Open Environmental Restoration Resource (OER2) Webinar

EPA's Superfund Optimization Program

Presented by:

NAVFAC Environmental Restoration Program

Logistics

- **Submit all questions via chat box throughout the presentation**
- **Presentation is being recorded**
- **Complete the webinar survey (main feedback mechanism)**

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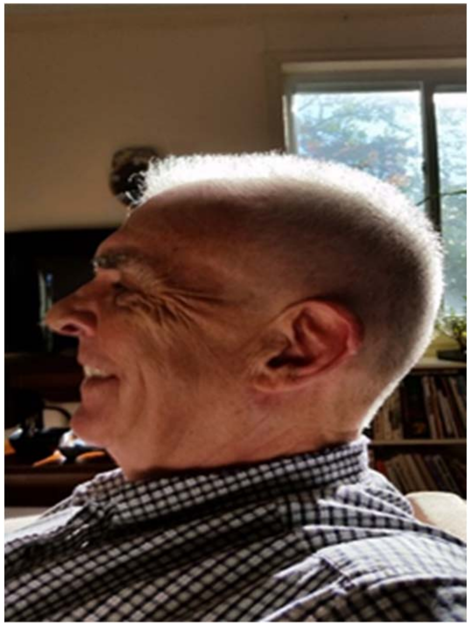
Speaker Introduction

Kirby Biggs (Presenter)



- Superfund Office, National Optimization Program Lead
- Specializes in:
  - –Superfund Technical Support
  - –Remedial System Evaluations
  - –LTM and Optimization Studies
  - –Strategic Planning and Budgeting.
  - –Regulation and Policy Development

- B.A. Economics, University of Virginia
- M.A. Public Policy, University of Maryland

Biggs.Kirby@epa.gov

Speaker Introductions

Carlos Pachon (Presenter)

- Senior Environmental Protection Specialist (EPA)
- Based at HQ Superfund Office in DC
- Specializes in
  - Advancing and Promoting Best Practices
  - Identifying New Clean-up Technology
  - Produces Superfund Optimization Progress Report
  - Green Remediation
  - Integrate Climate Resilience in Clean up Programs

- B.S. Colorado State University
- M.S. Environmental Management, Duke University
- MBA Georgetown University

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OER2 Webinar Series

- **Why Attend?**
  - –Obtain and hear about the latest DOD and DON's policies/guidance, tools, technologies and practices to improve the ERP's efficiency
  - –Promote innovation and share lessons learned
  - –FEEDBACK to the ERP Leadership
- **Who Should Attend?**
  - –ERP Community Members: RPMs, RTMs, Contractors, and other remediation practitioners who support and execute the ERP
  - –Voluntary participation
- **Schedule and Registration:**
  - –Every other month, 4th Wed (can be rescheduled due to holidays)
  - –Registration link for each topic (announced via ER T2 email)
- **Topics and Presenters:**
  - –ERP community members to submit topics (non-marketing and DON ERP-relevant) to POCs (Gunarti Coghlan – gunarti.coghlan@navy.mil or Tara Meyers – tara.meyers@navy.mil)
  - –Selected topic will be assigned Champion to work with presenter

Superfund Optimization: Progress, Outcomes, and Strategy

OER2 Webinar Series
March 21, 2019

U.S. EPA

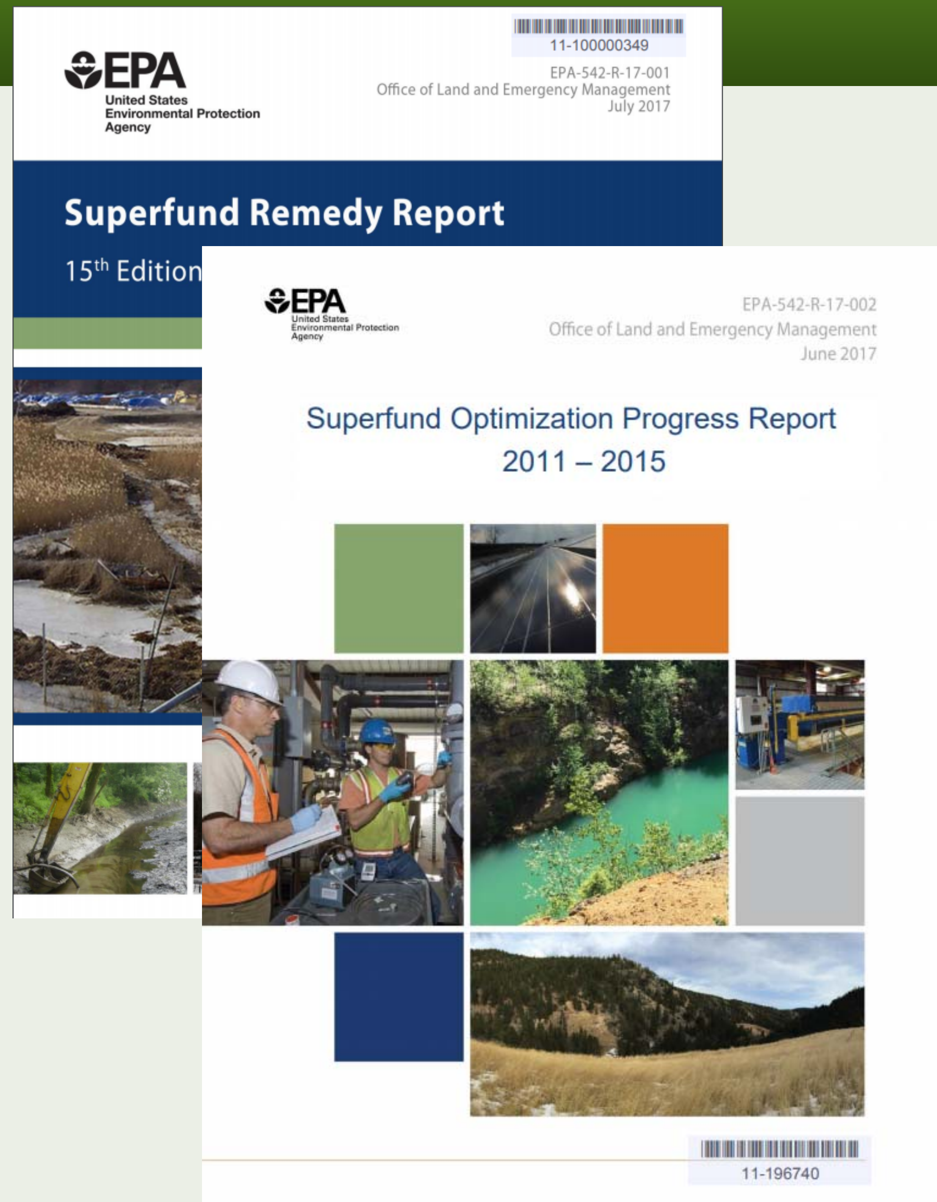
Office of Superfund Remediation & Technology Innovation

Presenters: Kirby Biggs, Carlos Pachon

EPA
United States
Environmental Protection
Agency

Today's Presentation

- The genesis of optimization in Superfund
- Key Elements of Superfund Optimization Program
- Optimization 101
- Findings from the 2017 Superfund Optimization Report
- Practical Lessons Learned in Superfund's Optimization Program
- Concluding remarks



