

Module 2

Restoration Process Overview



Life Cycle Site Decision-Making is Based on Data

- Are contaminants present in environmental media at levels above background at a site?
- Does the site present ongoing and immediate health and safety issues?
- Do those contaminants pose unacceptable dose or risk concerns?
- Which portions of a site require remediation?
- Are remedial actions performing as expected?
- When can remediation stop, and are we confident that residual risks/doses are at acceptable levels?

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For Every Step of the Process, Data Inputs are Key

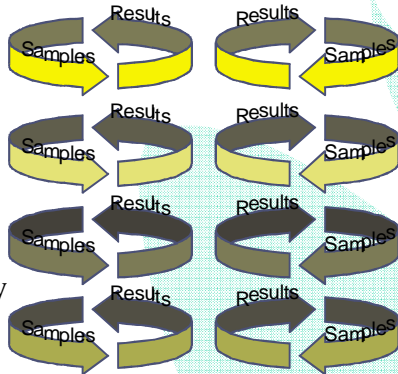
CERCLA (Comprehensive Environmental Response, Compensation and Liability Act)

RCRA (Resource Conservation and Recovery Act)

Discovery

Cleanup

- Discovery; Preliminary Assessment (PA)
- Site Investigation (SI)
 - Extended Site Investigation (ESI)
 - Remedial Investigation/Feasibility Study (RI/FS)
- Remedial Action
- Closure



- Discovery
- RCRA Facility Assessment (RFA)
- RCRA Facility Investigation (RFI)
- Corrective Measures Study (CMS)
- Corrective Measures Implementation (CMI)
- Closure

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Discovery Phase

Are contaminants present?

- Relatively limited judgmental/biased sampling
- Broad suite analyses
- Relatively high levels of analytical quality
- Individual sample results typically compared to some threshold
 - Soil screening levels
 - Background threshold values

Cleanup Phase

Are contaminants above cleanup levels?

- Relatively more, systematic sampling
- More limited set of target contaminants
- Opportunity for using lower quality analytical methods suitable for contaminants of concern/cleanup levels
- Sets of sample results compared to cleanup levels

Bad Data Lead to Bad Consequences

- Missing site-specific dose or health risks that should be addressed
- Spending resources on remedial actions that are not truly necessary from a risk or dose perspective
- Inefficient remedial actions that were based on misleading data

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The Decision Unit for Criteria is Often **Not** Well-Defined

“Lead should not exceed 400 ppm in soils”

or

“TCE should not exceed 5 ppb in ground water”

Decisions are often ambiguous because cleanup criteria do not provide enough information to define the **decision units**.

Complete Cleanup Criteria Definitions

- Cannot achieve data **representativeness** without a complete definition of cleanup criteria
- Incomplete criteria leads to confusion...example:
 - an *in situ* XRF Pb reading from a yard is 560 ppm,
 - while a homogenized sample from same is 200 ppm,
 - while the average for the yard is 50 ppm.
- Different **sample supports** → different concentration estimates that are all correct but lead to different conclusions
- **Must DEFINE population of interest to interpret data!!**

For Soils, Three Cleanup Requirement Definitions are Most Common:

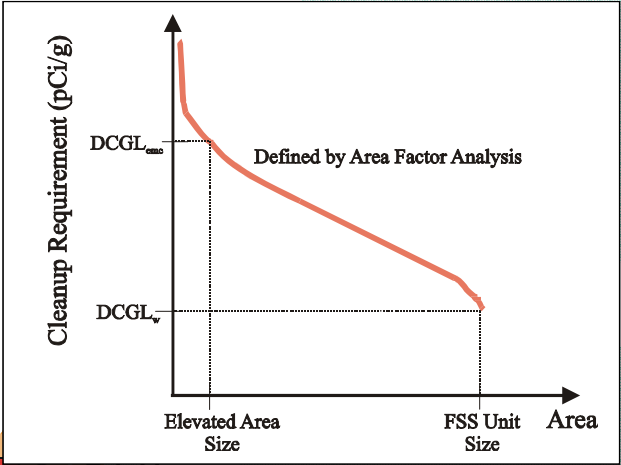
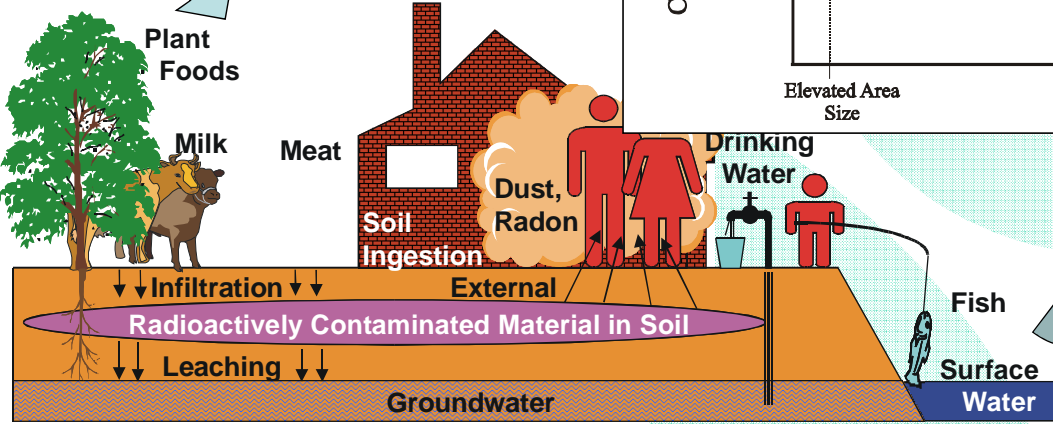
- Never-to-Exceed Criteria: “Lead concentrations cannot be > 400 ppm”
- Hot-Spot Criteria: “Lead concentrations cannot be > 400 ppm averaged over 100 m^2 ”
- Averaged Criteria: “The average concentration of lead over an exposure unit cannot be > 400 ppm”

MARSSIM Requires DCGLs

- Rad sites are covered by MARSSIM
- MARSSIM poses cleanup requirements as DCGL (Derived Concentration Guideline Levels)
- $DCGL_w$ – wide area standard that must be achieved over an area the size of a survey unit
- $DCGL_{emc}$ – elevated measurement comparison, a higher level defined for smaller areas

DCGL Derivation

Site Specific Risk or Dose-Based Requirements



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Defensible Statistical Sampling Program Design and Data Analysis Requires:

- Clearly defined decision units and decision-making (e.g., action level) criteria
- Sample supports that are representative of the decision unit of interest
- Analytical method implementation consistent with required sample support

Any Questions?



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