

Final Report:
Pilot Region-Based
Optimization Program
for
Fund-Lead Sites
EPA Region III



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NOTICE

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1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

During fiscal years 2000, 2001, and 2002, the EPA Office of Superfund Remediation and Technology Innovation (OSRTI) conducted optimization evaluations called Remediation System Evaluations (RSEs) at 24 Fund-lead pump and treat (P&T) sites (i.e., those sites with P&T systems funded and managed by Superfund and the States). In 2003 and 2004, OSRTI conducted RSEs at additional Fund-lead sites, and piloted the RSE process at RCRA P&T sites and LUST P&T sites. Also during 2003 and 2004, EPA Region III funded optimization evaluations at two more of its Fund-lead P&T sites, marking the first time an EPA Region had sponsored its own effort to optimize Fund-lead sites using an evaluation process like an RSE.

Based on the positive results of these optimization evaluations and a realization that Regional resources are likely need to augment the nationwide optimization effort by OSRTI, EPA OSRTI and Region III initiated a pilot study for a Region-based optimization program of the Region III Fund-lead sites with P&T systems. The pilot program consists of the following components:

- Conducting streamlined optimization evaluations
- Implementing a formal follow-up/tracking program
- Documenting the project results
- Providing technical assistance based on requests of the Remedial Project Managers (RPMs) and findings during follow-up

Each of these components is implemented by a Regional Optimization Evaluation Team (ROET) that is comprised of Regional management, Regional technical staff, technical experts unassociated with the sites, and a representative from OSRTI. This is a modification of the process utilized in the nationwide OSRTI program in that with this Regional program, Regional management and technical staff are more directly involved with the optimization evaluations and follow-up.

In addition to these optimization components, the ROET was tasked with developing site-specific milestones to help track the progress of each P&T system in meeting its remedial objectives.

1.2 SELECTED SITES

Region III identified 13 Fund-lead sites within the Region where P&T was either implemented or planned as a site remedy. One of these sites, North Penn Area 6, was determined to not be appropriate for the optimization pilot program because of an ongoing dynamic management program conducted by a third party (i.e., the U.S. Geological Survey) to continually optimize the pumping strategy. The other 12 sites were included in this Regional optimization pilot program. Four of the 12 sites received full-scale optimization evaluations between 2001 and 2004 (prior to entering this pilot program) so they entered the pilot program at the follow-up/tracking phase.

The other eight sites entered the program at the streamlined optimization evaluation phase. The following table indicates the 12 sites that were included in the program, distinguishing the four “old” sites from the eight “new” sites.

Site Name	Location	Site Status	Date of O&F
“Old” Sites that Received Full-Scale Evaluations Prior to Entering the Pilot Program			
Greenwood Chemical Co. (“Greenwood”)	Newtown, Virginia	Interim Remedy	3/2002
Havertown PCP (“Havertown”)	Havertown, Pennsylvania	Interim Remedy	N/A
Hellertown Manufacturing Co. (“Hellertown”)	Hellertown, Pennsylvania	LTRA	9/1997
Raymark	Hatboro, Pennsylvania	LTRA	6/1995
“New” Sites that Had Not Received Optimization Evaluations Prior to the Program			
AIW Frank/Mid-County Mustang Site (“AIW Frank”)	Exton, Pennsylvania	LTRA	3/2001
Butz Landfill (“Butz”)	Tannersville, Pennsylvania	LTRA	7/2001
Crossley Farm (“Crossley”)	Berks County, Pennsylvania	Pre-Design for Interim Remedy	N/A
Croydon TCE (“Croydon”)	Croydon, Pennsylvania	LTRA	11/1995
Cryochem Inc. (“Cryochem”)	Worman, Pennsylvania	LTRA	5/1998
North Penn – Area 1 (“North Penn 1”)	Souderon, Pennsylvania	LTRA	9/1998
Saunders Supply Co. (“Saunders”)	Chuckatuck, Virginia	LTRA	6/1999
Standard Chlorine of Delaware (“SCD”)	Delaware City, Delaware	Design	N/A

1.3 SCHEDULE OF PROJECT ACTIVITIES

The project began with a kickoff meeting on November 3, 2004. The kickoff meeting included the following participants:

- All Regional staff that would participate in the pilot program, including management, technical staff, coordination staff, and site RPMs
- EPA OSRTI representatives that would participate in or observe the pilot program
- EPA optimization contractors that would facilitate the program and be a technical lead

The kickoff meeting was designed to introduce Regional staff to the pilot program objectives and procedures and introduce Regional staff to the EPA OSRTI representatives and optimization contractor. The sign-in sheet and agenda for this kickoff meeting are provided as Attachment A to this report.

Optimization evaluations and follow-up/tracking meetings began shortly after the kickoff meeting. The schedules for all the optimization evaluations and follow-up meetings for each of the 12 sites are listed in the following table.

Site	Optimization Evaluation Meeting	Date of Draft Opt. Eval. Report	1st Follow-Up Meeting	Final Opt. Eval. Report & Draft Site Tracker	2nd Follow-Up Meeting
“Old” Sites that Received Full-Scale Evaluations Prior to Entering the Pilot Program					
Greenwood	8/7/2003	4/2/2004 *	12/16/2004	3/7/2005 **	10/18/2005
Havertown	8/5/2003	3/4/2004 *	12/16/2004	3/14/2005 **	10/18/2005
Hellertown	6/5/2001	11/14/2001 *	12/16/2004	1/24/2005 **	10/18/2005
Raymark	6/8/2001	12/19/2001 *	12/16/2004	3/7/2005 **	10/18/2005
“New” Sites that Had Not Received Optimization Evaluations Prior to the Program					
AIW Frank	12/15/2004	1/14/2005	7/20/2005	7/29/2005	11/7/2005
Butz	12/15/2004	1/14/2005	7/20/2005	7/29/2005	10/19/2005
Crossley	2/8/2005	3/21/2005	11/7/2005	10/26/2005	***
Croydon	12/1/2004	1/14/2005	7/20/2005	8/5/2005	10/19/2005
Cryochem	12/1/2004	2/14/2005	7/13/2005	8/5/2005	10/19/2005
North Penn 1	2/8/2005	3/21/2005	7/20/2005	8/5/2005	11/7/2005
Saunders	2/10/2005	5/20/2005	7/13/2005	7/29/2005	11/7/2005
SCD	2/10/2005	4/15/2005	7/13/2005	8/5/2005	10/19/2005

Note:

* Full-scale evaluations were conducted at Greenwood, Havertown, Hellertown, and Raymark for the previous pilot studies. The dates indicate the completion of the final evaluation reports.

** The dates indicate the draft site tracker only.

*** Two follow-up meetings were scheduled for this site, but the first scheduled follow-up meeting was used to discuss the draft optimization report and arrange a site visit for both the site team and ROET. Therefore, the second scheduled follow-up meeting is the first true follow-up for this site.

2.0 OPTIMIZATION EVALUATIONS

2.1 OPTIMIZATION EVALUATION PROCESS

The Hellertown and Raymark sites (e.g., two of the “old” sites) were evaluated using the RSE process developed by the U.S. Army Corps of Engineers (USACE), and the Havertown and Greenwood sites (e.g., the other two “old” sites) were evaluated using an identical process to the RSE. The eight “new” sites were evaluated using a streamlined version of the RSE process. All three of these evaluation processes are designed to provide a third-party perspective of site operations with the goal of providing recommendations to improve remedy effectiveness, reduce cost, improve general operations, and gain site closure. The evaluations are not intended to be an audit or to criticize previous efforts. The activities and various roles and responsibilities associated with the streamlined evaluation process are discussed below.

Preparation

The preparation stage began at the kickoff meeting on November 3, 2004. The streamlined optimization evaluations were scheduled for the eight new sites and the first round of follow-up meetings was scheduled for the four old sites. In addition, the ROET distributed baseline information forms to the site RPMs so that the RPMs could provide baseline information regarding annual costs, remedy status, and other fundamental remedy information. The baseline form, designed for use with operating systems, is provided as Attachment B to this report. A slightly modified version of the form was developed later in the project to use for systems in the design or planning stage. This modified version is also included in Attachment B. The RPMs for each of the 12 sites completed the form and returned it to the ROET prior to the optimization evaluation meeting (for the new sites) or the first round of tracking/follow-up (for the old sites). Regional coordination staff also gathered relevant site documents and transferred them to the ROET for review. The coordination staff identified relevant documents by referring to a list of useful documents provided in the kickoff agenda (see Attachment A), reviewing the administrative record, and coordinating with the RPM and ROET.

Evaluation

The ROET began the evaluation phase for the eight new sites by reviewing the baseline site information and the site documents to become familiar with the site and to generate questions to be answered during the optimization evaluation meeting. This review began approximately one month prior to the scheduled optimization evaluation meeting. The ROET then met with the site team on the scheduled day for 1.5 hours to discuss the site and answer questions that stemmed from a review of the baseline information and site documents. The meeting was geared toward information gathering so that the ROET could later analyze the data, update the site information form, develop recommendations, and draft a report. The meetings were constructed so that optimization evaluations for up to four sites were conducted in one day. This reduced the optimization contractor travel costs associated with meeting attendance. A typical agenda for an optimization meeting that was distributed to Regional staff during the kickoff meeting for introductory purposes is provided as Attachment C to this report.