EARLY YEARS OF SUPERFUND: AN HISTORICAL DRIVER FOR OPTIMIZATION

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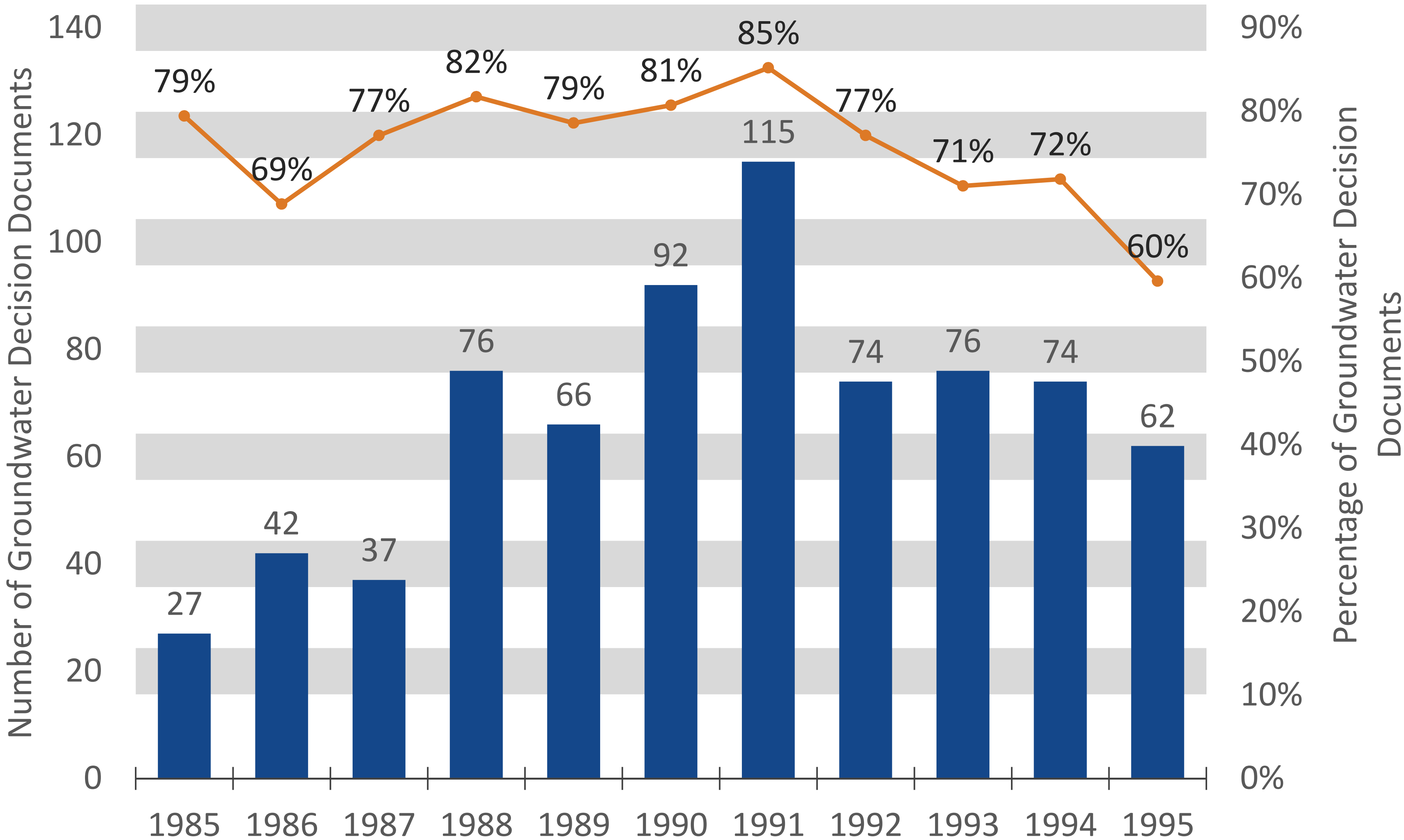
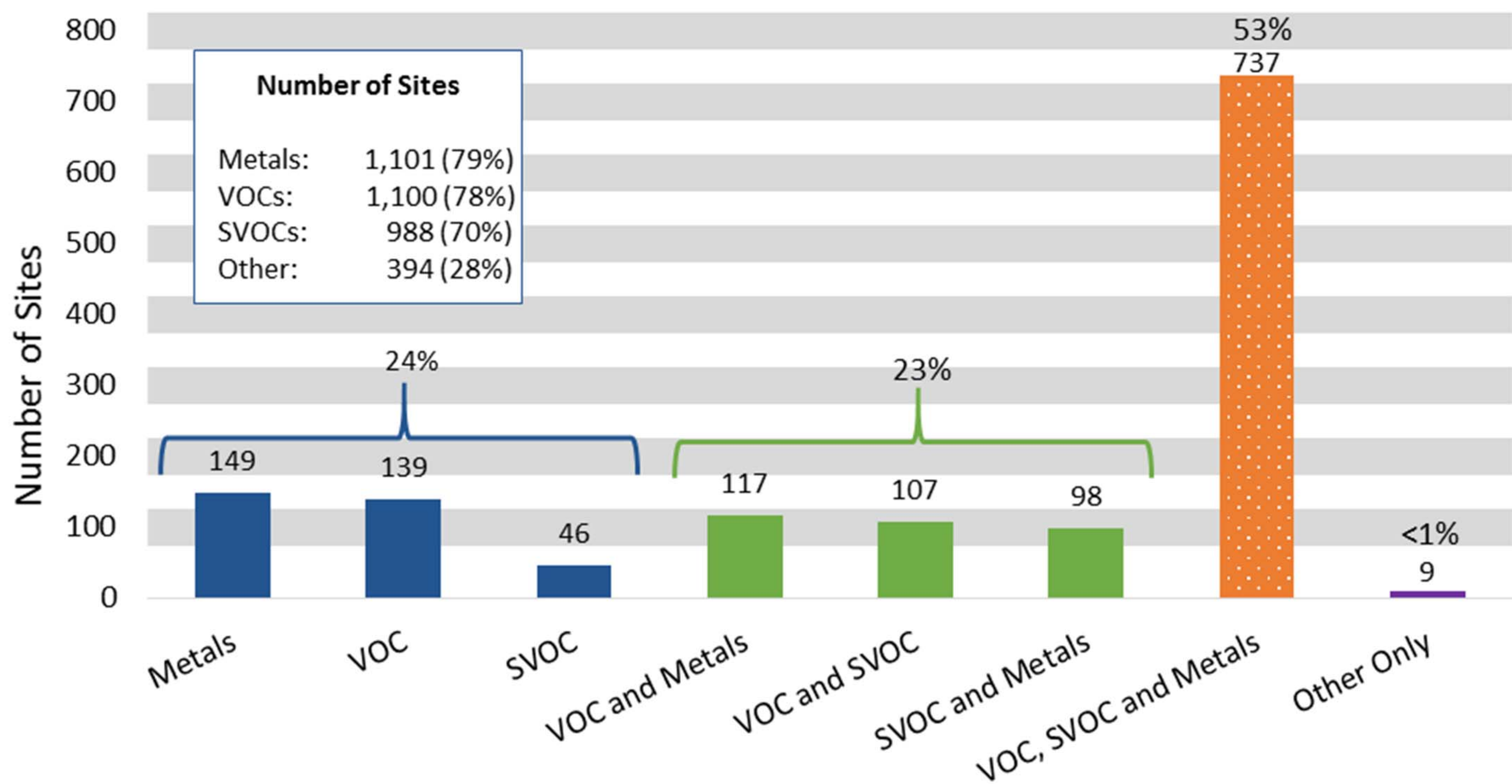
P&T Selection for Decision Documents with Groundwater Remedies (FY 1985-1995)



