

Headquarters U.S. Air Force

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Green and Sustainable Remediation Efforts Outside DoD



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11 May 2011

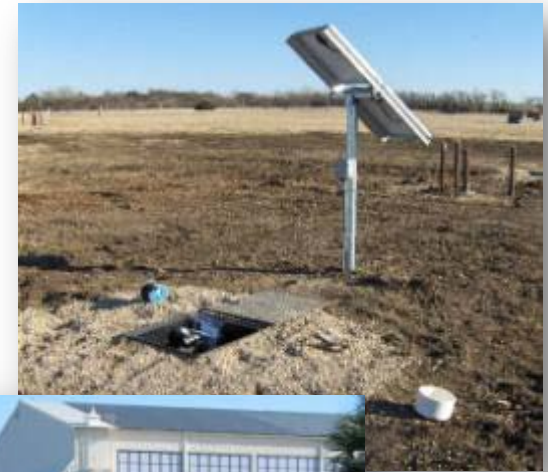
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Outline

- **ITRC – Interstate Technology Regulatory Council**
- **ASTM International**
- **ASTSWMO**
- **SURF – Sustainable Remediation Forum**
- **NICOLE – Network for Industrially Contaminated Land in Europe**
- **State Programs**
 - **California**
 - **Illinois**
 - **Minnesota**
 - **New York**
 - **Wisconsin**





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ITRC GSR

Interstate Technology Regulatory Council GSR Team

- **Established 2009**
- **Wide range of practitioners on team**
- **Documents developed on consensus basis**
 - **Overview document – summarizes current status of GSR practices (in press)**
 - **Technical and regulatory guidance document**
 - **Under review; expected final end of 2011**
 - **Framework for conducting GSR with detailed guidance for regulators to conduct GSR reviews**
 - **Tools, case studies, etc.**
 - **Internet-based Training (IBT)**
 - **Concurrently being developed; first public offering Nov 2011**



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ITRC GSR

ITRC GSR Team Technical Regulatory Guidance Document

■ Introduction

- Problem statement, definitions, state survey summary

■ GSR Planning

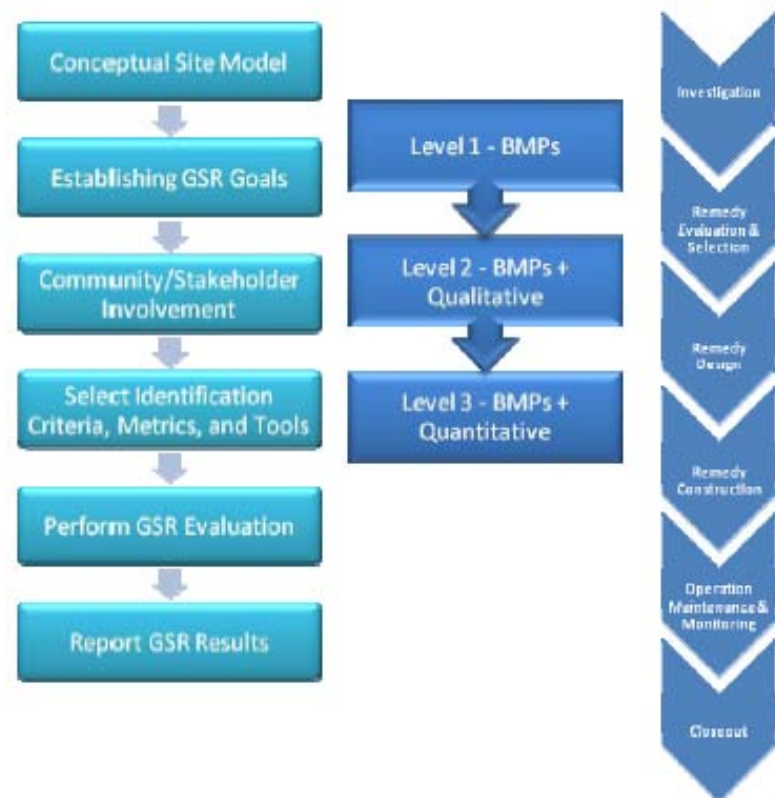
- Scalable approach, GSR planning
- Establishing GSR goals
- Criteria, metrics and tools
- Customizing a state specific framework

■ GSR Framework

- Throughout remediation process cycle

■ GSR Tools and Technologies

- How to measure “greenness”
- Metrics and performance measures





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ASTM Standard on Greener and More Sustainable Cleanups (GAMSC)

