



# U.S. Information Resources

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# Office of Solid Waste and Emergency Response (OSWER)



- Develops standards and regulations for hazardous and non-hazardous waste (RCRA)
  - Promotes resource conservation and recovery (RCRA)
  - Cleans up contaminated property and prepares it for reuse (Brownfields, RCRA, Superfund, UST)
- 
- Helps to prevent, plan for, and respond to emergencies (Oil spills, chemical releases, decontamination)
  - Promotes innovative technologies to assess and clean up contaminated soil, sediment, and water at waste sites (Technology Innovation)

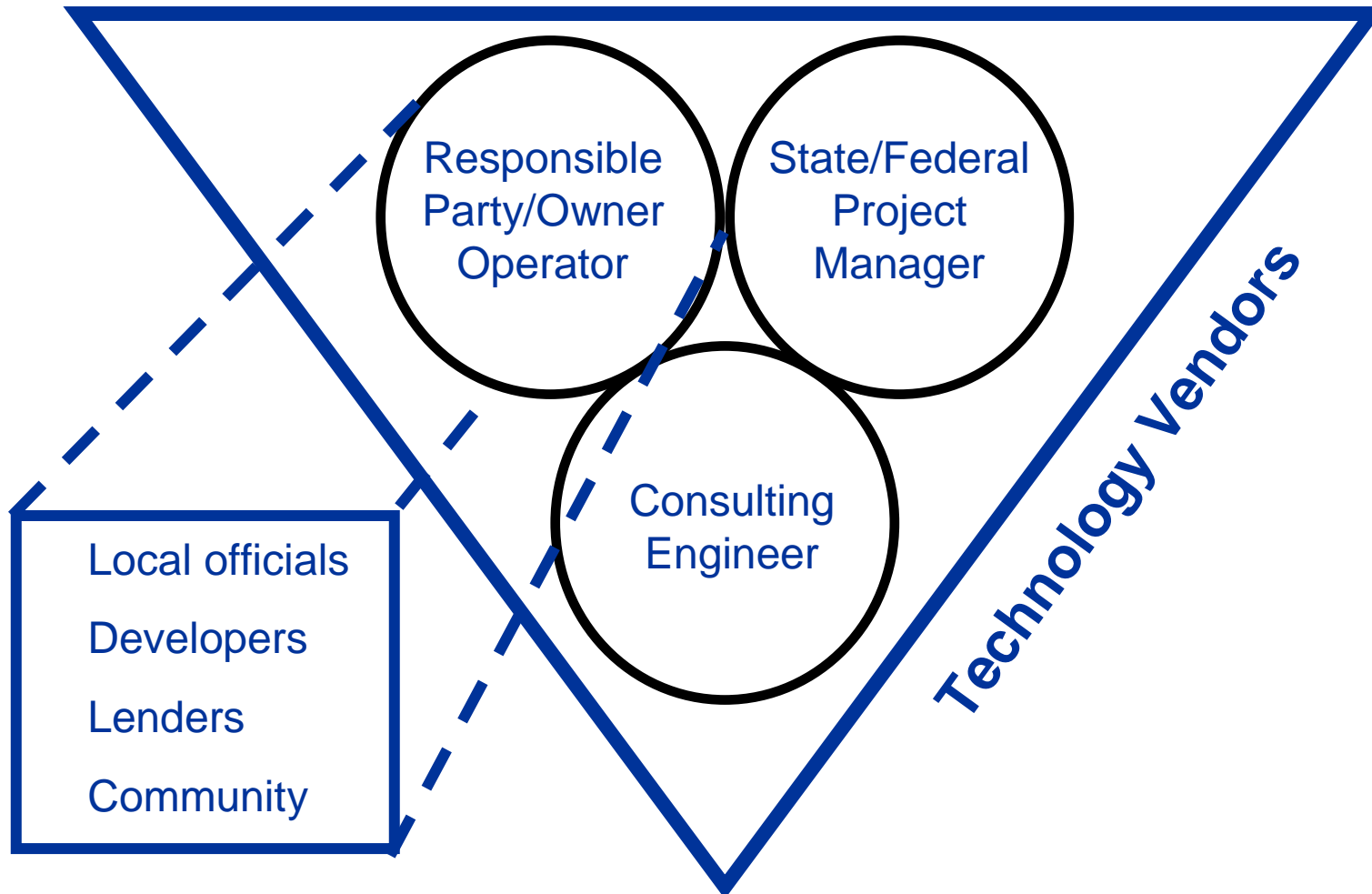


# Office of Superfund Remediation and Technology Innovation (OSRTI)

## Technology Innovation Field Services Division (TIFSD)

- OSRTI - implements and manages Superfund program
- TIFSD Core Mission:
  - Advancing best practices in site cleanup
  - Technology support to EPA Regional project managers, states, local governments, tribes
  - Informational support to cleanup community at large
- Primary activity areas to advance mission:
  - Evaluate and document innovative technologies
  - Transfer knowledge through publications, training, internet, etc.
  - Provide direct technical support at sites in Superfund, Brownfields, RCRA, and UST
  - Manage analytical services for the Superfund program

## Target Audience



# Levels of Environmental Remediation Information

- Rules (i.e., Laws and Regulation)
- Policy – developed to support rules
- Guidance

### Ecol and Attract

**Fast Facts on Ecological Remediation**

- The first phase of the Remediation process is to assess the site and determine the extent of contamination.
- The Remediation process is a multi-step process that involves the assessment, design, and implementation of remediation measures.
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**Introduction**

The Remediation process is a multi-step process that involves the assessment, design, and implementation of remediation measures.

### Characterization of Remedial Actionability under a Total Air Act Assessment and Cleanup Technology Rule

**Introduction**

The Remediation process is a multi-step process that involves the assessment, design, and implementation of remediation measures.

### Streamlining Site Cleanup in New York City

**Introduction**

The Remediation process is a multi-step process that involves the assessment, design, and implementation of remediation measures.

### Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites

**Introduction**

The Remediation process is a multi-step process that involves the assessment, design, and implementation of remediation measures.

### Brownfields Technology Vapor Intrusion Considerations for Redevelopment

**Introduction**

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### Nanotechnology for Site Remediation Fact Sheet

**Introduction**

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### Emerging Contaminants - Nanomaterials

**Introduction**

The Remediation process is a multi-step process that involves the assessment, design, and implementation of remediation measures.

## Session Goal

- Provide a roadmap to identify information on innovative approaches to site cleanup
- Highlight specific information sources from EPA and other U.S. Agencies
- Present information on specific topics such as treatment technologies, Green Remediation, and other current areas





# Overview

- EPA Information Dissemination
- Additional Information on Site Cleanup Best Practices and Technologies From Other U.S. Agencies
- Resources of Specific Interest to ConSoil Attendees
- Summary



