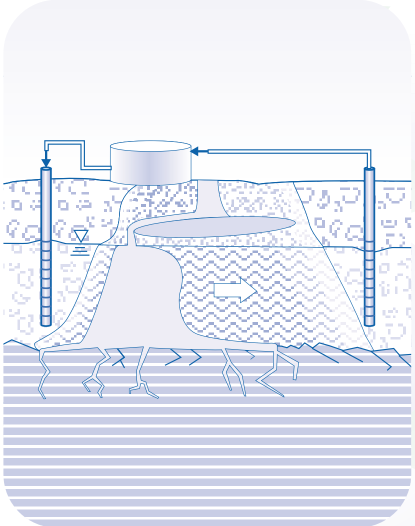
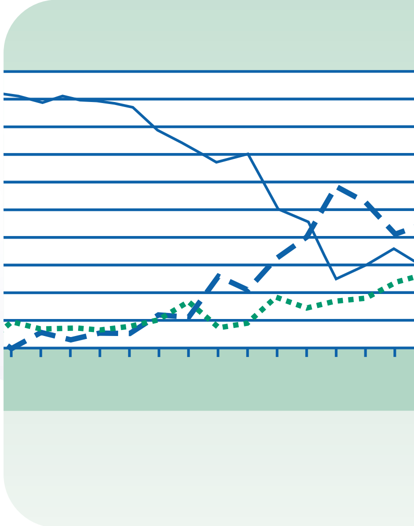
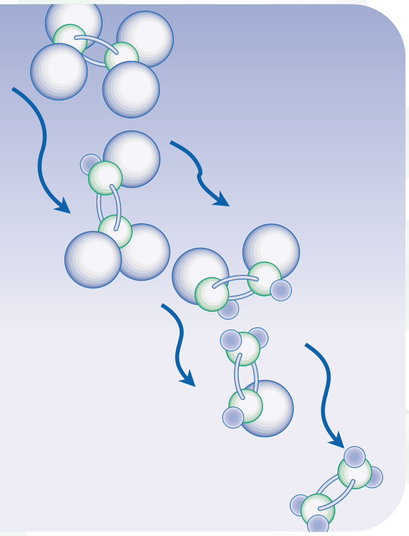
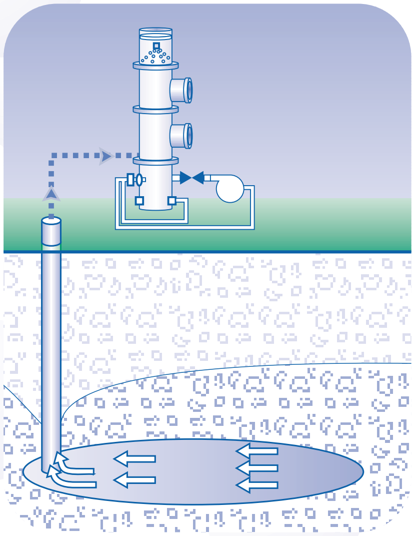
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

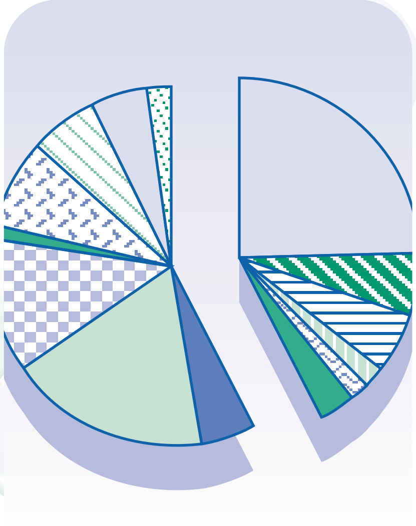
Treatment Technologies for Site Cleanup: Annual Status Report (Eleventh Edition)

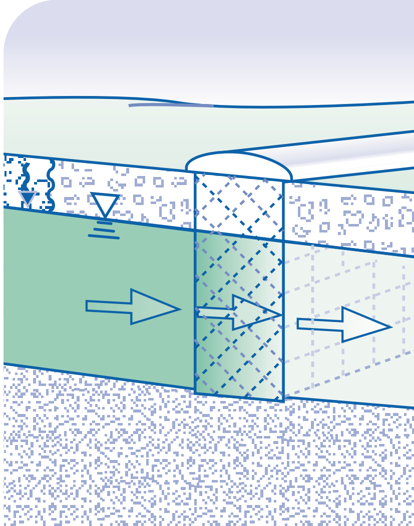












On the Cover

Top row from left to right:

Model of an in situ chemical treatment system for DNAPLs. See page 4 for a description of chemical treatment.

Figure 19. Superfund Remedial Actions: Trends in the Selection of Pump and Treat (FY 1986 - 2002), page 33. See Section 3: Groundwater Remedies for a discussion of this figure.

Middle row from left to right:

Theoretical model of the biodegradation of tetrachloroethene. See page 4 for a description of bioremediation.

Model of a groundwater pump and treat system. See page 7 for a description of groundwater pump and treat systems.

Bottom row from left to right:

Figure 7. Superfund Remedial Actions: Source Control Treatment Projects (FY 1982 - 2002), page 16. See Section 2: Treatment Technologies for Source Control for a discussion of this figure.

Model of a permeable reactive barrier. See page 7 for a description of a permeable reactive barrier.

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(5102G)

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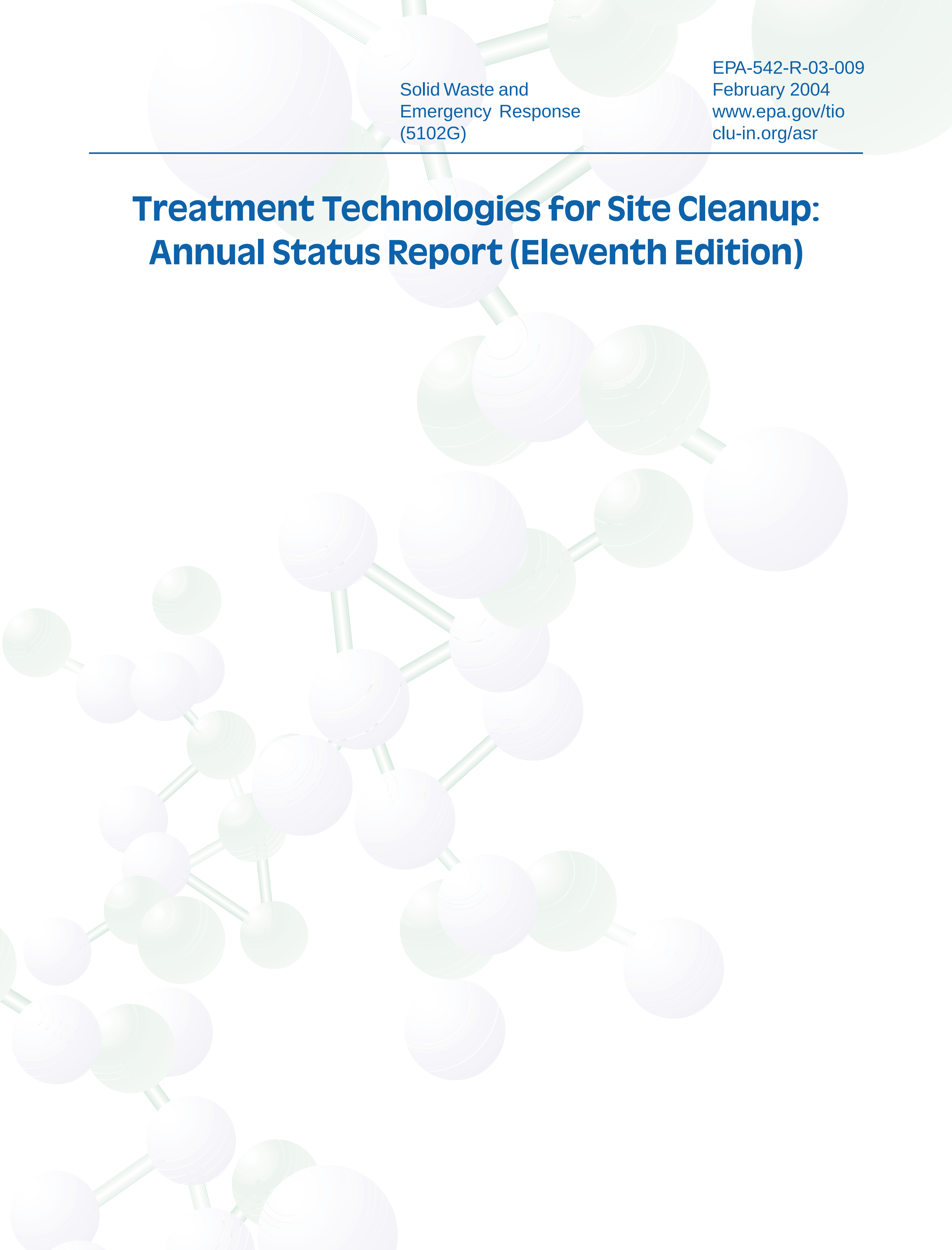

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Notice

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A portable document format (PDF) version of the ASR is available for viewing or downloading from the Hazardous Waste Cleanup Information (CLU-IN) web site at *http://clu-in.org/asr*. Printed copies of the ASR can also be ordered through that web address, subject to availability.

The data for the ASR are available in a searchable on-line database (the ASR Search System) at *http://cfpub.epa.gov/asr/*. In addition, the data for the ASR have been incorporated into EPA's REmediation And CHaracterization Innovative Technologies (EPA REACH IT) on-line searchable database at *http://www.epareachit.org*.

Acknowledgment

This document was prepared for EPA's Technology Innovation Program under contract number 68-W-02-034. Special acknowledgment is given to the federal and state staffs and other remediation professionals for individual sites, for providing the detailed information presented in this document. Their cooperation and willingness to share their expertise on treatment technologies encourages the application of those technologies at other sites.

List of Acronyms

ASR	Annual Status Report
BTEX	Benzene, toluene, ethylbenzene, and xylene
CCL	Construction Completion List
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CLU-IN	EPA's CLeanUp INformation system
COR	Close-out report
cy	Cubic yard
DCA	Dichloroethane
DCE	Dichloroethene
DNAPL	Dense nonaqueous-phase liquid
DRE	Destruction and removal efficiency
EOU	Excess, obsolete, or unserviceable
EPA	U.S. Environmental Protection Agency
ESD	Explanation of significant differences
FCOR	Final close-out report
FRTR	Federal Remediation Technologies Roundtable
FY	Fiscal year
GW	Groundwater
LNAPL	Light nonaqueous-phase liquid
MNA	Monitored natural attenuation
NA/NFA	No action/no further action
NAPL	Nonaqueous-phase liquid
NPL	National Priorities List
NSCEP	National Service Center for Environmental Publications
OB	Open burn
OD	Open detonation
OSC	On-Scene Coordinator
OSRTI	Office of Superfund Remediation and Technology Innovation
OSWER	Office of Solid Waste and Emergency Response
OU	Operable unit
P&T	Pump and treat
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PCE	Tetrachloroethene
PCOR	Preliminary close-out report
PDF	Portable document format
PRB	Permeable reactive barrier
REACH IT	EPA's REmediation And CHaracterization Innovative Technologies on-line searchable database
ROD	Record of Decision
RPM	Remedial Project Manager
RSE	Remediation System Evaluation
S/S	Solidification/stabilization
SARA	Superfund Amendments and Reauthorization Act
SVE	Soil vapor extraction
SVOC	Semivolatile organic compound
TCA	Trichloroethane
TCE	Trichloroethene
UV	Ultraviolet
VC	Vinyl chloride
VEB	Vertical engineered barrier
VOC	Volatile organic compound

Executive Summary

This report documents the status and achievements, as of March 2003, of treatment technology applications for soil, other solid wastes, and groundwater at Superfund sites. The data in this report were gathered from Superfund Records of Decision (ROD) from fiscal year (FY) 1982 - 2002, Close-out Reports (COR) from FY 1983 - 2002, and project managers at Superfund remedial action sites. The report examines:

- *in situ* and *ex situ* treatment technologies for sources (e.g., soil, sludge, sediment, other solid-matrix wastes, and non-aqueous phase liquids [NAPL]).
- *in situ* and *ex situ* (pump and treat [P&T]) groundwater treatment technologies.
- vertical engineered barriers (VEB).
- the selection of monitored natural attenuation (MNA) remedies for groundwater.

This edition of the Annual Status Report (ASR) provides a summary of the 1,811 technology applications identified for Superfund remedial actions. The Tenth Edition of the ASR included information on 934 technologies from RODs from FY 1982 -1999.

- This report adds information from FY 2000, 2001, and approximately 70% of 2002 RODs.
- For the first time, this report includes detailed information regarding 743 groundwater P&T projects.
- For the most frequently selected technologies in the Superfund remedial program, the report analyzes selection trends over time, contaminant groups treated, quantities of soil and groundwater treated, and the status of project implementation.
- The report also focuses on the achievements made at Superfund remedial action sites through the application of treatment technologies, including an analysis of the numbers and types of completed technology applications.
- In addition, more detailed information is provided on the application of chemical treatment, one of several innovative technologies whose use has been increasing in recent years, particularly for the *in situ* treatment of dense nonaqueous-phase liquids (DNAPL), which historically have been difficult to treat.

Major Findings

Overall use of treatment at Superfund remedial action sites:

- At almost two-thirds (62%) of sites on the National Priorities List (NPL), the remedy already implemented or currently planned includes treatment of a source or groundwater (including groundwater P&T remedies).
- The complexity of RODs has been increasing. The proportion of RODs addressing both soil and groundwater contamination has increased from 20% in FY 1997 to 56% in FY 2002.
- Of the 2,610 RODs and ROD amendments signed from FY 1982 - 2002, 1,505 (58%) included treatment remedies.

Use of treatment for source control:

- The percentage of RODs selecting source control treatment as a remedy increased from 40% in FY 2000 to 52% in FY 2002 (about 70% of FY 2002 RODs were available for this report).
- *In situ* technologies make up 42% of all source control treatments at Superfund remedial action sites. Since the inception of the Superfund program in FY 1982, the use of *in situ* source control treatments at these sites has been increasing to the current level of 45% in FY 2002.
- *In situ* soil vapor extraction (SVE) is the most frequently used source control treatment technology (25% of source control projects), followed by *ex situ* solidification/stabilization (18%) and off-site incineration (12%).
- The percentage of completed source control treatment projects increased from 47% in FY 2000 to 54% in FY 2002.
- Innovative applications account for 21% of all source control treatments. Bioremediation is the most commonly applied innovative technology, representing about half of innovative applications for source control treatment.
- Approximately 75% of the source control treatment projects address organic contaminants. Just over 25% address metal or metalloid contaminants. Some of these projects address both organics and metals.
- Since FY 1982, nearly three times as much contaminated soil has undergone remediation by *in situ* treatment (40 million cubic yards [cy]) than by *ex situ* treatment (13 million cy). Approximately 42% (24 million cy) of the total volume of soil undergoing treatment is being treated by *in situ* SVE.

Use of treatment and MNA for groundwater:

- Groundwater treatment was part of the remedy at 71% of Superfund sites that selected a groundwater remedy.
- The percentage of groundwater RODs selecting *in situ* treatment as a remedy increased from none in FY 1986 to 24% in FY 2002.
- At 51% of NPL sites, a groundwater treatment remedy (including *in situ* groundwater treatment and P&T) is currently planned or already being implemented.
- For all remedies selected from FY 1982 - 2001, P&T was the most frequently selected groundwater remedy, followed by MNA and *in situ* treatment.
- The percentage of RODs selecting only MNA as a remedy for groundwater rose from 6% in FY 1986, when MNA was first selected without another groundwater treatment remedy, to a peak of 32% in FY 1998. However, this percentage decreased to 4% in FY 2002.
- The contaminants most commonly treated by groundwater P&T systems were chlorinated volatile organic compounds (VOC), nonchlorinated VOCs, metals, and metalloids.
- More than half of P&T systems use air stripping as a treatment technology. Other commonly used technologies include activated carbon adsorption, filtration, and metals precipitation.
- Most P&T projects (52%) are operational.

Sites achieving construction completion status:

- U.S. Environmental Protection Agency (EPA) has prepared CORs for more than half (57%) of all NPL sites. CORs are prepared for sites when (1) any necessary physical construction is complete, whether or not final cleanup levels or other requirements have been achieved; or (2) EPA has determined that the response action should be limited to measures that do not involve construction; or (3) the site qualifies for deletion from the NPL.
- The most common technologies used at sites for which CORs have been prepared are P&T (32%), SVE (9%), and incineration (9%).

Overview

Introduction

The Eleventh Edition of the Annual Status Report (ASR) updates and expands information provided in the Tenth Edition (February 2001) report. Updated data have been included from the following sources:

- Fiscal year (FY) 2000 Records of Decision (ROD)
- FY 2001 RODs
- FY 2002 RODs available in March of 2003 (an estimated 70% of the total number of FY 2002 RODs that are expected to be signed)
- Close-out Reports (COR) from FY 1983 - 2002

In addition, the scope of the report has been expanded to include groundwater pump and treat (P&T). Information is included on 743 P&T applications selected in RODs from FY 1982 - 2002. A list of sites and an analysis of 1,811 applications of treatment and groundwater containment technologies under remedial actions are also provided. Information has been added about 127 applications of treatment technologies selected by RODs in FY 2000, 75 selected in 2001, and 70 selected in 2002. The U.S. Environmental Protection Agency (EPA) uses RODs to compile baseline information about Superfund remedial actions. At the time of this report's publication, only about 70% of RODs from FY 2002 were available. Therefore, this report does not include information for all of the RODs anticipated for FY 2002.

Box 1. New in the Eleventh Edition

- Information from Close-Out Reports (COR) regarding the construction achievements at Superfund sites and implementation status of treatment technologies.
- Analysis of 743 Superfund pump and treat (P&T) projects.
- A detailed look at an innovative treatment technology, chemical treatment, and construction completion at Superfund sites.

What Treatment Technologies are Addressed in This Report?

Most RODs for remedial actions address the source of contamination, such as soil, sludge, sediments, and solid-matrix wastes; such "source control" RODs select "source control technologies." Groundwater remedial action, also known as "a non-source control action," may be a component of the "source control" ROD and the treatment technologies chosen for groundwater remediation are referred to as "groundwater technologies." Appendix F to this document is a detailed description of the methodology used to identify ROD types, including detailed definitions of "source control," "groundwater technologies," and other remedy types. An example of a ROD selecting both source control and groundwater treatment remedies is summarized in Box 2.

Box 2. ROD Selecting Multiple Remedy Types

A Record of Decision (ROD) issued for the Alaric Inc. site contains both source control and groundwater remedies for the 1.7-acre site in Tampa, Florida. The contamination was the result of degreasing and steam-cleaning processes that used chlorinated solvents. Tetrachloroethene (PCE) and trichloroethene (TCE) have been identified in two areas of the soil. Groundwater contamination is also present.

An interim ROD was issued in July 2002 for remedial action at this site. The ROD specified both source control and groundwater treatment remedies. The treatment portion of the source control remedy is in situ chemical treatment. The groundwater treatment remedy consists of groundwater P&T with air stripping and carbon adsorption. Long-term groundwater monitoring was also selected as part of the groundwater remedy.

For Superfund remedial actions, the ASR documents and tracks the use of both *in situ* and *ex situ* treatment for source control and groundwater, as well as groundwater monitored natural attenuation (MNA) remedies, and groundwater containment using vertical engineered barriers (VEB).

The methodology used to determine ROD and remedy types has evolved over time. As new technologies are developed and innovative techniques for site remediation are implemented, the number of types of remedies has expanded. The methodology and definitions provided in Appendix F were used to classify remedies selected in RODs from FY 1982 - 2002.

The term “treatment technology” means any unit operation or series of unit operations that alters the composition of a hazardous substance or pollutant or contaminant through chemical, biological, or physical means so as to reduce toxicity, mobility, or volume of the contaminated materials being treated. Treatment technologies are an alternative to land disposal of hazardous wastes without treatment (March 8, 1990 Federal Register [55 FR 8819], see 40 CFR 300.5 “Definitions”).

Established treatment technologies are those for which cost and performance information is readily available. The most frequently used established technologies are on- and off-site incineration,

BOX 3. SUMMARY OF REMEDY TYPES

SOURCE CONTROL REMEDY TYPES*

Source Control Treatment

- Treatment of a contaminant source *in situ* or *ex situ*.
- Can include any of the source control treatment technologies described in this report, such as chemical treatment and thermal desorption.

Source Control Containment

- Containment of a contaminant source.
- Can include the use of caps, liners, covers, and landfilling both on- and off-site.

Source Control Other

- Other remedies for contaminant sources.
- Can include institutional controls, monitoring, and population relocation.

GROUNDWATER REMEDY TYPES*

Pump and Treat (P&T)

- Extraction of groundwater from an aquifer and treatment aboveground.
- Extraction usually is conducted by pumping groundwater from a well or trench.
- Treatment can include any of the P&T technologies described in this report, such as air stripping and ion exchange.

***In Situ* Treatment**

- Treatment of groundwater in place without extracting it from an aquifer.
- Can include any of the *in situ* groundwater treatment technologies described in this report, such as air sparging and permeable reactive barriers.

Monitored Natural Attenuation (MNA)

- The reliance on natural attenuation processes (within the context of a carefully controlled and monitored approach to site cleanup) to achieve site-specific remediation objectives within a time frame that is reasonable compared to other alternatives.
- Natural attenuation processes include a variety of physical, chemical, and biological processes.

Groundwater Containment

- Containment of groundwater through the use of a vertical, engineered, subsurface, impermeable barrier.
- Containment of groundwater through a hydraulic barrier created by pumping.

Groundwater Other

- Groundwater remedies that do not fall into the categories of groundwater P&T, *in situ* treatment, MNA, or containment remedies.
- Can include a variety of remedies, such as water use restrictions and alternate water supply.

** - See Appendix F-2 for further definitions of Source Control Remedies and F-6 for Groundwater Remedies.*

solidification/stabilization (S/S), soil vapor extraction (SVE), thermal desorption, and P&T technologies for groundwater. Treatment of groundwater after it has been pumped to the surface usually involves traditional water treatment; as such, P&T groundwater remedies are considered to be established technologies.

Innovative treatment technologies are alternative treatment technologies with a limited number of applications and limited data on cost and performance. Often, these technologies are established in other fields, such as chemical manufacturing or hazardous waste treatment. In such cases, it is the application of a technology or process at a waste site (to soils, sediments, sludge, and solid-matrix waste [such as mining slag] or groundwater) that is innovative, not the technology itself. Innovative technologies for source control are discussed in Section 2 and those for the *in situ* treatment of groundwater are discussed in Section 3.

Both innovative and established technologies are grouped as source control treatment or *in situ* groundwater treatment technologies on the basis of the type of application most commonly associated with the technology. Some technologies may be used for both source control and *in situ* groundwater treatment. These technologies and their respective groupings are listed in Appendix F.

Sources of Information for This Report

EPA verifies and updates the draft information obtained from the RODs through interviews with Remedial Project Managers (RPMs), On-Scene Coordinators (OSCs), and other contacts for each site, along with information from the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), EPA's Superfund tracking system. For this edition of the ASR, project information and status were also updated using information from Superfund CORs. CORs provide information on the construction achievements at Superfund sites and the implementation status of many technologies tracked in the ASR. For more information regarding CORs, see Section 4. The information collected from these sources is stored and maintained in the ASR Search System. Box 4 summarizes the types of information included in the ASR Search System.

Information about technologies and sites identified in this report may differ from information found in the CERCLIS database. The CERCLIS database includes information from RODs, ROD amendments, and explanations of significant differences (ESDs). This document also includes additional information gathered from other sources, including CORs and contacts with RPMs.

BOX 4. INFORMATION IN ASR SEARCH SYSTEM

Site Information
- Site name and location (city and state)
- CERCLIS ID
- Description

Project-Specific Information
- Operable unit name
- Cleanup type
- ROD date
- Lead agency/funding information

Contact Information
- Contact name and affiliation
- Address, phone number, and e-mail

Technology Information
- Technology and type (in situ or ex situ)
- Description of technology
- Treatment of residuals, if applicable
- Details (such as type of additives)
- Indicate whether part of a treatment train

Media and Quantity Information
- Media and quantity

Contaminant Information
- Contaminants treated
- Contaminants not treated

Status Information
- Status
- Date began operation
- Date completion is planned

Completed Project Information
- Cost
- Contaminant concentrations before and after treatment

ASR Online Components

To allow users of the ASR access to additional information, EPA maintains several resources online, including:

- Downloadable Spreadsheets - For Tables 1, 2, 7, and 9, and Figure 25 of this report, EPA prepared spreadsheets listing the specific sites names, locations, CERCLIS ID numbers, and types of remedies selected in RODs for those sites. These spreadsheets can be downloaded from *http://clu-in.org/asr.*

- Appendices to the ASR - Appendices B, C, D, and E have expanded over time, and are not available in the printed version of this report. These appendices are available on-line at *http://clu-in.org/asr.*
- ASR Search System - EPA created a searchable, on-line system to allow access to the data that form the basis for this report. See Box 4 for a list of the types of information available from the ASR Search System. This system is available at *http://cfpub.epa.gov/asr/.*
- EPA REACH IT - The ASR data are also available on EPA REACH IT. This system, sponsored by EPA's Technology Innovation Program, lets environmental professionals use the power of the Internet to search, view, download, and print information about innovative remediation and characterization technologies. EPA REACH IT provides information on more than 350 vendors offering 350 remediation and nearly 200 site characterization technologies. EPA REACH IT fosters communication between technology vendors and users by providing information about the availability, performance, and cost associated with the application of treatment and characterization technologies. EPA REACH IT is available at *http://www.epareachit.org.*

Definitions of Specific Treatment Technologies

This section provides definitions of 17 types of source control (primarily soil) treatment technologies, 10 types of *in situ* groundwater treatment technologies, 8 types of groundwater P&T technologies, and 1 groundwater containment technology. Technologies that are applicable to both source control and groundwater treatment are described only once under the source control treatment section. For P&T technologies, the descriptions focus on the treatment portion of the technology. Groundwater pumping technologies are not addressed in this report. Definitions are based on the Remediation Technologies Screening Matrix and Reference Guide, Version 4.0, which can be viewed at the Federal Remediation Technologies Roundtable (FRTR) web site at *http://www.frtr.gov*. Sketches for some of the newer innovative treatment technologies are provided.

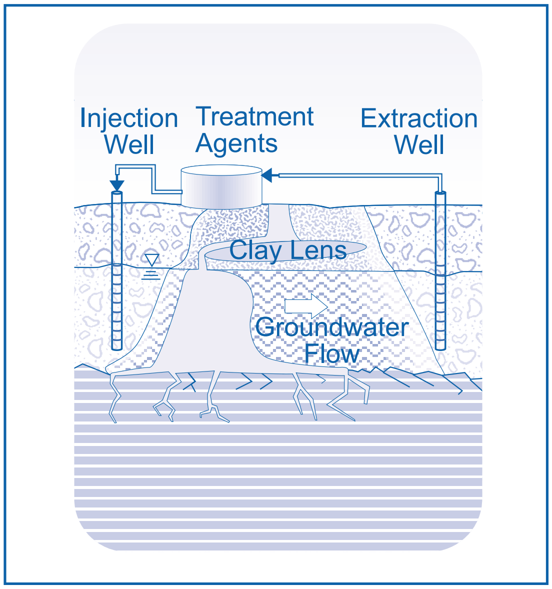
Source Control Treatment Technologies

BIOREMEDIATION uses microorganisms to degrade organic contaminants in soil, sludge, solids, and groundwater either *in situ* or *ex situ*. It can also be used to make metals or metalloids less toxic or mobile. When treating organic contaminants, the microorganisms break down contaminants by using them as a food source or cometabolizing them with a food source. Aerobic processes require an oxygen source, and the end-products typically are carbon dioxide and water. Anaerobic processes are conducted in the absence of oxygen, and the end-products can include methane, hydrogen gas, sulfide, elemental sulfur, and dinitrogen gas. *Ex situ* bioremediation technologies for groundwater typically involve treating extracted groundwater in a bioreactor or constructed wetland. *In situ* techniques stimulate and create a favorable environment for microorganisms to grow and use contaminants as a food and energy source, or to cometabolize them. Generally, this process involves providing some combination of oxygen, nutrients, and moisture, and controlling the temperature and pH. Microorganisms that have been adapted for degradation of specific contaminants are sometimes applied to enhance the process. For the treatment of metals and metalloids, it involves biological activity that promotes the formation of less toxic or mobile species, by either creating ambient conditions that will cause such species to form, or acting directly on the contaminant. The treatment may result in oxidation, reduction, precipitation, coprecipitation, or another transformation of the contaminant.

CHEMICAL TREATMENT, also known as chemical reduction/oxidation, typically involves reduction/oxidation (redox) reactions that chemically convert hazardous contaminants to compounds that are nonhazardous, less toxic, more stable, less mobile, or inert. Redox reactions involve the transfer of electrons from one compound to another. Specifically, one reactant is oxidized (loses electrons) and one is reduced (gains electrons). The oxidizing agents used for treatment of hazardous contaminants in soil include ozone, hydrogen peroxide, hypochlorites, potassium permanganate, Fenton's reagent (hydrogen peroxide and iron), chlorine, and chlorine dioxide. This method may be applied *in situ* or *ex situ* to soils, sludges, sediments, and other solids, and may also be applied to groundwater *in situ* or *ex situ* (P&T).

P&T chemical treatment may also include the use of ultraviolet (UV) light in a process known as UV oxidation.

MODEL OF IN SITU CHEMICAL TREATMENT SYSTEM FOR DNAPLs



ELECTROKINETICS is based on the theory that a low-density current will mobilize contaminants in the form of charged species. A current passed between electrodes is intended to cause aqueous media, ions, and particulates to move through the soil, waste, and water. Contaminants arriving at the electrodes can be removed by means of electroplating or electrodeposition, precipitation or coprecipitation, adsorption, complexing with ion exchange resins, or by the pumping of water (or other fluid) near the electrode.

For FLUSHING, a solution of water, surfactants, or cosolvents is applied to the soil or injected into the subsurface to treat contaminated soil or groundwater. When treating soil, the injection is often designed to raise the water table into the contaminated soil zone. Injected water and treatment agents are recovered together with flushed contaminants.

Both on-site and off-site INCINERATION use high temperatures (870 to 1,200°C or 1,600 to 2,200°F) to volatilize and combust (in the presence of oxygen) organics in hazardous wastes. Auxiliary fuels are often employed to initiate and sustain combustion. The destruction and removal efficiency (DRE) for properly operated incinerators exceeds the 99.99% requirement for hazardous waste and can be operated to meet the 99.9999% requirement for polychlorinated biphenyls (PCB) and dioxins. Off-gases and combustion residuals generally require treatment. On-site incineration typically uses a transportable unit; for off-site incineration, waste is transported to a central facility.

MECHANICAL SOIL AERATION agitates contaminated soil, using tilling or other means to volatilize contaminants.

MULTI-PHASE EXTRACTION uses a vacuum system to remove various combinations of contaminated groundwater, separate-phase petroleum product, and vapors from the subsurface. The system typically lowers the water table around the well, exposing more of the formation. Contaminants in the newly exposed vadose zone are then accessible to vapor extraction. Once above ground, the extracted vapors or liquid-phase organics and groundwater are separated and treated.

NEUTRALIZATION is a chemical reaction between an acid and a base. The reaction involves acidic or caustic wastes that are neutralized (pH is adjusted toward 7.0) using caustic or acid additives.

OPEN BURN (OB) and OPEN DETONATION (OD) operations are conducted to destroy excess, obsolete, or unserviceable (EOU) munitions and energetic materials. In OB operations, energetics or munitions are destroyed by self-sustained combustion, which is ignited by an external source, such as a flame, heat, or a detonation wave. In OD operations, explosives and munitions are destroyed by detonation, which generally is initiated by an energetic charge.

PHYSICAL SEPARATION processes use physical properties to separate contaminated and uncontaminated media, or separate different types of media. For example, different-sized sieves and screens can be used to separate contaminated soil from relatively uncontaminated debris. Another application of physical separation is the dewatering of sediments or sludge.

PHYTOREMEDIATION is a process that uses plants to remove, transfer, stabilize, or destroy contaminants in soil, sediment, or groundwater. The mechanisms of phytoremediation include enhanced rhizosphere biodegradation (takes place in soil or groundwater immediately surrounding plant roots), phytoextraction (also known as phytoaccumulation, the uptake of contaminants by plant roots and the translocation/accumulation of contaminants into plant shoots and leaves), phytodegradation (metabolism of contaminants within plant tissues), and phytostabilization (production of chemical compounds by plants to immobilize contaminants at the interface of roots and soil). Phytoremediation applies to all biological, chemical, and physical processes that are influenced by plants (including the rhizosphere) and that aid in the cleanup of contaminated substances. Phytoremediation may be applied *in situ* or *ex situ* to soils, sludges, sediments, other solids, or groundwater.

SOIL VAPOR EXTRACTION (SVE) is used to remediate unsaturated (vadose) zone soil. A vacuum is applied to the soil to induce the controlled flow of air and remove volatile and some semivolatile organic contaminants from the soil. SVE usually is performed *in situ*; however, in some cases, it can be used as an *ex situ* technology.

