

# Incorporation of GSR into Army Environmental Remediation: Pilot Project Performance for Formulation Of Army GSR Policy

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# Report Documentation Page

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# Overview

- GSR Definition
- GSR Drivers
- Army GSR Study
  - ▶ Study Process
  - ▶ Study Results
- Future Activities



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# DEFINITION



# DoD Definition of GSR (from 2009 DoD policy)

- Employ strategies for cleanups that...
  - ▶ Use natural resources and energy efficiently
  - ▶ Reduce negative impacts on the environment
  - ▶ Minimize or eliminate pollution at its source
  - ▶ Protect and benefit the community at large
  - ▶ Reduce waste to the greatest extent possible
- Use strategies that consider all environmental effects of remedy implementation and operation and incorporate options to maximize the overall environmental benefit of cleanup actions



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# DRIVERS



# DoD and Army GSR Drivers

- DoD policy (DoD 2009) is “to consider and implement green and sustainable remediation opportunities when and where they make sense”  
<https://www.denix.osd.mil/portal/page/portal/content/environment/cleanup/WN/Green%20and%20Sustainable%20Remidiation%20Policy.pdf>
- 2010-11 Army Environmental Cleanup Strategic Plan –“encourages project managers to seek opportunities to incorporate options for minimizing the impact on the environment of cleanup actions undertaken at Army installations” (<http://www.aec.army.mil/usaec/cleanup/10stratplan.pdf>.)
- No current GSR regulatory requirement
- Army GSR Study
  - ▶ Is Army-wide GSR policy and guidance necessary?
  - ▶ Is so, what should be the content?
  - ▶ Army funding study with the USACE EM CX to provide the information necessary and the recommendations for the consideration and development of Army-wide GSR policy and guidance



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# STUDY DESCRIPTION



# Study Scope

- Follow the consideration and incorporation of GSR practices into 12 Army environmental remediation projects
- Ascertain the effectiveness of the GSR practices that are considered and incorporated
- Provide procedures by which GSR practices can be identified, considered, implemented and documented by Army Project Teams
- Provide recommendations for Army-wide policy and guidance



# Pilot GSR Projects for Study

Project Description	Program	Phase
Pump and Treat (P&T) with MNA	IRP – FUDS	RD
P&T Replacement (PRB and/or MNA)	IRP – BRAC	FS/ESD/RD
Consolidation/Capping of Landfill	IRP – FUDS	RD
Petroleum Soil Remediation	IRP – NGB	RA
Munitions Remediation	MMRP – NGB	RI/FS
In-situ Bio/MNA	IRP – Active Army	FS
Munitions Remediation	MMRP – Active Army	FS
Chemical Warfare Material Remediation	MMRP – FUDS	RI/FS
Optimization P&T's, Source Removal	IRP – Active Army	RA-O
MNA w, w/o Source Removal	IRP – FUDS	Post FS (PP)
SI/RI Planning	IRP – FUDS	SI/RI

# Study Team

## OACISM

- Kevin Roughgarden

## USACE Environmental and Munitions CX

- Carol Dona (PM)
- Nick Stolte and Deborah Walker (MMRP)

