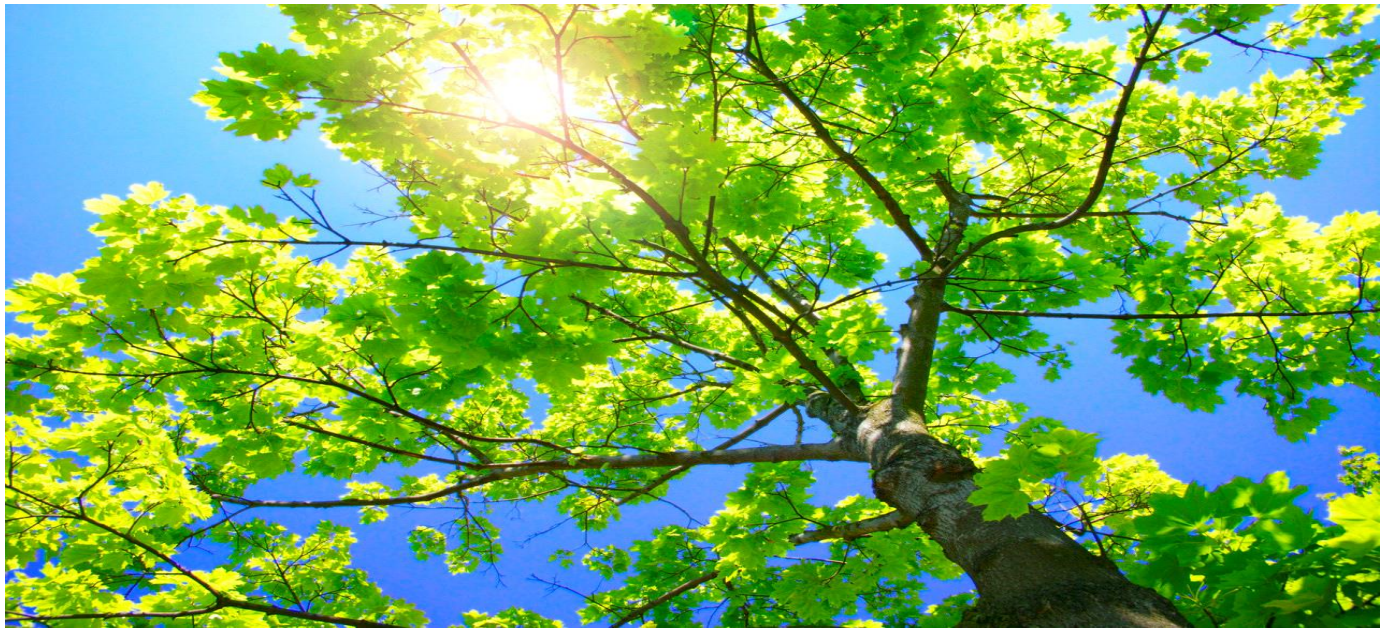
Is Your Cleanup Green?

Compare Using the New ASTM Standard Guide for Greener Cleanups (ASTM E2893-13)



Brad Bradley, USEPA
Cannon Silver, CDM Smith
Nancy Zikmanis, Ohio EPA- DERR

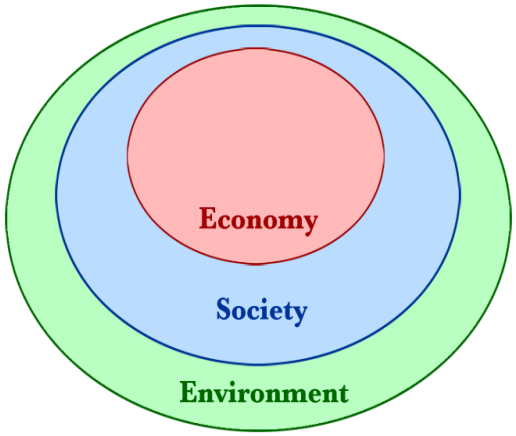
WHY Greener?

Our Past and Our Present

Cuyahoga River Fire of 1969

Today, bustling waterfront of Cleveland

What Does Sustainability Mean?

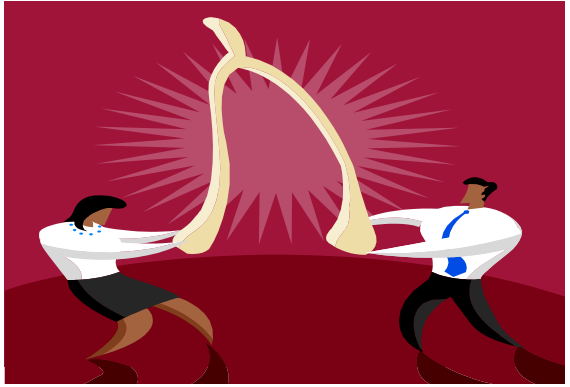


Sustainability is the capacity to endure.