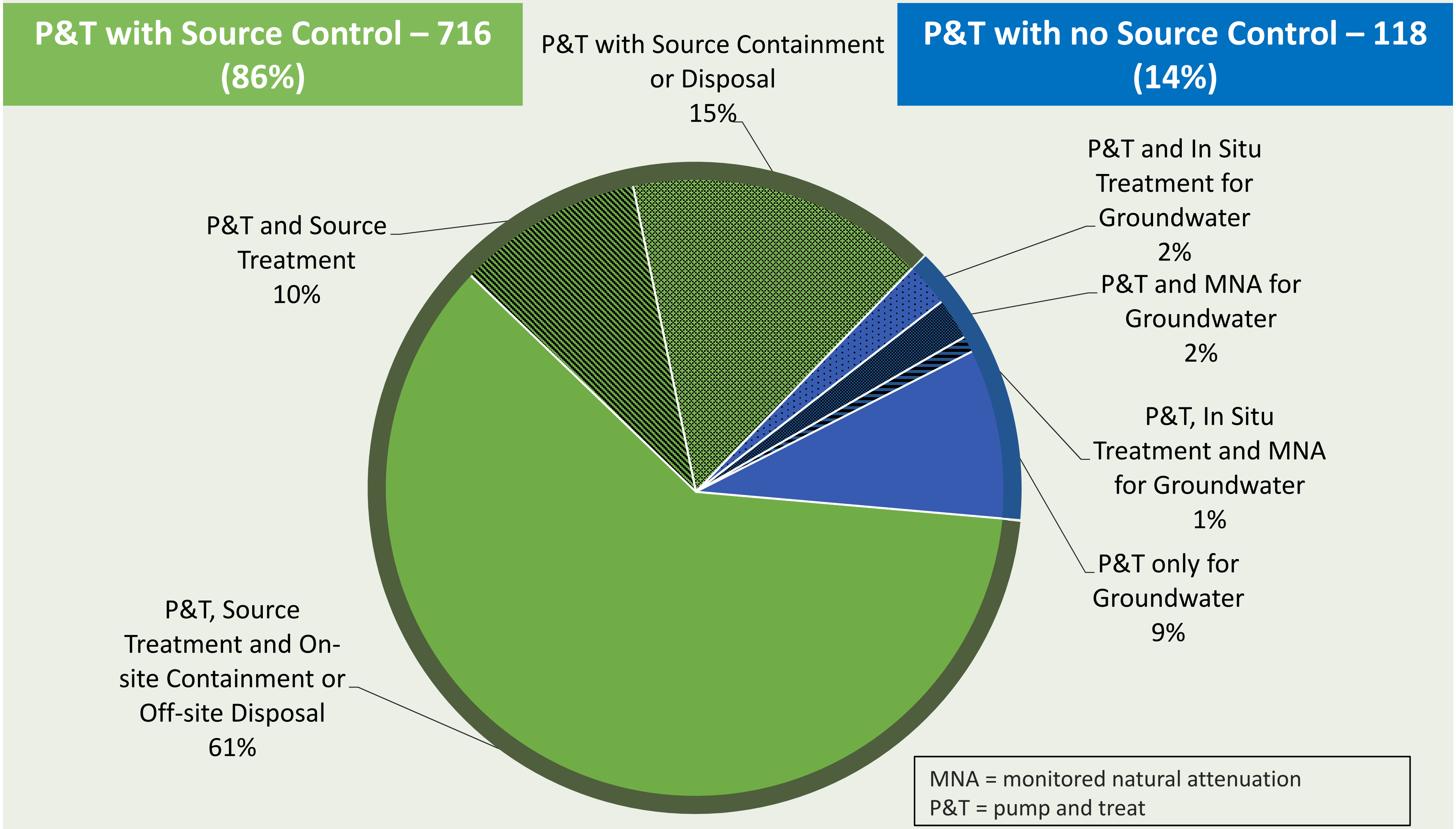
COCs at Superfund Sites (FY 1982-2014)



"Other" COCs may also be present at sites with metals, VOCs and/or SVOCs. At 9 sites they are the only COCs. Examples include cyanide, nitrate, sulfate and asbestos.

Summary of Selected Groundwater P&T Remedies (FY 1982-2014)