ASTM International developing GSR Standard Guide

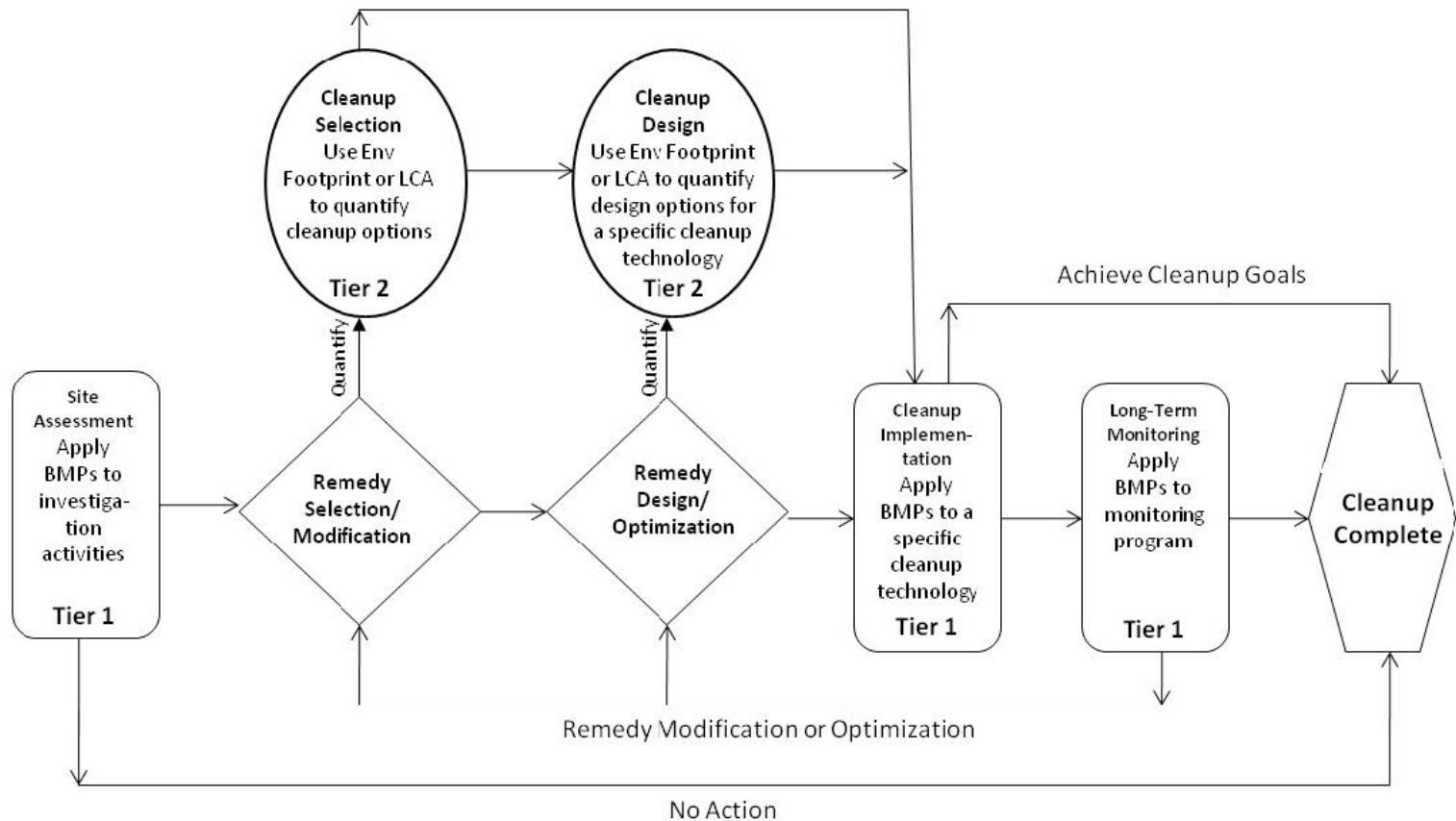
- Task Group since October 2009
- Document development through several iterations
- Extensive balloting process to reach consensus
- Detailed set of Green Best Management Practices (BMPs)
 - Based on phases, nature and purpose of BMPs
 - Specific to remedies and technologies
- Sustainability core elements
 - Economic: costs, assets, job creation, etc.
 - Social: health & safety, equity & justice, aesthetics, etc.
- Document available for second balloting in Fall 2011
- Expected to finalize within next year



ASTM Standard on GAMSC

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■ Example ASTM process: Green and Sustainable tracks with two-tiered approach