Report

For the eight new sites, after the optimization evaluation meeting the optimization contractor took the lead on developing recommendations and drafting a report. The optimization contractor worked in concert with the other members of the ROET to develop appropriate recommendations. A draft report that included findings and recommendations was generally submitted to the site team within 45 days of the optimization evaluation meeting. The report also included an updated site information form. The reports were streamlined compared to those associated with a full-scale evaluation. These streamlined reports focused mostly on findings and recommendations and did not provide a comprehensive summary of the site.

The streamlined report and updated site information form for each site were finalized after feedback was received from and discussed with the site RPM. These documents then served as a baseline for subsequent follow-up activities.

2.2 SUMMARY OF RECOMMENDATIONS

The following table lists the number of recommendations provided for each of four categories, based on the finalized optimization evaluation report:

Site	System Effectiveness	Cost Reduction	Technical Improvement	Site Closure	Total
“Old” Sites that Received Full-Scale Evaluations Prior to Entering the Pilot Program					
Greenwood	4	5	2	2	13
Havertown	4	2	2	2	10
Hellertown	4	2	1	1	8
Raymark	7	0	0	3	10
Old-Site Subtotal	19	9	5	8	41
“New” Sites that Had Not Received Optimization Evaluations Prior to the Program					
AIW Frank	1	1	2	1	5
Butz	2	3	2	1	8
Crossley *	2	0	1	0	3
Croydon	2	1	0	1	4
Cryochem	3	4	1	2	10
North Penn 1	3	0	2	1	6
Saunders	3	1	1	1	6
SCD	1	3	0	0	4
New-Site Subtotal	17	13	9	7	46
Total	36	22	14	15	87

** Recommendations were not finalized at the time of this summary report. The indicated recommendations for Crossley were based on the draft optimization report.*

2.3 SUMMARY OF POTENTIAL COSTS AND COST SAVINGS

The following table summarizes the potential costs and cost savings associated with implementing recommendations in each of the recommendation categories. There were several recommendations where estimates for costs and/or savings were “not quantified” in the optimization evaluation reports to the open-endedness of the recommendation. This table does not reference any “unquantified” estimates of costs or cost savings.

Recommendation Category	Estimated Capital Costs to Implement	Estimated Change in Annual Costs after Implementation
“Old” Sites that Received Full-Scale Evaluations Prior to Entering the Pilot Program		
Protectiveness	\$851,000	\$26,000
Cost Reduction	\$125,000	(\$295,000)
Technical Improvement	\$80,000	\$35,000
Site Closeout*	(\$1,500,000)	(\$30,000)
Old-Site Subtotal	(\$444,000)	(\$264,000)
“New” Sites that Had Not Received Optimization Evaluations Prior to the Program		
Protectiveness	\$322,000	\$2,000
Cost Reduction	\$0	(\$161,000)
Technical Improvement	\$10,000	\$29,200
Site Closeout	\$320,000	(\$80,000)
New-Site Subtotal	\$652,000	(\$209,800)
Total	\$208,000	(\$473,800)

Costs in parentheses indicate cost savings.

** Costs associated with site closeout recommendations for old sites include costs for a recommendation to remove contaminated surface soil or use a permeable soil cover instead of constructing an impermeable RCRA cap. The optimization evaluation suggested anticipated savings of \$1,500,000 for using these alternatives in place of the impermeable cap (e.g., the difference between \$2 million for a RCRA cap and \$500,000 for the alternative).*

2.4 SUMMARIES BY SITE

The optimization evaluation reports for all 12 sites (full-scale reports for the four old sites and streamlined reports for the eight new sites) are included as part of the optimization follow-up site trackers, which are provided within Attachment D to this report. Summaries of the optimization evaluation results for each of the 12 sites are provided below for convenience.

AIW Frank

This site with karst geology has a relatively small source area (less than one acre) but a dilute plume that is approximately 2,000 feet long. The primary contaminant of concern is TCE and its breakdown products, but 1,1,1-TCA is present at concentrations below the MCL and 1,4-Dioxane is present at concentrations up to 250 ug/L. At the time of the meeting, there were no established cleanup or discharge limits for 1,4-Dioxane, which was present in the system

influent. The optimization evaluation included one recommendation to improve protectiveness, which was to verify the appropriate 1,4-Dioxane limits. The one recommendation to reduce cost was to streamline the VOC removal process by either discontinuing air stripping or bypassing the GAC polishing step. The evaluation team also recommended the use of chemical oxidation with Fenton's reagent in the source area to address both the TCE and the 1,4-Dioxane. Recommendations were also made with regard to progress reporting.

Butz

The P&T system at this site operates cost-effectively to address a TCE plume in fractured bedrock. Prior to operation of the P&T system EPA had extended a water line for all but few residents in the area. The recommendations for improving protectiveness included implementing institutional controls to prevent future use of impacted ground water, and attempting to sample potable wells at two residences that are not hooked up to the waterline. The recommendations to reduce cost included reductions in the ground water sampling frequency, reductions in the process monitoring sampling, and elimination of the sampling for MNA parameters. Other recommendations pertained to improving progress reporting and reducing system downtime. The evaluation team also suggested that the site team continue with a P&T remedy rather than pursuing alternative remedial approaches.

Crossley

The interim remedy for this site with fractured bedrock and TCE concentrations over 100,000 ug/L included the installation of point-of-entry treatment systems for residential wells and a P&T system in the source area that was in the pre-design stage at the time of the optimization evaluation. The planned interim P&T system was to contain the TCE concentration at the 100,000 ug/L contour, but funding for design and construction had been delayed. At the time of the optimization evaluation, the site team was piloting the use of in-situ chemical oxidation in the source area using permanganate. The optimization evaluation for this site involved an original meeting associated with a streamlined evaluation and a follow-up visit to the site. The evaluation team recommended the installation of a P&T system at a location further downgradient than previously planned to contain more of the plume, a vapor intrusion analysis for residences located over the plume, and further consideration of aggressive source remediation technologies.

Croydon

At the time of the streamlined optimization evaluation for this site, the remedy was reaching the end of the LTRA period and the site team was preparing to transfer the remedy to the State. The site had low level TCE concentrations (e.g., approximately 10 ug/L). The recommendations for improving protectiveness were to implement institutional controls and to extend access to a local property to allow continued operation of the remedy. The one recommendation to reduce cost was to reduce the process monitoring. The evaluation also suggested consideration of an exit strategy, but recognizes that this is best left to the State given the upcoming transfer.

Cryochem

The P&T system for this remedy was designed to capture the contaminant plume upgradient of a residential area with potable wells, but the demonstration of capture was unclear in site reports. The recommendations to improve protectiveness were to perform a detailed capture zone analysis, continue monitoring for MTBE and 1,4-Dioxane to detect if concentrations increase above discharge standards, and work with local government to implement institutional controls. The recommendations to reduce cost included reducing the both ground water and process water sampling and the associated data validation. A recommendation was also made to produce timelier ground water monitoring reports. The evaluation provided further recommendations supporting a continuation of a P&T remedy and avoiding source removal activities given the difficulty and expense of fully characterizing the source area contamination.

Greenwood

This site received a full-scale optimization evaluation in 2003/2004 that included a site visit by an optimization team. The optimization team found the site operating in a manner consistent with its ROD for an interim ground water remedy. The P&T system was extracting contamination and reducing the potential for contaminant migration; however, the plume had not been fully delineated and plume capture offered by the P&T system had not been fully evaluated. The optimization evaluation included the following recommendations for improving protectiveness: resample nearby residential wells, improve plume delineation (specific monitoring locations were suggested), establish a target capture zone, and check condition of vapor phase GAC used to treat vapors from process tanks. The recommendations to reduce cost were as follows: reduce operator labor, address lagoon sediments to reduce solids loading to the treatment plant, consider bypassing the UV/Oxidation system, streamline the ground water monitoring program, and review project management and technical support costs. Recommendations for site closure included recommended alternatives to a RCRA cap that was planned to address surface soil contamination.

Havertown

This site received a full-scale optimization evaluation in 2003/2004 that included a site visit by an optimization team. The ROET found the site operating in a manner consistent with its ROD for an interim ground water remedy. The P&T system was extracting contamination and reducing the potential for contaminant migration; however, the plume was not fully delineated and plume capture offered by the P&T system had not been fully evaluated. The optimization evaluation included the following recommendations for improving protectiveness: continue efforts to investigate and seal the abandoned sewer line to eliminate this preferential path for contaminant migration, delineate the plume (specific monitoring locations were suggested), establish a target capture zone, and modify the treatment plan to reduce downtime. The recommendations to reduce cost were as follows: bypass two or more of the UV/Oxidation units to rely on GAC for contaminant removal and consider reductions in labor (particularly project management and sampling labor) once system reaches steady-state operation.

Hellertown

This site received a full-scale optimization evaluation in 2001 that included a site visit by an optimization team. The optimization team observed a site with relatively low-level concentrations of TCE (maximum concentration of approximately 200 ug/L) and a P&T system that was operating cost-effectively. The degree of plume capture offered by the P&T system was unclear. The optimization evaluation included the following recommendations for improving protectiveness: install an additional monitoring well downgradient of the extraction well to monitor concentration trends and evaluate plume capture, evaluate the cause of recent reductions in well capacity, continue pursuit of appropriate institutional controls for the site, and investigate a potential source area that may remain near the former lagoons. The recommendations to reduce cost were as follows: consider replacing the air stripper with GAC to treat extracted ground water and reduce the building heat from approximately 65 degrees to approximately 40 degrees to save energy costs.

