

# Optimization Reviews An Opportunity to Consider Exit Strategies









Federal Remediation Technologies Roundtable



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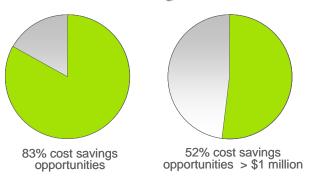




# **Superfund Optimization Results To Date**

Based on an analysis of 52 of 100 optimized sites

#### Cost savings



Similarly positive findings for the other 48 optimized sites...

and >\$350M in potential cost savings/avoidance for all 100 sites.

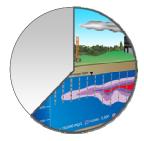
#### Improved protectiveness



19% eliminate or confirm no ecological exposures



33% eliminate or confirm no human exposures



62% improve or confirm control of plume migration

~45% of sites include recommendations for CSM or characterization improvement!

#### Perspective

- Definition by perspective, statute, program
  - EPA Superfund no formal definition
  - AFCEE example
- exit strategy n 1. a method or plan for extricating oneself from an undesirable situation 2. a plan and timetable for withdrawal from a military engagement 3. the method by which an investor intends to cash out of an investment
  - Collins English Dictionary Complete & Unabridged 10th Edition 2009 © William Collins Sons & Co. Ltd. 1979, 1986 © HarperCollins Publishers 1998, 2000, 2003, 2005, 2006, 2007, 2009

# **How Might Exit Strategies Help in Superfund?**

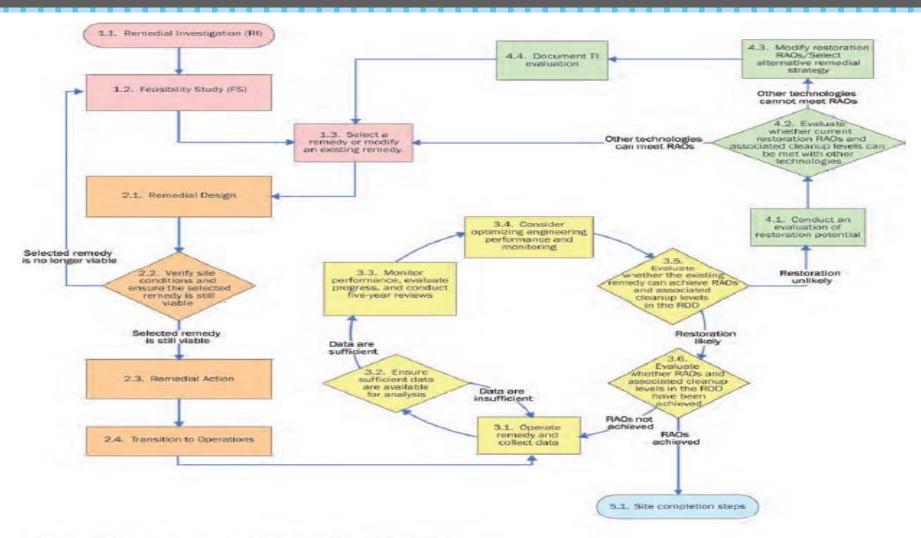
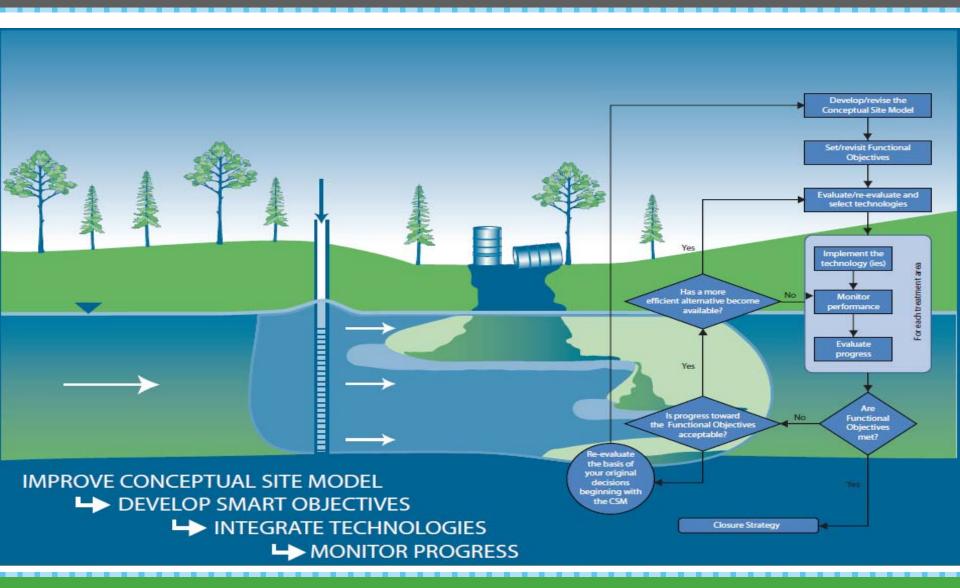
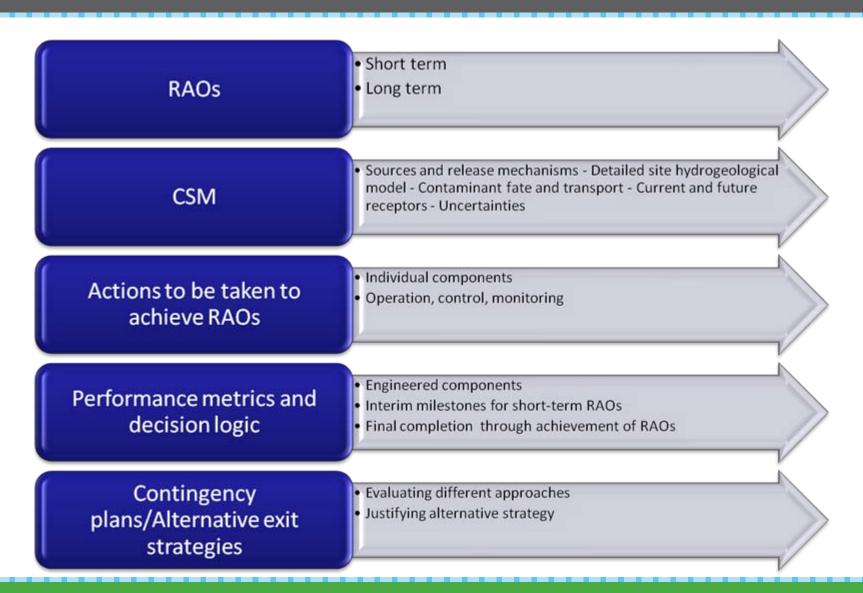