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ASTSWMO

Association of State and Territorial Solid Waste Management Officials

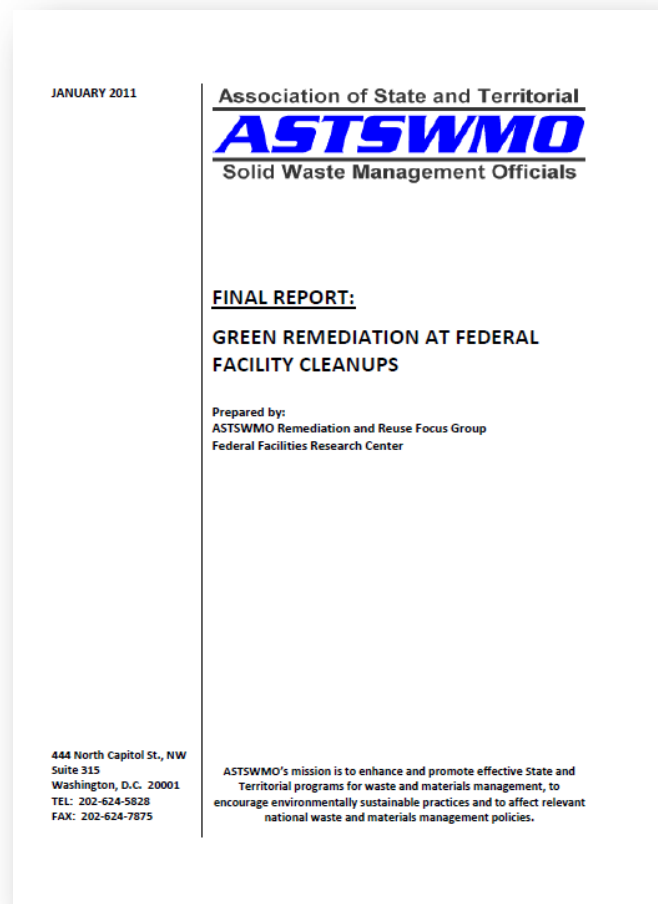
- **Greener Cleanup Task Force under Sustainability subcommittee**
- **One of earliest regulatory entities to address GSR**
- **2009 produced set of strategy papers on Green cleanups including:**
 - **Incorporating Greener Cleanups into Remedy Reviews**
 - **Incentives for Greener Cleanups**
 - **Implementing Greener Cleanups Strategies in States**
 - **Barriers to Greener Cleanups**
 - **Green Remediation Myth Busters**



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ASTSWMO

- **ASTSWMO latest document**
 - **Specific to Green Remediation at Federal Facility Cleanups**
 - **Opportunities for incorporating Green and Sustainable approaches to cleanups at Federal facilities**
 - **Provides table of several federal programs and links to some policy documents**
 - **Highlights some concerns state regulators may have regarding selecting and implementing GSR**





Department of Energy (DOE)

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- **Following EO 13423, DOE issued Order 450.1 to address environmental protection program in 2008**
- **Required specific revisions:**
 - **Reflect environmental management system (EMS) elements and framework found in the International Organization for Standardization's (ISO)14001:2004 (E)**
 - **Implement sustainable practices for enhancing environmental, energy, and transportation management performance**
 - **Achieve DOE Sustainable Environmental Stewardship goals, examples of which are:**
 - **Eliminate waste at source using pollution prevention (P2)**
 - **Eliminate acquisition of hazardous chemicals and materials**
 - **Maximize use of environmentally preferred products**



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Sustainable Remediation Forum (SURF)

- One of earliest entities working on sustainable remediation efforts in the USA – Meeting quarterly for over four years
- Members authored groundbreaking White Paper on sustainable remediation published in special edition Summer 2009 Remediation Journal
 - Communicates SURF members' thoughts on incorporating sustainability principles into environmental remediation
 - Ongoing panel on sustainable remediation continues discussion on this subject
- Publishing Framework and Metrics article in upcoming issue of Remediation Journal
- Comprehensive website with case studies, articles, whitepapers, tools, links to many sites, etc.
- SURF UK & SURF Australia affiliates to SURF USA



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NICOLE

Network for Industrially Contaminated Land in Europe

- **Leading forum on contaminated land management**
- **Sustainable Remediation Workgroup**
- **Bottom up approach – Promotes site-by-site basis within existing regulatory framework instead of setting policies and wide ranging definitions**
- **Developed “Road Map for Sustainable Remediation” – Sept 2010**
 - **Presents principles and methodology developed by NICOLE to implement sustainable remediation on any kind of project**
- **Conducting pilot tests at several sites – Results expected in 2012**