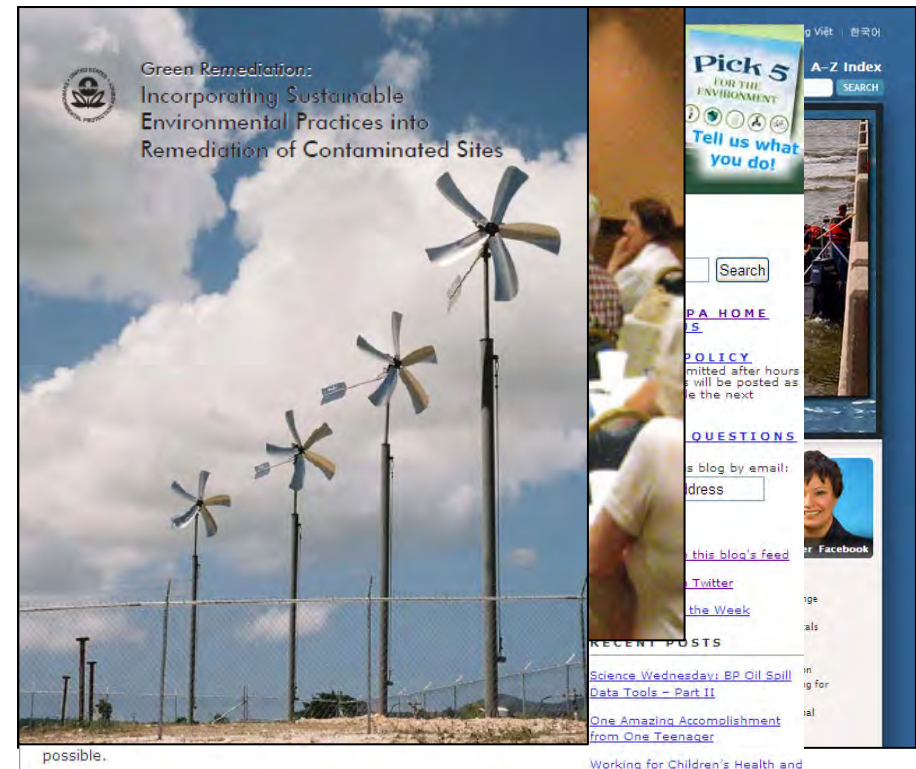
# EPA Information Dissemination





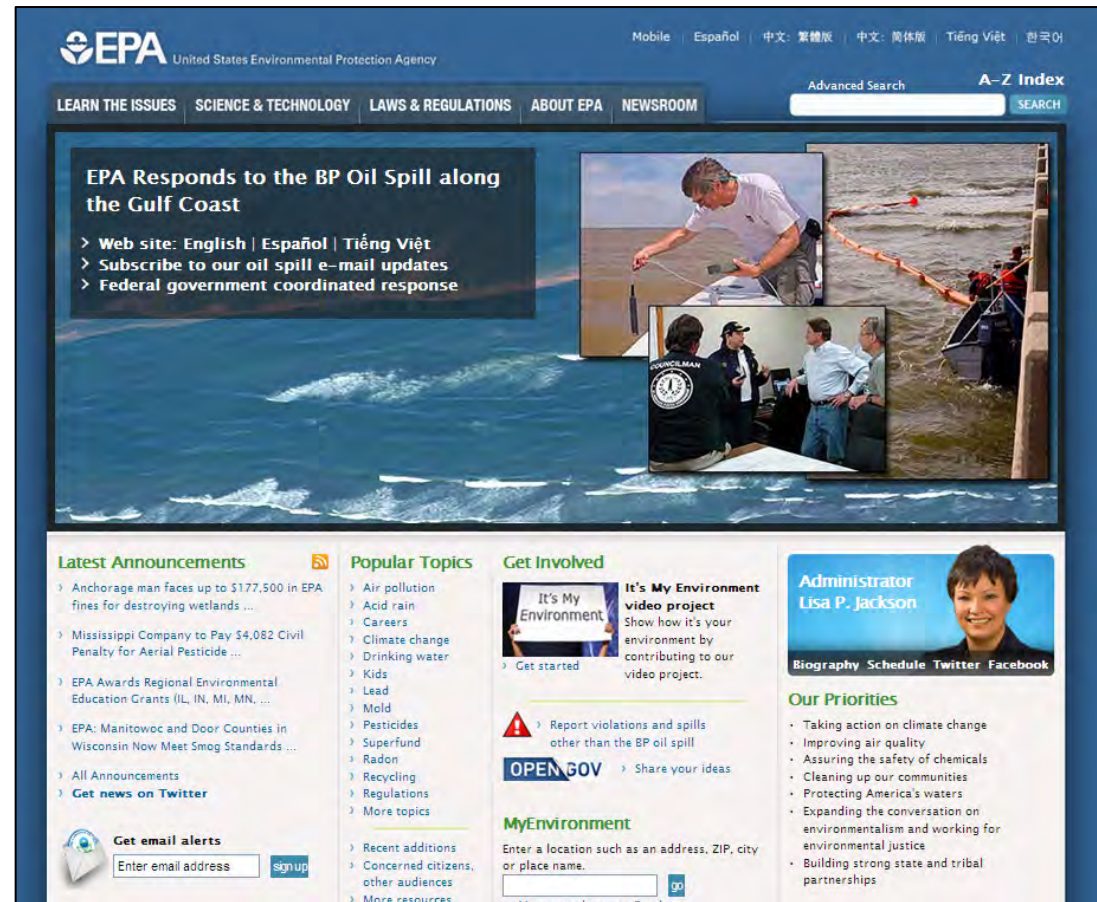
## EPA Information Dissemination

- Internet Resources
- Electronic Distribution
- Social Networking
- Training
- Hardcopy



## US EPA

- Federal environmental laws, regulations, and guidance
- News, press releases, speeches
- Program-specific sites
  - News
  - Laws
  - Funding
  - Regional sites
- EPA initiatives



The screenshot shows the EPA website homepage. At the top, there is the EPA logo and navigation links for Mobile, Español, 中文, 繁體版, 中文, 简体版, Tiếng Việt, and 한국어. Below this is a search bar and an A-Z Index. The main content area features a large banner for "EPA Responds to the BP Oil Spill along the Gulf Coast" with sub-links for English, Español, and Tiếng Việt, and options to subscribe to e-mail updates and view the federal government's coordinated response. Below the banner are sections for "Latest Announcements" (including a story about an Anchorage man facing fines for destroying wetlands), "Popular Topics" (listing air pollution, acid rain, careers, climate change, drinking water, kids, lead, mold, pesticides, superfund, radon, recycling, and regulations), "Get Involved" (with a video project "It's My Environment" and a report violations and spills button), and "Our Priorities" (listing actions on climate change, air quality, chemical safety, community cleaning, water protection, environmental justice, and tribal partnerships). There is also a section for "Administrator Lisa P. Jackson" with links to her biography, schedule, and social media profiles.

[www.epa.gov](http://www.epa.gov)

## US EPA Superfund

The screenshot shows the EPA Superfund website interface. At the top, it features the EPA logo and the text 'U.S. ENVIRONMENTAL PROTECTION AGENCY'. Below this is a search bar with options for 'All EPA' and 'This Area'. A navigation menu on the left lists various topics such as 'Superfund Home', 'Basic Information', and 'Superfund Sites Where You Live'. The main content area includes a 'Superfund QuickFinder' table with links to resources like 'Brownfields', 'Cleanup Technology', and 'Environmental Justice'. There are also sections for 'Superfund Topics' with sub-links for 'Basic Information' and 'Superfund Sites Where You Live', and a 'Search for Superfund Sites' box with search criteria.

- Cleanup process
- Accomplishments and performance measures
- Laws, policy and guidance
- Enforcement

[www.epa.gov/superfund](http://www.epa.gov/superfund)

## Contaminated Site Clean-Up Information (CLU-IN) Website



The screenshot shows the CLU-IN website homepage. At the top left is the EPA logo and the text "United States Environmental Protection Agency". To the right is the "Technology Innovation and Field Services Division" and a search bar. The main heading is "Clean-Up Information" with a background image of a contaminated site. Below the heading is a navigation menu with tabs for "Technologies", "Contaminants", "Issues", "Strategies & Initiatives", "Vendors & Developers", "Training & Events", and "Additional Resources". A tagline reads: "Providing information about innovative treatment and site characterization technologies while acting as a forum for all waste remediation stakeholders". A "Spotlight" section features a yellow flower image and a "Vendors & Developers" article titled "EPA Solicits Innovative Ideas and Technological Solutions for Enbridge Oil Spill". To the right of the spotlight are three vertical panels: "Vendors & Developers" (EPA Solicits Innovative Ideas and Technological Solutions for Enbridge Oil Spill), "Grants" (EPA Announces \$16 Million in Brownfields Funds to Clean up Communities), and "Registration Now Open" (Partners in Environmental Technology Technical Symposium & Workshop, Nov 30-Dec 2, 2010). Below these are "Jobs" (Six Open Positions Supporting EPA) and a "Staying Connected" sidebar with icons for "News Room", "Live Events", and "TechAlert".