North Penn 1

This site with PCE contamination in fractured bedrock consists of one extraction well that pumps approximately 2 gpm. At the time of the streamlined optimization evaluation, the extracted water generally had a concentration of approximately 10 ug/L, but a monitoring well downgradient of this well had PCE concentrations over 2 mg/L. The streamlined optimization evaluation recommended updating the site conceptual, conducting a pump test (instead of the planned packer test) in the well with the elevated PCE to determine the effect of pumping on the concentration, and determining the need for further characterization based on the pump test results. The evaluation also recommended improving the reporting, revising the current pumping strategy, and considering in-situ remedial options (such as in-situ chemical oxidation) for the impacted well.

Raymark

A full-scale Remediation System Evaluation was conducted at this site in June 2001, approximately six years after it had become operational and functional. During that first six years, the site had been transferred to several RPMs, and a number of protectiveness issues had developed that the current RPM was addressing. The RSE provided seven recommendations for improving protectiveness, including surveying and evaluating well-construction data for all site monitoring wells, creating a potentiometric surface map, delineating plume contamination, evaluating capture, and evaluating vapor intrusion. No recommendations were made in the cost reduction category. Recommendations were also made to organize the site data, complete an O&M manual, and label all site wells.

Saunders

The P&T system at this former wood treating site overlying unconsolidated media has four extraction wells that pump a total of a approximately 1 gallon per minute. The highest contamination detected on-site was located at depth downgradient from the original source area, with no overlying contamination. The streamlined optimization evaluation recommendations to

improve protectiveness included documenting a site conceptual model, conducting a preliminary capture zone analysis, and potentially installing additional monitoring points. Other recommendations included reducing the ground water monitoring frequency, improving O&M reports, and considering other remedial alternatives if continued P&T is not the most appropriate remedy given a revised conceptual site model.

SCD

At the time of the streamlined optimization evaluation, the remedy for this site was in the design phase. The remedy would include a barrier wall encircling a large source area and a P&T system extracting water to maintain an inward and upward gradient. The one streamlined optimization evaluation recommendation to improve protectiveness included further investigation of the presence of contamination in the deeper aquifer. The recommendations to reduce cost included conducting a cost comparison of additional P&T downgradient of the barrier wall with the proposed in-situ chemical oxidation that was planned for the area, reevaluating the costs of including a cap for the site, and considering the potential use for on-site regeneration of GAC rather than the planned off-site regeneration.

3.0 FOLLOW-UP AND TRACKING

3.1 FOLLOW-UP PROCESS

The optimization program was designed to include a follow-up process that would continue a dialogue between the ROET and the site team after the optimization evaluation was conducted. The follow-up process included two in-person meetings for each site. For the eight new sites, these follow-up meetings were intended to occur within one year of conducting the original optimization evaluation. It is expected that the optimization program will continue after this initial pilot year and that additional follow-up meetings will occur, with the frequency dependent on the complexity of the site and the site activities that are either planned or being implemented.

Each of the two follow-up meetings was 1.5 hours in length per site and consisted of both the ROET and the site team. For the eight new sites, the first meeting was generally conducted within 6 months of submitting the draft optimization evaluation report, and the objectives of the first meeting were as follows:

- Discuss recommendations and finalize the draft optimization report accordingly
- Determine progress toward implementing any recommendations
- Discuss issues facing the site that were either not discussed during the optimization evaluation or are new to the site since the optimization evaluation
- Identify areas where the site team would benefit from technical assistance provided by the outside contractor
- Discuss potential milestones for tracking site progress toward meeting its remedial objectives

The second follow-up meeting was generally conducted approximately 3 months after the first follow-up meeting, and had similar objectives to the first follow-up meeting with the exception that the optimization evaluation report was considered final prior to the second follow-up meeting.

The follow-up process was facilitated by the use of a site tracker that is updated with each follow-up meeting. The site tracker provides the following information:

- Updated site information sheet to summarize site costs and other information
- Site team and ROET participants
- Progress in implementing recommendations that have not yet been fully implemented

- Additional recommendations that were identified during the most recent follow-up meeting
- Archive of recommendations that have been implemented, including the purpose of each recommendation, how it was implemented, when it was implemented, and estimated costs or cost savings associated with implementation
- Technical assistance archive in reverse chronological order, including both current and historical technical assistance provided by the ROET and/or outside contractor (attached as an appendix)
- Original optimization evaluation report (attached as an appendix)

The site trackers for the 12 sites in this project are provided as Attachment D of this report.

3.2 SUMMARY OF OPTIMIZATION PROGRESS

The following table summarizes the progress the Region has made in considering and implementing the recommendations from the pilot program by the end of the latest follow-up meeting.

Recommendation Category	Implemented	In progress	Planned/ Delayed*	Will not be implemented	Total
Status for Four Old Sites					
Effectiveness	13	3	1	2	19
Cost Reduction	3	3	2	1	9
Technical Improvement	7	1	0	0	8
Site Closure	3	1	1	0	5
Subtotal for New Sites	26	8	4	3	41
Status for Eight New Sites					
Effectiveness	1	8	6	2	17
Cost Reduction	11	1	0	1	13
Technical Improvement	4	4	0	0	8
Site Closure	5	1	2	0	8
Subtotal for New Sites	21	14	8	3	46
Total	47	22	12	6	87

* Also includes those recommendations that are “under consideration” or “deferred to the State”.

3.3 SUMMARY OF COSTS AND COST SAVINGS

The following table summarizes “actual” costs and cost savings associated with implementing recommendations in each of the recommendation categories. “Actual” costs and cost savings refers to those values that have been provided by the site team representing costs or savings that have either been incurred or are expected to be incurred. The table only provides those values that have been provided by the site teams. Values for several recommendations were not available at the time this report was prepared. This includes values associated with some recommendations that have been implemented but costs and/or savings were not broken out as of the date of this report. Therefore, the table reflects only a snapshot of the costs and savings that will eventually be incurred/realized.

Recommendation Category	Capital Costs for Implementation*	Change in Annual Costs after Implementation*
“Old” Sites that Received Full-Scale Evaluations Prior to Entering the Pilot Program		
Protectiveness ¹	\$630,000	\$0
Cost Reduction	\$0	(\$54,000)
Technical Improvement	\$0	\$0
Site Closeout ²	(\$2,000,000)	\$0
Old-Site Subtotal	(\$1,370,000)	(\$54,000)
“New” Sites that Had Not Received Optimization Evaluations Prior to the Program		
Protectiveness ¹	\$175,000	\$0
Cost Reduction	(\$10,000)	(\$130,000)
Technical Improvement	\$0	\$0
Site Closeout ³	\$90,000	\$0
New-Site Subtotal	\$255,000	(\$130,000)
Total	(\$1,115,000)	(\$184,000)

Costs in parentheses indicate cost savings.

* Noted capital costs and changes in annual costs are either actual costs/savings from implementing recommendations or are reasonable estimates of costs/savings that have not yet been quantified by the site team. Estimates were calculated by the ROET but were considered reasonable by the site team.

- 1 Several of the high cost protectiveness recommendations were implemented as part of system modifications associated with transitioning remedies from interim remedies to final remedies.
- 2 A recommendation for removing contaminated surface soil or using an impermeable soil cover as an alternative to an impermeable RCRA cap at one site was effectively implemented as EPA went through the process selecting and implementing a final remedy. The actual costs of the alternative were similar to those estimated in the optimization evaluation for a RCRA cap (\$2 million) but were substantially lower than the EPA final cost estimate for the RCRA cap (~\$4 million) in the Proposed Plan. Therefore, instead of realizing savings of \$1.5 million (i.e., the difference between \$2 million and \$500,000) indicated in the table in Section 2.3, the site team realized savings of \$2 million (i.e., the difference between \$4 million and \$2 million). The savings of \$2 million is reflected in the above table.
- 3 Capital cost of \$100,000 reflects the cost-effective implementation of a recommendation that the ROET estimated would cost approximately \$300,000.

3.4 SUMMARY OF FOLLOW-UP BY SITE

AIW Frank

The streamlined optimization evaluation provided five recommendations to the AIW Frank site (one for effectiveness, one for cost reduction, two for technical improvement, and one for site closeout). Between the original evaluation meeting in December 2004 and the end of the pilot project in December 2005, the AIW Frank site team had implemented four of the five recommendations and made progress on implementing the fifth. Highlights of the site team’s effort during the optimization pilot project include the following:

- Implementing the cost reduction recommendation involved piloting the use of GAC only (e.g., discontinuing air stripping) for VOC treatment, interpreting the pilot results, and

ultimately bypassing the treatment plant air stripper. The site team estimates that up to \$18,000 will be saved annually from reduced electrical costs. The site team also indicates that additional savings will likely be realized because GAC changeouts will be easier, because hardening of the GAC has decreased in the absence of air stripping.

- Implementing the site closeout recommendation involved all aspects of applying in-situ chemical oxidation in the source area, including work plan development and actual implementation planned for November 2005.
- The recommendation to improve protectiveness was to determine an appropriate discharge and cleanup standard for 1,4-Dioxane. EPA is continuing to work with the State to determine this standard.

The only additional considerations/recommendations suggested by the ROET during the tracking/follow-up process were suggestions regarding monitoring and evaluating the results of the in-situ chemical oxidation, the majority of which would likely occur after the optimization pilot program comes to an end.

