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Incorporating Sustainable Practices into Site Remediation

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

Green Remediation: *The practice of considering all environmental effects of remedy implementation and incorporating options to maximize net environmental benefit of cleanup actions.*

This introduction is the first of a series of fact sheets on the opportunities for implementing best management practices (BMPs) of green remediation. Upcoming topics include renewable sources of energy, enhanced stormwater control measures, BMP checklists for the field, and enabling mechanisms for practitioners.

Overview of Green Remediation

As part of its mission to protect human health and the environment, EPA is committed to developing and promoting innovative cleanup strategies that restore contaminated sites to productive use, reduce associated costs, and promote environmental stewardship. The Agency strives for cleanup programs that use natural resources and energy efficiently, reduce negative impacts on the environment, minimize or eliminate pollution at its source, and reduce waste to the greatest extent possible. EPA supports adoption of green remediation as the practice of considering all environmental effects of cleanup actions and incorporating strategies to maximize the net environmental benefit.

Sustainable practices result in cleanups minimizing the environmental and energy "footprints" of all actions taken during a project life. BMPs of green remediation emphasize a "whole-site" approach that closely evaluates core elements of a cleanup project:

- Energy requirements,
- Air emissions,
- Water requirements and associated impacts on water resources,
- Impacts on land and ecosystems,
- Material consumption and waste generation, and
- Impacts on long-term stewardship of a site.

Evolving Practices

Concerns regarding climate change have prompted major efforts to reduce greenhouse gas (GHG) emissions caused by activities such as fossil fuel consumption. Accordingly, one category of EPA's evolving practices for green remediation places greater emphasis on approaches that reduce energy consumption and GHG emissions. Another category focuses on related "greening" goals concerning water conservation. Best practices include:

- Designing treatment systems with optimum efficiency and modifying existing systems as needed,
- Using renewable resources such as wind and solar energy to meet power demands of treatment systems,
- Generating electricity from byproducts such as methane gas or secondary materials,
- Participating in power generation or purchasing partnerships based on renewable resources,
- Minimizing fresh water consumption and maximizing water reuse during treatment processes,
- Preventing impacts such as nutrient loading on water quality in nearby water, and
- Reclaiming treated water for beneficial use such as irrigation or for storage through aquifer reinjection.

Site Profile: *Umatilla Army Depot, Hermiston, OR*

- *Mixed 15,000 tons of explosives-contaminated soil with manure, sawdust, and alfalfa,*
- *Destroyed contaminant byproducts or permanently bound byproducts to soil or humus, achieving non-detectable concentrations of explosives,*
- *Provided $150,000 potential revenue from sale of humus-rich soil,*
- *Saved an estimated $2.6 million compared to alternative of soil incineration, and*
- *Avoided significant fossil fuel consumption by an incinerator and for offsite transportation.*

Building on Current Practices

Sustainable site cleanup and revitalization reflects sound decision-making that balances environmental, social, and economic factors. Green remediation builds on environmentally conscious practices already used by public agencies and within business sectors, and promotes state-of-the art methods for:

- Conserving water,
- Improving water quality,
- Increasing energy efficiency,
- Managing and minimizing toxics,
- Managing and minimizing waste, and
- Reducing emission of criteria air pollutants and GHG.

BMPs and high performance criteria of green remediation often draw on elements of private or public initiatives such as the U.S. Green Building Council's Leadership in Energy and Environmental Design or EPA's low impact designs for stormwater management.

Where and When to Apply Green BPMs

Best management practices of green remediation may be applied to cleanup actions taken at almost any hazardous waste site, whether conducted under federal, state, or local cleanup programs or by private parties. The practices holistically apply to all phases of site assessment, remediation, and redevelopment including removal actions, site investigations, remedy construction, operation of treatment systems, monitoring of treatment processes and progress, and site close-out.

To maximize sustainability, cleanup and reuse options are considered early during the planning process, enabling best practices used during remediation to carry forward to redevelopment activities and ultimate land reuse. Incorporation of green remediation strategies into cleanup procurement documents and site management plans helps to open the door for best practices in the field.

In accordance with federal procurement policy, selection of cleanup equipment and services meets a project's performance and cost requirements, while giving preference to green products and providers.

Green remediation strategies apply to all types of activities undertaken during all stages of a site cleanup and land revitalization project such as:

- Deconstruction, demolition, and removal,
- Cleanup, remediation, and waste management,
- Design and construction for reuse, and
- Sustainable use and long-term stewardship.

Benefits of Green Remediation

Implementation of the best practices of green remediation results in a range of benefits, including:

- Reduction in fossil fuel consumption and GHG emissions,
- Better conservation of water and other natural resources,
- Cost savings derived from improved efficiencies of energy-intensive treatment systems and increased use of optimized passive-energy treatment systems,
- Educational opportunities regarding environmental stewardship and sustainable activities, and
- Regional employment opportunities for renewable-energy businesses at revitalized sites.

Site Profile: *Pemaco, Maywood, CA*

- *Uses high-vacuum dual-phase extraction, thermal oxidation, and electrical resistance heating to treat contaminated ground water and soil,*
- *Coordinated remedy construction with the city's infrastructure development for a riverfront park,*
- *Added a roof-top photovoltaic system providing 375 kilowatt-hours of electricity for the treatment system each month, and*
- *Avoids annual emission of 4,311 pounds of carbon dioxide by using solar energy.*

Advancing the Use of Green Remediation

To foster green remediation strategies, EPA's Office of Solid Waste and Emergency Response (OSWER) is:

- Documenting the state of BMPs,
- Identifying opportunities for improvement,
- Establishing a community of BMP practitioners, and
- Developing mechanisms and tools for BMPs.

Partners include other agencies such as the U.S. Department of Energy and Army Corps of Engineers, state environmental agencies, and local development organizations. Key opportunities lay in integrated cleanup and reuse planning, daily operations, system optimization, and expanded use of renewable energy.

Visit Green Remediation Web *to learn or contribute more about BMPs, decision-making tools, and resources such as the technology primer,* Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites *at:* http://cluin.org/greenremediation.

For more information, contact:
Carlos Pachon, OSWER/OSRTI (pachon.carlos@epa.gov)
U.S. Environmental Protection Agency