FEDERAL REMEDIATION TECHNOLOGIES ROUNDTABLE ANNUAL SUMMARY OF ACTIVITIES: AUGUST 2010 - HIGHLIGHTING VAPOR INTRUSION

FRTR HIGHLIGHTS

- Twenty-six new cost and performance case studies
- Summary and presentations from the FRTR meeting on Vapor Intrusion (VI) posted on the FRTR website
- FRTR launched the Vapor Intrusion Data Workgroup in partnership with several federal agencies in March 2010
- EPA released OSWER directive (OSWER 9200.2-72), "*Operational and Functional Determination and the Transfer of Fund-Lead Vapor Intrusion Mitigation Systems to the States*" in April 2009
- The "*DoD Vapor Intrusion Handbook*" is a resource for remedial project managers (RPM) who may need to investigate the VI pathway at DoD sites, and is available on line at https://www.denix.osd.mil/portal/page/portal/denix/environment/cleanup/WN/DoD%20VI%20Handbook%20Final%20Jan%2009.pdf
- EPA has on-line resources dedicated to VI that are available at
  - *http://www.clu-in.org/issues/default.focus/sec/Vapor_Intrusion/cat/Overview/*, and
  - *http://www.epa.gov/oswer/vaporintrusion/*
- FRTR "What's New" website feature contains recent publications
  - EPA Region 7 published a fact sheet, "*What you should know about Vapor Intrusion*," to answer frequently asked questions about VI
  - Three new Green and Sustainable Remediation Case Studies

This fact sheet summarizes the activities of the Federal Remediation Technologies Roundtable (FRTR) over the last year. The FRTR is an interagency working group that promotes cooperation among member agencies to promote 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 U.S. National Aeronautics and Space Administration (NASA), and the U.S. Environmental Protection Agency (EPA).

The roundtable meets twice each year to share information and has done so continuously since it was established in May 1990. Meeting summaries and presentations are available on the FRTR website at: *www.frtr.gov*. Recent meetings focused on Green Remediation (December 2008) and Data Management (May 2009). The 39th FRTR meeting, held in November 2009, focused on vapor intrusion (VI); the objectives of the meeting were as follows:

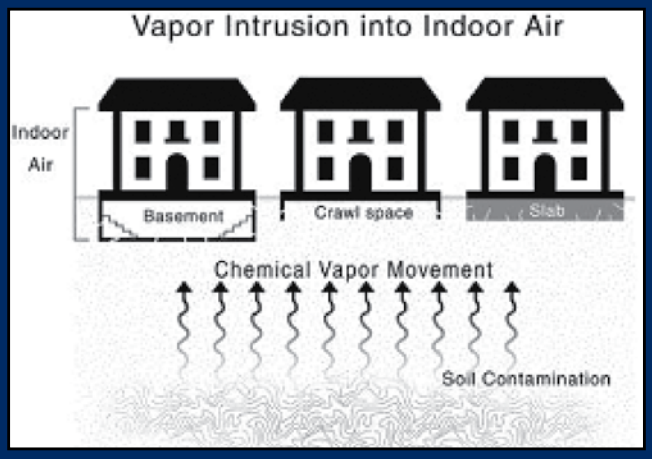
- Improve communication on and common understanding of VI issues;
- Share experiences and lessons learned in advancing best practices for VI;
- Outline key issues and develop shared strategies to address VI; and
- Develop a "charge" for future FRTR action related to VI.

This factsheet highlights work that the FRTR member agencies are doing on VI issues.

VI refers to the condition when vapors and gases from contaminated groundwater and soil seep into indoor spaces; these vapors may have the potential to cause health problems. Federal agencies are actively working on understanding the potential for VI at sites, as well as the cleanup and

VAPOR INTRUSION

Vapor intrusion (VI) is the migration of volatile chemicals from the subsurface into overlying buildings. Volatile chemicals in buried wastes or contaminated groundwater can emit vapors that may migrate through subsurface soils and into indoor air spaces of overlying buildings (Office of Solid Waste and Emergency Response [OSWER] draft 2002 VI guidance). More information on VI is available at *www.clu-in.org/issues/default.focus/sec/Vapor_Intrusion/cat/Overview*



possible health issues raised by VI. Some aspects of VI investigation/mitigation include:

- VI involves complex fate and transport mechanisms that move volatile organic compounds (VOC) from the subsurface to below-grade or aboveground building structures;
- Multiple lines of evidence are useful in evaluating the potential for VI, including data for groundwater, soil gas, sub-slab gas, and indoor air;
- A good site conceptual model is critical in helping site teams design sampling programs and define data quality objectives to address potential VI concerns;
- Assessors are focusing on inhalation dosimetry methodology to derive appropriate VI cleanup levels at sites; and
- VI mitigation approaches differ for new construction and existing buildings.

Currently, there are areas of uncertainty associated with VI. These include substantial uncertainties associated with VI fate and transport models; difficulty in achieving streamlined monitoring to identify a complete pathway; understanding cost-effectiveness of mitigation approaches; challenges associated with implementing VI monitoring in homes because of reluctant home owners and because other materials that could contain VOCs may be found in homes; and difficulty in evaluating and implementing the best institutional controls. In March 2010, FRTR formed the Vapor Intrusion Data Workgroup in partnership with several Federal agencies, and subsequently invited several State agencies to participate. The workgroup will meet to discuss VI-related issues. In addition, FRTR member agencies are supporting several efforts and activities to improve their ability to address VI effectively. Examples of ongoing VI-related efforts within FRTR member agencies are provided below.

Vapor Intrusion Efforts within DoD

In January 2009, DoD published the "*DoD Vapor Intrusion Handbook*" to serve as a resource for remedial project managers (RPMs) who may need to investigate the VI pathway at DoD sites, including active and closed U.S. Air Force, U.S. Army, U.S. Navy, and U.S. Marine Corps bases, as well as Formerly Used Defense Sites (FUDS). The handbook provides a general framework for conducting VI investigations under the Defense Environmental Restoration Program (DERP). Both residential and occupational exposure scenarios are discussed, since both groups can be affected by VI. Based on the 2009 DoD handbook, the Air Force is developing a VI strategy that includes a "multiple lines of evidence" approach.

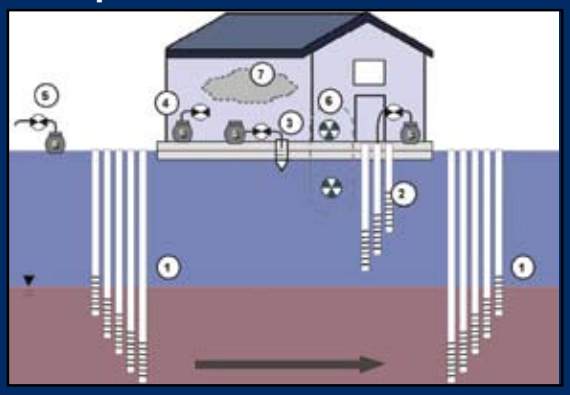
The Navy is developing various resources to guide its RPMs on approaches to VI issues at sites. The 2008 Navy/Marine Corps VI policy describes how to consider VI in the environmental restoration by (1) determining whether to evaluate the VI pathway for a site, (2) planning and implementing a VI pathway evaluation, (3) addressing background chemical issues, (4) evaluating human health exposure risks posed by VI, (5) evaluating remedial alternatives, and (6) considering previously transferred property. The Navy's VI Focus Group brings together VI technical leads from the Naval Facilities Engineering Command (NAVFAC), the Naval Facilities Engineering Service Center (NFESC), the Navy Marine Corps Public Health Center, Navy contractors, and industry experts to develop resources such as the VI Conceptual Site Model Checklist.