Butz

In the 11-month period between the streamlined optimization evaluation and the last follow-up meeting for the site, the site team had implemented five recommendations, made significant progress on two recommendations, and decided against implementing one recommendation. The implemented recommendations included reducing the ground water monitoring frequency, eliminating analysis for MNA parameters, receiving timelier ground water monitoring reports, and continuing with P&T instead of pursuing alternative remedies. A savings of approximately \$10,000 per year will likely be realized. As of the end of the follow-up process, the site team was abandoning pilot tests of other technologies and appropriately focusing on P&T by estimating the costs for another extraction well. Approximately \$50,000 of funding is appropriately being reallocated to the installation of a source area extraction well. The significant progress toward reducing system downtime included a search for a local person to regularly check and restart the system, if necessary. The significant progress toward implementing institutional controls included reviewing efforts made by previous RPMs

Crossley

The streamlined optimization evaluation provided three recommendations to this site that is in the pre-design phase (two for protectiveness and one for site closeout). Between the original evaluation meeting in February 2005 and the end of the pilot project in December 2005, the site team and ROET worked together on this complex site (including a site visit) to identify the most appropriate next steps for the site. Highlights of the site team's effort during the optimization pilot project include the following:

- The site team worked with the ROET during the optimization evaluation meeting, first follow-up meeting, and a site visit to determine the most appropriate location for an extraction system and treatment plant.

- In response to recommendation to evaluate vapor intrusion, the site team tasked the support team from Fort Meade to develop a work plan for evaluating vapor intrusion at approximately 20 residences located over the Crossley Farm TCE plume.
- The RPM decided to prepare a ROD Amendment documenting the revised location for the extraction system and treatment plant. The new location would involve installing the extraction system downgradient from the source area location indicated in the ROD. The new location will better contain the plume and provide a better opportunity for the area downgradient of the extraction system to eventually reach cleanup standards.

Because the RPM is planning on including the potential for source area pumping in the ROD Amendment (in addition to pumping from the downgradient location), the ROET has provided additional considerations for conducting pump tests to help determine the most appropriate way of implementing the source area pumping given that an extraction system and treatment system will be present at a downgradient location. Also during follow-up, the ROET provided considerations for the vapor intrusion evaluation that will be conducted by the Fort Meade group.

Croydon

In the 11-month period between the streamlined optimization evaluation and the last follow-up meeting for this site, the site was preparing for transfer to the State. EPA had discussed the recommendations with the State but was not able to have them implemented prior to transfer. The recommendations, such as establishing institutional controls, maintaining site access, and considering an exit strategy, will be addressed by the State.

Cryochem

In the 11-month period between the streamlined optimization evaluation and the last follow-up meeting for this site, the site team had implemented (or implemented an alternative to) seven of the recommendations and was making significant progress on the remaining three recommendations, including the capture zone analysis, which was a subject of further technical assistance from the evaluation team, and working toward implementing appropriate institutional controls. Recommendations that were implemented included reducing the ground water monitoring frequency and eliminating analysis for metals from the extraction well sampling program. Savings of approximately \$100,000 per year is expected to be realized due to reduced sampling labor.

Greenwood

The full-scale optimization evaluation conducted prior to the optimization pilot project provided 13 recommendations for this site that currently has an interim remedy (four for protectiveness, five for cost reduction, two for technical improvement, and two for site closeout). Between the original evaluation site visit in August 2003 and the second follow-up meeting conducted as part of the pilot project, the site team had implemented nine of the recommendations, made significant progress on three of them, and made significant strides toward reaching construction

completion for a final remedy. The three recommendations in progress were to continually aim to eliminate metals removal and the UV/Oxidation units while maintaining protectiveness, optimizing the ground water monitoring program, and evaluating project management for costs. As of October 2005, the site team was conducting a pilot test to bypass the UV/Oxidation unit and was obtaining favorable results for eliminating that process. Savings of approximately \$17,000 will likely be realized. The other two recommendations will be more effectively implemented once the modifications to the P&T system for the final remedy are completed and operation is stable. A recommendation for removing contaminated surface soil or using an impermeable soil cover as an alternative to a RCRA impermeable cap was effectively implemented as EPA went through the process selecting and implementing a final remedy for OU-4. The actual costs of the alternative were similar to those estimated by the optimization evaluation for a RCRA cap (\$2 million) but were substantially lower than the costs estimated by EPA for the RCRA cap (~\$4 million), according to the Proposed Plan for the site. Therefore, a savings of approximately \$2 million (e.g., the difference between \$4 million and \$2 million) was realized.

Havertown

The full-scale optimization evaluation conducted prior to the optimization pilot project provided ten recommendations for this site that currently has an interim remedy (four for protectiveness, two for cost reduction, two for technical improvement, and two for site closeout). Between the original evaluation site visit conducted in August 2003 and the first round of follow-up conducted as part of the pilot project, the site team made significant progress on four recommendations and implemented three others. Highlights of the site team's effort during that period include the following:

- The site team had plugged an abandoned sewer that was acting as a conduit for contamination to migrate downgradient. They had also investigated the impacts and were awaiting results from field samples.
- The site team had attempted to delineate the plume by following the optimization evaluation recommendation and installed six new monitoring wells. Sampling of the new wells indicated additional monitoring wells would need to be installed.
- The site team had developed a numerical model to evaluate capture. It was later determined by the ROET that this model was incorrectly calibrated and that additional work would be needed for the model to be useful for the site.
- The site team had piloted operation of the treatment system with only one UV/oxidation unit instead of three. The pilot confirmed that the treatment plant would be effective in this mode, and the treatment plant is now running with one unit, result in savings of approximately \$35,000 per year.
- The site team has made several modifications to the treatment plant to improve reliability and reduce down time.

During the second round of follow-up for this site, the site team informed the ROET of results from recent ground water sampling and implications for the final remedy. As a result of the sampling, the site team was planning on using a new well location as an extraction point for the final remedy. The ROET subsequently provided considerations for further evaluating this well location, including conducting a pump test from the well, re-calibrating the numerical model, and using the calibrated model to simulate the effects of extracting from the new well.

Hellertown

Of the eight recommendations made at this site in the full-scale RSE conducted in June 2001, the site team had implemented four of them by the second follow-up meeting, which was conducted in October 2005. One of these recommendations included lowering the thermostat for the building temperature to saving heating costs. The site team estimates savings of approximately \$2,000 per year from implementing this recommendation. The site team determined that another recommendation (replacing the air stripper with GAC) would not be implemented until the air stripper required replacement or extensive maintenance. By deferring implementation of this recommendation, the projected savings of \$33,000 per year associated with this recommendation will not be realized, but the capital cost of \$125,000 to implement the recommendation will not be incurred. Two of the remaining recommendations required cooperation from other entities, including accessing a parcel of land to install monitoring wells for a capture zone evaluation and working with the property owner to implement institutional controls. The final recommendation (to establish cleanup levels for the site) is scheduled for completion in 2006 when an ESD will document MCLs as the site cleanup levels.

North Penn 1

Of the six recommendations made at this site, one has been implemented, three are in progress, and two are delayed based on the results of implementing other recommendations. The one recommendation that was implemented was to discontinue pumping at the one extraction well where low concentrations were observed. The intent is to perform further investigation, including a pump test, at a nearby well where much higher concentrations are observed. The results of that investigation, which has not yet been performed, will determine subsequent actions. Other recommendations include more clearly stating the site conceptual model and improving semi-annual monitoring reports.

Raymark

Of the 10 recommendations made at this site in the full-scale RSE conducted in June 2001, the site team had implemented six of them prior to transferring the site to the State in June 2005. Two of the recommendations will not be implemented. The first was to evaluate the TCE impacts on the surface water body that receives the treated water, and the Region opted against this recommendation due to the presence of other non-site-related TCE sources in the area. The second was to abandon selected wells, which will not be implemented due to a lack of funding for the site and a priority for other site-related activities prior to site transfer to the State. EPA will continue with a soil gas survey and installation of an extraction after the site transfer and will attempt to evaluate the potential vapor intrusion as part of that evaluation. A total capital cost of \$270,000 was reserved for conducting these activities.

Saunders

The streamlined optimization evaluation provided six recommendations to the Saunders site (three for effectiveness, one for cost reduction, one for technical improvement, and one for site closeout). During the first follow-up meeting, the ROET identified potential problems with the sampling technique that has been used at the site. The use of bailers have likely resulted in increased turbidity that may have led to metals and PCP concentrations that were not representative of ground water and that ground water concentrations may be significantly lower than previously suggested by the old sampling method. The ROET recommended resampling with low-flow sampling with an in-line filter. Between the original evaluation meeting in February 2005 and the end of the pilot project in December 2005, the Saunders site team had conducted two rounds of sampling with the revised sampling technique. The other recommendations, which primarily focus on updating the site conceptual model and conducting a capture zone analysis, have been delayed until the results of the sampling have been reviewed. The sampling appears to indicate that ground water concentrations are sufficiently high to merit additional remediation, so the site team is moving forward with the recommendations. The site team will also move forward with the recommendation to reduce the ground water monitoring frequency from quarterly to semi-annually. The reduction will likely save approximately \$12,000 per year in labor costs.

SCD

Three of the four recommendations provided were ideas for consideration during design, and the fourth was a recommendation to investigate the deeper aquifer. In the seven-month period between the streamlined optimization evaluation meeting and the second follow-up meeting, which was held in October 2005, the site team made significant progress toward the deeper aquifer investigation and fully considered the three other ideas. The investigation was being conducted by the USGS as part of a larger hydrogeological investigation for a cost of \$150,000. During the follow-up process, the evaluation team also provided additional items for consideration beyond those communicated in the evaluation report.

