SESSION 17

RCRA CORRECTIVE ACTION:

RCRA FACILITY INVESTIGATION WORK PLAN AND REPORT

Session 17 Agenda:
RCRA Facility Investigation Work Plan and Report

- Introduction
- RFI Work Plan Components
- RFI Report
- RFI Report Components

RCRA Facility Investigation (RFI) Work Plan

- The objective of the RFI Work Plan is to:
  - Describe and outline the process that will be followed to delineate the nature and extent of contamination and prepare the RFI Report

RFI Work Plan Components Overview

- Description of Current Conditions
- Description of Investigations
- Data Collection Quality Assurance Project Plan
- Data Management Plan
- Health and Safety Plan
- Community Relations Plan
- Project Management Plan

Description of Current Conditions

- Describe facility operations
- Describe history of ownership, operations, and waste management
- Summarize available information on potential receptors
- Provide background data that support proposed investigation program

Description of Investigations

- Identify and justify the investigations proposed to characterize site
- Describe sampling locations and procedures
  - Innovative technologies
  - Standard techniques
  - Parameters to be analyzed and rationale based on facility processes and operations
    - Should include all plausible contaminants likely to have been released
  - Analytical methods and detection limits
  - Analytical techniques (field vs. laboratory)

Description of Investigations

- Follow Triad Approach
  - Systematic Planning Key decision makers collaborate with stakeholders to resolve clear goals for project

    Multi-disciplinary technical team

    Conceptual site model

    Managing uncertainty

  - Dynamic Work Plans

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  - Real time analysis

    On-site data collection, results, and decisions

Description of Investigations

- Use a step-out approach to data collection if possible for:
  - Determining nature and extent of contamination
    - Horizontal (source area outward)
    - Vertical (source area downward)
    - Media (follow pathways)
    - Potential receptors (closest to site outward)

Description of Investigations

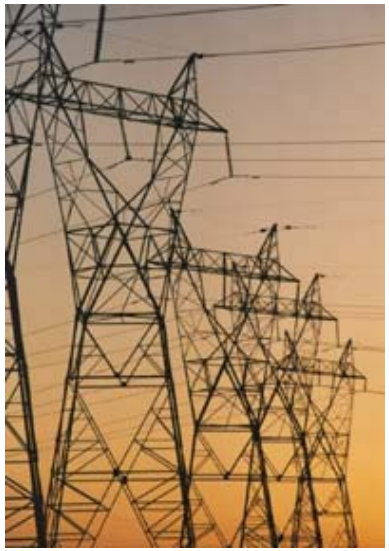
- Use innovative site characterization technologies where appropriate
  - Rapid sample collection techniques and on-site analytical techniques
    - Direct push technologies for sampling
      - Soil gas
      - Soil
      - Groundwater
    - On-site sample analysis by
      - Assay kits
      - X-ray fluorescence
      - Field gas chromatography/ mass spectrometry (GC/MS)

Description of Investigations

- Sampling strategy — RFI work plan
  - Objectives defined
  - Sampling locations on maps within RFI work plan
  - Sampling procedures and rationale should be documented in the RFI work plan
  - Standard operating procedures (SOPs) in Quality Assurance Project Plan (QAPP)

Description of Investigations

- Other sampling location considerations
  - Environmental variables
    - Seasonal
    - Meteorological
  - Health and safety
    - Overhead obstructions (e.g., powerlines, piping)
    - Utilities (e.g., sewer systems, cables)



Data Collection QAPP

- Ensures the collection of data of appropriate quantity and quality to meet the objectives of the investigation
- Establishes the Data Quality Objectives (DQOs) for the sampling and analytical approach
- DQOs are qualitative and quantitative statements that specify the quality of the data for the investigation. The intended use of the data will dictate the level of data quality

