TWENTY YEARS OF MULTI-AGENCY OPTIMIZATION STUDIES: HISTORY, LESSONS, & TRENDS

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PRESENTATION OVERVIEW

Definition of optimization
Early history of multi-agency cooperation on optimization
Evolution of optimization among agencies
Lessons learned and observations from years of studies
- Impacts to date
- Technological issues
- Characterization issues
- “People” issues
- Contracting issues
- Exit strategy issues

Future trends and issues for optimization

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DEFINITION OF OPTIMIZATION

Paraphrasing EPA's definition:

"Efforts to identify and implement specific actions that improve the effectiveness and cost-efficiency of the remedy. Such actions may also improve the remedy's progress towards site completion."

This emphasizes improvement, not finding true "optimum," but that is okay… "Optimal" perhaps not as robust as "good"

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FEDERAL AGENCY OPTIMIZATION HISTORY

Long History of Federal Optimization Partnerships

Several agencies looking optimization starting in late 1990s:

- EPA
- Air Force
- USACE
- Navy
- DOE

Initial focus: post-construction pump & treat, monitoring

Cross-pollination: agencies invited others to participate

Early Optimization Conference (St. Louis, 1999)

- EPA, with input from Air Force, Navy, DOE, USACE
- Follow-up conference in Dallas, 2004

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EVOLUTION OF OPTIMIZATION

Agency optimization approaches: different but similar

ITRC Remediation Process Optimization - 2003

Optimization: Agencies Team with States (e.g., New Jersey, Georgia, California)

Agencies identified the commonalities to optimization

- Independent, expert review
- Holistic, balanced (effectiveness & cost) review
- Constructive, inclusive with project teams

EPA, USACE collaborated on monitoring optimization guidance 2005

EPA, Navy, USACE collaborated on ESTCP projects to demonstrate modeling, monitoring optimization

- Other SERDP/ESTCP projects

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EVOLUTION OF OPTIMIZATION, CONTINUED

Expansion of Optimization Umbrella

Parallel efforts with Triad optimization of characterization

Recognition of the importance of closure strategy

- ITRC Fact Sheet

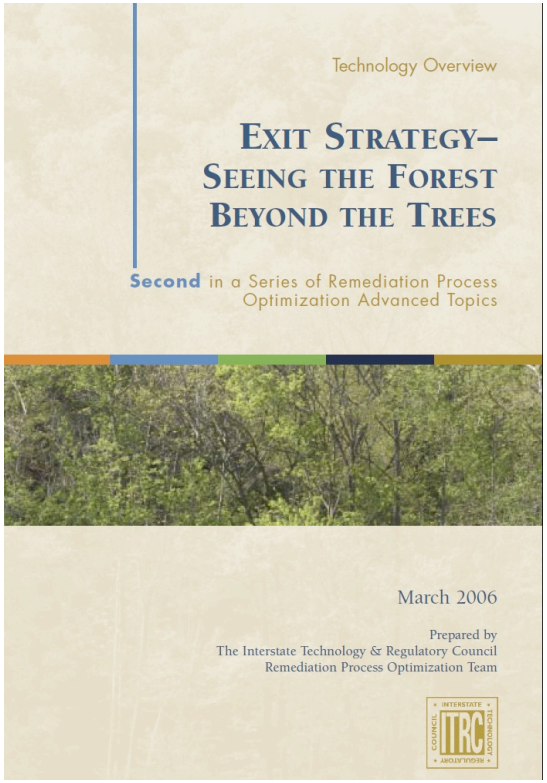
Need for a well founded conceptual site model

- Became integral in Air Force & EPA optimization

Expansion of optimization to include all life-cycle phases

- EPA emphasizes integration of optimization

Shift to performance-based contracting



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OBSERVATIONS AND LESSONS LEARNED

Efforts having an impact!

Project teams and contractors are usually aware of optimization and looking for opportunities

- Team members more aware of new technologies
- Continued technology transfer efforts (e.g., webina
- Some teams routinely conduct “internal” optimization

Monitoring optimization quite widely applied

Most operators are well qualified

- Systems are largely well maintained (though hav seen some exceptions)

Many recommendations implemented with real cost savings, increases in performance

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OBSERVATIONS AND LESSONS LEARNED, CONTINUED

Technological issues

Projects for optimization are “aging”

- Many systems are now decades old, equipment needs replacing

Dramatic shift to in-situ technologies

- Improvements to amendment selection, dosing, delivery definitely needed
- ITRC Injection Optimization team

Recognize limits to achievable end points

- Treatment train, transitions to MNA more common
- Source area treatment, focus on mass discharge