For humans, sustainability is the long-term maintenance of responsibility, which has environmental, economic, and social dimensions, and encompasses the concept of stewardship, the responsible management of resource use.

- - From Wikipedia, the free encyclopedia

ASTM TEAM SPLIT



- Identified there was room for two Standard Guides
- One on Greener Cleanups
  - Focuses on a variety of environmental Best Management Practices and a Quantitative Analysis for Greener Cleanups
- One on Sustainable Environmental Practices in cleanups
  - Documents all three sustainable concepts – Environmental, Economics, and Equity

“Greener Cleanup” Definition in Standard

- The incorporation of practices, processes, and technologies into cleanup activities with the goal of reducing impacts to the environment through reduced demands on natural resources and decreased emissions to the environment.
- A *greener cleanup* considers the five *core elements*, while protecting human health and the environment.
- In the environmental remediation industry, this term is used interchangeably with green cleanup, green remediation, and greener remediation

Sustainable Practices are Brownfield $$ Drivers

- **LEED Certification in Remediation** focus developers to greener options:
  - Green storm water options (biocell, vegetated sediment strips, permeable pavement); bioremediation of ground water; recycling of concrete and asphalt; native vegetation use.
  - Less expensive; more marketable.

- Developer costs focused on **Availability and Cost Reduction:**
  - Use of recycled materials from property; native plants; local labor and disposal facilities.

- Resource focus is **Cost Reduction by Maintenance Reduction**
  - Better survival of native species for landscaping; Lower costs of transportation consolidation and local trips; Reuse of existing infrastructure.

Some Examples of BMPs used <u>before</u> the Standard in Ohio

- Landfills using methane recovery systems to heat small on-site buildings
- Using recycled concrete and brick as clean hard fill on sites
- Recycling steel and wood beams from demolition.
- Bio-remediation material substrates more sustainable (algae, soybean, or molasses)
- Phytoremediation techniques

Two Case Study Examples

- Brownfield - Middletown Regional Hospital

- Remedial Site – NASA Glenn Research Center

Middletown Green Activities Goal: Save $$$

- Planning Activities to Save Costs – Deconstruction of the Hospital
  - Develop recycling plan
    - Crushed aggregate – to be used as backfill
    - Hospital equipment - donations
    - Miscellaneous materials – scrap metal, re-use of materials, etc.
  - Identification of Donor Organizations
  - Planned involvement of regulatory agencies
  - Planned community involvement
    - How to deal with complaints and questions

Benefits of Recycling vs. Landfilling

Concrete Recycled:	25,000 CY
Metal Recycled:	3,127 Tons
Salvage Items Reused:	900 CY
Construction & Demolition (C&D) Debris Not Recycled:	25,975 CY
Net Benefit of Recycling vs. Landfilling:	$635,000.00
Avoidance of Importing 25,000 CY of engineered-fill	$195,800.00

Total Benefit of Recycling vs. Landfilling:
$830,800.00

Cost Savings and More Points in Grant Application

NASA – Glenn Research Center Environmental Projects

Green BMPs Used in Remedial Activities

- **Recycle** or Reuse of building materials.
- **Traffic** control and use of local suppliers/disposal facilities
- **Wood** Sales from clearing of remedial areas, minimize cleared area, and then replant in proper season.
- **Prairie grass** – native species – less maintenance on landfill areas.
- Green requirements in contracting
- **Minimize** off-site disposal (soil reuse and stockpile on site)

ASTM Greener Cleanup Standard Guide Overview

Brad Bradley, U.S. EPA Region 5
Superfund Greener Cleanup Coordinator

ASTM Standard Guide for Greener Cleanups

- What it does:
  - Process for reducing environmental footprint
  - Protocol for contracting purposes and state cleanup programs
  - Incentivize implementation of greener cleanups

Guide Overview

- Released November 2013 E2893-13
- Available to U.S. EPA employees at http://portal.astm.org/CUSTOMERS/filtrexx40.cgi?index.frm
- Most states have a subscription
- available for $60 at http://www.astm.org/Standards/E2893.htm

Guide Overview

- Relies on core elements for framework
- Complements regulatory and voluntary cleanup programs
- Provides a process for implementing best management practices (BMPs)
- Establishes guidelines for a quantitative evaluation
- Includes robust reporting structure to show decision-process and greener cleanup outcomes

Technical Overview

- 160+ BMPs
  - Management categories
  - Core elements
  - Remediation technologies

- Quantitative evaluation
  - Footprint analysis
  - Life cycle assessment (LCA)

