Protecting Human Health & the Environment with a Lower Environmental Footprint: US EPA's Experience to Date

Carlos Pachon

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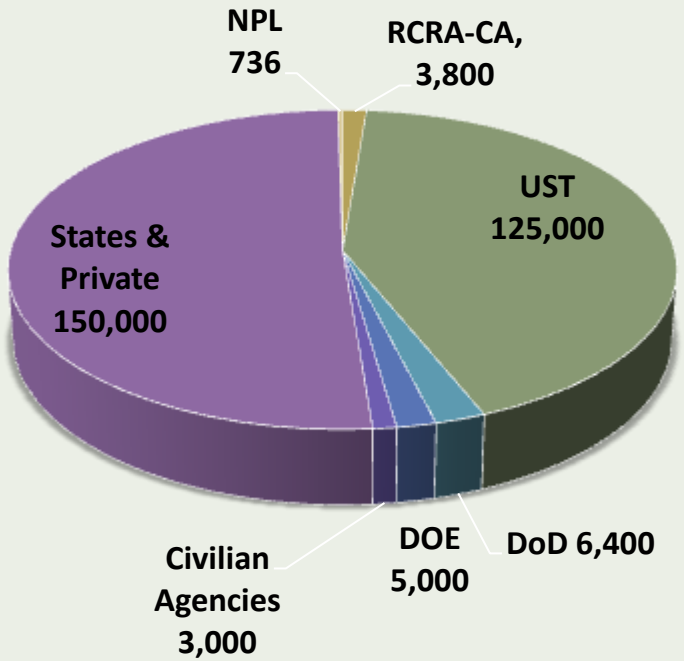
EPA Contaminated Site Programs: We Still a Lot of Remediation Work to Do

- We have made great progress cleaning up contaminated sites…
- Going forward we will invest significant resources cleaning up contaminated sites in all programs
  - » Superfund
  - » RCRA Corrective Action
  - » Underground Storage Tanks
  - » Brownfields
  - » Federal Facilities
- We have an opportunity to take lessons learned over the past decades, and apply the innovations and best management practices to future sites.

Estimated Number of Contaminated Sites
(United States, Cleanup horizon: 2004 – 33)

Total Sites = 294,000



Source: www.clu-in.org/market

Sustainability : U.S. Policy Drivers at Many Levels

- **Executive Order 13514: Federal Leadership in Environmental, Energy, and Economic Performance**

  It is the policy of the United States that Federal agencies shall increase energy efficiency; measure, report, and reduce their greenhouse gas emissions from direct and indirect activities; conserve and protect water resources through efficiency, reuse, and stormwater management; eliminate waste, recycle, and prevent pollution (President Obama)

- **EPA Strategic Plan 2011-2015: Goal 3: Cleaning Up Communities and Advancing Sustainable Development**

  EPA's Superfund program will implement its green remediation strategy to reduce the energy, water, and materials used during site cleanups while ensuring that protective remedies are implemented (Administrator Lisa Jackson)

- **EPA Office of Solid Waste & Emergency Response Policy (OSWER): Principles for Greener Cleanups**

  As a matter of policy, OSWER's goal is to evaluate cleanup actions comprehensively to ensure protection of human health and the environment and to reduce the environmental footprint of cleanup activities, to the maximum extent possible. (OSWER Assistant Administrator Mathy Stanislaus)

- **Regional policies and action plans**

- **… consistent with regulatory requirements**

Sustainability in Superfund Site Remediation

- **Social:**
  - Engaging communities in site cleanup decisions
  - Turning contaminated sites into community assets
- **Economic:**
  - Redevelopment in blighted areas (aligns with smart growth goals)
  - Fostering employment opportunities in communities where sites are cleaned up
  - Rising property values in communities
  - Remediation in the U.S.: A $7billion/year economic engine
- **Environmental:**
  - Protecting Human Health and the Environment
  - Liberating contaminated sites for reuse (1 remediated acre redeveloped = 4 acres of green field development)
- **Challenge: A smaller footprint in cleaning up sites**