Data Collection QAPP
Ensuring Quality of Data

- 25 Data Elements
- Grouped into four types of elements
  - Project management (10)
  - Measurement/data acquisition (10)
  - Assessment/oversight (2)
  - Data validation and usability (3)

Data Collection QAPP
Ensuring Quality of Data

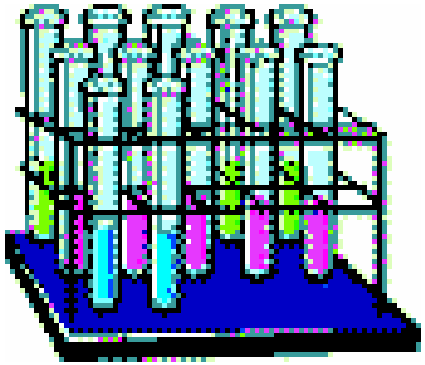
- Data produced during the RFI must be legally defensible
- QAPP describes procedures for ensuring legally defensible data, includes:
  - Laboratory and field procedures
  - Sampling and analytical methodologies
  - Ensuring data quality and DQOs
  - Precision and accuracy limits
  - Standard Operating Procedures (SOPs)
    - Laboratory SOPs
    - Field SOPS
  - Describes disposition of investigation-derived waste (IDW)

Data Collection QAPP
Ensuring Quality of Data

- Appropriate laboratory methods identified
  - The laboratory method must be capable of analyzing the media being sampled
  - The laboratory method must be capable of detecting the constituents of interest
  - The laboratory method must produce data that support the end use of the data
  - The laboratory method must detect constituent concentrations at or below “action” levels
  - The precision/accuracy limits of the laboratory method must meet or exceed those established in the DQO process

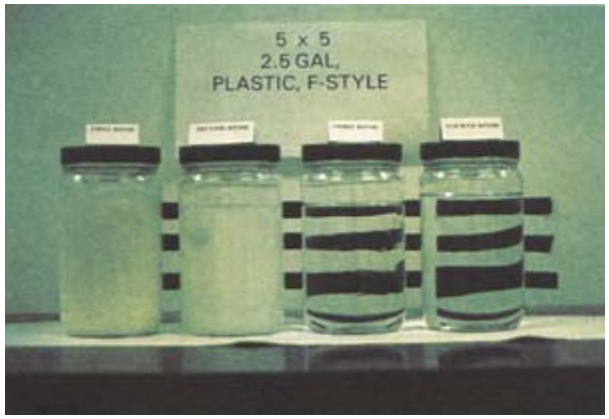
Data Collection QAPP
Data Collection

- Common Compound/Analyte Suites
  - Volatile organic analytes (VOAs)
  - Semi-volatile organic compounds (SVOCs)—Also known as BNAs (base / neutrals / acids)
  - Pesticides
  - Polychlorinated biphenyls (PCBs)
  - Polychlorinated dibenzodioxins (PCDDs or dioxins)/ polychlorinated dibenzofurans (PCDFs or furans)
  - Metals (lead, cadmium, chromium, etc.)
  - Cyanide



Data Collection QAPP
Ensuring Quality of Data

- Field quality control (QC) samples used to measure sampling data quality
  - Trip blanks
  - Field blank
  - Field replicates (duplicates)
  - Rinsate (equipment) blanks
- Lab QC samples – Measure Lab quality
  - Matrix Spike/Matrix Spike Duplicates
  - Laboratory duplicate/replicate
  - Surrogate Analysis
  - Laboratory Control Sample (LCS)
  - Calibration Standards



Data Management Plan

- Procedures for documenting sampling/analysis results
- Establishes a data record
- Provides format for data presentations (RFI Report)
- Documenting sampling/analysis results
- Establishing a data record
  - Project filing requirements
  - Data storage

Health and Safety Plan

- Ensure the health and safety of the investigative team
- Ensure work is being performed in accordance with federal/state health and safety requirements

