

# FEDERAL REMEDIATION TECHNOLOGIES ROUNDTABLE

## REMEDIATION CASE STUDIES AND TECHNOLOGY ASSESSMENT REPORTS FACT SHEET



The Federal Remediation Technologies Roundtable (FRTR) is an interagency working group that promotes cooperation among member agencies to further the development and use of new technologies for improved remediation of hazardous waste sites. Primary members of the FRTR include the U.S. Department of Defense (DoD), the U.S. Department of Energy (DOE), the U.S. Department of the Interior (DOI), the National Aeronautics and Space Administration (NASA) and the U.S. Environmental Protection Agency (EPA). A major activity of the Roundtable is collection and distribution of information from federal and state agencies on the use of new technology at their sites. Each year, the Roundtable compiles reports and makes them available at the Web site [www.frtr.gov](http://www.frtr.gov). This fact sheet describes the status of cost and performance information on the web site and the new reports that were added for the spring 2007 update. A total of 756 case studies are now available with this recent addition of 38 new reports.

Figure 1 shows the variety of information available on the FRTR homepage. Figure 2 illustrates access to the four categories

**FIGURE 1: INFORMATION ON FRTR HOMEPAGE**

**Search:** Search the FRTR Web site for information.

**FRTR Meetings:** Obtain information on upcoming FRTR Meetings and download summaries and presentations from previous meetings.

**Screening Tools:** Use screening matrices to evaluate technologies for characterizing and treating hazardous waste sites and for decision support.

**Technology Cost and Performance:** View and download case studies on remediation/characterization technologies and technology assessment reports as well as access web sites on technology cost analysis.

**Remediation Optimization:** View and download case studies and guidance information on monitoring and remediation technology optimization.

**Environmental Cost Engineering:** Obtain information on tools and reference documents for cost estimation of environmental projects.

**Publications:** View and download abstracts and publications issued under the auspices of the FRTR.

**Information Links:** Access web sites of other FRTR members.



### HIGHLIGHTS

- Three remediation case studies on treatment of mine waste
- Eight reports on performance verification of various field-portable X-ray fluorescence spectrometers for the analysis of trace elements
- Two reports on screening and characterization of vapor intrusion pathways
- An in situ thermal treatment design document
- A cost and performance review of electrical resistance heating for source treatment
- Technology assessment reports on remediation of 1,4-dioxane and mercury
- One case study on using the Triad approach to expedite site characterization
- Three reports on remediation process optimization

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## HIGHLIGHT OF NEW REMEDIATION CASE STUDY

### Palmerton Zinc Pile, Compost/Biosolids Application to Revegetate Defoliated Areas

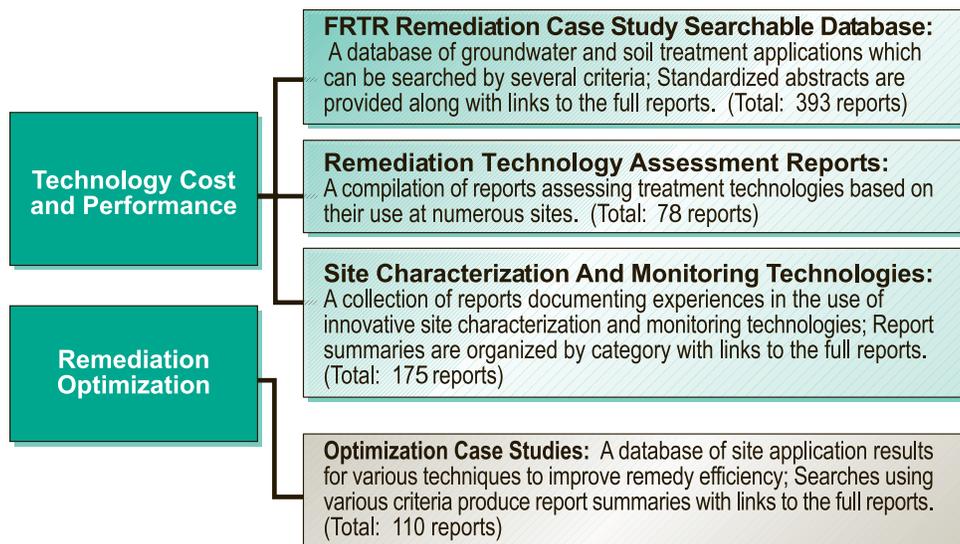
This report summarizes a full-scale phytoremediation project that was implemented at the Palmerton Zinc Pile Superfund Site in Palmerton, Carbon County, Pennsylvania. Previous zinc smelting operations had created an area of more than 2,000 acres of defoliated land on the adjacent Blue Mountain, a cinder bank composed of 33 million tons of material that contained leachable metals, and additional defoliation along Stoney Ridge. The surface soil, groundwater, and stream sediments at the site and surrounding areas had been contaminated by heavy metals as a result. The treatment technology to address the heavy metal contamination involved revegetation of the defoliated areas using lime, potash, sludge, and fly ash to support the new plantings. Through mid-2006, about 1,300 acres of Blue Mountain, 220 acres of the cinder bank, and 40 acres of Stoney Ridge have been revegetated. Additional revegetation of Blue Mountain and Stoney Ridge is planned for the remainder of 2006 and in 2007. Results of the phytoremediation project have stabilized treated areas, reduced soil erosion, and improved water quality (decreased contaminant concentrations of soluble metals) associated with runoff from the site.

