



## Using Remedy Monitoring Plans To Ensure Remedy Effectiveness and Appropriate Modifications

- BACKGROUND:** The National Contingency Plan (NCP) requires remedy performance and compliance monitoring to ensure that a CERCLA remedy is protective of human health and the environment. The NCP further requires periodic review all remedial actions which allow hazardous substances, pollutants, or contaminants to remain at the site above levels that allow for unlimited use and unrestricted exposure. The RCRA Corrective Action program relies on similar remedy monitoring and review approaches. An EPA Superfund Administrative Reform to allow remedy modifications based upon remedy monitoring data increases the value of a well constructed and implemented remedy monitoring plan. This Information Brief discusses the regulatory requirements for remedy monitoring plans and suggests that these plans include features that prompt decisionmakers to modify the monitoring plan itself and/or the selected remedy in response to new information. Monitoring plans can be structured to result in an iterative process which acknowledges the uncertainty in remedies and natural processes and accumulates the data needed to appropriately modify remedies.
- STATUTES:** RCRA Corrective Action authorities, i.e., Sections 3004(u), 3004(v), 3005(c)(3), 3008(h), 3013, 6001, and 7003; CERCLA 120 (Federal Facilities), and 121 (Cleanup Standards)
- REGULATIONS:** 40 CFR 300.430, "Remedial Investigation/Feasibility Study and Selection of Remedy;" 40 CFR 300.435, "Remedial Design/Remedial Action, Operation and Maintenance;" 40 CFR 264.101, "Corrective Action for Solid Waste Management Units;" 264 Subpart F, "Releases From Solid Waste Management Units;" 264 Subpart G, "Closure and Post-Closure;" and 40 CFR 265 Subpart G, "Closure and Post-Closure."
- REFERENCES:**
1. "Superfund Reforms: Updating Remedy Decisions," EPA/OSWER Directive No. 9200.0-22 (Sept. 27, 1996).
  2. "Uncertainty Management: Expediting Cleanup Through Contingency Planning," DOE/EH (CERCLA) - 002, DOE EM/EH and EPA Fact Sheet (December 1996).
  3. "Corrective Action for Releases From Solid Waste Management Units at Hazardous Waste Facilities," 61 *FR* 19432 (May 1, 1996).
  4. "Corrective Action for Solid Waste Management Units at Hazardous Waste Management Facilities; Proposed Rule," 55 *FR* 30798 (July 27, 1990).
  5. "Land Use in the CERCLA Remedy Selection Process," EPA/OSWER Directive No. 9355.7-04 (May 25, 1995).
  6. "National Oil and Hazardous Substances Pollution Contingency Plan: Final Rule" 55 *FR* 8666 (Mar. 8, 1990).
  7. "Effects of Future Land Use Assumptions on Environmental Restoration Decisionmaking" Information Brief, DOE/EH-413 9810 (May 1998).

### What is a Remedy Monitoring Plan?

A remedy monitoring plan (RMP) identifies the objectives, schedules, reporting requirements, sampling strategies, technologies, and personnel necessary to ensure remedy effectiveness and modification if necessary. It also includes the procedures for modifying the remedy as well as the plan itself. The RMP should be a self-correcting information loop, i.e., information gained through monitoring should be used to appropriately modify the monitoring strategy as well as the remedy.

An RMP must be designed to allow the periodic evaluation of three key components of a remedy: compliance monitoring; performance monitoring; and monitoring current and future land use and exposure assumptions underlying the remedy.

### What Are the Key Elements of a Monitoring Plan?

**Compliance Monitoring:** Interim actions and final remedies implemented under either RCRA corrective action or CERCLA may require compliance monitoring as part of the relevant implementing mechanism -- whether that mechanism is a record of decision (ROD), order, agreement, or permit. A CERCLA ROD must specify the remedial goals to be achieved and require measurements at appropriate locations in groundwater, surface water, soils, and air to ensure compliance with the remedial goals (ref. 6). A permit or permit modification issued under RCRA addressing a corrective measure must include requirements for achieving compliance with media cleanup standards (ref. 4)

**Performance Monitoring:** An RMP must also gauge the performance of the design, operation, and maintenance of a given remedy. Such monitoring could include measurements relating to performance of treatment processes and engineering controls which need to be conducted throughout the implementation of a remedy (ref. 6). Performance monitoring requirements could also necessitate maintaining records to demonstrate that detailed remedy construction plans and specifications were followed. For example, performance monitoring may involve documenting that the design permeability for a landfill liner was achieved during the construction of a remediation waste landfill.