HIGHLIGHT OF VAPOR INTRUSION COST AND PERFORMANCE REPORT

Detailed Field Investigation of Vapor Intrusion Processes

DoD's ESTCP conducted a detailed demonstration study using conceptual models to investigate VI at the Altus Air Force Base in Oklahoma and at Hill Air Force Base in Utah. The demonstration consisted of collecting high-density data at the test sites, analyzing the data, and using the results to develop a cost-effective and accurate approach for the investigation of VI into buildings overlying contaminated groundwater. The primary objectives of the study were to collect data representative of site conditions, identify VI impacts, and develop a reliable VI investigation approach. This report describes the sampling and monitoring procedures, data collection, and the performance and cost assessment of the VI investigation. Data collected in the study include geotechnical data and indoor air concentrations of volatile organic compounds (VOCs), oxygen, and carbon dioxide. These data were used to assess the spatial and temporal variability in VOC concentration, movement of VOCs across key interfaces, and the VI impacts at the selected test sites. The results of the demonstration were used to support a step-wise process for the investigation of VI from groundwater sources at other sites. The results also provide facility managers with investigation results that support a cost-effective, building-specific evaluation approach of VI impacts at corrective action sites. A detailed report about this study is available on line at *http://costperformance.org/monitoring/pdf/Vapor-Intrusion-Processes-ESTCP.pdf.*

Conceptual Data Collection Plan for Detailed Evaluation of The Vapor Intrusion Pathway.



1. Multilevel discrete depth samples upgradient, midgradient, and downgradient of the building used to characterize groundwater mass flux [three multilevel clusters]; **2.** Multilevel soil gas (SG) sampling conducted below or adjacent to the building used to characterize SG concentration gradients and mass flux [three multilevel clusters]; **3.** Subslab SG samples, combined with the other data, provide an understanding of transport from the groundwater source to indoor air [three sample points]; **4.** Indoor air samples [three sample points] combined with **5.** Ambient air samples [three sample points], and **6.** Analysis of radon allows separation of indoor air sources and vapor intrusions sources; **7.** Unique tracer gas released within the building allows for accurate measurement of building air exchange rate

The Army is also updating its 2006 interim VI policy; this policy will address the Army's position on various VI-related issues such as regulatory drivers that guide the use of environmental funding; the use of existing technical guidance; assessment procedures for the VI pathway; considerations for buildings, undeveloped property, and transferred property; and 5-year review considerations. DoD's environmental technology programs, such as the Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP), have undertaken several initiatives to develop an improved understanding of the VI pathway from groundwater plumes contaminated by chlorinated solvents. Two ongoing SERDP projects are focusing on modeling tools to assess VI pathways. In addition, three ongoing ESTCP demonstrations are addressing VI, including (1) developing a protocol for VI evaluation, (2) testing the application of a sensor-based technology to assess VI, and (3) developing cost-effective tools for long-term monitoring of soil VI to indoor air.

Vapor Intrusion Efforts within EPA

On November 29, 2002, EPA's OSWER published a notice in the Federal Register (67 FR 71169) announcing and soliciting comment on its Draft OSWER Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soil (Subsurface Vapor Intrusion Guidance) (EPA 530-D-02-004). This draft guidance outlines a multi-tiered approach to determine whether, or not, the VI exposure pathway is complete and may present a risk to human health. The recommended process starts with a simple and relatively conservative screening evaluation, which can progress to a more complex assessment involving increasingly greater use of site-specific data. Since the Draft guidance was

EPA'S VAPOR INTRUSION RESOURCES

1. EPA's OSWER has developed a website *http://www.epa.gov/oswer/vaporintrusion/* that provides basic information about vapor intrusion, technical and policy documents to support environmental investigations, and highlights of recent and upcoming activities related to vapor intrusion.
2. EPA's Office of Superfund Remediation and Technology Innovation (OSRTI) has developed a website (*www.clu-in.org/issues/default.focus/sec/Vapor_Intrusion/cat/Overview*) that serves as a repository of technical information related to VI. This website is updated regularly and draws on information from federal cleanup programs, state sources, universities, nonprofit organizations, peer-reviewed publications, and public-private partnerships.
3. EPA's Vapor Intrusion Database, available at *http://iavi.rti.org*, was updated in March 2008. The database holds data to support site-specific measurements of vapor attenuation, or the reduction in vapor concentrations as volatile contaminants move from soil and groundwater into indoor air.
4. EPA published an Engineering Issue, Indoor Air Vapor Intrusion Mitigation Approaches (EPA 600-R-08-115), which presents the "state of the science" regarding management and treatment of VI into building structures *(www.clu-in.org/download/char/600r08115.pdf)*.
5. EPA Region 7 published a fact sheet on VI in February 2010 that provides answers to several frequently asked questions about VI. The fact sheet is available on line at *http://www.epa.gov/region07/factsheets/2010/faq_about_vapor_intrusion_201002.htm*.
6. EPA published the Brownfields Technology Primer: Vapor Intrusion Considerations for Redevelopment (EPA 542-R-08-001), which is designed for land revitalization stakeholders concerned about vapor intrusion, including property owners, municipalities, and real estate developers. The report is available on line at *http://brownfieldstsc.org/pdfs/BTSC%20Vapor%20Intrusion%20Considerations%20for%20Redevelopment%20EPA%20542-R-08-001.pdf*