Greener Cleanup Standard Guide Outline

- Section 1: Scope
- Section 2: Referenced Documents
- Section 3: Terminology
- Section 4: Significance and Use
- Section 5: Planning and Scoping
- Section 6: BMP Evaluation Process
- Section 7: Quantitative Evaluation Process
- Section 8: Documentation and Reporting
- Appendices: Resources, Technical Summary Form, BMP Table, Information on QE

BMP Table Filters

BMP Categories (10)	Core Elements (5)	Remedial Technologies (11)
Project Planning and Team	Energy	Soil Vapor Extraction
Sampling and Analysis	Air	Air Sparging
Materials	Water	Pump and Treat
Vehicles and Equipment	Materials and Waste	In-situ Chemical Oxidation
Site Preparation/Land Restoration	Land and Ecosystems	Bioremediation/MNA
Buildings		In-Situ Thermal Treatment
Power and Fuel		Phytotechnology
Surface Water and Storm Water		Subsurface Containment & Treatment Barriers
Residual Solid and Liquid Waste		Excavation and Surface Restoration
Wastewater		Ex-Situ Bio/Chemical Oxidation
		Vapor Intrusion Mitigation

BMP Appendix
Example: Pump & Treat

Best Management Practice	Energy	Air	Water	Materials and Waste	Land and Ecosystems
Operate system during off-peak hours of electrical demand, without compromising cleanup progress	X				
Use pulsed rather than continuous injections when delivering or extracting air to increase energy efficiency when nearing asymptotic conditions	X				
Use gravity flow where feasible to reduce the number of pumps for water transfer after subsurface extraction	X			X	
Install amp meters to evaluate consumption rates on a real-time basis to evaluate options for off-peak energy usage	X				
Use on-site generated renewable energy (including but not limited to solar photovoltaic, wind turbines, landfill gas, geothermal, and biomass combustion, etc.) to power cleanup activities	X	X			
Use excess plant steam as an energy source to power cleanup activities	X				

BMP Assessment Process

- BMP Opportunity Assessment- identify all potentially applicable BMPs
- BMP Prioritization- sort based on greatest predicted environmental footprint reductions
- BMP Implementation
- BMP Documentation

Environmental Trade-offs

- It is important to identify and predict the potential impact of trade-offs among the five core elements
- A quantitative analysis can be performed to assist with this process but is generally not appropriate for smaller, less complex sites or emergency removal actions

U.S. EPA Use of ASTM Standard Guide for Greener Cleanups (the GC Guide)

- December 23, 2013 Mathy Stanislaus Memo- "…I encourage you to consider ASTM's *Standard Guide for Greener Cleanups* as an available resource for reducing the environmental footprint of cleanups and furthering the Administrator's themes."
- "I recommend that Regions and OSWER programs facilitate and encourage the use of ASTM's *Standard Guide for Greener Cleanups* in your efforts to implement greener cleanup practices."

Region 5 Plans for Use of the GC Guide

- Provide to all Brownfields grantees
- Provide training that will help grant applicants and recipients build GC considerations into grant application and implementation
- Push for inclusion of language about GC Guide in regional grant terms and conditions

Brad Bradley
U.S. EPA Region 5
Brownfields and NPL Reuse Section 2
bradley.brad@epa.gov
312-886-4742