of remediation reports, including cost and performance case studies for soil and groundwater treatment technologies at specific sites; broad assessments of these technologies based on their use at multiple sites; case studies of innovative site characterization and monitoring technologies; and case studies of various optimization efforts.

## REMEDICATION TECHNOLOGY COST AND PERFORMANCE CASE STUDIES

Ten new cost and performance case studies for remediation (treatment or containment) technologies are being added. These case studies primarily involve in situ processes for treating chlorinated solvents in groundwater and technologies for treating metals from mining and smelting operations. Most of the chlorinated solvent projects were prepared by DoD's Environmental Security Technology Certification Program (ESTCP). One study involves bioaugmentation, where a microbial culture was able to successfully induce degradation. Other projects involve creation of a reactive zone — in one case using permeable electrodes to produce oxidizing and reducing conditions, and in another case to test the use of cottonwood trees to intercept and treat groundwater contaminated with trichloroethylene. Another project documents ongoing work by the State of Florida to remediate a dry cleaning facility using aggressive source zone treatment consisting of in situ chemical oxidation (Fenton's

**FIGURE 2: REMEDIATION REPORTS**



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chemistry). The remaining projects address metal contamination. An EPA report from a Superfund site demonstrates how a constructed wetland was able to reduce metals to concentrations below maximum contaminant levels (MCL). Other Superfund projects at smelting sites demonstrate aggressive revegetation to control migration of metals and the potential for permeable reactive barriers using zero-valent iron to control arsenic. Two EPA Superfund Innovative Technology Evaluation (SITE) projects demonstrated use of a compost-free bioreactor and of a semi-passive alkaline lagoon to treat acid mine drainage. Finally, an ESTCP project demonstrated the successful use of a proprietary product (derived from processing fish bones) to stabilize lead in situ.

The abstracts for all of the new reports are available in the eleventh volume of *Abstracts of Remediation Case Studies* (542-R-07-004), which is available for download only at the FRTR Web site. Past volumes of *Abstracts of Remediation Case Studies* are also available at the Web site to download or order.

## SITE CHARACTERIZATION AND MONITORING REPORTS

This focus area includes reports on field-based site characterization and monitoring technologies. Of the 11 new reports added, one actually consists of a collection of eight reports for individual field-portable X-ray fluorescence (XRF) spectrometers vendors. This report by the SITE program is a comparative demonstration of the XRF instruments for the analysis of trace metals. This demonstration was designed to collect reliable data on performance and cost for commercially available XRF instruments and to document the relative performance of each. The objective of the evaluation was to evaluate each XRF instrument's accuracy, precision, sample throughput, and tendency for matrix effects. This field demonstration involved analysis of prepared samples of soil and sediment, which included blends from nine different collection sites as well as spiked samples with certified element concentrations. Accuracy was assessed by comparing the XRF instrument's results with data generated by a fixed reference laboratory. The SITE program also produced an evaluation of a rapid dioxin assay that can be used as an effective screening tool to identify areas of greatest concern for cleanup and to limit the number of more expensive analysis.

