Developing an Exit Strategy to Facilitate the Remedial Decision Process

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Presentation Overview

- Basis for Developing an Exit Strategy (DERP Goals)
- Key Elements of an Exit Strategy
- Case Example: Vadose-Zone Soil Exit Strategy
- Case Example: Groundwater Exit Strategy
- Relevance to CTC and STC Estimates
- Q&A

Current DERP Goals

- Goal 1:
  - Desired Endpoint: Reduce risk to human health and the environment
  - Means: through implementation of effective, legally compliant, and cost-effective response actions.
- Goal 2:
  - Desired Endpoint: Make property environmentally suitable for transfer.
- Goal 3:
  - Means: Put final remedies in place, and
  - Desired Endpoint: complete response actions.
- Goal 4:
  - Desired Endpoint: Expedite termination of DoD-funded environmental liabilities
  - Means: by completing specific stages of the response process by specific dates (i.e., milestone requirements).

Current DERP Implementation

Perceived lack of progress toward meeting Goal 1 has resulted in mandated schedules to

- **Expedite termination of DoD-funded environmental liabilities by completing specific stages of the response process by specific dates (i.e., milestone requirements) (Goal 4),**

So that Components can show that they have

- **Put final remedies in place (Goal 3),**

Which presumably will allow DoD to

- **Make property environmentally suitable for transfer (Goal 2),**

Assuming that the Component has

- **Reduced risk to human health and the environment through implementation of effective, legally compliant, and cost-effective response actions (Goal 1).**

But the critical element of this decision logic is missing ….