For SOIL WASHING, contaminants sorbed onto fine soil particles are separated from bulk soil in a water-based system on the basis of particle size. The wash water may be augmented with a basic leaching agent, surfactant, or chelating agent, or by adjusting the pH to help remove contaminants. Soils and wash water are mixed *ex situ* in a tank or other treatment unit. The wash water and various soil fractions are usually separated using gravity settling.

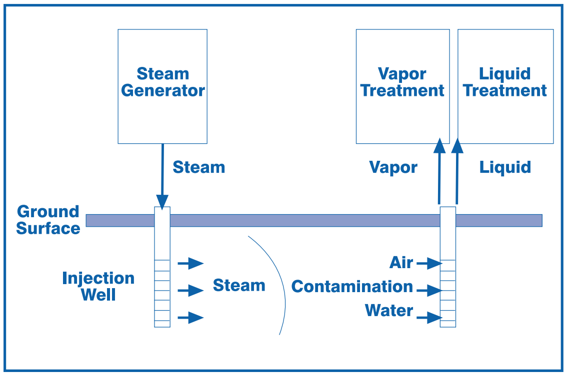
SOLIDIFICATION/STABILIZATION (S/S) reduces the mobility of hazardous substances and contaminants in the environment through both physical and chemical means. The S/S process physically binds or encloses contaminants within a stabilized mass. S/S is performed both *ex situ* and *in situ*. *Ex situ* S/S requires excavation of the material to be treated, and the resultant material must be disposed. *In situ* S/S uses auger/caisson systems and injector head systems to add binders to the contaminated soil or waste without excavation, leaving the resultant material in place.

SOLVENT EXTRACTION uses an organic solvent as an extractant to separate contaminants from soil. The organic solvent is mixed with contaminated soil in an extraction unit. The extracted solution then is passed through a separator, where the contaminants and extractant are separated from the soil.

For THERMAL DESORPTION, wastes are heated so that organic contaminants and water volatilize. Typically, a carrier gas or vacuum system transports the volatilized water and organics to a gas treatment system, typically a thermal oxidation or recovery system. Based on the operating temperature of the desorber, thermal desorption processes can be categorized into two groups: high temperature thermal desorption (320 to 560°C or 600 to 1000°F) and low temperature thermal desorption (90 to 320°C or 200 to 600°F). Thermal desorption is an *ex situ* treatment process. *In situ* thermal desorption processes are discussed below as *in situ* thermal treatment.

IN SITU THERMAL TREATMENT is a treatment process that uses heat to facilitate extraction through volatilization and other mechanisms or to destroy contaminants *in situ*. Volatilized contaminants are typically removed from the vadose zone using SVE. Specific types of *in situ* thermal treatment techniques include conductive heating, electrical resistive heating, radio frequency heating, hot air injection, hot water injection, and steam enhanced extraction. *In situ* thermal treatment is usually applied to a contaminated source area but may also be applied to a groundwater plume.

Model of an In Situ Thermal Treatment System



VITRIFICATION uses an electric current to melt contaminated soil at elevated temperatures (1,600 to 2,000°C or 2,900 to 3,650°F). Upon cooling, the vitrification product is a chemically stable, leach-resistant, glass and crystalline material similar to obsidian or basalt rock. The high temperature component of the process destroys or removes organic materials. Radionuclides and heavy metals are retained within the vitrified product. Vitrification may be conducted *in situ* or *ex situ*.

In Situ Groundwater Treatment Technologies

AIR SPARGING involves the injection of air or oxygen into a contaminated aquifer. Injected air traverses horizontally and vertically in channels through the soil column, creating an underground stripper that removes volatile and semivolatile organic contaminants by volatilization. The injected air helps to flush the contaminants into the unsaturated zone. SVE usually is implemented in conjunction with air sparging to remove the generated vapor-phase contamination from the vadose zone. Oxygen added to the contaminated groundwater and vadose-zone soils also can enhance biodegradation of contaminants below and above the water table.

BIOREMEDIATION - See Source Control Treatment Technologies.

CHEMICAL TREATMENT - See Source Control Treatment Technologies.

ELECTROKINETICS - See Source Control Treatment Technologies.

FLUSHING - See Source Control Treatment Technologies.

For IN-WELL AIR STRIPPING, air is injected into a double-screened well, causing the volatile organic compounds (VOC) in the contaminated groundwater to transfer from the dissolved phase to the vapor phase in air bubbles. As the air bubbles rise to the surface of the water, the vapors are drawn off and treated by a SVE system.

MULTI-PHASE EXTRACTION - See Source Control Treatment Technologies.

PERMEABLE REACTIVE BARRIERS (PRB), also known as passive treatment walls, are installed across the flow path of a contaminated groundwater plume, allowing the water portion of the plume to flow through the wall. These barriers allow the passage of water while prohibiting the movement of contaminants by employing treatment agents within the wall such as zero-valent metals (usually zero-valent iron), chelators, sorbents, compost, and microbes. The contaminants are either degraded or retained in a concentrated form by the barrier material, which may need to be replaced periodically.

PHYTOREMEDIATION - See Source Control Treatment Technologies.

IN SITU THERMAL TREATMENT - See Source Control Treatment Technologies.

Pump and Treat Technologies (Ex situ Treatment)

In ADSORPTION, contaminants concentrate at the surface of a sorbent, thereby reducing their concentration in the bulk liquid phase. This technology is typically applied by passing extracted groundwater through a column containing granular adsorbent. The most common adsorbent is granulated activated carbon. Other natural and synthetic adsorbents include activated alumina, lignin adsorption, sorption clays, and synthetic resins.

AIR STRIPPING partitions volatile organics from extracted groundwater by increasing the surface area of the contaminated water exposed to air. Aeration methods include packed towers, diffused aeration, tray aeration, and spray aeration.

BIOREMEDIATION - See Source Control Treatment Technologies.

CHEMICAL TREATMENT - See Source Control Treatment Technologies.

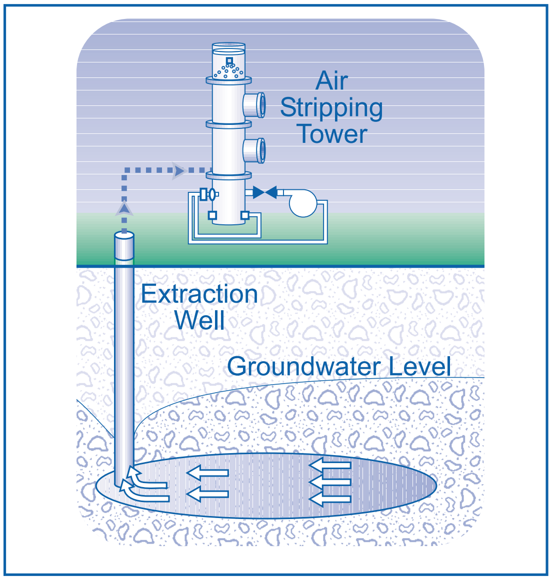
FILTRATION is the physical process of mechanical separation based on particle size, whereby particles suspended in a fluid are separated by forcing the fluid through a porous medium. As fluid passes through the medium, the suspended particles are trapped on the surface of the medium and/or within the body of the medium.

ION EXCHANGE removes ions from the aqueous phase by the exchange of cations or anions between the contaminants and the exchange medium. Ion exchange materials may consist of resins made from synthetic organic materials that contain ionic functional groups to which exchangeable ions are attached.

METALS PRECIPITATION transforms dissolved contaminants into an insoluble solid, facilitating the contaminant's subsequent removal from the liquid phase by sedimentation or filtration. The process usually uses pH adjustment, addition of a chemical precipitant, and flocculation.

MEMBRANE FILTRATION separates contaminants from water by passing it through a semipermeable barrier or membrane. The membrane allows water and other low molecular weight chemicals to pass, while blocking contaminants with a higher molecular weight. Membrane filtration processes include microfiltration, ultrafiltration, nanofiltration, and reverse osmosis.

MODEL OF A GROUNDWATER PUMP AND TREAT AIR STRIPPING



Monitored Natural Attenuation (MNA) for Groundwater

Groundwater MNA is the reliance on natural attenuation processes (within the context of a carefully controlled and monitored approach to site cleanup) to achieve site-specific remediation objectives within a time frame that is reasonable, compared with that offered by other, more active methods. The "natural attenuation processes" include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These *in situ* processes include biodegradation; dispersion; dilution; sorption; volatilization; radioactive decay; and chemical or biological stabilization, transformation, or destruction of contaminants. Guidance on MNA is available from the document "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (OSWER Directive 9200.4-17P, EPA, April 21, 1999.").

In Situ Groundwater Containment

VERTICAL ENGINEERED BARRIERS (VEB) are subsurface barriers made of an impermeable material designed to contain or divert groundwater. VEBs can be used to contain contaminated groundwater, divert uncontaminated groundwater from a contaminated area, or divert contaminated groundwater from a drinking water intake or other protected resource.

Section 1: Overview of RODs

As of March 2003, a total of 1,499 sites have been listed on the National Priorities List (NPL). Of these, 269 sites have been deleted leaving 1,230 sites on the NPL. An additional 54 sites are proposed for listing. Updated information on site listings and deletions is available at *http://ww.epa.gov/superfund*. Some sites may cover a large area, include several types of contaminated media, or include areas in which the types of contamination differ. To facilitate the establishment of remedies at a complex site, the site may be divided into operable units (OU), with separate remedies for each. Remedies for NPL sites are documented in RODs. A separate ROD may be developed for each OU. In addition, each OU may require a number of RODs to address different media within it, or to revise the selected remedy; therefore, each site may have multiple RODs.

From fiscal year (FY) 1982 - 2002 (including an estimated 70% of 2002 RODs), 2,610 RODs and ROD amendments were signed. In order to permit an analysis of remedies across the Superfund program, EPA developed a remedy classification system, which is described in Appendix F. Appendix F provides the definitions of the various ROD types, such as source control treatment ROD or groundwater *in situ* treatment ROD, and the methodology used to categorize each ROD. A ROD is assigned a type based on the remedies it contains. Each site is then assigned a type based on the types of RODs issued for that site. For sites with multiple RODs, the hierarchy presented in Appendix F is used to assign a site type. In general, a ROD and site are placed in the treatment category if any portion of the remedy includes treatment.

At almost two-thirds of NPL sites (62%), source control or groundwater treatment has been implemented or is planned as a remedy for some portion of the site. Treatment for both source control and groundwater has been implemented or is planned for 24% of sites. For 27% of sites, the selected remedies do not include treatment. No ROD has been issued for 11% of sites. Figure 1 summarizes the number of NPL sites with each type of remedy.

The remedy selected in a ROD may not be the remedy that is actually implemented at a site. Examples of where a different remedy may be used include a treatment technology that was selected in a ROD based on bench-scale treatability testing that proves to be ineffective in pilot-scale tests conducted during the design phase. Additional contamination may be discovered at the site during the implementation of a remedy. A particular remedy may have been included in a ROD only as a contingent remedy, with future site investigations revealing that implementation of that contingent remedy was not necessary. When significant and fundamental changes are made to remedies selected in the ROD, the changes usually are documented in an ESD or ROD amendment. Box 5 describes a source control remedy that was changed through a ROD amendment.

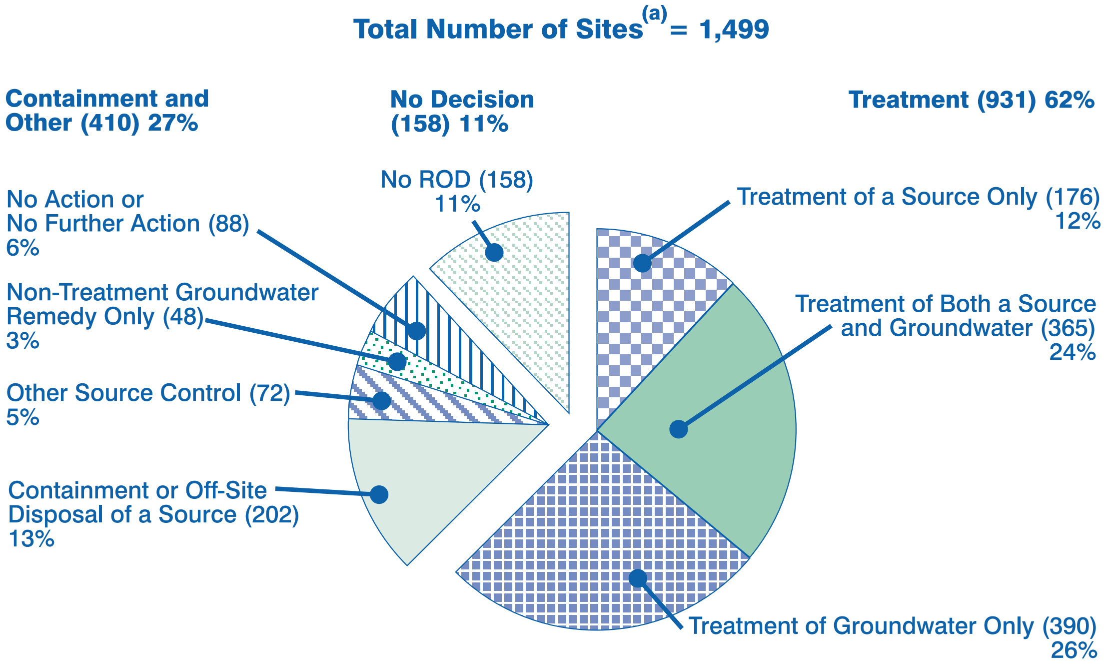
Box 5. Source Control Remedy Change

The source control remedy originally selected for the Helena Chemical Company Landfill Superfund Site was changed through a ROD amendment. The Helena Chemical Company Landfill Superfund Site is a 13.5 acre site where pesticides were formulated from the mid 1960’s through 1971. The soil was contaminated with halogenated organic pesticides, and groundwater with halogenated and nonhalogenated volatile organic compounds as well as halogenated organic pesticides. This site, located in Fairfax, SC, is currently being operated as a retail sales outlet for agricultural chemicals.

A 1993 ROD selected a treatment train of dechlorination followed by bioremediation as part of the remedy for contaminated soil. However, treatability studies showed that the dechlorination would not achieve performance standards identified in the ROD. A ROD amendment in 1995 changed the source control technology from dechlorination and bioremediation to off-site incineration. The incineration of 5,172 cy of pesticide-contaminated soil was completed in 1999. The groundwater remedy selected in the original ROD (1993) included P&T. The P&T system became operational in 1999 and is expected to treat approximately 250 million gallons of groundwater during its anticipated 12 years of operation.

Figure 1 reflects the current status of remedial actions at NPL sites. The information used to develop Figure 1 reflects the remedies selected in RODs and the remedies actually implemented or currently planned at those sites. Sources for the information include the RODs, ROD amendments, and ESDs published for each site, and contacts with RPMs to identify the most current remedy selected for each site.

Figure 1: Superfund Remedial Actions: Actual Remedy Types at Sites on the National Priorities List (NPL) (FY 1982 - 2002)*



ROD = Record of Decision

** Includes information from an estimated 70% of FY 2002 RODs.*

(a) NPL sites include current sites and former NPL sites that were deleted or removed from the NPL between FY 1982 and 2002.

Appendix F describes the methodology used to identify remedy types for each site.

Sources: 1, 2, 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

RODs Signed by Fiscal Year

Data from FY 1982 - 2002 RODs are included in this report. The total number of RODs expected for FY 2002 is 106 (about 70% of the FY 2002 RODs were available for this report).

As defined in Appendix F, RODs may select remedies for the source of contamination, such as soil, sludge, sediments, nonaqueous-phase liquids (NAPL), leachate, and solid-matrix wastes; they are referred to as "source control" RODs (see Box 3 on page 2). RODs may also address a contaminated aquifer, and are known as "groundwater" RODs. Because each ROD may include multiple remedies for different media, some RODs contain remedies for both the source and groundwater. Other RODs indicate that no action or no further action (NA/NFA) is necessary at a site, and are known as NA/NFA RODs.

For each FY, Figure 2 shows the number of RODs selecting the following remedies:

- Only source control remedies
- Both groundwater and source control remedies
- Only groundwater remedies
- NA/NFA remedies

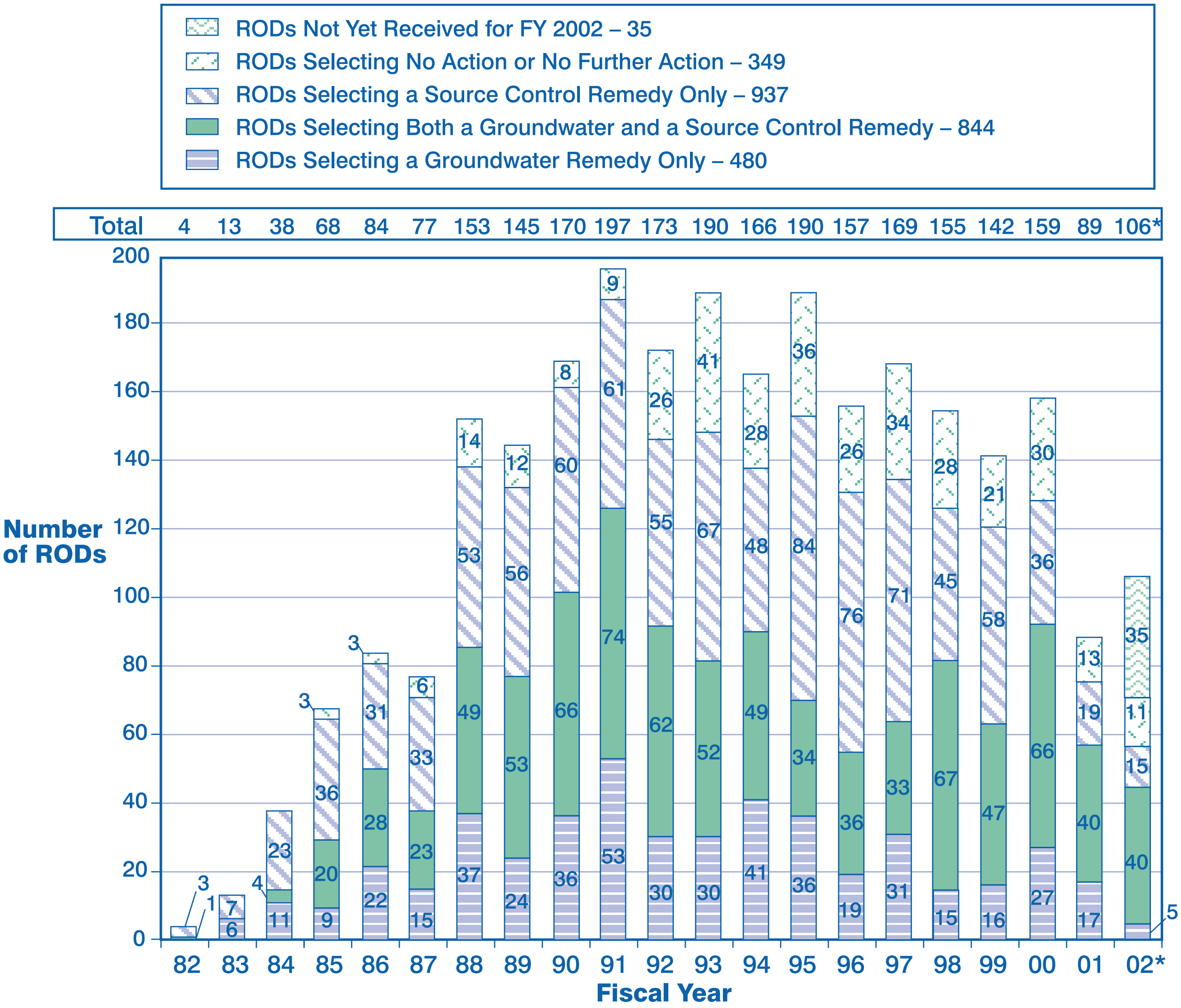
The complexity of RODs has been increasing. The proportion of RODs addressing both soil and groundwater contamination has increased from 20% in FY 1997 to 56% in FY 2002, an indication of the complexity of sites on the NPL still requiring RODs. Although the number of RODs signed in the last two years has dropped, the greatest decrease has been in RODs addressing single media.

From FY 1988 - 2002, the percentage of RODs selecting a source remedy, either alone or in combination with a groundwater remedy, ranged from a low of 58% in FY 1994 to a peak of 77% in FY 2002. The percentages provided are based on the number of RODs shown in Figure 2.

The percentage of RODs selecting a groundwater remedy, either alone or in combination with a source control remedy, peaked in FY 1991 at 64%. This percentage decreased to 35% in FY 1996 and has since risen again to 64% in FY 2001.

Figure 2: Superfund Remedial Actions: RODs Selecting Groundwater and Source Control Remedies (FY 1982 - 2002)*

Total Number of RODs = 2,610



ROD = Record of Decision

** Includes information from an estimated 70% of FY 2002 RODs. A total of 106 RODs are anticipated for FY 2002.*

Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Superfund Remediation Progress

Information collected and analyzed for this report helps document the progress of remediation technologies implemented at Superfund sites. EPA has developed a better picture of the contribution of remediation technologies to Superfund site cleanup by using additional data. The new data include information from CORs and data on P&T projects. This report also focuses on data collection efforts relating to technology status and treatment accomplishments. This section presents an overview of the progress of treatment technologies at Superfund remedial action sites. Additional information on this topic is presented in Section 4.

The Superfund Amendments and Reauthorization Act of 1986 (SARA) expressed a preference for permanent remedies (that is, treatment) over containment or disposal in the remediation of Superfund sites. Some 58% of all RODs analyzed for the ASR contained provisions for treatment. EPA currently tracks the status of 1,760 projects for the application of treatment technologies at Superfund sites, including *in situ* and *ex situ* treatments for both source control and groundwater. These applications include 499 *ex situ* source control treatments (28% of all projects), 349 *in situ* source control treatments (20%), 743 P&T (42%), 154 *in situ* groundwater treatments

(9%), and 15 *in situ* source control and *in situ* groundwater treatments (1%). Of these projects, 546 have been completed or shut down (31%).

Completed projects are those where the treatment has been performed and is no longer ongoing. For most source control and *in situ* groundwater treatment projects that are no longer ongoing, the technologies achieved their treatment goals. These projects are described as "completed" in this report. The term "completed" has not been used for P&T system projects that are no longer ongoing. Preliminary data indicate that a significant percentage might not have achieved their treatment goals. These projects are provisionally described as "shut down" in this report. Appendix G lists the 63 P&T projects that are shut down, and the reasons that were identified for making that decision. Information about the reason for shut down was not available for all P&T projects from the data sources used for this report. EPA is currently conducting additional data gathering to better understand, across the Superfund Program, the decisions that result in the shut down of P&T systems. In many cases, this appears to be driven by a "treatment train" approach, where P&T is supplemented by a different remedy such as in situ treatment or MNA (see Box 6, Definition of Completed Project).

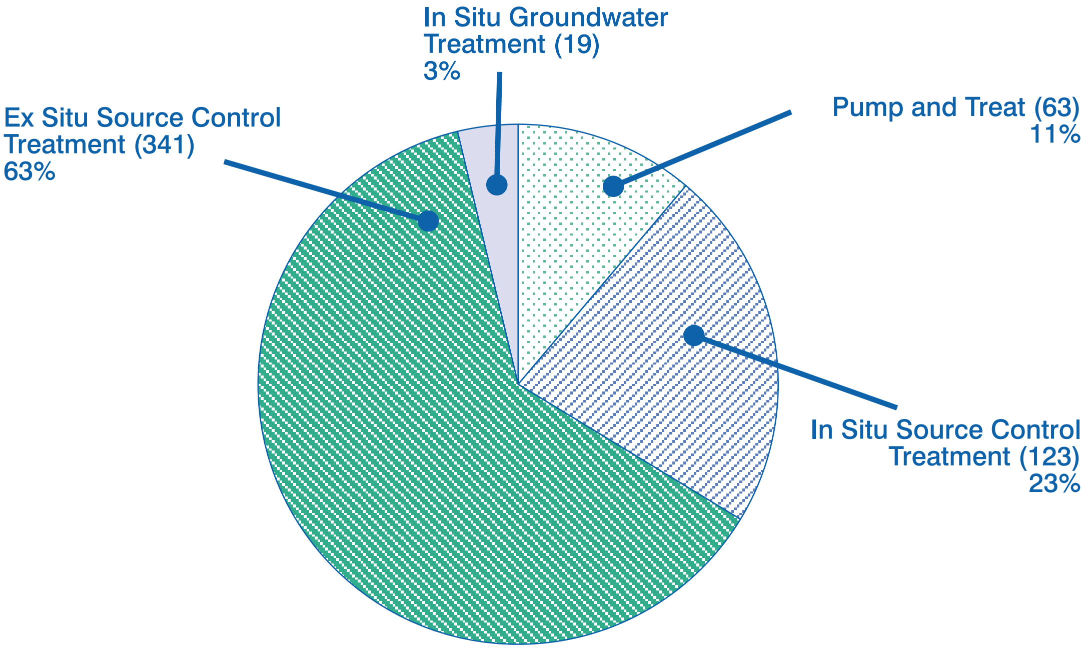
Figure 3 shows the number and percentage for each type of completed or shut down project at Superfund remedial action sites. For treatment technologies, a total of 546 projects (31%) have been completed or shut down and another 698 (39%) are operational. Most of the completed projects are *ex situ* source control treatments

BOX 6. DEFINITION OF COMPLETED PROJECT

Project completion and *construction completion* (CC) are different terms used in defining progress in Superfund. The first refers to a specific project (ex: a soil vapor extraction system that is shut down after reaching cleanup levels), whereas CC refers to construction of all remedies being achieved for an entire site (all remedy construction is complete).

Figure 3: Superfund Remedial Actions: Percentages of Completed Source Control and Groundwater Treatment Projects by Remedy Type (FY 1982 - 2002)*

Total Projects Completed = 546

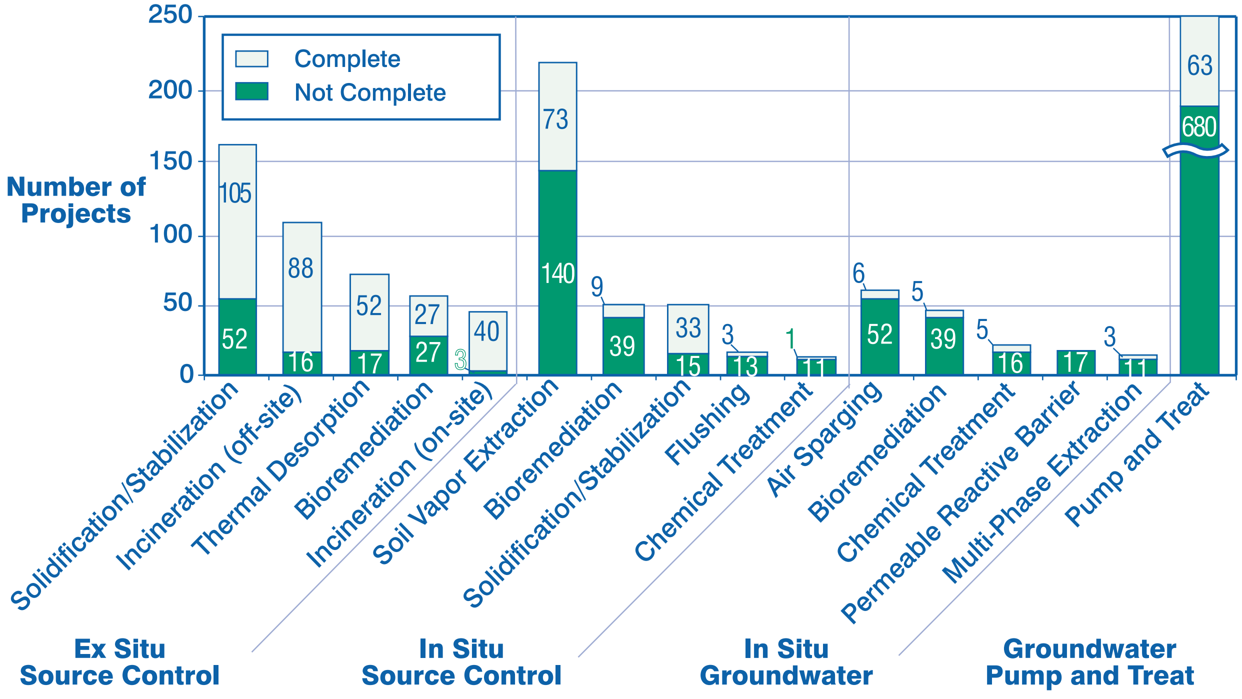


** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

(63%). *Ex situ* source control projects usually involve the excavation of contaminated soil and the application of an aggressive treatment technology in a controlled environment. Therefore, this type of remedy typically requires a shorter amount of time to complete. Additional information on source control projects is presented in Section 2. *In situ* treatments are those that are applied to contaminated media in place, without excavation. These projects typically require longer treatment times because they take place in a less controlled environment, which may limit the treatment rate. P&T projects, which represent the largest number of projects (743), also typically require longer treatment times, and in fact represent only 11% of all completed and shut down projects. The application of P&T is often limited by environmental factors, including the rate at which contaminated groundwater can be extracted from an aquifer and the presence of continuing sources of groundwater contamination such as DNAPLs. Additional information on groundwater projects is provided in Section 3.

Figure 4 shows the number of completed and shut down projects for the most commonly used technologies for *ex situ* source control, *in situ* source control, *in situ* groundwater, and P&T. For *ex situ* source control treatments, nearly all incineration projects have been completed. Approximately 70% of the S/S and thermal desorption projects have been completed. For *in situ* source control treatments, approximately 70% of S/S projects have been completed, as compared to one-third of all SVE projects. Fewer *in situ* groundwater projects have been completed as compared to source control projects. However, these technologies tend to be innovative, and have been selected in more recent RODs. For P&T, 8% of projects have been shut down.

Figure 4: Superfund Remedial Actions: Number of Projects Completed by Technology (FY 1982 - 2002)*



** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Section 2: Treatment Technologies for Source Control

Source control treatment technologies are designed to treat soil, sediment, sludge, or solid-matrix wastes (in other words, the source of contamination) and are not designed to treat groundwater directly. Source control remedies can be delineated further by the general type of remedy specified (see Box 3 or Appendix F for more detail). Table 1 contains information about the remedy actually implemented or currently planned at sites addressing source contamination. At 70% of all NPL sites, a source control remedy has been implemented or is currently planned. At over one-third (541) of sites, source control treatment has been implemented or is planned as a remedy for some portion of the site. A similar number of sites (576) has containment or off-site disposal of a source. Table 1 includes sites with more than one type of source control remedy in each applicable remedy category. Sites identified in Table 1 as having a source control treatment remedy may also have groundwater remedies. Groundwater technologies are discussed in Section 3.

Source Control Remedies

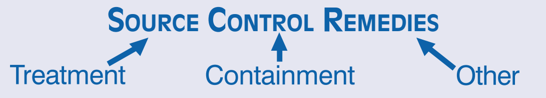


Table 1. Superfund Remedial Actions: Actual Remedy Types at National Priorities List Sites (FY 1982 - 2002)*

Total Numbers of Sites with a Source Control Remedy = 1,046

Remedy Type	Number of Sites
Treatment of a Source	541
Containment or Off-Site Disposal of a Source	576
Other Source Control	650

**Includes information from an estimated 70% of FY 2002 RODs.*
Sites may be included in more than 1 category.
Appendix F describes the methodology used to identify remedy types for each site.
Sources: 1, 2, 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Download file containing source data for Table 1.

Source Control RODs

From FY 1988 - 2000, the total number of source control RODs varied between 97 and 135, decreasing to 59 in FY 2001. However, the percentage of source control RODs signed in FY 2001 and 2002 (66% in FY 2001 and 77% in FY 2002) remained similar to that of previous years. Figure 5 shows the number of source control RODs of each type. The information sources used for this report contained only an estimated 70% of RODs signed in FY 2002. Although information on FY 2002 may change as more RODs become available, this report includes FY 2002 ROD data for comparison purposes. Figure 6 shows the percentage of source control RODs of each type for each FY.

As shown in Figure 6, from FY 1988 - 1993, approximately 70% of source control RODs each year contained provisions for treatment of wastes. From FY 1995 to 2001, the percentage mostly decreased with a low of 39% in FY 1999. However, it has recently increased to 52% in FY 2002. For most of the past 13 years (with the exception of FY 1997 and 2000), the percentage of RODs including a source control treatment remedy has equaled or exceeded the percentage with only source control containment.