Several reports from the Interstate Technology & Regulatory Council (ITRC) are included. Two

## HIGHLIGHT OF NEW CHARACTERIZATION REPORTS

### Vapor Intrusion Pathway: A Practical Guide and Vapor Intrusion Pathway: Investigative Approaches for Typical Scenarios



The Interstate Technology Regulatory Council (ITRC) has released two guidance documents on vapor intrusion characterization — Vapor Intrusion Pathway: A Practical Guide, and Vapor Intrusion Pathway: Investigative Approaches for Typical Scenarios. The first document (Vapor Intrusion

Pathway: A Practical Guide) provides a 13-step approach to investigate vapor intrusion and to determine whether any remediation is warranted. The second document (Vapor Intrusion Pathway: Investigative Approaches for Typical Scenarios) provides six hypothetical scenarios for a vapor intrusion investigation. The six scenarios include: (1) a gas station in a residential neighborhood; (2) a dry cleaner in a strip mall adjacent to a neighborhood; (3) a large industrial facility with a long plume under several hundred buildings; (4) a vacant lot with proposed Brownfield development over a ground water plume; (5) a vacant large commercial building with warehouse space and office space; and (6) an apartment building with a parking garage over a ground water plume.

documents address vapor intrusion. One of these documents provides an overview and a procedure for conducting an investigation to determine whether remediation is warranted. A companion document provides six hypothetical scenarios to illustrate application of the procedures. Two ITRC reports cover passive samplers that are primarily intended for groundwater monitoring, but many can also be used for surface

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water and vapor sampling. Twelve technologies are discussed in terms of operation, applications, advantages and limitations, and status. Another report provides protocols for five of these groundwater samplers, along with case histories of their use. In addition, an ITRC report describes technologies that have been combined for real-time measurement of radionuclides in soil. Five case studies are provided where the technologies have been applied and conclusions are given concerning their use. Three reports from the ESTCP include a survey of munitions response technologies with illustrations on evaluating and selecting characterization technologies for unexploded ordnance based on site conditions; demonstration of an innovative analytical assay technology that detects bioavailable ferric iron; and a demonstration that shows the cost effectiveness of a single-well push-pull test for evaluating the potential for in situ aerobic cometabolism. Finally, an EPA case study is included on use of the Triad approach to unravel complex contaminant distribution patterns and support expedited site characterization.

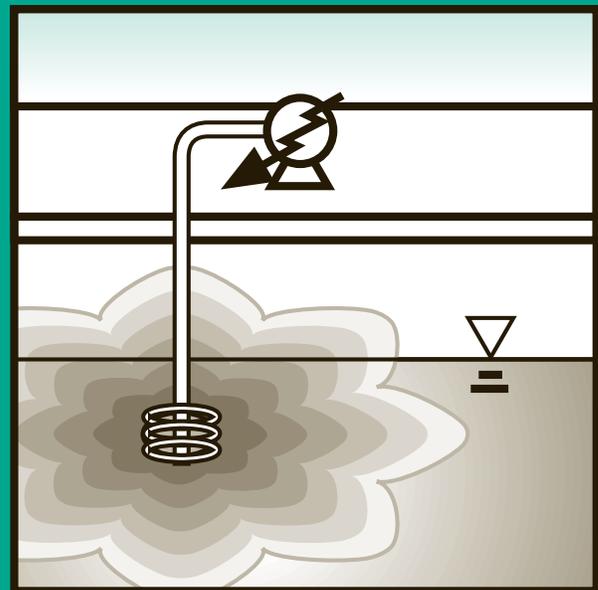
### **LONG-TERM MONITORING AND OPTIMIZATION CASE STUDY REPORTS**

New documents added in this area include reports from ITRC and EPA on process optimization and EPA reports on monitoring optimization. The ITRC is preparing a series of reports on remedial process optimization topics. The first deals with life cycle cost analysis, which considers all project costs as the basis for comparison of alternatives. Another provides an overview of performance-based management, which focuses on accelerating the achievement of desired results or remedial action objectives. Another report discusses data management, data analysis, and visualization techniques. This report covers useful techniques for extracting information to support analysis from existing and newly collected data. EPA refers to its process optimization as Remedial Site Evaluation, and three reports are included that illustrate its application. These reports include optimization of an existing soil vapor extraction and in-well air stripping system, and two pump-and-treat systems that also involve recovery of free product. In addition, three EPA case studies concern optimization of long-term monitoring networks through both spatial (sample location) and temporal (sample frequency) statistical analysis. One of these projects uses statistical tools available with the Monitoring and Remediation Optimization System software (MAROS).