Community Relations Plan

- Proper dissemination of public information
- Ensure that public is involved in corrective action process
- Description of local community
- Public communication techniques
  - Mailing lists
  - Information repositories
  - Key contact people
  - Preparation/distribution of fact sheets
- Community relations schedule

Project Management Plan

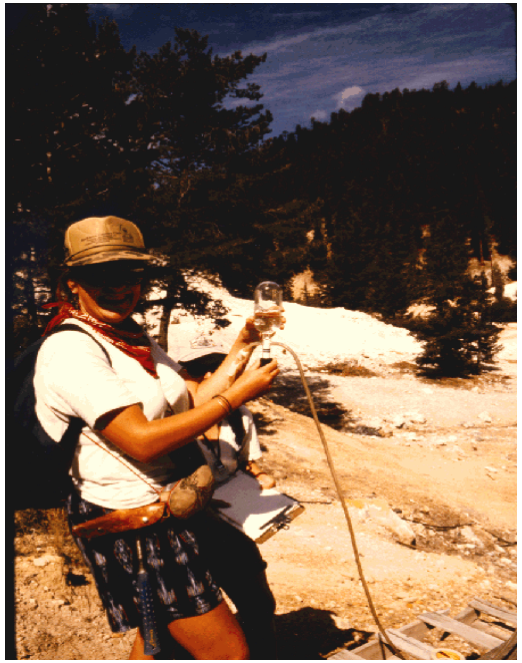
- Documents management approach
- Documents technical approach
- Schedule
- Identify key personnel

Objectives of the RFI Report

- Characterize nature and extent of contamination
- Collect information to fill data gaps in the site conceptual model for characterization of:
  - Source areas
  - Pathways
  - Potential receptors
- Collect data for evaluating risk to human health and the environment

RFI Report Components

- Detailed descriptions of
  - Environmental setting and site background
  - Investigation and sampling techniques, methodology, and data interpretation
  - Rationale for sample selection and location
  - Nature and extent of contamination
  - Any potential receptors
  - Conclusions and recommendations



Environmental Setting

- Usually discussed in RFI Work Plan and supplemented as information becomes available in the RFI Report
- Climatic features
  - Annual rainfall
  - Wind directions
- Hydrologic setting
  - Surface water bodies characteristics
  - Geologic Setting
  - Run-on/runoff
  - Watershed

Environmental Setting

- Geologic setting
  - Topographic/geomorphic features
  - Geologic history
  - Regional extent of geologic units (formations)
  - Lateral/vertical extent of geologic units beneath the facility
  - Local and site-specific stratigraphic successions
  - Physical descriptions of soil/rock materials

Environmental Setting

- Geologic setting characterization tools
  - Stratigraphic columns
    - Identify geologic units/formations
    - General sequence subsurface materials
  - Cross sections
    - Lateral/vertical extent of geologic units
    - Orientation of subsurface units
    - Correlation of units
  - Drilling logs
    - Physical description of subsurface materials
    - Grain size
    - Graduations
    - Moisture content (general)

Environmental Setting

- Hydrogeologic setting characterization
  - Identify/characterize all aquifers and confining units
    - Regionally
    - Locally
    - Facility-wide
  - Regional groundwater flow and influences
    - Recharge/discharge areas
    - Industrial/municipal wells
  - Facility/SWMU-specific groundwater flow and influences
  - Identify whether the facility is located within karst geology

Environmental Setting

- Hydrogeologic setting characterization tools
  - Cross sections
    - Lateral/vertical extent of aquifers/confining units
    - Identify preferential flow paths
    - Identify impediments to contaminant flow
    - Identify “sinks”
    - Piezometric surface
  - Drilling logs
    - Physical descriptions - aquifers/confining units/vadose zone
    - Depth to water table
    - Perched aquifers

Environmental Setting

- Hydrogeologic setting characterization tools
  - Groundwater contour maps
    - Groundwater flow
    - Recharge/discharge areas
  - Flow nets
    - Groundwater flow - three dimensions