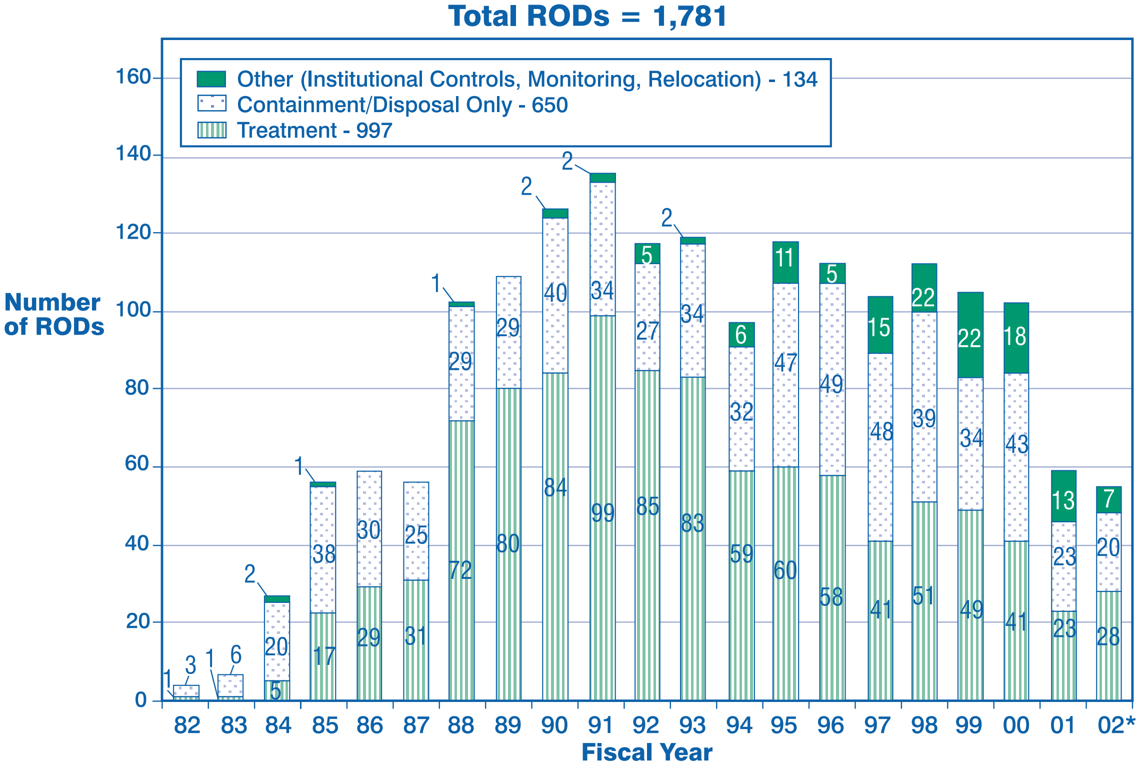
Cumulatively, 50% of source control RODs are of the type "treatment," 43% "containment or disposal," and 6% "other source remedy." From FY 1997 - 2002, the percentage of each type of source control remedy has remained relatively constant, with approximate values of 40% treatment, 40% containment, and 20% other. From FY 1988 - 1996, the percentage of source control treatment RODs was generally higher, ranging from 51% to 73%, while the percentage of containment and other source control remedies was generally lower.

In Situ Versus *Ex Situ* Technologies

In situ technologies for source control are those applications in which the contaminated medium is treated or the contaminant is removed without excavating, pumping, or otherwise moving the contaminated medium to the surface. Implementation of *ex situ* technologies requires excavation, dredging, or other processes to remove the contaminated medium before treatment either on site or off site.

Over FY 1982 - 2002, 863 treatment technologies were selected for source control. Of these, 42%

Figure 5: Superfund Remedial Actions: Source Control RODs (FY 1982 - 2002)*

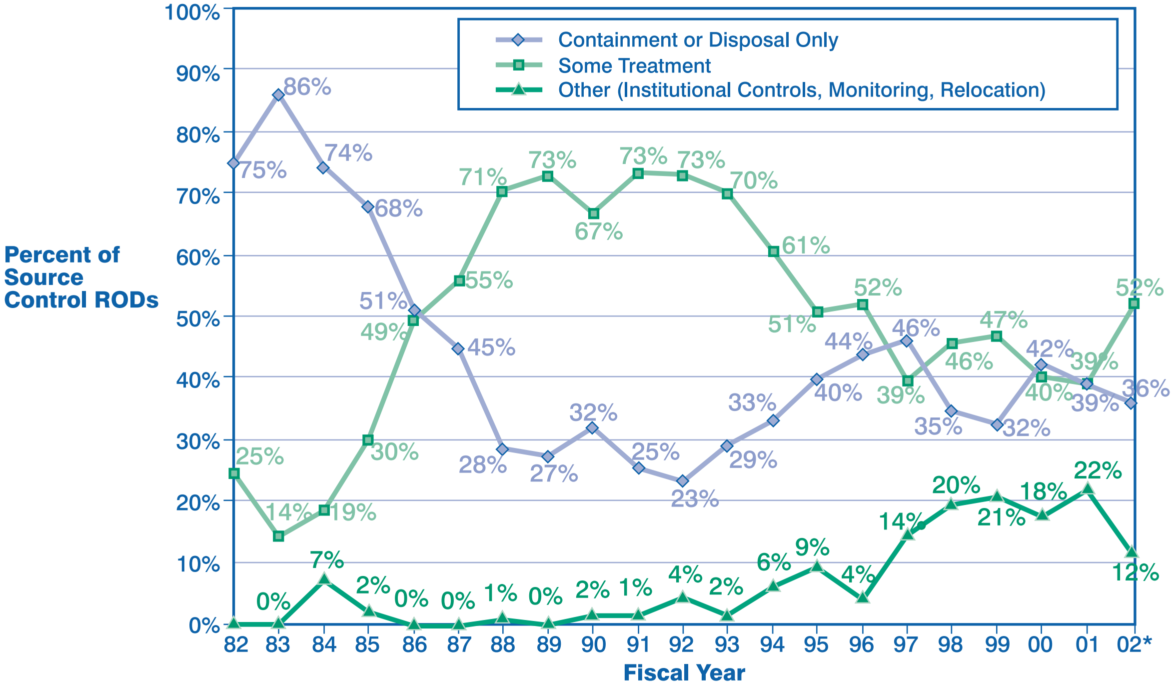


ROD = Record of Decision

** Includes information from an estimated 70% of FY 2002 RODs.*

Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Figure 6: Superfund Remedial Actions: Trends in Types of Source Control RODs (FY 1982 - 2002)*



ROD = Record of Decision

** Includes information from an estimated 70% of FY 2002 RODs.*

Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

were *in situ* technologies and 58% were *ex situ* technologies. Figure 7 provides a cumulative overview of *in situ* and *ex situ* treatment technologies selected for source control.

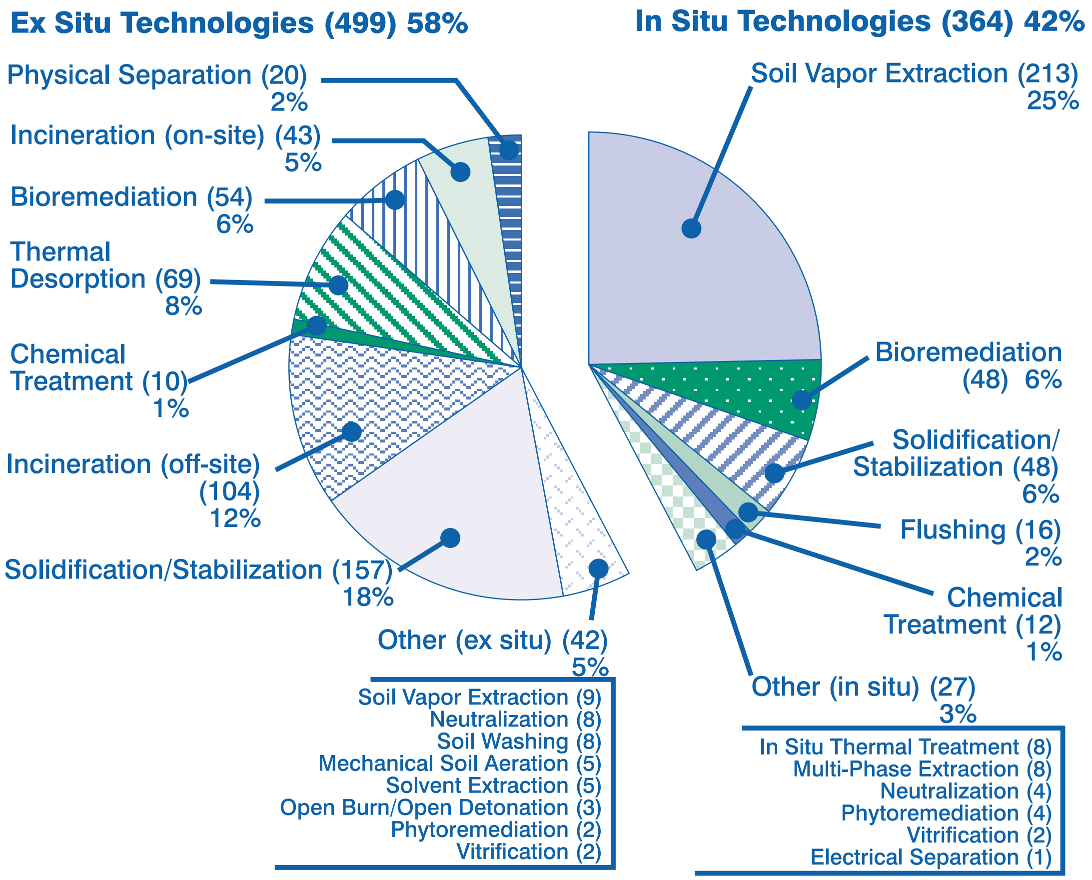
As Figure 7 indicates, SVE (213 projects, 25%), bioremediation (48 projects, 6%), and S/S (48 projects, 6%) are the most common *in situ* technologies, together making up 85% of all *in situ* source control treatment projects.

The most common *ex situ* technologies are S/S (157 projects, 18%), incineration (147 projects, 17%), thermal desorption (69 projects, 8%), and bioremediation (54 projects, 6%). These technologies together represent 86% of *ex situ* source control treatment projects.

Since the Tenth Edition of the ASR (ROD data through FY 1999), an additional 107 source control treatment projects have been selected. As shown in Figure 8, *in situ* SVE and bioremediation and *ex situ* S/S, incineration, and thermal desorption are still the most frequently selected technologies. More than half of all *in situ* chemical treatment projects (7 of 12) have been selected during the last three years. The increased use of this technology is discussed in more detail in Section 4. Bioremediation and thermal desorption also made up a significantly larger percentage of projects in FY 2000 - 2002. Many of the more common conventional technologies were selected with less frequency, including incineration (both on- and off-site), S/S (both *in* and *ex situ*), and SVE. The number of physical separation projects increased primarily because the definition of the technology was expanded to include decontamination of debris and dewatering of sediments for this edition of the ASR.

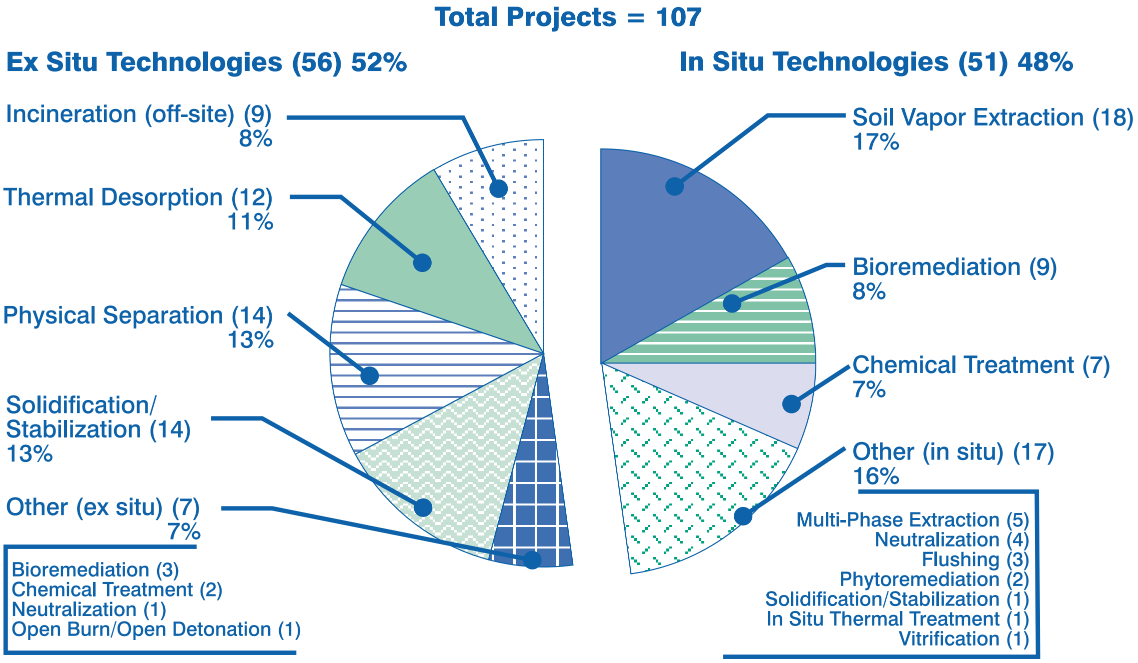
Figure 9 presents the number of *in situ* technologies as a percentage of all treatment technologies for source control by FY. As shown in Figure 9, *in situ* treatment technologies display an increasing trend as a percentage of all treatment technology projects between FY 1985 - 2002. The figure does not include FY 1982 through 1984 because too few RODs were signed during those years to develop accurate information about trends

Figure 7: Superfund Remedial Actions: Source Control Treatment Projects (FY 1982 - 2002)*



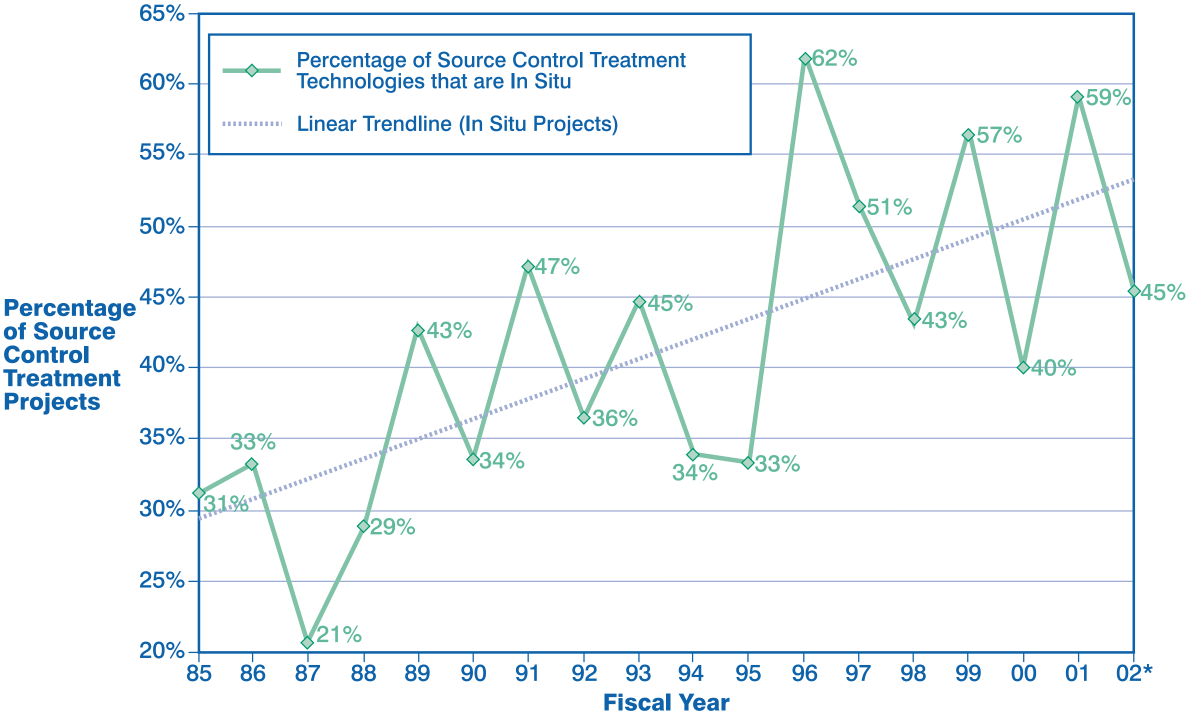
** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Figure 8: Superfund Remedial Actions: Source Control Treatment Projects Selected in FY 2000, 2001, and 2002*



** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Figure 9: Superfund Remedial Actions: In Situ Technologies for Source Control (FY 1985 - 2002)*



** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

in remedy selection. A 5-year moving average of the percentage of *in situ* treatment technologies shows a generally steady increase from 31% (FY 1985 - 1989) to 49% (FY 1998- 2002). The factors that may play a role in this upward trend include the following:

- Because *in situ* technologies require no excavation, risk from exposure to contaminated media is reduced, compared with levels of risk associated with *ex situ* technologies that do require excavation.
- For large sites where excavation and materials-handling for *ex situ* technologies can be expensive, *in situ* technologies are often more cost-effective.
- As *in situ* treatment technologies are used more frequently, they are receiving greater acceptance as a reliable technology by site managers, regulators, and other remediation professionals.

Appendix B contains a list of treatment technology projects for source control at remedial sites by EPA Region. The appendix can be accessed at *http://clu-in.org/asr*.

Status of Source Control Treatment Projects

Figure 10 shows the status of *in situ* and *ex situ* source control treatment projects, comparing the projects in the Tenth Edition of the ASR (data collected through August 2000) with the Eleventh Edition of the ASR (data collected through March 2003).

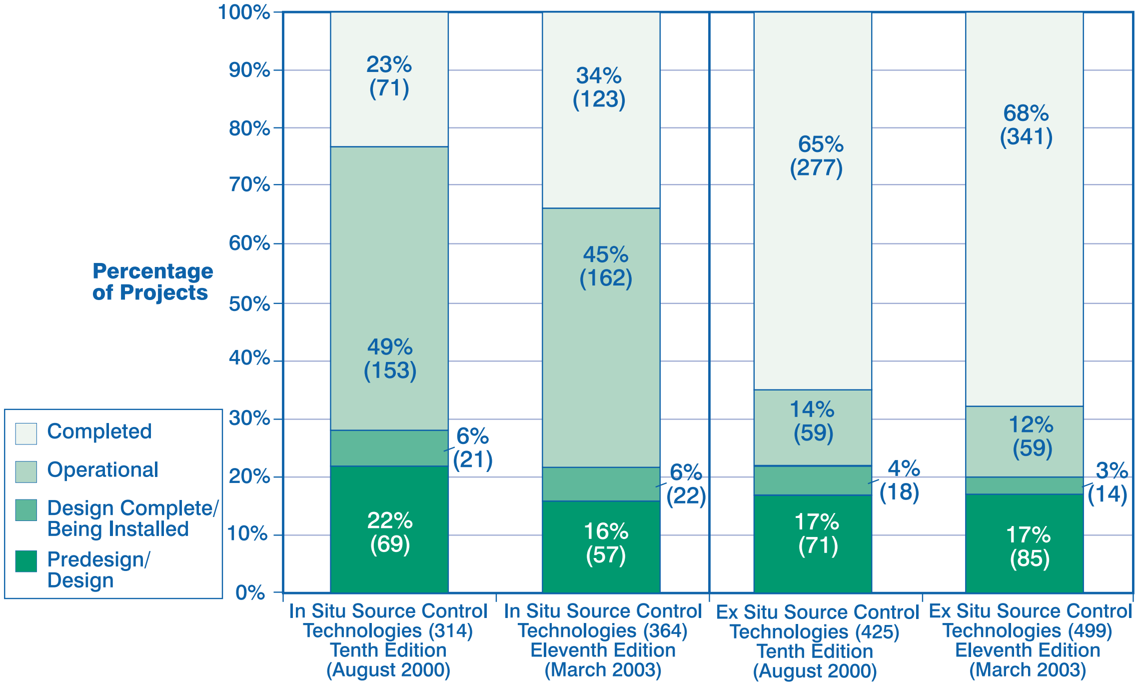
Based on the data in Figure 10:

- For *in situ* and *ex situ* source control projects, the number of completed projects increased by 73% and 23%, respectively. This increase indicates that Superfund sites continue to make progress in treating contaminant sources.
- The percentage of completed *in situ* source control projects increased from 23% in August 2000 to 34% in March 2003.

The status of treatment selected in FY 2000 - 2002 at Superfund remedial action sites includes:

- 107 additional treatment technology projects for source control were selected.

Figure 10: Superfund Remedial Actions: Status of In Situ and Ex Situ Source Control Treatment Projects Comparison Between Tenth and Eleventh Editions of the ASR (FY 1982 - 2002)*



** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

- Nine projects selected in this period have also been completed, including three off-site incineration projects, two *ex situ* S/S projects, two thermal desorption projects, one SVE project, and one bioremediation project.
- An additional 18 projects selected in the period became operational.

Table 2 provides a summary of project status for each technology type. Some 85% of the SVE projects are in the operational or completed phases. Among *ex situ* technologies, bioremediation has the same number of projects (17) that are operational as S/S, even though bioremediation is only the fourth most common *ex situ* technology (see Figure 7). The high percentage may be the result of the length of time required for bioremediation, compared with other *ex situ* technologies. Bioremediation enhances the ability of microorganisms to degrade contaminants through the addition of nutrients and oxygen. The time required to reach cleanup goals using bioremediation is limited by the degradation processes and depends on many factors such as the specific contaminant, temperature, and moisture. Because of those considerations, treatment by bioremediation (*in situ* or *ex situ*) typically requires a

Table 2. Superfund Remedial Actions: Status of Source Control Treatment Projects by Technology (FY 1982 - 2002)*

Technology	Predesign/ Design	Design Complete/ Being Installed	Operational	Completed	Total
In Situ					
Soil Vapor Extraction	21	10	109	73	213
Bioremediation	10	1	28	9	48
Solidification/Stabilization	7	5	3	33	48
Flushing	3	0	10	3	16
Chemical Treatment	7	2	2	1	12
In Situ Thermal Treatment	2	1	2	3	8
Multi-Phase Extraction	3	1	4	0	8
Neutralization	1	1	2	0	4
Phytoremediation	2	1	1	0	4
Vitrification	1	0	0	1	2
Electrical Separation	0	0	1	0	1
Total	57	22	162	123	364
Percentage of In Situ Technologies	*16%*	*6%*	*45%*	*34%*	—
Percentage of All Source Control Technologies	*7%*	*3%*	*19%*	*14%*	*42%*
Ex Situ					
Solidification/Stabilization	27	8	17	105	157
Incineration (off-site)	9	0	7	88	104
Thermal Desorption	13	0	4	52	69
Bioremediation	9	1	17	27	54
Incineration (on-site)	1	1	1	40	43
Physical Separation	13	1	3	3	20
Chemical Treatment	3	0	0	7	10
Soil Vapor Extraction	0	1	4	4	9
Neutralization	1	0	1	6	8
Soil Washing	4	1	1	2	8
Mechanical Soil Aeration	0	1	0	4	5
Solvent Extraction	2	0	2	1	5
Open Burn/Open Detonation	1	0	1	1	3
Phytoremediation	0	0	1	1	2
Vitrification	2	0	0	0	2
Total	85	14	59	341	499
Percentage of Ex Situ Technologies	*17%*	*3%*	*12%*	*68%*	—
Percentage of All Source Control Technologies	*10%*	*2%*	*7%*	*39%*	*58%*

** Includes information from an estimated 70% of FY 2002 RODs.*

Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

longer period of time than other *ex situ* technologies, such as incineration, thermal desorption, or S/S, for which the treatment rate is limited primarily by the capacity and throughput of the equipment used.

Time Between ROD Signature and Project Completion

The amount of time required between signature of a ROD selecting a particular source control treatment technology and completion of the project depends on many factors, such as the treatment rate of the technology, the need for mobilization or construction, pilot-scale testing, the amount of media to be treated, contaminant concentrations, and the time needed for permits or other approvals. Table 3 shows the average amount of time between ROD signature and project completion for technologies where completion date information are available for more than 15 completed projects.

Off-site incineration and *in situ* S/S projects have the shortest duration, at about 4 years. Although S/S is an *in situ* treatment, it is an established treatment technology, does not require excavation, and can be completed in relatively short treatment times. *Ex situ* S/S is the technology with the most completed projects, and averages 4.5 years per project. However, the duration ranges significantly, with some projects being completed in the same year as ROD signature, and others requiring up to 10 years. The data presented in Table 3 include only completed projects. *Ex situ* bioremediation projects have the longest duration (6 years). This technology typically requires pilot testing and can be slowed by many site-specific factors, such as climate and soil and contaminant characteristics. Operating dates are available for many of the projects from the ASR Search System at *http://cfpub.epa.gov/asr/*. See Box 4 for more details on the ASR Search System.

Innovative Applications

In the Overview section, innovative technologies were defined as alternative treatment technologies that have a limited number of applications and limited data on cost and performance. Innovative technologies have the potential for providing more cost-effective and reliable alternatives for cleanup of contaminated soils and groundwater.

For example, DNAPLs historically have been difficult to treat because of their behavior in the environment. Because DNAPLs tend to pool below the groundwater table, they may not contact soil vapor, and therefore are not effectively treated by technologies that extract soil vapor, such as SVE, which removes soil vapor from the vadose zone. However, innovative technologies such as *in situ* thermal treatment or *in situ* flushing can effectively treat DNAPLs in some cases. In other cases, an innovative technology may be less expensive than an established technology. It may be expensive to treat soils deep below the ground surface by incineration because of the amount of excavation required to reach the soil. However, an *in situ* chemical oxidation process may work effectively at that depth, resulting in a lower cost. Other reasons for selecting innovative technologies can include reduction in the exposure of workers to contaminated media; reduction in costs for excavation and materials handling (*in situ* technologies); and community concern about off-site releases of contaminants, noise, or odor. Box 7 summarizes an example of an established remedy (incineration) that was changed to an innovative one (bioremediation).

Table 3. Superfund Remedial Actions: Average Number of Years from ROD Signature until Project Completion (FY 1982 - 2002)*

Technology	Average Number of Years from ROD Date until Technology Complete	Number of Completed Projects	Number of Projects with Dates of Completion
Incineration (off-site)	4	88	41
Solidification/Stabilization (*in situ*)	4	33	26
Solidification/Stabilization (*ex situ*)	4.5	105	84
Thermal Desorption	4.5	52	41
Soil Vapor Extraction (*in situ*)	5	73	43
Incineration (on-site)	5	40	37
Bioremediation (*ex situ*)	6	27	15

ROD = Record of Decision
** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

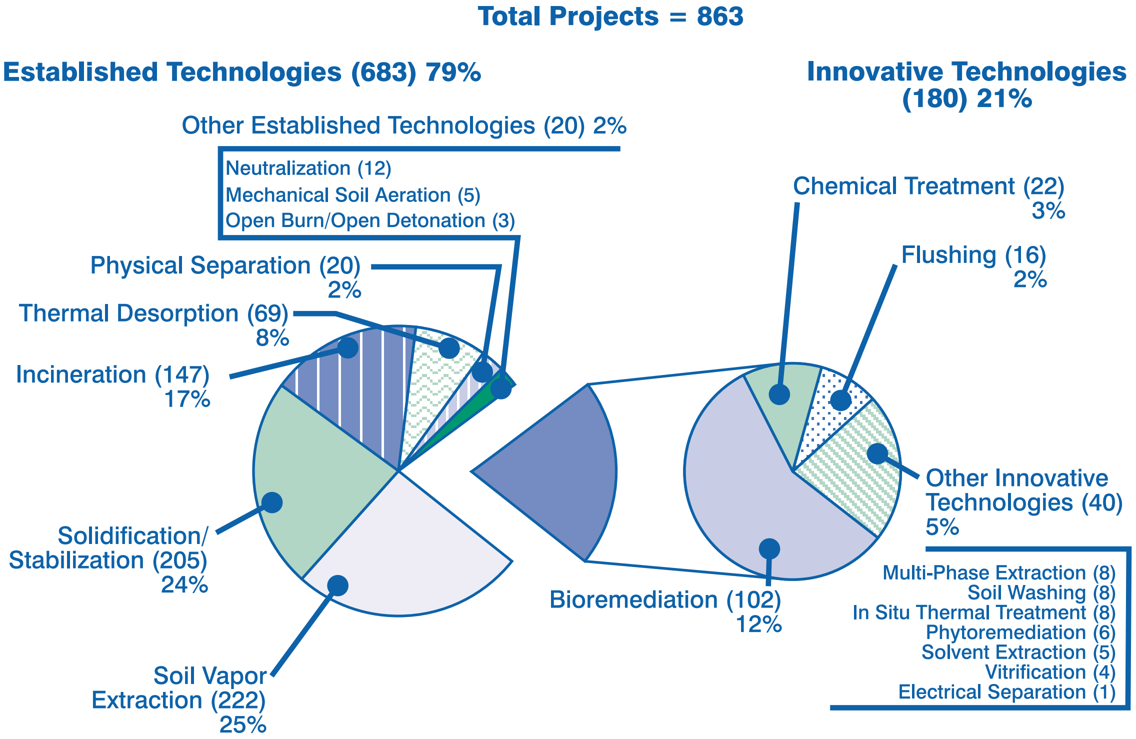
For source control treatment, Figure 11 depicts the number and types of innovative and established technologies used. As shown, innovative treatment technologies represent 21% of all technologies used for source control. Bioremediation makes up more than half of the innovative applications (102). *In situ* chemical treatment and flushing are the second and third most frequently selected innovative technologies. Innovative technologies being used for fewer than 9 projects at Superfund sites are listed under the other innovative technology category, which includes a total of 7 technologies and 40 applications.

The number of applications of a technology is not necessarily indicative of its effectiveness. In some cases, the technology may have only recently become available and has not had time to become widely accepted and used at Superfund sites. In other cases, the technology may be designed for specific types of applications, such as certain contaminants or media. For example, vitrification typically has higher energy costs than other technologies. However, when radioactive contaminants are mixed with other hazardous chemicals, vitrification is often capable of destroying the hazardous chemicals in addition to immobilizing the radioactive contaminants. In three of the four vitrification applications, the contaminants treated included a mixture of radioactive and other contaminants.

BOX 7. INNOVATIVE SOURCE CONTROL TREATMENT

An innovative technology, bioremediation, replaced an established technology, incineration, at the MacGillis & Gibbs Co./Bell Lumber and Pole Co. site. This site consists of two adjacent wood preserving facilities in New Brighton, MN. Both facilities have been active since the 1920's. The soil at Operable Unit (OU) 3 has been contaminated with halogenated and nonhalogenated semivolatile organic compounds, including pentachlorophenol, polycyclic aromatic hydrocarbons, dioxins, and furans. A ROD issued for OU 3 in 1994 specified on-site incineration for organic-contaminated soils. In 1999, a ROD amendment was signed, which changed the remedy from on-site incineration to bioremediation. A new remedy was selected because of the high costs associated with incineration and new risk-based determinations for future land use. In addition, EPA issued the document "Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites" in 1995, which identified bioremediation as a presumptive remedy. Based on these factors, *ex situ* bioremediation was selected for 18,000 cy of soil. This remedy was completed in November 2002.

Figure 11. Superfund Remedial Actions: Innovative Applications of Source Control Treatment Technologies (FY 1982 - 2002)*



** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

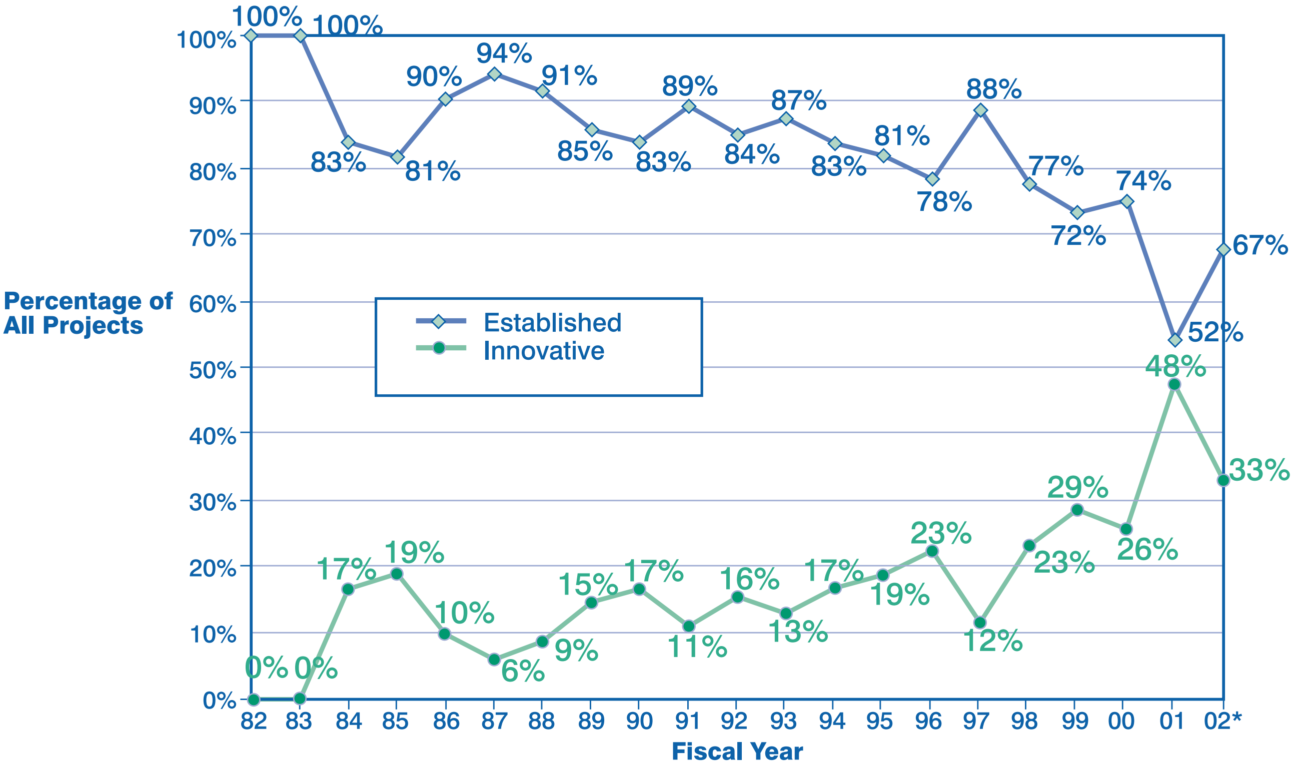
Figure 12 depicts the percentage of projects selected for innovative and established technologies for both source control and groundwater by FY. This figure includes both source control and groundwater projects to provide a broader perspective on the overall trends in innovative technology use. The figure shows that while established technologies historically have been the most frequently used, the frequency of their use relative to innovative technologies has been relatively stable from the mid-1980s through FY 1997. Since FY 1997, the use of innovative technologies has increased and peaked in FY 2001 at 48%. In FY 2001, the percentage of projects using innovative technologies was almost equal to the percentage for established technologies for the first time. This declining trend for established technologies is most dramatic for incineration, which peaked at 18% in FY 1990 and declined to 3% in FY 2002.

