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OFFICE OF
SOLID WASTE AND
EMERGENCY RESPONSE

OSWER 9283.1-34

MEMORANDUM

SUBJECT: Ground Water Remedy Optimization Progress Report: 2008 - 2009

FROM: James E. Woolford, Director
Office of Superfund Remediation and Technology Innovation

TO: Superfund National Policy Managers, Regions 1-10

The purpose of this memorandum is to transmit the latest summary report on remedy optimization efforts in the Superfund program. The "Ground Water Remedy Optimization Progress Report: 2008 - 2009" (OSWER 9283.1-34) provides a summary and analysis of progress toward implementation of site-specific optimization recommendations.

Regions are encouraged to review the report and appendix to assess progress in their respective programs. This summary report generally represents the status of optimization recommendations that were implemented during calendar years 2008 and 2009, and demonstrates continued improvement in the pace at which Remedial Project Managers address recommendations. I greatly appreciate your continued commitment to optimization as a means to achieve greater efficiencies in the Superfund program.

This report and all other documents related to the optimization effort can be found on the internet at http://www.epa.gov/superfund/cleanup/postconstruction/optimize.htm and http://www.clu-in.org/optimization. Questions or concerns should be directed to Jennifer Hovis, Remedy Optimization Team Leader, at (703) 603-8888.

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Ground Water Remedy Optimization Progress Report: 2008 - 2009

Office of Superfund Remediation and Technology Innovation

1.0. Introduction

1.1 Purpose

The purpose of this report is to provide a summary and analysis of progress toward implementation of optimization recommendations at Superfund-financed ground water pump and treat (P&T) sites. The report summarizes successful implementation strategies, opportunities for improvement, barriers to implementation, and changes in project costs as a result of optimization.

The main body of the report is accompanied by an appendix containing a summary of optimization recommendations by Region and site name. Regions are encouraged to review the appendix to assess progress in their respective programs. This summary report describes implementation of optimization recommendations during calendar years 2008 and 2009 at 19 sites. The report contains updated information for 18 sites where implementation has continued since the last summary report, as well as one site subject to a more recent review which is being reported for the first time. The name, location, and review date for these sites are listed in *Exhibit 1*.

1.2 Project Background

The Office of Solid Waste and Emergency Response (OSWER) developed the pilot Fund-lead P&T optimization initiative as part of the *FY2000-FY2001 Superfund Reforms Strategy* (OSWER 9200.0-33; July 7, 2000). Optimization is intended to facilitate systematic review and modification of operating remediation systems to promote continuous improvement, and to enhance overall remedy and cost effectiveness. In the Superfund program, most optimization evaluations utilize the Remediation System Evaluation (RSE) process, a tool developed by the U.S. Army Corps of Engineers.

The pilot phase of the optimization initiative demonstrated that this effort offers measurable benefits in the form of cost savings and improved remediation systems. In August 2004, the Office of Superfund Remediation and Technology Innovation (OSRTI) developed the *Action Plan for Ground Water Remedy Optimization* ("2004 Action Plan") (OSWER 9283.1- 25; August 25, 2004) to further implement important lessons learned from the pilot phase and fully integrate optimization into the Superfund cleanup process where appropriate. Among other things, the Action Plan envisions the development of routine progress reports concerning the implementation of recommended system changes.

Since the creation of the Action Plan, the Superfund Program has developed additional tools and approaches that apply optimization concepts to sites earlier in the investigation and cleanup process. These related efforts continue to evolve and expand optimization to a growing number of sites. At this time, only a subset of sites that receive an optimization review are monitored and subject to reporting pursuant to the Action Plan. The sites discussed in this report are primarily Fund-financed, operating P&T systems.

1.3 Sites Subject to Optimization Reviews

The approach for selecting sites to receive an optimization review typically includes a review of annual operating costs, the age of the system, and concerns for remedy effectiveness or system efficiency. Ground water remedies with the highest annual operating costs likely offer the greatest opportunities for cost savings and increased efficiency. RSEs may also be appropriate for systems that have been operating for two to four years, in order to maximize early opportunities for improvements and cost savings. Sites with an ongoing Fund-financed long term response action (LTRA) continue to be a high priority for the program in order to help ensure smooth transfer to States for operation and maintenance (O&M).