## Tetra Tech, Inc. (Contractor to USACE)

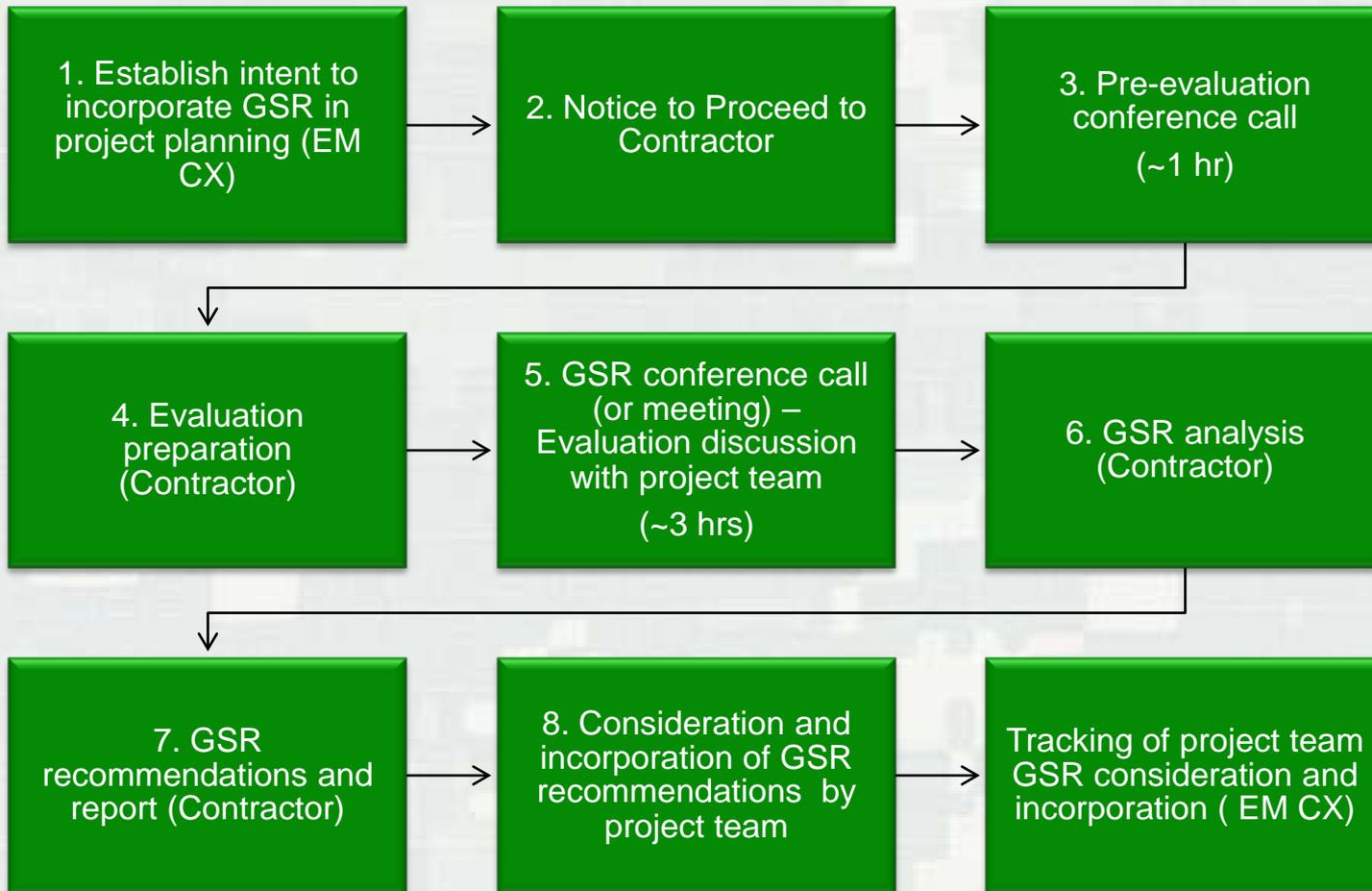
- Rob Greenwald (project manager)
- Doug Sutton (IRP GSR lead)
- Michelle Caruso (MMRP GSR lead)

## Others

- Army National Guard Bureau (NBG)
- Army Environmental Command (AEC)
- Deputy Assistant Secretary of the Army for Environment, Safety, and Occupational Health [DASA(ESOH)]
- Formerly Used Defense Sites (FUDS)
- Military Munitions Support Services (M2S2)
- U.S. Army Engineering and Support Center, Huntsville
- Army Environmental Policy Institute (AEPI)