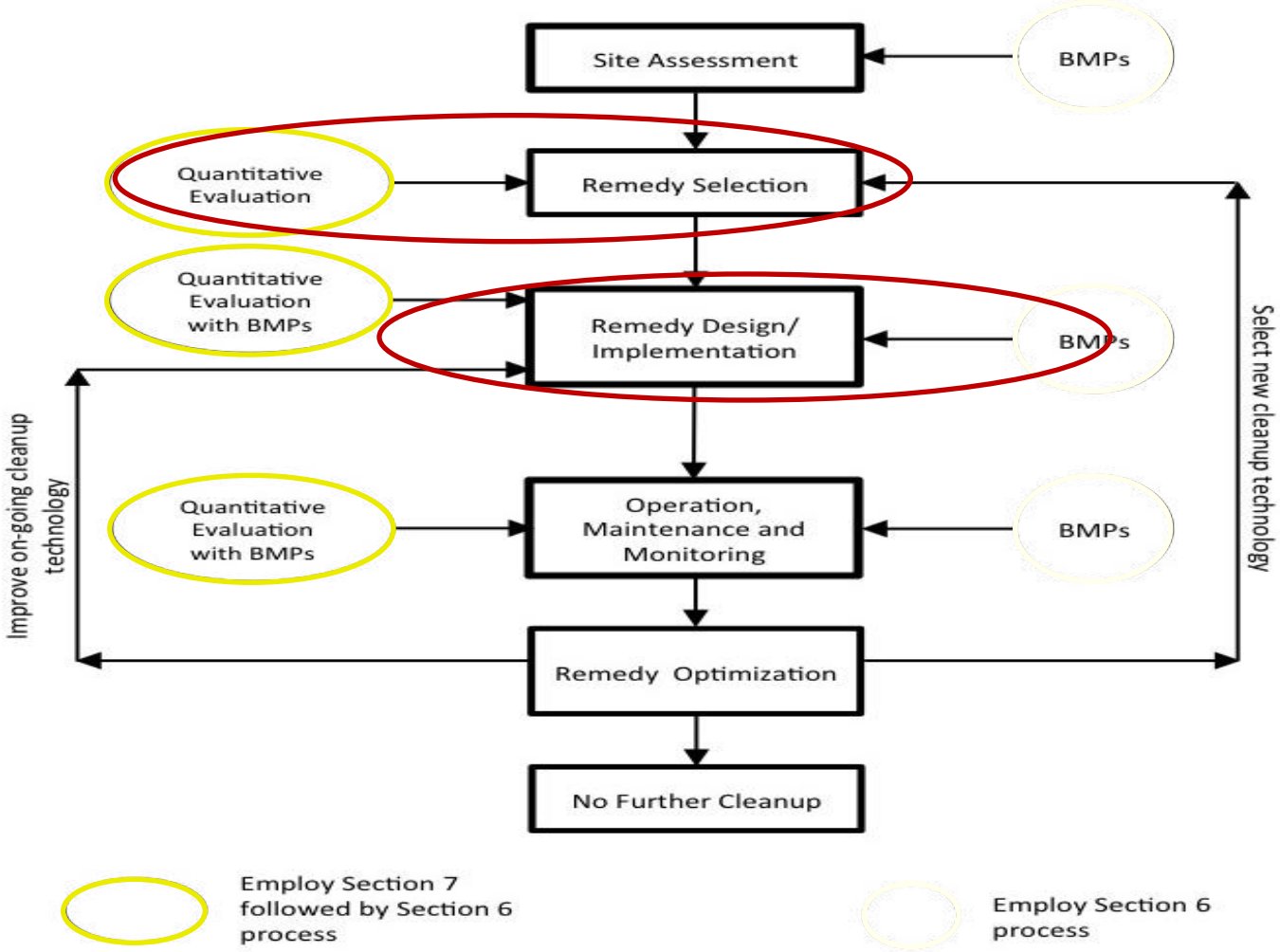
Case Study: Test Driving the New GC Guide

Cannon Silver, P.E.
Principal Environmental Engineer
CDM Smith

Test Driving at Manufacturing Site

- 60 acre manufacturing site
- Soil contaminated with polycyclic aromatic hydrocarbons (PAHs) above state risk-based preliminary cleanup goals
- Applied ASTM standard to two phases:
  - Remedy Selection
    - Applied quantitative evaluation
  - Remedy Design
    - Specify BMPs for the contracting process

Planning and Scoping: ASTM Greener Cleanup Overview



Test Driving during Remedy Selection

QUANTITATIVE EVALUATION

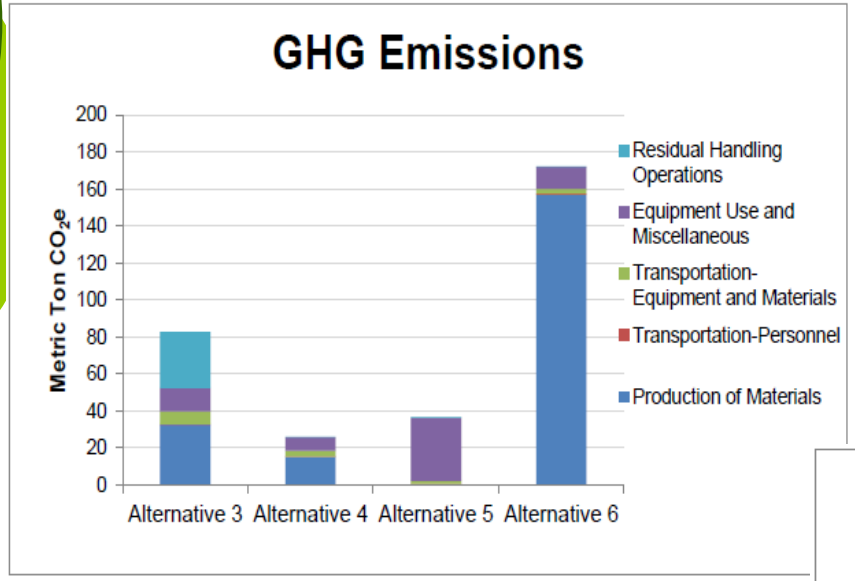
Test Driving during Remedy Selection Phase