### **HIGHLIGHT OF REMEDIATION TECHNOLOGY ASSESSMENT REPORTS**

#### **Cost and Performance Review of Electrical Resistance Heating (ERH) for Source Treatment and In Situ Thermal Treatment Design Document**

The U.S. Navy and the USACE have each released a document on evaluating and selecting in situ thermal treatment technologies. The U.S. Navy has released Cost and Performance Review of Electrical Resistance Heating (ERH) for Source Treatment, which presents information on five ERH cost and performance projects. These projects focus on the treatment of dense nonaqueous-phase liquid (DNAPL) contamination at a variety of Department of Defense (DoD) facilities. The USACE has released In Situ Thermal Treatment Design Document, a guidance document that provides information on screening and selecting the appropriate in situ thermal remediation technologies. Technologies evaluated in this document include steam-enhanced extraction injection, electrical resistivity heating, and thermal conductive heating. Background information and technology descriptions are provided along with cost and performance information.



## REMEDATION TECHNOLOGY ASSESSMENT REPORTS

The reports in this section provide technology assessments based on results from field experience gained from multiple sites. Two new reports provide valuable information about in situ thermal treatment. The U.S. Army Corp of Engineers (USACE) has produced a design manual to support evaluation and selection of the major thermal options, including steam-enhanced extraction, electrical resistance heating, and thermal conductive heating. The manual provides information on the proper application of the technologies and helps identify design, operational, and monitoring issues. The Navy has published a report focusing on electrical resistance heating that includes five cost and performance case studies from applications at naval facilities. The results from these projects show this technology to be effective for treating dense nonaqueous phase liquids (DNAPL). The ITRC has published a document on post-closure care of municipal solid waste landfills. Although it is focused on municipal waste, the report also has information that could be useful for management of hazardous wastes. The ITRC also produced a document on ecological land reuse. Case studies are provided to document the integration of natural or green technologies and to illustrate the resulting benefits. An EPA fact sheet on soil amendments for site remediation and reuse provides a reference matrix that describes the potential application of organic waste streams to revitalize areas that have been stressed from activities such as mining. It is based on lessons learned from extensive site-specific experience. Two additional EPA reports are contaminant-specific assessments of available and emerging technologies for treating 1,4-dioxane and mercury. The final report is from ESTCP and the U.S. Geological Survey and provides a draft protocol for characterizing natural attenuation of chlorinated solvents in groundwater plumes that discharge to wetlands. This document is based on a previous report and presents alternatives for developing the site conceptual model and field methodologies for characterizing the natural attenuation process.

### REMEDATION CASE STUDIES AND TECHNOLOGY ASSESSMENT REPORTS - ORDERING INFORMATION

The following FRTR documents are available free of charge from the U.S. EPA/National Service Center for Environmental Publications (NSCEP), while supplies last. To order, mail a request to:

U.S. EPA/National Service Center for Environmental Publications  
P.O. Box 42419  
Cincinnati, OH 45242

Or FAX to (513) 489-8695. In addition, telephone orders may be placed at (800) 490-9198 or (513) 489-8190.

- Abstracts of Remediation Case Studies, Volume 11, August 2007 (EPA-542-R-07-004) [Downloadable only at [www.frtr.gov](http://www.frtr.gov)].
- Remediation Case Studies & Technology Assessment Reports Fact Sheet, June 2007 (EPA-542-F-07-002).
- Remediation Technology Assessment Reports: Summary of Selected Documents, August 2005 (EPA-542-F-05-006).
- Guide to Documenting and Managing Cost and Performance Information for Remediation Projects, Revised Version, October 1998 (EPA-542-B-98-007).



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