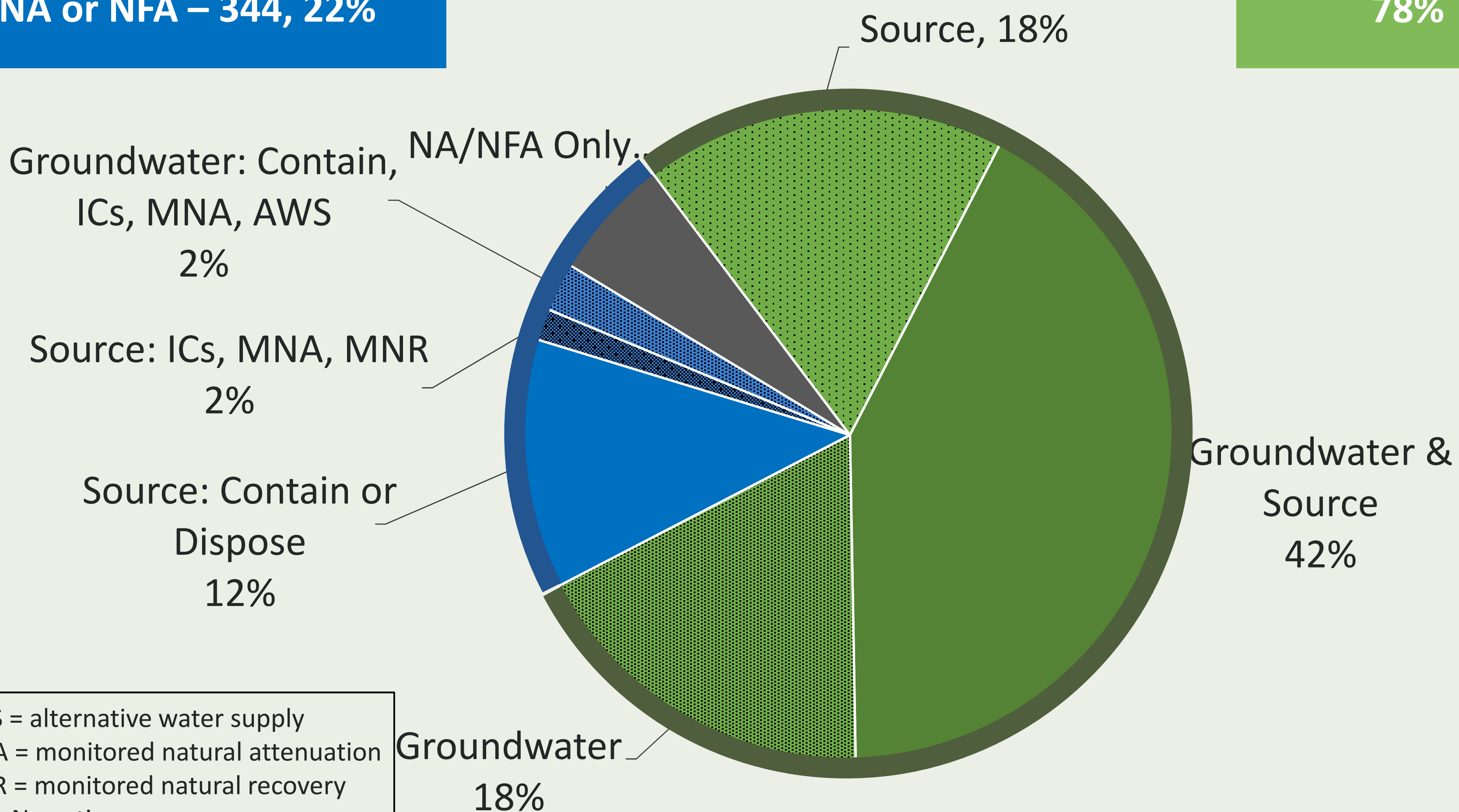
P&T Sites = 834



Treatment at Superfund Sites (FY 1982-2014)
Number of Sites = 1,540

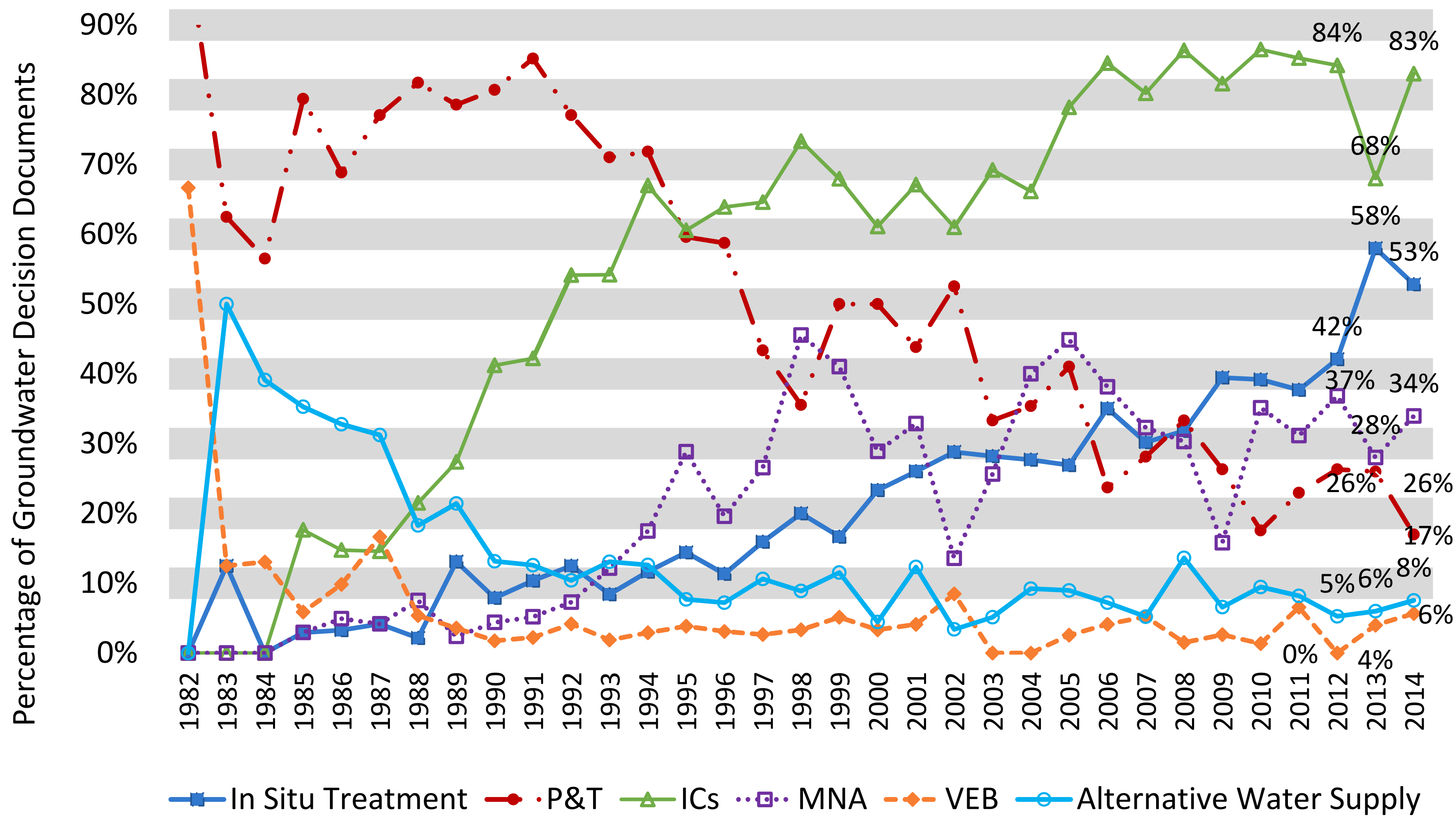
Non-Treatment, NA or NFA – 344, 22%

Treatment – 1,196 78%



AWS = alternative water supply
MNA = monitored natural attenuation
MNR = monitored natural recovery
NA = No action
NFA = No Further Action

Selection Trends for Decision Documents with Groundwater Remedies (FY 1986-2014)
Groundwater Decision Documents = 2,357



SUPERFUND OPTIMIZATION PROGRAM

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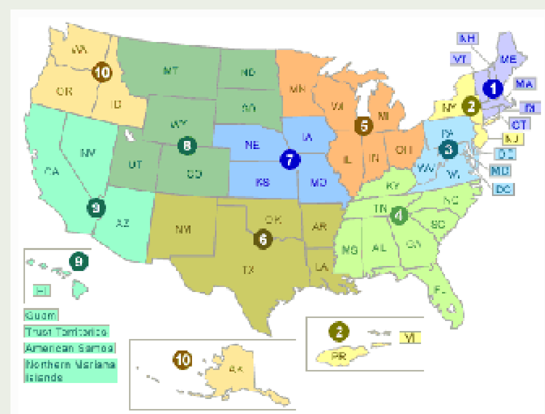
EPA's Working Definition of Optimization

Systematic site review by a team
of independent technical experts,
at any phase of a cleanup process,
to identify opportunities to improve
remedy protectiveness,
effectiveness
and cost efficiency, and to facilitate
progress toward site completion.

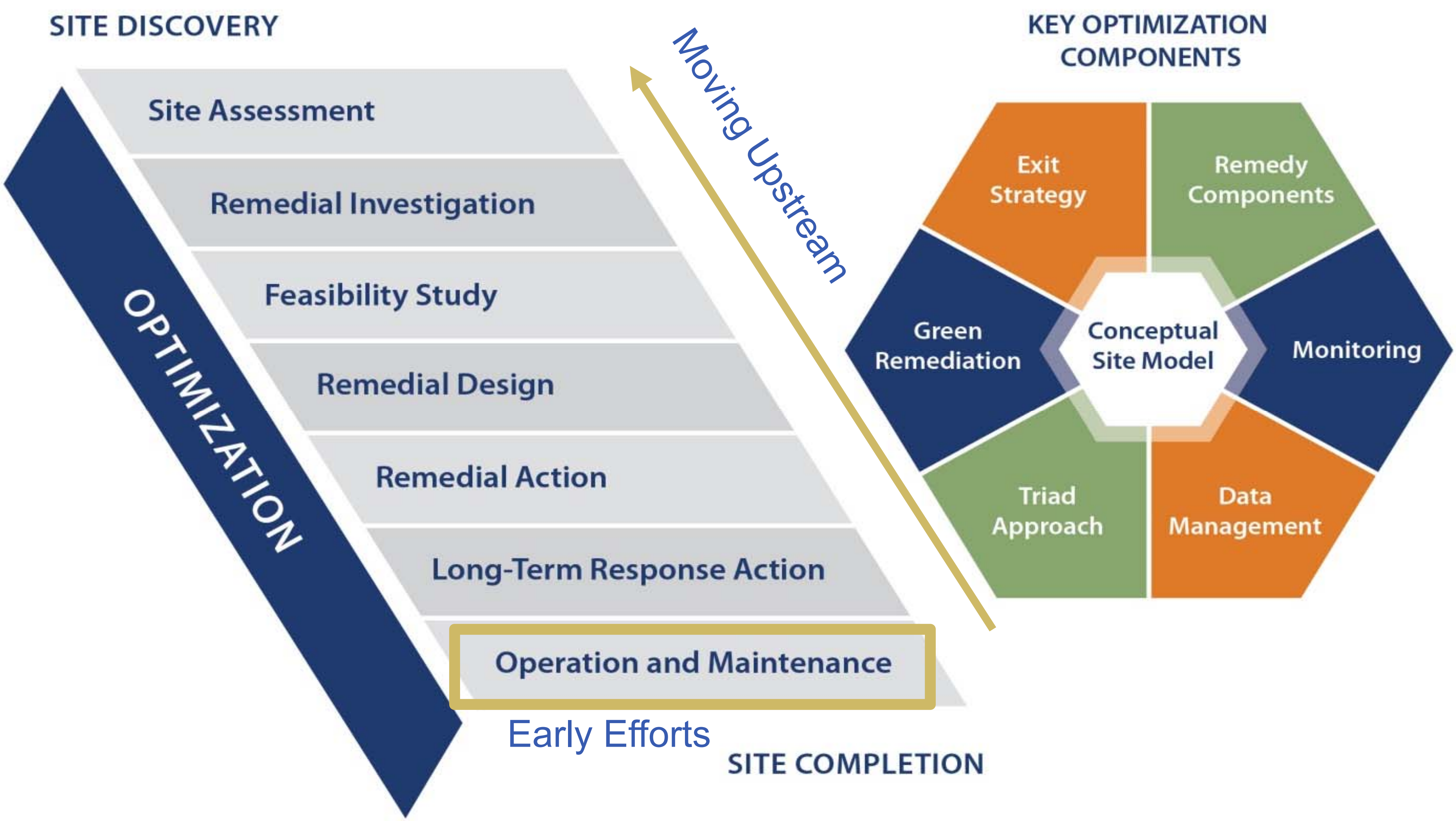
EPA's National Optimization Program revolves around third-party evaluations