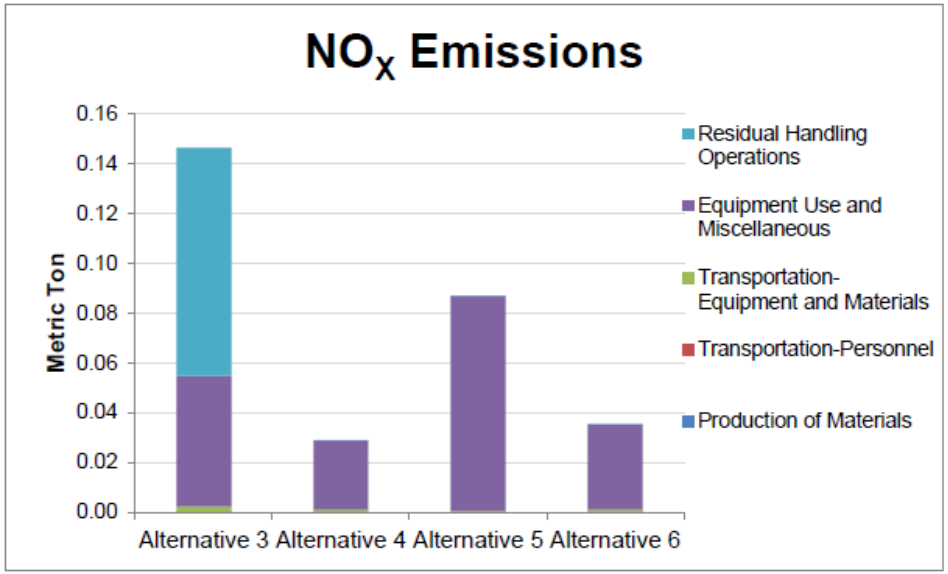
- Developed remedial action objectives
- Evaluated the following remedial alternatives:
  - Alternative 3: Shallow excavation
  - Alternative 4: Soil cover
  - Alternative 5: Enhanced Bioremediation
  - Alternative 6: Stabilization
- Applied Quantitative Evaluation (SiteWise™)

SiteWise™

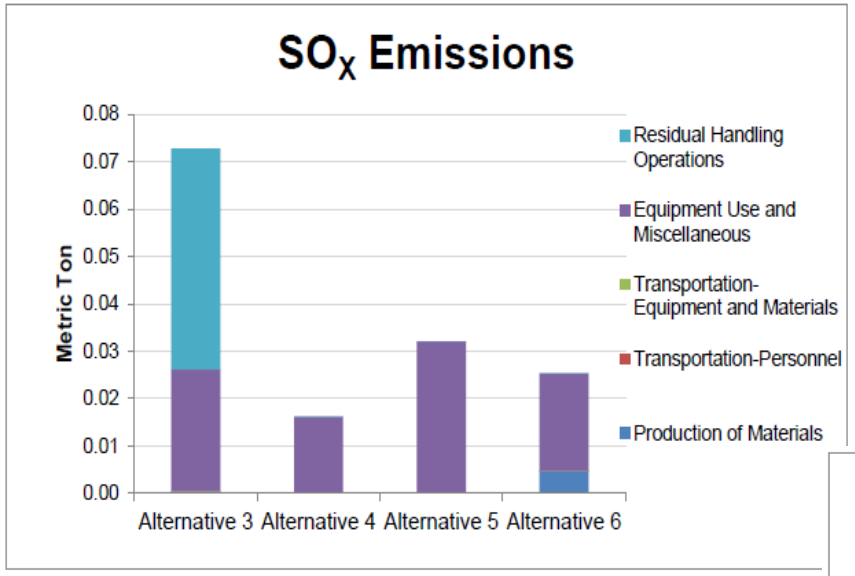
- SiteWise™ quantitatively assesses the environmental footprint of a remedial alternative or technology using a consistent set of metrics
  - Global Warming Potential (greenhouse gas emissions)
  - Criteria Air Pollutant Emissions
    - Nitrogen oxides [NOx]
    - Sulfur oxides [SOx]
    - Particulate matter [PM_{10}]
  - Energy Consumption
  - Water Usage
  - Worker Safety