released, our knowledge and experience with VI has increased considerably.

In 2009, EPA's Office of the Inspector General (OIG) released an evaluation report: Lack of Final Guidance on Vapor Intrusion Impedes Efforts to Address Indoor Air Risks (Report No. 10-P-042). The report is available at *http://www.epa.gov/oig/reports/2010/20091214-10-P-0042.pdf*.

The OIG made the following recommendations:

1. Identify and publicly report the portions of OSWER's November 2002 Draft VI guidance that remain valid and the portions that should be updated,
2. Issue final VI guidance(s) that incorporates information on
   a. Updated toxicity values.
   b. A recommendation(s) to use multiple lines of evidence in evaluating and making decisions about risk from vapor intrusion.
   c. How risk from petroleum hydrocarbons should be addressed
   d. How the guidance applies to Superfund Five-Year reviews.
   e. When or whether preemptive mitigation is appropriate.
   f. Operations and maintenance, the termination of the systems, and when institutional controls and deed restrictions are appropriate.
3. Train EPA and State staff and managers, and other parties, on the newly updated, revised, and finalized guidance document (s), and
4. Complete toxicity assessments of trichloroethene and perchloroethene.

EPA's OSWER will address the first three of these recommendations. The fourth recommendation is being addressed by EPA's Office of Research and Development (ORD). The status and progress of these recommendations will be posted at *http://www.epa.gov/oswer/vaporintrusion*.

In April 2009, EPA released OSWER directive, "*Operational and Functional Determination and the Transfer of Fund-Lead Vapor Intrusion Mitigation Systems to the States*" (OSWER 9200.2-72), to guide when VI mitigation systems can transfer to the state for operation and maintenance (O&M). EPA is also encouraging dialogue between various stakeholders on the VI issue. In January 2009, EPA Region 3 hosted the National Forum on VI in Philadelphia to highlight government and stakeholder perspectives on VI. Proceedings from the conference are available at *www.epa.gov/osp/hstl/viforum09.htm*.

REMEDIATION CASE STUDIES AND TECHNOLOGY ASSESSMENT REPORTS

A major activity of the roundtable throughout the year is to collect and distribute information from federal and state agencies on the use of new technologies at their sites. Each year, the roundtable compiles reports and makes them available at the website www.frtr.gov. The "What's New" section regularly provides notices about meetings, conferences, and publications of relevance to FRTR and is updated monthly.

The FRTR website provides case studies and reports in four categories: Remediation Technology, Site Characterization and Monitoring, Long-Term Monitoring and Optimization, and Remediation Technology Assessment. The case studies share data collected by member agencies and are based on real experiences and lessons learned in selecting and implementing site characterization and treatment technologies to delineate and remediate soil and groundwater contamination at hazardous waste sites. Remediation case study reports describe the performance and cost of technology applications at full-scale and large-scale demonstration projects.