Figure 1: Recommended Process for Restoring Contaminated Groundwater at Superfund Sites

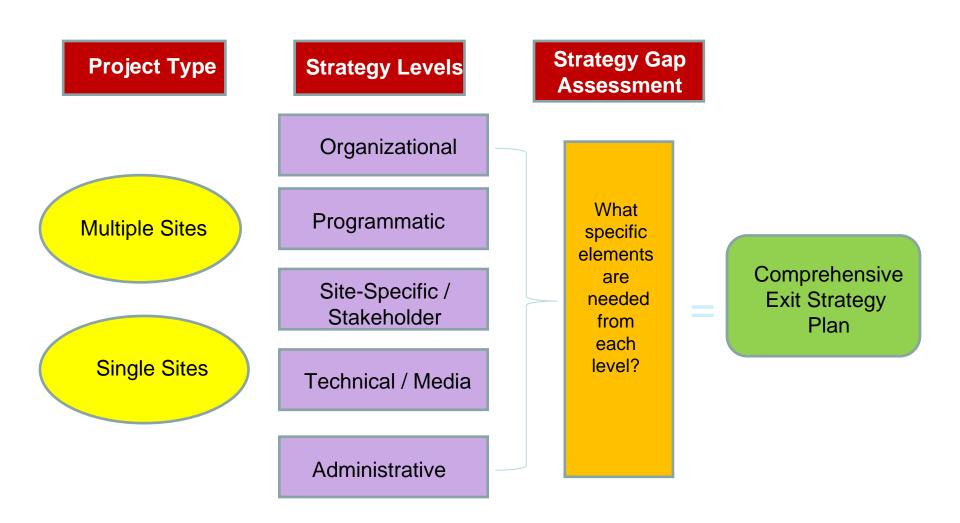
# **ITRC Nov 2011- Integrated DNAPL Site Strategy**