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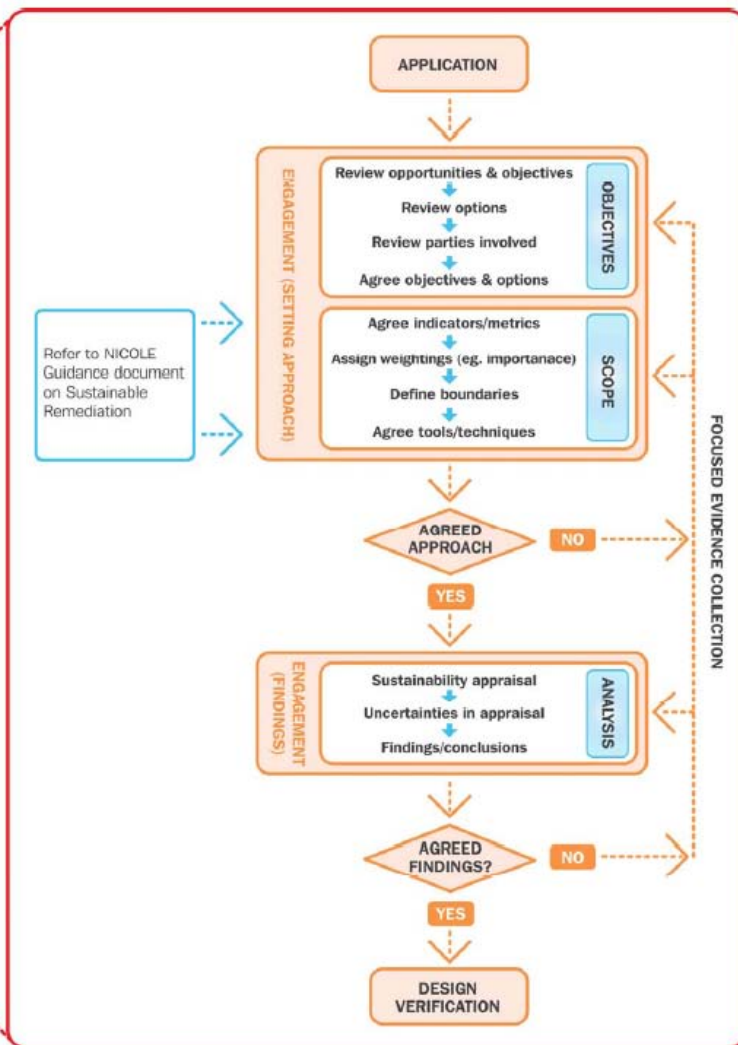
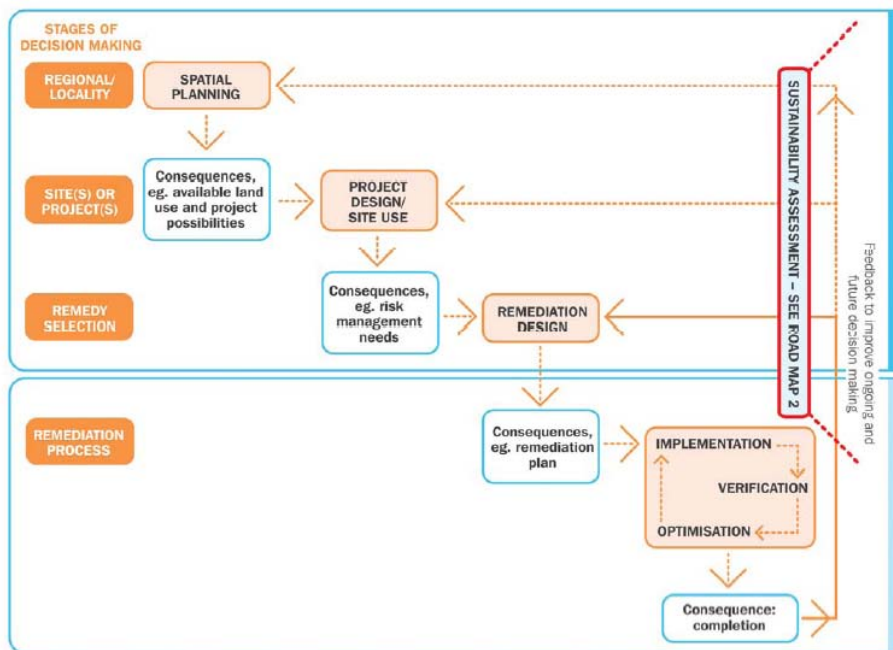
NICOLE: Sustainable Remediation Roadmap