Remediation Technology Cost And Performance Case Studies

More than 400 Remediation Technology Cost and Performance Case Studies (treatment or containment) are available on the FRTR website. Recently, ten new cost and performance case studies for remediation technologies have been added. These case studies address the use of *in situ* remediation technologies for contaminated sediment, soil, and groundwater. Six reports prepared by DoD's ESTCP provide data on cost and performance for bioremediation of dense non-aqueous phase liquids (DNAPL), chlorinated hydrocarbons, and perchlorate. In addition, one report developed by ESTCP addresses the use of activated carbon to stabilize polychlorinated biphenyls (PCB) in contaminated sediment. Three reports developed by EPA describe (1) *in situ* bioremediation and soil vapor extraction to treat

HIGHLIGHT OF NEW REMEDIATION TECHNOLOGY COST AND PERFORMANCE REPORT

Field Application of a Permeable Reactive Barrier for Treatment of Arsenic in Groundwater

The ASARCO East Helena plant was a smelter located south of East Helena, Montana. The plant began operations in 1888 and operated for more than 100 years. It was listed on the EPA's National Priorities List (NPL) in 1984. Lead operations at the site contaminated the groundwater with arsenic. ASARCO shut down its operations in 2001, and plant demolition is under way.

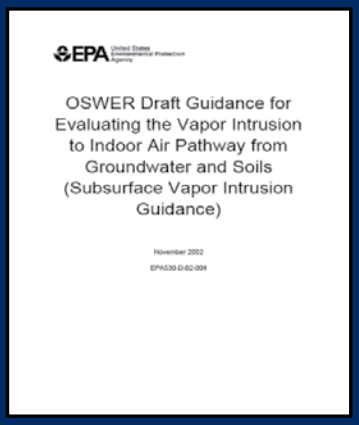
A pilot study was conducted at the site to evaluate the performance and efficiency of a zero-valent iron permeable reactive barrier (PRB) for treatment of the arsenic-contaminated groundwater. The PRB consists of granular zero-valent iron that runs 9.1 meters (m) long, 13.7 m deep, and 1.8 to 2.4 m wide. The PRB was installed over 3 days using bio-polymer slurry methods and excavation equipment. Forty groundwater monitoring wells were installed in July 2005, and groundwater samples were collected at month 1, 4, 12, 15, and 25 of operation.

The results concluded that the permeable reactive barrier is effective at treating arsenic-contaminated groundwater. Monitoring results indicated that groundwater upgradient of the barrier contained arsenic at concentrations of more than 25 milligrams per liter (mg/L) and that groundwater within the barrier has an average arsenic concentration of less than 0.01 mg/L. In addition to this demonstration, this report addresses aspects of site characterization, remedial design, and remedy implementation, and monitoring results for this pilot-scale PRB effort, including a flux-based analysis for arsenic.

Backfilling of Trench with Granular Iron

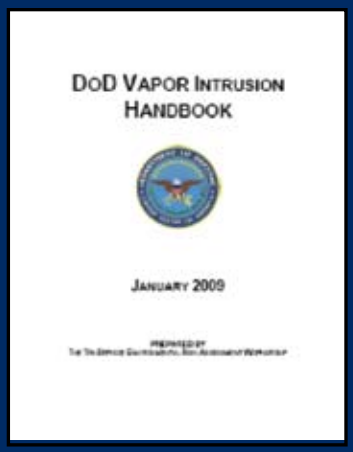
VAPOR INTRUSION (VI) PUBLICATIONS

The VI publications listed below represent some of the most up-to-date information available on the evaluation and (if appropriate) the mitigation of the VI pathway. They also provide guidance on how to assess the human health risks associated with the VI pathway and incorporate this information into the baseline human health risk assessment used to decide whether site remediation is warranted to address contaminants of concern (COCs).



OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils. This draft guidance was published by EPA Office of Solid Waste and Emergency Response (OSWER) in November 2002. It provides useful information in evaluating the VI pathway, including a three-tiered approach to evaluate the potential risks associated with this pathway. This draft guidance provides the basis for other documents that followed, such as the DoD VI handbook, described below. The draft guidance is available on line at *http://www.epa.gov/osw/hazard/correctiveaction/eis/vapor/complete.pdf.*

Vapor Intrusion Pathway: A Practical Guideline. Published by the Interstate Technology and Regulatory Council (ITRC)'s Vapor Intrusion Team in January 2007, this technical and regulatory guidance provides a generalized 13-step framework for evaluating the VI pathway and describes the various tools available for site investigation, data evaluation, and mitigation. The guideline is intended to be used in conjunction with any applicable federal or state vapor intrusion policy or guidance. A companion document (described below) puts this framework in the light of typical VI site scenarios. This document is available on line at *http://www.itrcweb.org/Documents/VI-1.pdf.*