# GSR Approach (Steps) in the Study



# Overall Study Schedule

Task	FY10	FY11				FY12
	Q4	Q1	Q2	Q3	Q4	Q1
Develop Process for Applying GSR	■	■	■			
GSR Evaluations for 12 Pilot Projects		■	■	■	■	
Draft and Final Study Report					■	■



# Current Study Status

Current Project Status	
Draft Final Study Approach Completed (will be modified with Study Results for approach to be used by Army project teams)	
Projects	
Project Stage	No. of Projects
Project teams agree to participate in Study	12
Introductory Step 3 calls completed	11
Step 5 calls scheduled/completed	6/5
Draft GSR evaluation reports completed, in review by project teams	5
GSR incorporation complete	1



# Content of GSR Evaluation for Each Project

## Summary of GSR Best Management Practices (BMPs)

- BMP list guides the collection of information by the GSR Team
- GSR evaluation report summarizes applicability of each BMP
- Highlight GSR practices already implemented

## Quantified GSR Parameters (i.e., Footprint) for a “Baseline Option”

- Environmental
- Economic
- Societal

## Changes to GSR Parameters for Potential Alternatives (when applicable)

- Description of potential alternative options
- Changes from quantified footprint of “Baseline Option”

## Other Qualitative Considerations

- Site-specific considerations not otherwise quantified

## GSR Recommendations



# GSR Parameters Quantified in Study

## Environmental

- Energy Use
- Percent of Energy from Renewable Resources
- Global Warming Potential
- Criteria Air Pollutants
- Hazardous or Toxic Air Pollutants
- Potable Water Use
- Other Water Use
- Refined/Unrefined Materials
- Percent of Refined/Unrefined Materials from Recycled or Reused Sources
- Non-Hazardous/Hazardous Waste Generation
- Percent of Total Potential Waste That is Recycled or Reused
- Land Transferred for Beneficial Use
- Existing Ecosystem Destruction
- Time Frame for Land Reuse
- Flexibility and Breadth of Options for Site Reuse

## Economic

- Life-Cycle Cost, Discounted
- Life-Cycle Cost, Undiscounted
- Up-Front Cost

## Societal

- Increased Risk for On-Site Workers
- Increased Risk for Transportation
- One-Way Heavy Vehicle Trips through Residential Areas

- **SiteWise™ Green and Sustainable Remediation (GSR) Tool**, co-developed by Battelle, the Army, the USACE and the Navy used to calculate many parameters, others are calculated manually outside the Tool. Other GSR Best Management Practices (BMPS) given qualitative consideration



# Tracking Table for GSR recommendations

- Recommendation & date
- Basis of recommendation
- Resources conserved
- Net cost over 5 yrs (qualitative)
- Up-front investment required
- Portion of GSR report where calculations and/or assumptions are provided
- Implementation status and explanation of status