- Technologies
- Contaminants
- Issues
- Strategies & Initiatives
- Vendors and Developers
- Training & Events
- Additional Resources

[www.clu-in.org](http://www.clu-in.org)

# CLU-IN Website – Technologies (examples)



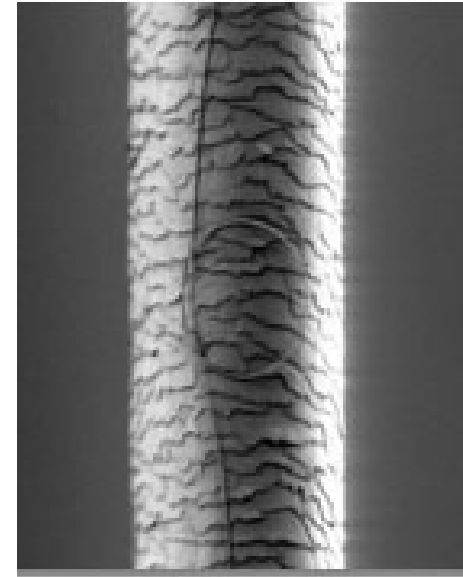
- **Characterization and Monitoring Technologies**
  - Fiber Optic Chemical Sensors
  - Direct-Push Membrane Interface Probe (MIP)
  - X-Ray Fluorescence (XRF) Detector
- **Remediation Technologies**
  - Evapotranspiration covers
  - Permeable Reactive Barriers (PRB)
  - Soil Vapor Extraction (SVE)
- **Available Information**
  - Regulatory Guidance
  - Demonstration Project Profiles
  - Case Studies
  - Analytical and Decision Tools
  - Cost Data
  - Conference and Training Opportunities

[www.clu-in.org/technologies](http://www.clu-in.org/technologies)

# Nanotechnology for Environmental Remediation Technology Focus Area



- Nanomaterials currently used for environmental remediation
- Factors affecting performance
- Potential nanomaterials
- Field demonstrations and case studies
- Research on fate, transport, and toxicity



Mazur Group, Harvard University.

[www.clu-in.org/technologies](http://www.clu-in.org/technologies)



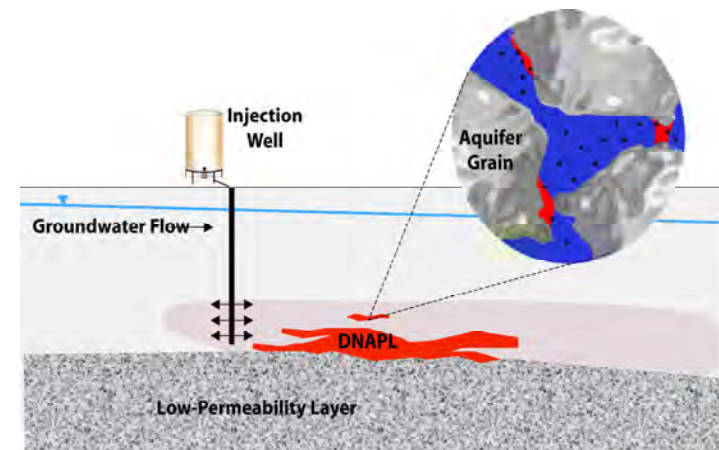
# CLU-IN Website – Contaminants

- **Example Contaminants**
  - Dense Nonaqueous Phase Liquids (DNAPLs)
  - Persistent Organic Pollutants (POPs)
  - Trichloroethylene (TCE)
- **Available Information**
  - Policy and Guidance
  - Chemistry and Behavior
  - Environmental Occurrence
  - Toxicology
  - Detection and Site Characterization
  - Treatment Technologies
  - Conferences and Seminars

[www.clu-in.org/contaminantfocus](http://www.clu-in.org/contaminantfocus)

# DNAPL Contaminant Focus Area

- Currently available:
  - Halogenated alkanes
  - Halogenated alkenes
  - Halogenated monaromatics
  - Polychlorinated biphenyls (PCBs)
  - Multi-Component Waste (creosotes, coal tars, heavy oils)
- For future development:
  - Ethers
  - Other (aniline, benzyl chloride, etc.)



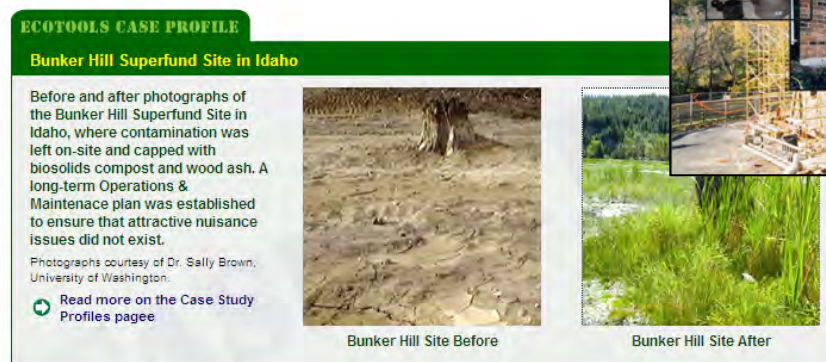
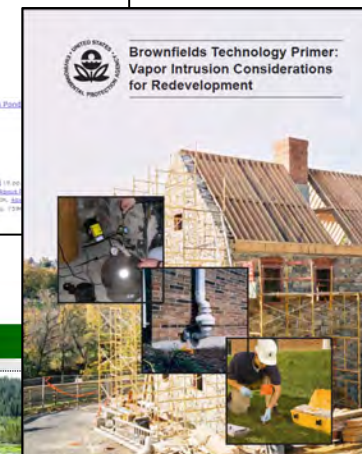
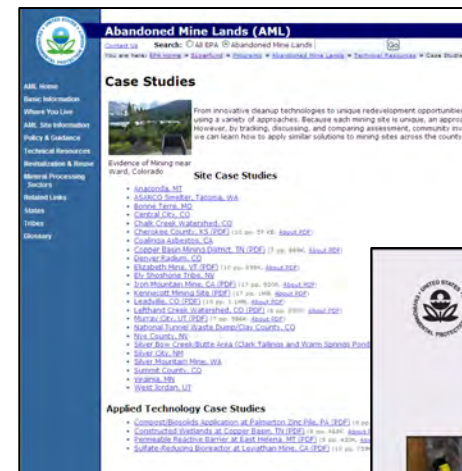
Tratnyek and Johnson (2006)  
NanoToday 1(2): 44-48

[www.cluin.org/contaminantfocus/default.focus/sec/Dense\\_Nonaqueous\\_Phase\\_Liquids\\_\(DNAPLs\)/cat/Overview](http://www.cluin.org/contaminantfocus/default.focus/sec/Dense_Nonaqueous_Phase_Liquids_(DNAPLs)/cat/Overview)



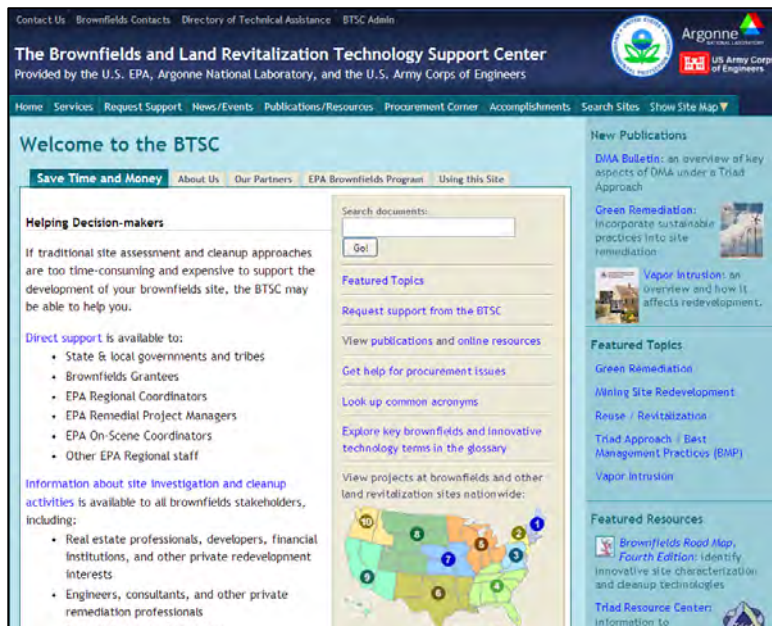
## CLU-IN Website - Issues

- Brownfields
- Triad: A Smarter Solution to Site Cleanup
- Green Remediation
- Ecological Land Reuse
- Mining Sites
- Nanotechnology
- Vapor Intrusion
- Wood Treater Sites