Regardless of annual operating costs or the age of the system, an optimization review may be valuable at sites where there are concerns about the effectiveness of the remedy or the efficiency of the P&T system. An RSE may also help address recommendations in Five-Year Reviews that identify similar concerns.

1.4 Monitoring Implementation Progress

Each site that receives an optimization review is subject to follow-up, typically in the form of annual conference calls between OSRTI and the Region, for at least two years after the RSE report is finalized. These follow-up discussions highlight the status of recommended changes and obstacles to implementation that require additional attention. Continuous oversight of progress at RSE sites helps maximize the benefits of optimization, identify lessons learned, and provide technical assistance.

RSEs generate a number of suggestions, ideas, and recommendations which should be discussed and evaluated. Regions weigh many factors including, but not limited to, technical feasibility, short-term implementation issues, long-term benefits, public and State acceptance, contractual requirements, and availability of funding when determining whether to implement optimization recommendations. Disagreements regarding the implementation of a particular recommendation are possible, and may be elevated to management for resolution.

If RPMs have questions regarding implementation of complex RSE recommendations, technical assistance is available from many sources, including Regional technical support staff, OSRTI staff and the RSE team, the EPA laboratories through the Technical Support Project, and the U.S. Army Corps of Engineers.

Exhibit 1. Sites included in this progress report

EPA Region	State	Site Name	Fiscal Year of Review [(a)]	Reporting Status [(b)]
1	NH	Savage Municipal Water Supply	2001	updated
2	NJ	Higgins Farm	2003	updated
	NJ	Ellis Property	2006	updated
	NY	GCL Tie & Treating	2006	updated
3	PA	Havertown PCP	2003	Updated
	PA	Millcreek Dump Site	2009	N/A
4	NC	Cape Fear Wood Preserving	2004	updated
	FL	Alaric, Inc.	2009	N/A
	FL	American Creosote Works, Inc. (Pensacola)	2006	updated
	NC	Benfield Industries	2007	new
5	MI	Ott/Story/Cordova Chemical Co.	2001	updated
	IN	Douglas Road/Uniroyal, Inc., Landfill	2004	updated
	IN	Reilly Tar & Chemical Corp. (Indianapolis)	2004	updated
	MI	Peerless Plating Co. Inc.	2005	updated
6	--	*No sites for this reporting period*	--	--
7	KS	57th & North Broadway	2006	updated
	KS	Ace Services	2007	updated
	NE	10th Street Site	2009	N/A
8	CO	Central City, Clear Creek	2007	updated
9	CA	Modesto Ground Water Contamination	2001	updated
10	WA	Boomsnub/Airco	2002	updated
	WA	Wyckoff Co./Eagle Harbor	2004	updated
	OR	Northwest Pipe & Casing	2007	updated

(a) Date refers to date of review; RSE reports may be finalized months later, following multiple-party review. All RSE reports may be accessed online via http://www.epa.gov/superfund/cleanup/postconstruction/optimize.htm.

(b) *Updated* sites were included in previous progress reports; progress at *new* sites is being reported for the first time. Sites with a status of *N/A* received a review in 2009 and had not yet begun implementation monitoring at the time of this report.

2.0 Summary of Implementation Progress

2.1 Overview

Each RSE results in an improved understanding of the operating P&T system and identified a number of opportunities for improvements in efficiency and effectiveness. The RSE reports specifically highlight recommendations in the following four categories:

- recommendations to improve remedy effectiveness,
- recommendations to reduce operating costs,
- recommendations for technical improvement, and
- recommendations to expedite site closure.

The annual follow-up discussions between OSRTI and the Remedial Project Manager (RPM) assess progress with the implementation of each recommendation contained in the RSE reports. *Exhibit 2* summarizes progress in each of the four categories of recommendations. The subsequent sections provide an analysis of implementation progress and highlights of site-specific progress. The data included in this report represents only the sites that are still subject to the follow-up process described above (all sites in *Exhibit 1*). Sites that completed the follow-up process, as documented in previous progress reports, are no longer included in the calculations.