DoD Vapor Intrusion Handbook. This handbook, developed by DoD in January 2009, discusses various technical approaches associated with evaluating the VI pathway and provides perspective for site managers on developing and interpreting VI investigations. By considering project needs, state regulations, and the pros and cons of the various approaches, the site managers can make informed and cost-effective decisions on the best way to evaluate VI at a site. This handbook is available on line at *https://www.denix.osd.mil/portal/page/portal/denix/environment/cleanup/WN/DoD%20VI%20Handbook%20Final%20Jan%2009.pdf*

HIGHLIGHT OF NEW REMEDIATION TECHNOLOGY COST AND PERFORMANCE REPORT

Field Testing of Activated Carbon Mixing and *In situ* Stabilization of Polychlorinated Biphenyls (PCB) in Sediment at Hunters Point Shipyard (HPS) Parcel F, San Francisco Bay, California

HPS is a former Navy installation located on a peninsula in the southeastern corner of San Francisco, California. The site is approximately 928 acres, with approximately 432 acres of offshore sediment. Historical site activities associated with ship repair and maintenance released chemicals such as PCBs to the environment, including offshore sediment located near the South Basin. Because PCBs tend to adsorb to fine-grained sediment particles and organic matter, sediment resuspension and deposition are major contaminant transport pathways at the site. In 1989, HPS was included on the National Priorities List (NPL). The Navy closed the base in 1991 under the Defense Base Closure and Realignment Act. The base is being remediated and will be converted to nonmilitary use.

A site characterization study was conducted in 1991 to evaluate the presence of contaminants in offshore areas of the HPS. Results of the study indicated that PCBs were a major risk driver for HPS Parcel F, located at the HPS tidal mudflat within the South Basin. Within this area of the site, PCB concentrations were identified as approximately 2 parts per million (ppm) from a depth of 0 to 12 inches. As a result, Parcel F of the site was selected for the *in situ* remedial technology demonstration study.

A 3-year field-scale project was conducted at the site to demonstrate that activated carbon (AC) sorbent mixed with sediment is a cost-effective, *in situ*, nonremoval, management strategy for reducing risk and the bioavailability of PCBs in offshore sediments. Four test plots with areas of 370 square feet each were studied to compare mixing technologies and evaluate the AC treatment technology. Two test plots were amended with AC in January 2006 using two different mixing devices (Aquamog rototiller system and CEI slurry injector system). At each of these plots, AC was added to a nominal 1-foot depth. The other two test plots served as controls; one test plot served as a mixing control, and the other served as a non-mixing control. The four plots were analyzed using a combination of sampling and analysis and statistical tests. The plots were sampled once before and three times after treatment. This 3-year field-scale project successfully demonstrated that the top layer of sediments in a PCB-contaminated tidal mudflat could be amended with AC using large-scale commercial mixing equipment. Field-scale AC-amendment reduced the availability of PCBs to water without impairing the natural benthic community of macroinvertebrates or releasing PCBs into overlying water.

AC – Sediment Mixing

HIGHLIGHT OF NEW CHARACTERIZATION REPORT

A Guide for Assessing Biodegradation and Source Identification of Organic Groundwater Contaminants using Compound Specific Isotope Analysis (CSIA)

This report, prepared by the Environmental Protection Agency (EPA), provides a guide to the use of Compound Specific Isotope Analysis (CSIA) to examine organic groundwater contaminants. CSIA has the ability to improve our understanding of the behavior of organic contaminants at hazardous waste sites. Recent advances in analytical chemistry make it possible to perform CSIA on dissolved organic contaminants such as chlorinated solvents, aromatic petroleum hydrocarbons and fuel oxygenates, at concentrations in water that are near their regulatory standards. Since CSIA is a new approach, there are no widely accepted standards for accuracy, precision and sensitivity, and no established approaches to document accuracy, precision and sensitivity and representativeness.