The EPA Optimization Strategy

- **Comprised of four elements -**
  - » Planning and Outreach
  - » Communication and Training
  - » Implementation
  - » Measurement
- **Developed by National Optimization Workgroup (ongoing).**
- **Leverages regional and HQ resources for reviews.**
- **Develops regional optimization programs and expertise.**
- **Tracks optimization results for all reviews.**
- **Is in full swing during 2019.**



Key Optimization Components and Superfund Pipeline Activities



Applies Across Site Types, Remedies, and Cleanup Pipeline Phases

Types of Sites	Types of Remedies Evaluated	Phases of Remediation
• Industrial facilities • Wood treating facilities • Dry cleaners • Landfills • Mines	• P&T systems • Air sparging/soil vapor extraction • Groundwater recirculation wells • NAPL recovery • Biosparging • *In situ* thermal remediation • *In situ* chemical oxidation • *In situ* bioremediation • Monitored natural attenuation • Sediment capping • Barrier walls • Constructed wetlands • Landfill gas collection • Surface water diversion/collection/treatment	• Site Assessment • Remedial Investigation • Feasibility Study • Remedy Design • Remedial Action • LTRA • O&M

Optimization can be applied to all site types, all remedy types, and phases

Historical Superfund Optimization Tools

The Program has evolved from a focus on Pipeline stages to a standard SOP for Optimization events at any stage of the pipeline. However, the focus remains the same.

- Investigation Stage – Conceptual site modeling, dynamic work-plans, real-time data collection, field methods, adaptive site management, 3D visualization -- in *all* stages of the pipeline.
- Design Stage – Will proposed design successfully address site conditions? Serves as Value Engineering Screen when properly constructed.
- Remediation Stage - Assessment of holistic site operation during construction underway or complete
- Long-Term Monitoring Stage - Statistical modeling techniques to maximize remediation effectiveness and minimize cost during operation of the completed remedy
- O&M stage – Support States in effectuating final disposition of the site and reuse.
- Green Remediation – Assessing and reducing the environmental footprint of the site through the pipeline

Optimization Reviews

- **Optimization reviews result in site-specific reports with recommendations that fall within one of six standard recommendation categories:**
  - remedy effectiveness
  - cost reduction
  - technical improvement
  - site closure
  - Reuse/Redevelopment
  - Footprint reduction and Climate Resiliency
- **There are three prevalent optimization concepts applied during third-party optimization of sites regardless of the remedial stage**
  - Active site and remedy management
  - CSM development/revision
  - Alternative technologies/approaches

BK1

Optimization Evaluations Through March 8, 2019

Region	Evaluations/Region			Total Events 1997 to Date	% per Region
	1997-2010	2011-2018	2019 To Date		
1	10	23	1	34	12%
2	12	17	0	29	10%
3	18	11	1	30	10%
4	11	5	0	16	5%
5	12	9	2	23	8%
6	5	19	4	28	10%
7	6	17	2	25	9%
8	4	30	0	34	12%
9	6	29	0	35	12%
10	10	28	2	40	14%
Total	94	188	12	294	100%

Slide 21

BK1 Add current stats for the webinar.
Biggs, Kirby, 3/8/2019

FUNDAMENTALS – OPTIMIZATION

KEY CONCEPTS

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Key Optimization Concepts

- There are three prevalent optimization concepts applied during third-party optimization of sites regardless of the remedial stage
  - » CSM development/revision
  - » Evaluation of remedial operations or strategy
  - » Active project and site management

- These concepts are also applicable to site teams evaluating their own sites

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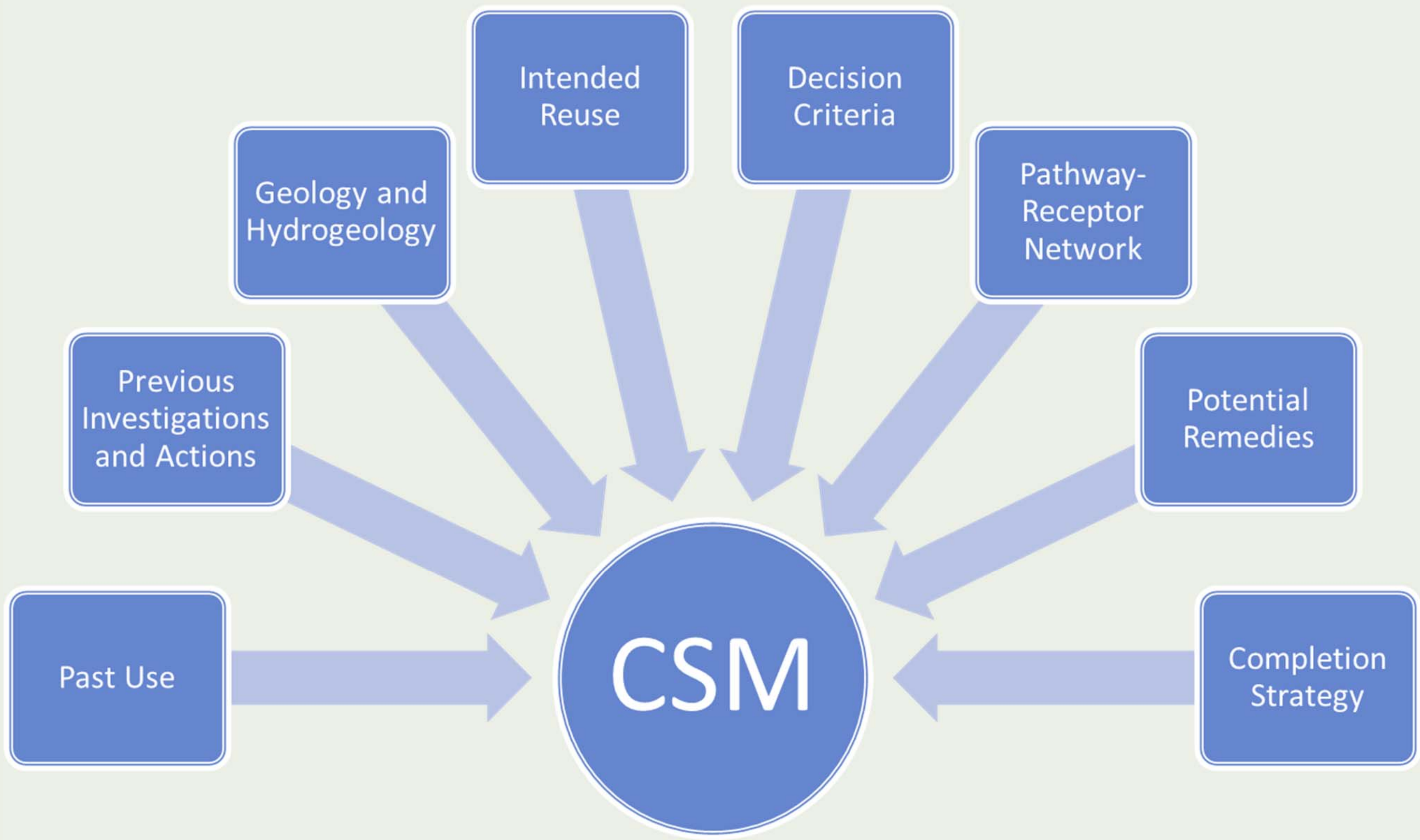
Conceptual Site Model Components



