Title: Metrics for Success at Contaminated Sites

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PROBLEM STATEMENT

- How do we demonstrate success and risk reduction in contaminated sites clean up?
WHAT DRIVES CONTAMINATED SITES CLEAN UP

- Policy to protect human health and the environment
- Land transaction/development permits
- (Re-)financing
- Reduce financial liability
- Due diligence/environmental management program
- Regulatory orders (usually due to off-site migration)
- Spill response
Other drivers to clean up sites - Stakeholders

- Concerned employees
- Concerned neighbours
- Negative media attention
- Political pressure
Superfund Remedial Performance Measures

- **Remedial Site Assessment Completions:**
  - # of site assessments completed

- **Remedial Action (RA) Project Completions:**
  - applies to actual construction or implementation of a discrete scope of activities supporting a Superfund site cleanup
  - augments site-wide Construction Completion measure

- **Construction Completion (CCs):**
  - site-wide measure
  - documents where physical construction of all cleanup activities is complete

Source: http://www.epa.gov/superfund/accomplishments.htm
Superfund Remedial Performance Measures (cont’d)

• **Human Exposure Under Control (HEUC):** all identified unacceptable human exposures from site contamination for current land and/or ground water use conditions controlled.

• **Groundwater Migration Under Control (GMUC):**
  1) contamination below risk-based levels, OR if not
  2) migration of contaminated GW stabilized, no unacceptable discharge to SW, and on going monitoring confirm affected GW remains in original area of contamination.

• **Site-wide Ready for Anticipated Use (SWARU):**
  1) construction of the remedy completed,
  2) all cleanup goals achieved to reduce unacceptable risk,
  3) all institutional controls implemented.

Source: [http://www.epa.gov/superfund/accomplishments.htm](http://www.epa.gov/superfund/accomplishments.htm)
RCRA CORRECTIVE ACTION 2008 AND 2020 GOALS

• Site Assessments completed
• Current Human Exposures Under Control: CA725
• Migration of Contaminated Groundwater Under Control: CA750
• Remedy Selected: CA400
• Remedy Construction Complete: CA550
US State Program Success Indicators

- Written Letter of Compliance from Regulators
- “No Further Action” Letter
- Completed Remedial Investigations and Feasibility Studies
- Phases complete
- Acreage made available for reuse
- Amount of $$ on site with what was accomplished
- Worst sites addressed
- No. of site closeouts per year
- No. of sites where Imminent Hazards identified and abated
- Initiating cleanup on a particularly “bad” site
- Remedy Selection and Construction Complete
US State Program Indicators

- Property/parcels transferred
- Documents created (!)
- State concurrences
- NDAI (No DoD Action Indicated) concurrences
- Amount of money spent (!)
- Amount of media treated
- Texas: site cleanups completed and cleanup documents approved
- Issuance of Ready for Reuse Determinations
Measuring success from Community Involvement Perspective (Missouri)

- Was “restoration advisory board” adjourned (good) or disbanded (bad)?
- Are stakeholders/citizens happy with outcome?
- Were stakeholders/citizens able to be actively involved in cleanup decisions? Were they actively involved?
- Are citizens aware of contamination left in place, understanding site restrictions for future generations?
- Is remediated property being used for benefit of community?
CALIFORNIA
(from “Measuring Success: Cleanup of Federal Facilities – State Profiles”)
http://www.astswmo.org

• Public Health and Environment are protected
• Public and stakeholders are informed, empowered and involved
• Land is available for reuse
• Groundwater contamination is prevented and reduced
FCSAP (from: Federal Contaminated Sites Action Plan (FCSAP)
REPORT FOR CANADA’S ECONOMIC ACTION PLAN YEARS (2009–2011))

• **Overview of Program Results 2009–2010**
  – Assessment activities on 3,060 sites cost $56 million
  – Remediation and risk-management activities on 584 sites cost $230 million
  – Adjusted liability increased by $350 million compared to 2008–2009

• **2010–2011**
  – Assessment activities on 2,702 sites cost $55 million
  – Remediation and risk-management activities on 639 sites cost $304 million
  – Adjusted liability increased by $155 million compared to 2009–2010
# FCSAP Indicators


Table 1: Highest Step Completed (HSC) at FCSAP-funded Remediation Sites, 2009–2011

<table>
<thead>
<tr>
<th>Status</th>
<th>No. of sites in 2009–2010</th>
<th>No. of sites in 2010–2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remediation/Risk-management plan being developed (&lt; Step 7)</td>
<td>94</td>
<td>100</td>
</tr>
<tr>
<td>R/RM plan developed (Step 7)</td>
<td>263</td>
<td>312</td>
</tr>
<tr>
<td>R/RM plan implemented (risk reduced) (Step 8)</td>
<td>103</td>
<td>134</td>
</tr>
<tr>
<td>Confirmatory sampling completed (site closed) (Step 9)</td>
<td>119</td>
<td>92</td>
</tr>
<tr>
<td>Long-term monitoring completed (site closed) (Step 10)</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>584</strong></td>
<td><strong>639</strong></td>
</tr>
</tbody>
</table>
RECOMMENDED PROGRESS METRICS ON SITE BASIS

- Site is fully characterized for all matrices (Steps 1-6)
- Remedy is selected (Step 7)
- Human exposures under control – no ongoing unacceptable risk to human health, current use, both land and GW (Step 8)
- Groundwater migration under control – either below risk targets or contaminated GW is stable/contained with no unacceptable discharge (Step 8)
- Construction Completion – physical construction of cleanup activities is complete (Step 8)
- Site is ready for anticipated use (construction completed, no unacceptable risk, institutional controls implemented) (Step 9, 10)
- Site is Closed – No Further Action (Step 9)
- Stakeholder Satisfaction Index
Demonstrating Financial Benefits

– Reducing liability? Usually means subtracting costs incurred from original liability estimate.
– Suggestion: Compare actual costs incurred to meet goals versus worst case, e.g., (“dig and dump” option).
– Example:
  • Site X would cost $3.0 M to dig and dump vs. risk assessment/risk management (10 years LTM) of $250K
  • Cost savings = $3.0M - $0.250M = $2.75M or 92%
Towards a Comprehensive Value/Risk Reduction Indicator

- Use modified NCSCS-based score before and after remediation/risk management
- Focus only one elements that can be directly changed by R/RM actions, i.e., receptor characteristics unlikely to change, but source and pathway characteristics will
- Risk scores should be multiplicative, i.e., risk = source x pathway x receptor, not additive per NCSCS
- Include other factors such as stakeholder satisfaction, public interest, land made available for reuse
- Should be risk reduction multiplication factor based on size and complexity of site, e.g., simple, small site = 1, large complex site, 10.
Conclusions / Outcome

- Many drivers to contaminated sites clean up/risk management => metrics should reflect these.
- We need to do better in showing sites are progressing and $$ spent are beneficial/good value.
- “Site assessed” and “site closed” are two easy milestones but what about progress on sites in between these stages?
- Use $$ saved through Risk Management or other options versus Dig and Dump baseline as possible financial metric.
Thanks

Questions?

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