- To simplify the construction process and reduce cost, the evaluation team suggested constructing the P&T system prior to constructing the full-encircling barrier wall so that pumping could be initiated before the source area was enclosed. The evaluation team also provided considerations for contracting the construction teams for the barrier wall.
- The evaluation team pointed out that mass removal through P&T alone will provide substantially more mass removal than what previous DNAPL collection efforts have demonstrated. Therefore, the evaluation team recommended for cost-effectiveness that the site team not include DNAPL collection as a focus of the remedy.
- The evaluation team also raised a question about the in-situ oxidation planned for the impacted wetlands. Although the contamination is adversely impacting the wetlands, the proposed remedy would likely result in more severe impact to the wetlands and would cost approximately \$10 million. Therefore, the evaluation team suggested other potential alternatives to addressing the wetland contamination and encouraged the site team to discuss these alternatives with Regional ecologists and toxicologists.

4.0 TECHNICAL ASSISTANCE

4.1 SITES WITH TECHNICAL ASSISTANCE

As part of the scope of this project, technical assistance either has been provided at the following five sites:

- Havertown
- Hellertown
- SCD
- Cryochem
- Crossley
- AIW Frank

4.2 BRIEF SUMMARY OF TECHNICAL ASSISTANCE

Havertown

A technical review was provided on the “Groundwater Model Report” prepared by Val F. Britton, revision dated July 29, 2004. The report was reviewed by the ROET contractor. The details are included in the Havertown site tracker (Attachment D of this report).

Hellertown

Technical assistance was provided on the following issues:

- Capture zone width and stagnation point calculations
- Replacement pump information
- Development of an exit strategy

The details are included in the Hellertown site tracker (Attachment D of this report).

SCD

Technical assistance was provided regarding considerations for the following:

- Sequencing the construction of the barrier wall and P&T system
- DNAPL recovery
- Addressing the wetlands contamination
- Contracting considerations for construction of the barrier wall

The details are included in the SCD site tracker (Attachment D of this report).

Cryochem

A conference call was conducted between RPM, RSE-lite team, and site contractor regarding the capture zone analysis for the site and the related modeling effort performed by the site contractor. Subsequently, a written technical review with a suggested approach for a revised model calibration has been prepared. The details are included in the Cryochem site tracker (Attachment D of this report).

Crossley

At Crossley, a site visit by the ROET and site team was conducted on September 14, 2005. The site visit was arranged so that the site team and ROET could walk the site and determine the most appropriate location for an extraction system and treatment plant. The site team had been preparing for an extraction system in the source area while the ROET was recommending an extraction system further downgradient to contain a larger portion of the plume. A consensus was reached during the site visit. The optimization evaluation report was then finalized to document recommendations (including extraction system location) that were determined based on the site visit.

AIW Frank

At AIW Frank, the site conducted in-situ chemical oxidation in response to a recommendation from the optimization evaluation. This effort was conducted near the end of the optimization project. For technical assistance, the ROET provided an example decision tree that the site team could consider for evaluating the results of the in-situ chemical oxidation application.

5.0 MILESTONES

5.1 PURPOSE OF DEVELOPING MILESTONES

One pilot project objective was to develop site-specific milestones and a standardized milestone program to help track the progress of a long-term ground water remedy from the time it becomes operational and functional until the time cleanup standards are reached. If successfully implemented at the Regional scale, the milestone program could be launched nationwide to help all EPA Regions, EPA OSRTI, and the States to track the progress of approximately 90 Fund-lead P&T systems. The task of developing milestones and a milestone program was thought to be uniquely suited to the ROET because it included Regional management, Regional technical staff, EPA OSRTI representatives, and an outside optimization contractor. By not including a site RPM, the ROET avoids the potential conflict for a site RPM to develop its own milestones.

5.2 FIRST ATTEMPT TO DEVELOP MILESTONES

The optimization contractor provided a first, preliminary attempt at developing site specific milestones for each site to serve as a discussion point with the rest of the ROET. This preliminary attempt helped identify a number of issues that complicates the development of such milestones. The preliminary attempt at developing milestones had the following components:

- Ten site-specific milestones were developed for each site. The first milestone was O&F and the tenth milestone was site closure.
- Although many of the milestones were intended to be met in sequential order, progress to remediation would be determined by how many of the 10 milestones had been met, regardless of the order. This would provide more flexibility in how site conditions might change as progress to site closure is reached.
- The ten milestones were designed to be relatively equally spaced between O&F and site closure so that reaching each milestone was an indicator that significant progress had been made. This would theoretically reduce the potential for achieving 9 of 10 milestones but still being far from reaching site closure.
- Each of the milestones was given a target date for achievement. If a target date was not achieved, it would be a possible indication that the appropriateness of the remedy should be reviewed.

A sample set of milestones for one site is provided in the following table to illustrate the concept behind this preliminary approach to developing milestones.

#	Milestone	Status (Yes/No/In Progress)	Actual/Target Date
1	Remedial System Operational and Functional	Yes	3/29/2001
2	Remove 50 pounds of TCE; 1,1,1-TCA; and PCE combined (e.g., estimated mass removal of source area wells after one to two years of operation)	Yes	7/2004
3	Observe a 50% decrease in TCE concentrations in MW-112A and MW-112B (determined as average of four most recent samples compared to an average of the four first samples from each well)...these are first set of downgradient performance monitoring wells relative to presumed capture zone	No	3/2006
4	Observe a 50% decrease in TCE concentrations in MW-113A and MW-113B (determined as average of four most recent samples compared to an average of the four first samples from each well)... these are second set of downgradient performance monitoring wells relative to presumed capture zone	No	3/2011
5	Observe a 50% decrease in TCE concentrations in OB-11, MW-108A, and MW-111 (determined as average of four most recent samples compared to an average of the four first samples collected between October 2000 and April 2001)...source area wells	No	3/2006
6	Observe a 90% decrease in TCE concentrations in OB-11 and MW-108A (determined as average of four most recent samples compared to an average of the four first samples collected between October 2000 and April 2001)...source area wells	No	3/2011
7	Discontinue pump and treat in favor of monitoring only, TI, or another remedial approach based on appropriate criteria	No	3/2016
8	Maximum concentration of each contaminant of concern within one order of magnitude of that contaminant's cleanup standard.	No	3/2016
9	Maximum concentration of each contaminant of concern within a factor of five of that contaminant's cleanup standard.	No	3/2026
10	Site closure – Contaminants of concern are below standards for a specified number of sampling events that is consistent with EPA Region 3 policy, or based on TI waiver	No	

Some of the identified issues of using such milestones are as follows:

- The assigned dates to most milestones (particularly the later ones) are somewhat arbitrary unless they are based on simulations with well-calibrated ground water flow and contaminant transport modeling, and such modeling is not necessary for remediation purposes at many sites. Therefore, the milestones should not include target dates.
- Setting a milestone by comparing a maximum contaminant concentration to some multiple of the cleanup level (e.g., “Maximum concentration of each contaminant of concern within a factor of five of that contaminant’s cleanup standard”) does not

necessarily reflect an equivalent milestone for reduction of risk, which is the basis for Superfund remedial actions.

- The use of 10 milestones for each site will lead to some sites with more milestones than are appropriate.
- Despite best efforts, milestones at some sites will be achieved at a faster rate than at others due to site conditions, and through no fault of a site team, RPM, or Region milestones may not be reached, suggesting failure or non-performance of EPA staff and contractors.
- Changing conditions may merit the addition of new milestones and/or eliminating certain milestones, complicating the intended use of the milestones.
- The milestones have relatively little relevance to the management of the site at the site or Regional level. The number of Fund-lead sites in each Region is sufficiently small for Regional management to track in a more meaningful and comprehensive manner. In addition, EPA's role in site management changes after LTRA, which is typically 10 years after O&F. Therefore, life-cycle milestones have relatively little relevance during the LTRA period and places additional reporting and tracking pressures on the States and EPA after LTRA.

Several suggestions were made to develop an alternative to the milestones, including developing criteria to help the EPA RPM track remedy performance during LTRA and/or developing criteria to help the EPA RPM provide regulatory oversight after LTRA. Because these suggestions were inconsistent with the original objective of measuring or tracking progress toward site closure, these were not implemented.

6.0 LESSONS LEARNED AND CONCLUSION

This optimization pilot program differed from other optimization efforts that EPA has implemented to date. Some of those differences and associated lessons learned are discussed below.

Establishment of a Region Optimization Evaluation Team (ROET)

The establishment of a ROET greatly facilitated the optimization process because it involves Regional management and Regional technical staff beyond those directly associated with the site. Although involving this many people complicates scheduling of optimization-related meetings, the participation of these individuals, in addition to the optimization contractor and OSRTI representative, means that these individuals are involved in forming optimization recommendations. The following benefits result:

- The RPM knows that management and technical staff support the recommendations, and the RPM can therefore move forward with implementation immediately.
- The recommendations fully consider/incorporate EPA and Regional policy rather than just the technical considerations provided by an optimization contractor.
- Policy or funding obstacles to implementing recommendations can be resolved quickly.
- A consistent group of Regional staff become involved with multiple sites and can assist in transferring knowledge and lessons learned from one site to another.
- A presence from the original optimization evaluation remains within the Region after the contract with the optimization contractor ends.
- Recommendations are provided by Regional colleagues (with the assistance of optimization contractors and a headquarters representative) as part of a team rather than by an optimization contractor directed by headquarters. As a result, the ROET is seen more as a resource for improvement rather than as an auditor.