The FRTR case studies web site *(http://www.frtr.gov/costperf.htm)* provides detailed information on the cost and performance of both innovative and established technologies applied at Superfund sites. As of June 2003, the FRTR had 342 case studies covering a wide range of treatment technologies that are available for viewing on-line or for downloading from the FRTR website. The case studies were developed by the EPA, Department of Defense, Department of Energy, and National Aeronautics and Space Administration for Superfund and non-Superfund sites. They present available cost and performance information for full-scale remediation efforts and large-scale demonstration projects. They also provide information about site background and setting, contaminants and media treated, technology, cost and performance, and points of contact for the technology application.

Innovative Treatment Trains

Two or more innovative and established technologies may be used together in treatment trains, which are either integrated processes or a series of treatments that are combined in sequence to provide the necessary treatment. Some treatment trains are employed when no single technology is capable of treating all the contaminants in a particular medium. For example, soil contaminated with organics and metals may be treated first by bioremediation to remove organics, and then by S/S to reduce the

Figure 12: Superfund Remedial Actions: Established and Innovative Projects (FY 1982 - 2002)*

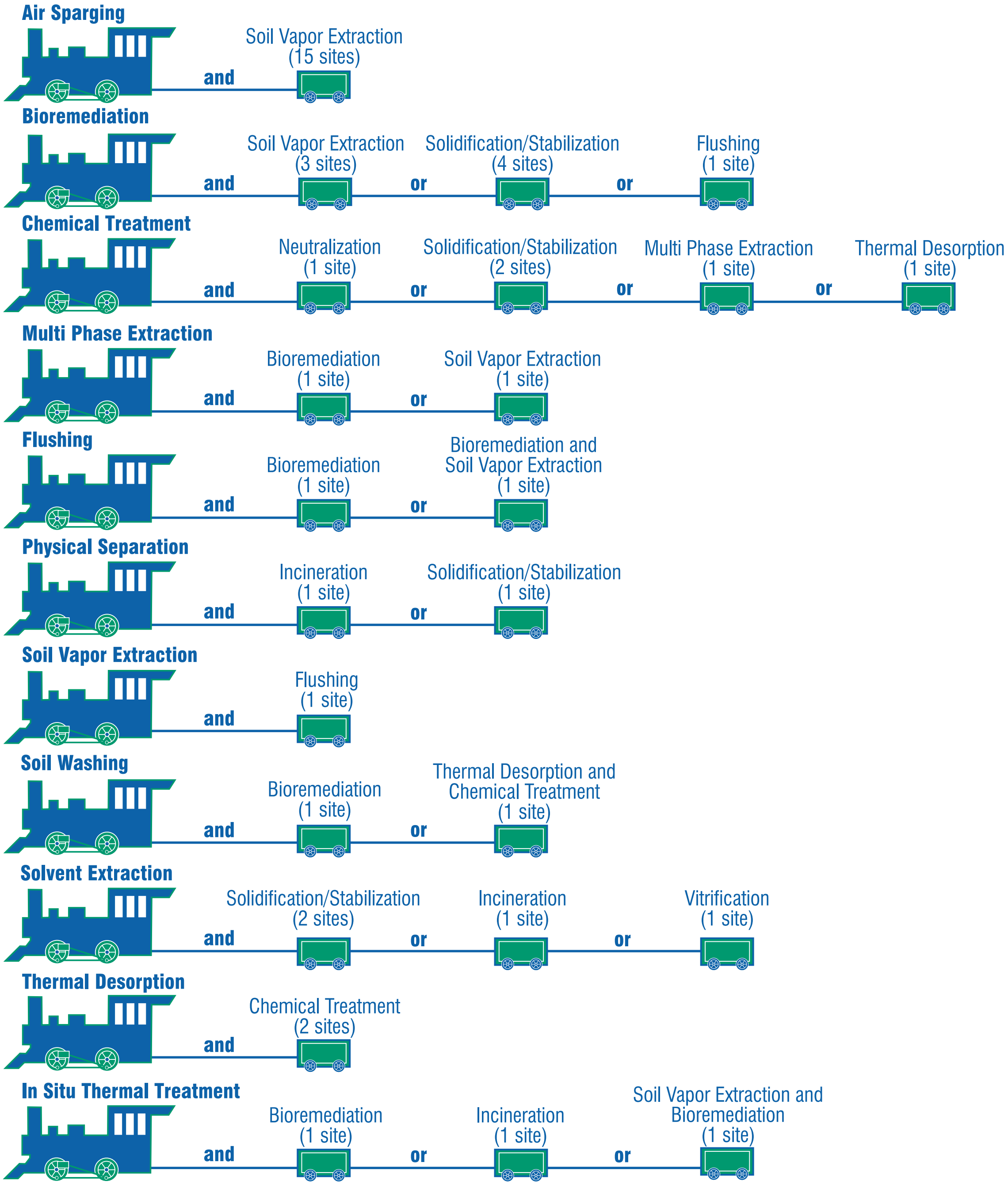


** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

leachability of metals. In other cases, a treatment train might be used to render a medium more easily treatable by another technology, reduce the amount of waste that requires further treatment by a more expensive technology, prevent the emission of volatile contaminants during excavation and mixing, or minimize the overall cost of the treatment.

Treatment trains that include one or more innovative technologies are the selected source control remedy at 46 Superfund sites. Figure 13 identifies specific treatment trains used in remedial actions. Innovative treatment technologies may be used with established technologies or with other innovative technologies. The most common treatment trains are air sparging used in conjunction with SVE, and bioremediation followed by S/S or SVE. In the case of air sparging used with SVE, the air sparging is used to remove contaminants from groundwater *in situ*, while the SVE captures the contaminants removed from the

Figure 13. Superfund Remedial Actions: Treatment Trains with Innovative Treatment Technologies (FY 1982 - 2002)*



** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

groundwater and removes contaminants from the soil above the groundwater (the vadose zone). A detailed discussion of the volumes of soil for these projects is contained in the Treatment Trains and Their Effects on Quantity of Soil Treated section.

Contaminants Addressed

Table 4 summarizes the contaminants being targeted by specific technologies. Nine major groups of contaminants were analyzed for this report. Compounds were categorized as halogenated VOCs, semivolatile organic compounds (SVOC), or polycyclic aromatic hydrocarbons (PAH) according to the lists provided in EPA's SW-846 test methods 8010, 8270, and 8310, with the exceptions noted in Table 4. Overall, approximately 75% of the source control treatment projects address organics and more than 25% of projects address metals. The number of projects in Table 4 exceeds the total number of projects in Figure 7 because some projects involve more than one type of contaminant. Therefore, such projects are listed in Table 4 multiple times, once for each contaminant type.

The selection of a treatment technology for a site often depends on the physical and chemical properties of the contaminants. For example, VOCs are amenable to treatment by certain technologies, such as SVE, because of their volatility. In other cases, metals, which are not volatile and do not degrade, are not usually amenable to treatment by SVE and thermal desorption. Because metals form insoluble compounds when combined with appropriate additives, such as Portland cement, S/S is most often used for treatment of those contaminants.

As Table 4 shows, halogenated VOCs; benzene, toluene, ethylbenzene, and xylene (BTEX); and non-

Table 4. Superfund Remedial Actions: Contaminants Treated by Source Control Technologies (FY 1982 - 2002)*

Technology	Total number of projects[a]	Polycyclic aromatic hydrocarbons	Other nonhalogenated semivolatile organic compounds[b]	Benzene-toluene-ethylbenzene-xylene	Other nonhalogenated volatile organic compounds[c]	Organic pesticides and herbicides	Other halogenated semivolatile organic compounds[d]	Halogenated volatile organic compounds	Polychlorinated biphenyls	Metalloids and metals
Soil Vapor Extraction	222	14	31	102	48	3	27	**183**	0	0
Solidification/ Stabilization	205	16	18	12	13	14	7	14	35	**174**
Incineration	147	28	41	35	23	36	34	**47**	37	6
Bioremediation	102	38	**49**	30	29	25	15	16	1	2
Thermal Desorption	69	20	16	23	15	9	11	**30**	14	2
Chemical Treatment	22	1	2	3	2	2	2	7	4	**11**
Physical Separation	20	6	2	1	0	3	0	0	5	**7**
Flushing	16	3	6	5	4	1	4	**10**	0	5
Neutralization	12	0	0	0	0	0	0	0	0	0
Multi-Phase Extraction	8	1	1	**5**	2	0	2	**5**	1	0
Soil Washing	8	2	1	0	0	2	0	0	1	**3**
In Situ Thermal Treatment	8	**5**	0	2	0	3	2	3	0	0
Phytoremediation	6	1	2	2	2	1	1	3	0	**4**
Mechanical Soil Aeration	5	0	0	1	1	0	1	**4**	0	0
Solvent Extraction	5	2	1	0	1	1	0	2	**3**	1
Vitrification	4	0	0	1	1	0	1	**2**	**2**	1
Open Burn/ Open Detonation	3	0	**2**	0	0	0	1	0	0	0
Electrical Separation	1	0	0	0	0	0	0	**1**	0	0
Total Projects	863	139	172	222	141	100	108	327	103	216

** Includes information from an estimated 70% of FY 2002 RODs.*

[a] *Each project may treat more than 1 contaminant group.*

[b] *Does not include polycyclic aromatic hydrocarbons.*

[c] *Does not include benzene, toluene, ethylbenzene, and xylene.*

[d] *Does not include organic pesticides and herbicides.*

Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

halogenated VOCs are treated most often by SVE. Non-halogenated SVOCs and PAHs are treated most often by bioremediation. Polychlorinated biphenyls (PCB), organic pesticides/herbicides, and halogenated SVOCs are treated most often by incineration. Metals are treated almost exclusively by S/S. An interesting exception is the use of bioremediation to treat metals in two projects. However, these projects are in the design phase, and the effectiveness of bioremediation for metals at these sites has not yet been demonstrated.

EPA has developed the Hazardous Waste Cleanup Information (CLU-IN) Contaminant Focus area (*http://www.clu-in.org/contaminantfocus/*), which bundles information associated with the cleanup of individual contaminants and contaminant groups. This information is presented in categories including Overview, Policy and Guidance, Chemistry and Behavior, Environmental Occurrence, Toxicology, Detection and Site Characterization, Treatment Technologies, Conferences and Seminars, and Other Resources. Contaminant Focus will be continuously updated with information from federal cleanup programs, state sources, universities, nonprofit organizations, peer-reviewed publications, and public-private partnerships. New contaminants will be added on a periodic basis.

Quantity of Soil Treated

Table 5 shows the results of an analysis of the quantity of soil addressed by the various treatment technologies. Data on the quantity of treated soil are available for 217 *in situ* projects and 325 *ex situ* projects for which source control treatment technologies were selected to treat soil. Typically, *in situ* technologies are used to address larger

Table 5. Superfund Remedial Actions: Estimated Quantities of Soil Treated by Source Control Technologies (FY 1982 - 2002)*

	Total Number of Projects	Number of Projects with Data	Minimum (cubic yards)	Median (cubic yards)	Average (cubic yards)	Maximum (cubic yards)	Total Quantity (cubic yards)
Ex Situ							
Bioremediation	54	46	21	12,750	74,000	1,936,000	3,400,000
Chemical Treatment	10	7	760	21,000	22,000	50,000	154,000
Incineration (off-site)	104	51	5	1,000	4,800	23,000	247,000
Incineration (on-site)	43	34	12	21,000	50,000	330,000	1,714,000
Mechanical Soil Aeration	5	3	2,100	NC	NC	12,000	16,600
Phytoremediation	2	2	850	NC	NC	10,900	11,800
Soil Vapor Extraction	9	7	540	2,400	20,000	81,000	137,000
Soil Washing	8	7	6,400	13,600	26,000	100,000	179,000
Solidification/Stabilization	157	105	18	12,700	51,000	1,071,000	5,322,000
Solvent Extraction	5	4	7,000	NC	NC	300,000	329,000
Thermal Desorption	69	59	250	16,400	32,400	137,000	1,913,000
Average	-	-	1,600	12,600	35,000	368,300	1,220,000
Total	**466**	**325**	**-**	**-**	**-**	**-**	**13,423,400**
In Situ							
Bioremediation	48	26	3,100	24,000	313,000	5,760,000	8,127,000
Chemical Treatment	12	6	2,200	15,800	18,700	41,000	112,000
Multi-Phase Extraction	8	2	77,000	NC	NC	100,000	177,000
Flushing	16	9	2,000	19,000	131,000	1,000,000	1,180,000
Phytoremediation	4	2	60,000	NC	NC	101,000	178,000
Soil Vapor Extraction	213	134	2	31,000	176,000	6,100,000	23,587,000
Solidification/ Stabilization	48	31	180	21,000	99,000	1,920,000	3,063,000
In Situ Thermal Treatment	8	7	200	23,000	567,000	3,528,000	3,969,000
Average	-	-	18,100	22,300	217,500	2,319,000	5,000,000
Total	**357**	**217**	**-**	**-**	**-**	**-**	**40,393,000**
Average for All Technologies	-	-	8,600	16,800	113,000	1,190,000	2,832,000
Total for All Technologies	**823**	**542**	**-**	**-**	**-**	**-**	**53,816,400**

Technologies with data on fewer than two projects were not listed in this table.

** Includes information from an estimated 70% of FY 2002 RODs.*

Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

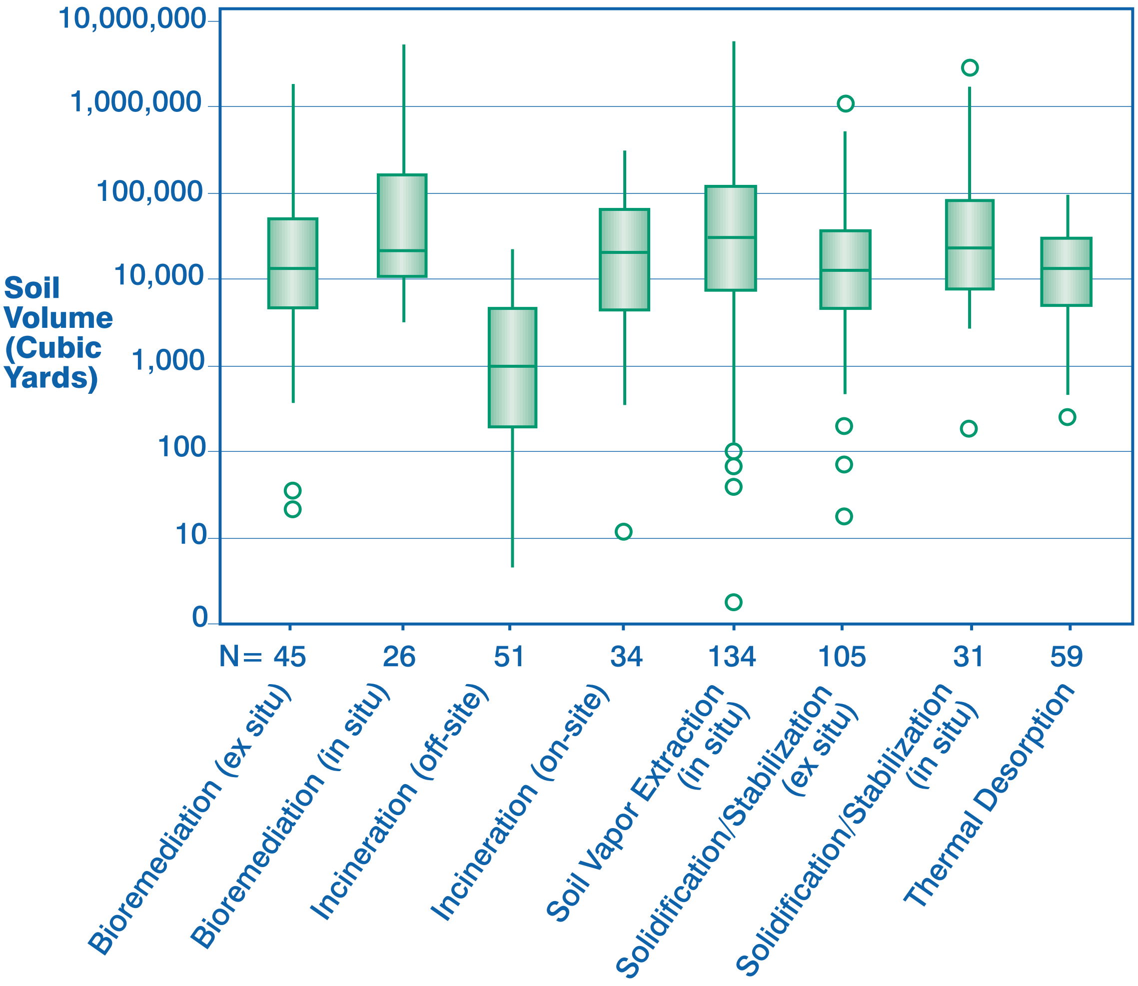
quantities of soil, while *ex situ* technologies are used to treat smaller quantities. Because quantities for *in situ* projects often cannot be determined accurately and many projects have not been completed, the quantities in Table 5 should be considered estimates. Based on the 65% of projects for which data are available, an estimated 82 million cy of soil have been treated.

For *ex situ* technologies, the median volume of soil treated per project ranged from approximately 1,000 cy for off-site incineration to 21,000 cy for both on-site incineration and chemical treatment. After on-site incineration and chemical treatment, thermal desorption had the next highest median (16,400 cy), followed by bioremediation and soil washing (both with approximately 14,000 cy). For *in situ* technologies, the median volume of soil treated per project ranged from almost 16,000 cy (chemical treatment) to 31,000 cy (SVE).

The volume of soil treated by the 8 technologies (for which data on soil volume were available for at least 10 projects) were plotted for comparison purposes. Figure 14 presents a box-and-whiskers plot of the volume of soil treated by technology type to show the distribution of the data. Because of the wide range in volumes of soil treated, the soil volumes are plotted on a logarithmic scale.

Figure 14 shows the median, 25th, and 75th percentiles, as well as the largest and smallest nonoutlier values. In a box plot, the 25th and 75th percentiles are shown as the ends of the box. The largest and smallest nonoutlier values are shown by the lines that extend from the ends of the box, which are known as the "whiskers." Outliers represent values that are between one and one-half and three box lengths from the top or bottom of the box. Extreme values are more than three box lengths from the top or bottom of the

Figure 14. Superfund Remedial Actions: Box-and-Whiskers Plot of Cubic Yards of Soil Treated (FY 1982 - 2002)*



** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

box. Outliers and extreme values are depicted on Figure 14 by circles.

With the exception of off-site incineration, the median volume of soil treated for all technologies falls between 10,000 and 100,000 cy. The range of values, as shown by the length of the box and whiskers, is much greater for SVE than for all other technologies, ranging from about 100 cy to almost 10 million cy. The 75th percentile value for SVE and bioremediation (*in situ*) is above 100,000 cy, indicating that the volume being treated by these technologies is above 100,000 cy for 25% of the projects for which data are available.

Comparing similar technologies that can be conducted both *in situ* and *ex situ* shows that *in situ* technologies are typically used to treat larger volumes of soil. As Figure 14 shows, the median volume of soil per project for *in situ* bioremediation is greater than that for *ex situ* bioremediation. The range of soil volumes for bioremediation indicate that, when applied *in situ*, it is more applicable to projects with large volumes of soil. For smaller soil volumes, *ex situ* bioremediation is more applicable. S/S, which has both *in situ* and *ex situ* applications, also tends to treat larger volumes *in situ* and smaller volumes *ex situ*.

Off-site incineration is generally treating the smallest volume of soil with a median volume of only 1,000 cy. On-site incineration is used to treat larger volumes, and has a median of 21,000 cy. Off-site incineration costs are typically based on the volume treated, with no start-up costs. On-site incineration typically entails significant start-up costs related to mobilizing equipment to the site and obtaining permits. However, once an on-site incinerator has started up, the treatment cost per unit of material incinerated is typically lower because costs for off-site transportation are eliminated. Therefore, on-site incineration can be more cost-effective than off-site incineration when treatment of a large amount of material is necessary.

Treatment Trains and Their Effect on Quantity of Soil Treated

The ASR Search System contains data on the volumes of soil treated in 26 treatment trains. These data were evaluated to identify treatment trains that may have an effect on the volumes of soil treated.

At 13 sites where treatment trains were used, the volume of soil treated by each technology in the train remained the same. At 10 sites, the volume of soil decreased from 7% to nearly 100% as it moved through the treatment train. The initial technologies with the largest percent decrease were SVE and bioremediation. Both technologies were followed by S/S.

At three sites, the volume of soil increased as it moved through the treatment train. At Robins Air Force Base in Georgia, the treatment train consisted of SVE to remove volatile organics followed by S/S to immobilize metals. The volume of material increased during the S/S step due to the binders added in the S/S process.

When *in situ* technologies are used in a treatment train, a more aggressive technology may be applied to remediate areas with high contaminant concentrations or NAPLs (hot spots), followed by application of a less aggressive technology to remediate a larger area that includes the former hot spot area. This occurred at two of the three sites where the volume of soil increased between the first and second technologies in the treatment train. At the Southern California Edison, Visalia Pole Yard, *in situ* thermal treatment was used to treat 213,500 cy of soil and removed approximately 55,000 pounds of DNAPL (creosote) contamination. Following the *in situ* thermal treatment, bioremediation (biosparging) was implemented to treat approximately 5,760,000 cy of soil and residual groundwater contamination. At the Petro-Chemical Systems Inc. OU 2, *in situ* thermal treatment was used to treat 330 cy of soil to remove BTEX from two hot spots, followed by the application of SVE to 300,000 cy.

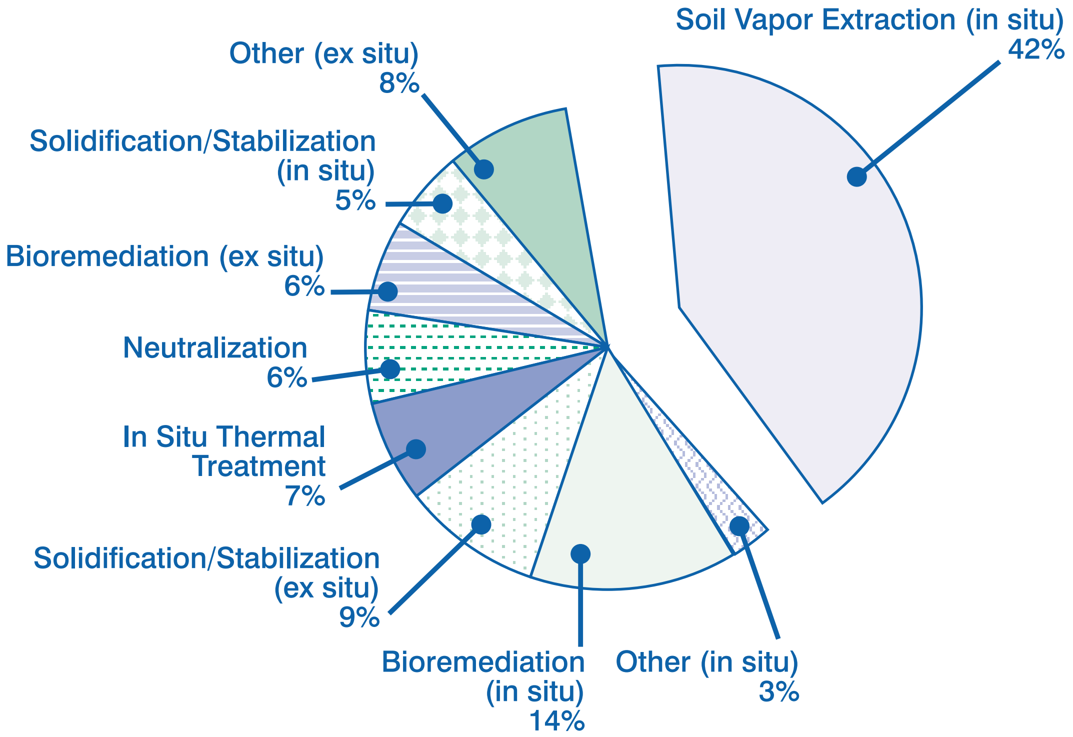
Cumulative Soil Treatment Volumes

Figure 15 shows the percentage of soil volume being treated for each technology type, which indicates SVE treats the largest volume of soil. SVE is the most frequently selected technology at 25% of all source control treatment projects (see Figure 7) and, on average, treats the largest volume of soil (see Figure 14). Those factors explain the large fraction of soil being treated by this technology. Figure 15 is based on the 65% of source control treatments at Superfund remedial action sites where soil treatment data are available.

Remedy Changes

As discussed in Section 1, remedies selected for Superfund remedial actions are documented in a ROD, and changes to the original remedies can

Figure 15: Superfund Remedial Actions: Percentage of Soil Treated by Technology Type (FY 1982 - 2002)*



** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

be either formally documented or executed through clauses in the original ROD. Remedy changes often occur during the pre-design or design phase of a project when new information about site characteristics is discovered or treatability studies for the selected technologies are completed.

Many of the treatment remedies that were modified involved a change from source control treatment to a remedy that is not source control treatment. Source control treatment remedies have been changed to non-treatment remedies at over 120 Superfund remedial action sites. These remedies are often changed to containment, MNA, or institutional controls. The most commonly cited reason for changing source control treatment to another type of remedy was that further site investigation revealed that the concentration or extent of contamination was less than expected. Other frequently cited reasons included rising groundwater levels making soil treatment impracticable, community concerns about on-site remedies, and high costs.

The Superfund program allows EPA and state environmental regulators the flexibility to modify remedies as site conditions change. The ASR tracks 863 source control treatment projects, not including the 120 that have been changed to non-treatment remedies. Based on a total of 983 source control treatment remedies (863 active plus 120 changed), 12% have been changed.

In 90 instances, one source control treatment technology was replaced with a different treatment technology. Table 6 provides information about the most frequently changed treatment technologies, and the technologies that replaced them, as indicated by cumulative data from FY 1982 - 2002. The source control treatment technologies that were most frequently changed to another source control treatment technology were incineration, bioremediation, and thermal desorption. These technologies are the third, fourth, and fifth most frequently selected treatment technologies (see Figure 7). The most common technologies selected to replace incineration, bioremediation, and thermal desorption were thermal desorption (replacing incineration and bioremediation), S/S, SVE, and incineration (replacing bioremediation and thermal desorption).

Previous editions of the ASR included an appendix (Appendix D) that listed all the technology changes, additions, and deletions made since the previous edition of the ASR. Because the appendix has expanded over time, it is now available on-line at *http://clu-in.org/asr*.

Table 6. Superfund Remedial Actions: Number of Most Commonly Changed Technologies (1982 - 2002)*

	Technology Initially Selected			
New Treatment Technology	**Incineration**	**Bioremediation**	**Thermal Desorption**	**Total**
Thermal Desorption	9	3	-	12
Solidification/Stabilization	7	3	1	11
Bioremediation	5	-	0	5
Soil Vapor Extraction	3	2	5	10
Solvent Extraction	1	0	0	1
Incineration	-	5	5	10
Air Sparging	0	1	0	1
Chemical Treatment	1	0	1	2
Soil Washing	0	0	1	1
Physical Separation	0	0	1	1
In Situ Thermal Treatment	0	1	0	1
Pump and Treat	0	2	0	2
Total Number of Remedy Revisions	26	17	14	57

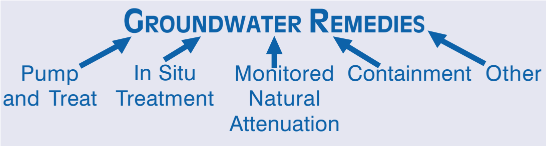
** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Section 3: Groundwater Remedies

In January 2002, EPA published the report Groundwater Remedies Selected at Superfund Sites (EPA 542-R-01-022), which provided information about trends in the selection of P&T, *in situ* treatment, and MNA for groundwater in RODs. This edition of the ASR incorporates and updates the information and analyses from that report. This report focuses on groundwater treatment (P&T and *in situ* treatment) and MNA remedies because they reduce contaminant concentrations or decrease their mobility[1].

Groundwater remedies are delineated by whether the remedy specified: (1) extraction of groundwater followed by aboveground treatment (P&T), (2) *in situ* treatment, (3) MNA, (4) containment using subsurface VEBs, or (5) other actions (such as alternate drinking water supplies or drilling prohibitions), as shown in the box below.

Groundwater Remedy Types



Appendix F defines these remedy types and describes how they are identified. Detailed descriptions of the technologies used to perform groundwater P&T and *in situ* groundwater treatment are presented in the Overview at the beginning of this report.

As shown in Table 7, P&T is the most frequently used groundwater remedy. Because of its prevalence, EPA began an effort to gather more information about P&T remedies and to track the status of P&T projects. For the first time, this report presents detailed information on P&T remedies. See page 39 for a detailed description of the findings.

This report also provides data collected for specific groundwater treatment projects. Detailed information on the status of MNA projects was not collected because it is not a focus of this report. Other groundwater remedies (see Overview), such as well-drilling prohibitions and alternate drinking water supplies, are not a focus of this report because these remedies, while being protective, typically do not directly result in a reduction of contaminant concentrations or a decrease in contaminant mobility.

Groundwater Sites

A groundwater remedy has been implemented or is currently planned at 1,062 sites, 71% of sites on the NPL. As shown in Table 7, P&T has been implemented or is planned at 713 of the sites addressing groundwater. Many sites have more than one type of groundwater remedy. These sites are counted in Table 7 once for each type of groundwater remedy they have. Sites may also have source control remedies in addition to groundwater remedies. Over 700 sites with groundwater remedies also have a source control remedy.

For sites at which several types of groundwater remediation were used, such as a P&T system and *in situ* treatment, the remediation may not have occurred in the same aquifer or groundwater plume. When different types of groundwater remedies are applied to the same contaminant

Table 7. Superfund Remedial Actions: Actual Remedy Types at National Priorities List Sites (FY 1982 - 2002)*

Total Number of Sites with a Groundwater Remedy = 1,062

Remedy Type	Number of Sites
Groundwater Pump and Treat	713
In Situ Treatment of Groundwater	135
MNA of Groundwater	201
Other Groundwater	822

MNA = Monitored natural attenuation
ROD = Record of Decision
**Includes information from an estimated 70% of FY 2002 RODs.*
Sites may be included in more than 1 category. Other groundwater includes sites with groundwater other remedies, as well as groundwater vertical engineered barriers.
Appendix F describes the methodology used to identify remedy types for each site.
Sources: 1, 2, 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.
Download file containing source data for Table 7.

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[1] MNA does not generally satisfy the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) preference for treatment because it is not an engineered technology (see Reference 12, on page 50).

plume, they may be used to treat different parts of the plume. For example, an *in situ* groundwater treatment technology may be used for areas that are difficult to treat using P&T, such as hot spots, NAPL source zones, tight clays, fractured rock, and areas with heterogenous hydrogeology. P&T, in turn, may be used to control plume migration and remediate other areas of the plume with lower contaminant concentrations. MNA may be used to treat areas of the plume with relatively low contaminant concentrations that remain above remediation goals. Box 8 describes a site that has selected and implemented groundwater P&T, *in situ* groundwater treatment, and MNA.

Figure 16 shows the use of P&T, *in situ* treatment, and MNA for groundwater, both alone and in combination with other remedies. At least one of these three is a remedy at 851 sites. The most common is P&T only, with 556 sites. The second most common is MNA only at 96 sites. When two types of groundwater remedies were used at the same site, a P&T system was used most frequently with MNA (64 sites) and *in situ* treatment (63 sites). For 30 of the 851 sites, three types of groundwater remedies were used. At most sites where one of these remedies was selected, some form of groundwater treatment was included. P&T or *in situ* treatment was included in the selected remedy at 89% (755) of the sites, while 11% (96) of sites selected only MNA.