- **Best solution when considering environmental, social and economic factors together – as agreed by stakeholders**
- **Similar to environmental risk assessment process, NICOLE recommends two components**
 - **Sustainability assessment – Integration of sustainability practices to contaminant land management**
 - **Sustainability management – Process of understanding of possible outcomes for three elements (environmental, social, and economic) of sustainable development**
- **Emphasis on earlier involvement of stakeholders for sustainability principles consideration for improved outcomes with greater benefits**



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NICOLE: Sustainable Remediation Roadmap



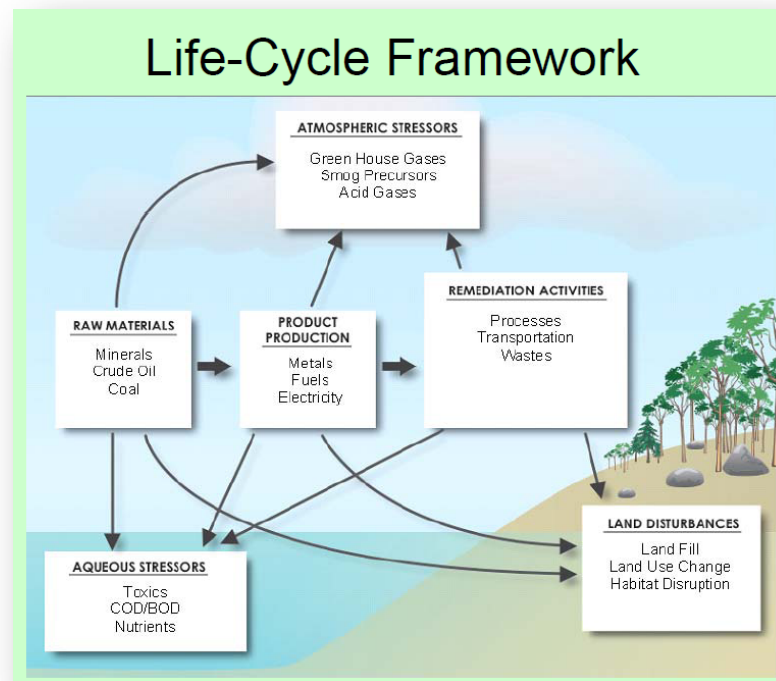


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State Efforts – California

Department of Toxic Substances Control Green Remediation

- Green Remediation Team Formed Feb 2007
- Green Remediation – holistic approach that incorporates sustainability concepts and life-cycle thinking over broad scope and time horizon
- Developed Interim Advisory for Green Remediation in Dec 2009
- Conducted symposium on: “Global Perspectives on Green Remediation – Making Clean Green” in Feb 2009





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State Efforts – California

Department of Toxic Substances Control Green Remediation

- Created Excel spreadsheet tool – Green Remediation Evaluation Matrix (GREM)
- Used to perform qualitative comparisons of treatment alternatives

Green Remediation Evaluation Matrix (GREM) *				
Stressors	Affected Media	Mechanism/ Effect	Y/N **	Score
Substance Release/Production				
Airborne NOx & SOx	Air	Acid rain & photochemical smog		
Chloro-fluorocarbon vapors	Air	Ozone depletion		
Greenhouse gas emissions	Air	Atmospheric warming		
Airborne particulates/toxic vapors/gases/water vapor	Air	General air pollution/toxic air/humidity increase		
Liquid waste production	Water	Water toxicity/sediment toxicity/sediment		
Solid waste production	Land	Land use/toxicity		
Thermal Releases				
Warm water	Water	Habitat warming		
Warm vapor	Air	Atmospheric humidity		
Physical Disturbances/Disruptions				
Soil structure disruption	Land	Habitat destruction/soil infertility		
Noise/Odor/Vibration/Aesthetics	General environment	Nuisance & safety		
Traffic	Land; general environment	Nuisance & safety		
Land Stagnation	Land; general environment	Remediation time; cleanup efficiency; re-development		
Resource Depletion/Gain (Recycling)				
Petroleum (energy)	Subsurface	Consumption		
Mineral	Subsurface	Consumption		
Construction materials (soil/concrete/plastic)	Land	Consumption/reuse		
Land & space	Land	Impoundment/reuse		
Surface water & groundwater	Water, land (subsidence)	Impoundment/sequester/reuse		
Biology resources (plants/trees/animals/microorganisms)	Air, water, land/forest, subsurface	Species disappearance/diversity reduction/regenerative ability reduction		

Notes:

* Use for evaluating one technology or remedial alternative as a checklist.