Streamlined Optimization Process Applied to a Portfolio of Sites

The streamlined optimization process involved face to face meetings that were conducted in the office for multiple sites in one day. In addition, the optimization evaluation reports were shorter, focusing on key findings and recommendations. This reduced the initial level of effort for reviewing each site, and if a site visit, further evaluation, technical assistance, or elaboration on existing recommendations was needed, it could be addressed during the follow-up period and/or through a generic technical assistance task. As a result, resources could be dedicated to those sites that needed the most assistance from the ROET rather than devoting equal time to each site regardless of site complexity. For example, more resources were dedicated to the Havertown and SCD sites than to the Croydon and Butz sites due to the difference in site complexity and potential for optimization.

Implementation of a Dynamic Optimization Process

Each site received two in-person follow-up meetings after the original optimization evaluation. This format of multiple in-person meetings provided an improved forum for discussion of the draft report, follow-up on implementation status for recommendations, and addressing new or recurring site issues. As a result, technical assistance was requested for 6 of the 12 sites involved in the program, and new issues/recommendations were identified during follow-up at 6 of the 12 sites.

By the end of the project (a one year time frame), 21 of 46 total recommendations for the new sites were implemented, and 14 of 46 recommendations were in progress. Therefore, over 75% of the recommendations for new sites were either implemented or in progress within one year of making the recommendation. The Region also chose to pursue 81 of 87 recommendations that were made at all 12 sites. Recommendations that were not implemented were generally either determined to be impractical after further consideration or were not allowed by the State. These statistics are comparable or represent a possible improvement over what has been documented for the nationwide optimization conducted by EPA between 2000 and 2001 as documented in the *Pilot Project to Optimize Superfund-financed Pump and Treat Systems: Summary Report and Lessons Learned* (EPA 542-R-02-008a, October 2002).

Use of Optimization on Interim Sites and Sites in the Design Phase

Of the 12 sites involved in the project, two were interim remedies, one was in the design phase, and one was in the pre-design phase. Although optimization evaluations in the nationwide effort had previously focused on operating final remedies, the optimization evaluation process proved beneficial at these four sites. For one of the interim sites (Havertown), the ROET provided suggestions for greatly improving the calibration for a model that would be used to design the final extraction system. For the site in the design phase (SCD), the ROET provided suggestions for sequencing the construction of the barrier wall and P&T system as well as suggestions for determining an appropriate remedy for impacted wetlands. For the site in the pre-design phase (Crossley), the ROET and the site team worked together to determine a more appropriate location for an extraction system and treatment plant than the one originally identified in the interim ROD. Therefore, the optimization evaluation process helped identify issues that would improve effectiveness and ultimately save time and resources before the systems became operational.

Implementation of Continued Follow-up

This pilot project included two rounds of follow-up for each of the 12 sites. For the original four sites, these follow-up meetings allowed for tracking of optimization progress, for the ROET to provide additional recommendations or considerations, and for the opportunity for the site team to use the ROET as a technical resource. For the eight new sites, the follow-up meetings were generally helpful for developing a final optimization report and adapting ROET and site team feedback as new information was collected. Most of the sites benefited from the continued follow-up and would continue to benefit from future follow-up. However, three of the sites

(Croydon, Butz, and Raymark) are either very stable in terms of site activities or have been transferred to the State and the benefits of additional follow-up meetings with the ROET beyond these first two meetings would not necessarily outweigh the costs. Future follow-up for most of the sites would likely be appropriate on an annual basis, but given the complexity and the number of decisions being made at the Havertown, Greenwood, Crossley, and SCD sites, semi-annual follow-up might be more appropriate.

Pilot Program Costs and Benefits

This pilot optimization program had a total optimization contractor cost of approximately \$240,000 for project kickoff, optimization evaluations for the eight new sites, two rounds of follow-up, and a final summary report. As indicated in Section 3.3 of this report, implementation of recommendations from the pilot program has resulted in a net savings of over \$1 million in capital costs and a net savings of approximately \$184,000 per year in annual operations costs, with the potential for additional savings as more recommendations are implemented.

It should be noted, however, that approximately \$2 million in capital cost savings resulted from one recommendation that was provided in the pre-design stage for a soil remedy at the Greenwood site. During the original optimization evaluation conducted in 2003 for this “old” site, EPA indicated the intent to proceed with an impermeable RCRA cap. The optimization evaluation provided an alternative to this remedy and several reasons (both pertaining to cost and remedy effectiveness) to avoid an impermeable cap. Ultimately, EPA went through the formal remedy selection process, and selected a remedy consistent with the optimization evaluation recommendation. With or without this single recommendation that has such a large influence on the cost savings for the Region, the annual savings from the implementation of other recommendations will more than pay for the cost of the pilot program in one or two years.

During the follow-up process, the ROET also identified the potential to avoid a costly remedy (approximately \$10 million) for impacted wetlands at the SCD site and to opt for a more appropriate, but lower cost remedy. The ROET input on a downgradient location for the P&T system at the Crossley site may also result in substantial savings. These potential savings have not yet been quantified, but the location selected during the optimization process may save the capital and operating costs for a second P&T system. These examples of cost savings during the pre-design or design phase at the SCD and Crossley sites, along with the example from the Greenwood site, demonstrates the value of conducting optimization evaluations prior to system construction and operation. Furthermore, the example for the Greenwood site demonstrates that the optimization evaluation process is valuable for remedies other than P&T.

The benefits from this optimization process are not limited to cost savings. Several recommendations were provided and are either implemented or are being implemented to improve the remedy protectiveness. For example, recommendations for improving the capture zone analyses at Hellertown and Cryochem were provided and are now being implemented. The plumes at Havertown and Greenwood are better delineated and, as a result, will likely be appropriately addressed by final remedies. A larger portion of the plume at Crossley will be contained and the residences overlying the plume will be evaluated for potential vapor intrusion. The remedy at AIW Frank will operate more efficiently due to a streamlined treatment plant, and

site closure may be reached faster as the result of aggressive source remediation with in-situ chemical oxidation.

Application to Other Regions

The pilot conducted in this Region is easily transferable to other Regions. In other Regions, a similar program could apply to more remedies than just operating P&T systems because of the benefits noted in this pilot project for P&T remedies in the design (or pre-design) stage and non-P&T remedies. The following aspects of the project would likely be replicated if applied in another Region:

- Creation of a ROET that involves Regional management, Regional technical staff, OSRTI representative, and a technical contractor
- Inclusion of all (or most) Fund-lead sites in the Region
- Streamlined optimization evaluations and two follow-up meetings as implemented here
- A generic technical assistance allocation
- A final report for presentation to both the Region and OSRTI

General Comments and Feedback from Regional Staff

Feedback on the pilot project from Region III staff was solicited by Regional management. A total of 11 RPMs participated in the project (one RPM managed two of the 12 sites), and eight of those RPMs provided feedback. A total of four Regional hydrogeologists participated in the project, and one of the site hydrogeologists provided feedback. The feedback is summarized below.

- Among the comments received from the nine responders, the following benefits of the project were cited:
 - Discussions were multi-sided. They included the RPM rather dictating instruction to the RPM.
 - A second or fresh set of eyes provided detailed input and implementable recommendations.
 - The project provided a focused, comprehensive review of a site's remedy and progress.
 - Management was involved in and supportive of the site reviews and optimization.
 - Expert site-specific input was not biased by previous site experience.
 - Optimization contractor provided independent engineering expertise not normally available to Regional staff.
 - Cost and potential for cost reduction was reviewed.
- Among the comments received from the nine responders, the following drawbacks of the project were cited:

- If the project ended at the pilot, it would be too short.
 - The review team should have been brought in earlier.
 - Two of the responders noted that having the follow-up meetings conducted by an optimization contractor seemed to place that contractor in a position of authority (potentially intimidating to the RPM and/or Regional hydrogeologist).
 - One responder noted that sometimes the whole site needs to be reviewed rather than just the P&T system.
 - One responder noted that the review team appeared “annoyed” if progress was not made after several reviews.
 - One responder noted that stronger expertise in bedrock remediation and sufficient time for the optimization contractor to analyze geology would have been helpful.
- Eight of the nine responders recommended that the optimization process continue in Region III beyond this pilot project. The ninth responder did not provide direct feedback on this topic. Of those eight responders, six suggested continued involvement of the outside contractor, and two suggested review continue only with internal Regional personnel. One of the responders cited the need for strong upper-level management participation.
 - All nine of the responders recommended that a similar process be implemented in the other EPA Regions, but one of these nine responders noted that each Region would need to be committed to following through.

**ATTACHMENT A:
KICKOFF MEETING SIGN-IN SHEET AND AGENDA**

Region III Pilot Optimization Program Kickoff Meeting
November 3, 2004
Meeting Attendees

Name	Email
Region 3 Staff and Management	
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Proposed Kickoff Agenda and Related Preparation Region-Based Optimization Program for Region 3 Revised October 7, 2004

Purpose of this Document

A pilot project for a Region Based Optimization Program for Region 3, described below, is expected to begin within several weeks. An early milestone in this project will be a project kickoff meeting. The purpose of this document is to propose an agenda for the kickoff meeting, and identify items that should be addressed to prepare for the meeting. A preliminary schedule for the entire pilot project is also provided.

