


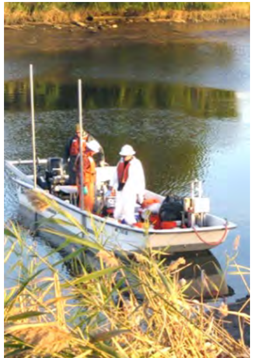

Evolution of Customized Waterway Sediment Sampling Equipment to Achieve Data Quality Objectives in a Phased Remedial Investigation

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#GEOSED

Parsing the Title

Evolution of

(Looking at a series of…)

…Customized Waterway Sediment Sampling Equipment

(…specialized equipment we used and designed…)

…to Achieve Data Quality Objectives

(…to achieve the changing requirements…)

…in a Phased Remedial Investigation

(…associated with this project.)

Why Is This Worth Discussing?

Complex questions require data which are:

- Specific
- High-Quality

} Potentially outside the capabilities of conventional approaches

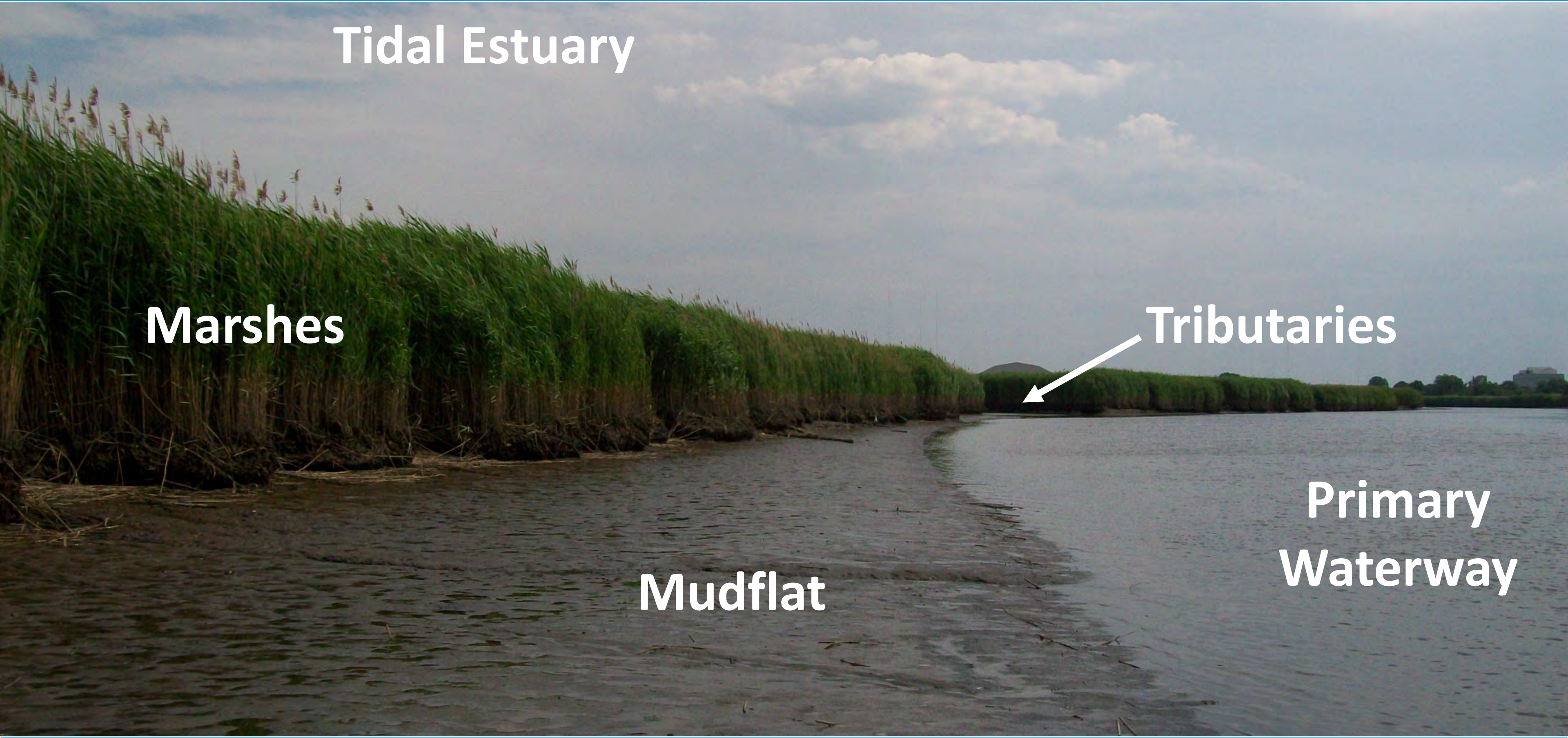
Exploring customized, need-based solutions can:

- Generate the ‘best’ data
- Improve data quality and utility
- Improve data collection efficiency
- Minimize or mitigate safety hazards
- Reduce cost

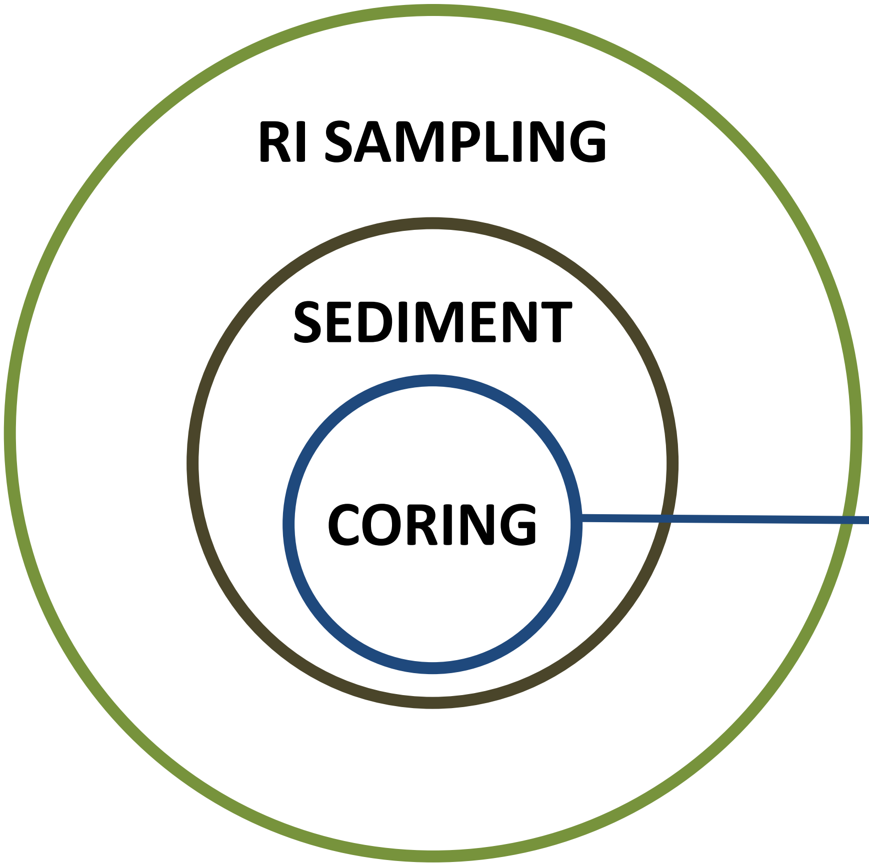
Overview

- Multi-Phase RI
  - Changing Data Quality Objectives (DQOs)
  - Selected approaches
  - Areas of design change/improvement
  - Implementation
  - Net effect of design changes on data

Site Setting



Program Focus



The subject RI includes a variety of sampling matrices and approaches

Sediment coring occurred in multiple phases

- **Phase 1**
- **Phase 2**
- **Phase 3**

Phase 1 Data Quality Objectives

- DQOs for sediment coring were to:
  - – Characterize top 1m of sediment
  - – “Low-resolution” sampling
    - Geochronology: 10cm intervals
    - COPCs: vary, 6 to 40cm intervals
  - – Broad spatial characterization
  - – Direct future coring programs