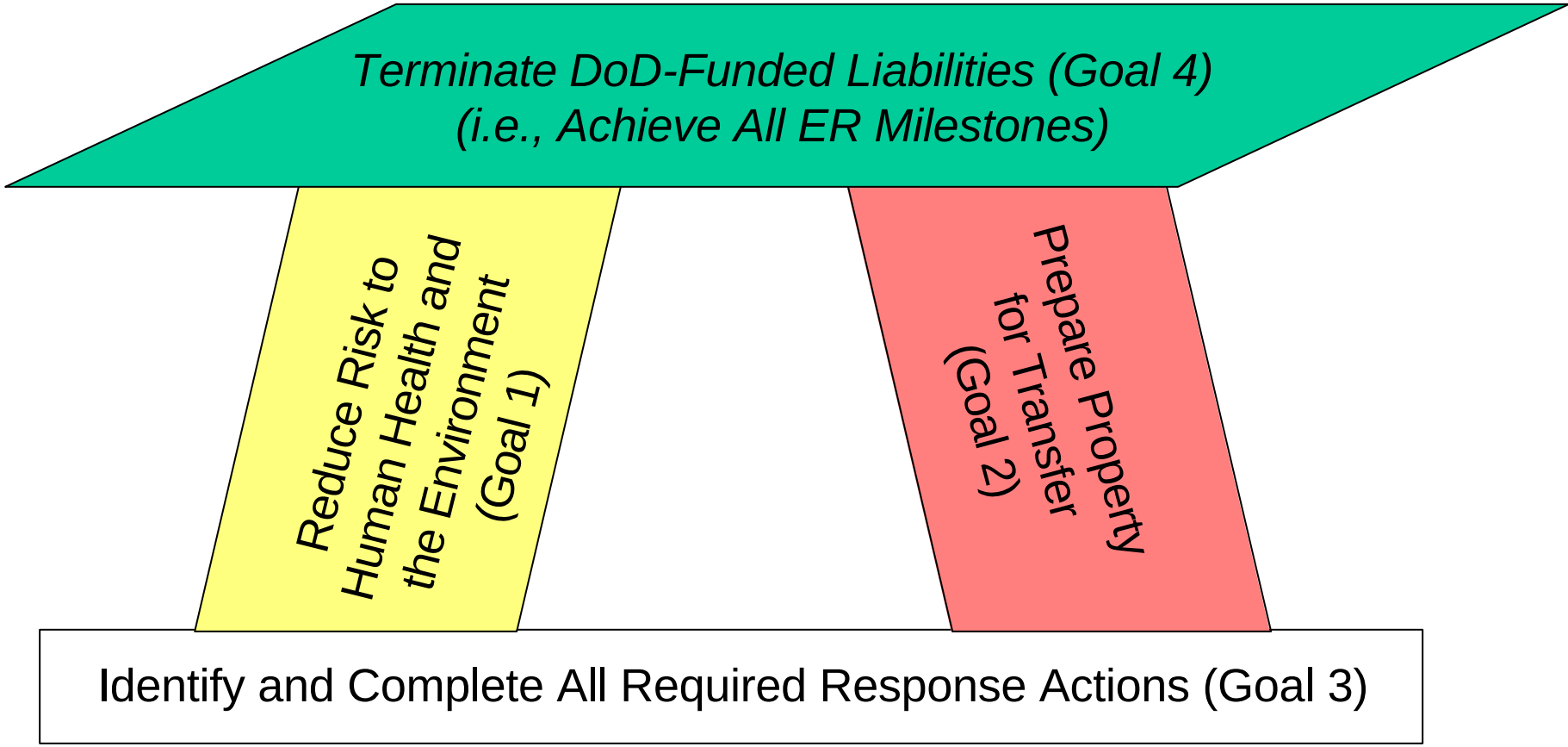
Refocusing on the Ultimate ER Goal

- **The ultimate goal of the DERP is to *complete* all environmental response actions (*Goal 3*), not just to put remedies into place or achieve administrative milestones**

- **A well-defined exit strategy - endorsed by all stakeholders in advance of final remedy selection and implementation – can minimize surprises and long-term impacts on being able to achieve the DERP goals**

- **Exit strategies are consistent DERP requirements and with CERCLA and RCRA Reform objectives**

Foundation of the DERP



Air Force & DLA Approach

- **Remedial Process Optimization (RPO) program was initiated to review P&T systems and all other remedial plans that require long-term response or management**
- **RPO emphasizes use of:**
  - **More effective <u>long-term</u> groundwater remediation strategies (i.e., alternative cleanup methods and *achievable* remedial action objectives, or RAOs)**
  - **Short-term system optimization opportunities**
- **Designed to support more realistic cost- and schedule-to-complete (CTC and STC) estimates**