[www.clu-in.org/contaminantfocus](http://www.clu-in.org/contaminantfocus)

## Brownfields and Land Revitalization Technology Support Center (BTSC)



- Strategy and Project Planning Support
- Document Reviews
- Technology Scoping for Site Assessment and Cleanup
- Information on Innovative and Real-Time Investigation Technologies
- Information on Remedial Technologies

[www.brownfieldstsc.org](http://www.brownfieldstsc.org)

# Green Remediation and Remedial System Evaluations (RSE)

- Policies and Strategies
- Best Management Practices (BMP)
- Incorporation of BMPs
- Green Remediation Profiles
- Conferences and Seminars



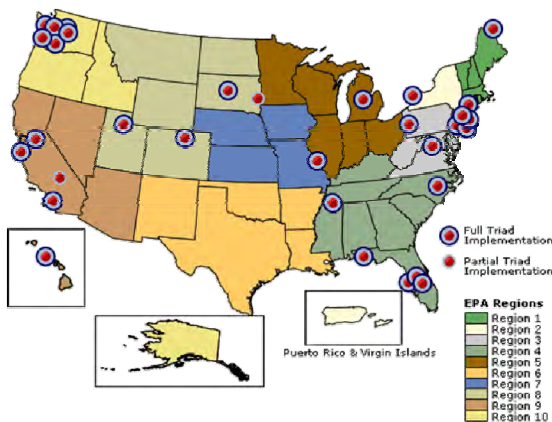
**Green Remediation Focus**  
Profiles of Green Remediation

Site Name	State	Energy Efficiency	Energy Renewable	Air Emission	Water	Land & Ecosystem	Materials & Waste
Aerjet-General Corporation	CA	●	●	●	●	●	●
Atlas Air Force Base	OK	●	●	●	●	●	●
Apache Powder	AZ	●	●	●	●	●	●
Barkdale Air Base	LA	●	●	●	●	●	●
BP Canger	WV	●	●	●	●	●	●
BP Paulsboro	NJ	●	●	●	●	●	●
California Gulch	CA	●	●	●	●	●	●
Crozet Orchard	VA	●	●	●	●	●	●
De Soto Restoration Area	GA	●	●	●	●	●	●
DeFasco Forge	TX	●	●	●	●	●	●
Former Caswell Air Force Base	TX	●	●	●	●	●	●
Former Fortuna Landfill	WV	●	●	●	●	●	●

[www.clu-in.org/greenremediation](http://www.clu-in.org/greenremediation)

## Triad Approach

- Regulatory Information
- Considerations for the use of Triad
- Triad Technical Components
- Triad Profiles
- Triad Community of Practice (CoP)



[www.triadcentral.org](http://www.triadcentral.org)

**Use of Field Portable X-ray Fluorescence (FPXRF) and the Triad Approach To Remediate Lead Contamination at a Small Arms Training Range Fort Lewis, WA**

**Triad Elements Used**

- Systematic Planning
- Real-Time Measurements
- Dynamic Work Strategies

**Table of Contents**

1. Site Information
2. Project Information
3. Triad Approach Information
4. Supporting Information

**Also-Glance**

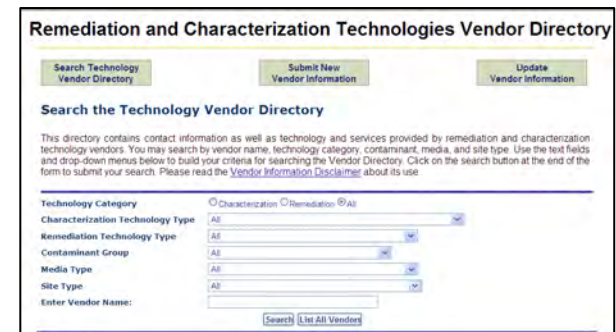
- Development of a conceptual site model (CSM) to identify preferential pathways for migration of free petroleum product and associated vapors to potential receptors.
- Use of the Rapid Optical Screening Tool (ROST™) along with other field-based measurement techniques and traditional soil and groundwater analysis to identify the nature and extent of contamination associated with released free product.
- Completion of collaborative data sets to predict where vapor migration issues might be encountered and where product removal efforts should be concentrated.
- Application of heuristic work strategies to iteratively evolve the CSM and prompt critical data gaps for later investigations.
- Use of the CSM to develop a consensus vision among a broad stakeholder group concerning the direction of field studies and the design and evaluation of treatment systems.

**Summary**

The remedial site is located in the northern portion of the village of Marford, Illinois, along the eastern edge of the active Mississippi River channel. EPA has established an Administrative Order on Consent (AOC) with a group of private responsible parties (RPs) to address environmental contamination resulting from historical petroleum refining and management practices adjacent to the village. Activities are currently being carried out under the AOC to mitigate hazards from vapor intrusion identified within the village limits. From 1968 through 1995, hazardous waste occurred intermittently in the village that may have been caused or exacerbated by petroleum vapors. More recently, homeowners have expressed complaints about petroleum hydrocarbon odors that triggered the need to temporarily relocate several households. Because of these concerns, EPA Region 5, and the EPA Office of Superfund Remediation and Technology Innovation (OSRTI) initiated a remedial program to address the associated groundwater plume and long-term vapor migration measures and delineating free phase and vapor phase hydrocarbons to support final remediation objectives. Systematic planning was initiated for the site involving historical data compilation, preparation of a preliminary CSM for the site, and suggestions for optimization of site-appropriate monitoring design uncertainties in support of defensible site decisions.

## CLU-IN Website – Vendors and Developers

- Market Analysis
- Business Planning and Funding
- Research & Development
- Demonstration & Testing
- Permitting & Regulatory Assistance
- Commercialization & Contracts
- Vendor Information



[www.clu-in.org/vendor](http://www.clu-in.org/vendor)

## CLU-IN Website – Training and Events

- Upcoming Internet Seminars
  - Phone line
  - Streaming audio
- Archived Internet Seminars
  - View online
  - Download MS PowerPoint with audio
  - Download audio in MP3 format
  - Subscribe to archive podcast feed
- Upcoming Courses and Conferences



[www.clu-in.org/training](http://www.clu-in.org/training)



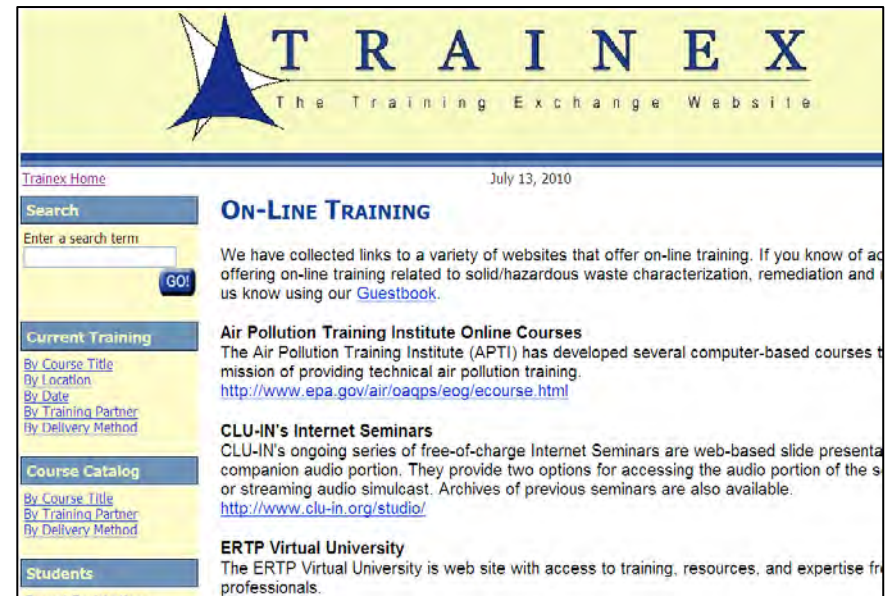
## CLU-IN Website – Training and Events (continued)