Community Involvement (CI): Robust "Social" leg in Superfund

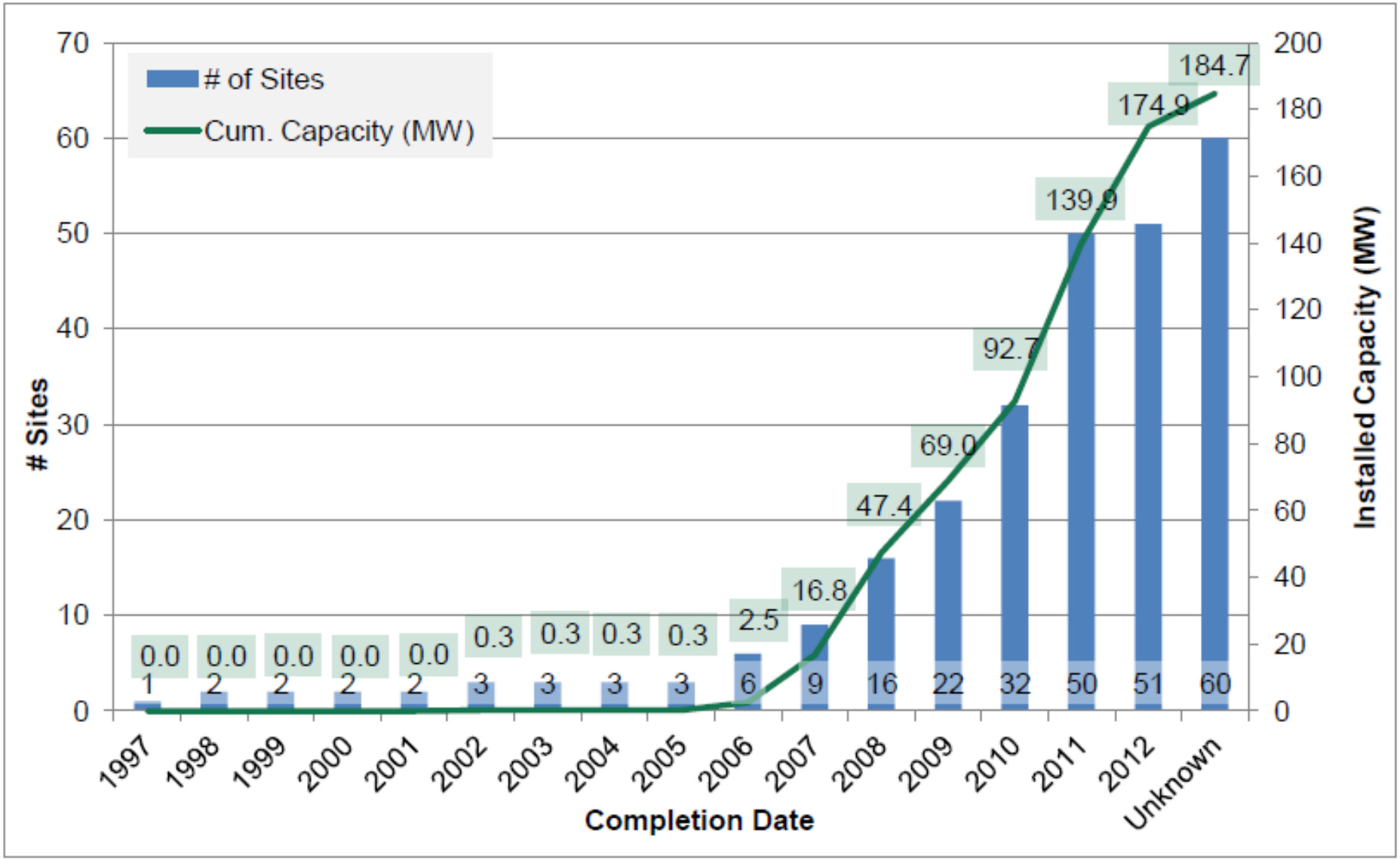
- By Law, Superfund requires community input in remedy decisions and implementation
- EPA parallels the International Association for Public Participation 7 "core values of public participation"
- EPA has a CI policy since 1981, and nearly 100 CI Coordinators across the 10 regional offices
- Technical assistance (grants and services) are provided to ensure communities are independently advised on challenging technical issues
- Our experience shows good CI results in better remedies
- Environmental justice link

…members of the public affected by a Superfund site have a right to know what the Agency is doing in their community and to have a say in the decision-making process. (Superfund Community Involvement Handbook).