- Needs were met using a “standard” method

Phase 1 Standard Vibracore

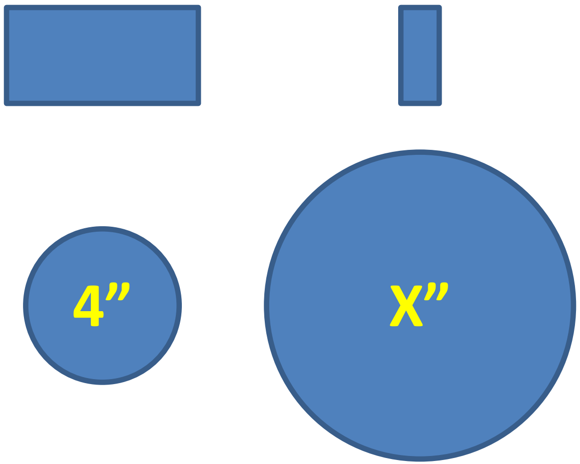
Phase 2 Data Quality Objectives

- Desire to look at deposition and resuspension potential in greater detail

- DQOs for sediment coring were to:
  - Characterize soft sediment material
  - Deeper characterization (up to 2m)
  - “High-resolution” (2 cm) from surface
  - Extensive list of physical and chemical parameters added

Phase 2 Identified Areas of Need

- Boost Core Integrity
  - Depth Integrity
    - Allow accurate sectioning on 2cm intervals to 2m depth
    - Minimize compression, core loss
  - Spatial Integrity
    - Collect sample using as few cores as possible
    - Work with laboratory to minimize mass required
  - Sample Integrity
    - Vertical processing
    - Large sample mass needed



Phase 2 Design Implementation

Phase 2 Design Implementation

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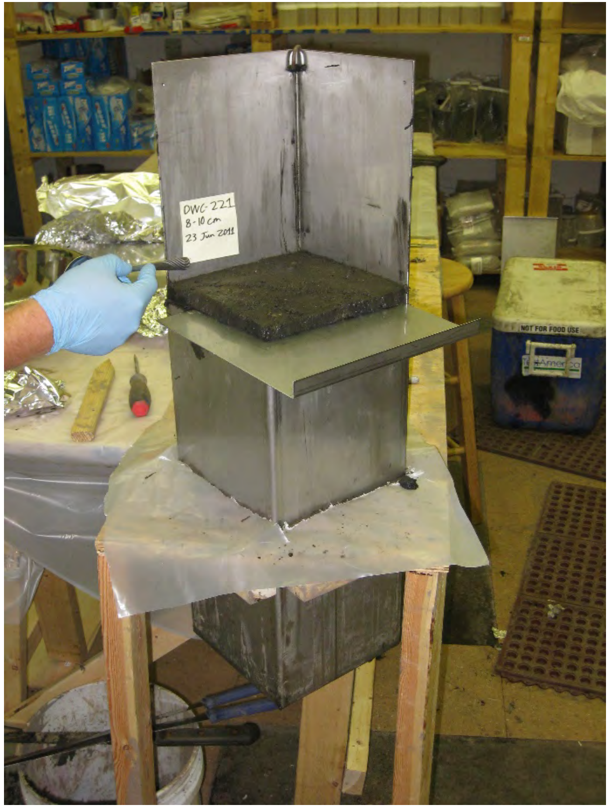
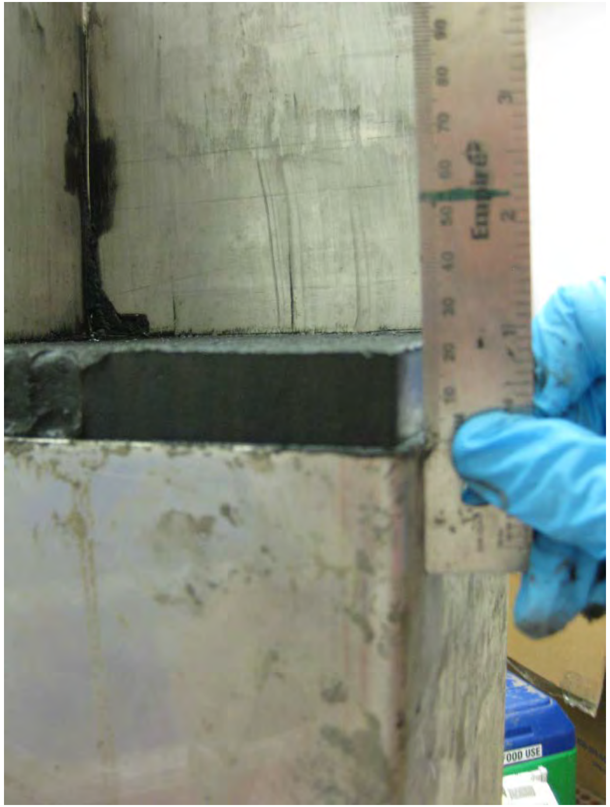