- Identifying & Evaluating Ecosystem Services at Contaminated Sites Prior to Remediation
- US and EU Perspectives on Green and Sustainable Remediation
- Using Ecological-Based Tools and Approaches to Assess Bioavailability
- MTBE and TBA Cleanup-New Research Perspectives
- Implementation of Triad for Petroleum Brownfield's Cleanup and Reuse

[www.cluin.org/live/archive](http://www.cluin.org/live/archive)

## Trainex Website

- Hazardous waste management and remediation training
  - Classroom
  - Internet Seminar
  - CD-ROM Based
  - Streaming Video
  - Independent on-line
  - Video by mail
  - Web-based training
- Example upcoming training
  - Advanced Triad Training for Practitioners
    - Kansas City, KS, USA
    - October 26-28



The screenshot shows the Trainex website homepage. At the top, there is a yellow banner with the Trainex logo (a blue star) and the text "TRAINEX The Training Exchange Website". Below the banner, the date "July 13, 2010" is displayed. The main content area is divided into several sections:

- Search:** A search box with the text "Enter a search term" and a "GO!" button.
- ON-LINE TRAINING:** A section with the heading "ON-LINE TRAINING" and a paragraph: "We have collected links to a variety of websites that offer on-line training. If you know of a website offering on-line training related to solid/hazardous waste characterization, remediation and management, please let us know using our [Guestbook](#)."
- Current Training:** A section with the heading "Current Training" and a list of links: "By Course Title", "By Location", "By Date", "By Training Partner", and "By Delivery Method".
- Course Catalog:** A section with the heading "Course Catalog" and a list of links: "By Course Title", "By Training Partner", and "By Delivery Method".
- Students:** A section with the heading "Students" and a link: "By Course Title".


Additional content includes:

- Air Pollution Training Institute Online Courses:** "The Air Pollution Training Institute (APTI) has developed several computer-based courses to support its mission of providing technical air pollution training. <http://www.epa.gov/air/oaqps/eog/ecourse.html>
- CLU-IN's Internet Seminars:** "CLU-IN's ongoing series of free-of-charge Internet Seminars are web-based slide presentations with a companion audio portion. They provide two options for accessing the audio portion of the seminar: streaming audio simulcast. Archives of previous seminars are also available. <http://www.clu-in.org/studio/>
- ERTP Virtual University:** "The ERTP Virtual University is web site with access to training, resources, and expertise from environmental professionals."

[www.trainex.org](http://www.trainex.org)



## Other EPA Resources

- Tech Direct 
  - New technical, policy, and guidance resources
  - Upcoming live Internet seminars
  - New documents and web resources
  - Conferences and symposia
- Technology News and Trends
- Technology Innovation News Survey



[www.cluin.org/newsletters](http://www.cluin.org/newsletters)

## Other EPA Resources (continued)

- Electronic Distribution – RSS feed
- Podcasts
  - Green Chemistry Challenge
  - Risk Management Research
- Social Networking
  - Facebook
  - Greenversations (<http://blog.epa.gov/blog>)
  - Twitter ([www.twitter.com/epagov](http://www.twitter.com/epagov))
  - YouTube ([www.youtube.com/user/USEPAgov](http://www.youtube.com/user/USEPAgov))



## Office of Research and Development

- National Research Programs
- Reports and Technology Evaluations
- Models, Methods, and Databases
  - Toxicity Reference Database
  - Test Method Collections Website
  - ECOTOX Database



[www.epa.gov/ord](http://www.epa.gov/ord)

# EPA Libraries

- Online Library System (OLS)
  - [www.epa.gov/libraries/aboutols.htm](http://www.epa.gov/libraries/aboutols.htm)
- National Environmental Publications Internet Site (NEPIS)
  - [www.epa.gov/nscep](http://www.epa.gov/nscep)





# **Additional Information on Site Cleanup Best Practices and Technologies From Other U.S. Agencies**



## Federal Remediation Technologies Roundtable (FRTR)

- Technology-related efforts of mutual interest
- Future directions site remediation programs
- State and private industry technology development programs
- Partnerships to pursue mutual interests

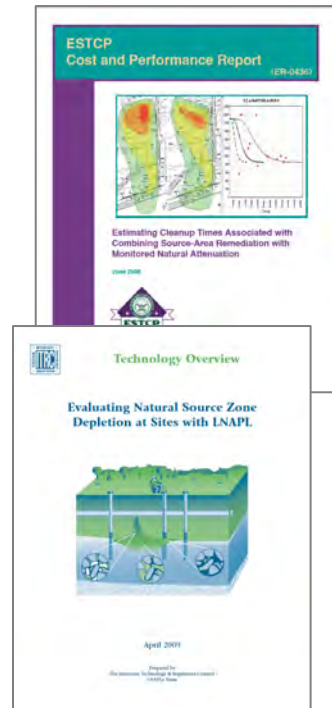


The screenshot shows the FRTR website interface. At the top, there is a banner with the title "Federal Remediation Technologies Roundtable" and a central circular logo containing various agency icons. Below the banner is a navigation menu with links such as "Home", "What's New?", "Technology Screening Matrix", "Cost & Performance Case Studies", "Decision Support Matrix", "Environmental Cost Engineering Remediation Optimization", "FRTR Meetings", "Current Publications", "Agency Program Links", "Abbreviations & Acronyms", "Glossary", "Archives", "Site Map", "Search", and "Comments". The main content area features a paragraph describing the FRTR's mission: "The Federal Remediation Technologies Roundtable (FRTR) works to build a collaborative atmosphere among federal agencies involved in hazardous waste site cleanup. FRTR was established in 1990 to bring together top federal cleanup program managers and other remediation community representatives to:" followed by a bulleted list of goals: "Share information and learn about technology-related efforts of mutual interest," "Discuss future directions of the national site remediation programs and their impact on the technology market," "Interact with similar state and private industry technology development programs, and," and "Form partnerships to pursue subjects of mutual interest." To the right of this text is a quote: "Leading the Federal Government's Efforts to Promote Interagency Cooperation to Advance the Use of Innovative Technologies to Clean up Hazardous Waste Contamination". Below the main text, it lists "FRTR members-agencies include:" followed by a list of agencies with expandable arrows: "U.S. Department of Defense" (with sub-items "U.S. Air Force", "U.S. Army", "U.S. Navy"), "U.S. Department of Energy", "U.S. Department of the Interior", "U.S. Environmental Protection Agency", and "National Aeronautics and Space Administration".

