Environmental Remediation Optimization: Cost Savings, Footprint Reductions, and Sustainability Benchmarked at DOE Sites.

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Objective

To benchmark, train, and evaluate the cost-benefit of Green & Sustainable Remediation (GSR) practices applied to cleanup and closure projects at U.S. Department of Energy (DOE) field sites and DOE Headquarters' management of those projects.

SiteWise™

Excel-based program designed to calculate the environmental footprint of remedial alternatives in terms of sustainability metrics using a method similar to Life Cycle Assessment.
Tool can be applied at any stage: remedy selection, design, implementation, and remedy optimization.
SiteWise™ is designed by United States Navy, United States Army Corps of Engineers, and Battelle.

Input | Metrics

SiteWise™ requires inputs such as material production, transportation, equipment used, residual handling and resource consumption.
Metrics evaluated are greenhouse gas emissions, criteria pollutant emissions, energy consumption, water impact, resource consumption and worker's safety.

Analysis | Results

- Identify high footprint activities.
- Conduct comparative analysis among all of the remedial alternatives.
- Develop list of potential footprint reduction methods.
- Perform cost and footprint sensitivity analysis.
- Include the selected footprint reduction methods in the remedial design.

Case Study
Outfall 200 Mercury Treatment Plant

Two alternatives were analyzed using SiteWise™. Both remediation technologies use Granular Activated Carbon as a treatment media for mercury contaminated water. Alternative A uses virgin GAC, while alternative B uses regenerated GAC as other footprint reduction practices.

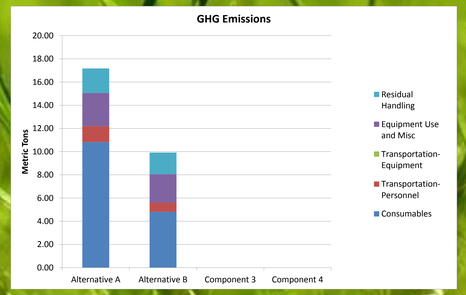

Figure 1: GHG emissions graph of alternatives A and B

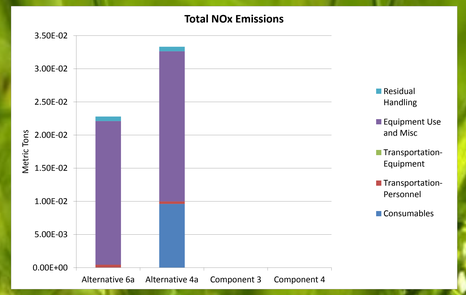

Figure 2: Total NO_x emissions graph of alternatives A and B

Results

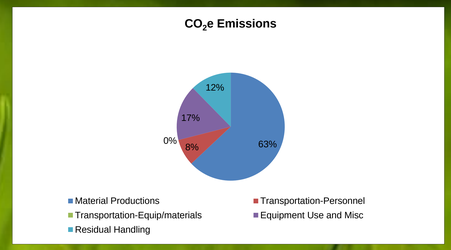

Figure 4: CO_2 equivalents emissions graph for Alternative A

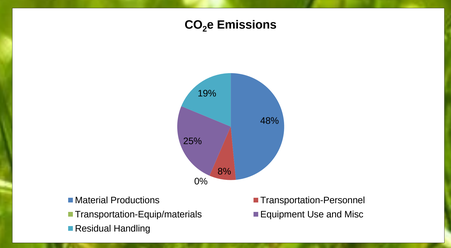

Figure 5: CO_2 equivalents emissions graph for Alternative B

Phase	Activities	GHG Emissions	Total Energy Used	Water Consumption	Electricity Usage	Onsite NOx Emissions	Onsite SOx Emissions	Onsite PM10 Emissions	Total NOx Emissions	Total SOx Emissions	Total PM10 Emissions	Accident Risk Fatality	Accident Risk Injury
		metric ton	MMBTU	gallons	MWH	metric ton	metric ton	metric ton	metric ton	metric ton	metric ton		
Alternative A	Consumables	10.82	5.7E+01	NA	NA	NA	NA	NA	2.2E-05	2.2E-05	1.1E-06	NA	NA
	Transportation-Personnel	1.38	1.7E+01	NA	NA	NA	NA	NA	4.2E-04	1.8E-05	8.6E-05	4.7E-05	3.8E-03
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	2.86	4.3E+01	0.0E+00	0.0E+00	2.0E-02	4.5E-03	1.4E-03	2.2E-02	5.5E-03	1.7E-03	9.1E-07	2.3E-04
	Residual Handling	2.12	2.9E+01	NA	NA	0.0E+00	0.0E+00	0.0E+00	6.8E-04	2.8E-05	5.5E-05	5.4E-06	4.3E-04
	Sub-Total	17.17	1.47E+02	0.00E+00	0.00E+00	1.97E-02	4.52E-03	1.45E-03	2.28E-02	5.61E-03	1.88E-03	5.31E-05	4.43E-03
Alternative B	Consumables	4.81	5.1E+01	NA	NA	NA	NA	NA	9.6E-03	1.3E-02	1.6E-03	NA	NA
	Transportation-Personnel	0.80	1.4E+01	NA	NA	NA	NA	NA	3.7E-04	4.1E-06	8.9E-05	4.7E-05	3.8E-03
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	2.45	5.4E+01	0.0E+00	0.0E+00	2.0E-02	3.7E-03	1.3E-03	2.3E-02	5.1E-03	1.8E-03	9.1E-07	2.3E-04
	Residual Handling	1.86	3.6E+01	NA	NA	0.0E+00	0.0E+00	0.0E+00	6.8E-04	9.8E-06	6.1E-05	5.4E-06	4.3E-04
	Sub-Total	9.92	1.55E+02	0.00E+00	0.00E+00	2.01E-02	3.68E-03	1.30E-03	3.33E-02	1.79E-02	3.53E-03	5.31E-05	4.43E-03

Figure 3: Results table comparing alternatives A and B

Conclusion

SiteWise™ is capable of comparing two or more remediation technologies to evaluate the cost-benefit of GSR practices. It calculates the remedy footprint generation and helps identify areas and methods for potential footprint reduction. In our case study we can see that no one alternative is the best, but we can identify aspects of both to combine them and come up with the most appropriate remediation technology.

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