Flaws in feasibility studies

- Assumption that all alternatives have equal likelihood of success
- Have trade-off of cost and uncertainty

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OBSERVATIONS AND LESSONS LEARNED, CONTINUED

Characterization issues:

Very common to find inconsistencies in conceptual site model

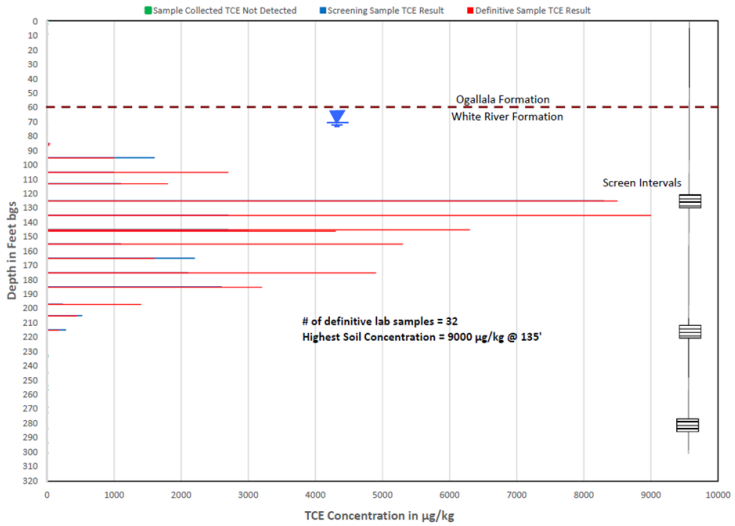
- Miss plume extent, pathways (including vapor intrusion)
- Validates need for independent optimization
- Affects cost, protectiveness
- Not updating conceptual site model based on remedy performance

Need for high resolution site characterization

- improve efficiency and protectiveness
- shorten time to attainment of goals

Consider emerging contaminants

- 1,4-dioxane, PFAs



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OBSERVATIONS AND LESSONS LEARNED, CONTINUED

Issues with people:

Still some reticence, suspicion

- Optimization team must be positive, tactful, forward-looking
- Key point – all cleanups must change, nothing wrong with modifications after start-up
- Sell concept of adaptive management

Motivating teams to implement recommendations

- Follow up required, back with funding for changes
- Realistic estimates for implementation

Senior staff retiring

- Difficulty in finding, accessing expertise for optimization

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OBSERVATIONS AND LESSONS LEARNED, CONTINUED

Contracting issues:

Performance-based contracts (PBCs) are powerful tools, but…

- Federal agencies inconsistent in crafting performance goals, metrics
- Inherit unexpected liabilities at end of contract period
- Too much emphasis on cost, not enough on technical risks
- Need qualified oversight by agencies to assure expected progress
- Independent optimization can help identify problems, risks, seed ideas for next PBC.

Other incentives to optimize

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OBSERVATIONS AND LESSONS LEARNED, CONTINUED

Issues with "exit strategy":

There are few good examples

- ITRC guidance
- DOE guidance for SVE, pump and treat transitions

Need flexibility in decision documentation

- Allow adaptive management with contingencies
- Emphasize adaptive management concepts
- Flexibility in setting "end" goals

Management should provide clear programmatic strategy

- Can have cleanup fast or cheap, but not both – tell us what you want
- Cost/benefit tradeoff – some small investments can shave decades off of the time to cleanup
- Uncertainties in predicted timeframes, modeling often required

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LOOKING FORWARD

Future issues/trends of federal remedy optimization

Focus on optimization for aging sites

- Recommendations regarding old remedial infrastructure
- Ideas to address sites that plateau above cleanup goals

More recognition of other natural attenuation processes

- abiotic processes, co-metabolic processes

Consideration of climate change on some long-term remedies

Increased use of formal, numerical optimization techniques

- High-performance and cloud computing makes powerful tools available for our projects
- Optimize exit strategy milestones (e.g., Parker et al., 2017)

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LOOKING FORWARD, CONTINUED

- Optimization to suggest new life for old technologies
  - Aggressive pump and treat with injection
  - Permeability enhancement for overcoming diffusion limitations
- Developing the next generation of optimization experts
  - Mentor young professionals
  - Value technical expertise in agency staff
  - Get them to see many sites!
- Programmatic and systematic reviews
  - Optimization studies have been intense looks at one site
  - More impact for quick looks at many sites?

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SUMMARY AND QUESTIONS

Federal agency partnerships fostered cross-pollination of optimization principles

Federal optimization efforts have had an impact

Nature of optimization is changing as technologies change

Agencies must look forward to assuring capability for independent, expert optimization that impacts entire portfolio of sites

Questions?

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