**Monitoring Current and Future Land Use Exposure Assumptions Underlying the Remedy:** Remedial alternatives under CERCLA and corrective measure alternatives under RCRA are developed based upon current and reasonably anticipated future land use (ref. 5). In some cases, an environmental restoration remedy can only remain protective of human health and the environment if the underlying land use assumptions remain unchanged. Should current or future land use change from, for example, industrial to residential the selected remedy may no longer be protective. Because of the important linkage between land use and the selected remedy, an RMP must periodically substantiate that the land use assumptions on which the remedy is based have not changed (ref. 7).

### **How Can Remedy and Monitoring Modification “Triggers” be Built Into a Remedy Monitoring Plan?**

The need to modify remedies and monitoring plans can arise from regulator acknowledgment that complete treatment or removal may not be practicable remedies for some sites, advances in characterization and remediation technologies, changes in land use patterns, and the increase of site-specific remedy performance knowledge. The recent EPA directive on updating remedy decisions is designed to align past remedy decisions with the current state of knowledge of remediation science and technology. This alignment should improve the cost effectiveness of site remediation while ensuring reliable short and long term protection of human health and the environment (ref. 1). The directive states that remedies will only be updated on a showing of sufficient information. Thus, important objectives for an RMP should be to gather data to:

- Justify modification of the monitoring program to reduce sampling, analysis, and reporting requirements.
- Substantiate modification of the remediation objectives due to changes in land use patterns, changes in physical limitations posed by site conditions, or the nature of the contamination.
- Facilitate the incorporation of new technologies into a remedy where the modification would result in a more

cost effective, yet equally protective, cleanup.

Implicit in each of these RMP objectives is the need for “triggers” which reveal the need to modify the plan and/or the selected remedy. These triggers reflect decision rules, established as part of the Data Quality Objectives process, which identify the monitoring requirements necessary to detect significant deviations or improvements in remedy or monitoring performance and the actions which should follow that detection (ref. 2).

### **What Are the Benefits of Building Triggers into Monitoring Plans?**

The EPA has recognized the importance of performance monitoring and the fact that long-term sample collection and analysis routines can carry a significant financial burden (ref. 3). In order to aid in achieving cost effectiveness, a monitoring plan could initially incorporate the use of an exhaustive suite of analytical parameters from numerous monitoring wells. During early sampling efforts, this establishes an environmental baseline. Later, assuming the established triggers indicate the basis for instituting a simpler sampling strategy, a more limited list of analytical parameters at a smaller number of wells can be used. Thus, the resources committed to sample collection and analysis could be substantially reduced.

In a similar fashion, dense non-aqueous phase liquids (DNAPLs), substances which have proven to be particularly recalcitrant to groundwater pump and treat remedies, may be included in a RMP. The RMP would be crafted so that the detection of DNAPLs in groundwater during post ROD activities would allow decision makers to request a remedy modification based upon technical impracticability considerations. (ref 1).

### **When in the Environmental Restoration Process Should an RMP be Developed?**

Ideally, a rough RMP should be sketched out for each alternative being considered when developing remedial alternatives. This serves as a reality check when screening remedial alternatives for effectiveness, implementability, and cost.

RMP development early in the remedy selection phase is especially appropriate when environmental restoration managers intend to integrate technical impracticability as an aspect of a remedy. The monitoring data collected during the CERCLA feasibility study and/or RCRA corrective measure study could be used to help substantiate integration of technical impracticability into the remedy eventually selected.

At a minimum, the RMP, including the triggers to be used to prompt modifications to the RMP and/or the remedy, are established in either the ROD or the RCRA permit modification that designates the remedy.

*Questions of policy or questions requiring policy decisions will not be dealt with in EH-413 Information Briefs unless that policy has already been established through appropriate documentation. Please refer any questions concerning the material covered in this Information Brief to John Bascietto, RCRA/CERCLA Division, EH-413, (202) 586-7917.*