**Can be Updated Over Time**

Recommendation: <i>3.1.2 - Include VFDs for Extraction Pumps</i>		Current Date: 2/5/11
		Date of Original Recommendation: 2/5/11
Basis for Recommendation (Include discussion of cost impacts and value if appropriate):  <i>Reduces footprints for energy use, CO2e, criteria pollutants, and water used to generate electricity. Requires minimal up-front cost, and has a payback period of approximately 3 years. Does not appear to have any significant negative impacts.</i>		
Resources Conserved: <input type="checkbox"/> Hazardous air pollutants <input checked="" type="checkbox"/> GHG emissions (CO2e) <input checked="" type="checkbox"/> Energy <input checked="" type="checkbox"/> Water <input type="checkbox"/> Waste <input checked="" type="checkbox"/> Criteria pollutants <input type="checkbox"/> Safety/Community <input type="checkbox"/> Materials <input type="checkbox"/> Land-use		
Qualitative Net Cost Impact Over 5 Years, No Discounting  <input type="checkbox"/> Cost Increase <input checked="" type="checkbox"/> Cost Savings <input type="checkbox"/> Cost Neutral <input type="checkbox"/> N/A		<input type="checkbox"/> Recommended action otherwise required? If checked, required by:
Level of Up-Front Investment Included in 5 Year Cost Impact: <input type="checkbox"/> Negligible <input type="checkbox"/> < \$10,000 <input type="checkbox"/> \$10,001 - \$50,000 <input checked="" type="checkbox"/> \$50,001 - \$100,000 <input type="checkbox"/> \$100,001 - \$500,000 <input type="checkbox"/> > \$500,000		
Attachment(s) to report with footprint assumptions and calculations:  <i>This alternative is summarized in Section 2.3.3 of this GSR Evaluation Report, and supporting information and/or calculations are provided in Appendix C-3 of this GSR Evaluation Report. SiteWise spreadsheets utilized for evaluating this alternative are attached electronically (SiteWise Alternative 2 directory, as explained in Appendix C-3)</i>		
Implementation Status:  <input type="checkbox"/> Fully <input type="checkbox"/> Partially <input checked="" type="checkbox"/> Not Yet <input type="checkbox"/> Not Planned	Explanation of Status:  <i>This is a new recommendation for the Project Team to consider during the 60 Percent Design.</i>	



# GSR Consideration/Incorporation Tracking

- In all pilots to date, project team summarizing GSR incorporation in project documents. Project teams can also reference GSR evaluation reports if they choose, i.e. in the Administrative Record
- Project Team process also documented by EM CX (over time) by updating the tracking table for each recommendation, with reasons provided regarding the implementation or rejection of each recommendation (what makes sense and when and where)
- EM CX preparing a technical memorandum for each pilot that documents the process through which recommendations of the GSR evaluation report were considered, incorporated, and documented



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# STUDY SAMPLE RESULTS



# Example: Qualitative GSR Best Management Practice

<b>Recommendation</b>	
Submit report appendices and lab reports on CD	
<b>Basis for Recommendation</b>	
<ul style="list-style-type: none"><li>• Annual report is distributed in both hard copy and electronic forms</li><li>• Recommended that lab data and other appendices be distributed electronically instead of hard copy</li></ul>	
<b>Resources Conserved</b>	
Saves paper, shipping, storage space	
Qualitatively reduces hazardous air pollutants, criteria pollutants, GHG emissions, energy, materials, and water (not specifically quantified)	
<b>Qualitative Cost Impact Over 5 Years</b>	<b>Level of Up-Front Investment</b>
Cost Savings	Negligible



# Example: Quantitative GSR Best Management Practice

## Recommendation

Include variable frequency drive (VFDs) for air stripper blower motor

## Basis for Recommendation

Reduces footprints for energy use, CO<sub>2</sub>e, criteria pollutants, and water used to generate electricity. Requires minimal up-front cost, and has a payback period of approximately 3 years. Does not appear to have any significant negative impacts.

## Resources Conserved

Reduces footprints over remedy lifetime (30 years) by the following amounts:

- Electricity Usage - 1.5 million kWh
- Energy - 16,000 MMBtu
- CO<sub>2</sub>e - 1,300 metric tons
- NO<sub>x</sub> - 2.6 metric tons
- SO<sub>x</sub> - 4.5 metric tons
- Water - 770,000 gallons

## Estimated Costs/Savings

Up-Front Cost ~\$7,500

Payback Period <3 yrs

Annual Savings ~\$3,300/yr

Lifecycle Savings ~\$57,000 NPV



# Example: Qualitative GSR Additional Design Option

<b>Recommendation</b>	
Further evaluate an idea (raised during GSR discussion) to dig out part of an existing ditch to allow pooling of surface water for use during remedy construction	
<b>Basis for Recommendation</b>	
<ul style="list-style-type: none"> <li>• Would provide a local source water that could be accessed for water needs during construction of a landfill cap, such as for dust control and cap compaction</li> <li>• Would eliminate the need for a water well and associated infrastructure</li> <li>• Could subsequently serve as flood control and/or a wetlands area.</li> <li>• Low-cost since construction equipment would already be mobilized</li> </ul>	
<b>Resources Conserved</b>	
Groundwater. Also potentially creates additional future wetlands.	
<b>Qualitative Cost Impact Over 5 Years</b>	<b>Level of Up-Front Investment</b>
Cost Neutral	Negligible