** Expand for alternative comparison by adding additional score columns for each alternatives.

** State whether the impact applies or does not apply to the alternative and continue the evaluation.

DTSC Matrix (12/09)



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State Efforts – Illinois

Illinois Environmental Protection Agency (IEPA) Matrix

- Illinois' greener cleanups matrix: how to maximize environmental benefits of site remediation
- IEPA evaluated certain cleanups in UST program, site remediation program, CERCLA and RCRA programs using site-specific questionnaires, field visits, and consultations with green remediation practitioners to build matrix
- Based on five guiding principles
 - Ensure protection of human health and environment
 - Integration of site reuse plans into cleanup strategy
 - Conserve raw materials – soil, water, salvage building materials and other resources
 - Conserve energy
 - Consider environmental effects treatment technologies



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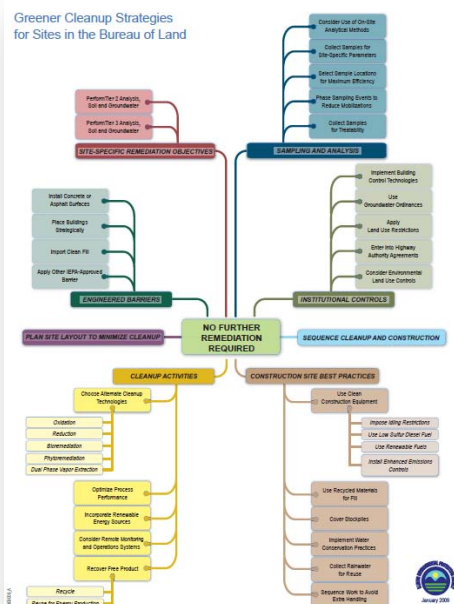
State Efforts – Illinois

■ IEPA green remediation tools include:

- Simple & detailed matrices
- Decision trees

■ Addresses:

- ROs
- Sampling & analysis
- Engineered remedies
- ICs
- Cleanup activities
- BMPs



Greener Cleanups:
How to Maximize the Environmental Benefits of Site Remediation

action	level of effort	feasibility	cost	benefits	energy
Improve lifting mechanisms on construction equipment	High	High	Low	Reduce air emissions from on-site construction equipment and from staged vehicles	Reduce fuel use in on-site construction equipment and in trucking waste materials
Use low-sulfur diesel fuel	Medium	High	Low	Reduce air emissions from on-site construction equipment and from staged vehicles	
Use alternative fuels (biodiesel, etc.)	Medium	High	Low	Reduce air emissions from on-site construction equipment and from trucking waste materials	Reduce use of petroleum products in on-site construction equipment and in trucking waste materials
Use construction equipment with enhanced emission controls	Medium	High	Low	Reduce air emissions from on-site construction equipment and from staged vehicles	
Sequence work to minimize idling/handling of materials	High	High	Low	Reduce air emissions from on-site construction equipment. Reduce nuisance dust from stockpiles	Reduce fuel use in on-site construction equipment
Cover stockpiles with large heavy materials dust control measures, or equivalent	High	High	Low	Reduce nuisance dust from stockpiles	Reduce emission
Collect rain water for on-site use, such as dust control	High	High	Low		Reduce probable water use
Implement a water conservation plan	High	High	Low		Reduce probable water use
Capture and treat greywater for reuse	Medium	High	Low		Reduce probable water use
Adaptation rather than remove infrastructure structures	Medium	High	Low		Reduce waste material requiring off-site disposal. Reduce off-site disposal requirements
Crush existing structures to optimize on-site recovery and produce fill materials	Medium	High	Low		Reduce waste material requiring off-site disposal. Reduce off-site disposal requirements
Control waste water and other effluents for on-site use	Medium	High	Low		Reduce waste material requiring off-site disposal. Reduce fuel use in trucking waste material
Use recycled materials for fill	High	High	Low		Reduce virgin fill requirements
Routinely evaluate treatment processes for optimal performance	High	High	Low	Reduce air emissions from treatment processes	Reduce probable water use and waste water discharge from treatment processes
Capture free product or effluents for on-site energy recovery	High	High	Low	Reduce air emissions from treatment processes	Reduce waste material requiring off-site disposal
Incorporate renewable energy resources, such as wind or solar, into treatment systems	High	High	Low		Reduce waste material requiring off-site disposal
Use energy-efficient systems and off-site equipment in job trailer	High	High	Low		Reduce purchased energy use

Legend:
 High: Indicates a benefit may add cost, time, or technical complexity - the number of symbols indicates the relative amount of the increase.
 Medium: Indicates a benefit may reduce cost, time, or technical complexity - the number of symbols indicates the relative amount of the reduction.
 Low: Indicates a benefit may add or reduce cost, time, or technical complexity depending on the project specifics.
 Indicates a benefit won't likely impact cost, time, or technical complexity.