Fostering Redevelopment and Economic Opportunities

- In Superfund, Remedial Action Objectives factor *reasonably anticipated future landuse*.*
- EPA serves as an active partner in helping to return sites to productive uses
  - » Funding reuse assessments and redevelopment planning
  - » Removing reuse barriers, real or perceived
  - » Partnering with local governments, communities, developers, and other interested stakeholders
- Beyond cleanup: Sites ready for anticipated reuse is a key Superfund "GPRA" goal
- Annually 300 businesses at 142 Superfund sites with redevelopment has taken place generate $8.8 billion in sales, 25,000 jobs and $1.6 billion in employment income

Contaminated Lands with Renewable Energy



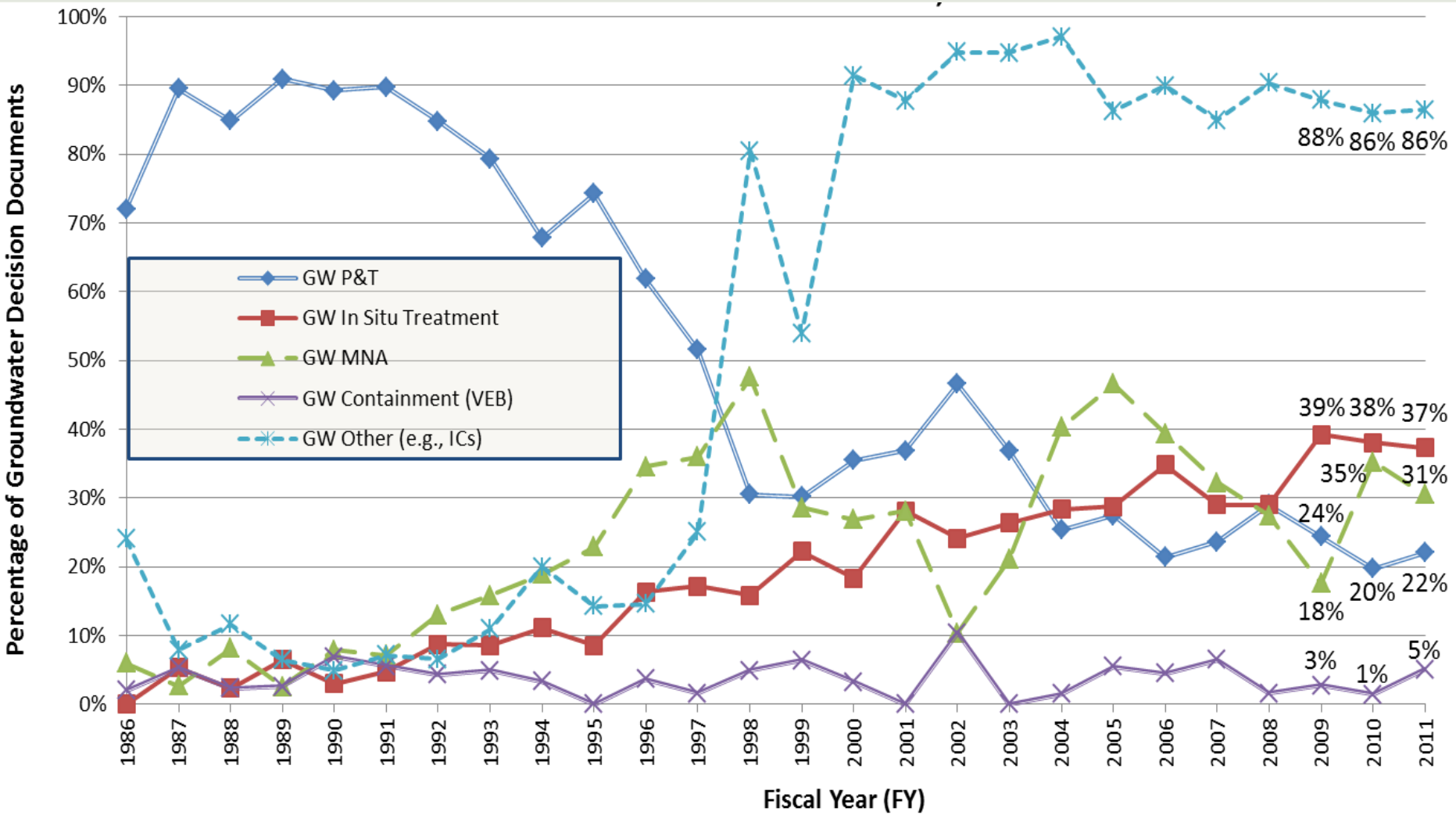
Challenge: Lowering the Environmental Footprint of Site Cleanup Projects

