



Green Remediation & TSP: Opportunities for Tech Support

Carlos Pachon, *Office of Superfund and Technology Innovation*

Mike Gill, *R9 STL*

Raji Josiam, *R6 Superfund*

U.S. Environmental Protection Agency



What is Green Remediation?

The practice of considering all environmental effects of a cleanup during each phase of the process, and incorporating strategies to maximize the net environmental benefit of the cleanup.

Focus is currently on remedy implementation vs. remedy selection

Opportunities to Increase Sustainability in Site Cleanups

- Apply to all cleanup programs
- Exist throughout site investigation, design, construction, operation, and monitoring
- Involve best management practices for core elements





Is it Our Job?

- Executive Order 13423, January 26, 2007-Strengthening Federal Environmental, Energy, and Transportation Management
 - Section 1. Policy. It is the policy of the United States that Federal agencies conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner.
- EPA Strategic Plan Goal 1: Clean Air and Global Climate Change
 - Protect and improve the air so it is healthy to breathe and risks to human health and the environment are reduced. Reduce greenhouse gas intensity by enhancing partnerships with businesses and other sectors.
- EPA Strategic Plan Goal 5: Compliance and Environmental Stewardship
 - Stewards of the environment recycle wastes to the greatest extent possible, minimize or eliminate pollution at its source, conserve natural resources, and use energy efficiently to prevent harm to the environment or human health.

Green Remediation on the Web

www.clu-in.org/greenremediation



- Technical resources
- Project profiles
- Updates and tools

Site Name	State	Core Elements						
		Energy Efficiency	Renewable Energy	Air Emission	Water	Land & Ecosystem	Materials & Waste	Stewardship
Altus Air Force Base	OK							
Apache Powder	AZ							
Barksdale AF Base	LA							
BP Casper	WY							
BP Paulsboro	NJ							
California Gulch	CO							
Crozet Orchard	VA							
De Sale Restoration Area	PA							
Former Carswell Air Force Base	TX							
Former Ferdula Landfill	NY							
Former Nebraska Ordnance Plant	NE							
Former St. Croix Alumina Plant	VI							
Fort Carson	CO							



OSWER

Green Remediation “Strategy”

For the purpose of advancing green remediation best practices across cleanup programs OSWER seeks to:

- Benchmark and document GR best management practices
- Assemble a toolkit of enablers
- Build networks of practitioners
- Develop performance metrics and tracking mechanisms

This slide is certainly optional for the NBA. I use it to explain how all the GR activities in OSWER relate to and complement each other



Green Remediation Activities

Existing

- Green remediation primer, website, and profiles of projects
- Internet seminars, and archived discussions (clu.in.org)
- Tech support for Federal and State project managers
- Contracts toolkit for RACs
- Renewable energy fact sheets and website
- NARPM 8-hour training

In the Pipeline

- MOU with NREL
- MOU with the USACE recognizing and fostering GR BMPs at Superfund cleanups
- Green Remediation Analyses and Development of Methodology (Region 9)
- Contracts toolkit for ERRS
- Remedy specific green remediation “cheat sheets”
- Site cleanup energy audit tool
- Who’s who in green remediation (EPA Intranet)
- ER3 for green remediation
- OSC 4-hour training
- Engineering forum “GR review and technical support” capability
- **Green cleanup voluntary standards project**



EF & FFF Tech Support in Green Remediation

- Develop in-house focused knowledge on green remediation
- Provide a first level “go-to” service to peers and help them connect the dots prior to “going deep”
- Stay connected with other related efforts
- Track and document projects of value to peers, leveraging resources to produce case studies
- It’s about the people!