Phase 3 Data Quality Objectives

- Need to look at deposition and resuspension potential in additional site settings

- DQOs for sediment coring were to:
  - Characterize soft sediment material
  - Deeper characterization (up to 2m)
  - “High-resolution” (2 cm) from surface
  - Extensive list of physical and chemical parameters
  - Expand sampling location settings

Phase 3 Identified Areas of Need

- Coring method needed that meets all previous requirements and:
  - Can be used in many settings
    - Previous emphasis on exposed mudflats shifting to subtidal areas
    - Main channel and tributaries
  - Improves efficiency
  - Improves core representation
    - Eliminate use of vacuum to recover core
    - Collect all samples from one core
  - Minimizes reliance on power tools

Phase 3 Design Implementation

Entirely stainless steel

Uses sliding, interlocking "double-V" design developed for Phase 2 surface sampler

Basic component is a 110cm-long double-V with "jaws" at the bottom

Phase 3 Design Implementation

Two corers are combined to create a 220 cm-long device

Phase 3 Design Implementation

Jaws – similar to those found on a typical box core, but low-profile and removable

Phase 3 Design Implementation

Extension rods allow for advancement of the corer under feet of overlying water

Corer is advanced using a combination of the equipment weight and applied force

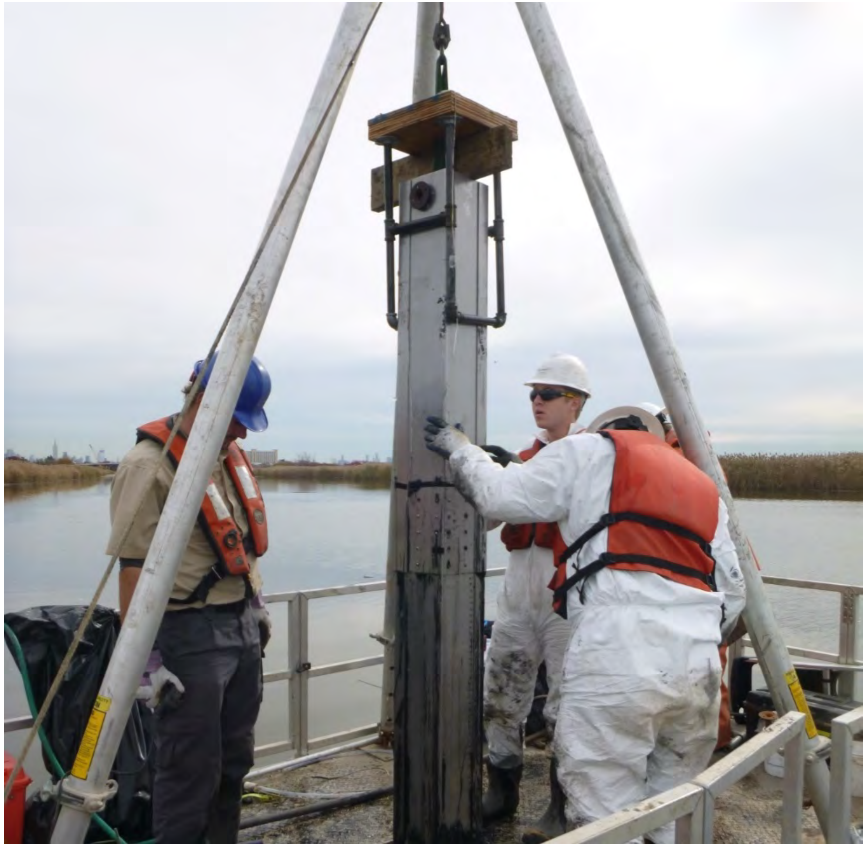
Phase 3 Design Implementation

Rods push down on jaws to ensure closure

(Jaws can close from the force of sediment applied during retrieval)

Once closed, friction forces maintain jaw position

Phase 3 Design Implementation



Core is retrieved using tripod and winch

Overlying water is pumped from the core box during retrieval to reduce weight and allow observation of the core surface