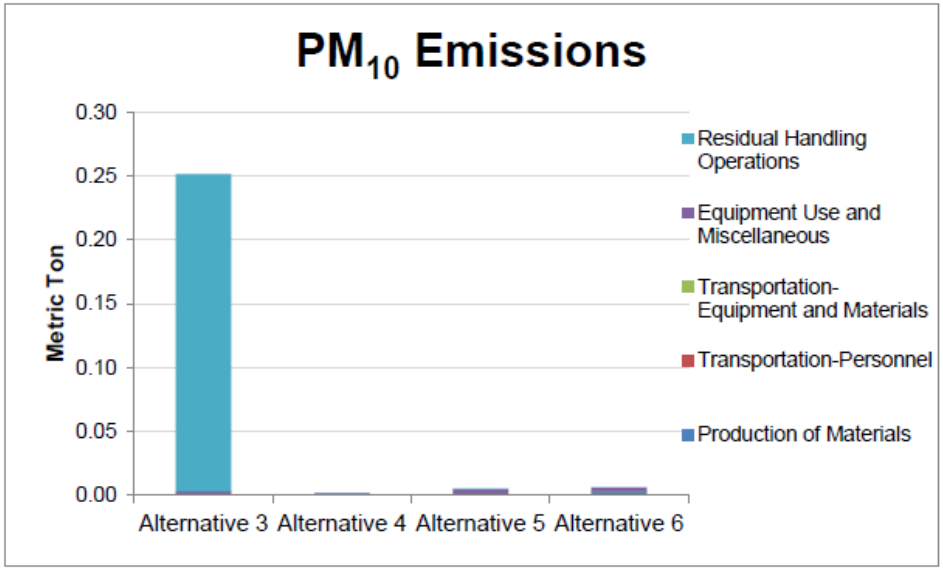
SiteWise™ Comparison Results



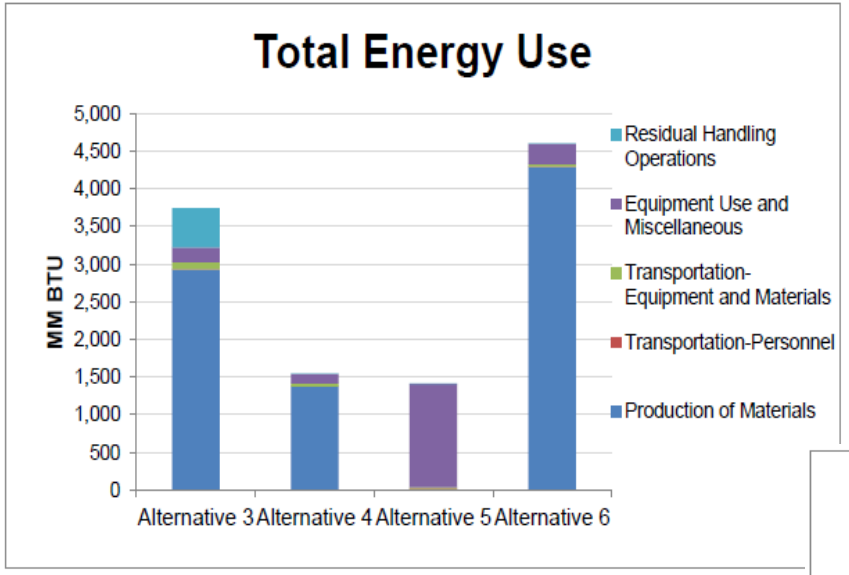


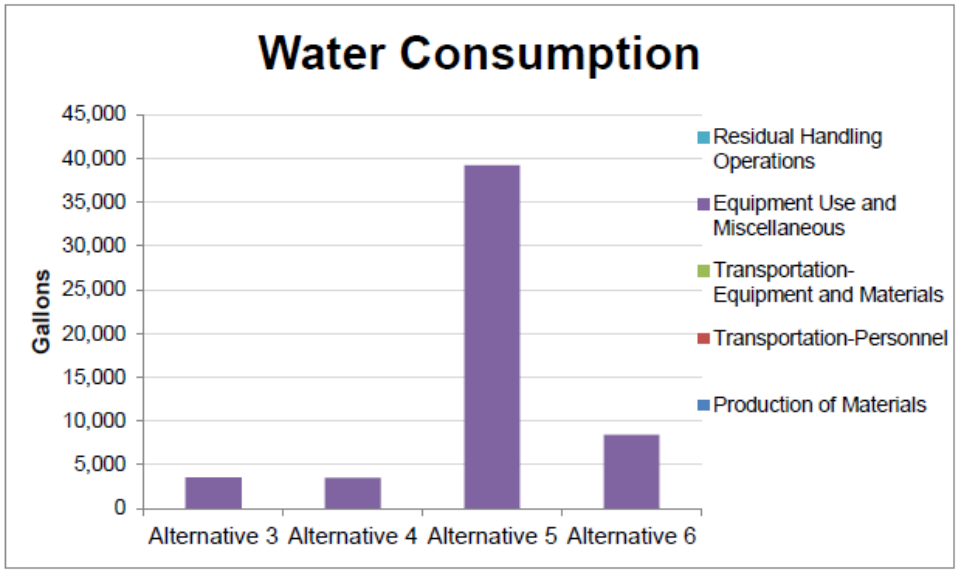
SiteWise™ Comparison Results



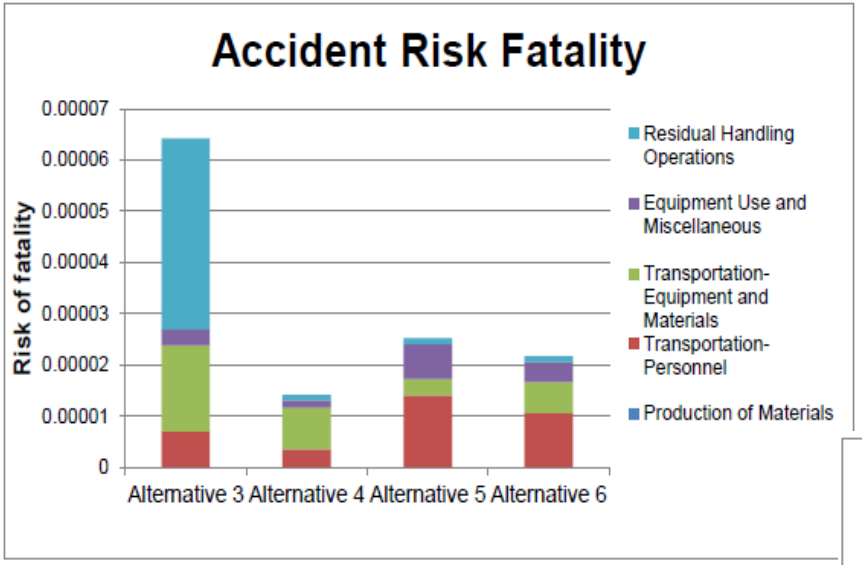


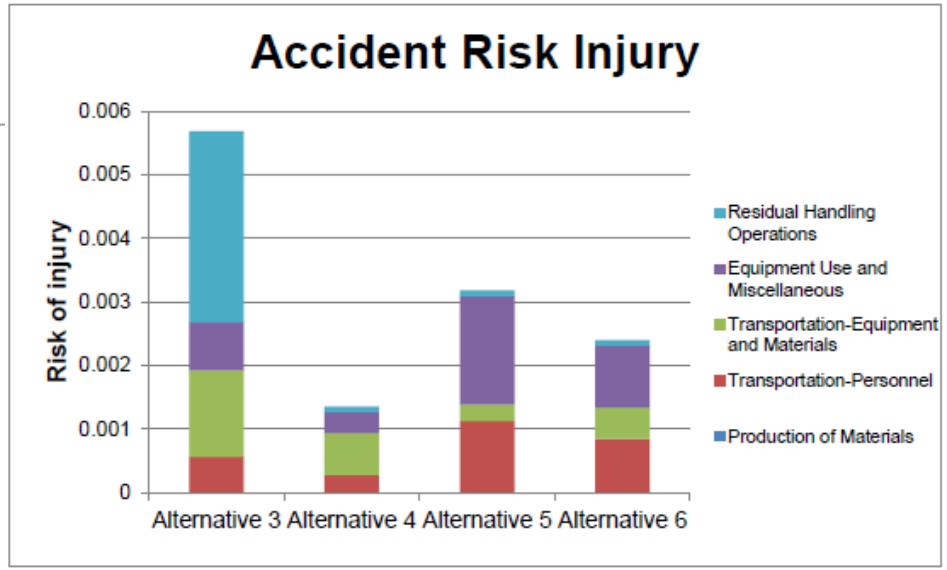
SiteWise™ Comparison Results





SiteWise™ Comparison Results





Evaluation Criteria

- Long-term effectiveness and permanence
- Reduction In Toxicity, Mobility and Volume through treatment
- Short-Term Effectiveness
- Implementability
- Environmental Impacts
- Costs

Scoring of Alternatives

Alternatives	Value	Decision Scores
Alt-3: Excavation to G	0.609	
Alt-5: Enhanced Biore	0.564	
Alt-6: In Situ Stabilizati	0.564	
Alt-4: Soil Cover Over I	0.549	
Alt-2: Institutional Contr	0.543	
Alt- 1: No Action	0.415	

Overall Scoring using CDP

Higher Scores
=
Higher Ranked

- The scoring is as follows :
  - **0.609—Alternative 3 (shallow excavation)**
  - 0.549—Alternative 4 (capping)
  - 0.564—Alternative 5 (bioremediation)
  - 0.564—Alternative 6 (stabilization)
- Shallow Excavation achieved highest ranking:
  - More compatible with future development than Alternative 4
  - Will reach RAOs two to three years sooner than would Alternative 5
  - Is more adaptable than Alternative 6

Test Driving during Remedial Design

BEST MANAGEMENT PRACTICES (BMP)