[www.frtr.gov](http://www.frtr.gov)

## FRTR (continued)

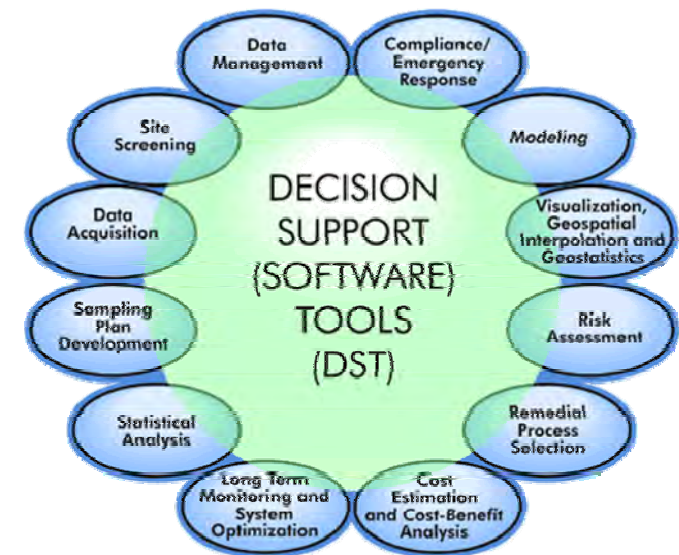
- Case Studies
  - Remediation Case Study Searchable Database
    - 414 full-scale and large-scale demonstration projects
  - Remediation Optimization Case Studies
    - 130 case studies of specific optimization efforts
  - Remediation Technology Assessment Reports
    - 92 reports analysis of remedial technologies
  - Site Characterization and Monitoring Technologies
    - 144 experiences and lessons learned in field demonstrations and full-scale uses of innovative technologies



[www.frtr.gov/costperf.htm](http://www.frtr.gov/costperf.htm)

## FRTR (continued)

- Matrices
  - The Remediation Technologies Screening Matrix
  - Decision Support Tools (DST)



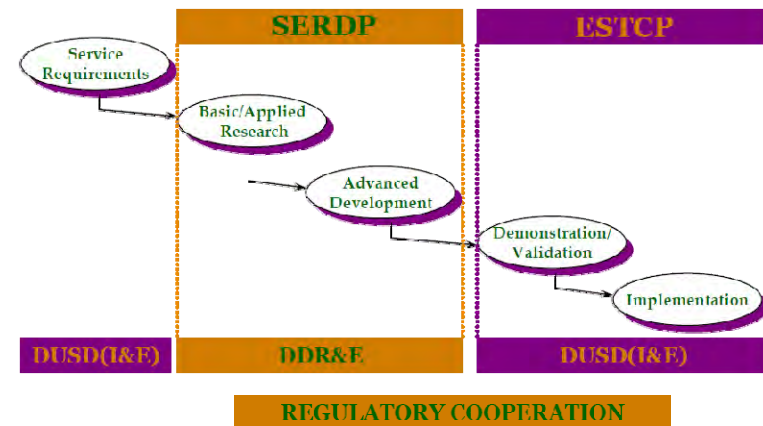
[www.frtr.gov](http://www.frtr.gov)



## US Department of Defense (DoD)



- Strategic Environmental Research and Development Program (SERDP)
- Environmental Security Technology Certification Program (ESTCP)
- Environmental Restoration Tools and Trainings
  - Groundwater plume treatment
  - Monitoring and characterization
  - Contaminated sediments



[www.serdp-estcp.org](http://www.serdp-estcp.org)

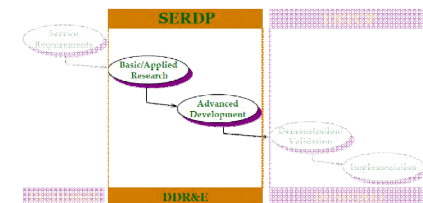
## DoD (continued)

- SERDP



- Environmental science and technology program
- Partnership with EPA & Department of Energy (DOE)
- Recent publications
  - *Evaluation of Performance and Longevity at DoD Permeable Reactive Barrier Sites* (Project ID: ER-1140)
  - *In Place Soil Treatments for Prevention of Explosives Contamination* (Project ID: ER 200434)

[www.serdp-estcp.org](http://www.serdp-estcp.org)

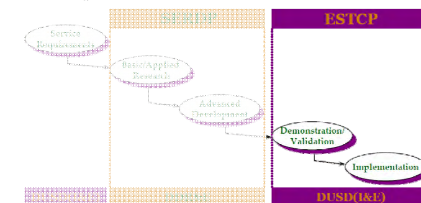


## DoD (continued)

- ESTCP



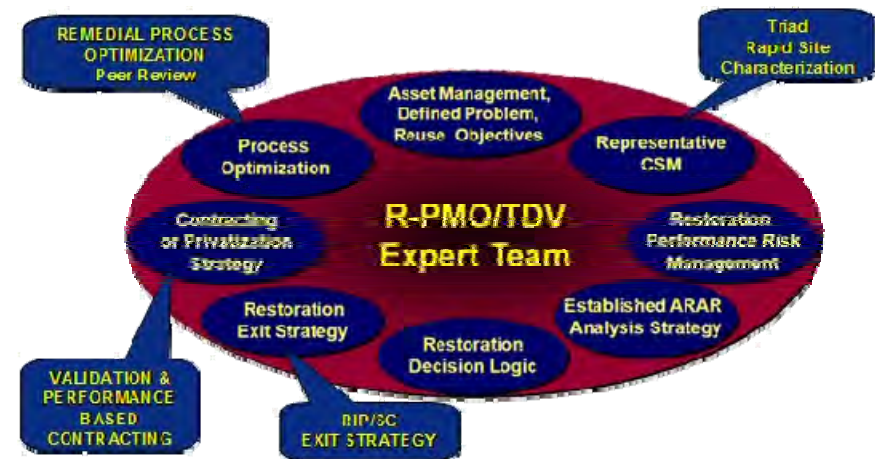
- Environmental technology demonstration and validation program
- Recent publications:
  - *State-of-the-Practice Overview: Critical Evaluation of State-of-the-Art In Situ Thermal Treatment Technologies for DNAPL Source Zone Treatment* (Project ID: ER-200314)
  - *Emulsified Zero-Valent Nano-Scale Iron Treatment of Chlorinated Solvent DNAPL Source Areas* (Project ID: ER 200431)



[www.serdp-estcp.org](http://www.serdp-estcp.org)

## US Air Force Center for Engineering and the Environment (AFCEE)

- Environmental Restoration Program Optimization (ERP-O)
- Long-Term Monitoring Optimization (LTMO)
- Groundwater Modeling
- AFCEE Sustainable Remediation Tool (SRT)



[www.afcee.af.mil/resources/sustainability/index.asp](http://www.afcee.af.mil/resources/sustainability/index.asp)



# Interstate Technologies Regulatory Council (ITRC)

- Consists of 50 states, the District of Columbia, multiple federal partners, industry participants, and other stakeholders
- Develops guidance documents for consistent regulatory knowledge and approaches for reviewing and approving specific technologies:
  - Accelerated Site Characterization
  - Alternative Landfill Technologies
  - Bioremediation of DNAPLs
  - Brownfields
  - Constructed Wetlands
  - Dense Nonaqueous Phase Liquids
  - Diffusion/Passive Samplers
  - Ecological Land Reuse
  - Enhanced Attenuation: Chlorinated Organics
  - Enhanced In Situ Bionitrification
  - In Situ Bioremediation
  - In Situ Chemical Oxidation
  - LNAPLs
  - Mass Flux
  - Metals in Soils
  - Mitigation Wetlands
  - MTBE and Other Fuel Oxygenates
  - Perchlorate
  - Permeable Reactive Barriers
  - Phytotechnologies
  - Plasma Technologies
  - Policy
  - Radionuclides
  - Remediation Process Optimization
  - Risk Assessment Resources
  - Sampling, Characterization and Monitoring
  - Small Arms Firing Range
  - Thermal Desorption
  - Unexploded Ordnance
  - Vapor Intrusion

[www.itrcweb.org](http://www.itrcweb.org)

## US Navy

VFAC > NAVFAC Worldwide > Engineering Service Center > Environmental-old > Environmental Restoration & BRAC > Remediation Innovative Technology Seminar (RITS)

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[RITS Spring 2010 Announcement \(PDF\)](#)

Thanks to all who attended the Spring 2010 seminar.  
 The announcement for the Fall 2010 seminar will be available here in September 2010.

### Remediation Innovative Technology Seminar (RITS)

The Remediation Innovative Technology Seminar (RITS) offers a day of presentations twice a year for Navy Remedial Project Managers (RPMs). RPMs get the latest information on technologies, methodologies, and guidance to carry out their responsibilities in the Navy Environmental Restoration Program. Other Department of Defense (DoD) personnel, Navy environmental restoration contractors\*, and federal/state environmental regulators are welcome to attend. Our goal is to achieve site restorations more efficiently and cost effectively.

All past RITS presentations are available online as PDF files. Click the [Past RITS](#) tab on the [RITS Homepage](#) to view them.