Exhibit 2. Status of optimization recommendations

Types of Recommendations	Implementation Status					
	Implemented	In progress	Planned	Declined	Deferred to PRP/State	Under Consideration
Remedy Effectiveness (61 total)	77% (47)	11.5% (7)	-- (0)	9.8% (6)	-- (0)	1.6% (1)
Cost Reduction (63 total)	74.6% (47)	7.9% (5)	3.2% (2)	11.1% (7)	1.6% (1)	1.6% (1)
Technical Improvement (50 total)	70% (35)	12% (6)	6% (3)	8% (4)	4% (2)	-- (0)
Site Closure (24 total)	41.7% (10)	41.7% (10)	4.2% (1)	-- (0)	4.2% (1)	8.3% (2)
Overall Progress (198 total)	70.2% (139)	14.1% (28)	3% (6)	8.6% (17)	2% (4)	2% (4)

Note: Numbers in parentheses represent actual number of recommendations, used to calculate rounded percentages.

RPMs have made positive efforts to address 98% of all recommendations made at the sites covered in this progress report. The proportion of recommendations that were declined or deferred to other parties has decreased from 15% in the previous reporting period to only 10.6% during this period. Similarly, the percentage of recommendations that remain under consideration (the least advanced reporting category) is the smallest ever reported, at just 2%. Overall, this analysis demonstrates an increasingly strong commitment by RPMs to address optimization recommendations in a timely manner.

2.2 Implementation of Remedy Effectiveness Recommendations

A thorough review of remedy effectiveness is a principal element of OSRTI's optimization initiative. Recommendations to improve effectiveness predominantly suggest more rigorous evaluation of the extraction and subsurface portions of the remedy rather than the above-ground treatment portion. The most common recommendations in this category generally relate to plume delineation, additional source area characterization, and sampling for new contaminants or exposure pathways (e.g., 1,4-dioxane, vapor intrusion).

More than three-quarters (77%) of remedy effectiveness recommendations have been implemented and another 11.5% are in progress. The implementation of remedy effectiveness recommendations continues to be a high priority for RPMs; this category has consistently had the greatest proportion of recommendations implemented since national reporting began.

Highlight: Success with Remedy Effectiveness Recommendations

Vapor Intrusion: Vapor intrusion (VI) is the migration of volatile chemicals from the subsurface into overlying buildings. Volatile chemicals in buried wastes and/or contaminated groundwater can emit vapors that may migrate through subsurface solid and into air spaces of overlying buildings. The RSE team formulated recommendations to evaluate the potential for vapor intrusion at four of the sites contained in this report.

At the *57th and North Broadway* site, the risk of VI was ruled out through the application of standard EPA screening methods. Additional ground water and/or soil gas samples were required in order to evaluate potential VI impacts at the *American Creosote Works (Pensacola)* site, the *GCL Tie & Treating* site, and the *Northwest Pipe & Casing* site. In each of these instances, the site team determined that there was no site-related impact through the vapor intrusion exposure pathway.

2.3 Implementation of Cost Reduction Recommendations

RSE recommendations pertaining to cost reduction may cover many aspects of system operation, including the selection of treatment technologies, operator and laboratory labor, and project management. A common recommendation for cost reduction typically calls for site managers to streamline ground water or process monitoring once a system is operating at steady-state.

RSEs continue to identify opportunities to reduce onsite labor without sacrificing remedy effectiveness. Such reductions may be expected following system shakedown or automation, when a remedy is operating at steady-state. Furthermore, some treatment components become inefficient or unnecessary as a result of changing site conditions, or due to conservative estimates during the design phase. Simplifying a treatment system under such conditions has resulted in cost savings associated with reduced material usage, utilities, and labor.

The implementation rate of cost reduction recommendations has continually improved from 53.5% in 2005, to 65% in 2007, and now to 74.6% for this reporting period. While EPA Regions and the States continue to report reduced operating costs and improved efficiencies, documenting precise cost savings and expenditures as a direct result of RSE implementation continues to pose a challenge.