Green Remediation

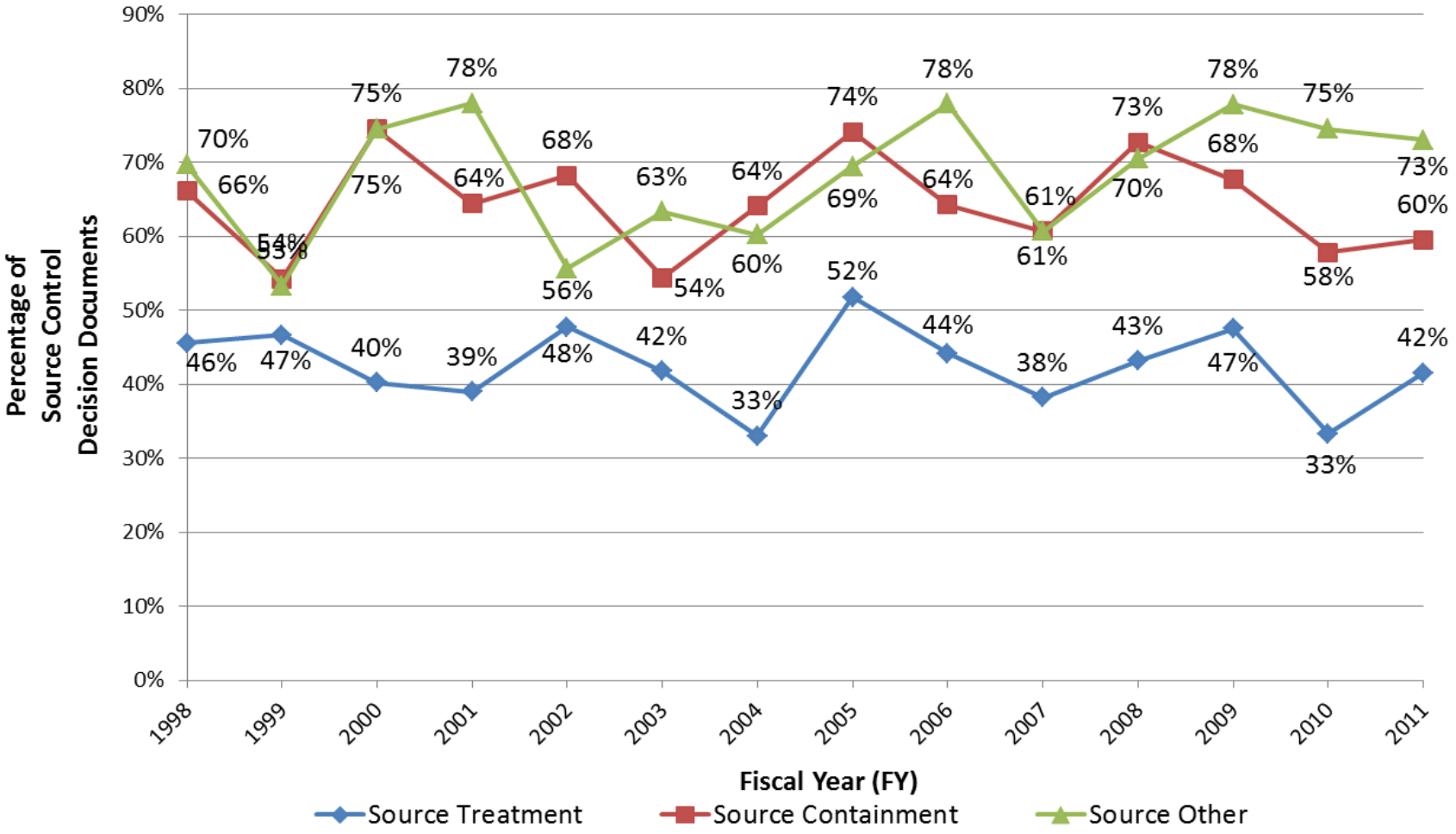
The practice of considering all environmental effects of remedy implementation and incorporating options to minimize the environmental footprints of cleanup actions.