Investigation and Sampling

- Hydrogeologic setting - common investigatory procedures
  - Collection/review of local industrial/residential/municipal well information
  - Monitoring well and/or piezometer installation
    - Water level measurement (groundwater flow)
    - Slug tests (hydraulic conductivity)
    - Pump tests (aquifer interconnections/hydraulic conductivities)
  - Geophysical methods
    - Surface
    - Downhole
  - Soil borings/rock corings
    - Lateral/vertical extent of units
    - Physical description of units

Investigation and Sampling

- Monitoring well and/or piezometer installation
  - Use drilling method that is conducive to subsurface materials encountered (e.g., auger rigs do not drill through consolidated rock)
  - Ensure that cross-contamination will not occur during drilling
  - Consider accessibility of the drilling site
  - Ensure that the drilling method is capable of installing a well of desired diameter and depth

Investigation and Sampling

- Avoiding cross-contamination between aquifers
  - Do not drill through confining units between aquifers without taking appropriate precautions
    - Creates a conduit for contaminant flow between aquifers
    - Causes smear zones between aquifers and confining units
  - If monitoring of lower aquifer is required
    - Install solid casing through the upper aquifer, into the underlying confining zone, and continue drilling (telescopic through the surface casing)
    - Use drilling methods that are known to not cause cross contamination (e.g., Air Rotary with Casing Driver)

Investigation and Sampling

- Sampling Rationale
  - Media of concern
  - Constituents of concern
  - Location of releases
  - Intended data use
  - Accepted levels of confidence
- Sampling Procedures
  - Soils
  - Groundwater
  - Soil gas
  - Surface water
  - Air

Nature and Extent of Contamination

- Characterize waste for each SWMU/AOC
  - Waste composition/quantity
  - Physical/chemical characteristics (e.g., pH, temperature, density, solubility)
  - Migration/dispersal characteristics (e.g., sorption coefficients, biodegradability)
- Physical/chemical characteristics of SWMU/AOC
  - Type of unit
  - Design features
  - Operating practices
  - Period of operation
  - Closure procedures/sampling

Nature and Extent of Contamination

- Present existing data on extent, origin, direction and rate of movement of contaminant plumes
- Propose additional sampling/analysis, if necessary, to fully characterize the extent, origin, direction and rate of movement of contaminant plumes
- Sufficient data to perform a risk evaluation
- Sampling must be conducted for each impacted media
- The sampling results must be capable of delineating the nature, extent, origin, direction and rate of movement of the contaminant plumes

Nature and Extent of Contamination

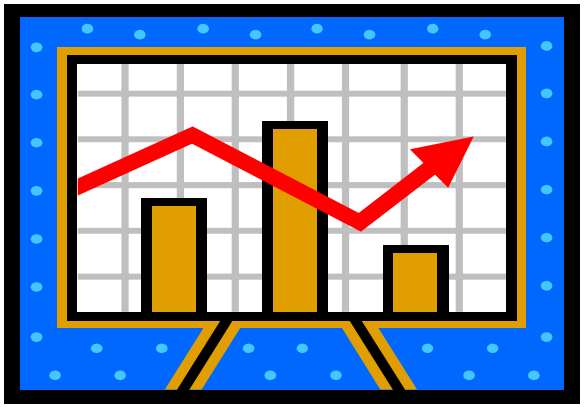
- Groundwater contamination
  - Horizontal/vertical extent of plumes
  - Velocity of contaminant movement
  - Concentrations of hazardous constituents
  - Factors influencing plume movement (environmental setting)
  - Extrapolation of future movement (modeling)
- Soil contamination (unsaturated zone)
  - Horizontal/vertical extent of contamination
  - Soil/contaminant properties (environmental setting)
  - Concentrations of hazardous constituents
  - Extrapolation of future movement (modeling)