# The Usual Suspects



# **Elements Potentially Applicable to Exit Strategies**



# Exit Strategies Viewed Through The Superfund Optimization Lens

- No identified data sufficiency or statistical techniques to close sites very near attainment
- Historically focused on CSM elements
  - Source identification, strength, hydrogeologic context, data consistency with CSM
  - Plume delineation and stability, concentration trends, attenuation processes/strength/speed
- Make case for data sufficiency for conclusions to date and future needs for completion
- 3 Superfund optimization examples

#### Well 12A

#### Oil recycling/solvent processing- VOC contamination

- Original ROD 1983, RODA 1985, ROD modification 1987
- Remedial actions- GETS, VES, filter cake excavation
- 5 yr reviews- 1993, 1998, 2003, 2008
- RSE 2001
- State operating the groundwater treatment plant since October 2005
- 3D visualization and site-wide optimization 2009/2010

#### 2009/2010 Findings

- GETS not capturing TCE
- High concentration soils- shallow filter cake, deeper zones likely feeding dissolved plume
- Important hydrogeologic features- anaerobic/aerobic conditions,
   areas of significant potential matrix diffusion

# Well 12A exit strategy

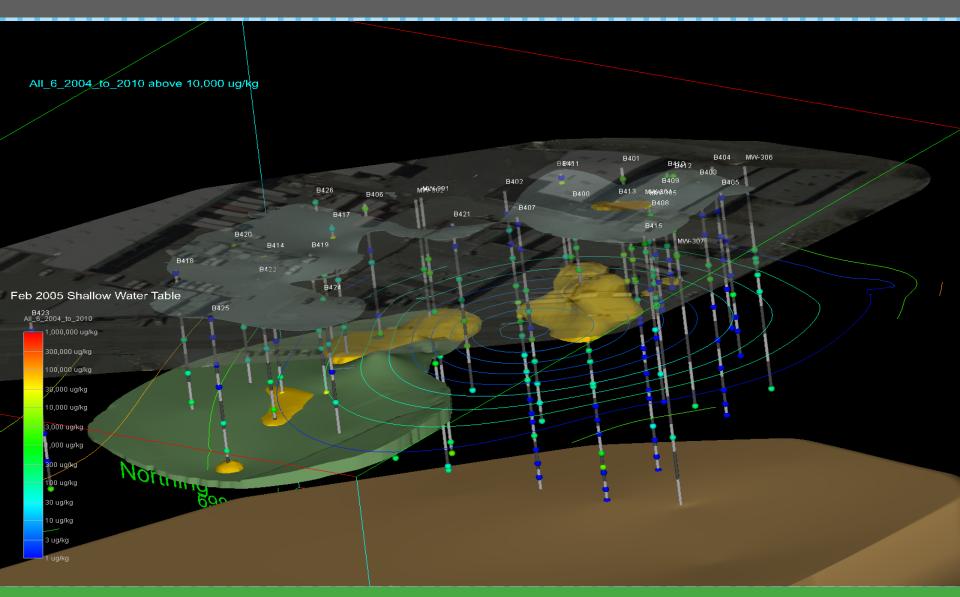
#### Articulate desired end state in 2010 RODA

- Adequate use of robust source removal, timely transition to polishing steps
- Reduce/eliminate need for pump and treat
- Appropriate reliance on MNA, mass flux metrics
- Adaptive, flexible implementation

#### Define actions (spatial), metrics (temporal)

- Shallow excavation, focused thermal footprint
- Enhanced anaerobic bio near source dissolved phase
- Transition to MNA, monitoring/modeling to assess RAO of MCLs at municipal well

### Well 12A



#### Palermo Wellfield

- TCE at municipal well identified 1993
- ROD 1999
  - Wellhead air stripper treatment system (PCE, TCE)
  - SVE at upgradient dry cleaner (operated 1998-2000)
  - French drain system- shallow GW, VI
- Subsequent monitoring and 5 year reviews
  - CSIA- minimal degradation, TCE source investigation
  - Plume delineation, capture, VI?