*as defined by US EPA, *a.k.a.* greening response actions, greener cleanups, etc.

Trends in Superfund Decision Documents Selecting Groundwater Remedies (FY 1986–11) Total Groundwater Decision Documents = 1,912



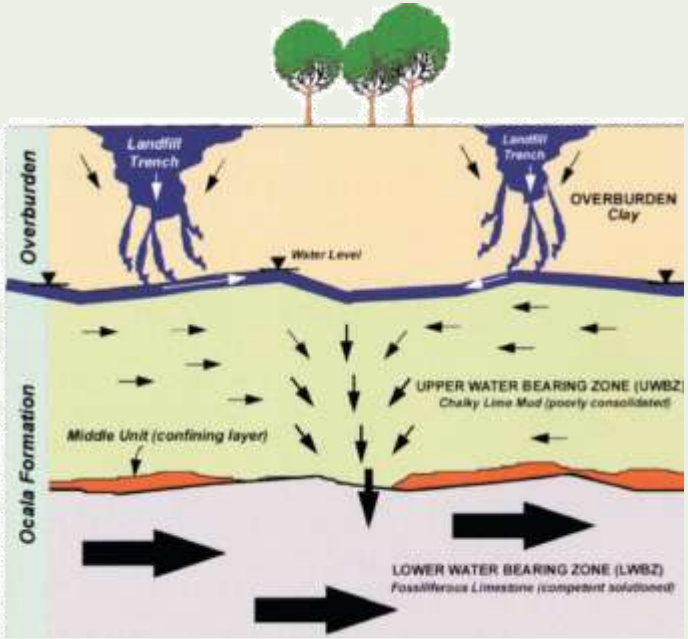
How Are We Cleaning up Contaminated Sites?
Trends in Types Superfund Source Control Decision Documents



It's no

Footprint Reduction in Remedies

- **Consistent with science and engineering principles and lessons learned to date**
- **Minimizing footprints and large reductions in footprints come from…**
  - » Accurate conceptual site model (CSM)
  - » Well-characterized source areas and contaminant plumes
  - » Optimal remedial strategy
  - » Sound engineering in design
  - » Streamlined performance monitoring

