

**Suggested GSR Evaluation Checklist to Complement
other RSE Checklists for Remedy Optimization within
the Remedial Operation Phase of a Remedy**



U. S. Army Corps of Engineers Remediation System Evaluation Green and Sustainable Remediation

Installation Name	_____
Site Name / I.D.	_____
Evaluation Team	_____
Site Visit Date	_____

This checklist is meant to assist the evaluation of Green and Sustainable Remediation (GSR) as a component of Remedy Optimization within the Remedial Operation phase of a remedy. This checklist has the following sections:

- 1) Typical GSR Evaluation Components
- 2) References
- 3) Data Collection, Evaluation of Alternatives, and Potential Cost Savings
- 4) Documenting Results
- 5) Supplemental notes and data

The checklist provides suggestions for information gathering, and space has been provided to record observations and notes from data review and the site visit. Supplementary notes, if required, should be numbered to correspond to the appropriate checklist sections.

1) Typical GSR Evaluation Components

A GSR evaluation typically involves the following components:

- Planning for a GSR evaluation
- Considering GSR Best Management Practices (BMPs)
- Evaluating specific GSR “metrics” (i.e., “quantitative GSR footprints”) and assessing qualitative GSR considerations (e.g., land use, aesthetics, renewable energy)
- Documenting the GSR evaluation and the consideration/implementation of GSR opportunities

2) References

The following references are suggested:

- DoD, “*Department of Defense Manual, Defense Environmental Restoration Program (DERP) Management,*” Publication Number 4715.20 (9 March 2012), Section 6.d.
<http://www.dtic.mil/whs/directives/corres/pdf/471520m.pdf>
- *Detailed Approach for Evaluating Green and Sustainable Remediation (GSR) on Army Environmental Projects*, which is which is Appendix A of the following report: *Final Study Report: Evaluation of Consideration and Incorporation of Green and Sustainable Remediation (GSR) Practices in Army Environmental Remediation*, August 27, 2012
http://www.fedcenter.gov/Documents/index.cfm?id=22322&pge_prg_id=27392

3) Data Collection, Evaluation of GSR Opportunities, and Potential Cost Savings

Refer to the GSR Approach outlined in *Detailed Approach for Evaluating Green and Sustainable Remediation (GSR) on Army Environmental Projects* (referenced above) for details. Planning for the GSR evaluation includes a suggested screening evaluation regarding the applicability of quantitative footprint calculations as part of a project-specific GSR evaluation across the entire environmental life cycle. The subsequent identification and analysis of GSR opportunities includes the following:

- Review Information and Fill Data Gaps
- Fill Out GSR BMP Checklist Tables
- Evaluate Quantitative Footprints (When Applicable) plus Qualitative Considerations
- Document GSR Evaluation Findings and Recommendations

The BMP checklists include GSR BMPs in the following general categories:

- A. Planning
- B. Characterization and/or Remedy Approach
- C. Energy/Emissions - Transportation
- D. Energy/Emissions - Equipment Use
- E. Materials & Off-Site Services
- F. Water Resource Use
- G. Waste Generation, Disposal, and Recycling
- H. Land Use, Ecosystems, and Cultural Resources
- I. Safety and Community
- J. Other Site-Specific BMPs

As mentioned above, the GSR evaluation typically includes quantification of GSR metrics, plus qualitative considerations, that include the following:

- Quantitative Environmental Metrics:
 - Energy Use
 - Global Warming Potential
 - Criteria Air Pollutants (NO_x + SO_x + PM)
 - Hazardous or Toxic Air Pollutants
 - Potable Water Use
 - Other Water Use
 - Refined Materials
 - Percent of Refined Materials from Recycled or Reused Sources
 - Unrefined Materials
 - Percent of Unrefined Materials from Recycled or Reused Sources
 - Non-Hazardous Waste Disposal
 - Hazardous Waste Disposal
 - Percent of Total Potential Waste Recycled or Reused
- Quantitative Economic Metrics:
 - Life-Cycle Cost, Discounted
 - Life-Cycle Cost, Undiscounted
 - Up-Front Cost
- Quantitative Societal Metrics:
 - Risk for Injuries/Fatalities
 - One-Way Heavy Vehicle Trips through Residential Areas