ASTM Standard BMP Process

Step 1: BMP Opportunity Assessment

↓

Step 2: BMP Prioritization

↓

Step 3: BMP Selection

↓

Step 4: BMP Implementation

↓

Step 5: BMP Documentation

Test Driving BMP Evaluation during Remedial Design Contracting Process

- Followed the draft ASTM protocol to insure BMPs are included during Design and Implementation phase
- Evaluated BMPs that reduce environmental footprint while not creating a large economic impact
  - Identified BMPs considered potentially applicable to the site conditions and cleanup phase
  - Grouped applicable BMPs into categories (e.g., high, moderate, and low) based on relative environmental footprint reduction potential

Site Results of BMP Prioritization: High

- Project Planning and Team Management
  - Surgically target Treatment Zone (TTZ) and select appropriate performance standards to minimize volume requiring treatment relative to remedial goals
    - ✓ Decided to apply residual risk analysis approach for cleanup
    - ✓ Reduced the amount of soil targeted for cleanup by 3,000 cubic yards

Site Results of BMP Prioritization: High (cont)

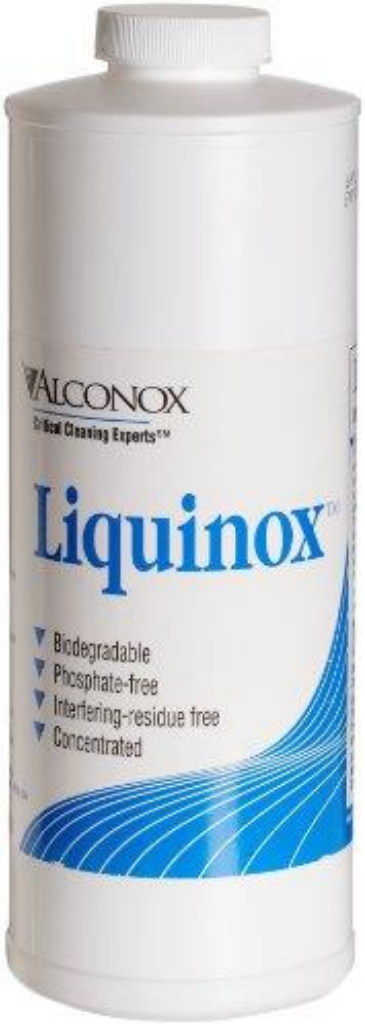
- Surface/Storm Water Management
  - Establish green requirements (e.g., BMPs) as evaluation criteria in the selection of contractors and include language in RFPs, RFQs, subcontracts, contracts, etc.
  - Use local staff (including subcontractors) when possible to minimize resource consumption.
  - Use gravel roads, porous pavement and separated pervious surfaces rather than impermeable materials to maximize infiltration.

Site Results of BMP Prioritization: Moderate

- Site Preparation/Land Restoration
  - Use onsite or nearby sources of backfill material for excavated areas, if shown to be free of contaminants.
  - Plant at the optimum time of the season (e.g. late winter/early spring) to minimize irrigation requirements.
- Power and Fuel
  - Use no or low mowing species between plantings to minimize mowing.

Site Results of BMP Prioritization: Low

- Materials
  - Steam-clean or use phosphate-free detergents or biodegradable cleaning products instead of organic solvents or acids to decontaminate sampling equipment.
- Sampling and Analysis
  - Use a local laboratory to minimize impacts from transportation.
  - Contract a laboratory that uses green practices and/or chemicals.



Test Driving: Documentation and Reporting

ASSESSMENT

Test Driving: Documentation and Reporting

- ASTM Standard Guide for Greener Cleanups language:
  - Step 1: document the process for each cleanup phase (or combined)
  - Step 2: report the documentation to the public along with a technical summary
- Our project
  - Sustainability evaluation documented and submitted as part of feasibility study
    - Submitted to local library and posted on client website
  - BMP requirements incorporated into RFP
- Minimal additional reporting effort

Test Drive Assessment—Qualified Success!

- Quantitative evaluation
  - Did not add costs to our evaluation--already part of our remedy selection process
  - Did not change selected remedy
- BMPs
  - Implemented risk-based approach to reduce volume requiring treatment by 3,000 cubic yards (saving $600K)
  - Will lead to implementation of BMPs and further reduction of environmental footprint
  - Providing consistency during design procurement
- Reporting—adequate flexibility; minimal additional effort

Access to the ASTM Standards

- Search on-line by:
  - ASTM number (E2893-13), or
  - Title (ASTM Standard Guide for Greener Cleanups)
- Working with ASTM to allow the purchase of the BMP table, Appendix X3, as a sortable Excel table

Nancy Zikmanis,
Ohio EPA- DERR
nancy.zikmanis@epa.ohio.gov
330-963-1160

Brad Bradley
U.S. EPA Region 5
Brownfields and NPL Reuse Section 2
bradley.brad@epa.gov
312-886-4742

Cannon Silver, P.E.
CDM Smith
silvercf@cdmsmith.com
614-847-6866