Phase 3 Design Implementation

Core is separated into two 110cm components and capped at all ends using decontaminated stainless steel plates

Core is now completely contained within the core box and can be transported safely

Separated cores are transported vertically for processing

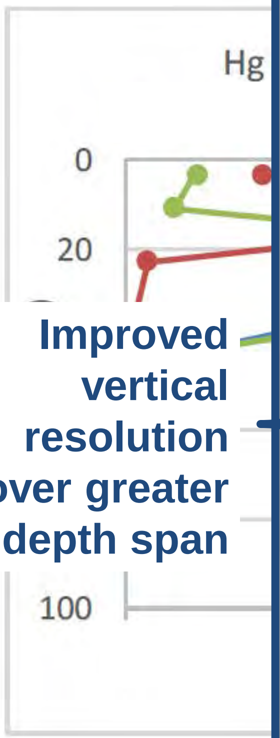
Phase 3 Design Implementation

Coring device exposes only current interval for sectioning

Stainless steel sectioning plates can cut through silt, sand, clay, and decayed organic detritus

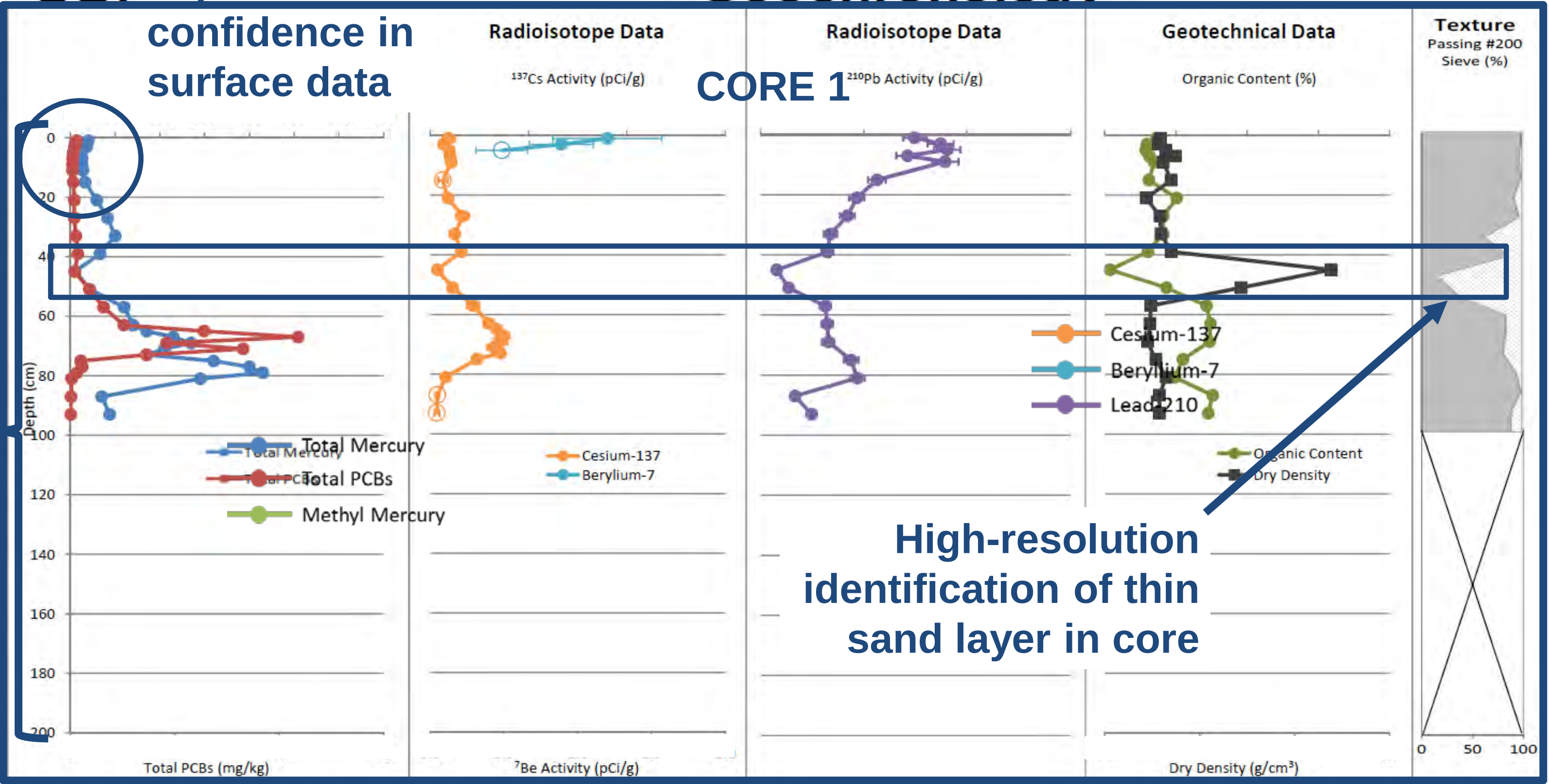
Progressive Effect on Data

Low-Resolution



Improved vertical resolution over greater depth span

High-Resolution



Improved confidence in surface data

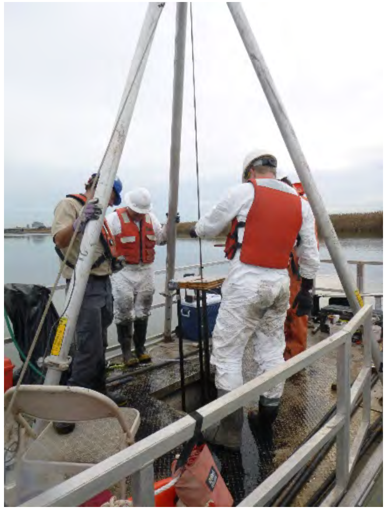
High-resolution identification of thin sand layer in core

Was the Re-Design Worthwhile?

