

Remedial Alternatives Screening by Incorporating Sustainability Metrics and Using Weighting Triangle Decision Support System

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Background/Objectives. In recent years, there has been a growing emphasis to include green and sustainable remediation (GSR) practices in the different phases of remedial action. The remedy selection phase of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) provides an opportunity to lower the overall remedy footprint. The remedy selection under CERCLA includes evaluation of site remedial alternatives based on multiple criteria documented in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). One of the first steps in this evaluation is screening of an initial list (often longer) of remedial alternatives based on the following criteria: effectiveness, implementability, and cost. This step results in a shorter list of remedial alternatives, which are subjected to detailed evaluation.

General approach has been proposed to incorporate sustainability metrics such as greenhouse gas (GHG) and pollutant emissions into the existing CERCLA regulatory framework for the evaluation of remedial alternatives (NAVFAC GSR Guidance 2012). This paper proposes a methodology to objectively map sustainability metrics into the CERCLA evaluation criteria such as effectiveness (long- and short-term), and cost to support screening of remedial alternatives. In addition, weighting triangle is proposed as an approach to effectively and efficiently present the results of the screening evaluation.

Approach/Activities. In accordance with the NCP, the evaluation of remedial alternatives with respect to effectiveness focuses on the degree to which an alternative reduces toxicity, mobility, or volume through treatment, and minimizes residual risks and short-term impacts (i.e. during remedy implementation). Therefore, the remedial alternative evaluation with respect to the effectiveness criterion should give adequate consideration to both primary and secondary impacts. Primary impacts are the impacts to the environment due to on-site contamination. Secondary impacts are impacts due to remediation. Based on this, the following sustainability metrics can be mapped into the effectiveness criterion: energy consumption, GHG and pollutant emissions, water use, resource consumption, worker safety, and community impacts. The evaluation of effectiveness that incorporates sustainability metrics, combined with evaluation based on implementability and cost can be used to screen the remedial alternatives and select a short list of these alternatives to carry forward for detailed analysis. The results of this screening evaluation can be presented using weighting triangle approach to facilitate decision making. The weighting triangle can display under which combination of weighting factors one alternative is better than the other. The different stakeholders involved do not have to set discrete weights but have to agree whether a combination of weights is plausible.

Results/Lessons Learned. Preliminary results of the application of the proposed methodology for a volatile organic compound impacted groundwater indicate that consideration of sustainability metrics impacts the results of the remedial alternatives screening compared to the case where sustainability metrics are not considered. In addition, weighting triangle allows incorporation of transparency and objectivity into this process. The presentation will include detailed discussion of the application of proposed methodology on remedial alternative screening for two case studies.