### Spring 2010 Topics and Agenda

8:00 am - 8:30 am	<b>Welcome and Introduction</b>
8:30 am - 10:00 am	<b>Green and Sustainable Remediation</b> Green and Sustainable Remediation (GSR) will be discussed along with the application of GSR practices throughout all phases of the remedial process. Relevant drivers, including regulations and executive orders, will be presented. The general approach to be considered by RPMs when applying GSR to their remedial process will be covered, including selection of metrics, fitting GSR into existing remedial programs (e.g. CERCLA), and footprint reduction methods.
10:00 am - 10:15 am	Break
10:15 am - 11:45 am	<b>Using SiteWise™</b> This presentation will introduce RPMs to the US Navy and US Army Corps of Engineers GSR tool SiteWise™. The SiteWise™ tool supports GSR assessments by calculating the environmental footprint for various metrics, including: 1) energy consumption; 2) greenhouse gas (GHG) emissions; 3) air emissions of criteria pollutants; 4) water consumption; and 5) accident risk. SiteWise™ can be used to support decision making during the remedy selection process, and to optimize planned or existing remedies by reducing the environmental footprint.
11:45 am - 12:45 pm	Lunch
12:45 pm - 2:15 pm	<b>Effectively Documenting the Remedy Selection Process</b> Through the evolution of the Navy's Streamlined ROD Strategy (DoN, 2007) and collaboration with EPA HQ, a ROD "Toolkit" was developed to supplement the 1999 EPA ROD Guidance. RPMs will learn how use of the Toolkit's tips and enhancements for data presentation can better tell the story of the site and present the remedy selection

## US Army Corps of Engineers



The screenshot shows the homepage of the US Army Corps of Engineers Environmental Laboratory. At the top, there is a navigation menu with links for NEWSROOM, WHO WE ARE, MISSIONS, HISTORY, RELATED LINKS, and BIDS CORNER. Below the menu is a banner with the text "RELEVANT READY RESPONSIVE RELIABLE" and "Proudly serving the Armed Forces and the Nation now and in the future." A sidebar on the left contains the US Army Corps of Engineers logo and a "HOW DO I..." section with links for "Contact the Corps?", "Find a Recreation Area?", "Get a Job with the Corps?", "Contract with the Corps?", "Find a Local Corps Office?", and "Find Publications?". Below the banner is a search bar and a "Search the Environmental Lab" button. The main content area features a grid of small images showing various environmental activities and a larger image of a lake and mountains.

[www.environmental.usace.army.mil/rse\\_checklist.htm](http://www.environmental.usace.army.mil/rse_checklist.htm)

## Other Agencies

- National Aeronautics and Space Administration (NASA)
  - <http://nasaksc.rti.org/index.cfm>
- US Department of the Interior (DOI)
  - [www.doi.gov/oepc](http://www.doi.gov/oepc)
- US Department of Energy (DOE)
  - National Renewable Energy Laboratory
  - [www.nrel.gov](http://www.nrel.gov)
- United States Geological Survey (USGS)
  - <http://water.usgs.gov>
  - <http://water.usgs.gov/international>







# Resources of Specific Interest to ConSoil Attendees





## CLU-IN ConSoil Website

- Pre-ConSoil 2010 Internet Seminar *US and EU Perspectives on Green and Sustainable Remediation*
- EPA Session Presentations
  - Green Remediation: Reducing the Environmental Footprint of Cleanups
  - Remedy Optimization through Independent Design Reviews (IDRs)
  - Remedy Optimization through Remediation System Evaluations (RSEs)
  - Investigation Process Optimization (IPO)
- Special Sessions: Sustainable Remediation
  - International developments
  - Case studies: Does it make a difference?
- Post-ConSoil 2010 Internet Seminar
- Archive of prior ConSoil Conferences



[www.clu-in.org/consoil](http://www.clu-in.org/consoil)


# CLU-IN Website



**www.clu-in.org/greenremediation**


- Newly redesigned website provides more effective access to resources

## New Document



Green Remediation:  
Incorporating Sustainable  
Environmental Practices into  
Remediation of Contaminated Sites

Available for downloading

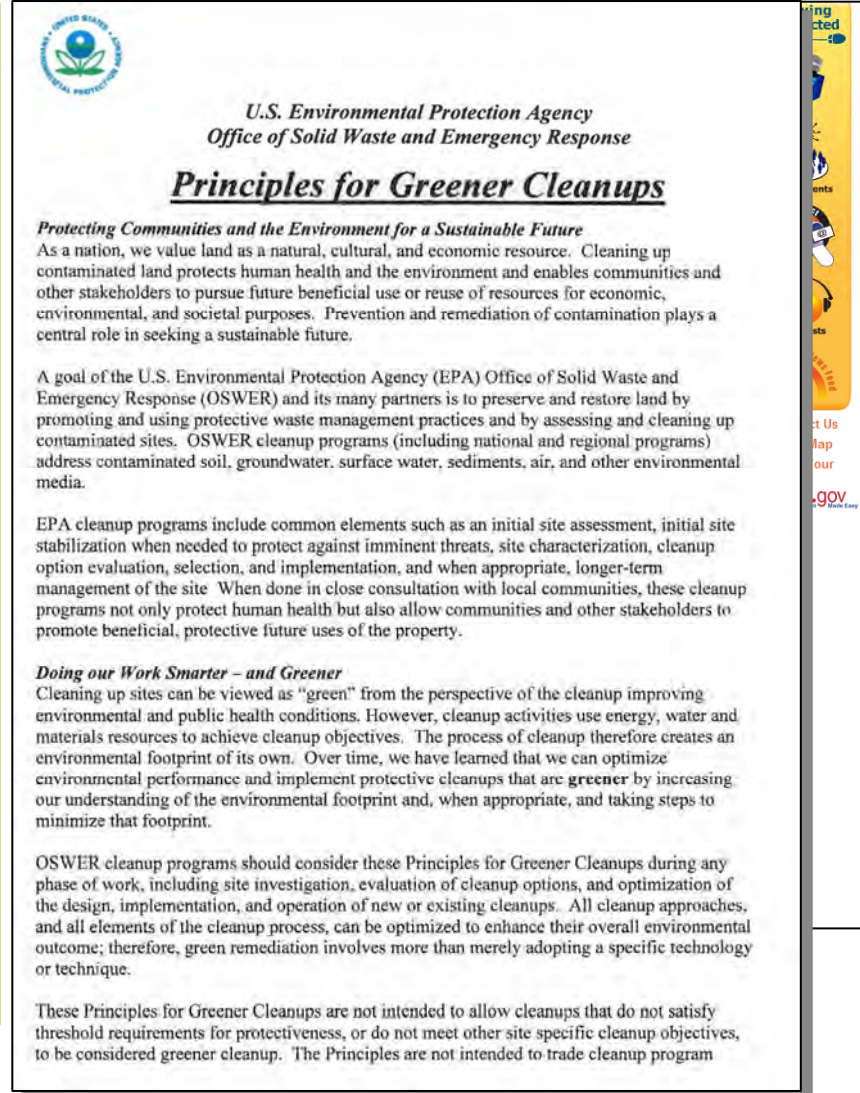



## CLU-IN Website



[www.clu-in.org/greenremediation](http://www.clu-in.org/greenremediation)

- Newly redesigned website provides more effective access to resources
- Policies and strategies information



 U.S. Environmental Protection Agency  
Office of Solid Waste and Emergency Response

### Principles for Greener Cleanups

**Protecting Communities and the Environment for a Sustainable Future**  
As a nation, we value land as a natural, cultural, and economic resource. Cleaning up contaminated land protects human health and the environment and enables communities and other stakeholders to pursue future beneficial use or reuse of resources for economic, environmental, and societal purposes. Prevention and remediation of contamination plays a central role in seeking a sustainable future.

A goal of the U.S. Environmental Protection Agency (EPA) Office of Solid Waste and Emergency Response (OSWER) and its many partners is to preserve and restore land by promoting and using protective waste management practices and by assessing and cleaning up contaminated sites. OSWER cleanup programs (including national and regional programs) address contaminated soil, groundwater, surface water, sediments, air, and other environmental media.