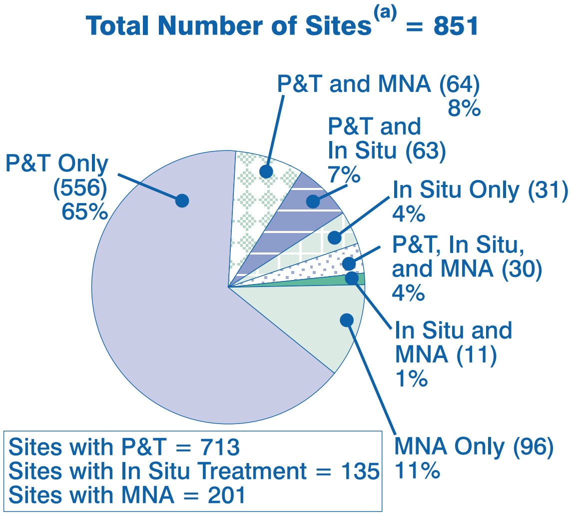
At many of the sites shown in Figure 16, the remedy also includes source control treatment. For example, source control treatment is part of the remedy at 43% of the 556 sites with P&T only. At 41% of the 96 sites with MNA only, source control treatment is also part of the remedy.

Box 8. Site with Multiple Groundwater Remedies

Groundwater contamination at the Naval Air Engineering Station site is being addressed with a combination of P&T, *in situ* treatment, and MNA. The US Navy has used this 7,382 acre site in Lakehurst, NJ since the 1920's for the development and testing of fleet support systems. Fuels, oils, metals, solvents, and other organic compounds have been disposed on-site, and contaminated areas include landfills, open pits, unlined lagoons, and drainage ditches. Petroleum hydrocarbons and volatile organic compounds, including benzene and trichloroethene, have been identified as contaminants of concern in the soil and groundwater.

Several areas (Areas A, B, C, E, H, I, and J) of the site are being remediated with groundwater remedies. At Areas A, B, C, E, and H, groundwater P&T was selected for plume containment through interim RODs in 1991 and 1992. The P&T system is currently operational. In 1997, final RODs were signed, and air sparging was added to Areas A, B, and E to enhance remediation of the most contaminated zone. A ROD was issued in 1999 that selected MNA and *in situ* bioremediation for the higher concentration portions of Areas I and J. Additional groundwater and source control remedies have been selected for other areas at the site.

Figure 16: Superfund Remedial Actions: Sites with P&T, In Situ Treatment, or MNA Selected as Part of a Groundwater Remedy (FY 1982 - 2002)*



MNA = Monitored natural attenuation
P&T = Pump and treat
** Includes information from an estimated 70% of FY 2002 RODs.*
(a) NPL sites include current sites and former NPL sites that were deleted and/or removed from the NPL between FY 1982 and 2002.
Appendix F describes the methodology used to identify remedy types for each site.
Sources: 1, 2, 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Source control is discussed in more detail in Section 2 of this report.

Groundwater RODs

Figure 17 shows the number of groundwater RODs of each type. RODs that select treatment may also include MNA, groundwater containment using VEBs, or other groundwater remedies. The number of groundwater treatment RODs peaked in FY 1991 at 114 and has been generally decreasing, similar to the behavior observed for source control RODS (see Figure 5). This peak matches the peak in the total number of RODs in FY 1991, as shown in Figure 2. From FY 1988 - 1995, the number of groundwater treatment RODs ranged from 55 to 114, while during the period from FY 1996 - 2001, it was between 31 and 42 RODs.

Selection of Groundwater Remedies

Figure 18 shows the percentages of RODs selecting groundwater remedies. Nearly 90% of RODs selected P&T from FY 1987 - 1992. This percentage decreased to 30% in FY 1998, but has since risen to 40% in FY 2002. MNA was selected in less than 10% of RODs from FY 1986 - 1991, but then increased every year until it peaked at 48% in 1998. It was only about half of its peak level in the following three years, and then decreased by an additional two-thirds to 9% in FY 2002. RODs selecting *in situ* groundwater treatment have been generally increasing, from none in 1986 to 24% in FY 2002. The percentage of RODs selecting VEBs has remained relatively consistent, below 10% for all years. RODs selecting other remedies were less than 25% from FY 1986 - 1997, but then increased rapidly. About 90% of RODs selected an other groundwater remedy from FY 2000 - 2002. RODs selecting multiple groundwater remedy types are included in each applicable category. Figures 18 through 21 do not include FY 1982 through 1985 because of the small number of RODs signed.

RODs selecting P&T alone have decreased from about 80% prior to FY 1993, to an average of 21% over the last 5 years (FY 1998 - 2002), as shown in Figure 19. In contrast, P&T is being used increasingly with *in situ* treatment or MNA, or not at all. RODs selecting P&T with another remedy generally ranged from 5% to 10% through FY 1995, but increased to an average of 14% from FY 1996 - 2002. Similarly, RODs selecting *in situ* treatment or MNA and not P&T generally ranged from 5% to 10% through FY 1993. However, these RODs

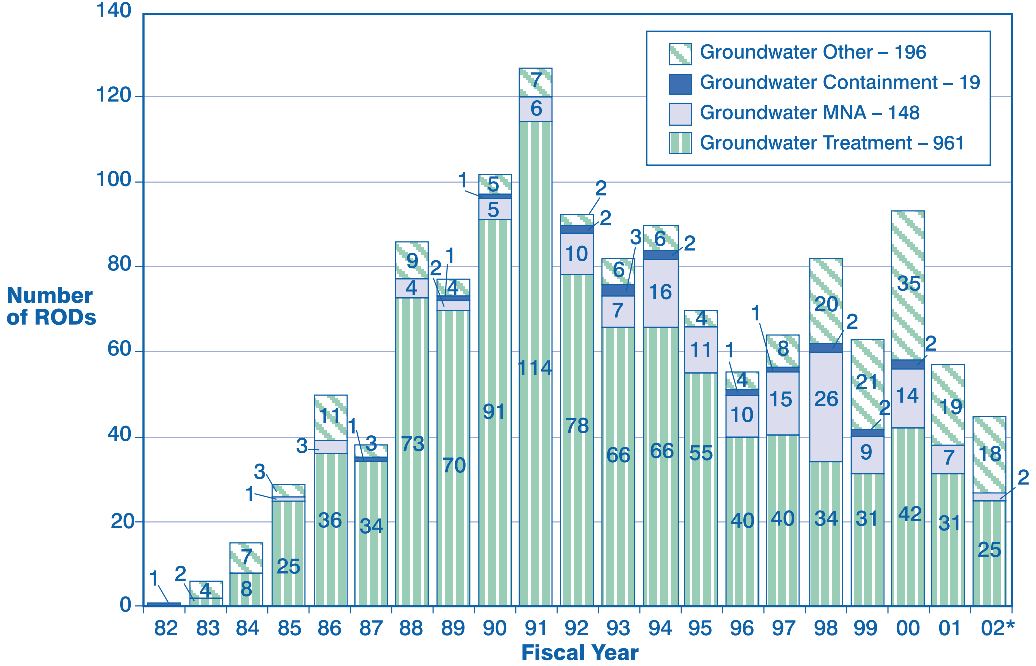
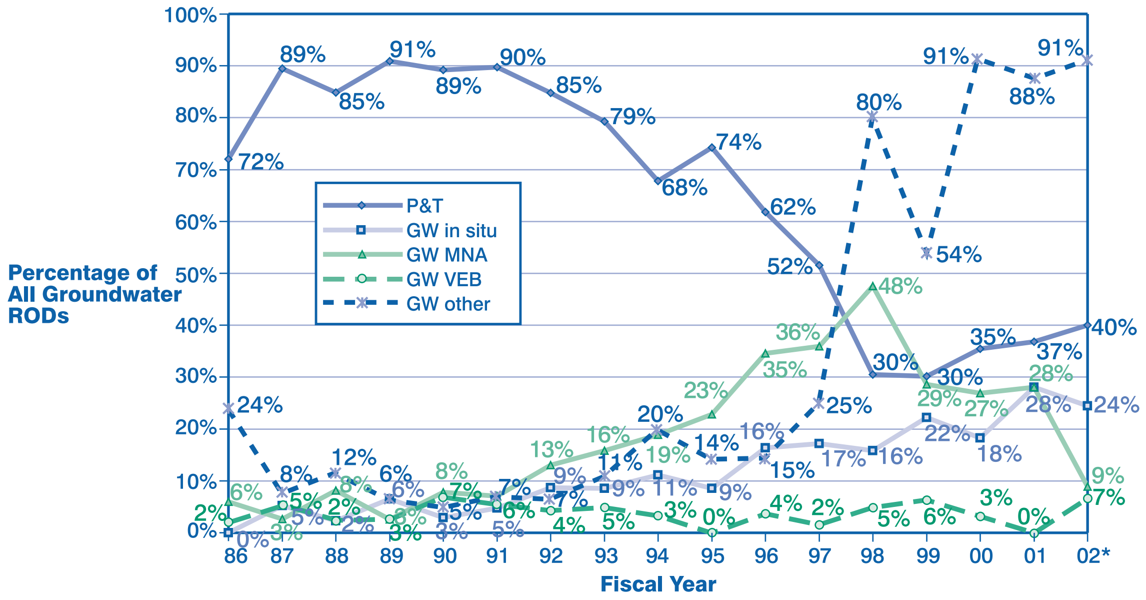


Figure 17: Superfund Remedial Actions: RODs Selecting Groundwater Remedies (FY 1982 - 2002)*

Total RODs = 1,324

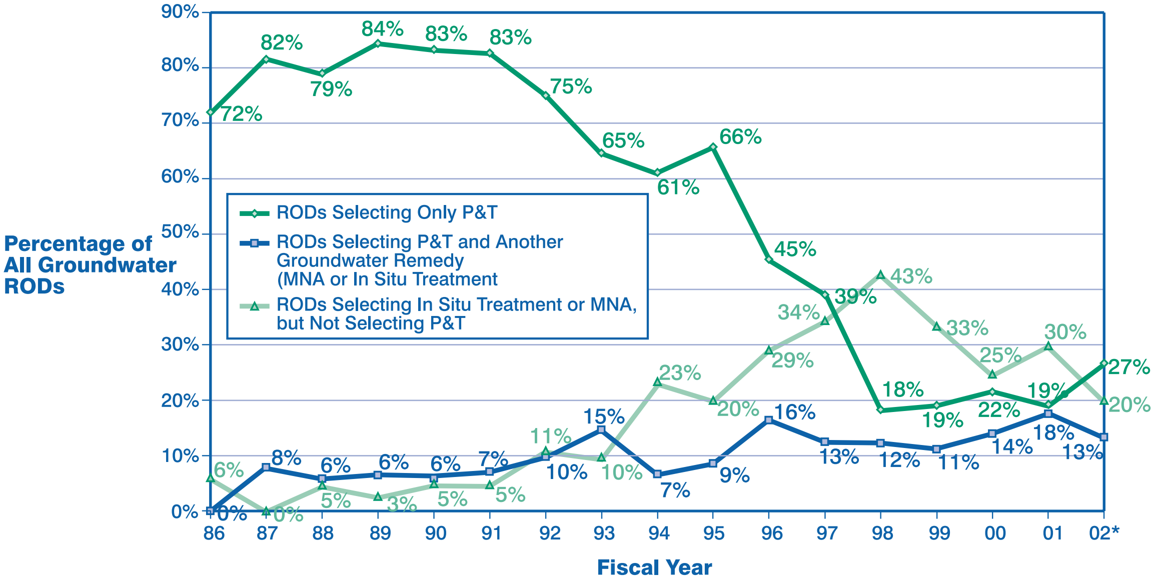
MNA = Monitored natural attenuation
ROD = Record of Decision
** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Figure 18: Superfund Remedial Actions: Trends in Groundwater Remedy Selection (FY 1986 - 2002)*



GW = Groundwater
MNA = Monitored natural attenuation
P&T = Pump and treat
ROD = Record of Decision
VEB = Vertical engineered barrier
** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Figure 19. Superfund Remedial Actions: Trends in the Selection of Pump and Treat (FY 1986 - 2002)*



MNA = Monitored natural attenuation
P&T = Pump and treat
ROD = Record of Decision
** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

then increased to a peak of 43% in FY 1998, and have since decreased to 20% in FY 2002.

The general decrease in the selection of P&T remedies may be due to a variety of factors, including the following:

- More widespread acceptance of innovative *in situ* groundwater treatment remedies
- Reduced operation and maintenance costs from using active *in situ* treatment technologies
- Reduced time to address risk and faster return of sites to beneficial uses by using active *in situ* treatment remedies
- Reduced costs by using MNA

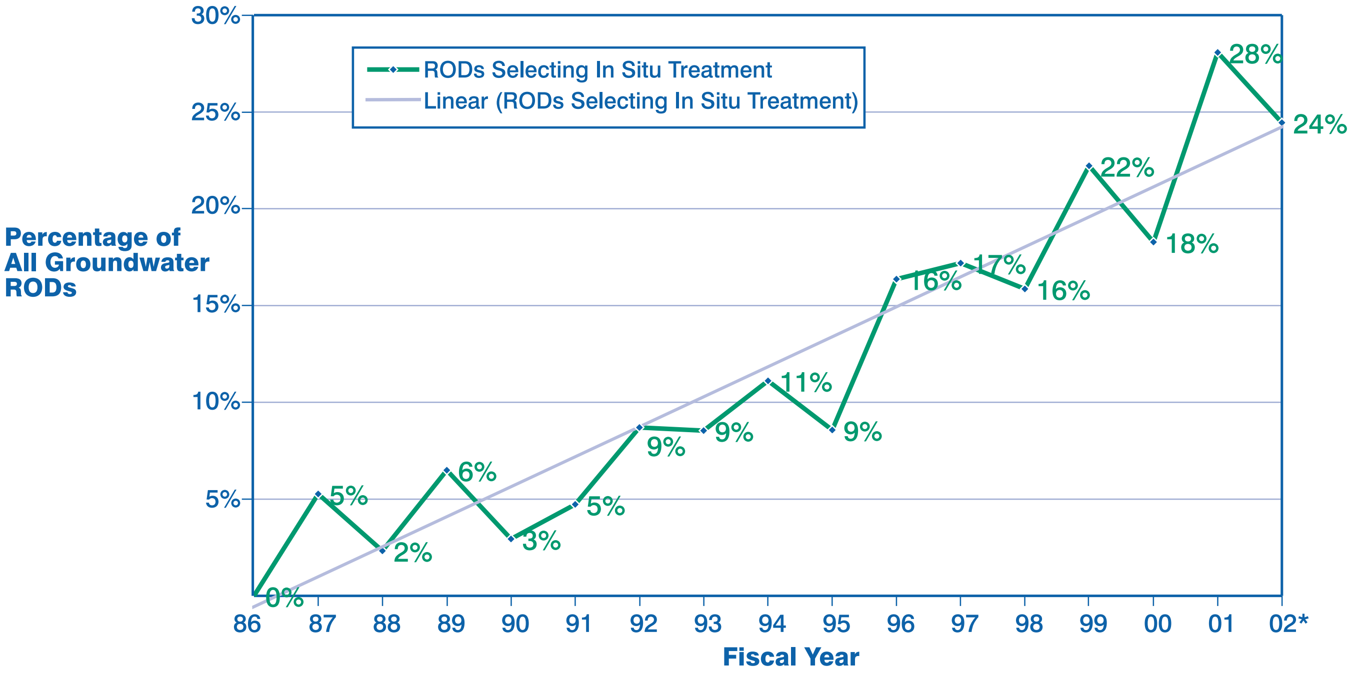
The general increase in the selection of P&T with MNA or *in situ* treatment may be due to a variety of factors, including the following:

- More active *in situ* treatments can reduce P&T treatment times by remediating hot spots and contaminant sources
- MNA can reduce P&T treatment times by allowing P&T systems to be shut down when contaminants reach levels that can effectively be treated by MNA
- MNA can treat areas of a contaminant plume with low concentrations, reducing the amount of the contaminant plume treated by P&T

The percentage of groundwater RODs selecting *in situ* treatment peaked in FY 2001 at 28%. The generally upward trend in the selection of *in situ* treatment, shown in Figure 20, may be due to several factors. The development of these technologies is growing rapidly. They have also begun to be used more frequently in recent years to treat some media and contaminants that are difficult to remediate, such as DNAPL, chlorinated solvents, and fractured bedrock. A detailed discussion of one such technology, chemical treatment, is presented in Section 4. Figure 20 counts all RODs that selected *in situ* groundwater treatment (with or without other remedies).

Groundwater MNA is the reliance on natural attenuation processes (within the context of a carefully controlled and monitored approach to site cleanup) to achieve site-specific remediation objectives within a time frame that is reasonable, compared with that offered by other, more active methods (see Reference 12 on Page 50). The "natural attenuation processes" include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These *in situ* processes include biodegradation; dispersion; dilution; sorption;

Figure 20: Superfund Remedial Actions: Trends in the Selection of In Situ Treatment for Groundwater (FY 1986 - 2002)*



ROD = Record of Decision

** Includes information from an estimated 70% of FY 2002 RODs.*

Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

volatilization; radioactive decay; and chemical or biological stabilization, transformation, or destruction of contaminants.

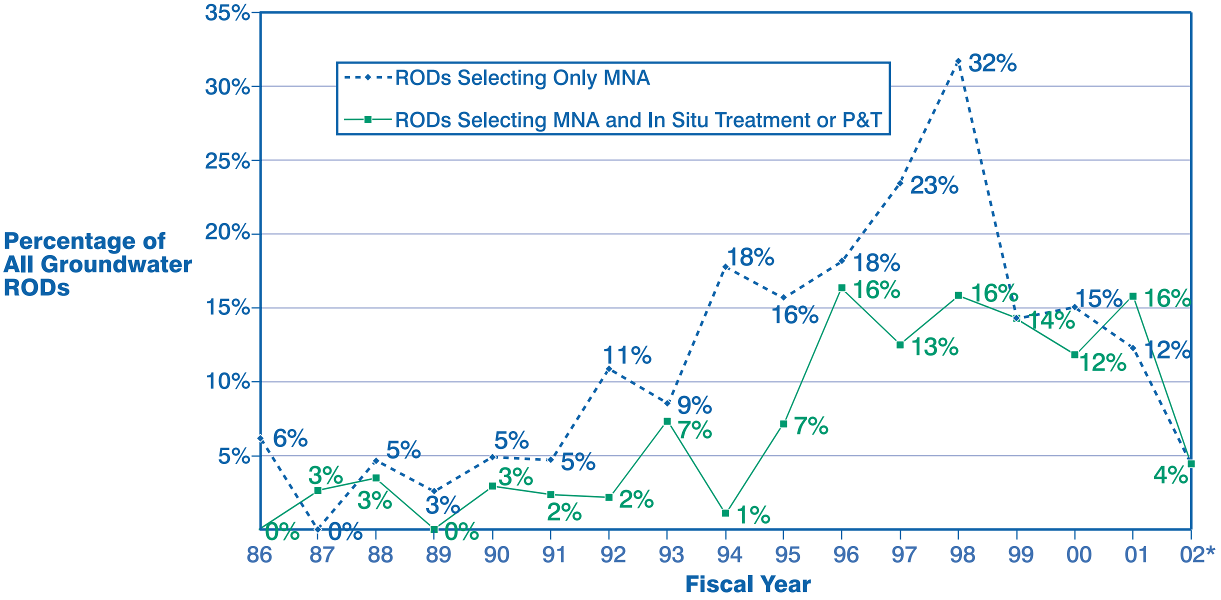
Cumulatively, 234 RODs have selected MNA; of those, 124 selected MNA without a groundwater treatment remedy. Since FY 1986, the fraction of groundwater RODs selecting MNA, both alone and in combination with P&T and *in situ* treatment, has increased. Figure 21 compares the trends in the percentage of groundwater RODs selecting only MNA to MNA in combination with groundwater treatment (P&T or *in situ* treatment). The selection of MNA, both alone and with groundwater treatment remedies, generally increased through 1998. In that year, MNA alone was selected in 32% of RODs, while MNA was selected with P&T or *in situ* treatment in 16% of RODs. From FY 1999 - 2001, MNA alone was half of its peak level, while MNA with a groundwater treatment remedy remained relatively constant. In FY 2002, both types of RODs decreased to 4%.

The decrease in MNA only RODs coincided with the publication of EPA guidance on the use of MNA in 1999 (see Reference 12 on page 50). This directive was issued to clarify EPA's policy regarding the use of MNA for the remediation of contaminated soil and groundwater at sites administered by EPA's Office of Solid Waste and Emergency Response, and contained guidance for the implementation of MNA. The guidance may have influenced remedy identification and selection. For example, the directive provided a more specific definition of MNA than was available in the past. Prior to publication of the directive, some remedies identified as MNA may not have met the definition provided in the directive. Authors of FY 1999 RODs may have identified remedies that they would have previously identified as MNA as another remedy, such as monitoring only or NA/NFA.

In Situ Groundwater Treatment Technologies

In situ technologies for groundwater treatment are those applications in which the contaminated groundwater is treated or the contaminant is removed from the groundwater without extracting, pumping, or otherwise removing the groundwater from the aquifer. Implementation of P&T remedies requires extraction of groundwater from

Figure 21: Superfund Remedial Actions: Trends in the Selection of MNA (FY 1986 - 2002)*



MNA = Monitored natural attenuation
P&T = Pump and treat
ROD = Record of Decision
** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

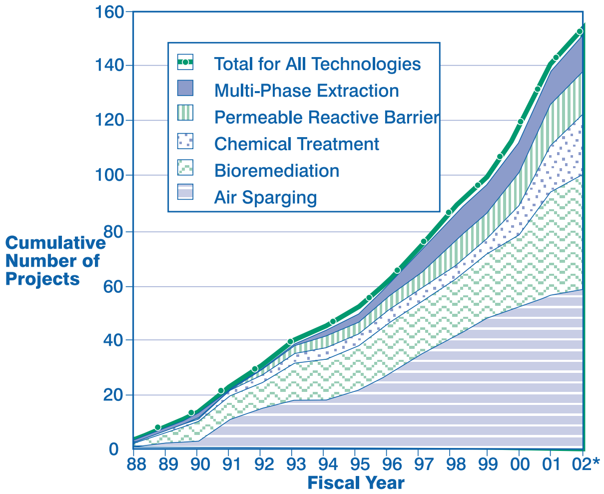
an aquifer, usually through pumping, and treatment aboveground. This section provides additional information about the innovative technologies used for *in situ* groundwater treatment.

Figure 22 shows the cumulative trends in the selection of *in situ* groundwater treatment technologies over time. The most common are air sparging, bioremediation, permeable reactive barriers (PRB), and chemical treatment. Air sparging decreased from 70% of *in situ* projects selected in FY 1996 to 9% in FY 2002. Cumulatively, air sparging continues to represent over 50% of all *in situ* groundwater treatment projects. *In situ* bioremediation has increased in recent years from 8% in FY 1997 to 36% in FY 2002. PRBs ranged from one to three projects in all years since FY 1996, except 1999, when no PRB projects were selected. *In situ* chemical treatment had no more than one project in each year from FY 1988 - 1998, with the number of projects increasing slightly in recent years to an average of four projects per year in the period from FY 1999 - 2002.

The data show that the most commonly selected technologies continue to be selected at high rates. Bioremediation and chemical treatment projects have been selected more frequently over the last three years than in the past. Nearly 50% of the bioremediation projects and 70% of the chemical treatment projects have been selected during the last three years. The number of *in situ* groundwater treatment projects selected in RODs from FY 2000 - 2002 is presented in Table 8.

Figure 23 shows, by technology, eight major groups of contaminants treated in groundwater. Compounds are categorized as VOCs, SVOCs, or PAHs according to the lists provided in EPA's SW-846 test methods 8010, 8270, and 8310, with the exceptions listed in the figure notes. Overall, VOCs, including both BTEX and halogenated VOCs, are the contaminants most commonly treated in groundwater using *in situ* technologies. Halogenated SVOCs (including organic pesticides and herbicides) and metals and metalloids in groundwater are treated least frequently. The number of projects in Figure 23 exceeds the total number of *in situ* groundwater projects because some projects involve more than one type of contaminant. Such projects, therefore, are repeated in Figure 23 under each contaminant type treated by the remedy.

Figure 22: Superfund Remedial Actions: Cumulative Trends for Most Common In Situ Groundwater Technologies (FY 1988 - 2002)*



** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Table 8. Superfund Remedial Actions: In Situ Groundwater Treatment Projects Selected in FY 2000, 2001, and 2002*

Total Projects = 66

Technology	Number of New Projects
Bioremediation	21
Chemical Treatment	15
Air Sparging	10
Permeable Reactive Barrier	7
Multi-Phase Extraction	4
In-Well Air Stripping	3
Phytoremediation	3
Flushing	2
In Situ Thermal Treatment	1

** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

The selection of a treatment technology for a site depends on the physical and chemical properties of contaminants at the site. For example, VOCs are amenable to air sparging because of their volatility. Metals, which are not volatile and do not degrade, are not amenable to this technology.

The selection of groundwater treatment technologies may also depend on site-specific factors, such as soil type and hydrogeology. For example, air sparging may be an effective treatment for VOCs at a site with sandy soil, but may not be effective at a site with tightly packed clay soil. As Figure 23 shows, BTEX and halogenated VOCs are treated most frequently using air sparging. PAHs and other non-halogenated SVOCs, which are not as volatile as BTEX and halogenated VOCs, but can be destroyed through microbial processes, are treated most frequently by bioremediation. Dissolved-phase halogenated VOCs may be difficult to remove from groundwater in low-permeability matrices using air sparging. Metals and metalloids are typically not amenable to air sparging, bioremediation, and multi-phase extraction. One exception is the use of *in situ* bioremediation to reduce hexavalent chromium to its less toxic trivalent form. This technology, which uses biological activity to create conditions that result in chemical reduction of chromium, is being applied at three sites. At one additional site, bioremdiation to treat arsenic is currently planned. Metals and metalloids may undergo chemical reactions with certain substances to form compounds that are less toxic or mobile. The PRBs were used most often to treat halogenated VOCs, metals, and metalloids.

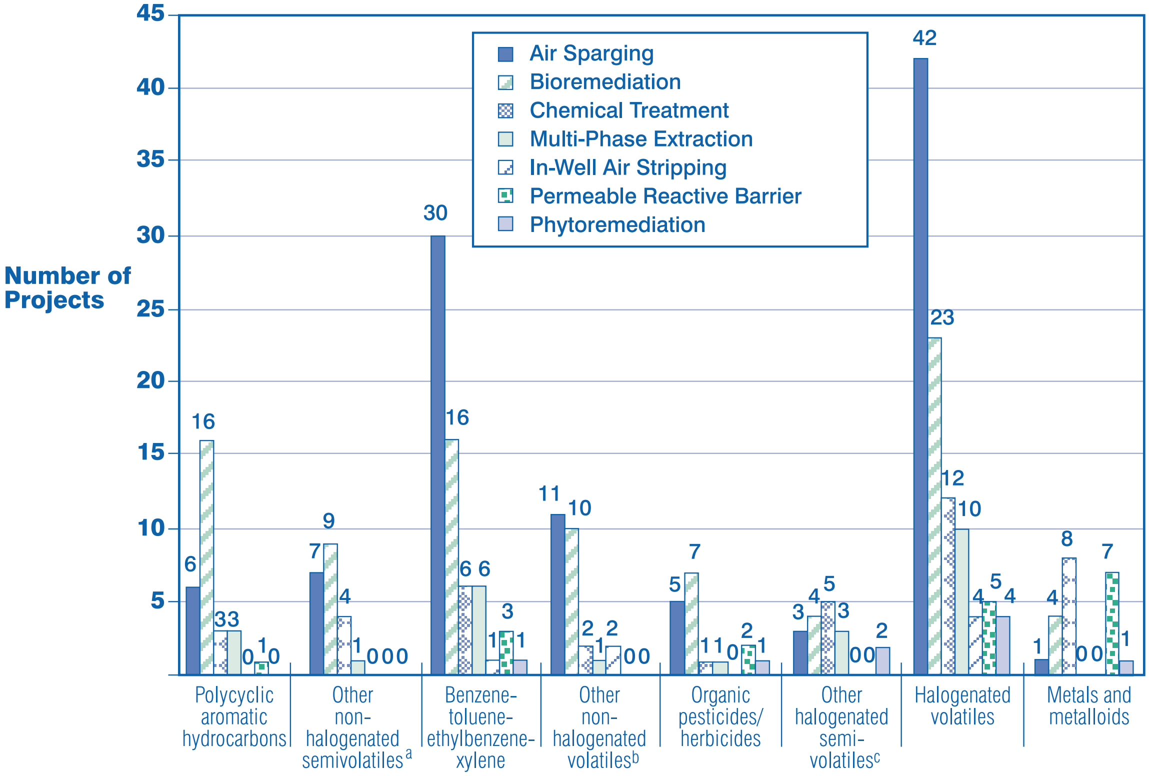
Status of *In Situ* Groundwater Projects

A snapshot of the status of *in situ* groundwater treatment technologies is presented in Figure 24.

The data in Figure 24 show:

- The total number of *in situ* groundwater treatment projects increased by 62%, from 104 to 169 between August 2000 and March 2003.

Figure 23: Superfund Remedial Actions: Contaminants Treated by In Situ Groundwater Technologies (FY 1982 - 2002)*



*Includes information from an estimated 70% of FY 2002 RODs.

[a] Does not include polycyclic aromatic hydrocarbons.

[b] Does not include benzene, toluene, ethylbenzene, and xylene.

[c] Does not include organic pesticides and herbicides.

Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

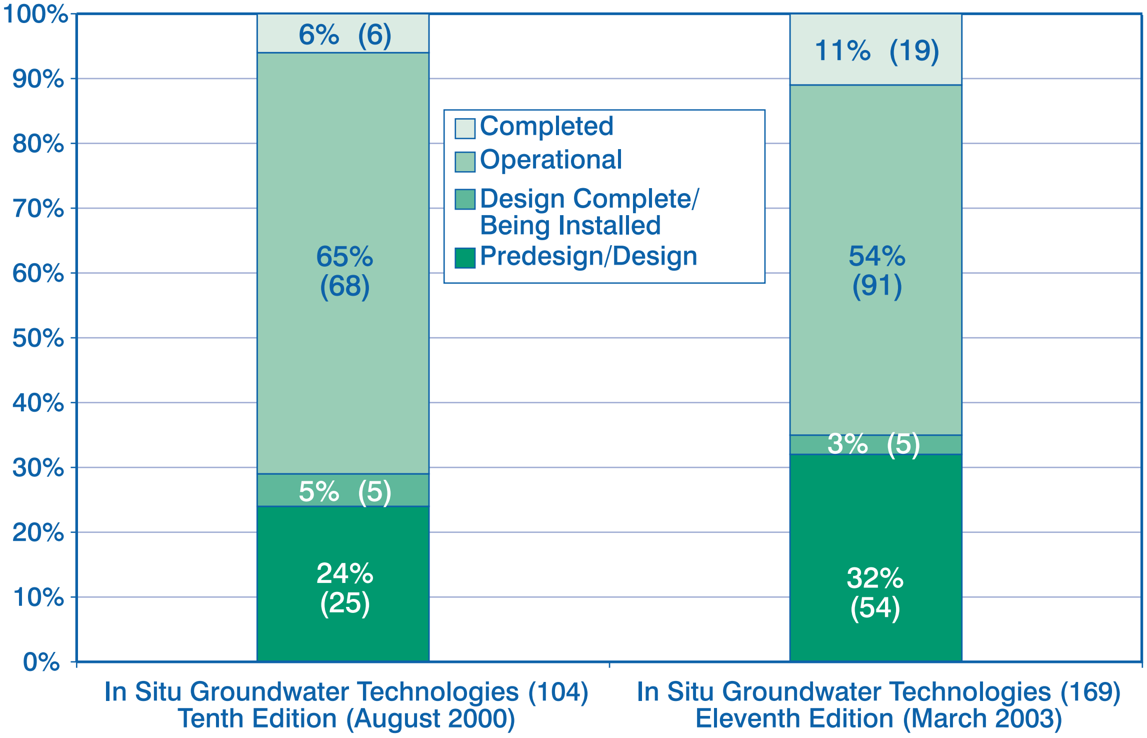
- An additional 13 *in situ* groundwater projects were completed, increasing the percentage of completed *in situ* groundwater projects from 6% to 11%. Completed projects included five chemical treatment, three air sparging, three bioremediation, and two multi-phase extraction projects.
- More than half (54%) of *in situ* groundwater treatment projects are operational.
- Although the percentage of *in situ* groundwater projects that are operational decreased, the total number of operational projects increased from 68 to 91. The technologies with the largest increase in the number of operational projects were air sparging (8 projects) and PRBs (6 projects).
- *In situ* groundwater treatment projects in the design phase increased. The technologies with the largest increase in the number of projects in the design phase were bioremediation (14 projects), chemical treatment (9 projects), and PRBs (4 projects).

The status of *in situ* groundwater treatments selected in FY 2000 - 2002 at Superfund remedial action sites include:

- 66 additional *in situ* treatment technology projects for groundwater were selected (see Table 8 on page 36). Technologies most frequently selected include bioremediation (21 projects), chemical treatment (15 projects), air sparging (10 projects), and PRB (7 projects).
- Three projects selected in the period have been completed, including bioremediation (2 projects) and chemical treatment (1 project).
- An additional 21 projects became operational.
- An additional four projects have progressed beyond the design phase, and the remedies are being installed.

