Greener Cleanup Sustainability and Remediation

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Drivers - Green Goes Mainstream





Drivers – Uncertainty in Energy Prices



Drivers - Climate Change

UN Framework Convention on Climate Change

- Multiple US regional, state, local, private, citizen initiatives
- Advanced Notice of Proposed Rule Making under the Clean Air Act (July 2008)
- Proposed Regulations for Mandatory GHG Emissions Reporting (March 2009)
- EPA Endangerment Finding Under Clean Air Act EPA proposed finding indicating that six greenhouse gases pose a threat to the health and welfare of current and future generations of Americans. (August 2009)
- "[The president and EPA Administrator] have repeatedly indicated their preference for comprehensive legislation to address [climate change] and create the framework for a clean energy economy." 4

August 17, 2009, EPA Press Release

More Drivers

O Advances in Engineering and Manufacturing

OPublic Policy

OGlobal Economic and Development Changes

You

&

Sustainable Development







Sustainable Development

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

> WCED "Our Common Future" (The Brundtland Report, 1987)

Commission on Sustainable Development Chapter 20 of Agenda 21

- Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments, and Major Groups in every area in which human impacts on the environment.
- Adopted by more than 178 Governments at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janerio, June 1992.
- O Overseen by Commission on Sustainable Development.
- Chapter 20 of Agenda 21: Prevention of the generation of hazardous wastes and the rehabilitation of contaminated sites are the key elements...



For **EPA**, Greener Cleanups Means:

Optimize the **environmental** results

ONarrower focus than sustainability

EPA Office of Solid Waste & Emergency Response Sustainability

OMaterials Management

OLand Management

The Materials Cycle



Source: World Resources Institute



Land Management Business as Usual



- O Development moves beyond brownfield land and pushes community footprint outward
- O Significant proportion of brownfield land remains vacant
- O Reduced greenspace reduces carbon stocks and sinks, resulting in greenhouse gas emissions
- O Increased infrastructure needs results in increased greenhouse gas emissions
- Vehicle miles traveled increase

Land Management Sustainable Approaches

Low Carbon Approaches

- Available community footprint is optimized
- Concentrated development reduces vehicle miles traveled
- Retained greenspace prevents GHGs from being emitted through development
- Reduced infrastructure needs results in GHG emissions avoided
- Green energy generation results in replacement of the traditional U.S. fuel mix and a reduction in GHG emissions



Life Cycle & Land Remediation

Life Cycle of the property
Life Cycle of the product
Life Cycle of remedial project

Framing the life cycle analysis





U.S. GHG Emissions (2006): Systems-Based View Land Management



Draft analysis



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.

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 energyrelated 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.

Opportunities to Optimize Environmental Results in Cleanups

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



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 highaltitude 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

Metal salt crust along Upper AK River prior to Superfund removal



Ten years after applying municipal biosolids and assorted nutrients





Land Restoration and Carbon Sinks: Non-Urban Lands

EPA Tracked Sites in Non-Urban Areas



- EPA-tracked Non-Urban sites
 - 3,235 sites
 - Approximately 13 million acres

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 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
- Increased long term carbon sequestration in soil and vegetative cover
 - Adaptive management approach reflecting local priorities and state-of-theart 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

- Renewable energy systems in remote locations or to offset
- grid electricity
- Optimized and effective treatment systems
- Energy efficient equipment operating at peak performance

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



Portable PV system for 5month 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*10 ³)	Total Estimated Energy Use <i>in 2008-2030</i> (kWh*10 ³)
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
Sum of 5 Technologies	Annual Carbon Footprint (MT CO2) 404,411	

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



Epa Green Remediation Activities

Existing

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

In the Pipeline

- MOU with NREL
- Environmental footprint analyses; Development of Methodology (HQ & Region 9)
- Contracts toolkit for ERRS
- Remedy specific green remediation "cheat sheets"
- Who's who in green remediation (EPA Intranet)
- OSC 4-hour training
- Engineering forum "GR review and technical support" capability
- Green cleanup voluntary standards project

Groups Active in Green Remediation

Technology Innovation Program Green Remediation (GR) Effort
Superfund GR Workgroup
Technical Support Project (TSP) Green Committee
Green Remediation, Revitalization, and Reuse (GRRR) Team
Climate Change and Contaminated Lands (CCCL) Workgroup
Climate Change Coordinating Committee (C4)
ASTSWMO Greener Cleanups Task Force
ITRC Green and Sustainable Remediation (GSR) Project
Federal Remediation Technologies Roundtable (FRTR) GR Focus
EPA Partnerships with Other Federal Agencies Department of Defense (USACE IAG & MOU)) Department of Energy (NREL IAG & MOU)
State Initiatives (Cal/EPA GR Team, Illinois Greener Cleanups, Wisconsin Initiative on Sustainable Cleanups (WISC)
Brownfields Sustainability Pilots: Green Redevelopment
Tribal Initiatives
EPA Regional Initiatives: Region 3 Pilot Project on Green Cleanup Standards Region 9 Cleanup-Clean Air Initiative
Sustainable Remediation Forum (SuRF)





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: <u>http://cluin.org/greenremediation</u>



"Guidelines for Making Environmentally-Sound Decisions in the Superfund Remedial Process"

- The purpose of this document is to introduce the pollution prevention philosophy to those involved in cleanups – both in Superfund and RCRA. The method used to accomplish this is by providing specific waste reduction activities in the Superfund remedial process...
- The hope is that once the pollution prevention philosophy has been embraced, project managers will identify other opportunities for making environmentally sound decisions. Set up a recycling corner in the trailer on-site; restore wetlands; or plant trees to help offset, even in the slightest way, global climate change "