EPA cleanup programs include common elements such as an initial site assessment, initial site stabilization when needed to protect against imminent threats, site characterization, cleanup option evaluation, selection, and implementation, and when appropriate, longer-term management of the site. When done in close consultation with local communities, these cleanup programs not only protect human health but also allow communities and other stakeholders to promote beneficial, protective future uses of the property.

**Doing our Work Smarter – and Greener**  
Cleaning up sites can be viewed as “green” from the perspective of the cleanup improving environmental and public health conditions. However, cleanup activities use energy, water and materials resources to achieve cleanup objectives. The process of cleanup therefore creates an environmental footprint of its own. Over time, we have learned that we can optimize environmental performance and implement protective cleanups that are **greener** by increasing our understanding of the environmental footprint and, when appropriate, and taking steps to minimize that footprint.

OSWER cleanup programs should consider these Principles for Greener Cleanups during any phase of work, including site investigation, evaluation of cleanup options, and optimization of the design, implementation, and operation of new or existing cleanups. All cleanup approaches, and all elements of the cleanup process, can be optimized to enhance their overall environmental outcome; therefore, green remediation involves more than merely adopting a specific technology or technique.

These Principles for Greener Cleanups are not intended to allow cleanups that do not satisfy threshold requirements for protectiveness, or do not meet other site specific cleanup objectives, to be considered greener cleanup. The Principles are not intended to trade cleanup program

## CLU-IN Website



**www.clu-in.org/greenremediation**

- Newly redesigned website provides more effective access to resources
- Policies and strategies information
- Best Management Practices toolkit



**Green Remediation Focus**

**Best Management Practice (BMP) Toolkit - Core Elements: Materials and Waste**

Home

Green remediation strategies for materials and waste management build on federal mandates such as Executive Order 13423 as well as related programs of state and local agencies. The strategies encourage decision makers to consider product life cycles during remediation planning, and to collaborate with local organizations such as recycling businesses and municipal waste authorities. BMPs focus on opportunities to reduce waste generation, recycle spent products, reuse materials, salvage items for donation or resale, beneficially use industrial byproducts, and purchase environmentally preferred products.



Core Elements: Materials & Waste, Energy, Land & Ecosystems, Air, Water

**Sample BMPs**

- Salvaging uncontaminated and pest- or disease-free organic debris during demolition for later use as infill, mulch, or compost
- Reclaiming and stockpiling uncontaminated soil during excavation for onsite habitat creation
- Reusing durable goods such as synthetic sheeting throughout remedy construction and maintenance
- Choosing commercial products with recycled and bio-based contents instead of petroleum-based components

**Site-Specific Examples**

- Manufacturing and municipal organic waste used as treatment media for contaminated ground water at Altus Air Force Base
- Biosolid amendment of contaminated soil along the Upper Arkansas River

View page 16 of *Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites* (58 pp, 814K) to learn more about waste management within the context of site management.

Top of Page

## CLU-IN Website

[www.clu-in.org/greenremediation](http://www.clu-in.org/greenremediation)

- Newly redesigned website provides more effective access to resources
- Policies and strategies information
- Best Management Practices toolkit
- BMP fact sheets

United States Environmental Protection Agency | Office of Solid Waste and Emergency Response (5203P) | EPA 542-F-10-007 March 2010

### Green Remediation Best Management Practices: Soil Vapor Extraction & Air Sparging

Office of Superfund Remediation and Technology Innovation | Quick Reference Fact Sheet

The U.S. Environmental Protection Agency (EPA) Principles for Greener Cleanups outlines the Agency's policy for evaluating and minimizing the environmental "footprint" of activities undertaken when cleaning up a contaminated site.<sup>1</sup> Use of the best management practices (BMPs) recommended in EPA's series of green remediation fact sheets can help project managers and other stakeholders apply the principles on a routine basis, while maintaining the cleanup objectives, ensuring protectiveness of a remedy, and improving its environmental outcome.<sup>2</sup>

#### Overview

Historically, approximately one-quarter of Superfund source control projects have involved *soil vapor extraction* (SVE) to remove volatile organic compounds (VOCs) sorbed to soil in the unsaturated (vadose) zone. Air is extracted from, and sometimes injected into, the vadose zone to strip VOCs from the soil and transport the vapors to ex situ treatment systems for VOC destruction or recovery. SVE generally is used to:

- Remove a VOC source by controlling and diverting vapor migration from the source area(s) toward a point of compliance, and
- Remove vapors stripped from VOC-contaminated soil by other soil treatment methods such as electrical resistance heating at sites where the soil or contaminants are not amenable to SVE treatment alone.

*Air sparging* (AS) involves injection of air into contaminated groundwater to drive volatile and semivolatile contaminants into the overlying vadose zone through volatilization. SVE is commonly implemented in conjunction with air sparging to remove the generated vapor-phase contamination from the vadose zone.

In many cases, introduction of air to contaminated groundwater and vadose zone aerobic biodegradation of contaminants below and above the water table. Technologies such as bioventing or biosparging use active or passive air exchange processes similar to those used in SVE and AS but focus on stimulating natural biodegradation processes and removing contaminant mass through vapor extraction. Information about

SVE and air sparging rely on air exchange between the ground surface and subsurface to volatilize contaminants, while similar air-based technologies promote biodegradation of contaminants by microbial populations.

minimizing environmental footprints of these and other biological technologies is provided in a green remediation fact sheet specific to bioremediation.<sup>3a</sup>

Many opportunities exist for reducing the footprints of SVE and AS implementation, which can: incur high rates of electricity and fuel consumption due to long-term operation and maintenance (O&M); release contaminant vapors through vertical short circuiting or incomplete treatment of offgases; and require offsite disposal of investigation and remedy construction wastes.

#### A Sampling of Electricity Consumed by SVE Components over Three Years

Vacuum blower	108,000 kWh
Off-gas treatment system	90,000 kWh
Data monitoring and processing	33,000 kWh
Aboveground treatment structure	1,800 kWh
<b>Total electricity consumption:</b>	<b>232,800 kWh</b>

Electricity consumption by typical SVE equipment operating for three years (excluding system design and construction) could emit 184 tons of carbon dioxide (based on the average U.S. fuel mix), which is equivalent to the electricity used by nearly 22 homes over one year.  
(<http://www.epa.gov/RDEE/energy/resources/cbcluinfo.html>)

A green cleanup involving SVE or AS will:

- Reduce total energy use and increase renewable energy use
- Reduce air pollutants and greenhouse gas (GHG) emissions
- Reduce water use and negative impacts on water resources
- Improve materials management and waste reduction efforts, and
- Enhance land management and ecosystem protection.

#### Designing an SVE or AS System

Green remediation strategies for implementing SVE and AS rely on an early development of a conceptual site model (CSM) that is refined as remedial activities progress. The CSM provides a tool to support selection of green

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## CLU-IN Website

A banner for the CLU-IN Green Remediation Focus website. It features the CLU-IN logo on the left and the text "Green Remediation Focus" in a large, stylized font. The background is green with silhouettes of wind turbines and trees.

[www.clu-in.org/greenremediation](http://www.clu-in.org/greenremediation)

- Newly redesigned website provides more effective access to resources
- Policies and strategies information
- Best Management Practices toolkit
- BMP fact sheets
- Green remediation profiles

A screenshot of the CLU-IN Green Remediation Focus website. The page title is "Farm Siting" and it includes a "close or Esc Key" link. The main content area features a photograph of a large solar farm with rows of blue solar panels. Below the photo is the caption "Aerojet-General Corporation - Farm Siting". A paragraph of text below the caption reads: "Efficiencies in electricity transmission are maximized by siting the solar farm in close proximity to onsite facilities for ground water treatment (upper right)."



# Summary

- Many resources are available from EPA and other U.S. resources
- Information sources are varied (podcast to hardcopy)
- No longer a problem of too little information





# Questions?





# Thank You

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