


# Planning Sampling

presented  
by

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**MassDEP**

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


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# Assessment Types

- **Preliminary Assessment (PA)**
- **Site Investigation (SI)**
- **Remedial Investigation (RI)**
- **Feasibility Study (FS)**
- **State Equivalent Assessments**  
MA uses Phases 1, 2, and 3

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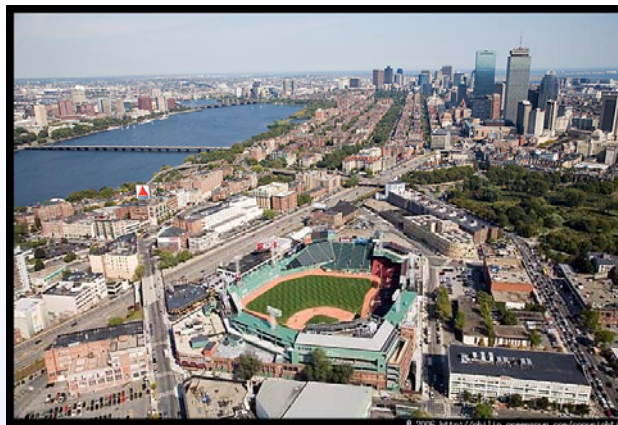
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## What and where are Sediment Sites?

### 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

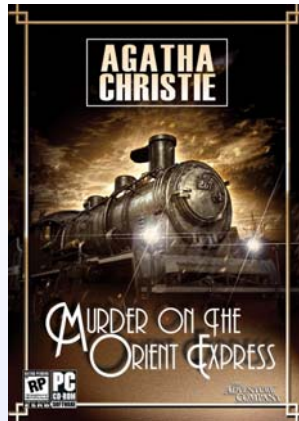
- **Who? Contractor, State Personnel**
- **Why? Purpose**
- **What? Sediment, Water, Biota**
- **When? Schedule**
- **How? Equipment**
- **How Much? Budget**

## Investigator Types




## Columbus

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## Agatha Christie

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## 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 Many Samples 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, 1<sup>st</sup> 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**
- *Guidance Manual to Support the Assessment of Contaminated Sediments in Freshwater Ecosystems, Volume I* EPA-905-B02-001-A, December 2002,  
[www.cerc.usgs.gov/pubs/sedtox/volumel.pdf](http://www.cerc.usgs.gov/pubs/sedtox/volumel.pdf)

- *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*, EPA-540-R-05-012, OSWER 9355.0-85, December 2005,  
[www.epa.gov/superfund/health/conmedia/sediment/pdfs/guidance.pdf](http://www.epa.gov/superfund/health/conmedia/sediment/pdfs/guidance.pdf)
- EPA NEW ENGLAND QUALITY ASSURANCE PROJECT PLAN PROGRAM GUIDANCE  
[www.epa.gov/region01/lab/qa/pdfs/QAPPProgram.pdf](http://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](http://www.astswmo.org/publications_cercla.htm)

## **US Army Corps of Engineers**

- **Environmental Laboratory Web Page**  
<http://el.ercd.usace.army.mil/index.cfm>
- **Center for Contaminated Sediments Web Page**  
<http://el.ercd.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 ?**