Highlight: Success with Cost Reduction Recommendations

Central City/Clear Creek (Idaho Springs, CO): The RSE team made a series of recommendations related to the production, handling and disposal of solids by the treatment system. The treatment system was producing a much greater volume of filtercake waste than was anticipated during remedial design. The RSE recommendations focused on reducing scaling in the system and increasing the density of the solids, thereby reducing chemical usage, labor and disposal costs.

The site team thoroughly evaluated the RSE recommendations, as well as data from previous pilot efforts at the site, and then determined that the best approach would be to implement a High-Density Sludge (HDS) system. Pilot efforts are underway; if implemented, the HDS system would likely include an aeration system, modifications to the pH adjustment system, and additional tanks for increased reaction time.

While this approach is not specifically what was recommended in the RSE report, it is consistent with the intent and endorsed by the RSE team. Implementation of a full HDS system should reduce ongoing costs related to sludge disposal, chemical usage, labor, and filter scaling. Potential cost savings have not been estimated since the site team is in the pilot stage; an estimate will hopefully be available in a subsequent progress report.

2.4 Implementation of Technical Improvement Recommendations

Technical improvement recommendations cover a wide range of items to improve overall site operations. As *Exhibit 2* demonstrates, 70% of these recommendations have been fully implemented. RPMs continue to implement the majority of these recommendations shortly after the RSE site visit highlights the opportunity for improvement. These recommendations are generally easy to implement, require little up front funding, and are not typically contingent on other recommendations.

Examples of technical improvement recommendations include the following:

- Reconfigure components of the treatment train,

- Clean, repair or replace faulty equipment,
- Rehabilitate fouled extraction or injection wells,
- Revise sequencing during site wide sampling events, and
- Improve maps and reports.

2.5 Implementation of Site Closure Recommendations

RSEs continue to identify opportunities to accelerate progress toward achieving final cleanup goals and eventual site closure. These recommendations most commonly involve developing a clear and comprehensive exit strategy and/or evaluating alternate remedial approaches in situations where the P&T system may no longer be the most effective remedy. Developing an exit strategy typically involves confirming that clear and appropriate cleanup goals were established in the Record of Decision, then determining the specific data and criteria to be used to evaluate if goals are met such that some or all of the system can be shut down. If the intermediate goals and milestones are not met, RPMs should then consider alternatives to the current system. This may include alternate technologies to replace P&T, or to supplement it with more aggressive source removal.

Ten of the 24 recommendations (41.7%) associated with site closure have been implemented, which is a slight decrease when compared to progress at the sites addressed by the previous progress report. However, an equal number of the recommendations in this area are in progress, which is a significant improvement. As demonstrated in previous progress reports, exit strategy recommendations are often considered after effectiveness and cost reduction recommendations are implemented. The use of a supplemental or alternative remedial approach may require funding that was not previously budgeted, revised contracts, and updated decision documents (e.g., an amended Record of Decision). For these reasons, the data continue to show a lower percentage of these recommendations implemented, and a larger percentage still under consideration.

Highlight: Success with Recommendations to Expedite Site Closure

Northwest Pipe & Casing (Clackamas, OR): The RSE included recommendations to improve delineation of the shallow zone of the southern plume area, and then to utilize the results to design an in situ remedy that would significantly reduce the highest concentrations of VOCs.

The site team completed the additional characterization work in 2008, which identified an area of PCE contamination that was much larger and deeper than previously known. Based on information collected, a removal action was initiated in August 2009 to remove source material. Approximately 500,000 gallons of contaminated groundwater and 16,000 tons of soil were treated or removed. Soil amendment was added to clean back fill to help stimulate biodegradation. The site team is currently monitoring to determine the effect of the removal action, though preliminary results indicate significant reduction of PCE concentrations and increasing trend in breakdown COCs. Additional data will determine whether the RSE recommendation for an in situ ground water remedy is still appropriate.