This Guide provides general recommendations on good practice for sampling groundwater for CSIA, and quality assurance recommendations for measurement of isotope ratios. The Guide also provides recommendations for data evaluation and interpretation to use CSIA to document degradation of organic contaminants, or to associate plumes of contaminants in groundwater with their sources. The report is divided into nine sections with additional references, tables and figures. The first two sections introduce the CSIA process and describe the benefits and value of data provided by CSIA. The next two sections explain different collection methods and strategies based on varying contaminants, plume size, location, etc. The remaining five sections provide recommendations for potential site and project managers, contractors or chemical analysts for CSIA data interpretation and application. In addition, this report provides information about various demonstration designs where CSIA has been used effectively to characterize a site.

chlorinated hydrocarbons, (2) electrical resistive heating to treat chlorinated hydrocarbons, and (3) permeable reactive barrier to treat arsenic in groundwater.

Site Characterization and Monitoring Reports

This focus area includes reports on field-based site characterization and monitoring technologies, and documents experiences and lessons learned in field demonstrations and full-scale applications; more than 195 reports are currently available. Seven new reports have been added, three each from ESTCP and EPA. Two of the EPA reports describe organic and inorganic chemical characterization, while one report describes the use of the Triad approach at a hydrocarbon-contaminated site. Two ESTCP reports address characterization of organic chemicals, including the use of fiber optic biosensors, while one report addresses characterization of bioavailability of lead. One ESTCP report provides information on characterization of unexploded ordnance.

Long-Term Monitoring and Optimization Case Study Reports

This focus area includes reports that describe long-term management and optimization efforts that involve techniques such as evaluations of groundwater monitoring programs and plume and hydraulic optimization. More than 125 reports are currently available under this focus area. Five new documents have been recently added and include one report from ESTCP and four reports from EPA. The ESTCP report summarizes an adaptive long-term monitoring program for environmental restoration sites. The four EPA reports focus on evaluations of extraction systems used for remediation at four sites across the United States.

Remediation Technology Assessment Reports

The reports in this focus area provide broad assessments of technologies based on results from field experience gained from multiple sites. Four new reports were added to this focus area, bringing the total to more than 92, including two new reports from ITRC and one each from EPA and the U.S. Army Corps of Engineers (USACE). The ITRC reports provide information on evaluating remedial technologies and monitored natural attenuation for light non-aqueous phase liquids (LNAPL). The EPA report overviews solidification/stabilization technology for use in site remediation. The USACE report is an engineering and design manual for *in situ* thermal remediation (ISTR) and provides guidance and background information to support screening and selection of ISTR technologies.

HIGHLIGHT OF NEW OPTIMIZATION CASE STUDY REPORT

Remediation System Evaluation at 10th Street Superfund Site in Nebraska

This report documents the evaluation and recommendations for optimizing the treatment systems currently in place at the 10th Street Superfund Site located in Columbus, Nebraska. The remedies consist of three parts: a groundwater extraction and treatment system; an air sparging/soil vapor extraction system; and an *in situ* chemical oxidation treatment system. Recommendations associated with improving the effectiveness of the treatment system included evaluating the need of further evaluation or potential for vapor intrusion, discontinuing pumping, addressing calibration issues, and addressing potential plume migration. Cost recommendations included discontinuing the *in situ* chemical oxidation treatment, continuing to use passive diffusion bags without extensive comparison, and reducing the monitoring and reporting. Technical improvement recommendations included measuring and tracking the specific capacity of wells and considering variable frequency drives for extraction well pumps. Recommendations for improved sustainability and consideration for gaining site closeout are also included in this report.

HIGHLIGHT OF REMEDIATION TECHNOLOGY ASSESSMENT REPORT

Technology Performance Review: Selecting and Using Solidification / Stabilization Treatment for Site Remediation