Overview of the Pilot Program

EPA OSRTI and EPA Region 3 intend to pilot a Region-based optimization program of the Superfund-financed pump and treat (P&T) sites in Region 3. The pilot program will consist of the following components:

- Conducting streamlined optimization evaluations (reduced in cost and scope relative to a full optimization evaluations) at Fund-lead sites in Region 3
- Developing a formal follow-up/tracking program, and implementing the follow-up at the sites receiving streamlined evaluations, plus four sites that previously received full evaluations (2 follow-ups per site)
- Providing technical assistance based on requests of the RPMs and findings during follow-up
- Demonstrating a systematic approach to capture zone analysis at two sites

The project will be implemented by GeoTrans, who will also participate as a member of the “Regional Optimization Evaluation (ROE) team” that will include members of Regional management, Regional technical staff, and a representative from Headquarters.

Anticipated Tasks and Proposed Project Schedule

A preliminary project schedule is provided below. It will be discussed in detail at the Kickoff Meeting, and may be modified at that time. The purpose of presenting this preliminary schedule in this document is to identify a general project time-line.

Preliminary Schedule

Pre-Meeting Preparation Items (the party responsible for each task is provided in parentheses)	Proposed Completion Date
Pre-meeting tasks - gather information on sites to be evaluated (Region/HQ) - preliminarily establish members of ROE team (Region) - outline of streamlined evaluation report (GeoTrans) - preliminary evaluation/follow-up/tracking program (GeoTrans) - develop list of candidate sites of capture zone assistance (Region/HQ) - establish available dates thru Dec '04 for ROE (All)	up thru 11/3/04
Kickoff Meeting	11/3/04
Optimization Evaluations	before 1/15/05
Follow-up Round #1 - Previously evaluated sites	before 1/15/05
Draft Status Report #1	before 1/31/05
Initiate Capture Zone Assistance (2 sites)	before 12/31/04
Site Specific Technical Assistance	as requested
Follow-up Round #2 - Previously and newly evaluated sites	before 4/15/05
Draft Status Report #2	before 3/31/05
Follow-up Round #3 - Newly evaluated sites	before 8/31/05
HQ Briefing (Washington DC)	before 6/30/05
Draft Final report	before 9/15/05
Finalized Report	before 10/15/05

Kickoff Meeting: Proposed Agenda

A proposed agenda for the project kickoff meeting is presented as Exhibit 1.

Exhibit 1: Proposed Meeting Agenda

Region-Based Optimization Program for Region 3
Proposed Agenda for Project Kickoff Meeting

Date: November 3, 2004
EPA Region 3, Philadelphia, PA
9:00 AM to 12:00 PM
open plans for lunch after the meeting

- 9:00 - 9:15 Introductions
- 9:15 - 9:30 Project description and objectives (Region 3/OSRTI)
- 9:30 - 9:45 Discuss composition and responsibilities of ROE Team (open discussion)
- 9:45 - 10:00 Discussion of Fund-lead sites to be included in project (Region 3)
- 10:00 - 10:20 Open discussion
- BREAK
- 10:30 - 10:45 Outline of Streamlined Optimization Evaluation Report (GeoTrans)
- 10:45 - 11:00 Plan for Tracking and Follow-up (GeoTrans)
- 11:00 - 11:15 Finalize remaining logistics regarding first three streamlined evaluations
- 11:15 - 11:30 Review/Update Preliminary Project Schedule (open discussion)
- 11:30 - 12:00 Open Discussion
- 12:00 - Open plans for lunch

Note: The capture zone demonstration aspect of the project will be discussed if time allows or a conference call will be scheduled for the capture-zone related discussions on a later date.

Suggested Items to prepare for Kickoff Meeting

A substantial amount of preparation will be appropriate to make the Kickoff Meeting an efficient use of time. Some of this preparation will be performed by personnel in the Region, and some will be performed by GeoTrans. Recommended items associated with this preparation are indicated in the above project schedule and are discussed below.

Gather Information on Sites to be Evaluated (Region)

An information gathering form previously developed for OSRTI accompanies this document. The information on this form should be completed for each of the Fund-lead P&T sites in Region 3 that will be part of this project.

In addition, although the optimization evaluations will take place after the kickoff meeting, the scheduling and logistics for these optimization evaluations can begin prior to the meeting to expedite the project schedule. The site teams (i.e., the RPM, the site hydrogeologist, and the site contractor) should identify potential dates and/or conflicts for holding the optimization evaluations. The optimization evaluations would require a half-day meeting at the Region 3 office in Philadelphia. Comprehensive site information for these sites should also be gathered and provided to GeoTrans. This comprehensive site information typically includes the following:

- Remedial Investigation Report
- Feasibility Study Report
- Record of Decision (ROD)
- ROD Amendments and Explanation of Significant Differences (ESDs), if any
- Design documents and O&M manual
- Recent O&M reports (weekly, monthly, etc.)
- Recent semi-annual and annual reports
- Previous 5-year reviews
- Any other reports or documents the site managers feel are pertinent to the site

The transfer of these site documents to GeoTrans can be coordinated with Doug Sutton from GeoTrans (732-409-0344, dsutton@geotransinc.com). Original documents can be sent to GeoTrans. GeoTrans will copy what is needed and return the originals to Region 3 in a timely manner.

Preliminarily Establish Members of ROE Team (Region)

The Region should preliminarily determine who will represent the Region on the ROE team. This should be done prior to the kickoff meeting, so scheduling can be performed to allow all of these individuals to be present for the kickoff meeting. The participants on the ROE Team will be finalized at the Kickoff meeting.

Outline of Streamlined Evaluation Report (GeoTrans)

GeoTrans will develop an outline for the streamlined evaluation reports, which will be presented, discussed, and finalized at the kickoff meeting.

Preliminary Evaluation/Follow-up/tracking Program (GeoTrans)

GeoTrans will develop an approach for following up on the evaluations at each site and tracking progress. This will be presented, discussed, and finalized at the kickoff meeting.

Develop List of Candidate Sites of Capture Zone Assistance (Region)

The Region should determine if there are already good candidate sites for the demonstration of capture zone analysis (i.e., where improved capture zone analysis is a high priority). If so, a brief presentation should be prepared for each such site. There may be time to discuss these candidate sites during the meeting. If there is no time during the meeting, a conference call will be scheduled in November for this purpose.

Establish Available Dates thru December '04 for ROE (All)

To the extent possible, dates requiring ROE Team participation (such as optimization evaluations) should be finalized at the kickoff meeting. Therefore, all ROE Team members (including GeoTrans) should determine open dates through December 15, 2004 and be prepared to commit to scheduled meeting days through December 15, while at the kickoff meeting.

**ATTACHMENT B:
BASELINE FORMS FOR GATHERING SITE INFORMATION**

Date: _____ Filled Out By: _____

A. Site Location, Contact Information, and Site Status			
1. Site name		2. Site Location (city and State)	
4a. EPA RPM		5a. State Contact	
4b. EPA RPM Phone Number		5b. State Contact Phone Number	
4c. EPA RPM Email Address		5c. State Contact Email Address	
5. Is the groundwater remedy an interim remedy or a final remedy? Interim <input type="checkbox"/> Final <input type="checkbox"/>			
6. Is the site EPA lead or State-lead with Fund money? EPA <input type="checkbox"/> State <input type="checkbox"/>			
B. General Site Information			
1a. Date of Original ROD for Ground Water Remedy		1b. Dates of Other Ground Water Decision Documents (e.g., ESD, ROD Amendment)	
2a. Date of O&F		2b. Date for transfer to State	
3. What is the primary goal of the P&T system		4. Check those classes of contaminants that are contaminants of concern at the site.	
<ul style="list-style-type: none"> <input type="checkbox"/> Contaminant plume containment <input type="checkbox"/> Aquifer restoration <input type="checkbox"/> Containment and restoration <input type="checkbox"/> Well-head treatment 		<ul style="list-style-type: none"> <input type="checkbox"/> VOCs (e.g., TCE, benzene, etc.) <input type="checkbox"/> SVOCs (e.g., PAHs, PCP, etc.) <input type="checkbox"/> metals (e.g., arsenic, chromium, etc.) <input type="checkbox"/> other 	
5. Has NAPL or evidence of NAPL been observed at the site? Yes <input type="checkbox"/> No <input type="checkbox"/>			
6. What is the approximate total pumping rate?			
7. How many active extraction wells (or trenches) are there?		8. How many monitoring wells are regularly	
9. How many samples are collected from monitoring wells or piezometers each year? (e.g., 40 if 10 wells are sampled quarterly)		10. How many process monitoring samples (e.g., extraction wells, influent, effluent, etc.) are collected and analyzed each year? (e.g., 24 if influent and effluent are sampled monthly)	
11. What above-ground treatment processes are used (check all that apply)?			
<ul style="list-style-type: none"> <input type="checkbox"/> Air stripping <input type="checkbox"/> Carbon adsorption <input type="checkbox"/> Filtration <input type="checkbox"/> Off-gas treatment <input type="checkbox"/> Ion exchange 		<ul style="list-style-type: none"> <input type="checkbox"/> Metals precipitation <input type="checkbox"/> Biological treatment <input type="checkbox"/> UV/Oxidation <input type="checkbox"/> Reverse osmosis <input type="checkbox"/> Other 	
12. What is the approximate percentage of system downtime per year? 10% <input type="checkbox"/> 10 to 20% <input type="checkbox"/> >20% <input type="checkbox"/>			