2.6 Sites Requiring No Further Follow-Up

As shown in *Exhibit 2*, RPMs continue to demonstrate a commitment to the implementation of RSE recommendations. In fact, the optimization process is complete at a number of sites as a result of the successful implementation or thorough consideration of all RSE recommendations. OSRTI is no longer conducting annual follow-up discussions at these particular sites, though assistance is still available to site managers in the event that any optimization-related issues arise. *Exhibit 3* highlights the 5 sites that completed the follow-up process during the 2008-2009 reporting period. Previous progress reports identified 24 additional sites that no longer require implementation tracking, for a total of 29 sites that have successfully completed the follow up process.

Exhibit 3. Sites requiring no further follow-up

Rationale	Site Name
Successful implementation and/or thorough consideration of all RSE recommendations	Ace Services Ellis Property Havertown PCP Higgins Farm Savage Municipal Water Supply

3.0 Future Plans

OSRTI expects to continue to fund independent, technical experts to conduct additional RSEs and streamlined RSE-Lites each year. OSRTI will continue to select sites for future reviews based on annual operating costs, the age of the system, and concerns for remedy effectiveness and system efficiency. Regions should contact OSRTI to recommend any sites that may benefit from an optimization review.

OSRTI will continue to utilize the existing process for follow-up discussions in order to monitor progress with the implementation of RSE recommendations. Follow-up will continue at all sites, with the exception of those identified in *Exhibit 3*. RPMs may request technical assistance to aid in the implementation of system changes.

4.0 References

4.1 Internet Resources

OSRTI, Post-Construction Program Area

- Guidance for post-construction completion activities, with optimization project updates
- http://www.epa.gov/superfund/cleanup/postconstruction/optimize.htm

OSRTI, Hazardous Waste Clean-Up Information (CLU-IN) web site

- Site-specific RSE reports and recommendations
- http://www.clu-in.org/optimization

U.S. Army Corps of Engineers, Hazardous, Toxic and Radioactive Waste Center of Expertise

- RSE checklists and scope of work, provided by developers of the RSE tool
- http://www.environmental.usace.army.mil//ltm_rse.htm

Federal Remediation Technologies Roundtable

- Case studies, conference materials and more, compiled by an inter-agency workgroup
- http://www.frtr.gov/optimization.htm

4.2 Guidance and Fact Sheets

*A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems (*EPA 600-R-08-003; January 2008)

A Cost Comparison Framework for Use in Optimizing Ground Water Pump and Treat Systems (EPA 542-R-07-005; May 2007)

Optimization Strategies for Long-Term Ground Water Remedies (with Particular Emphasis on Pump and Treat Systems) (EPA 542-R-07-007; May 2007)

*Options for Discharging Treated Water from Pump and Treat Systems (*EPA 542-R-07-006; May 2007)

Effective Contracting Approaches for Operating Pump and Treat Systems (OSWER 9283.1-21FS / EPA 542-R-05-009; April 2005)

O&M Report Template for Ground Water Remedies (With Emphasis on Pump and Treat Systems) (OSWER 9283.1-22FS / EPA 542-R-05-010; April 2005)

Cost-Effective Design of Pump and Treat Systems (OSWER 9283.1-20FS / EPA 542-R-05-008; April 2005)

Action Plan for Ground Water Remedy Optimization (OSWER 9283.1-25; August 25, 2004)

Pilot Project to Optimize Superfund-financed Pump and Treat Systems: Summary Report and Lessons Learned (OSWER 9283.1-18; November 2002)

Elements for Effective Management of Operating Pump and Treat Systems (OSWER 9355.4-27FS-A; November 2002)

Implementation of RSE Recommendations: Technical Assistance Resources Available to RPMs (January 2002)

4.3 General Project Documentation

Ground Water Remedy Optimization Progress Report: 2006-2007 (OSWER 9283.1-31; July 2008)

2005 Annual Progress Report for Ground Water Remedy Optimization (OSWER 9283.1-28; December 2006)

2004 Annual Progress Report for Ground Water Remedy Optimization (OSWER 9283.1-27; August 2005)

Groundwater Pump and Treat Systems: Summary of Selected Cost and Performance Information at Superfund-financed Sites (EPA 542-R-01-021a; December 2001)

Superfund Reform Strategy, Implementation Memorandum: Optimization of Fund-lead Ground Water Pump and Treat (P&T) Systems (OSWER 9283.1-13; October 31, 2000)