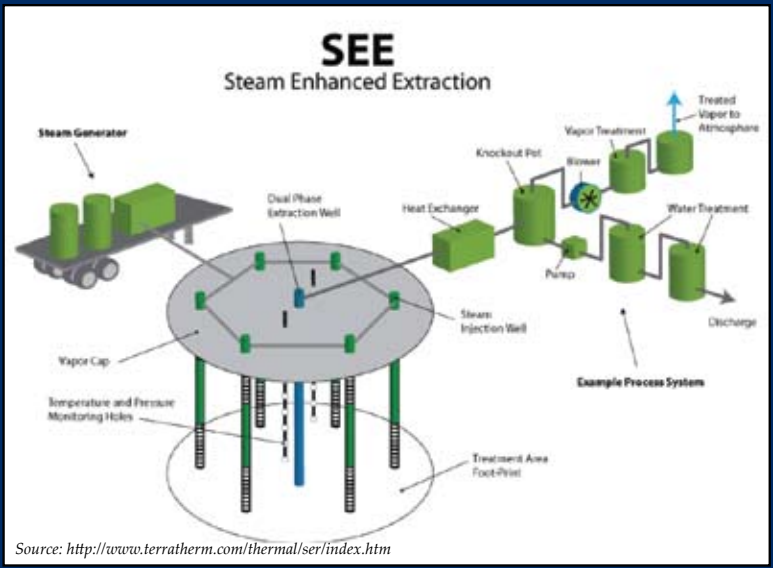
This report prepared by EPA provides assistance to decision makers such as Remedial Project Managers (RPMs) and other interested parties in evaluating Solidification/Stabilization (S/S) as a treatment option for their sites. S/S is a widely used treatment technology to prevent migration and exposure of contaminants from contaminated media (i.e. soil, sludge and sediment). Solidification refers to a process that binds contaminated media with a reagent, changing its physical properties by increasing the compressive strength, decreasing its permeability and encapsulating the contaminants to form a solid material. Stabilization refers to the process that involves a chemical reaction that reduces the leachability of a waste, chemically immobilizing it and reducing its solubility. Therefore, the contaminants become less harmful and less mobile.

The report provides a basic summary of the S/S process and its potential applicability across multiple sites and conditions. This document also addresses important factors to consider in the selection of S/S treatment, such as S/S specifications to evaluate performance, type of contaminants to be treated, and cost considerations. Site-specific case studies illustrate where this technology has been successfully applied and where there are limitations. Each case study includes a brief project description, regulatory status, S/S treatment process (including the binder materials used), and a summary of the performance data. Estimated treatment costs and maintenance activities are also included when available.

In-Situ Treatment of Sludge Pit Wastes at the South 8th Street Landfill Superfund Site in West Memphis, Arkansas

HIGHLIGHT OF REMEDIATION TECHNOLOGY ASSESSMENT REPORT

Engineering and Design Manual, Design: *In situ* Thermal Remediation



Source: http://www.terratherm.com/thermal/ser/index.htm

This U.S. Army Corps of Engineers (USACE) Engineering and Design Manual, Design: *In situ* Thermal Remediation (ISTR) provides guidance and background for screening and selection of ISTR technologies, including steam enhanced extraction, electrical resistivity heating, and thermal conductive heating. This document is intended to help distinguish proper applications of the technology and identify important design, operational, and monitoring issues relevant to government oversight personnel. The following topics are included: fundamental processes of ISTR performance, site characterization for ISTR technology screening and design, design considerations, cost and performance results, monitoring requirements and approaches, and system shut-down. The manual identifies specific issues related to implementation of ISTR technology, including regulatory considerations, contracting, safety, and patent and licensing. Specific applications of ISRT technologies are summarized where information is available.

ANNOUNCEMENT

John Kingscott, a long-time supporter and original member of the FRTR, retired in July 2010 after an illustrious 36-year career as a dedicated public servant at EPA. John distinguished himself through his pioneering efforts in introducing and mainstreaming innovative technologies for hazardous waste site remediation. John helped to organize the FRTR to improve collaboration among federal agencies involved in waste site cleanup. Over the years, John was a tireless advocate for the FRTR. John conceptualized the FRTR cost and performance case study initiative and, in June of 1996, the USEPA and the Air and Waste Management Association presented the EPA Science Achievement Award in Waste Management to John for advancing acceptance of innovative technologies through development of a national framework for documenting cost and performance of remediation projects.

FEDERAL REMEDIATION TECHNOLOGIES ROUNDTABLE SUMMARY OF ACTIVITES: August 2010 (EPA-530-F-10-001) — ORDERING INFORMATION

This FRTR fact sheet is 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:

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