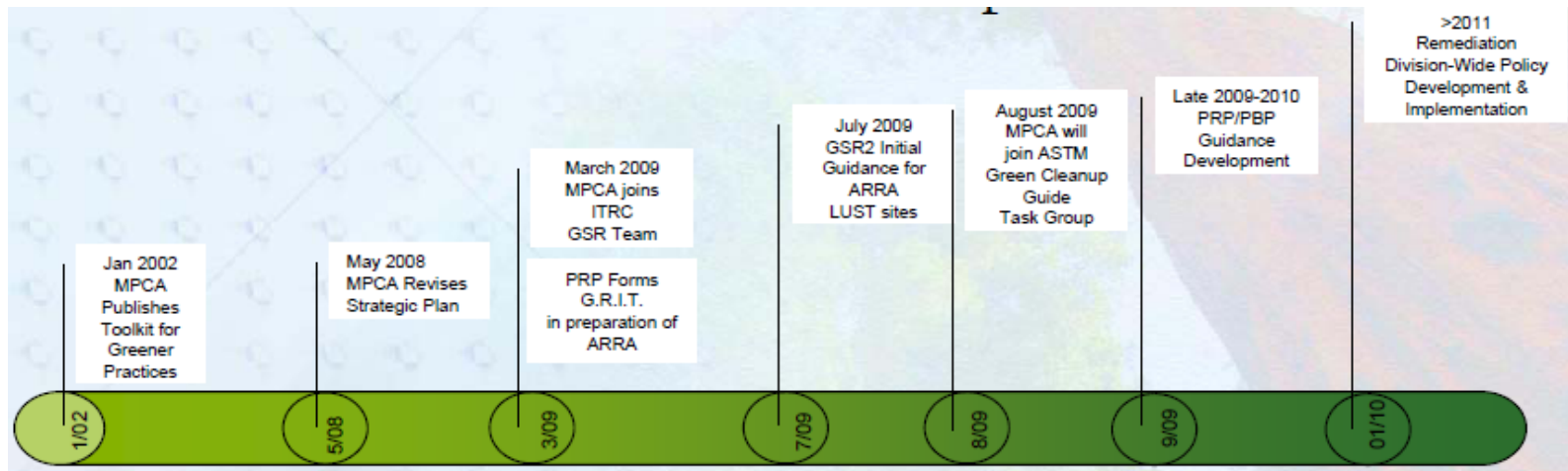


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State Efforts – Minnesota

Minnesota Pollution Control Agency (MPCA)

- Green Remediation Implementation Team
- Predicated upon five core elements of US EPA's Greener Cleanups
- Produced guidance document for Green Practices for use during American Reinvestment and Recovery Act (ARRA) projects
- 'Green score' weighted and utilized in overall contractor selection process





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State Efforts – New York

New York Department of Environmental Conservation (NYDEC)

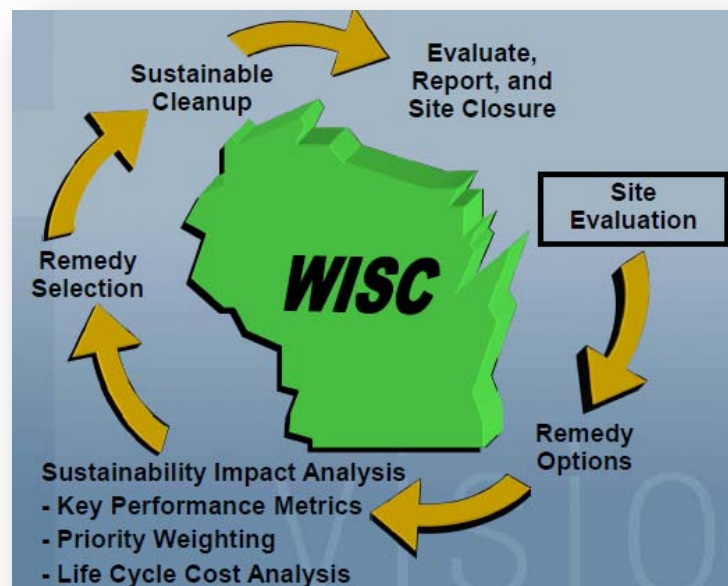
- **As first step to implement green remediation within NY DEC's remediation programs, Division of Environmental Remediation (DER) released policy document 2010**
- **Concepts and techniques of green remediation and guidance on how to apply them for DER programs**
- **Does not specify methods or criteria to be used to quantify effectiveness of various green remediation concepts**
- **Policy applies to all phases of site cleanup process from investigation through completion of remediation in most program areas**
- **According to policy, 'green remediation concepts will be considered and implemented to the extent feasible, and documented'**