RPO is DoD's investment in "smarter/faster/cheaper" ER strategies

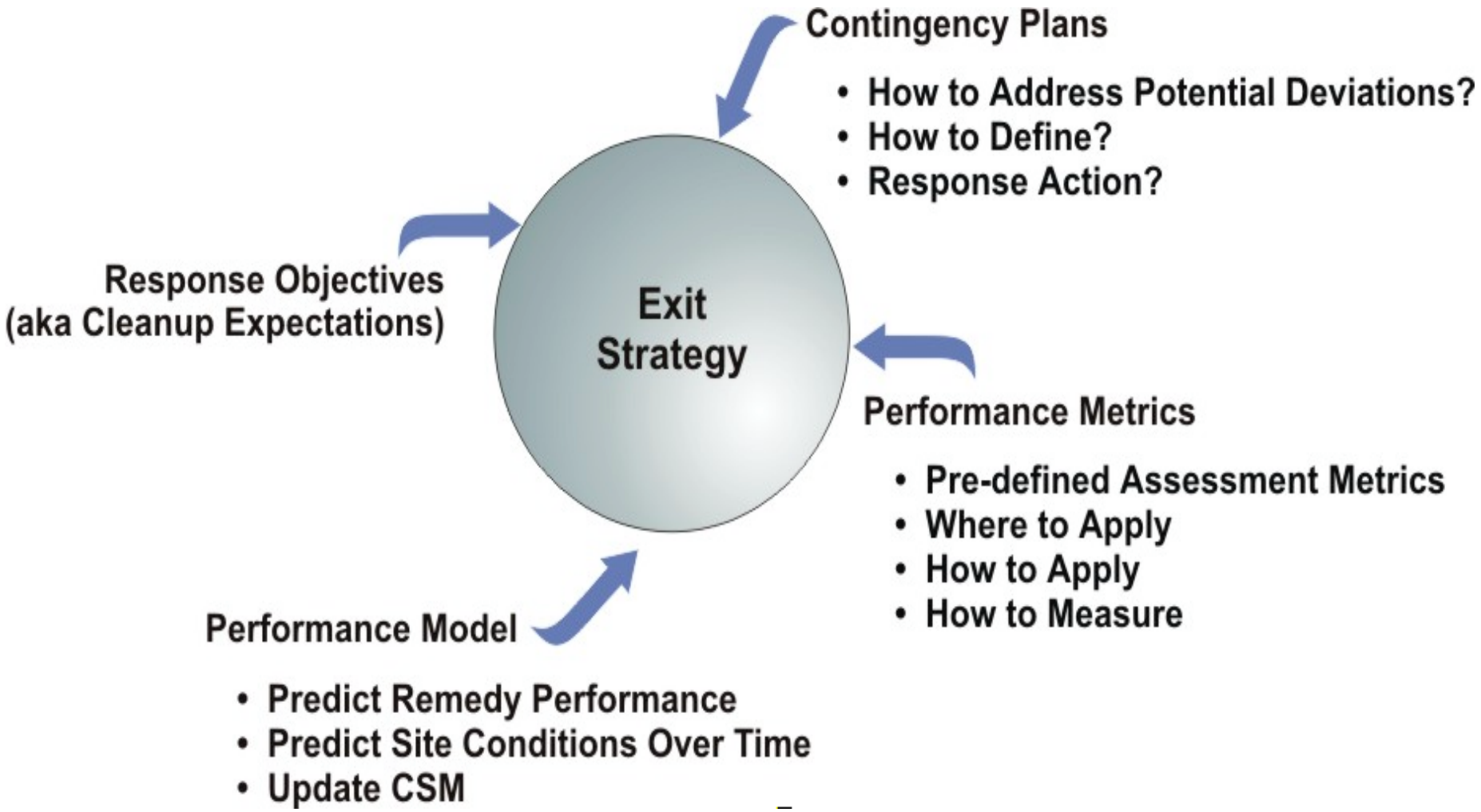
Implementing the DERP with RPO

- **An "exit strategy" requires *realistic* assessments of the:**
  - **Complexity of site conditions,**
  - **Performance capabilities of available remedial technologies and management options,**
  - **Protective alternatives to "default" and/or infeasible RAOs, and**
  - **Degree of confidence in data necessary to terminate response activities**
- **An independent assessment of your ERP honors the Superfund/DERP process, which calls for periodic "reality checking" of prior stakeholder ER decisions**

The Basics of RPO

- **<u>What:</u> A comprehensive third-party performance evaluation of remedial systems and/or remedial plans**
- **<u>Why:</u> To comply with the DERP by**
  - **Verifying that the remedial strategy is capable of achieving RAOs in a reasonable time-frame (Can we do what we *say* we can do? What *can* we do? How much will it cost and how long will it take?).**
  - **Identifying "smarter/faster/cheaper" remedial strategy (What's the best strategy to achieve <u>all</u> of our ER goals?).**
  - **Improving the operational effectiveness of remedial strategies (Can we increase the short-term effectiveness of limited DoD resources?).**
- **<u>When:</u> Ideally, during the remedy planning process, or during the CERCLA five-year review process**

Defining an Exit Strategy



Exit Strategy Elements

- **Clear and concise problem statement that**
  - **Specifies the condition(s) requiring action**
  - **Bounds the likely response(s) appropriate for consideration**
  - **Focuses data collection on reducing key uncertainties to support remedy selection and implementation**
- **Specification of the information needed to demonstrate that**
  - **Desired remedy performance has been achieved**
  - **Response objectives have been met**
  - **Associated activities can be terminated**

Exit Strategy Elements

- **Environmental progress/performance metrics**
  - **Mechanistic milestones (e.g., issuance of ROD, RD completion)**
  - **Results-based milestones (e.g., progress toward cleanup objectives, environmental indicators of compliance)**

- **Remedy development and implementation must be consistent with the overall exit strategy**
  - **Establish performance-based metrics in decision process**
  - **Incorporate evolving site and remedial knowledge into remedy development and review process**
  - **Encourage real progress toward achievable cleanup goals**

Building an Exit Strategy

Preliminary Assessment

Is a site releasing or have the potential to release hazardous contaminants into the environment?