# Palermo Wellfield- Optimization and Exit Strategy

#### Wellhead treatment effective, continue active remedy

- Plume capture question remains, recommended well locations and minimal data necessary
- Select sampling frequency reductions

#### Vapor Intrusion

- Base VI RAOs on indoor air/soil gas rather the GW depth
- Crawlspace survey plus 2 additional focused sampling events, VI assessment/SVE effectiveness at dry cleaners

#### Shallow GW

Surface water expression, aeration pond

#### Other

- TCE upgradient source
- Data management, extraction rate/volume reporting, City agreement

## **Applied Materials**

- Site characterization 1983, NPL 1987, GW ROD 1990
- The groundwater extraction and treatment system
  - 1985 and 1999 in the A zone
  - 1990-2002 the A2 zone
  - Phased out due to low COC recovery (1996-2002)
- Intermittent low level exceedences
  - 1,1,1 TCA and TCE below cleanup levels across site
  - TCA Daughter products 1,1-DCE and 1,1-DCA exceed
- Hydrogeology, primary contaminant sources, plume morphology, attenuation trends all well understood

# **Applied Materials Exit Strategy**

- Closure clarity
  - Attainment throughout aquifer = all COCs, all wells
- MAROS- reduced monitoring frequency
  - Specific wells and frequencies
- CSM and concentration trend analysis
  - Active remediation not necessary/limited value
  - Source largely depleted, limited secondary sourcing resulting in daughter product exceedences
- Policy, statistics, data standard questions remain

# **Applied Materials**

TABLE 1 SUMMARY RESULTS FOR APPLIED MATERIALS SELECT WELLS 1996 - 2011

#### Applied Materials Building 1, Santa Clara, California

WellName	Number of Samples	Number of Detects	Percent Detection	Mann-Kendall Trend	Statistically Below Standard*?	Date of Final Sampling Event
1,1-Dichloroethane						
AM1- 1	13	11	85%	D	NO	1/9/2003
AM1- 5B	14	5	36%	D	YES	1/8/2003
AM1-10	13	13	100%	D	NO	7/11/2003
AM1-11	23	22	96%	D	NO	1/18/2011
AM1-2	8	0	ND	ND	YES	1/8/2003
AM1-5E	35	34	97%	D	NO	1/18/2011
AM1-6	37	36	97%	S	YES	1/18/2011
AM1-7	36	36	100%	NT	NO	1/18/2011
AM1-9	7	0	ND	ND	YES	1/8/2003
AM1-EP	11	10	91%	NT	YES	1/8/2003
AV- 1B	25	24	96%	D	NO	7/20/2006
AV- 7A	10	4	40%	D	YES	7/20/2006
1,1-Dichloroethene						
AM1- 1	13	11	85%	D	NO	1/9/2003
AM1- 5B	14	0	ND	ND	YES	1/8/2003
AM1-10	13	11	85%	D	NO	7/11/2003
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AM1-6	37	36	97%	D	NO	1/18/2011
AM1-7	36	36	100%	D	NO	1/18/2011
AM1-9	8	0	ND	ND	YES	1/8/2003
AM1-EP	11	0	ND	ND	YES	1/8/2003
AV- 1B	24	21	88%	NT	YES	7/20/2006
AV- 7A	11	1	9%	NT	YES	7/20/2006

#### **Opportunities**

- Integrated approaches across multiple strategy levels
- Clear framework
  - Improved framework for technical and media strategies
    - Specify data sufficiency, temporal aspects, statistics
  - Include organization, program, stakeholder, administrative elements
- Streamlined and cost effective
  - 8-10 pages with tables and figures
  - < 25K for development</p>
- Build consensus, goal oriented, includes schedule/budget elements, measures progress for interim and final goals
  - Continuity, automate decisions
  - Opportunity to revisit at a prescribed frequency (annually?)

# Questions