# Example: Quantitative GSR Alternative Design Option

## Recommendation

Design P&T to address two plume lobes with separate treatment plants rather than one centrally located treatment plant, plus implement VFDs for extraction pumps

## Basis for Recommendation

Eliminates ~20,000 ft of piping and associated piping. Lowers electrical use due to reduced pumping head plus use of VFDs. Provides greater treatment flexibility. Requires an extra building and some duplicate equipment.

## Resources Conserved

Reduces footprints over remedy lifetime (30 years) such as:

- Electricity usage – 12 million kWh
- Energy – 120,000 MMBtu
- CO<sub>2</sub>e – 10,000 metric tons
- NO<sub>x</sub> - 20 metric tons
- SO<sub>x</sub> - 30 metric tons
- HDPE – 600,000 lbs

## Estimated Costs/Savings

Up-Front Savings ~\$609,500

Payback Period: Immediate

Annual Savings ~\$27,000/yr

Lifecycle Savings ~\$1,100,000 NPV

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# STUDY FINDINGS TO DATE



# Important GSR Integration Considerations

- GSR evaluations are most beneficial when findings and recommendations can be integrated into the remedial process
  - ▶ Example 1: Pump and Treat, design phase
    - GSR evaluation conducted after 30% “conceptual design” which included many details that could be used for the GSR evaluation
    - GSR findings and recommendations could then be considered in the 60% design
  - ▶ Example 2: Pump and Treat, FS phase
    - GSR evaluation will be based on Draft FS which includes development of alternatives
    - GSR findings and recommendations can then be considered in the Draft Final FS
- Highest GSR gains generally found through identification of alternative remedial options
  - ▶ Alternate design options
  - ▶ Optimizations to equipment and/or remedy in existing remedies
  - ▶ Independent review by GSR Study contractor valuable in identifying options
- BMPs the easiest to assess, implement
- Study identifies both existing and additional potential GSR options Most pilots have significant GSR already incorporated



# Important Project Considerations

- **Don't interfere with project schedule**
  - ▶ GSR consideration/incorporation needs to match project schedule
  
- **Be alert to contract considerations**
  - ▶ Even minimal GSR language in contract, easier to incorporate GSR
  
- **Keep GSR results internal until project team approves**
  
- **Provide cost impact**
  - ▶ Cost savings/neutral vs. cost increase options
  - ▶ Payback periods important information for additional upfront expenses
  
- **Determine optimum time to include regulators**
  - ▶ Regulators included early enough so document re-review not necessary
  - ▶ Typical arrangement is regulator notice that GSR is being considered before or in Draft, with regulator review of incorporation of GSR in Draft Final



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# **FUTURE ACTIVITIES**



# Future Activities

- Completion of the Study
  - ▶ Finalization of the Study Approach (combined IRP-MMRP approach). Will be made available on a USACE and/or Army web site
  - ▶ Completion of the remaining Study pilots
  - ▶ Compilation and evaluation of pilot results into the overall Study report. Study to include:
    - GSR practices that make sense (and when and where they make sense)
    - Process that can be used by Army Project Teams to consider, incorporate, and document GSR practices
    - Recommendations for modifications to SiteWise GSR Tool
    - Recommendations for performing cost impact of GSR practices
    - Recommendations for Army-wide GSR policy and guidance
    - Recommendations for revisions to USACE GSR Interim Guidance
  
- Use of the Study results for consideration and development of Army-wide guidance and policy



# Questions?

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