No → No further action (Not an OU)

Yes ↓

Is emergency response/IRA warranted?

Yes ↓

- Implement emergency response/IRA
- Establish qualitative RAOs for IRA (not final RAOs)
- Factor risk-reduction/remedy-performance data into final remedy planning

No ↓

SI/RI

- Define & delineate nature and extent of site-related contamination
- Initiate development of RAOs
- Determine the need for response (baseline risk assessment)
- Identify possible response technologies (treatability studies)

↔

FS

- Identify RAOs required to protect human health and the environment
- Identify potential ARARs (which may be waived)
- Narrow alternatives to <u>technically feasible</u> options
- Evaluate long-term effectiveness & permanence potential
- Consider statutory preference for treatment
- Determine short-term effectiveness
- Implementability
- Cost
- Regulatory/Public Acceptance

→ **Go to ROD for final remedy**

Implementing an Exit Strategy

Final ROD

- Detail each remedial component
- Describe basis for each component
- Identify short-term and final RAOs
- Describe performance metrics to assess progress toward RAOs
- Outline contingency plans

RD/RA Phase

- Develop plans and specifications for each remedial component to ensure OPS and site completion
- Define decision criteria for each remedial component (monitoring requirements and if/then decision logic toward interim and final RAOs)
- Establish **results-based methodology for interpreting system O&M and groundwater monitoring data**
- Integrate project cost/schedule tracking data with technical performance data
- Periodically evaluate need for contingency plans
- Implement selected remedial action (RA)

Construction complete listing (CCL)

CCL/PCOR

Interim RA Completion Report (GW/SW only)
Preliminary Closeout Report (PCOR)

- Use site-specific O&M and other periodic environmental compliance monitoring data **to verify and attribute** progress made by each specific remedial component toward RAOs
- Project timeframe to achieving final RAOs
- Acknowledge any early potential for material deficiencies (e.g., non-compliance events, variances from design to operation, anomalous temporal-trend data)
- Include RA contract inspection results and/or OPS documentation (for engineered systems only)
- Confirm consistency with other OUs toward facility closeout

Final RA/Site Completion (All Media)
Final Closeout Report (FCOR)

- Continue extended **non-RA O&M phase** (e.g., verification monitoring)
- Present detailed information on the remedy performance
- Verify attainment of final RAOs (through required series of formal RA completion inspections)
- Summarize project costs and technology performance results into a "lessons learned" synopsis

Steps to Response Complete

Where Focus Needs to Shift

Ensure Metrics are Established to Demonstrate When RAOs Are Met

Where Focus Gets Stuck

Pick a Remedy & Get It Installed & Operating

Start

Implement Any Required IRA

RI/FS

What is our potential problem & how might we solve it?

Identify COCs/RAOs

What can we **realistically** remediate to be protective?

Final ROD

How do we plan to achieve and document compliance with final RAOs?

RD/RA/CCL

Design & implement remedy & conduct remedy shake-down

Initiate RA O&M, Prepare PCOR

Verify remedy progress toward final RAOs and facility closeout (long-term prove-out)

Achieve Completion Criteria

Demonstrate reliable attainment of final RAOs

Finish

Prepare FCOR, Delete OU, Initiate non-RA O&M Requirements

Document completion of ER obligations, move facility toward being able to be de-listed from final NPL, initiate verification monitoring