CSM Development/Revision

Concept: **Using available information to develop or update a CSM and identifying critical data gaps, revise the CSM and fill critical data gaps based on new information. Make key site decisions based on an up-to-date CSM.**

- ♦ **Example applications during the *Investigation Stage***
  - » Development and early versions of CSM in systematic planning
- ♦ **Example applications during the *Feasibility Study* stage**
  - » Consider how details of CSM influence and refine alternative development

CSM Development/Revision

- **Example applications during the *Design Stage***
  - Updating the CSM based on pre-design investigations and pilot study results
  - Designing a remedy based on an up-to-date CSM
- **Example applications during the *RA or LTRA Stage***
  - Updating the CSM based on data from remedy implementation
  - Modifying a remedy or revisiting a remedial approach based on an up-to-date CSM
- **Clu-in CSM Lifecycle document**

https://clu-in.org/download/remed/csm-life-cycle-fact-sheet-final.pdf

Evaluation of Remedial Operations or Strategy

***Concept:* Considering current operations and alternative technologies/approaches to supplement or replace those currently in use**

- **Example applications during the *Investigation Stage***
  - Use of *innovative/alternative* tools during site characterization
- **Example applications during the *Feasibility Study* stage**
  - Probability of alternative or technology efficacy given site-specific CSM – not just short-term cost
- **Example applications during the *Design Stage***
  - Use of innovative/alternative remedy components, reagents, or delivery mechanisms
  - Use of innovative/alternative modeling tools to augment design process

Evaluation of Remedial Operations or Strategy

- **Example applications during the RA or LTRA stage**
  - *Replacement* of a remedial process with an alternative replacement component, reagent, or delivery mechanism
  - Use of innovative/alternative *modeling tools* to optimize extraction or injection networks or to optimize monitoring programs
  - Replace current technology with other technology better suited to conditions

Analogous to the Value Engineering process of functional analysis in which each function of a remedy is examined to determine if something else can provide that function faster, cheaper, better.

Active Site and Project Management

Concept: **an iterative approach to characterization and remediation that considers new information as it becomes available***

- **Example applications during the *Investigation Stage***
  - » Dynamic work plans
  - » Real-time measurement
- **Example applications during the *Feasibility Study* stage**
  - » Development of alternatives with phased remedial activities and flexibility
  - » Identify data gaps and how decisions will be influenced by additional data

*(Superfund Remedial Program Review Action Plan, FY14, http://www.epa.gov/superfund/cleanup/pdfs/Final_SPR_Action_Plan-11_26_2013)

KEY FINDINGS FROM THE 2017 OPTIMIZATION PROGRESS REPORT

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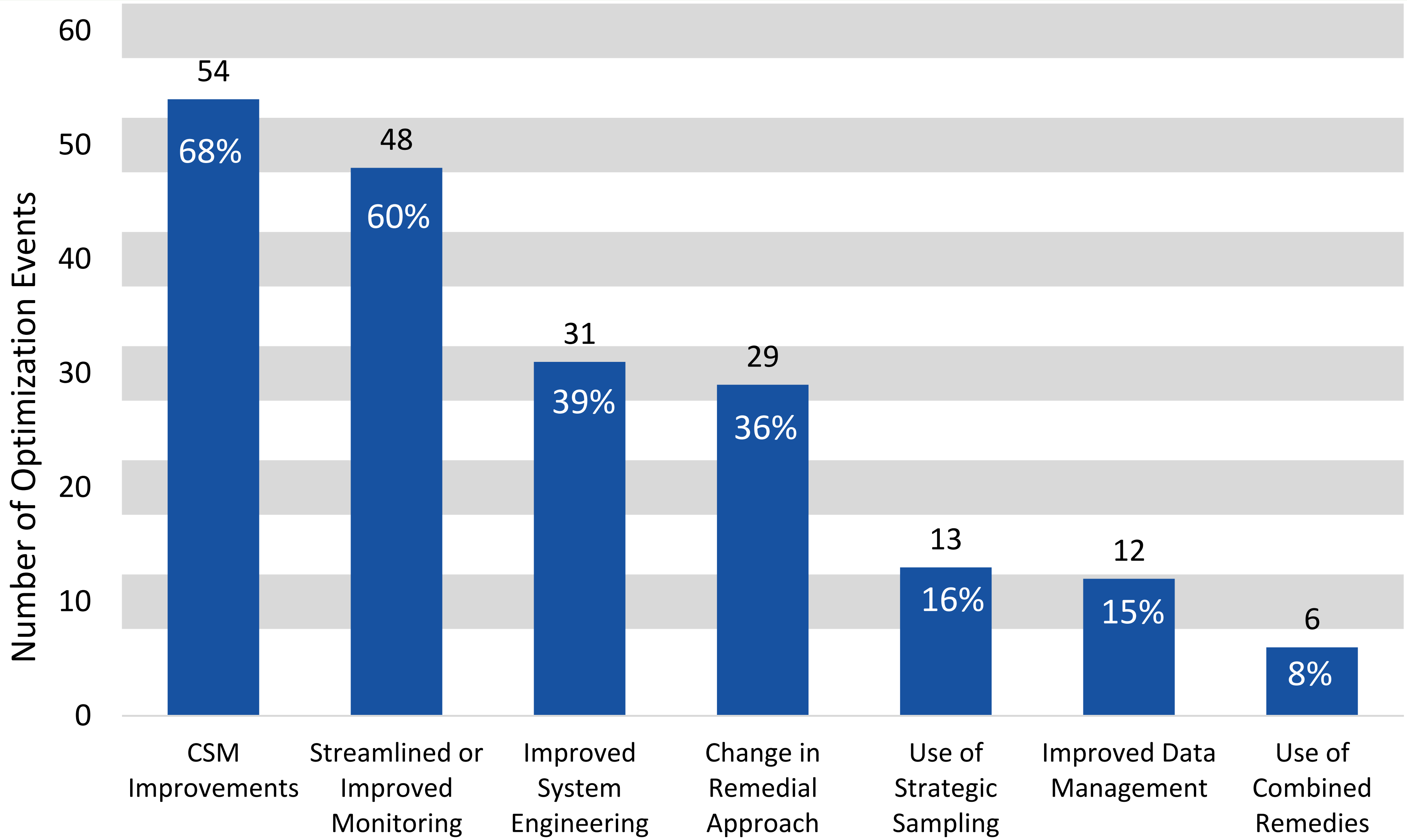
Summary of Outcomes from Remedy Optimization Efforts

2011-2015 – 645 Recommendations

▪ Remedy effectiveness	273
▪ Cost reduction	152
▪ Technical improvement	158
▪ Site closure	107
▪ Green remediation	32
▪ Total (some rec in multiple groups)	722

Number of Implemented Tools and Techniques
Total Number of Optimization Events = 80