- Qualitative Considerations:
 - Land Transferred or Made Available for Potential Beneficial Use
 - Existing Ecosystem Destruction
 - Time Frame for Land Reuse
 - Flexibility and Breadth of Options for Site Reuse
 - Aesthetics
 - Use of Renewable Energy

These items are typically assessed for a “baseline case” and one or more alternatives to the baseline. Calculations for many GSR metrics are typically performed using the SiteWise™ spreadsheet tool (or equivalent), but some GSR metrics must be calculated outside of such tools. Implementation of a GSR opportunity may have an impact on the life-cycle cost of the remedial process, with respect to the following items that may increase, decrease, or stay the same as a result of the GSR opportunity:

- Up-front costs and/or large non-routine expenses (i.e., capital costs)
- Annual costs
- Remedial process duration

In some cases, implementation of a GSR opportunity may increase life-cycle costs, and presumably this type of GSR opportunity will be implemented only if the perceived environmental benefits of the GSR opportunity are determined by project stakeholders to justify the additional costs. For cases where implementation of a GSR opportunity decreases life-cycle cost, but capital costs are high, the alternative might still not be preferred. When there is a capital cost coupled with a lower annual cost, a “payback period” and “return on investment” can be calculated. Potential constraints that may limit implementation of GSR opportunities include the following:

- Cost, including lack of sufficient capital to meet up-front costs
- Schedule
- Contracting
- Program policy
- Regulatory and public reviews/input
- GSR evaluation timing within the remedial phase
- Other project-specific variables and logistics

GSR opportunities are potentially "practical" if they are feasible from a technical standpoint and provide net benefits as shown from the economic, social, and environmental metrics and other qualitative considerations. However, issues such as those listed above impact the potential implementability of GSR opportunities.

a) Has the GSR Approach in *Detailed Approach for Evaluating Green and Sustainable Remediation (GSR) on Army Environmental Projects* (referenced above) been reviewed?

b) Has the screening evaluation described in Section 2.1.4 of the GSR Approach been performed regarding the applicability of quantitative footprint calculation?

c) Are there significant data gaps that need to be filled before GSR evaluation can be completed?

d) Have GSR BMP checklists from the GSR Approach been evaluated (to serve as an outline for identifying potential GSR opportunities as well as identifying GSR items already considered and implemented)?

e) Have GSR considerations been considered when developing potential alternatives to the current operating (i.e., baseline) remedy?

f) Have GSR metrics (including costs) and qualitative considerations been evaluated for a baseline and alternatives to the baseline?

4) Documenting Results

The results of the GSR evaluation may be incorporated as a section and/or appendix of a Project report (e.g., as part of a Remediation System Evaluation report). In some cases, the entire GSR Evaluation Report will be included as a stand-alone report or Appendix, and in other cases the GSR evaluation results may simply be summarized in a formal Project document or provided as a memorandum. The goal is to document that GSR items were considered and GSR recommendations were implemented when feasible. The use of tracking tables for each GSR recommendation (a template of which is included in the GSR Approach referenced earlier) allows the team to document and explain the basis of each GSR recommendation and the implementation status. Such tracking tables for GSR recommendations can be updated throughout the project with reasons provided for implementation or rejection of each recommendation.

a) Will the GSR evaluation results be part of another report (e.g., a section of an RSE Report) or will the GSR evaluation findings and recommendations be documented in a standalone report or memorandum?

b) Have GSR opportunities previously implemented for this remediation project been documented?

c) Have completed GSR BMP checklists from the GSR Approach been included, and/or have significant findings from the evaluation of GSR BMPs been summarized?

d) Have results of calculation of GSR metrics (if calculated) been presented, and have the methods and assumptions for those calculations been documented?

e) Have tracking tables from the GSR Approach been included for each GSR recommendation to document the basis of each GSR recommendation, the implementation status, and an explanation of the implementation status?

f) Is there a plan to document progress towards implementing GSR opportunities in future project reports?

5) Supplemental Notes and Data

There are _____ pages of supplemental notes and data attached to this checklist.