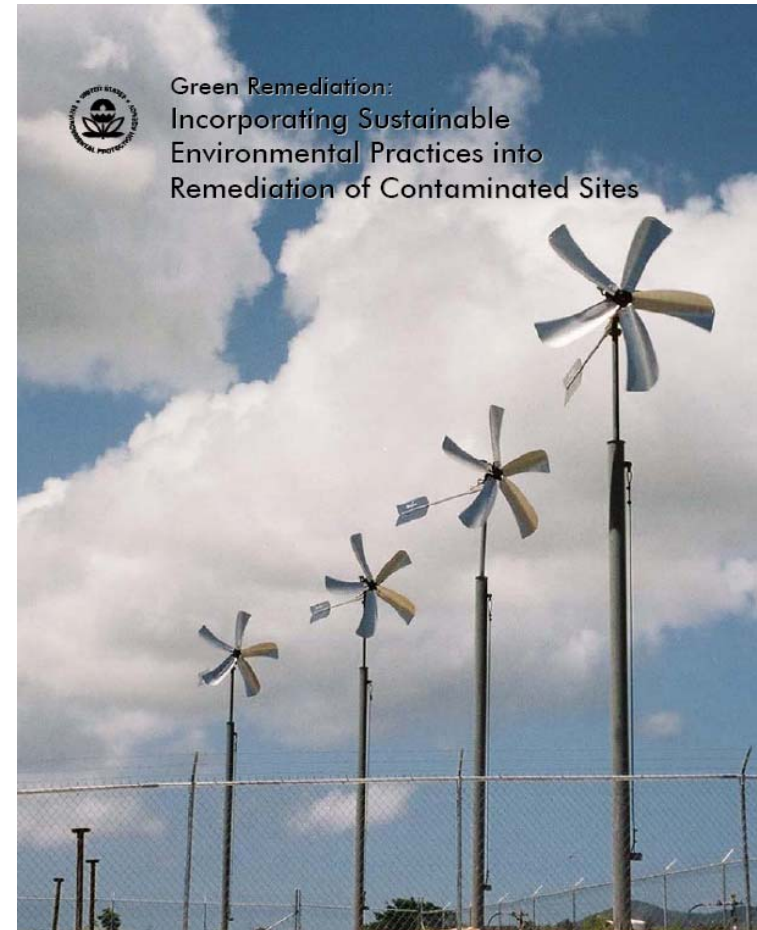


EF & FFF Tech Support in Green Remediation II

- Some specific examples:
 - Lead tech review of the green cleanup voluntary standards
 - Technical oversight of gtechnology specific green remediation cheat sheets
 - Continued support for the production and implementation of the Superfund green remediation strategy
 - Again – peer-to-peer support

EPA Green Remediation Primer

- Provides introduction to best practices with examples of how and where they are used
- Focuses on remedy implementation across regulatory frameworks
- Released April 2008, available at:
<http://clu.in.org/greenremediation>



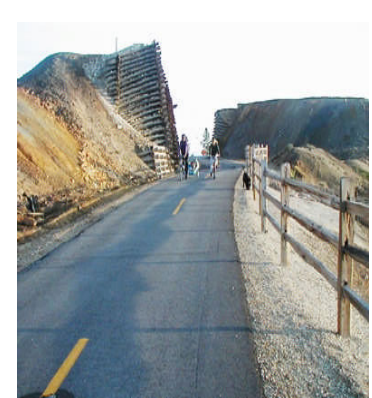
Core Elements: Air Emissions

- Use of cleaner fuel and retrofit diesel engines
- Modified operations to reduce operating and idle time
- Minimized dust export of contaminants
- Alternatives to off-site T&D of contaminated soil

Air compressors mounted on windmills to power hydraulic skimming pumps for recovery of petroleum from ground water at former St. Croix Alumina Plant



Paved bike path constructed above waste left in place in high-altitude California Gulch mining area



Core Elements:

Water Requirements and Resources

- Minimum fresh water use and maximum reuse
- Reclaimed treated or storm water for beneficial use or storage
- Native vegetation requiring little or no irrigation
- Prevention of water quality impacts, e.g. nutrient-loading or disruption of natural hydraulics

Stormwater channels and erosion control blankets for excavation and backfilling at Port Deposit



Low impact development strategies restoring original conditions after Poudre River excavation



Core Elements: Land and Ecosystems

- Minimal habitat disturbance such as noise and lighting
- Soil and sediment protection from compaction, decon, or uncontrolled traffic
- Ecorestoration practices
- Use of local byproducts such as fly ash or ag waste
- Minimally invasive in situ technologies

Metal salt crust along Upper AK River prior to Superfund removal



Ten years after applying municipal biosolids and assorted nutrients



Core Elements: Material Consumption and Waste Generation

- Minimized extraction and disposal of natural resources
- Reuse and recycling of materials, including C&D debris and clean metal
- Passive sampling devices and cleanup technologies producing minimal waste

Salvaged concrete during response actions at Barksdale AFB, as part of federal “greening the government” goals



Single ten-day mobilization for investigations and removal actions at Paducah GDP, needing only 23 lab samples through use of Triad



Core Elements: Long-Term Stewardship

- Reduced emission of CO₂, methane, and other GHGs
- Adaptive management approach reflecting local priorities and state-of-the-art technologies
- Leverage of response action infrastructure into future site use

Environmentally friendly brownfield cleanup converting illegal “Grove Landfill” into environmental education facility



Community involvement in environmental monitoring of Re-Solve, Inc. Superfund site



Core Elements: Energy Requirements

- Optimized passive-energy technologies (with little or no demand for external utility power) to treat low levels of contamination
- Energy efficient equipment operating at peak performance
- Renewable energy systems in remote locations or to offset grid electricity

PV array for pumping 2-3 gpm of water through a low-energy mulch bioreactor at Altus AFB



Portable PV system for 5-month SVE operations after oil pipeline break at Rocky Mountain House air base in Alberta, Canada



Carbon & Energy Footprints of Superfund Cleanup Technologies

Technology	Estimated Energy Annual Average (kWh*10³)	Total Estimated Energy Use in 2008-2030 (kWh*10³)
Pump & Treat	489,607	11,260,969
Thermal Desorption	92,919	2,137,126
Multi-Phase Extraction	18,679	429,625
Air Sparging	10,156	233,599
Soil Vapor Extraction	6,734	154,890
Technology Total	618,095	14,216,209

	Annual Carbon Footprint (MT CO₂)
Sum of 5 Technologies	404,411