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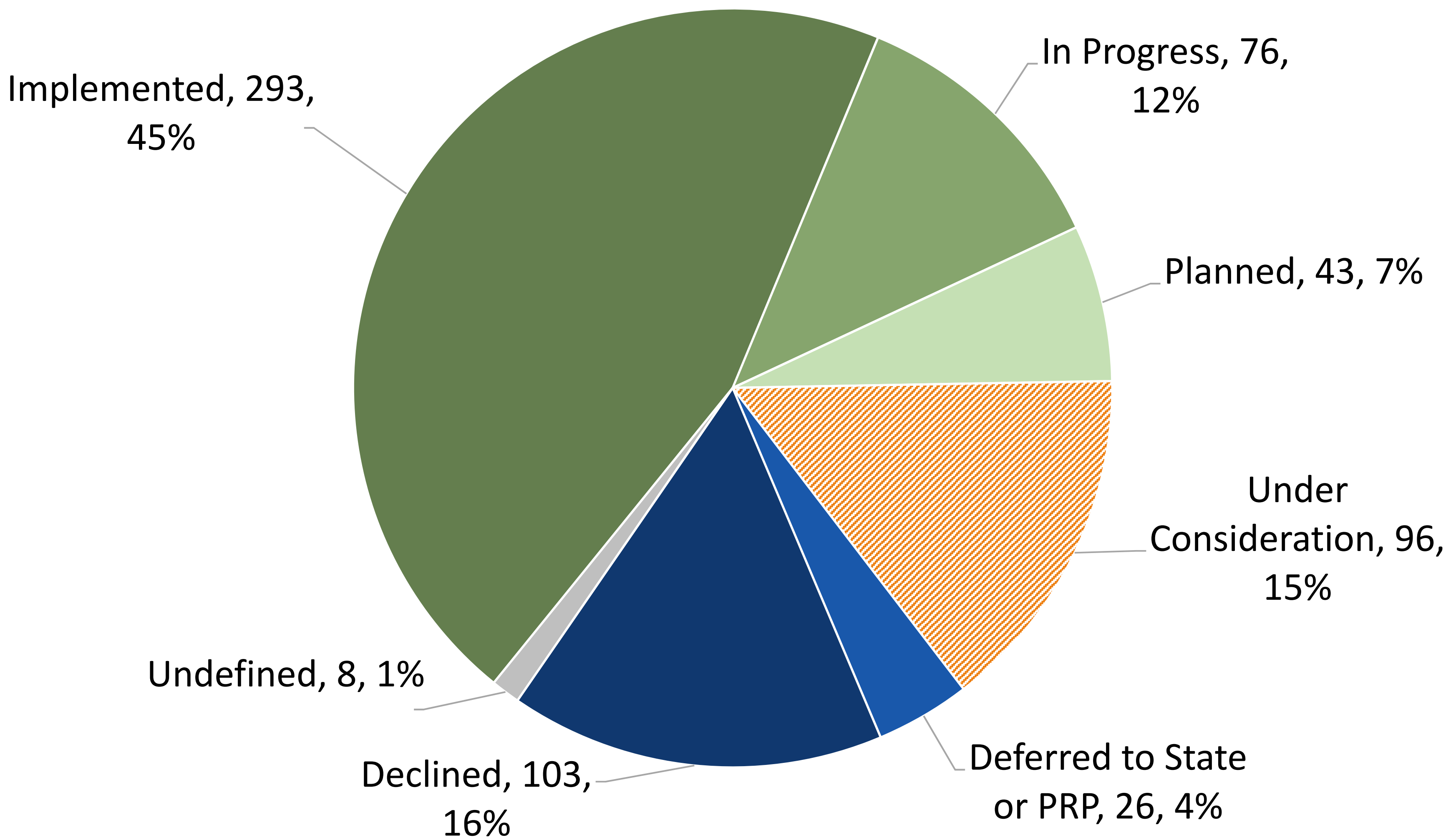
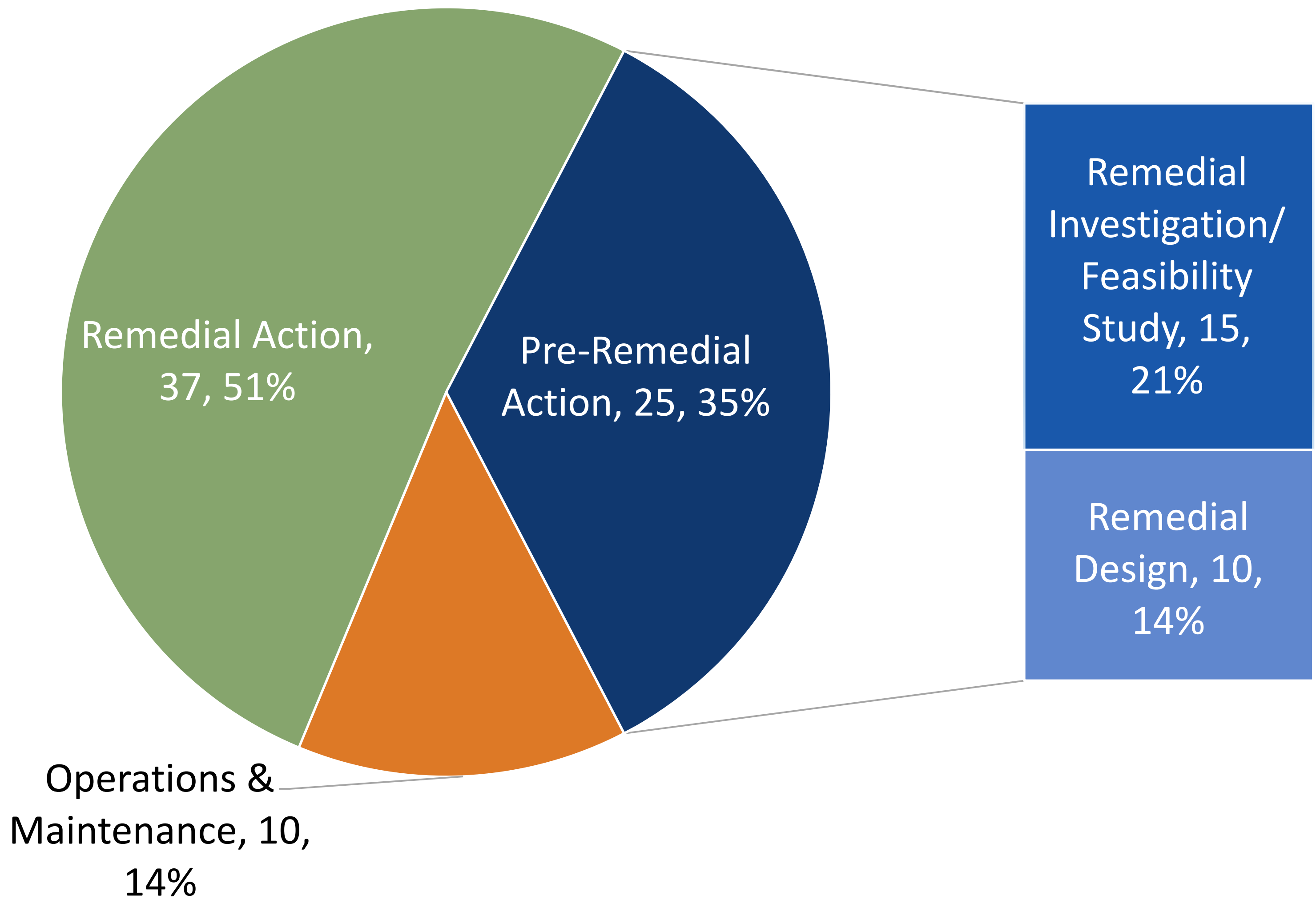
Overall Status of all Optimization Recommendations

Total Number of Recommendations = 645



Superfund Phase of Optimization Events
Number of Superfund Optimization Reviews and Technical Support Events = 72