Can delete each OU individually, or wait for full facility de-listing effort

Exit Strategy Planning

- **Questions for strategy planning discussions:**
  - **Is there a problem requiring action?**
  - **If so, what is the problem?**
  - **What are the appropriate actions to consider?**
  - **What uncertainties must be reduced prior to selecting a remedy, and what uncertainties can be managed during remedy implementation (i.e., data needs *vs*. data gaps)?**
  - **What information will be used to demonstrate when the action is complete (i.e., that RAOs have been achieved)?**
  - **What information will be used to trigger implementation of an alternative remedial action should the selected remedy fail to meet response objectives?**

Remedy-Specific Case Example: Soil Vapor Extraction

- **The Castle AFB SVE Termination or Optimization Process (STOP) protocol provides metrics that enable the Component to optimize or shut-down soil-vapor extraction systems by documenting specific performance data**

Sets Up Three Decision Criteria → **Provides 13 Performance/Cost Metrics to Evaluate Criteria** → **Allows SVE System to be Optimized or Shut Down**

- **All stakeholders endorse the STOP protocol during the remedy planning stage, thereby avoiding later disagreement on when a site has achieved "response complete" status**

Groundwater Case Example: Defense Supply Center Richmond

- DSCR is an NPL site with multiple source areas and at least three groundwater contaminant plumes
- Groundwater COPCs are CAHs and various inorganics
- COPCs originated from submerged landfill wastes, and other potential DNAPL release areas
- CAHs have affected two water-bearing units and have migrated off-facility to the east
- A P&T IRA was installed in 1996 as part of a phased response to control off-site CAH plume migration, initiate risk reduction, and reduce CAH mass
- Extracted groundwater is treated via air stripping and discharged to surface water
- No final cleanup goals have been established for groundwater at DSCR

Comparative-Outcomes Analysis

Previous ER Strategy

- P&T system presumed to be a core element of the final GW response
- Incomplete CSM limited design requirements of P&T to organics only
- Lack of emphasis on RAOs suggests MCLs = “default” RA endpoint
- Negligible mass-removal achieved demonstrates that P&T not feasible to effect COPC recovery
- Hydraulic constraints allow only partial COPC containment
- Off-site contamination not specifically targeted by planned RA
- Inter-media transport and release mechanisms not considered

Proposed Exit Strategy

- Supplement P&T with source control and alternative *in-situ* treatment/containment
- Expand CSM to address source and nature of all COPCs
- Establish spatially-defined and protective alternate concentration limits (ACLs)
- Refocus P&T objectives on containment and optimized treatment capacity; supplement with alternative treatment options
- Supplement with alternative containment systems (e.g., passive barriers)
- Consider zones of attainment for compliance, and point-of-use treatment
- Complete comprehensive risk assessment in support of ACLs for all media

DSCR Path Forward to Groundwater Response Complete

Long-term RA O&M begins (and never ends … response never complete because MCLs not achievable)

Performance-based RA O&M begins (and ends in a reasonable timeframe because ACLs are achievable)

Retain and expand P&T as final GW remedy

Pursue MCLs as policy-based cleanup requirements

Supplement P&T with "smarter/faster/ cheaper" alternative technologies

Replace policy-based cleanup goals with health-protective ACLs (waive MCLs with TI, equivalency, cost-benefit, inconsistency determinations)

No Defined Exit Strategy

IRA

Performance-Based Exit Strategy

Lessons Learned (or not)

Exit Strategies & CTC Estimates

- **CTC estimates = $$ required to *terminate* ER activities based on site-specific evaluations**
- **CTC estimates help answer these questions**
  - **Where should we focus our $$?**
  - **How much $$ do we need now and in the future?**
  - **Are we on track to response complete? If not, why not?**
  - **Are there any short-term $$ savings opportunities?**
- **CTC estimates must include all anticipated costs required to achieve RC at each site**

  RD + RA + RA-related O&M + management
- **Per the DERP, *you must have an exit strategy* (RAO definition, RA performance metrics, termination criteria) in order to prepare a CTC estimate**

You May Now Develop and Execute Your Own Exit Strategy!

Thanks for Your Attention and Have a Great Evening!