For some projects, the technology treats both sources and groundwater. For example, *in situ* thermal treatment may be applied to treat a DNAPL source and the groundwater contaminated by that source. In previous editions of the ASR, such applications were described only in the source control section. Because remediation professionals may be interested in both the source and groundwater treatment aspects of technologies applied to both contaminant sources and contaminated groundwater, this edition of the ASR presents

Figure 24: Superfund Remedial Actions: Status of In Situ Groundwater Treatment Projects (FY 1982 - 2002)*



** Includes information from an estimated 70% of FY 2002 RODs.*

Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

information in both the Source section (Section 2) and Groundwater section (Section 3). To make the August 2000 and March 2003 data comparable, the data in Figure 24 for August 2000 include technologies treating both sources and groundwater, and therefore do not match the information presented for groundwater remedies presented in the Tenth Edition of the ASR.

The specific types of *in situ* treatment remedies and their status at Superfund sites are listed in Table 9. *In situ* treatment of groundwater has been selected 169 times at 135 sites. Among *in situ* technologies, air sparging is the most frequently selected technology, followed by bioremediation. Both of these technologies have a large number of projects in the operational phase. The treatment rate of these technologies is typically limited by site-specific factors. For example, air sparging may require long treatment times when continuing sources of contaminants, such as light nonaqueous-phase liquid (LNAPL) and DNAPL, are present. Bioremediation may be limited by the rate at which microbes can break down contaminants, which can depend on a variety of factors such as climate, soil conditions, contaminant concentrations, and solubility.

The third most frequently selected technology is chemical treatment. Although this technology has approximately half the number of total projects of air sparging and bioremediation, it has the same number of completed projects. Chemical treatment is typically applied as an aggressive treatment technology that requires a relatively short treatment time to achieve cleanup goals. It may also be effective in treating small amounts of DNAPL and LNAPL. Since the Tenth Edition, the number of chemical treatment projects has increased, from only 2 to 21. PRBs rely on natural groundwater flow to carry contaminants into a reactive zone, where they are treated; therefore, this technology does not treat contaminants upgradient of the reactive zone. Most PRBs (10 of 17) are in the operational phase, and none are completed.

Groundwater Pump and Treat

P&T is the extraction of groundwater from an aquifer and treatment aboveground. The extraction step usually is conducted by pumping groundwater from a well or trench. The treatment step can include a variety of technologies. The technologies used at Superfund remedial action sites for the aboveground treatment of contaminated groundwater are described in the Overview section at the beginning of this report.

Table 9. Superfund Remedial Actions: Status of In Situ Groundwater Treatment Projects by Technology (FY 1982 - 2002)*

Technology	Predesign/ Design	Design Complete/ Being Installed	Operational	Completed	Total
In Situ					
Air Sparging	9	3	40	6	58
Bioremediation	18	0	21	5	44
Chemical Treatment	10	1	5	5	21
Permeable Reactive Barrier	6	1	10	0	17
Multi-Phase Extraction	2	0	9	3	14
Phytoremediation	2	0	4	0	6
In-Well Air Stripping	3	0	2	0	5
In Situ Thermal Treatment	2	0	0	0	2
Flushing	2	0	0	0	2
Total	54	5	91	19	169
Percentage of In Situ Technologies	32%	2%	54%	11%	—
Percentage of All Groundwater Technologies	6%	1%	10%	2%	19%

** Includes information from an estimated 70% of FY 2002 RODs.*

Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Download file containing source data for Table 9.

Status of Groundwater Pump and Treat Projects

This report contains information on 743 P&T projects at Superfund remedial action sites. Figure 25 shows the status of these projects, and allows for the following conclusions:

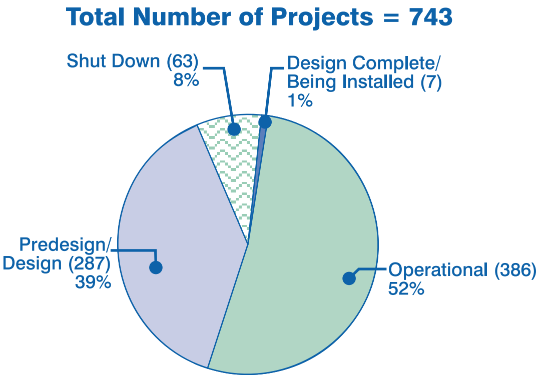
- Most P&T projects (52%) are operational.
- Some 39% are in the predesign/design phase.
- 63 (8%) of P&T projects are shut down (no longer ongoing). Appendix G lists the 63 P&T projects that are shut down, and the reason for the system shut down. Information about the reason for shut down was not available from the data sources used for this report for all P&T projects. EPA is currently gathering additional data to better characterize shut down P&T systems (see Box 6, Definition of Completed Project on page 12).

Pump and Treat Data Sources

Data on P&T remedies were collected from the following sources:

- RODs from FY 1982 - 2002
- The CERCLIS database
- CORs from FY 1983 - 2002
- The EPA P&T Optimization Database
- Contacts with RPMs through March 2003

Figure 25: Superfund Remedial Actions: Status of Groundwater Pump and Treat Projects (FY 1982 - 2002)*



** Includes information from an estimated 70% of FY 2002 RODs.*

Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Download file containing source data for Figure 25.

The P&T projects were identified primarily from RODs, CORs, and the CERCLIS database. Information collected from these sources on Superfund P&T projects included the contaminants treated, the technologies treating extracted groundwater, the implementation status of these projects, and remedy changes.

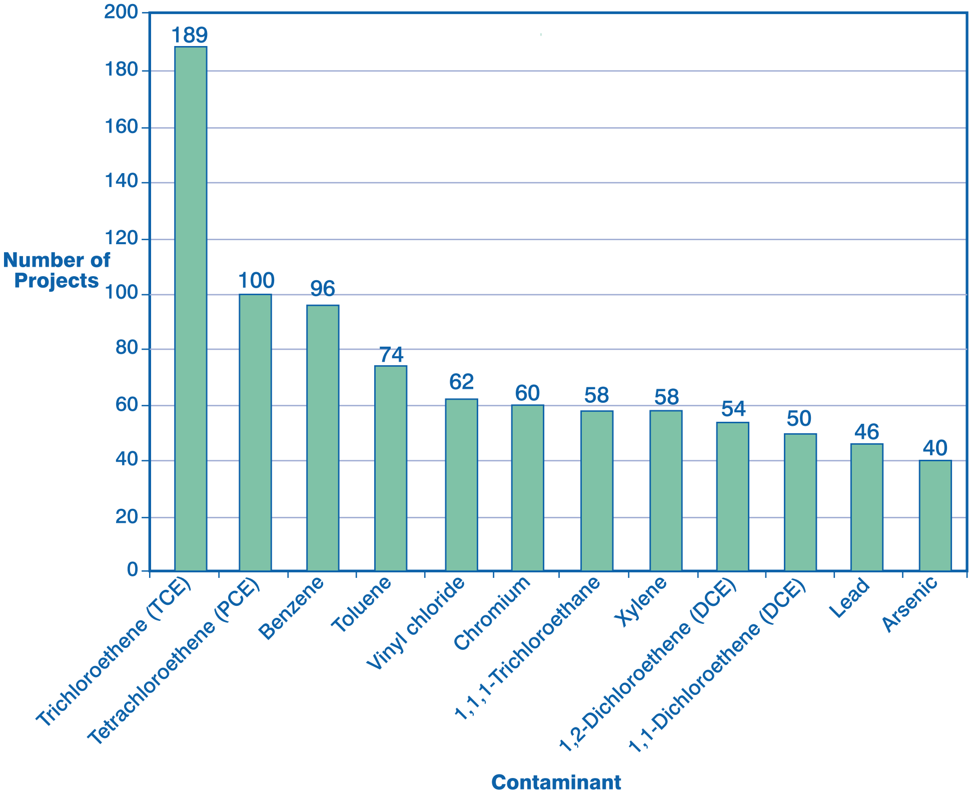
Due to the large number of projects, the diverse sources of information, and the limited resources available for data collection, complete information was not collected for every project from every data source. P&T projects were identified in RODs from FY 1982 to 2002. RPMs were generally not contacted for P&T projects selected in RODs signed after FY 1997, because P&T projects typically require five years to progress to the operational stage, and a higher priority was placed on gathering information on P&T systems that were more likely to be operational.

Information on the specific technologies applied in P&T projects was not collected from RODs. Most RODs do not specify the technologies to be used for P&T projects, and of those that do specify technologies, those technologies are frequently changed before the P&T project begins operation. Technology information was gathered primarily from CORs, contacts with the RPMs, and the P&T Optimization Database. The information on P&T projects presented in this report is as accurate and complete as possible given the limitations on the time and resources available for data collection. Future editions of the ASR may include additional information on more P&T projects.

Contaminants Treated by Pump and Treat

Contaminants treated were identified for 345 P&T projects. Figure 26 shows the 12 most frequently treated contaminants. The contaminant treated most often is trichloroethene (TCE). Other chlorinated VOCs are also frequently treated using P&T, including tetrachloroethene (PCE); vinyl chloride (VC); 1,1,1-trichloroethane (1,1,1-TCA); 1,1-dichloroethene (DCE); and 1,2-DCE. The second most frequently treated contaminants are nonchlorinated VOCs, including benzene, toluene, and xylene. P&T systems are also frequently used to treat heavy metals and metalloids, including chromium, lead, and arsenic. Projects that treat more than one contaminant are counted once for each contaminant listed in Figure 26.

Figure 26: Superfund Remedial Actions: Contaminants Treated by Pump and Treat Systems (FY 1982 - 1997)



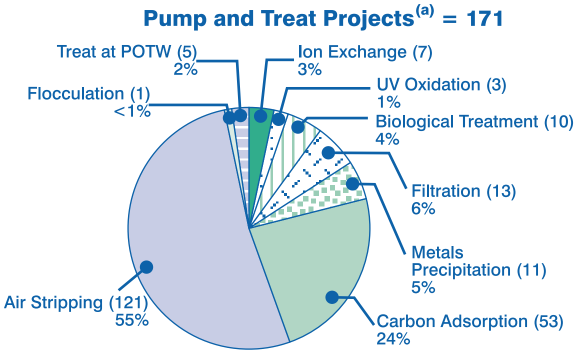
Pump and treat (P&T) projects from FY 1998 through 2002 are not included on this figure, because P&T systems do not generally become operational within 5 years of signing the ROD.
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Aboveground Components of Pump and Treat Projects

Data were available for 171 P&T projects using 224 treatment technologies as shown in Figure 27. More than half of these P&T systems are using air stripping to remove volatile compounds from groundwater. Carbon adsorption is the second most common P&T technology, which also is used to remove organic compounds, including VOCs. These technologies are being used to treat chlorinated and non-chlorinated VOCs, because, as shown in Figure 26, such contaminants make up 9 of the top 12 most frequently treated by P&T. The third and fourth most common technologies are filtration and metals precipitation, respectively. Three of the top 12 contaminants most frequently treated by P&T are metals or metalloids that can be effectively removed using metals precipitation.

Treatment trains are commonly used in P&T systems. Section 2 contains a detailed description of treatment trains and reasons for their use. For the 171 P&T systems for which technology data were available, 35 used a treatment train. The most commonly employed treatment train is air stripping followed by carbon adsorption for the effluent from the air stripper (18 projects). Figure 27 counts projects that use more than one technology once for each technology.

Figure 27: Superfund Remedial Actions: Above Ground Components of Groundwater Pump and Treat Projects (FY 1982 - 2000)



Of 743 pump and treat projects, 171 had a technology selected. Projects may include more than one technology type. POTW = Publicly-owned treatment works
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Data were collected on the amount of groundwater treated by operational and completed P&T projects. Table 10 shows the volume of groundwater treated for 18 P&T projects which used air stripping and carbon adsorption, the two most commonly applied P&T technologies (see Figure 27). The median volumes treated by air stripping and carbon adsorption are 500 million and 25 million gallons, respectively. P&T projects with both air stripping and carbon adsorption had a median volume of 230 million gallons of water treated. Sufficient data were not available to analyze treatment volumes for other technologies.

Table 10. Superfund Remedial Actions: Groundwater Volumes Being Treated Using Pump and Treat Technologies (FY 1982 - 1997)

Aboveground P&T Technology	Number of Projects	Median Volume (gallons)	Total Volume (gallons)
Air Stripping	11	500 million	14 billion
Carbon Adsorption	3	25 million	6 billion
Air Stripping and Carbon Adsorption	4	230 million	6 billion

P&T = Pump and treat
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

Pump and Treat Remedy Changes

One goal of this report is to compile a current list of all P&T projects. As discussed in Section 1, remedies selected for Superfund remedial actions are documented through a ROD, and changes to the original remedies may be formally documented. Remedy changes often occur during the pre-design or design phase of a project when new information about site characteristics is discovered or treatability studies for the selected technologies are completed.

EPA updated the status of 729 P&T projects, primarily by contacting RPMs and reviewing CORs. Of these 729 P&T projects, 80 were changed to other groundwater remedies. These remedies were most often changed to *in situ* groundwater treatment or non-treatment remedies, such as institutional controls and MNA. The most commonly cited reason for changing a P&T remedy was that further site investigation revealed that the concentration or extent of contamination was less than expected. Other frequently cited reasons included problems implementing the remedy due to site conditions such as hydrogeology, implementation of a more effective *in situ* treatment remedy, and high costs.

Pump and Treat Remedy Optimization

Once remediation systems have been functioning for a period of time, opportunities may exist to optimize the system, particularly if they are long-term remedies. The purpose of optimization is to identify potential changes that will improve the effectiveness of a system and reduce operating costs without compromising the effectiveness of the remedy or the achievement of other cleanup objectives.

EPA recognizes that long-term remedial approaches should not remain static, that conditions change over time, and that better technologies, tools, and strategies evolve, which allow for continuous improvement of remedy performance. In OSWER Directive No. 9200.0-33, Transmittal of Final FY00 - FY01 Superfund Reforms Strategy, dated July 7, 2000, EPA outlined a commitment to optimize Superfund-lead P&T systems at Superfund sites.

Information from Superfund-lead sites has been incorporated into the ASR Search System. This information was used to select sites for Remediation System Evaluations (RSE). Superfund-lead P&T systems include systems that are either EPA-lead or state-lead that are funded from the Superfund Program.

EPA performed an RSE on 20 Superfund-lead groundwater P&T systems during 2001. The results of this initiative are documented in the report Groundwater Pump-and-Treat Systems: Summary of Selected Cost and Performance Information at Superfund-Financed Sites. EPA is also preparing additional RSEs for Superfund-financed sites. The report and the RSEs are available at *http://clu-in.org/rse.* Additional information on RSE and optimization of remedies is available at *http://www.frtr.gov/optimization.htm*. This site includes information on optimization tools and techniques, including checklists that can be used to identify optimization opportunities for specific groundwater treatment technologies.

Vertical Engineered Barriers

In the Tenth Edition of the ASR, the scope of the report was expanded to include VEBs, a groundwater containment remedy. Although a

VEB is not a treatment technology, it is an engineered remedy. In addition, VEBs can be constructed using some innovative methods, such as deep soil mixing and geosynthetic walls. The technologies used for VEB construction are also used for *in situ* S/S. VEBs are also an integral part of many PRBs.

VEBs were selected at 49 Superfund remedial action sites for a total of 51 projects (some sites have more than one VEB). More than 80% of the VEBs have been installed (42 of 51). Table 11 indicates the number of each type of VEB. The types of barriers are:

- Slurry wall – Consists of a vertical trench that is filled with a low-permeability slurry of bentonite, soil, or cement.
- Geosynthetic wall – Constructed by placing a geosynthetic liner into a trench.
- Grout – Constructed by injecting a high pressure grout mixture into the subsurface. The grout used is typically cement or a mixture of cement and bentonite.
- Deep soil mixing – Overlapping columns created by a series of large-diameter, counter-rotating augers that mix *in situ* soils with an additive, usually bentonite, cement, or grout, which is injected through the augers.
- Sheet pile – Series of overlapping sheets of impermeable material, such as metal.

Overwhelmingly, slurry walls are the most frequently used type of barrier, with 46 applications. For each of the other types of VEBs, there are fewer than five applications at Superfund remedial action sites. Some VEBs have more than one type of barrier.

Additional information on VEBs is available in the following reports, both of which are available on-line at *http://clu-in.org*:

- Subsurface Containment and Monitoring Systems: Barriers and Beyond
- Evaluation of Subsurface Engineered Barriers at Waste Sites (EPA-542-R-98-005)

Table 11. Superfund Remedial Actions: Types of Vertical Engineered Barriers at 49 Sites Selecting This Technology (FY 1982 - 2002)*

Vertical Engineered Barrier Type	Number of Barriers
Slurry Wall	46
Grout	4
Sheet Pile	3
Geosynthetic Wall	2
Deep Soil Mixing	2
Other - VEB	1
TOTAL	58

** Includes information from an estimated 70% of FY 2002 RODs. Some sites have more than one barrier. Some barriers have more than one barrier type. Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.*

Section 4: Report Focus Areas: Chemical Treatment and Construction Completion

Two areas of interest to the remediation community are the focus of this section: (1) the application and use of chemical treatment, and (2) the remediation achievements at sites on the NPL. As discussed previously, the selection and application of innovative technologies has been increasing in the Superfund program. In particular, the selection and application of chemical treatment has increased significantly since the publication of the Tenth Edition of the ASR. This section provides information on the trends and usage of chemical treatment. In addition, the data sources used to compile this edition of the ASR have expanded to include CORs. This section presents documentation on the remediation achievements at Superfund sites using the information contained in CORs.

Chemical Treatment

Chemical treatment, also known as chemical reduction/oxidation (redox), typically involves redox reactions that chemically convert hazardous contaminants to nonhazardous or less toxic compounds that are more stable, less mobile, or inert. Redox reactions involve the transfer of electrons from one compound to another. Specifically, one reactant is oxidized (loses electrons) and one is reduced (gains electrons). The oxidizing agents used for treatment of hazardous contaminants in soil and groundwater include ozone, hydrogen peroxide, hypochlorites, potassium permanganate, Fenton's reagent (hydrogen peroxide and iron), chlorine, and chlorine dioxide. This method may be applied *in situ* or *ex situ*, to soils, sludges, sediments, and other solids, and may also be applied to groundwater *in situ* or *ex situ* (P&T). P&T chemical treatment for groundwater may also include the use of UV light in a process known as UV oxidation. This section focuses on source control and *in situ* groundwater applications of chemical treatment.

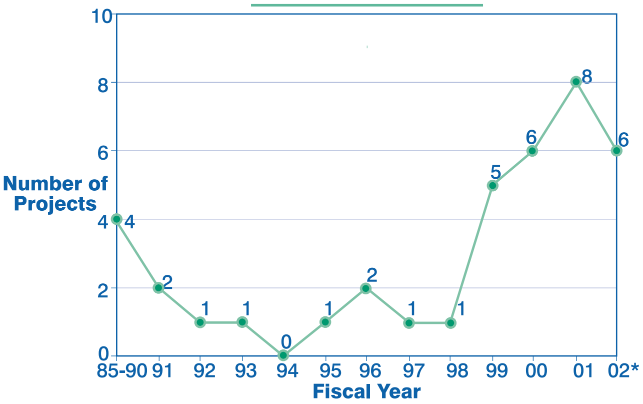
Chemical treatment primarily is used to treat organic contaminants, and is applicable to both halogenated and nonhalogenated VOCs and SVOCs. When organics are treated, these compounds are typically degraded to simpler and less toxic compounds. For example, chlorinated VOCs, such as tetrachloroethene, may be dechlorinated, and oxidized into chlorides, carbon dioxide, and water. When used to treat metals and metalloids, it may be used to change a contaminant's valence state, cause the contaminant to react with other species in the soil, or cause the contaminant to precipitate, rendering it less toxic or mobile. For example, some applications of chemical treatment have reduced chromium (VI) to its less toxic chromium (III) form.

The rate and extent of treatment of a target contaminant are dictated by the properties of the contaminant, its reactions with the chemicals used, concentrations of contaminants and treatment chemicals, and the matrix conditions. Conditions that can impact the effectiveness of chemical treatment include pH, temperature, and the concentration of other chemicals that may react with the treatment chemicals, such as natural organic matter, reduced minerals, carbonate, and free radical scavengers.

Effective *in situ* application of chemical treatment also depends on the method of delivery and distribution of treatment chemicals throughout a subsurface region. Delivery systems often employ vertical or horizontal injection wells or air sparge points with forced advection to rapidly move the chemicals into the subsurface. Chemical treatment can also impact the characteristics of the matrix to be treated. For example, some treatment chemicals can alter the pH if the system is not buffered effectively. Other potential effects that may impact treatment performance include colloid genesis leading to reduced permeability; mobilization of redox-sensitive and exchangeable sorbed metals; possible formation of toxic by-products; evolution of heat and gas; and destruction of microorganisms, leading to reduced potential for future biological treatment.

Chemical treatment is a relatively innovative technology, which has seen increased application in recent years, particularly for *in situ* treatment of recalcitrant remediation problems, such as DNAPLs, LNAPLs, and contaminated groundwater in fractured rock. For *in situ* groundwater treatment, chemical treatment had no more than one project in each year from FY 1988 - 1998. However, the use of this technology has increased in recent years, averaging four projects per year in the period from FY 1999 - 2002. Figure 28 plots the number of chemical treatment projects for source control and in situ groundwater by the FY for which the ROD was signed.

Figure 28: Superfund Remedial Actions: Trend in the Number of Chemical Treatment Projects (FY 1985 - 2002)*



** Includes information from an estimated 70% of FY 2002 RODs.*

Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

This section presents detailed information on the *in situ* chemical treatment projects at Superfund remedial action sites, and examines the types of contaminants treated using this technology. Table 12 lists the site name, state, contaminant groups, media, chemical treatment agents, and implementation status for *in situ* source control and groundwater chemical treatment projects.

This report focuses on *in situ* chemical treatment because its use has been increasing in recent years, whereas the use of *ex situ* treatment has not. Historically, chemical treatment has been used for source control treatment but has recently been applied for *in situ* groundwater treatment. Only four projects selected this technology for *in situ* groundwater treatment prior to FY 1998. However, chemical treatment represented 4 of 16 *in situ* groundwater treatment projects in FY 2002. Information about chemical agents is available for implemented projects, because the chemical agents

Table 12. Superfund Remedial Actions: In Situ Chemical Treatment Projects (FY 1982 - 2002)*

Site Name (Operable Unit), State	Contaminant Group	Media Type	Technology Description	Status
Alaric Inc Superfund Site OU 1, FL	Halogenated VOC	Soil (in situ)	Oxidizers may include potassium permanganate, ozone, hydrogen peroxide, or Fenton's reagent.	Pre-design
Battery Tech Duracell Lexington OU 1, NC	BTEX Halogenated SVOC Halogenated VOC Nonhalogenated VOC PCBs Solvents	Soil (in situ)	Mixture of hydrogen peroxide, sodium persulfate, iron II catalyst, sodium permanganate (if needed).	Designed/ Not Installed
Brunswick Wood Preserving Site - OU 1, GA	Halogenated SVOC Nonhalogenated SVOC Organic pesticides/herbicides PAHs	Groundwater (in situ)	Chemical oxidation.	Pre-design
Calhoun Park Area - OU 2, SC	BTEX Nonhalogenated SVOC Nonhalogenated VOC PAHs Solvents	DNAPL (in situ) Groundwater (in situ)	Oxidizing agents may include ozone, hydrogen peroxide, hypochlorites, chlorine, and chlorine dioxide.	Design
Cooper Drum Company, CA	BTEX Halogenated VOC Nonhalogenated SVOC Nonhalogenated VOC PAHs Solvents	Groundwater (in situ)	Potassium permanganate and HRC (a proprietary reductive dechlorination agent).	Design
Dublin TCE Site Remediation OU 2, PA	Halogenated VOC Solvents	DNAPL (in situ)	Chemical oxidation.	Pre-design
Eastern Surplus Company Superfund Site - Entire Site, ME	Halogenated VOC Solvents	Groundwater (in situ)	Permanganate.	Operational

Continued on next page

Table 12. Continued

Site Name (Operable Unit), State	Contaminant Group	Media Type	Technology Description	Status
Eastland Woolen Mill - OU 1, ME	BTEX Halogenated SVOC Halogenated VOC Heavy metals Nonhalogenated SVOC Nonhalogenated VOC Solvents	DNAPL (in situ) Groundwater (in situ)	Chemical reagents such as Fenton's reagent or other oxidizing agents.	Design
Ewan Property - OU 2, NJ	BTEX Halogenated SVOC Halogenated VOC Nonhalogenated SVOC Nonhalogenated VOC Solvents	Groundwater (in situ)	Fenton's reagent.	Pre-design
Frontier Hard Chrome Inc. - OUs 1 and 2, WA	Heavy metals	Soil (in situ) Groundwater (in situ)	Injection of a reducing chemical to convert hexavalent chromium to trivalent chromium.	Design
Frontier Hard Chrome Inc. - OUs 1 and 2, WA	Heavy metals	Groundwater (in situ)	Injection of a reducing chemical to convert hexavalent chromium to trivalent chromium.	Pre-design
Fruit Avenue Plume Site, NM	Halogenated VOC Solvents	Groundwater (in situ)	Chemical oxidation using permanganate.	Design
Halby Chemical Co. - OU 1, Process Plant Area, DE	Nonhalogenated VOC Solvents	Soil (in situ)	Sodium percarbonate.	Completed
Hanford Site - 100 Area - OU 2, WA	Heavy metals	Groundwater (in situ)	In Situ Redox Manipulation involves injecting sodium dithionite to reduce the mobility and toxicity of chromium in groundwater.	Operational
Hanscom Air Force Base - OU 1, Site 1 Source Area, MA	Halogenated VOC Solvents	Soil (in situ) Groundwater (in situ)	Potassium permanganate.	Operational
Jacksonville Naval Air Station - OU 3, FL	Halogenated SVOC Halogenated VOC Nonhalogenated VOC Solvents	Groundwater (in situ)	Oxidant such as potassium permanganate.	Pre-design
Jones Chemicals, Inc., NY	Halogenated VOC Solvents	DNAPL (in situ) Liquids	Oxidizing agent such as potassium permanganate or hydrogen peroxide.	Pre-design
New Hampshire Plating Co. - OU 1, NH	Heavy metals Inorganic cyanides	Soil (in situ)	Phosphate-based proprietary chemical agent addition.	Design
Odessa Chromium II Superfund Site, TX	Heavy metals	Groundwater (in situ)	Ferrous sulfate heptahydrate with hydrochloric acid will be used.	Operational
Peterson/Puritan Inc. - OU 1, PAC Area, RI	Heavy metals	Groundwater (in situ)	Oxygenated water is injected into the vadose zone and shallow groundwater at a rate of 5 gallons per minute to treat and immobilize arsenic.	Completed
Rasmussens Dump, MI	BTEX Halogenated SVOC Halogenated VOC Nonhalogenated VOC Solvents	Groundwater (in situ)	A mixture of ozone/oxygen is injected into the contaminated chlorinated hydrocarbon groundwater plume. Oxidation of the chlorinated hydrocarbons occurs in situ.	Completed
Silver Bow Creek/ Butte Area - Rocker Timber Framing And Treatment Plant OU, MT	Heavy metals	Groundwater (in situ)	Contaminated groundwater was treated with ferrous iron, limestone, and potassium permanganate.	Completed

Continued on next page

Table 12. Continued

Site Name (Operable Unit), State	Contaminant Group	Media Type	Technology Description	Status
Southern Solvents OU 1, FL Installed	Halogenated VOC Solvents	Soil (in situ) Liquids Groundwater (in situ)	Oxidizing agent such as hydrogen peroxide.	Designed/ Not Installed
Tex-Tin OU 1, TX	Heavy metals	Liquids	Sodium hydroxide and hydrochloric acid.	Operational
Townsend Chainsaw Company, Inc., SC	Heavy metals	Groundwater (in situ)	Ferrous sulfate.	Operational
Trans Circuits Site, FL	Halogenated VOC Solvents	Groundwater (in situ)	Perform in situ chemical oxidation of plume via the injection of potassium permanganate, hydrogenperoxide, ozone, or a combinationthereof through injection wells in the surficial aquifer.	Pre-design
Weldon Spring Chemical Plant - OU 2, MO	Halogenated VOC Solvents	Groundwater (in situ)	Permanganate.	Completed
Wright-Patterson Air Force Base Groundwater OU 12, OH	BTEX Halogenated SVOC Halogenated VOC Nonhalogenated VOC Solvents	Groundwater (in situ)	Strong oxidizer such as Fenton's reagent or potassium permanganate.	Completed

** Includes information from an estimated 70% of FY 2002 RODs.*

Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

BTEX = Benzene-toluene-ethylbenzene-xylene
DNAPL = Dense nonaqueous-phase liquid
OU = Operable unit
PAH = Polycyclic aromatic hydrocarbon
PCB = Polychlorinated biphenyl
SVOC = Semivolatile organic compound
VOC = Volatile organic compound

are usually identified during bench- and pilot-scale testing. This information is often not available for projects in the design phase. Box 9 contains more detailed information about one of the *in situ* groundwater projects.

In situ chemical treatment is typically used to treat the following:

- Contaminants associated with DNAPLs, including chlorinated VOCs and PAHs
- Contaminants associated with LNAPLs, such as BTEX
- Metals, metalloids, and inorganics, such as chromium, arsenic, and cyanide

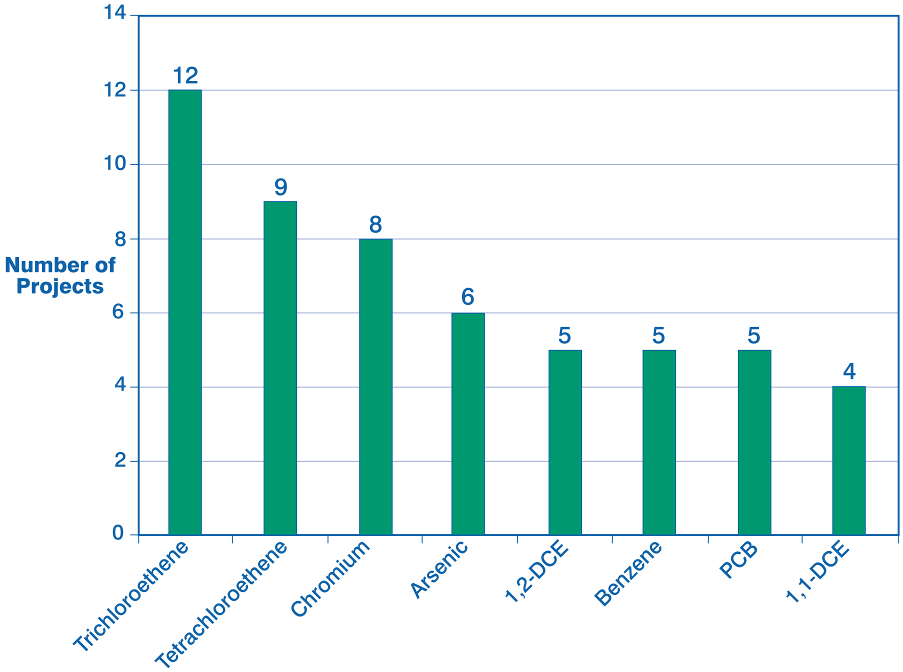
The eight contaminants most frequently treated using chemical treatment either *in situ* or *ex situ* are shown in Figure 29. TCE is the most commonly treated contaminant, followed by PCE, chromium, and arsenic.

Box 9. In Situ Groundwater Chemical Treatment

In situ chemical treatment is being used to treat groundwater contaminated with halogenated volatile organic compounds at the Eastern Surplus Company, a 5-acre site located in Meddybemps, Maine. This site served as a retail location for army surplus and salvage items from 1946 to the early 1980's. During an inspection in 1984, chemical odors, leaking electrical transformers, hundreds of deteriorating drums and containers, and numerous areas of stained soil were observed. Tetrachloroethene (PCE) was identified as the main site contaminant. Trichloroethene, 1,2-dichloroethene, 1,1,2-trichloroethane, methylene chloride, and xylene were also detected in site groundwater. A removal action was conducted, which included soil excavation (completed in 1999) and a groundwater P&T system for plume containment, which became operational in 2001.

A Record of Decision was issued in 2000 for in situ chemical oxidation to restore the site groundwater. Design of the system began in December 2000, and construction was completed in 2001. Several pilot applications were conducted, and the full-scale application began in 2002. This treatment includes permanganate injection for treating PCE.

Figure 29: Superfund Remedial Actions: Most Commonly Treated Contaminants for Chemical Treatment Projects (FY 1982 - 2002)*



** Includes information from an estimated 70% of FY 2002 RODs.*
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.
DCE = Dichloroethene
PCB = Polychlorinated biphenyls

Construction Completion

This edition of the ASR includes information from close-out reports (COR). CORs are prepared when physical construction of all cleanup actions is complete, all immediate threats have been addressed, and all long-term threats are under control. CORs contain information on the actions taken at the site to protect human health and the environment. These reports are prepared for Superfund sites on EPA's Construction Completion List (CCL). For long-term remedies, CORs may be prepared before the remedy is completed. For example, a site with groundwater contamination may achieve construction complete status when a P&T remedy becomes operational. In such cases, a Preliminary COR (PCOR) is prepared. When the groundwater cleanup has been completed, a final close-out report (FCOR) is prepared. This report incorporates both PCORs and FCORs. It is important to note that sites with a COR may not have a completed project, as defined in this report (i.e., the project may still be operating).

