Planning Sampling
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MassDEP

NEWMOA
Contaminated Sediments Sites
Characterization and Decision Making
Pomfret, CT Sept. 22, 2009
Westford, MA Sept. 23, 2009

Assessment Types

• Preliminary Assessment (PA)
• Site Investigation (SI)
• Remedial Investigation (RI)
• Feasibility Study (FS)
• State Equivalent Assessments
  MA uses Phases 1, 2, and 3
What and where are Sediment Sites?
Defined by location
– Underwater
– Sub tidal
– Shoreline
– Wetland

Example Locations - Ocean, Estuary, River, Lake, Pond

Previously dredged materials or filled locations not considered sediments in MA
Types of Inputs

- Spill or Direct Discharge
- Sewer, Storm Drain, CSO
- Surface Run Off
- Air Deposition
- Groundwater
- Historic or Ongoing Releases

Sediment Sites

- Can be Large
- Ecologically Complex
- Sediment and Contamination Movement via Water Flow - River, Tidal, Storm
- Contamination Deposition
  - Not Uniform
  - Various Locations and Depths
Sampling Plan

• Who? Contractor, State Personnel
• Why? Purpose
• What? Sediment, Water, Biota
• When? Schedule
• How? Equipment
• How Much? Budget

Investigator Types
Columbus

Agatha Christie
1st Task

Define Purpose or Goal of Assessment

- Define the nature and extent of contamination to determine if there is an unacceptable risk
- Provide adequate enough information to complete a RI/FS
- Get to the next step
Conceptual Site Model

A Conceptual Site Model generally is a representation of the environmental system and the physical, chemical, and biological processes that determine the transport of contaminants from sources to receptors.

Team of Friends
Needed Experts/Team

- Science – Biology, Chemistry, Soil
- Engineering - Hydrodynamics
- Modeling
- Sampling, QA/QC
- Financial / Contract / Legal
- State – Regulatory, Permits, Historical, Endangered Species
- Site and Local Information - Maps

QAPP

A Quality Assurance Project Plan (QAPP) describes the necessary quality assurance procedures, quality control activities, and other technical activities that will be followed for the specific project.
What to Sample?

- Sediment and Water
  - Physical Characteristics
  - Chemical
  - Contaminant

- Biological

Physical Characteristics

- pH
- Redox Potential (Eh)
- Soil Type – Sand, Clay, Silt
- Particle/Grain Size Distribution
- Total Solids
- Specific Gravity
- Bulk Density
- Thickness of Organic Sediments
Chemical Characteristics

• Salinity and Hardness
• Organic Carbon
• Ammonia / Ammonia Nitrogen
• Nitrate
• Total Phosphorus
• Total Sulfide
• Acid Volatile Sulfide (AVS)
• Simultaneous Extracted Metal (SEM)

Contaminants Properties

• Limited Solubility
• Low Volatility
• High Viscosity
• Limited Chemical or Biological Breakdown
Typical Contaminants

- Polychlorinated Biphenyls (PCBs)
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Pesticides
- Metals – Arsenic, Copper, Lead, Mercury, Cadmium, Chromium, Nickel, Selenium, and Zinc
- Metal Speciation - Chromium

PCBs

- Aroclors vs. Congeners
- Aroclors probably “weathered”
- Aroclors manufactured as mixtures
- 209 Congeners – How many enough?
  - WHO and NOAA lists
- Regulatory Requirements
Types of Biological Assessments

- Survey Numbers
- Sediment Toxicity Assays
- Tissue Contaminant Concentrations
- Biological Indicators “biomarkers”
- Food Chain

What to Sample?

- Invertebrates
- Fish
- Amphibians and Reptiles
- Birds and Mammals
- Plants – limited
Where to Sample?

- Grid – Square or Hexagonal
- Predetermined – Judgmental
- Random
- Combination
- Incremental – Based on Past Results
- Background
- Biota – near habitat

When to Sample?

- Weather Issues
- Plant and Animals may be seasonal
- Animals may be migratory
How May Sample Are Enough?

- Size and Complexity of Site
- Multiple Locations
- Type of Contaminants
- Depth of Contamination
- Sediment Type – Sand, Silt, Clay
- Sediment Organic Content
- Number of Plant and Animal Species

Access Problems

Can’t get there from here?
Access
Site and Background Location
- Written Access Agreement or Verbal
- Need to talk to Owner and Renter(s)
- May need to go to court
- May need a key
- Use Maps
- Pre-sampling site visit

So you think you have problems?
Planning for Problem?

• Sampling locations can be difficult to access, so carry backups of supplies
• Prepare Health and Safety Plan
• Safety Equipment, 1st Aid Kit, Phone
• Calibration Equipment before and check after sampling
• Contractor Insurance
• May need to modify plans

Bring
- Second Set of Clothes
- Towel
- Correct boots
- Hat, Sun Glasses
- Gloves
- Bug Spray
- Water, Food
- Maps and Charts
References

• SUPERFUND PROGRAM REPRESENTATIVE SAMPLING GUIDANCE VOLUME 5: WATER AND SEDIMENT PART I Surface Water and Sediment, Dec 1995 OSWER Directive 9360.4-16


• EPA NEW ENGLAND QUALITY ASSURANCE PROJECT PLAN PROGRAM GUIDANCE www.epa.gov/region01/lab/qa/pdfs/QAPPProgram.pdf
ASTSMO

- Guide to the Assessment and Remediation of State-Managed Sediment Sites.
- Framework for Long-Term Monitoring of Hazardous Substances at Sediment Sites
  www.astswmo.org/publications_cercla.htm

US Army Corps of Engineers

- Environmental Laboratory Web Page
  http://el.erdc.usace.army.mil/index.cfm
- Center for Contaminated Sediments Web Page
  http://el.erdc.usace.army.mil/dots/ccs

Massachusetts Guidance

Updates to the Guidance for Ecological Risk Assessment
http://www.mass.gov/dep/service/compliance/riskasmt.htm

Averaging Area for Benthic Invertebrate Assessments
Assessment Endpoints for Benthic Invertebrates
Assessing Risk of Harm to Benthic Invertebrates
Freshwater Sediment Toxicity Tests
Revised Sediment Screening Values
Ecological Value of Surface Water Features
Area-Based Screening for Sediment Contamination
“What did the sea say to the land? Thanks for the sediment.”

Questions?