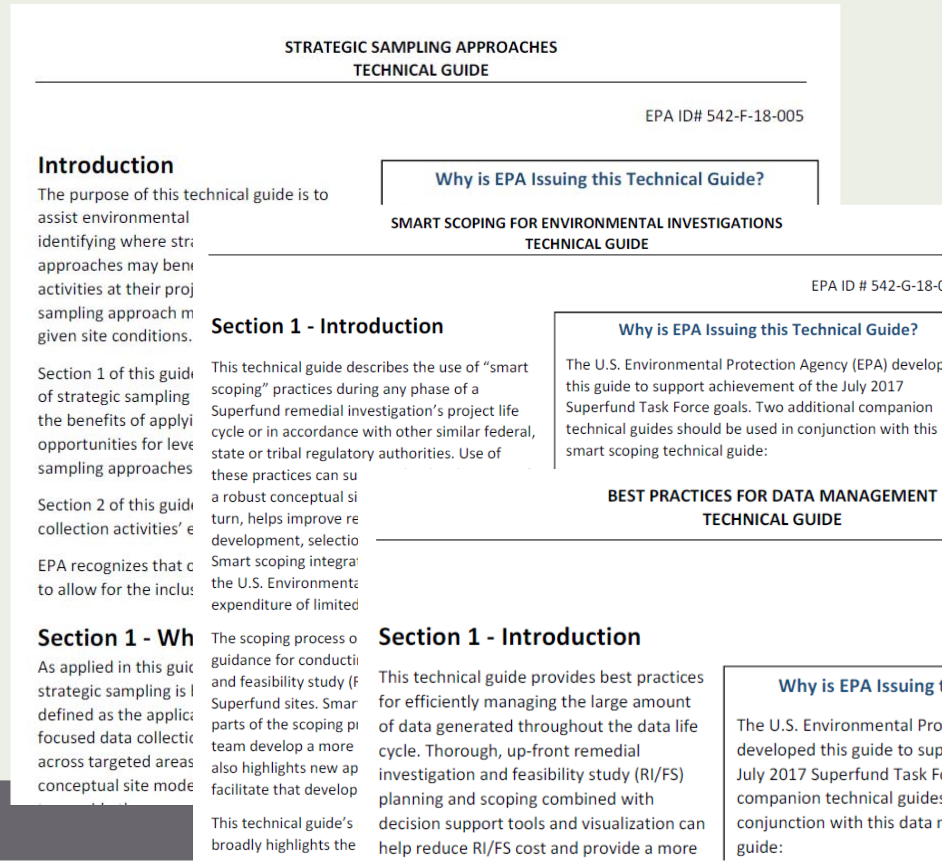
Implementing Recommendations

- ♦ Changes resulting from optimization recommendations vary from simple remedy operations (ex: GAC change out frequency) to full remedy changes:
- ♦ Kearsarge Metallurgical Corp.(KMC), OU01
  - » Original ROD 1990
  - » Optimization 12/09
  - » AROD 9/18/12
  - » GW containing 1,1,1-trichloroethane; 1,1-dichloroethane and 1,1-dichloroethene
  - » Outcomes
    - › Conducted a Focused Feasibility Study (FFS) using monitoring results from wells recommended by optimization to evaluate MNA.
    - › Issued AROD selecting MNA as follow-on remedial approach
    - › Discontinued GW P&T system, reducing costs while still projecting to reach cleanup levels within 18.5 years or less.

Institutionalizing Lessons Learned

- In 2018 the Superfund Program released three "Technical Guides" developed in a great part through the lessons learned at optimization and optimization related technical support projects

- The guides highlight BMPs to help focus and streamline the site characterization process by presenting more efficient scoping, investigation and data management approaches. The streamlining may reduce both time and costs during the remedial investigation/feasibility study (RI/FS) and throughout the Superfund process
- Data Management Tech Guide
- Smart Scoping BMP Tech Guide
- Strategic Sampling Tech Guide



PRACTICAL CONSIDERATIONS: LESSONS LEARNED IN SUPERFUND'S OPTIMIZATION PROGRAM

Progress Toward Institutional Practice in Waste Programs

- **Standardized processes applied to**
  - COI, site engagement and kickoff
  - Onsite visits and interviews
  - Report format and development/review/QC process
  - Optimization Report Inventory and Tracking Tool (ORITT) – tool for tracking metrics
  - Optimization Project Log (OPL) – tool for program/project management
- **Identifying and applying process improvements to reduce cost and time**
  - Streamlined standardized optimization report template
  - "Portfolios": multiple reviews conducted during singular travel events

EPA Optimization Process

- ♦ **Kickoff call**
- ♦ **Document exchange/review**
- ♦ **Site visit**
  - Introductions
  - Site tour
  - Optimization goals
  - CSM
  - Remedy effectiveness/protectiveness
  - Extraction/injection systems
  - Above-ground components
  - Costs
  - Footprint reduction
  - Site closure
  - Debrief
- ♦ **Draft report**
- ♦ **Final report**
- ♦ **Tracking**

Third-Party Optimization Guidelines

- ♦ Positive and forward-looking
- ♦ Collaborative between site team and optimization team
- ♦ Include all relevant stakeholders
- ♦ Balance effectiveness and cost
- ♦ Provide concrete findings and recommendations with realistic cost estimates
- ♦ Recommendations are not requirements, but all recommendations should be considered and evaluated
- ♦ Recommendations will often need further evaluation before implementation
- ♦ Third party optimization team should have extensive experience and expertise applicable to project

Optimization Level of Effort

- **Individual optimization reviews do not require a large level of effort**
  - Approximately 100 - 400 hours of senior LOE (depending on site size, documentation, complexity and the scope of the optimization)
  - Junior staff can provide support logistic and perform directed data evaluations
  - Government contracts are often not structured for optimization
    - Based on low senior LOE and significant junior LOE
    - Unattractive billing rates for senior staff
    - One optimization effort is sufficiently small in size that it may not be attractive to the high-end senior staff that are needed for optimization
    - Support from existing site contractor may not include scope to assist with optimization

Example: Illustrative allocation and amount of hours form a optimization effort at a complex site

Two experts each spending the approximately 100 hours as follows:

- 16 hours of initial site document review and data analysis
- 24 hours of travel for site visit
- 30 hours of further document review and data analysis
- 30 hours for report preparation and finalization

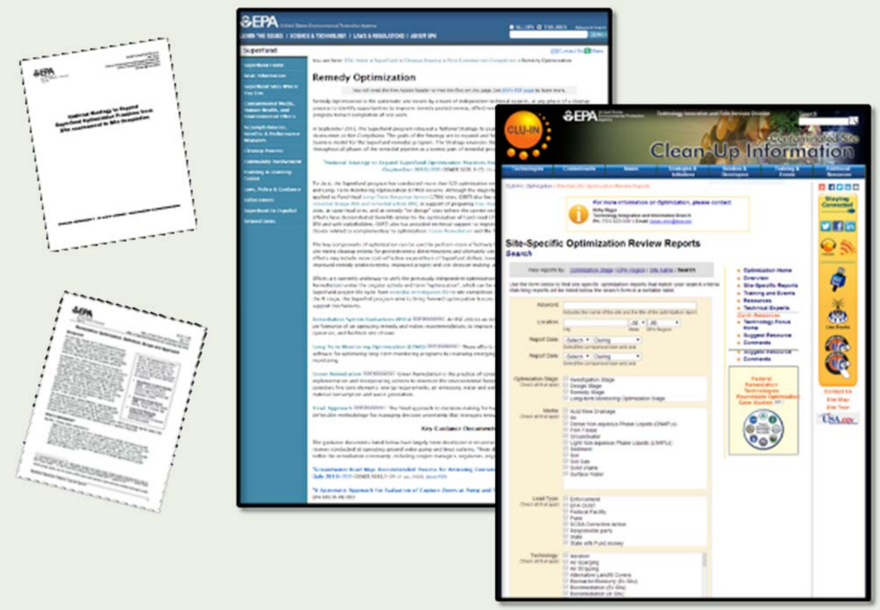
Junior and non-technical staff spending approximately 24 total hours in technical and production support

Closing Remarks

- ♦ EPA's optimization program is a mature effort (20 years) and fully integrated in the Superfund program across regions and project lifecycles.
- ♦ We are acting on findings: 64% of the recommendations at optimized projects are already implemented, in progress or planned; 15% more under consideration.
- ♦ Seeing benefits in six main areas: Remedy effectiveness, Cost reduction, Technical improvement, Site closure, Reuse, Green remediation.
- ♦ Going forward, we see continuing support and integration, as evidenced by Superfund Task Force Study Recommendations and the Superfund Remedial Action Framework.

EPA Optimization and other Resources available at https://www.epa.gov/superfund/cleanup-optimization-superfund-sites and www.cluin.org/optimization

- ***Remediation Optimization: Definition, Scope and Approach***
- **Optimization Review Guides**
  - » Investigation-Stage
  - » Design-Stage
  - » Remedy-Stage
  - » LTM-Stage
- **Site-specific reports**
- **Summary Reports on Implementation Progress**
- **15th Superfund Remedy Report**
  - » https://clu-in.org/asr/



Questions