One indicator of remediation progress in the Superfund Program is the number of CORs issued. CORs have been prepared for 57% of all NPL sites. Table 13 shows the number of NPL sites with CORs through FY 2002. Figure 30 shows technologies included in CORs from FY 1983 - 2000. The most common technology in CORs is P&T. SVE, S/S, incineration, and bioremediation are other technologies representing a large fraction of CORs. The total number of technologies in Figure 30 exceeds the total number of CORs because CORs discuss all remedies implemented at a site, and many sites have more than one remedy involving a treatment technology.

Construction Complete status is only achieved when the Construction Complete criteria are met for all portions of a site. At sites with multiple areas of contamination, or multiple types of contaminated media, achieving Construction Complete status may require a longer time than simpler sites with fewer contaminated areas or media. The number of treatment projects tracked

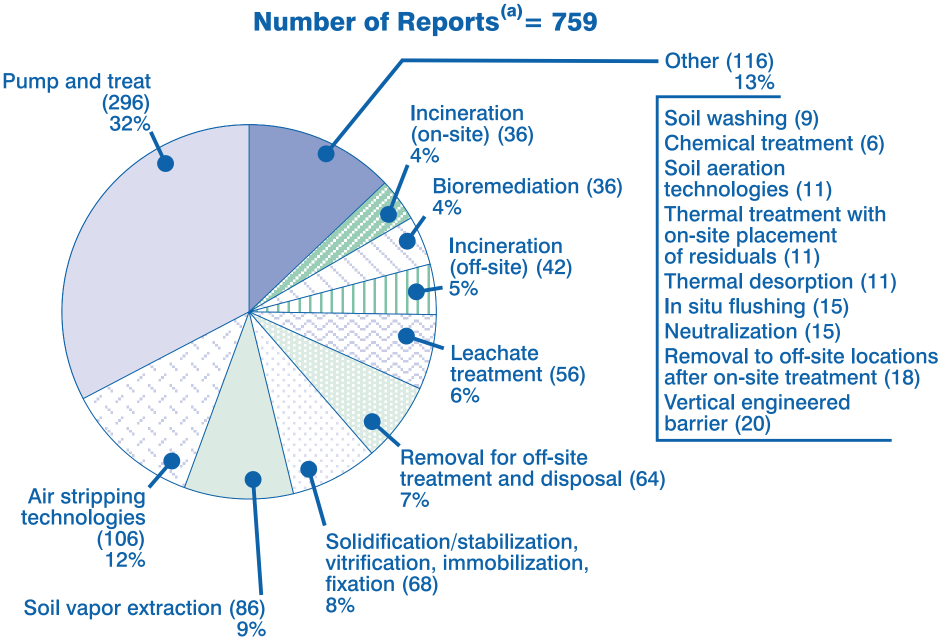
Table 13. Superfund Remedial Actions: Status of Close-out Reports at National Priorities List Sites (FY 1983 - 2002)

Status of Close-out Reports	Number of Sites	Percentage of Sites
Sites with a Close-out Report	846	56%
Sites without a Close-out Report	491	33%
Sites with no ROD (and no close-out report)	158	11%
Sites deleted and referred to another authority	4	1%

ROD = Record of Decision
Sources: 3, 4, 5, 7, 11. Data sources are listed in the References and Data Sources section on page 50.

in the ASR were compared for sites with CORs and sites without CORs. The average number of projects for sites with CORs is slightly less than the average number of projects for sites without them (1.7 compared to 2.2 projects per site). Sites with fewer treatment projects tend to be less complex, with fewer contaminants and smaller volumes of media requiring treatment. These less complex sites are likely to achieve construction complete status more quickly, and therefore have a COR published for them. More complex sites may take longer to identify and implement remedies. For example, 182 of the completed treatment projects identified in this report are at sites that do not have CORs. At these sites, construction of another remedy has not yet been completed.

Figure 30: Superfund Remedial Actions: Technologies Being Used at Sites That Have Achieved Construction Complete Status (FY 1983 - 2000)



(a) Through FY 2000, 759 sites had Close-out reports. Technology information was not available for FY 2001 and 2002. Some close-out reports include more than 1 technology.
Source: 18. Data sources are listed in the References and Data Sources section on page 50.

Section 5: References and Data Sources

1. List of Superfund National Priorities List (NPL) sites that are final. www.epa.gov/superfund/sites/query/queryhtm/nplfina.txt March 2003.
2. List of Superfund NPL sites that have been deleted. www.epa.gov/superfund/sites/query/queryhtm/npldela.txt March 2003.
3. Compilation of Record of Decision (ROD) abstracts, site summaries, and fact sheets for fiscal years (FY) 1982 - 2002. www.epa.gov/superfund/sites/query/advquery.htm March 2003.
4. Records of Decision (RODs), ROD amendments, Explanations of Significant Difference, and ROD abstracts from FY 1982 - 2002.
5. Contacts with remedial project managers, FY 1992 - 2002.
6. ROD Annual Reports. EPA Office or Superfund Remediation and Technology Innovation (OSRTI). 1998 - 1992.
7. Innovative Treatment Technologies: Annual Status Report (ASR) Tenth Edition (EPA-542-R-01-004). EPA. Office of Solid Waste and Emergency Response (OSWER). February 2001.
8. Personal communication from Ken Lovelace of EPA OSRTI to Tetra Tech EM Inc. April 1998.
9. Contacts with EPA Superfund Removal Branch Chiefs and On-Scene Coordinators.
10. Close-Out Procedures for National Priorities List Sites (EPA 540-R-98-016). OSWER Directive 9320.2-09A-P. EPA. OSWER. January 2000.
11. Groundwater Remedies Selected at Superfund Sites (EPA-542-R-01-022). EPA. OSWER. January 2002.
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APPENDIX A

SUPERFUND TREATMENT TECHNOLOGIES BY FISCAL YEAR

Superfund Remedial Actions:

Treatment Technologies by Fiscal Year

Technology Type	Fiscal Year																		
Ex Situ Source Control Technologies	**1982-85**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**TOTALS**
Solidification/Stabilization	3	3	6	7	11	13	20	22	11	13	3	6	3	14	8	6	2	6	157
Incineration (off-site)	3	2	3	9	9	15	12	6	9	5	9	5	3	3	2	6	1	2	104
Thermal Desorption	2	1	4	4	3	7	8	2	4	4	6	1	5	5	1	4	2	6	69
Bioremediation	1	1		3	5	3	1	8	3	5	6	5	0	4	6	2	1	0	54
Incineration (on-site)	4	3	4	7	6	4	3	3	1	1	2	1	4	0	0	0	0	0	43
Physical Separation	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	12	3	2	20
Chemical Treatment	1	0	1	0	0	1	1	1	0	0	1	1	0	0	1	0	2	0	10
Soil Vapor Extraction	0	0	0	0	0	0	1	0	2	1	0	2	1	1	1	0	0	0	9
Neutralization	0	0	0	1	0	0	0	4	0	0	2	0	0	0	0	0	0	1	8
Soil Washing	0	0	0	0	1	4	0	1	0	0	0	1	0	1	0	0	0	0	8
Mechanical Soil Aeration	1	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	0	0	5
Solvent Extraction	0	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	5
Open Burn/Open Detonation	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	3
Phytoremediation	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2
Vitrification	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2
TOTALS	15	10	19	32	36	49	47	47	32	31	32	22	17	29	22	30	11	18	499
In Situ Source Control Technologies	**1982-85**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**TOTALS**
Soil Vapor Extraction	4	2	1	8	21	17	34	17	14	7	10	22	15	8	15	6	8	4	213
Bioremediation	0	0	1	2	0	3	1	3	4	5	4	7	0	6	3	5	2	2	48
Solidification/Stabilization	0	2	3	3	3	3	3	6	7	0	2	5	3	4	3	1	0	0	48
Flushing	1	1	0	0	3	1	1	1	1	3	0	0	0	0	1	1	1	1	16
Chemical Treatment	0	0	0	0	0	0	1	0	0	0	0	0	0	1	3	1	2	4	12
Multi-Phase Extraction	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	1	2	8
In Situ Thermal Treatment	0	0	0	0	0	1	1	0	0	1	0	2	0	1	1	1	0	0	8
Neutralization	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	4
Phytoremediation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	1	4
Vitrification	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2
Electrical Separation	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
TOTALS	6	5	5	13	27	25	42	27	26	16	16	36	18	22	29	20	16	15	364
In Situ Groundwater Technologies	**1982-85**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**TOTALS**
Air Sparging	0	1	0	0	1	1	8	4	3	0	3	7	7	6	7	4	4	2	58
Bioremediation	1	0	0	0	3	3	1	1	4	2	2	1	1	2	2	4	12	5	44
Chemical Treatment	0	0	0	1	0	0	0	0	1	0	0	1	1	0	2	5	6	4	21
Permeable Reactive Barrier	0	0	0	0	0	1	0	3	0	1	0	1	1	3	0	3	3	1	17
Multi-Phase Extraction	0	0	0	0	0	0	0	0	1	2	1	1	4	1	0	1	0	3	14
Phytoremediation	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	1	0	6
In-Well Air Stripping	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2	1	0	5
Flushing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
In Situ Thermal Treatment	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2
TOTALS	1	1	0	1	4	6	9	8	9	5	7	11	14	14	13	22	28	16	169
Ex Situ Groundwater Technologies	**1982-85**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**TOTAL**
Pump and Treat	9	14	9	23	28	28	48	59	73	66	51	51	79	64	45	55	20	21	743

Some projects treat both in situ source control and in situ groundwater. These projects are counted in both sections of this appendix.

APPENDIX B

SUPERFUND TREATMENT TECHNOLOGY SUMMARY MATRIX

REGION 1

Source Control Treatment Technology Summary Matrix

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**																										**STATUS**
Kellogg-Deering Well Field	CT	1989	Remedial																♦											O
Atlas Tack Corp – OU 1	MA	2000	Remedial	♦																										D
Baird & Mcguire – OU 2 (Soil)	MA	1986	Remedial					♦																						C
Baird & Mcguire – OU 3 (Sediments)	MA	1989	Remedial					♦																						C
Cannon Engineering – Bridgewater OU	MA	1988	Remedial			♦																								C
Devens Reserve Forces Training Area (RFTA), Area of Contamination 57 Areas 2 and 3	MA	2001	Remedial						♦																					PD
Groveland Wells	MA	1988	Remedial																♦											O
Hanscom Field/Hanscom Air Force Base – OU1, Site 1 Source Area	MA	2001	Remedial																		♦									C
Hanscom Field/Hanscom Air Force Base – OU1, Site 1 Source Area	MA	2001	Remedial																					♦						O
New Bedford Harbor – OU 1	MA	2001	Remedial															♦												PD
New Bedford OU2	MA	1999	Remedial															♦												C
Otis Air National Guard (Usaf) – Fuel Spill (FS) 12	MA	1995	Remedial																♦											C
PSC Resources	MA	1992	Remedial	♦																										C
Re-Solve, Inc.	MA	1987	Remedial			♦																								C
Rose Disposal Pit	MA	1988	Remedial					♦																						C
Silresim Chemical	MA	1991	Remedial																♦											C
Silresim Chemical	MA	1991	Remedial	♦																										PD
W.R. Grace (Acton Plant) And Co., Inc.	MA	1989	Remedial		♦																									C
W.R. Grace (Acton Plant) And Co., Inc.	MA	1989	Remedial	♦																										C
Wells G&H – OU 1 (New England Plastics)	MA	1989	Remedial																♦											O
Wells G&H – OU 1 (Wildwood Conservation Trust)	MA	1991	Remedial		♦																									C
Wells G&H – OU 1 (Wildwood Conservation Trust)	MA	1989	Remedial																♦											O
Eastern Surplus Company Superfund Site	ME	2000	Remedial																			♦								O
Eastland Woolen Mill – OU1	ME	2002	Remedial																					♦						D

Status: **PD** = Predesign; **D** = Design; **D/I** = Designed but not Installed; **BI** = Being Installed; **I** = Installed; **O** = Operational; **C** = Complete

REGION 1

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Eastland Woolen Mill – OU1	ME	2002	Remedial																			♦								D
Loring AFB – OU 11, Fuels Tank Farm (FTF)	ME	1995	Remedial																		♦									O
Loring AFB – OU 8, Fire Training Area	ME	1996	Remedial																		♦									C
Loring AFB – OU 9, Auto Hobby Shop Area	ME	1999	Remedial																		♦									O
Loring AFB – OU 9, Power Plant Drainage Pipe (PDDP)/ Former Vehicle Maintenance Motor Pool	ME	1995	Remedial																		♦									C
Mckin Co.	ME	1985	Remedial			♦																								C
Pinette'S Salvage Yard – Amendment	ME	1993	Remedial		♦																									C
Union Chemical – OU 1	ME	1994	Remedial																♦											C
Fletchers Paint Works & Storage – OU 01	NH	1998	Remedial			♦																								PD
Kearsarge Metallurgical Corp.	NH	1990	Remedial		♦																									C
Mottolo Pig Farm	NH	1991	Remedial																♦											C
New Hampshire Plating Co. – OU 01	NH	1998	Remedial																					♦						D
Ottati & Goss/Kingston Steel Drum	NH	1987	Remedial			♦																								C
Ottati & Goss/Kingston Steel Drum – OU 4	NH	1987	Remedial			♦																								C
Pease AFB – Site 45	NH	1995	Remedial																♦											C
Pease AFB – Site 8	NH	1994	Remedial																♦											O
Pease AFB. – Zone 2	NH	1995	Remedial																♦											O
Savage Municipal Water Supply – OU 1, Ok Tool Source Area	NH	1997	Remedial																♦											O
Sylvester Dump	NH	1983	Remedial																♦											C
Tibbetts Road	NH	1992	Remedial																♦											O
Tinkham Garage – OU 1	NH	1986	Remedial																♦											C
Davis Liquid Waste	RI	1996	Remedial			♦																								C
Davisville Naval Construction Battalion Center	RI	1993	Remedial		♦																									C
Naval Station Newport – OU4	RI	2000	Remedial															♦												O

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REGION 1

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Peterson/Puritan Inc. – OU 1, CCL Area	RI	1993	Remedial																♦											O
Picillo Farm Site	RI	1993	Remedial																♦											BI
Stamina Mills	RI	1990	Remedial																♦											O
Burgess Brothers Landfill – OU 01	VT	1998	Remedial																♦											O

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REGION 2

Source Control Treatment Technology Summary Matrix

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
A O Polymer	NJ	1991	Remedial																♦											O
American Cyanamid Co. – Group I Impoundments (11, 13, 19, And 24)	NJ	1993	Remedial																	♦										O
American Cyanamid Co. – Group II Impoundments (15, 16, 17, And 18)	NJ	1996	Remedial	♦																										PD
Asbestos Dump – New Vernon Road and White Bridge Road Cleanup	NJ	1991	Remedial																	♦										C
Bog Creek Farm – OU 1	NJ	1985	Remedial					♦																						C
Bog Creek Farm – OU 2	NJ	1989	Remedial					♦																						C
Bridgeport Rental & Oil Services	NJ	1985	Remedial					♦																						C
Caldwell Trucking – Amendment	NJ	1995	Remedial																	♦										C
Caldwell Trucking – OU 1	NJ	1995	Remedial																♦											C
Caldwell Trucking – OU 1	NJ	1993	Remedial		♦																									C
Chemical Control	NJ	1987	Remedial	♦																										C
Ciba-Geigy Chemical Corporation – OU 2	NJ	2000	Remedial				♦																							D
Ciba-Geigy Chemical Corporation – OU 2	NJ	2000	Remedial																		♦									D
Ciba-Geigy Chemical Corporation – OU 2	NJ	2000	Remedial			♦																								PD
Cosden Chemical Coatings	NJ	1992	Remedial																♦											PD
Curcio Scrap Metal, Inc.	NJ	1991	Remedial		♦																									C
Dayco Corp./L.E. Carpenter Co., NJ	NJ	1994	Remedial																		♦									O
Ellis Property	NJ	1992	Remedial	♦																										O
Ewan Property – OU 1	NJ	1988	Remedial		♦																									C
FAA Technical Center – Area 20 A (Salvage Yard)	NJ	1990	Remedial		♦																									C
FAA Technical Center – OU 1, Area D – Jet Fuel Farm	NJ	1989	Remedial																♦											O
Federal Creosote Site – OU 1	NJ	1999	Remedial		♦																									D
Fried Industries	NJ	1994	Remedial	♦																										C
Garden State Cleaners	NJ	1991	Remedial																♦											C

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REGION 2

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																									
				Ex Situ															In Situ										
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**																									**STATUS**
Horseshoe Road Site – OU 1	NJ	2000	Remedial															♦											PD
Industrial Latex – OU 1	NJ	1992	Remedial			♦																							C
King Of Prussia	NJ	1990	Remedial								♦																		C
Lipari Landfill	NJ	1985	Remedial																							♦			O
Lipari Landfill – OU 2	NJ	1985	Remedial																			♦							O
Lipari Landfill Marsh Sediment – OU 3	NJ	1988	Remedial			♦																							C
Metaltec/Aerosystems – OU 1	NJ	1986	Remedial			♦																							C
Myers Property	NJ	1990	Remedial								♦																		PD
Myers Property	NJ	1990	Remedial						♦																				PD
Myers Property	NJ	1990	Remedial			♦																							PD
Nascolite Corp. – OU 2	NJ	1991	Remedial	♦																									D/I
Naval Air Engineering Center – OU 23	NJ	1993	Remedial																♦										O
Naval Air Engineering Center – Site 16 Under Area C	NJ	1996	Remedial																		♦								O
Naval Air Engineering Center – Site 17 Under Area C	NJ	1996	Remedial																♦										O
Naval Air Engineering Station, Site 28	NJ	1997	Remedial																♦										O
Naval Weapons Station Earle (Site A) – OU 03	NJ	1998	Remedial																♦										O
Nl Industries, Inc.	NJ	1991	Remedial	♦																									C
Nl Industries, Inc. – OU 1	NJ	1994	Remedial	♦																									O
Pulverizing Services OU1	NJ	1999	Remedial		♦																								O
Pulverizing Services OU1	NJ	1999	Remedial			♦																							O
Reich Farm	NJ	1988	Remedial			♦																							C
Sayreville Landfill	NJ	1990	Remedial		♦																								C
South Jersey Clothing Company	NJ	1991	Remedial																♦										C
Swope Oil & Chemical	NJ	1985	Remedial		♦																								C
Swope Oil & Chemical – OU 2	NJ	1991	Remedial																♦										O
Universal Oil Products	NJ	1993	Remedial										♦																C

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REGION 2

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Vineland Chemical Co., Inc. – OU 3 & 4	NJ	1989	Remedial								♦																			BI
Waldick Aerospace Devices, Inc.	NJ	1991	Remedial	♦																										C
Waldick Aerospace Devices, Inc. – OU 1	NJ	1987	Remedial			♦																								C
Williams Property	NJ	1987	Remedial		♦																									C
Woodland Route 532 Dump-Amendment	NJ	1999	Remedial																♦											BI
Woodland Routes 72 Dump (Amendment)	NJ	1999	Remedial																♦											BI
American Thermostat Co. – Phase 1	NY	1990	Remedial			♦																								C
American Thermostat Co. – Phase 2	NY	1997	Remedial			♦																								C
Brewster Well Field – OU 2	NY	1988	Remedial		♦																									C
Brookhaven National Laboratory (USDOE) – OU 4	NY	1996	Remedial																♦											O
Byron Barrel & Drum – OU 1/02	NY	1989	Remedial																			♦								O
Carroll & Dubies Sewage Disposal	NY	1995	Remedial				♦																							C
Carroll & Dubies Sewage Disposal	NY	1995	Remedial																♦											C
Carroll & Dubies Sewage Disposal	NY	1995	Remedial	♦																										C
Claremont Polychemical	NY	1990	Remedial			♦																								C
Facet Enterprises	NY	1992	Remedial	♦																										C
FMC Corp. (Dublin Road)	NY	1993	Remedial	♦																										C
Fulton Terminals – Soil Treatment	NY	1989	Remedial			♦																								C
GCL Tie And Treating – OU 1	NY	1994	Remedial			♦																								C
GCL Tie And Treating – OU 2	NY	1995	Remedial			♦																								C
General Motors/Central Foundry Division – OU 1 & OU 2	NY	1992	Remedial	♦																										O
Genzale Plating Company – OU 1	NY	1991	Remedial																♦											C
Genzale Plating Company OU1	NY	1991	Remedial	♦																										C
Hooker (102nd Street Landfill) – Amendment	NY	1995	Remedial		♦																									O
Hooker Chemical/Ruco Polymer	NY	1990	Remedial		♦																									C
Hooker Chemical/Ruco Polymer – OU 1	NY	1994	Remedial																			♦								O

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REGION 2

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**																										**STATUS**
Hudson River PCBs – OU2	NY	2002	Remedial	♦																										PD
Jones Chemicals, Inc	NY	2000	Remedial																♦											PD
Jones Chemicals, Inc.	NY	2000	Remedial																					♦						PD
Lehigh Valley Railroad Derailment – OU2	NY	1999	Remedial										♦																	D/I
Love Canal – 05	NY	1997	Remedial		♦																									C
Marathon Battery Corp. – Areas I, II, And III	NY	1986	Remedial	♦																										C
Mattiace Petrochemicals – OU 2	NY	1990	Remedial		♦																									C
Mattiace Petrochemicals – OU 3 and 4	NY	1991	Remedial										♦																	O
Olean Well Field – OU 2, Alcas Property	NY	1996	Remedial																♦											PD
Pasley Solvents And Chemicals, Inc.	NY	1992	Remedial																♦											O
Preferred Plating Corp. – OU 2	NY	1992	Remedial	♦																										C
Reynolds Metals Company Study Area, (RMC)	NY	1993	Remedial	♦																										O
Robintech, Inc./National Pipe Company	NY	1997	Remedial			♦																								C
Sarney Farm	NY	1990	Remedial			♦																								C
Sealand Restoration, Inc.	NY	1990	Remedial		♦																									C
Seneca Army Depot Activity (SEDA) Open Burning Grounds OU2	NY	1999	Remedial	♦																										O
Shore Realty (Formerly Applied Environmental Services) – Groundwater OU	NY	1991	Remedial																		♦									O
Shore Realty (Formerly Applied Environmental Services) – OU 1	NY	1991	Remedial																♦											O
Sinclair Refinery – OU 2	NY	1991	Remedial																♦											O
SMS Instrument	NY	1989	Remedial																♦											C
Solvent Savers	NY	1990	Remedial																♦											O
Stanton Cleaners Area Groundwater Contamination – OU1	NY	1999	Remedial																♦											O
Vestal Water Supply	NY	1990	Remedial																♦											O
Wide Beach Development	NY	1985	Remedial						♦																					C

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REGION 2

Source Control Treatment Technology Summary Matrix (continued)

SITE NAME	STATE	FY	ACTION	Source Control																										STATUS
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
				TECHNOLOGY TYPE																										
Wide Beach Development Site	NY	1985	Remedial			♦																								C
York Oil Co. – OU 1	NY	1988	Remedial	♦																										O
York Oil Co. – OU 2	NY	1998	Remedial	♦																										D/I
GE Wiring Devices	PR	1988	Remedial		♦																									C
Janssen Inc.	PR	1993	Remedial																♦											O
Upjohn Manufacturing Co.	PR	1988	Remedial																♦											C
Vega Alta Public Supply Wells – OU 2, PRIDCO Industrial Park	PR	1997	Remedial																♦											D/I
Tutu Well Field – Department of Education	VI	1996	Remedial																♦											D/I
Tutu Well Field – Dept of Education	VI	1996	Remedial										♦																	I
Tutu Well Field – Esso	VI	1996	Remedial																♦											C
Tutu Well Field – O' Henry	VI	1996	Remedial																♦											O
Tutu Well Field – Texaco	VI	1996	Remedial																♦											O
Bolling Air Force Base – OU1, Southwest Corner Landfill	DC	2002	Remedial			♦																								PD
Delaware Sand & Gravel Landfill	DE	1993	Remedial										♦																	O
Delaware Sand & Gravel Landfill – OU 4 and OU 5	DE	1993	Remedial																		♦									O
Dover AFB – Lindane Source Area Within Area 6	DE	1995	Remedial		♦																									C

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REGION 3

Source Control Treatment Technology Summary Matrix

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Dover AFB – OU 14	DE	1998	Remedial			♦																								C
Dover AFB – Target Area 3 Of Area 6	DE	1995	Remedial																		♦									D/I
Dover Gas Light Co.	DE	1994	Remedial		♦																									C
Dover Gas Light Co. – OU 01	DE	1998	Remedial																♦											C
Dover Gas Light Co. – OU 01	DE	1998	Remedial		♦																									PD
Halby Chemical Co. – OU 1, Process Plant Area	DE	1991	Remedial																					♦						C
Ncr Corp.	DE	1991	Remedial																♦											O
Standard Chlorine Of Delaware, Inc.	DE	1995	Remedial			♦																								D
Wildcat Landfill – OU 1, Landfill Proper And Adjacent Areas	DE	1988	Remedial		♦																									C
Aberdeen Proving Ground (Edgewood Area) J-Field Soil OU	MD	2001	Remedial																						♦					O
Patuxent River Naval Air Station – OU 1 Soils, Pesticide Shop Site 17	MD	2001	Remedial		♦																									O
Southern Maryland Wood Treating – Amendment	MD	1995	Remedial			♦																								C
Bendix Flight Systems Division	PA	1988	Remedial									♦																		C
Boarhead Farm	PA	1999	Remedial									♦																		D/I
Boarhead Farm	PA	1999	Remedial																						♦					D/I
Brodhead Creek	PA	1991	Remedial		♦																									C
Brodhead Creek – OU 1	PA	1991	Remedial																				♦							C
Bruin Lagoon	PA	1982	Remedial	♦																										C
C&D Recycling	PA	1992	Remedial																	♦										C
Centre County Kepone Superfund Site	PA	2001	Remedial																♦											BI
Centre County Kepone Superfund Site	PA	2001	Remedial																							♦				BI
Craig Farm Drum	PA	1989	Remedial	♦																										C
Douglassville Disposal	PA	1988	Remedial		♦																									C
Douglassville Disposal	PA	1989	Remedial	♦																										C

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REGION 3

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**																										**STATUS**
Drake Chemical – Phase III, OU 3	PA	1988	Remedial					♦																						C
Dublin TCE Site Remediation OU-2	PA	2002	Remedial																					♦						PD
Eastern Diversified Metals	PA	1991	Remedial		♦																									C
Hebelka Auto Salvage Yard	PA	1989	Remedial	♦																										C
Hunterstown Road	PA	1993	Remedial		♦																									C
Hunterstown Road	PA	1993	Remedial	♦																										C
Jacks Creek/Sitkin Smelting And Refining	PA	1997	Remedial																	♦										D
Letterkenny Army Depot (Se Area) – Former Solvent Disposal Lagoon/Earthen	PA	1991	Remedial	♦																										C
Letterkenny Army Depot (Se Area) – OU 1, K-Area	PA	1991	Remedial			♦																								C
Lord-Shope Landfill	PA	1990	Remedial																♦											O
M.W. Manufacturing	PA	1998	Remedial	♦																										D
MW Manuafacturing – Carbon Waste Pile	PA	1998	Remedial		♦																									C
MW Manufacturing – OU 05	PA	1998	Remedial			♦																								D
Palmerton Zinc Pile Superfund Site OU-3	PA	2002	Remedial																		♦									PD
Paoli Rail Yard	PA	1992	Remedial	♦																										O
Publicker Industries, Inc. – OU 3	PA	1996	Remedial		♦																									C
Raymark	PA	1992	Remedial																♦											C
Revere Chemical Co. – OU 1	PA	1994	Remedial										♦																	C
Saegertown Industrial Area – Former Gatx Property	PA	1995	Remedial		♦																									C
The Crater Resources Superfund Site	PA	2000	Remedial															♦												D
Tonolli Corp.	PA	1992	Remedial	♦																										C
Tysons Dump	PA	1988	Remedial																♦											C
Westline	PA	1986	Remedial		♦																									C
Whitmoyer Laboratories – OU 04 and OU 5	PA	1998	Remedial	♦																										C
Whitmoyer Laboratories – OU 1	PA	1989	Remedial		♦																									C

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REGION 3

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Whitmoyer Laboratories – OU 2 (Bldg Structures)	PA	1991	Remedial	♦																										C
Whitmoyer Laboratories – OU 2 (Bldg Structures, Vault OU 4 Uvw, And Lagoon Sludges OU 5)	PA	1995	Remedial		♦																									C
Whitmoyer Laboratories – OU 3	PA	1991	Remedial			♦																								C
Whitmoyer Laboratories – OU 3	PA	1991	Remedial	♦																										C
William Dick Lagoons – OU-03/Soil Remediation	PA	1993	Remedial			♦																								D
Abex Corp.	VA	1992	Remedial	♦																										D/I
Abex Corporation OU 1 – Inner Focus Area	VA	1994	Remedial	♦																										O
Arrowhead Associates/Scovillcorp. – OU 1	VA	1991	Remedial																♦											O
Atlantic Wood Industry – OU 1	VA	1995	Remedial				♦																							PD
C&R Battery Co., Inc.	VA	1990	Remedial	♦																										C
Defense General Supply Center (DLA) – OU 5	VA	1992	Remedial																♦											C
Dixie Cavern County Landfill	VA	1991	Remedial		♦																									C
First Piedmont Rock Quarry (Route 719)	VA	1991	Remedial	♦																										O
Fort Eustis Directorate of Logistics Storage Yard OU 5	VA	2001	Remedial															♦												PD
Greenwood Chemical Co. – OU 1	VA	1990	Remedial		♦																									C
H & H Burn Pit	VA	1999	Remedial																							♦				O
Naval Surface Warfare – Dahlgren – OU 03	VA	1998	Remedial	♦																										C
Naval Surface Warfare Center, Dahlgren, Site 12 – Chemical Burn Area	VA	1997	Remedial																♦											C
Naval Weapons Station – Yorktown – OU 03	VA	1998	Remedial				♦																							O
Naval Weapons Station OU2	VA	1999	Remedial				♦																							O
Naval Weapons Station -Yorktown OU 13	VA	1999	Remedial				♦																							O
Rhinehart Tire Fire Dump	VA	1999	Remedial						♦																					C
Rhinehart Tire Fire Dump	VA	1992	Remedial	♦																										C
Saunders Supply Co. – Amendment	VA	1996	Remedial		♦																									C
US Titanium	VA	2002	Remedial																										♦	PD

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REGION 3

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**																										**STATUS**
Fike Chemical, Inc. – OU 3 – Drum Removal	WV	1992	Remedial		♦																									C
Ordnance Works Disposal Areas OU 1	WV	1999	Remedial															♦												D
Vienna Superfund Site	WV	2002	Remedial																♦											PD
West Virginia Ordnance (Us Army)	WV	1987	Remedial												♦															C
Alabama Army Ammunition Plant – OU 5	AL	1997	Remedial		♦																									C

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REGION 4

Source Control Treatment Technology Summary Matrix

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Alabama Army Ammunition Plant – OU 5	AL	1997	Remedial	♦																										C
Alabama Army Ammunition Plant, Area A, Study Area 12 And D – OU 3	AL	1994	Remedial					♦																						C
Alabama Army Ammunition Plant, Area B, Stockpile Soil – OU 1	AL	1992	Remedial					♦																						C
Alabama Army Ammunition Plant, Area B, Study Area 6, 7, 10, 21 – OU 2	AL	1995	Remedial					♦																						C
Alabama Army Ammunition Plant, Area B, Study Areas 5, 10, 16, 19, OU 6	AL	1997	Remedial					♦																						C
Alabama Army Ammunition Plant, Area B, Study Areas 5, 10, 16, 19, OU 6	AL	1992	Remedial	♦																										C
Ciba Geigy (Mcintosh Plant) – OU 2	AL	1991	Remedial					♦																						C
Ciba Geigy (Mcintosh Plant) – OU 4	AL	1992	Remedial					♦																						C
Interstate Lead Co.	AL	1991	Remedial	♦																										D/I
Mowbray Engineering	AL	1986	Remedial																	♦										C
Redwing Carriers, Inc. (ROD Amendment)	AL	2000	Remedial															♦												D/I
Redwing Carriers, Inc. (ROD Amendment)	AL	2000	Remedial		♦																									PD
Stauffer Chemical (Cold Creek Plant) – OU2	AL	1995	Remedial				♦																							O
Stauffer Chemical LeMoyne Plant – OU 2	AL	1999	Remedial																			♦								D
T.H. Agriculture & Nutrition (Montgomery – OU 02)	AL	1998	Remedial				♦																							O
62nd Street Dump	FL	1990	Remedial																	♦										C
Agrico Chemical	FL	1992	Remedial	♦																										C
Airco Plating Company, OU 1	FL	1994	Remedial																♦											C
Alaric Inc Superfund Site – OU1	FL	2002	Remedial																					♦						PD
American Creosote Works – OU2, Phase 2	FL	1994	Remedial				♦																							PD
Bay Drum – OU 3	FL	1993	Remedial																	♦										C
Brown Wood Preserving	FL	1988	Remedial				♦																							C
Cabot/Koppers – Koppers OU	FL	1990	Remedial				♦																							PD