Nature and Extent of Contamination

- Air contamination (particulate and gaseous contaminants)
  - Horizontal/vertical extent
  - Direction/velocity of plume movement
  - Quantity of release
  - Chemical/physical/radiochemical composition of contaminants
  - Horizontal/vertical concentration profiles
- Subsurface gas releases
  - Horizontal/vertical extent of plumes
  - Direction/velocity of plume movement
  - Concentrations of hazardous constituents
  - Extrapolation of plume movement

Nature and Extent of Contamination

- Contaminant characterization presentation tools
  - Isopleth maps
    - Concentrations of contaminants laterally/vertically away from source
  - Line/bar graphs
    - Concentrations of contaminants away from source
  - Vertical profiles (cross sections)
    - Lateral/vertical extent of contaminant plumes
  - Three-dimensional data plots
    - Lateral/vertical extent of contaminant plumes



Potential Receptors

- Identify potentially affected human populations
- Identify potentially affected environmental systems
- Propose plan to fully describe human populations/ environmental system
- Determine where interim measures/presumptive remedies can be used

Potential Receptors

- Human populations
  - Adjacent land use
  - Demographic profiles (age, sensitive subgroups, etc.)
  - Groundwater use
    - Drinking (residential/municipals wells, etc.)
    - Industrial use
    - One-mile radius
  - Surface water use
    - Drinking (municipal intakes, etc.)
    - Recreation
    - 1.5-mile radius
  - Access to facility

Potential Receptors

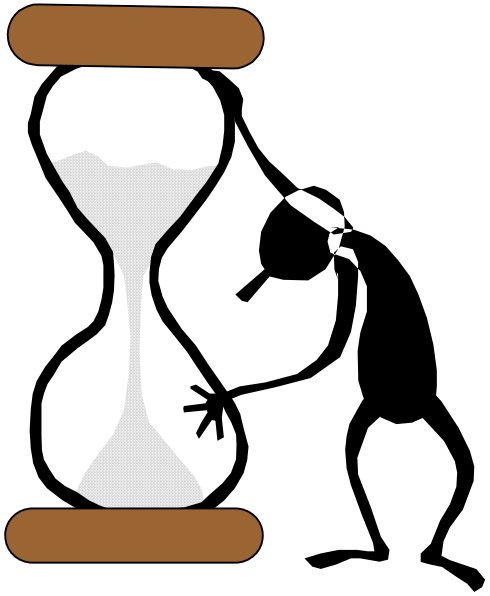
- Environmental systems
  - Local ecology
  - Surface water/wetland biota
  - Endangered/threatened species

Conclusions and Findings

- Determine whether extent of contamination is adequately defined
- Identify any existing data gaps and fine-tune site conceptual model
- Identify all potential receptors
- Determine need for further action and make recommendation
  - No further action
  - Risk Assessment
  - Corrective Measures Study

Other Considerations for RFI

- Combine RFI and CMS for sites:
  - That are low risk
  - Where corrective measures are
    - Obvious
    - Easy to implement
    - Agreed to by Agency and owner/operator
  - Where presumptive remedies are appropriate
- HSWA Permit/Consent Order requirements
  - RFI technical criteria
  - Identifies SWMUs/AOCs
  - RFI schedules
  - Data management/reporting requirements



The following guidance provides additional information

- U.S. Environmental Protection Agency. 2000. Information Sources for Innovative Remediation and Site Characterization Technologies. (EPA542-C-98-003).
- U.S. Environmental Protection Agency. 1996. Soil Screening Guidance: Users Guide. April 1996. (OSWER 9355.4-23).
- U.S. Environmental Protection Agency. 1989. RFI Guidance Document, Interim Final. May 1989. (EPA 530/SW-89-031).
- U.S. Environmental Protection Agency. 2001. Using the Triad Approach to Improve the Cost Effectiveness of Hazardous Waste Site Cleanups. October 2001. (EPA 542-R-01-016).