- Improvements:

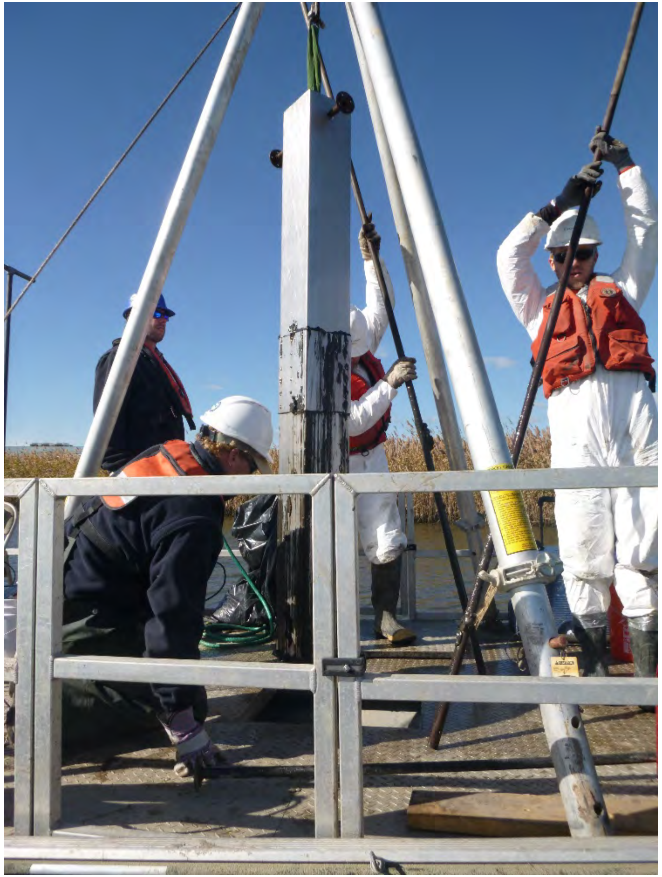
  Cores collected from:

  - exposed mudflats
  - intertidal and subtidal locations
  - overlying water up to 12 feet



Lessons Learned

- Understand the requirements
- Ask if current options are sufficient
  - Don't limit to existing options
  - "If it ain't broke…"
  - Don't re-invent the 'v-box corer'
- Is there a backup plan?
  - Makes the "go" harder on a re-design, but…
  - Makes a new design less risky
  - Budget for an advance trial



"Think of the imagination as a giant stone from which we carve out new ideas. As we chip away, our new ideas become more polished and refined. But if you start by editing your imagination, you start with a tiny stone."

-Brian Chesky (Co-founder/CEO, AirBnB)

Questions?

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