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State Efforts – Wisconsin

- Sustainability considered in remedy selection but must not compromise environmental protection
- Develop guidance document to help WDNR project managers evaluate and implement sustainable remediation
- Develop meaningful sustainability performance metrics to document and explain progress to stakeholders, administrators, and public
 - Easy to use/implement; broadly applied to state and federal remedial activities
 - Provide pathway for greener optimization of existing systems
 - Sustainability impact analysis during remedy selection





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GSR Resources

Upcoming Trainings and Events

- **SURF 17 Meeting:**
 - **Chicago – May 19-20, 2011 – US EPA Region 5**
- **Battelle Conference, June 27 - 30, 2011 three short courses:**
 - **The SRT™ and SiteWise™ Sustainable Remediation Tools**
 - **Framework and Metrics for Incorporating Sustainability into Remediation Projects**
 - **Life Cycle Assessment (LCA) and Other Approaches to Estimating Impacts for Remediation Systems**
- **ITRC GSR Internet-based Training:**
 - **First public offering in November, 2011**
- **SERDP/ESTCP:**
 - **Annual Symposium: November 29 - December 1, 2011**



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GSR Resources

Links to GSR resources

- ITRC GSR Team: www.itrcweb.org/teampublic_GSR.asp
- ASTM: www.astm.org/DATABASE.CART/WORKITEMS/WK23495.htm
- ASTSWMO:
http://astswmo.org/resources_sustainability_greenercleanups.html
- SURF: www.sustainableremediation.org/
- NICOLE: www.nicole.org/documents/DocumentList.aspx?w=SR
- California: www.dtsc.ca.gov/omf/grn_remediation.cfm
- Illinois: www.epa.state.il.us/land/greener-cleanups/
- Minnesota: www.pca.state.mn.us/index.php/about-mpca/assistance/financial-assistance/american-recovery-and-reinvestment-act-arra-of-2009-lust-prp-guidance.html
- New York: www.dec.ny.gov/environmentdec/64595.html
- Wisconsin: www.dnr.state.wi.us/org/aw/rr/cleanup/wisc.htm



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Questions?



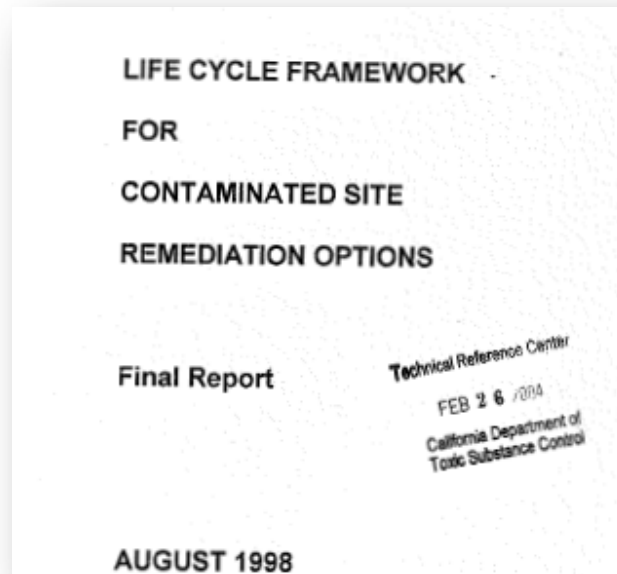
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SURF

■ Several documents



The Environmental Impact of Conducting Environmental Work

Ben T. Foster
Principal Hydrogeologist
LFR, Inc.

An abbreviated version of this paper was presented at the International MGP Symposium held in Reading, England in April 2006.

REMEDIATION Autumn 2009

The Sustainable Remediation Forum

Carol B. Baker

L. Maile Smith

David S. Woodward

Regulators seem to currently be focusing on green remediation and not sustainable remediation. How can the industry change this perception so that a more holistic approach is followed?

REMEDIATION Summer 2009

Sustainable Remediation White Paper—Integrating Sustainable Principles, Practices, and Metrics Into Remediation Projects

David E. Ellis

Paul W. Hadley