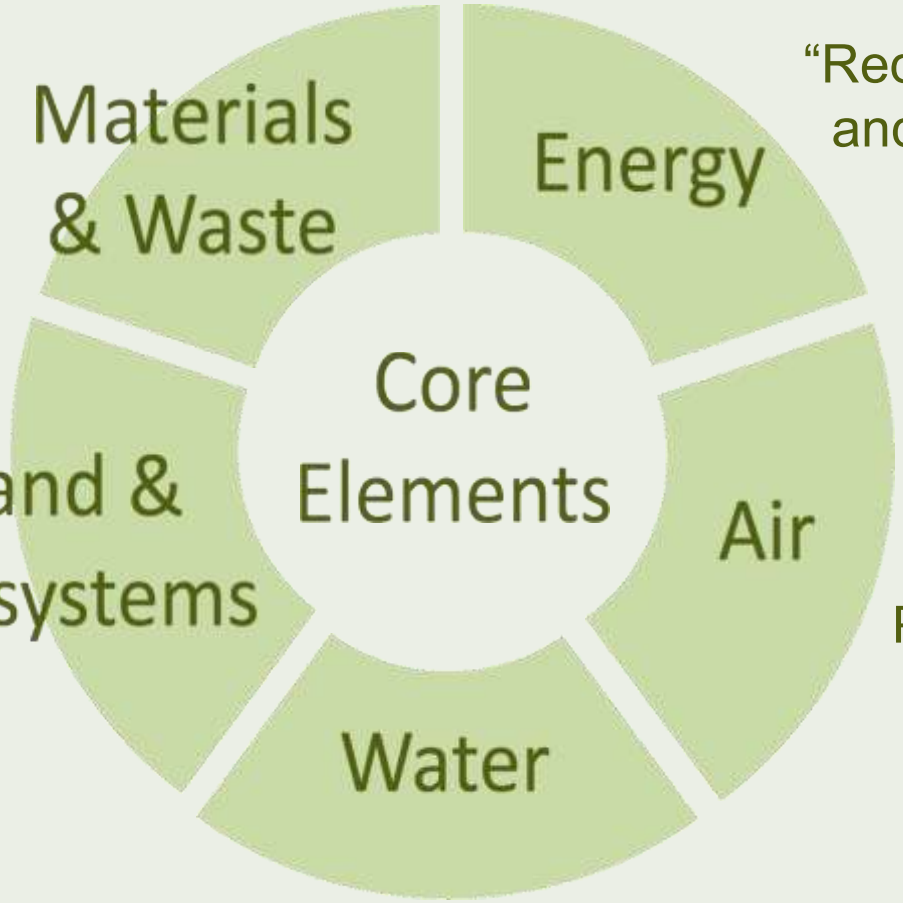


- **…then, focus on greening the resulting remedy**

Addressing the Environmental Leg of Sustainability: Core Elements of Green Remediation

"Minimize, Reuse, and Recycle…"

"Reduction, Efficiency, and Renewables…"



"Conserve, Protect, and Restore…"

"Protect Air Quality, Reduce Greenhouse Gases…"

"Improve Quality, Decrease Quantity of Use…"

Footprint Reduction Opportunities: The Superfund Energy & Greenhouse Gas Example

- Site cleanups often involve energy intensive remedies (see below)
- The annual carbon footprint of Superfund remedies is estimated at over 400kMT CO2e
- Use less: Optimizations completed at over 200 Superfund pump and treat systems
- Renewables: 185MW renewable capacity has been installed on contaminated sites*
- RECs for the rest: Superfund purchased 100k RECs in 2012

Technology	Estimated Energy Annual Average ($kWh*10^3$)	Total Estimated Energy Use in 2008-2030 ($kWh*10^3$)
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***

