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Sampling and Analysis
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Overview

- The Sampling and Analysis Plan
- Project-Specific Considerations
- Analytical Design
- Sampling Design
- Sample Handling
- QA/QC
- References
The Sampling and Analysis Plan

- Critical to success of project.
- Stipulates how samples will be collected and analyzed.
- Dependent on accurate and recent site information (good bathymetry, etc.).
- Dependent on accurate and complete project information (dredging footprint, project depth, potential obstructions).
- Provides opportunity to codify cost saving screening steps.
- Information collected to enable decisions beyond placement/disposal.
The Sampling and Analysis Plan

Serves as an agreement between regulators, permit applicant and contractor performing the work (e.g., compositing strategies, sample locations, etc.).

- Includes discussion of how results are to be interpreted and what will be included in final report.
- Should proactively identify potential problems anticipated in the field or issues that may arise during testing and provide for contingencies (refusal/obstructions at designated sampling locations, low water content clays, hard packed sands, mudstone).
The Sampling and Analysis Plan

Content:
• Background (Location and description of the project, site history, previous studies)
• Objectives: purpose of the sampling and analysis to be performed
• Sampling & Analysis Design
  • Overview of sampling design and rationale (including description of nature and type of samples to be collected)
  • Overview of analysis to be performed and rationale
The Sampling and Analysis Plan

Content (cont.):
• Material and Methods
  • Sample Collection & Handling
  • Physical, Chemical, and Biological Analysis
• Documentation
• Quality Assurance and Quality Control
• Reporting
• Schedule
• References
Objectives

- Representative – samples must be collected such that they reflect material to be assessed (dredging site and placement site)
- Adequate – Sufficient material should be collected for the required analysis (including contingencies) and handled in a manner that ensures integrity to the point of analysis.
- Reliable – appropriate collection, handling and analytical procedures using approved methods
Project Specific Considerations

- Project Objectives
- Review of Dredging Plan (area, depth, volume, method, etc.)
- Local/Regional Requirements
- Review of Historical Data
- Site characteristics
- Health & Safety Concerns (UXO, utilities, etc.)
Sampling Design

- Division of project area into Dredged Material Management Units (DMMUs)
- Number & Location of samples within DMMUs
- Sample Depth
- Stratification
- Contingencies (refusal, stratification, obvious signs of contamination, etc.)
- Compositing
- Sample Handling
Sampling Design- Subdivision of Dredging Area

Dredging area can be divided into segments based on:

• Historical data
• Sediment characteristics
• Geographical configuration
• Anticipated method of dredging
• Known contaminated areas
• Number of DMMUs should be sufficient to adequately represent the area to be dredged and generally reflective of how the material is likely to be dredged and managed
Sampling Design - Number of Samples

The number of sample locations within a DMMU are generally based on:

- The size of the area represented by the DMMU
- Potential for contamination within a DMMU (to facilitate hotspot isolation)
- Time/funding constraints

The numbers of samples per location within a DMMU should be based on:

- Volume for the required analysis plus contingencies.
- Time / funding constraints
Sampling Design - Sample Location

- Areas above proposed design depth (shoals) and within the footprint
- Areas downstream from point sources
- Areas free of known impediments/hazards (rip rap, debris, utilities, UXO)
- Areas where fine grained material may be deposited (side channels and bends)
- Distribute sample locations throughout project/segment area
Sampling Design-Compositing

- DMMUs are typically represented via a composite of the samples collected within the DMMU to reflect how the material will be managed.
- Compositing represents an average of the sites sampled within the DMMU.
- Compositing results in decreased description of variability within project area (hence its important to maintain archives of individual cores).
- Compositing is not intended as a means to dilute a highly contaminated area.
Sampling Design

Contaminant Zone

Dredging Project Area

Current Direction

Shore

Sand

Channel

T. Bridges, Inc. Galvanizing & BBQ

US Army Corps of Engineers - Engineer Research and Development Center
Sampling Design

Contaminant Zone

Sand

Current Direction

Shore

Channel
Sampling Design

Contaminant Zone

Current Direction

Shore

Sand

Channel

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O
Sampling Design

Contaminant Zone

Sand

Current Direction

Channel

Shore
Equipment

**Sediment Cores**
- Diver cores
- Box cores
- Gravity Cores
- Push Cores
- Piston Cores
- Vibracores (electric or hydraulic)
- Barge mounted hollow stem auger
- Vibratory hammer cores

**Sediment Grabs**
- Van Veen
- Ponar
- Bucket dredge

**Water**
- Van Dorn/Kimmler grab sampler
- Bucket
- Pumps
Equipment - Sediment Cores

Diver Core  Piston Core  Gravity Core  Vibracore
Equipment - Sediment Cores

- Box Corer
- Mod. Box Corer
- Vibratory Hammercore
- Rotary Drill Rig
Equipment – Sediment Grabs

Van Veen

Eckman

Shipek
Equipment Water - Grabs

Nisken Sampler

Rossette Sampler
Sample Handling

Handle sample according to published SOP
  • Container type
  • Preservative
  • Sample storage
Handle sample to minimize changes in composition
  • chemical
  • biological
  • avoid contamination
Quality Assurance & Quality Control

- Ensure sample integrity from point of collection to point of analysis (CoC)
- QA assures the quality of the data
- QC assures that procedures are followed to obtain quality data
Questions

- What approaches have you taken to streamline/reduce sampling testing on projects?
- What types of contingencies have you put in place in anticipation of potential sampling and analysis issues?
References

USEPA, 2001. Methods for Collection, Storage, Manipulation of Sediments
Higgins and Lee, 1987, Sediment Collection and Analysis Methods, Tech. Note EEDP-06-1. USACE.