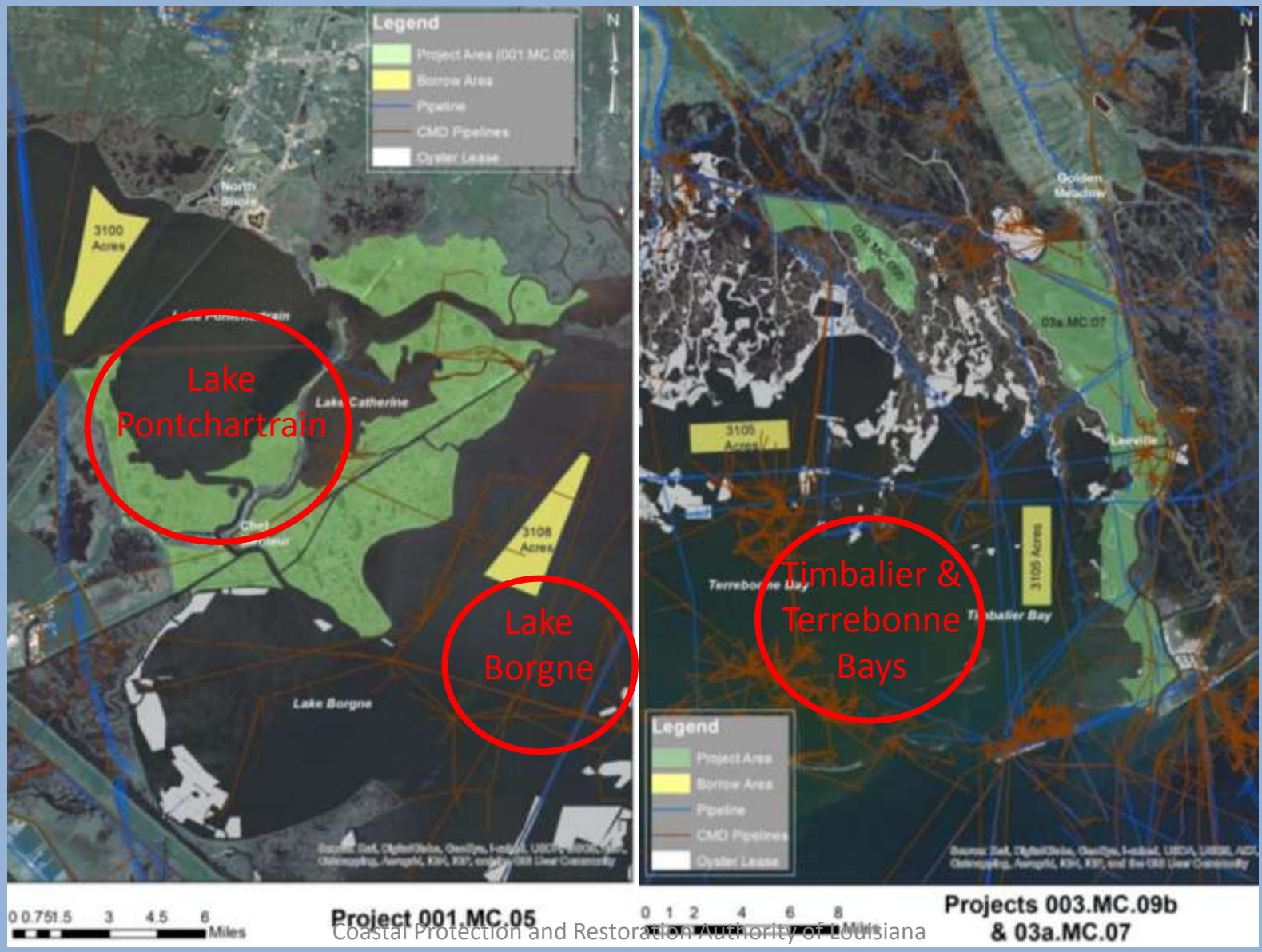

# Summary

| Location | Max. Cut Depth (ft) | Average Infill Thickness (ft) | Infilling Rate (ft/yr) | Hypoxia attributed to dredging (Y/N) |
|---|---|---|---|---|
| East Marsh Island | 14.2 | 7 | 3.5 | N |
| Lake Mechant | 9 | 1.3 | 0.3 | Y |
| Goose Point | 9 | 1.6 | 0.3 | Y |
| Barataria Landbridge | 13.5 | 2.0 | 0.7 | N |
| West Belle Pass | 20.9 | 1.4 | 1.4 | N |
| Sandy Point | 41.7 | 1.4 | 1.4 | Y |

# Questions ???

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