* www.epa.gov/renewableenergyland/docs/repowering_trackingmatrix_oct12.pdf

Implementation of GR in EPA Contaminated Site Programs

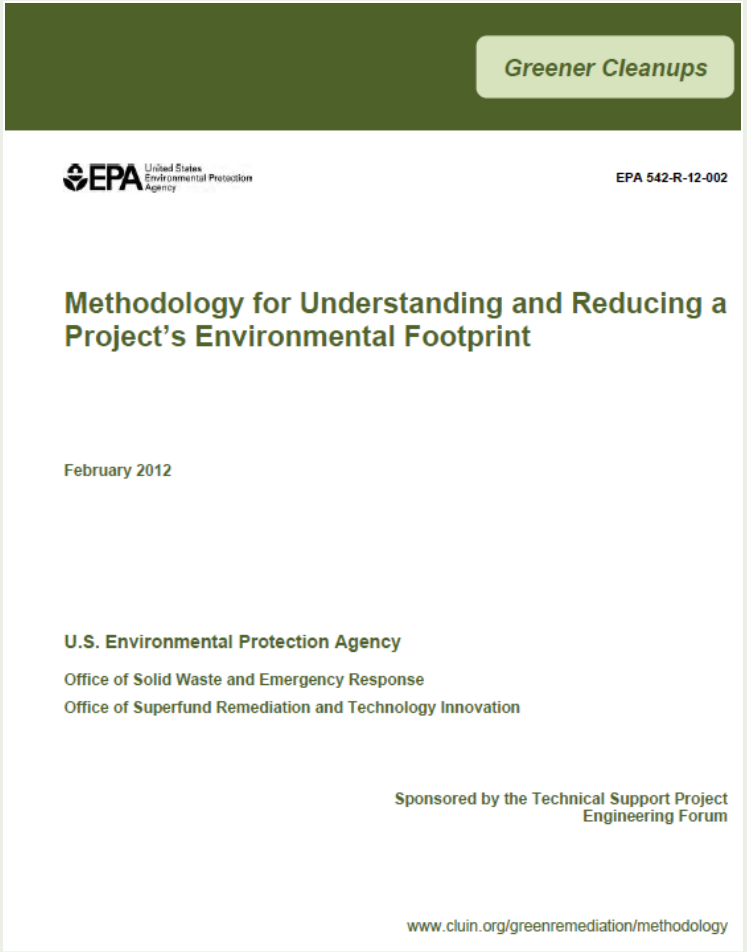
- Define internal policies, strategies and program action plans:
  - Cross-Agency Principles for all cleanup programs
  - Superfund green remediation strategy & 40 action items
  - Leverage related programs such as Re-Power America
  - Update contracting language to reflect new practices
- Develop technical guidance for practitioners
  - Best management practice fact sheets (13 to date)
  - Environmental footprint evaluation methodology
- Leverage voluntary market driven options
  - ASTM Standard Guide for Greener Cleanups
- Collaborating with other Federal Agencies quantifying footprints

Options for Implementing Green Remediation

- **Direct Use of Best Management Practices (BMPs)**
  - Excavation and Surface Restoration
  - Site Investigation
  - Pump and Treat Technologies
  - Bioremediation
  - Soil Vapor Extraction & Air Sparging
  - Clean Fuel & Emission Technologies for Site Cleanup
  - Integrating Renewable Energy into Site Cleanup
  - Sites with Leaking Underground Storage Tank Systems
  - Landfill Cover Systems & Energy Production
  - Mining Sites
  - Implementing In Situ Thermal Technologies
  - Overview of EPA's Methodology to Address the Environmental Footprint of Site Cleanup

www.cluin.org/greenremediation/

- **For Complex Projects – Apply Footprint Methodology**



Information and Resources

- **Guidance Documents**
- **Special Issues Primers**
- **Technical Bulletins**
- **Fact Sheets**
- **Case Studies and Project Profiles**
- **Technology Descriptions**
- **Vendor Support**
- **Current and In-depth Information:**
  - » BMPs for common cleanup approaches
  - » Policy information at Federal and State level
  - » Assessing a project's environmental footprint
  - » Technical support

Hazardous Waste Clean-Up Information (CLU-IN)
www.clu-in.org/greenremediation

Green Remediation Focus

US EPA
www.epa.gov/oswer/greenercleanups

Brownfields and Land Revitalization Technology Support Center
www.brownfieldstsc.org

Optimization
cluin.org/optimization

Thank You!

Carlos Pachon
pachon.carlos@epa.gov

EPA Office of Superfund Remediation and Technology Innovation

US EPA, Washington DC

http://cluin.org/greeremediation