C. Site Costs			
1. Annual O&M costs			
O&M Category	Actual Annual Costs for FY03	Actual Annual Costs for FY04	Projected Annual Costs for FY05
Labor: project management, reporting, technical support			
Labor: system operation			
Labor: groundwater sampling			
Utilities: electricity			
Utilities: other			
Consumables (GAC, chemicals, etc.)			
Discharge or disposal costs			
Analytical costs			
Other (parts, routine maintenance, etc.)			
O&M Total			
<p><i>The O&M total should be equal to the total O&M costs for the specified fiscal years, including oversight from USACE or another contractor. For costs that do not fit in one of the above cost categories, include them in the "Other" category. If it is not possible to break out the costs into the above categories, use the categories as best as possible and provide notes in the following box.</i></p>			
2. Non-routine or other costs			
<p><i>Additional costs beyond routine O&M for the specified fiscal years should be included in the above spaces. Such costs might be associated with additional investigations, non-routine maintenance, additional extraction wells, or other operable units. The total costs billed to the site for the specified fiscal years should be equal to the O&M total plus the costs entered in item 2.</i></p>			
Notes on costs:			

Date: _____ Filled Out By: _____

A. Site Location, Contact Information, and Site Status		
1. Site name	2. Site Location (city and State)	3. EPA Region
4a. EPA RPM	5a. State Contact	
4b. EPA RPM Phone Number	5b. State Contact Phone Number	
4c. EPA RPM Email Address	5c. State Contact Email Address	
5. Is the groundwater remedy an interim remedy or a final remedy? Interim <input type="checkbox"/> Final <input type="checkbox"/>		
6. Is the site EPA lead or State-lead with Fund money? EPA <input type="checkbox"/> State <input type="checkbox"/>		
B. General Site Information		
1a. Date of Original ROD for Ground Water Remedy	1b. Dates of Other Ground Water Decision Documents (e.g., ESD, ROD Amendment)	
2a. Date of Projected O&F	2b. Date for Projected Transfer to State	
3. What is the primary goal of the designed P&T system (select one)?	4. Check those classes of contaminants that are contaminants of concern at the site.	
<input type="checkbox"/> Contaminant plume containment <input type="checkbox"/> Aquifer restoration <input type="checkbox"/> Containment and restoration <input type="checkbox"/> Well-head treatment	<input type="checkbox"/> VOCs (e.g., TCE, benzene, etc.) <input type="checkbox"/> SVOCs (e.g., PAHs, PCP, etc.) <input type="checkbox"/> metals (e.g., arsenic, chromium, etc.) <input type="checkbox"/> other _____	
5. Has NAPL or evidence of NAPL been observed at the site? Yes <input type="checkbox"/> No <input type="checkbox"/>		
6. What is the designed total pumping rate? _____		
7. How many extraction wells (or trenches) are there based on design?	8. How many monitoring wells are proposed to be regularly sampled?	
9. How many samples are proposed to be collected from monitoring wells or piezometers each year? (e.g., 40 if 10 wells are sampled quarterly)	10. How many process monitoring samples (e.g., extraction wells, influent, effluent, etc.) are proposed to be collected and analyzed each year? (e.g., 24 if influent and effluent are sampled monthly)	
11. What above-ground treatment processes are proposed (check all that apply)?		
<input type="checkbox"/> Air stripping <input type="checkbox"/> Carbon adsorption (liquid phase only) <input type="checkbox"/> Filtration <input type="checkbox"/> Off-gas treatment <input type="checkbox"/> Ion exchange	<input type="checkbox"/> Metals precipitation <input type="checkbox"/> Biological treatment <input type="checkbox"/> UV/Oxidation <input type="checkbox"/> Reverse osmosis <input type="checkbox"/> Other _____	
12. What is the anticipated percentage of system downtime per year? 10% <input type="checkbox"/> 10 - 20% <input type="checkbox"/> >20% <input type="checkbox"/>		

C. Site Costs		
1. Projected Annual O&M costs		
O&M Category	Projected Annual Costs for System Start-up (e.g., year 1)	Projected Annual Costs for Steady-State Operation (e.g., after year 1)
Labor: project management, reporting, technical support		
Labor: system operation		
Labor: groundwater sampling		
Utilities: electricity		
Utilities: other		
Consumables (GAC, chemicals, etc.)		
Discharge or disposal costs		
Analytical costs		
Other (parts, routine maintenance, etc.)		
O&M Total		
<p><i>The O&M total should be equal to the total O&M costs for the specified fiscal years, including oversight from USACE or another contractor. For costs that do not fit in one of the above cost categories, include them in the "Other" category. If it is not possible to break out the costs into the above categories, use the categories as best as possible and provide notes in the following box.</i></p>		
2. Non-routine or other costs		
<p><i>Additional costs beyond routine O&M for the specified fiscal years should be included in the above spaces. Such costs might be associated with additional investigations, non-routine maintenance, additional extraction wells, or other operable units. The total costs billed to the site for the specified fiscal years should be equal to the O&M total plus the costs entered in item 2.</i></p>		
3. Estimated costs for system design and/or construction		
Notes on costs:		

D. Five-Year Review

1. Date of the Most Recent Five-Year Review

2. Protectiveness Statement from the Most Recent Five-Year Review

Protective

Not Protective

Protective in the short-term

Determination of Protectiveness Deferred

3. Please summarize the primary recommendations in the space below

[Large empty space for summarizing primary recommendations]

E. Other Information

If there is other information about the site that should be provided please indicate that information in the space below. Please consider enforcement activity, community perception, technical problems to be addressed, and/or areas where a third-party perspective may be valuable.

[Large empty space for providing other information]

**ATTACHMENT C:
TYPICAL AGENDA FOR AN OPTIMIZATION EVALUATION MEETING**

AGENDA FOR STREAMLINED OPTIMIZATION EVALUATION MEETINGS
AT
FUND-LEAD SITES WITH OPERATING PUMP AND TREAT SYSTEMS
Region 3 Pilot

The streamlined optimization evaluation, unlike a full-scale Optimization Support Evaluation (OSE) or Remediation System Evaluation (RSE), does not include a full-day site visit with the site stakeholders. Rather, the evaluation team gathers pertinent information through a review of site documents and a two-hour meeting with the site stakeholders at Region 3 in Philadelphia. Immediately after the meeting with site stakeholders, the evaluation team then spends one hour alone, summarizing the information from the meeting in a template format. Using this approach, two meetings can be conducted in one day.

It is assumed that, prior to the meeting, all participants are familiar with the site through either their daily work at the site or through reviewing site documents.

The following agenda has been developed to facilitate the evaluation meeting. The listed times are approximate based on a two-hour (120-minute) meeting and will vary by site. Much of the discussion will result from specific questions that the evaluation team has for the site stakeholders based on a review of site documents.

Minute	Discussion Topic
0 - 5	<p>Introductions - The evaluation team leader introduces the team and the concept behind the evaluation. Each call participant will be asked to introduce themselves by stating their name, affiliation, and role at the site.</p> <p>Each participant will be asked to provide their name, affiliation, title, role at the site, and contact information on a sign-in sheet.</p>
6 - 10	The evaluation team indicates any site-specific issues that they want to discuss during the meeting, based on their preliminary review of the documents.
11-15	<p>Site conceptual model - The evaluation team leader will ask someone knowledgeable about the site (typically the RPM or site contractor) to provide a brief description of the site conceptual model, including the following:</p> <ul style="list-style-type: none"> • Contaminant sources • Contaminant fate and transport • Previous and current remedies • Remedy goals

Minute	Discussion Topic
16-45	Protectiveness - The following items are discussed: <ul style="list-style-type: none"> • Receptors and exposure pathways • Receptor sampling • Plume capture • Performance monitoring • Institutional controls • Site fencing, health and safety, etc.
46-60	Extraction/Injection Systems - The following items are discussed: <ul style="list-style-type: none"> • Confirmation of extraction system components and specifications • Performance relative to design specifications • Associated sampling and analysis • Maintenance, fouling, etc.
61-80	Treatment System - The following items are discussed: <ul style="list-style-type: none"> • Confirmation of treatment system components and specifications • Performance relative to design specifications • Downtime • Operator responsibilities and level of effort • Chemicals and material usage • Utilities • Process monitoring • Water discharge and waste disposal • Exceedances, accidental releases, etc. • Recurring technical problems • Opportunities for system simplification
81-100	Costs - The following items are discussed: <ul style="list-style-type: none"> • Confirmation and clarification of provided cost information • Estimated life-cycle costs • Actual costs vs. original cost estimates • Primary cost drivers • Opportunities for reducing cost • Challenges or obstacles to implementing cost reduction opportunities
101-115	Site closure - The following items are discussed: <ul style="list-style-type: none"> • Potential alternative remedies • Remaining source removal or source control needs • Exit strategy for system • Exit strategy for various system components • Appropriate site-specific milestones towards site closure
116-120	Debriefing and Action Items - The evaluation team provides a time frame for submitting a report. The evaluation team may also ask for additional information to be forwarded. The evaluation team provides a schedule for follow-up.

**ATTACHMENT D:
OPTIMIZATION FOLLOW-UP SITE TRACKERS FOR THE 12 FUND-LEAD SITES
[PROVIDED AS INDIVIDUAL REPORTS]**