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REGION 4

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**																										**STATUS**
Cabot/Koppers – Koppers OU	FL	1990	Remedial								♦																			PD
Cabot/Koppers – Koppers OU	FL	1990	Remedial	♦																										PD
Cabot/Koppers – Koppers OU	FL	1990	Remedial																		♦									PD
Cecil Field Naval Air Station – OU 2, Site 17	FL	1994	Remedial			♦																								C
Cecil Field Naval Air Station – OU7, Site 16, SVE	FL	1999	Remedial																♦											O
Coleman-Evans Wood Preserving – Amendment	FL	1997	Remedial			♦																								O
Davie Landfill	FL	1985	Remedial	♦																										C
Dubose Oil Products Co.	FL	1990	Remedial				♦																							C
Florida Steel Corp. – OU 2	FL	1994	Remedial	♦																										C
Helena Chemical Company (Tampa Plant)	FL	1996	Remedial				♦																							D
Hollingsworth Solderless	FL	1986	Remedial																♦											C
Jacksonville Naval Air Station – OU 2 Psc 42	FL	1995	Remedial																	♦										C
Jacksonville Naval Air Station – OU 2 PSCs 2,41,and 43	FL	1994	Remedial	♦																										C
Jacksonville Naval Air Station – OU3	FL	2000	Remedial																♦											O
Jacksonville Naval Air Station – Psc-2	FL	1994	Remedial			♦																								C
Kassauf-Kimerling Battery – Wetlands Soils	FL	1990	Remedial	♦																										C
Kassauf-Kimerling Battery Disposal – OU 1 (Landfill Wastes)	FL	1989	Remedial	♦																										C
MRI Corporation NPL Site – OU1	FL	2000	Remedial	♦																										D
Normandy Park Apartments	FL	2000	Remedial	♦																										C
Peak Oil – OU 1	FL	1993	Remedial																	♦										C
Peak Oil/Bay Drum – OU 1	FL	1993	Remedial																	♦										D
Peak Oil/Bay Drum – OU 2, Site Wide Groundwater	FL	1993	Remedial																		♦									PD
Pepper Steel & Alloys, Inc.	FL	1986	Remedial																	♦										C
Sanford Gasification Plant Site – OU 5	FL	2000	Remedial		♦																									PD
Sapp Battery Salvage	FL	1986	Remedial	♦																										C
Schuylkill Metal	FL	1990	Remedial	♦																										C

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REGION 4

Source Control Treatment Technology Summary Matrix (continued)

SITE NAME	STATE	FY	ACTION	Source Control																										STATUS
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
				TECHNOLOGY TYPE																										
Southern Solvents OU 1	FL	1999	Remedial																					♦						D/I
Stauffer Chemical Co. (Tarpon Springs) – OU 01	FL	1998	Remedial																	♦										PD
Stauffer Chemical Company	FL	1996	Remedial				♦																							O
Whitehouse Oil Pits – Amendment	FL	1998	Remedial																	♦										D/I
Whitehouse Oil Pits – OU 01	FL	1998	Remedial	♦																										PD
Yellow Water Road Dump	FL	1990	Remedial	♦																										C
Zellwood Soil Contamination – OU 1 (Amendment)	FL	1990	Remedial	♦																										C
Brunswick Wood Preserving Site – OU 1	GA	2002	Remedial	♦																										PD
Cedartown Industries, Inc.	GA	1993	Remedial	♦																										C
Diamond Shamrock Corp. – Liquid Wastes	GA	1994	Remedial		♦																									C
Hercules 009 Landfill	GA	1993	Remedial	♦																										C
Hercules 009 Landfill	GA	1993	Remedial																	♦										C
Mathis Brothers Landfill – South Marble Top Road	GA	1996	Remedial		♦																									C
Robins Air Force Base – OU 1, Landfill And Sludge Lagoon	GA	1991	Remedial																♦											C
Robins Air Force Base – Sludge Lagoon	GA	1991	Remedial	♦																										C
Woolfolk Chemical Works, Inc. – OU 03	GA	1998	Remedial	♦																										PD
DOE Paducah Gaseous Diffusion Plant	KY	1998	Remedial																								♦			O
Howe Valley Landfill	KY	1990	Remedial									♦																		C
Maxey Flats Nuclear Disposal	KY	1991	Remedial	♦																										O
Smith'S Farm – OU 1 (Amendment)	KY	1991	Remedial						♦																					C
Smith'S Farm – OU 1 (Amendment)	KY	1991	Remedial			♦																								C
Smiths Farm OU2	KY	1993	Remedial				♦																							O
Flowood Site	MS	1988	Remedial																	♦										C
Newsom Brothers/Old Reichold Chemicals	MS	1989	Remedial		♦																									C
Abc One Hour Cleaners – OU2	NC	1994	Remedial																♦											O
Aberdeen Pesticide Dumps, OU 1 & OU 4 – Amendment	NC	1991	Remedial			♦																								C

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REGION 4

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**																										**STATUS**
Battery Tech Duracell Lexington – OU 1	NC	1999	Remedial	♦																										D/I
Battery Tech Duracell Lexington – OU 1	NC	1999	Remedial																					♦						D/I
Benfield Industries	NC	1995	Remedial				♦																							C
Bypass 601 Groundwater Contamination – Amendment	NC	1993	Remedial	♦																										C
Cape Fear Wood Preserving	NC	1989	Remedial			♦																								C
Cape Fear Wood Preserving	NC	1989	Remedial	♦																										D/I
Carolina Transformer Co.	NC	1991	Remedial											♦																O
Celanese – OU 2	NC	1989	Remedial					♦																						C
Celanese – OU 2	NC	1989	Remedial	♦																										C
Charles Macon Lagoon & Drum Storage – OU 1, Lagoon No. 7	NC	1991	Remedial																♦											C
Cherry Point Marine Corps Air Station – OU 2	NC	1999	Remedial																♦											I
Cherry Point Marine Corps Air Station – OU 2	NC	1999	Remedial																♦											O
Cherry Point Marine Corps Air Station – OU 3	NC	2001	Remedial																		♦									PD
FCX – Statesville – OU 2	NC	1995	Remedial						♦																					C
FCX – Statesville – OU 2	NC	1995	Remedial			♦																								C
FCX – Statesville – OU 3	NC	1996	Remedial																♦											O
Jadco-Hughes Facility	NC	1990	Remedial																♦											C
Jadco-Hughes Facility	NC	1990	Remedial																			♦								O
JFD Electronics/Channel Master	NC	1992	Remedial						♦																					C
JFD Electronics/Channel Master	NC	1992	Remedial	♦																										C
Koppers (Morrisville Plant)	NC	1993	Remedial		♦																									C
Martin-Marietta, Sodyeco, Inc., Area D	NC	1987	Remedial		♦																									O
North Carolina State University – Lot 86, Farm Unit #1	NC	1996	Remedial																	♦										C
Potters Septic Tank Service Pits	NC	1992	Remedial			♦																								C
USMC Camp Lejeune Military Base – OU 2, Site 82	NC	1993	Remedial																♦											C

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REGION 4

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**																										**STATUS**
Calhoun Park Area – OU 2	SC	2002	Remedial																					♦						D
Geiger (C&M Oil) – Amendment	SC	1993	Remedial																	♦										C
Golden Strip Septic Tank Service	SC	1991	Remedial	♦																										C
Helena Chemical Company Landfill – Amendment	SC	1995	Remedial		♦																									C
Independent Nail Co.	SC	1987	Remedial	♦																										C
Koppers Co., Inc. (Charleston Plant) – OU 01	SC	1998	Remedial																		♦									C
Leonard Chemical Company	SC	2001	Remedial																♦											PD
Medley Farm – OU 1	SC	1991	Remedial																♦											O
Palmetto Wood Preserving	SC	1987	Remedial						♦																					C
Palmetto Wood Preserving	SC	1987	Remedial	♦																										C
Para-Chem Southern, Inc OU H400	SC	2000	Remedial																♦											C
Sangamo/Twelve-Mile/Hartwell PCB – OU 1	SC	1991	Remedial			♦																								C
Savannah River Site (USDOE) – C Area Burning/Rubble Pit – SVE	SC	1999	Remedial																♦											O
Savannah River Site (USDOE) – Chemical Metals and Pesticide Pits OU	SC	2002	Remedial																♦											PD
Savannah River Site (USDOE) – L-Area Oil And Chemical Basin And L-Area Acid/Caustic Basin	SC	1997	Remedial																	♦										BI
Savannah River Site (USDOE) – Old F-Area Seepage Basin, Srs Building Number 904-49g	SC	1997	Remedial																	♦										C
Savannah River Site (USDOE) – OU 28	SC	2000	Remedial																♦											PD
Savannah River Site (USDOE) – OU 55,65	SC	1999	Remedial																	♦										O
Savannah River Site (USDOE) – OU 60	SC	1999	Remedial																	♦										C
Savannah River Site (USDOE) – OU 66	SC	1999	Remedial																	♦										D/I
SCRDI Bluff Road	SC	1990	Remedial																♦											C
Wamchem, Inc.	SC	1988	Remedial			♦																								C

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REGION 4

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																									
				Ex Situ															In Situ										
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																									STATUS
Arlington Blending And Packaging Co. – OU 1	TN	1991	Remedial			♦																							C
Carrier Air Conditioning	TN	1992	Remedial																♦										O
Milan Army Ammunition Plant – OU 3 & 4, Industrial Soil	TN	1996	Remedial				♦																						O
Oak Ridge Reservation (USDOE) – OU 14, Surface Impoundments	TN	1997	Remedial	♦																									D/I
Oak Ridge Reservation (USDOE) – OU 29, Melton Valley Watershed at the Oak Ridge National Laboratory	TN	2000	Remedial																	♦									PD
Oak Ridge Reservation (USDOE) – OU 29, Melton Valley Watershed at the Oak Ridge National Laboratory	TN	2000	Remedial																									♦		PD
Oak Ridge Reservation (USDOE) – OU 3, Pond Waste Management Project	TN	1991	Remedial	♦																									C
Oak Ridge Reservation (USDOE) – OU 40, Burial Complex 4	TN	1996	Remedial																	♦									C
Oak Ridge Reservation (USDOE) – OU-28	TN	2002	Remedial			♦																							PD
Oak Ridge Reservation (USDOE) – OU-28	TN	2002	Remedial	♦																									PD
Ross Metals Inc – OU 1	TN	1999	Remedial	♦																									D
Tennessee Products – OU1	TN	2002	Remedial															♦											PD

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REGION 5

Source Control Treatment Technology Summary Matrix

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Acme Solvent Reclaiming, Inc.	IL	1991	Remedial	♦																										C
Acme Solvent Reclaiming, Inc., OU 3	IL	1991	Remedial			♦																								C
Acme Solvent Reclaiming, Inc., OU 6	IL	1991	Remedial																♦											O
Cross Brothers Pail Recycling	IL	1989	Remedial		♦																									C
Cross Brothers Pail Recycling	IL	1989	Remedial																			♦								C
Galesburg/Koppers	IL	1989	Remedial				♦																							C
Jennison Wright Corporation Inc	IL	1999	Remedial				♦																							D/I
Jennison Wright Corporation Inc	IL	1999	Remedial																				♦							D/I
Joliet Army Ammunition Plant – Soil and Groundwater (LAP) OU	IL	1999	Remedial				♦																							O
Joliet Army Ammunition Plant – Soil and Groundwater (MFG) OU	IL	1999	Remedial				♦																							O
Lasalle Electrical Utilities (1988-1991)	IL	1986	Remedial					♦																						C
Lasalle Electrical Utilities (1992-1995)	IL	1988	Remedial					♦																						C
Lenz Oil Service, Inc – OU1	IL	1999	Remedial	♦																										PD
Outboard Marine Waukegan Coke Plant OU2	IL	1999	Remedial	♦																										D
Outboard Marine/Waukegan Harbor	IL	1989	Remedial		♦																									C
Outboard Marine/Waukegan Harbor – OU 3	IL	1989	Remedial			♦																								C
Sangamo Electric Dump/Crab Orchard National Wildlife Refuge – Explosives/Munitions Manufacturing Area OU	IL	1997	Remedial		♦																									PD
Sangamo Electric Dump/Crab Orchard National Wildlife Refuge – Metals Areas OU	IL	1990	Remedial	♦																										C
Sangamo Electric Dump/Crab Orchard National Wildlife Refuge – PCB Areas OU	IL	1990	Remedial					♦																						C
Sangamo Electric Dump/Crab Orchard National Wildlife Refuge – PCB Areas OU	IL	1990	Remedial	♦																										C
Sangamo Electric Dump/Crab Orchard National Wildlife Refuge – PCB Areas OU	IL	2000	Remedial																♦											PD

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REGION 5

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Savanna Army Depot Activity – TNT Washout Lagoon Area	IL	1992	Remedial					♦																						C
Southeast Rockford Groundwater Contamination – OU 3	IL	2002	Remedial																♦											PD
Southeast Rockford Groundwater Contamination – OU 3	IL	2002	Remedial			♦																								PD
Southeast Rockford Groundwater Contamination – OU 3	IL	2002	Remedial																							♦				PD
Velsicol Chemical	IL	1988	Remedial	♦																										C
American Chemical Services, Inc	IN	1992	Remedial																♦											D/I
American Chemical Services, Inc	IN	1999	Remedial																♦											O
Bennetts Dump-Stone Quarry	IN	2000	Remedial		♦																									C
Continental Steel Corp. – OU 02	IN	1998	Remedial	♦																										PD
Enviro. Conservation And Chemical – Amendment	IN	1991	Remedial																♦											C
Fisher-Calo	IN	1990	Remedial																♦											C
Fort Wayne Reduction Dump	IN	1988	Remedial		♦																									C
Lemon Lane Landfill – Source Control	IN	2000	Remedial		♦																									C
Main Street Well Field	IN	1991	Remedial																♦											O
Midco I	IN	1989	Remedial																	♦										PD
Midco I	IN	1989	Remedial																♦											PD
Midco I	IN	1989	Remedial	♦																										PD
Midco II	IN	1989	Remedial																	♦										PD
Midco II	IN	1989	Remedial																♦											PD
Neals Dump-Owen County	IN	2000	Remedial		♦																									C
Ninth Avenue Dump	IN	1989	Remedial																			♦								C
Ninth Avenue Dump – Amendment	IN	1994	Remedial																♦											O
Reilly Tar & Chemical (Indianapolis Plant)	IN	1993	Remedial			♦																								C
Reilly Tar & Chemical (Indianapolis Plant) – OU 2, Fire Pond at South Landfill	IN	1993	Remedial																	♦										C
Reilly Tar & Chemical (Indianapolis Plant) – OU 4, Hot Spot A	IN	1996	Remedial																♦											O

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REGION 5

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**																										**STATUS**
Reilly Tar & Chemical (Indianapolis Plant) – OU 4, Hot Spot B	IN	1996	Remedial																♦											C
Seymour Recycling Corp.	IN	1987	Remedial																		♦									C
Seymour Recycling Corp.	IN	1987	Remedial																♦											O
Wayne Waste Oil	IN	1990	Remedial																♦											O
Anderson Development Co. (Rod Amendment)	MI	1991	Remedial			♦																								C
Auto Ion Chemicals	MI	1989	Remedial	♦																										C
Bendix Site, St. Joseph	MI	1997	Remedial										♦																	O
Bofors Nobel – OU1	MI	1999	Remedial																						♦					D
Carter Industrials, Inc.	MI	1991	Remedial	♦																										C
Chem Central	MI	1991	Remedial																♦											O
Electrovoice – OU 1	MI	1992	Remedial																♦											C
Forest Waste Products	MI	1986	Remedial	♦																										C
Kysor Industrial Corp.	MI	1989	Remedial																♦											O
Liquid Disposal, Inc.	MI	1987	Remedial																	♦										C
Metamora Landfill	MI	1986	Remedial		♦																									C
Peerless Plating	MI	1992	Remedial																♦											C
Peerless Plating	MI	1992	Remedial	♦																										C
Petoskey Municipal Well Field – OU 01	MI	1998	Remedial										♦																	C
Rockwell International Superfund Site – OU2	MI	2002	Remedial			♦																								PD
Rose Township Dump	MI	1987	Remedial					♦																						C
Rose Township Dump – Amendment	MI	1995	Remedial																♦											O
Spartan Chemical Co. – OU 01	MI	1998	Remedial																♦											O
Springfield Township Dump	MI	1990	Remedial																♦											O
Springfield Township Dump	MI	1998	Remedial								♦																			O
Sturgis Municipal Well Field	MI	1991	Remedial																♦											C

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REGION 5

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Tar Lake	MI	1992	Remedial		♦																									C
Thermo-Chem, Inc – OU1	MI	1991	Remedial																♦											O
Verona Well Field – OU 1 (Thomas Solvent Raymond Road)	MI	1985	Remedial																♦											C
Verona Well Field – OU 2 (Grand Truck Railroad Paint Shop Area)	MI	1991	Remedial																♦											O
Verona Well Field – OU 2 (Thomas Solvent Annex Area)	MI	1991	Remedial																♦											O
Arrowhead Refinery Co. – Amendment	MN	1994	Remedial											♦																C
Burlington Northern Railroad Tie Treating Plant	MN	1986	Remedial				♦																							C
Joslyn Manufacturing And Supply Co.	MN	1989	Remedial				♦																							C
Kummer Sanitary Landfill – Soil Phase	MN	1988	Remedial																♦											C
Long Prairie Groundwater Contamination	MN	1988	Remedial																♦											C
Macgillis And Gibbs/Bell Lumber And Pole – OU 1	MN	1993	Remedial		♦																									O
Macgillis And Gibbs/Bell Lumber And Pole – OU 3	MN	1994	Remedial	♦																										C
Macgillis and Gibbs/Bell Lumber and Pole- OU-1	MN	1999	Remedial				♦																							C
New Brighton/Arden Hills – PCB Burn OU	MN	1989	Remedial					♦																						C
New Brighton/Arden Hills/TCAAP (USArmy) – OU 07	MN	1998	Remedial																♦											C
New Brighton/Arden Hills/TCAAP (USArmy) – OU 07	MN	1998	Remedial		♦																									C
New Brighton/Arden Hills/TCAAP (USArmy) – OU 07	MN	1998	Remedial	♦																										O
Ritari Post And Pole – OU 1	MN	1994	Remedial				♦																							D
South Andover Salvage Yards – OU 2 (Amendment)	MN	1994	Remedial			♦																								C
St. Louis River/Interlake/Duluth Tar Site – Soils OU	MN	1990	Remedial			♦																								C
St. Louis River/Interlake/Duluth Tar Site – Tar Seep	MN	1990	Remedial		♦																									C
St. Louis River/Intertake/Duluth Tar Site – Wire Mill Pond And OU J	MN	1990	Remedial																	♦										C
University Of Minnesota	MN	1991	Remedial					♦																						C
Waite Park Wells – OUs 1, 2, & 3	MN	1994	Remedial	♦																										O

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REGION 5

Source Control Treatment Technology Summary Matrix (continued)

SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
Alsco Anaconda	OH	1989	Remedial		♦																									C
Big D Campground	OH	1989	Remedial					♦																						C
Feed Materials Production Center (USDOE) – OU 4	OH	1995	Remedial													♦														D
Fernald Environmental Management Project – OU 4	OH	2000	Remedial															♦												PD
Fernald Environmental Management Project – OU 4	OH	2000	Remedial	♦																										PD
Fernald Environmental Management Project – OU 4 Silos 1 and 2 (ROD Amendment)	OH	2000	Remedial															♦												PD
Fernald Environmental Management Project – OU 4 Silos 1 and 2 (ROD Amendment)	OH	2000	Remedial	♦																										PD
Fernald Environmental Management Project, Formerly The Feed Materials Production Center, OU 5	OH	1996	Remedial	♦																										C
Fields Brook	OH	1997	Remedial					♦																						O
Fields Brook – Sediment and Floodplain/Wetland OU	OH	2001	Remedial			♦																								O
Fields Brook – Source Control OU	OH	1997	Remedial																♦											O
Laskin/Poplar Oil (FY87)	OH	1987	Remedial					♦																						C
Laskin/Poplar Oil (FY89)	OH	1989	Remedial					♦																						C
Miami County Incinerator	OH	1989	Remedial																♦											C
Ormet Corporation	OH	1994	Remedial	♦																										C
Ormet Corporation	OH	1994	Remedial																			♦								O
Pristine, Inc. – Amendment	OH	1990	Remedial			♦																								C
Pristine, Inc. – Amendment	OH	1990	Remedial																♦											O
Summit National Liquid Disposal Service	OH	1988	Remedial					♦																						C
United Scrap Lead Company	OH	1997	Remedial	♦																										C
Zanesville Well Field	OH	1991	Remedial																♦											O
Better Brite Chrome And Zinc Shops – Chrome Shop	WI	1996	Remedial	♦																										C
Hagen Farm – Source Control OU	WI	1990	Remedial																♦											O
Moss-American	WI	1990	Remedial				♦																							PD

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REGION 5

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**																										**STATUS**
Moss-American	WI	1990	Remedial								♦																			PD
Moss-American(Kerr-Mcgee Oil Co.) – OU 01	WI	1998	Remedial			♦																								C
Muskego Sanitary Landfill – Interim Action OU 1	WI	1992	Remedial																♦											C
N.W. Mauthe Site	WI	1994	Remedial	♦																										C
National Presto Industries – Melby Road Disposal Site	WI	1996	Remedial																♦											O
Northern Engraving Corporation – Sludge Lagoon	WI	1987	Remedial																	♦										C
Oconomowoc Electroplating	WI	1990	Remedial	♦																										C
Onalaska Municipal Landfill	WI	1990	Remedial																		♦									C
Penta Wood Products – OU 01	WI	1998	Remedial	♦																										O
Penta Wood Products – OU 01	WI	1998	Remedial																		♦									O
Wausau Groundwater Contamination	WI	1989	Remedial																♦											O

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REGION 6

Source Control Treatment Technology Summary Matrix

SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
Arkwood Inc.	AR	1990	Remedial															♦												C
Arkwood Inc. (ESD)	AR	1995	Remedial		♦																									C
Gurley Pit	AR	1987	Remedial	♦																										C
Industrial Waste Control	AR	1988	Remedial																	♦										C
Jacksonville Municipal Landfill	AR	1990	Remedial		♦																									C
Jacksonville Municipal Landfill	AR	1990	Remedial	♦																										C
Mid-South Wood Products	AR	1987	Remedial	♦																										C
Monroe Auto Pit (Finch Road Landfill) – Entire Site	AR	2001	Remedial	♦																										C
Old Midland Products	AR	1988	Remedial					♦																						C
Rogers Road Municipal Landfill	AR	1990	Remedial		♦																									C
Rogers Road Municipal Landfill	AR	1990	Remedial	♦																										C
South 8th Street Landfill – OU1	AR	1998	Remedial																	♦										BI
South 8th Street Landfill – OU1	AR	1998	Remedial	♦																										PD
Vertac, Inc.	AR	1990	Remedial					♦																						C
Vertac, Inc. – Onsite OU 1	AR	1995	Remedial		♦																									C
Vertac, Inc. – OU 2, Tetrachlorobenzene Soils	AR	1996	Remedial		♦																									C
American Creosote Works, Inc. (Winnfield Plant)	LA	1993	Remedial					♦																						C
American Creosote Works, Inc. (Winnfield Plant)	LA	1993	Remedial																		♦									O
Bayou Bonfouca	LA	1987	Remedial					♦																						C
Central Wood Preserving Superfund Site	LA	2001	Remedial			♦																								PD
Cleve Reber	LA	1987	Remedial					♦																						C
Cleve Reber	LA	1987	Remedial	♦																										C
Delatte Metals Superfund Site	LA	2000	Remedial	♦																										BI
Delatte Metals Superfund Site	LA	2000	Remedial																										♦	BI
Gulf Coast Vacuum Services – OU 1	LA	1995	Remedial				♦																							C

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REGION 6

Source Control Treatment Technology Summary Matrix (continued)

SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
Gulf Coast Vacuum Services – OU 1	LA	1992	Remedial																	♦										C
Highway 71/72 Refinery Site	LA	2000	Remedial																							♦				PD
Madisonville Creosote Works – OU 01	LA	1998	Remedial			♦																								C
Marion Pressure Treating Company	LA	2002	Remedial			♦																								D
Old Inger Oil Refinery	LA	1984	Remedial				♦																							C
Pab Oil & Chemical Services, Inc.	LA	1993	Remedial	♦																										C
Petro-Processors Of Louisiana, Inc.	LA	1984	Remedial					♦																						C
Petro-Processors Of Louisiana, Inc.	LA	1989	Remedial		♦																									O
Ruston Foundry – OU 1, Soils	LA	2002	Remedial	♦																										PD
Southern Shipbuilding Corporation	LA	1995	Remedial		♦																									C
Atchison, Topeka, & Santa Fe Clovis/Santa Fe Lake – TPH Soil	NM	1988	Remedial																		♦									C
Atchison, Topeka, & Santa Fe Clovis/Santa Fe Lake – TPH Lake Sediments	NM	1988	Remedial				♦																							C
ATSF Albuquerque Superfund Site	NM	2002	Remedial		♦																									PD
ATSF Albuquerque Superfund Site	NM	2002	Remedial	♦																										PD
ATSF Albuquerque Superfund Site	NM	2002	Remedial																						♦					PD
Cal West Metals	NM	1992	Remedial	♦																										C
Cimarron Mining Corporation, Sierra Blanca OU	NM	1991	Remedial	♦																										C
Fruit Avenue Plume Site	NM	2001	Remedial																♦											D
North Railroad Avenue Plume Superfund Site	NM	2001	Remedial				♦																							D
North Railroad Avenue Plume Superfund Site	NM	2001	Remedial																♦											D
North Railroad Avenue Plume Superfund Site	NM	2001	Remedial																			♦								D
Prewitt Abandoned Refinery	NM	1992	Remedial				♦																							C
Prewitt Abandoned Refinery	NM	1992	Remedial																♦											O
Double Eagle Refinery Co.	OK	1992	Remedial							♦																				C
Double Eagle Refinery Co.	OK	1992	Remedial	♦																										C

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REGION 6

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Fourth Street Abandoned Refinery	OK	1992	Remedial																	♦										C
Fourth Street Abandoned Refinery	OK	1992	Remedial																	♦										C
Fourth Street Abandoned Refinery	OK	1992	Remedial							♦																				C
Hardage/Criner – Amendment	OK	1990	Remedial		♦																									C
Okalahoma Refining Co. – Ex situ Nuetralization	OK	1992	Remedial							♦																				C
Oklahoma Refining Co.	OK	1992	Remedial																	♦										C
Oklahoma Refining Co. – Hazardous Landfill	OK	1992	Remedial				♦																							C
Oklahoma Refining Co. – In situ Nuetralization	OK	1992	Remedial							♦																				C
Oklahoma Refining Co. – Nonhazardous Landfill	OK	1992	Remedial				♦																							C
Sand Springs Petrochemical Complex	OK	1987	Remedial																	♦										C
Sand Springs Petrochemical Complex – Glenn Wynn Facility	OK	1987	Remedial		♦																									C
Tinker AFB – Soldier Creek And Building 3001	OK	1990	Remedial																		♦									I
Air Force Plant 4 – Building 181	TX	1996	Remedial																♦											O
Air Force Plant 4 – East Parking Lot Groundwater Plume	TX	1996	Remedial																				♦							O
Bio-Ecology Systems, Inc.	TX	1984	Remedial	♦																										C
Brio Refining	TX	1988	Remedial					♦																						PD
French Limited	TX	1988	Remedial																	♦										C
French Limited	TX	1988	Remedial																		♦									C
Longhorn Army Ammunition Plant – Burning Ground No. 3	TX	1995	Remedial			♦																								C
MOTCO	TX	1985	Remedial					♦																						C
Motco, Inc. – OU 1	TX	1993	Remedial		♦																									C
North Cavalcade Street	TX	1988	Remedial				♦																							C
Pesses Chemical Co.	TX	1989	Remedial																	♦										C
Petro-Chemical Systems, Inc. – OU 2	TX	1991	Remedial																♦											O
Petro-Chemical Systems, Inc. – OU 2	TX	1998	Remedial																				♦							O
Petro-Chemical Systems, Inc. – OU 2	TX	1998	Remedial																		♦									O

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REGION 6

Source Control Treatment Technology Summary Matrix (continued)

SITE NAME	STATE	FY	ACTION	Source Control																										STATUS
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
				TECHNOLOGY TYPE																										
Sheridan Disposal Services – Source Lagoon OU	TX	1989	Remedial	♦																										PD
Sikes Disposal Pits	TX	1986	Remedial					♦																						C
Texarkana Wood Preserving	TX	1990	Remedial					♦																						D/I
Tex-Tin – OU 1	TX	1999	Remedial	♦																										C
Tex-Tin – OU 1	TX	1999	Remedial																					♦						O
Tex-Tin – OU 1 (ROD Amendment)	TX	2000	Remedial															♦												C
Tex-Tin – OU 1 (ROD Amendment)	TX	2000	Remedial															♦												O
Tex-Tin – OU 1 (ROD Amendment)	TX	2000	Remedial																										♦	O
Triangle Chemical Co.	TX	1985	Remedial		♦																									C
Triangle Chemical Co.	TX	1985	Remedial									♦																		C
United Creosoting Co.	TX	1989	Remedial		♦																									C
United Creosoting Co.	TX	1989	Remedial											♦																O

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REGION 7

Source Control Treatment Technology Summary Matrix

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Chemplex – OU 2	IA	1993	Remedial																♦											O
El Dupont De Nemours & Co. Inc.	IA	1991	Remedial	♦																										C
Fairfield Coal Gasification Plant	IA	1990	Remedial		♦																									C
General Motors Corporation Former AC Rochester Facility Site	IA	2001	Remedial																		♦									PD
Iowa Army Ammunition Plant	IA	1998	Remedial				♦																							PD
Iowa Army Ammunition Plant – OU 01	IA	1998	Remedial	♦																										O
Mcgraw Edison	IA	1993	Remedial																♦											BI
Mid-America Tanning	IA	1991	Remedial																	♦										C
Peoples Natural Gas	IA	1991	Remedial		♦																									C
Shaw Avenue Dump	IA	1991	Remedial	♦																										C
Vogel Paint & Wax	IA	1989	Remedial				♦																							C
Vogel Paint & Wax	IA	1989	Remedial	♦																										C
29th And Mead Ground Water Contamination, Coleman OU	KS	1992	Remedial																♦											O
57th and North Broadway Streets OU 1 – Former Wilko Paint facility	KS	1999	Remedial																♦											D
Arkansas City Dump	KS	1988	Remedial							♦																				C
Pester Refinery Co.	KS	1992	Remedial																			♦								O
Pester Refinery Co. – OU 1, Burn Pond Site	KS	1992	Remedial																		♦									O
Ellisville Site – Amendment	MO	1991	Remedial		♦																									C
Former Weldon Spring Ordnance Works – OU 1, Soils And Pipeline	MO	1996	Remedial					♦																						C
Former Weldon Spring Ordnance Works – OU 1, Soils And Pipeline	MO	1996	Remedial	♦																										O
Kem-Pest Laboratories	MO	1991	Remedial		♦																									C
Lee Chemical	MO	1991	Remedial																			♦								C
Minker/Stout/Romaine Creek (R&S)	MO	1988	Remedial		♦																									C

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REGION 7

Source Control Treatment Technology Summary Matrix (continued)

SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
Missouri Electric Works	MO	1990	Remedial			♦																								C
Oronogo – Duenweg Mining Bell Site – OU 2 And 3	MO	1996	Remedial																	♦										C
Shenandoah Stables	MO	1990	Remedial		♦																									C
Syntex Facility	MO	1988	Remedial		♦																									C
Times Beach Site	MO	1988	Remedial					♦																						C
Valley Park TCE Site – OU2	MO	2001	Remedial																♦											D
Valley Park Tce Site – Wainwright – OU1	MO	1996	Remedial										♦																	C
Valley Park Tce Site – Wainwright – OU1	MO	1996	Remedial																♦											I
Weldon Spring Quarry/Plant/Pits (USDOE)	MO	1993	Remedial	♦																										C
10th Street Site – OU 2	NE	2001	Remedial																♦											O
Cleburn Street Well	NE	1996	Remedial																♦											O
Cleburn Street Well – OU5	NE	2001	Remedial																♦											PD
Former Nebraska Ordnance Plant – OU 1	NE	1995	Remedial					♦																						C
Former Nebraska Ordnance Plant – OU 2	NE	1997	Remedial					♦																						C
Hastings Groundwater Contamination – Colorado Ave, OU 9	NE	1988	Remedial																♦											O
Hastings Groundwater Contamination – Far-Mar Co. Subsite, OU 3	NE	1988	Remedial																♦											C
Hastings Groundwater Contamination – Hastings East Industrial Park Surface Soils, Former Naval Ammunition Depot	NE	1990	Remedial																	♦										C
Hastings Groundwater Contamination – Hastings East Industrial Park Surface Soils, Former Naval Ammunition Depot	NE	1995	Remedial		♦																									C
Hastings Groundwater Contamination – OU4	NE	2002	Remedial		♦																									PD
Hastings Groundwater Contamination – Well No. 3 Plume 1	NE	1989	Remedial																♦											C
Lindsay Manufacturing	NE	1990	Remedial																♦											C
Sherwood Medical Co.	NE	1995	Remedial									♦																		C
Waverly Groundwater Contamination	NE	1990	Remedial																♦											C

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REGION 8

Source Control Treatment Technology Summary Matrix

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**																										**STATUS**
Broderick Wood Products – OU 1 (Impoundment Sludges)	CO	1992	Remedial	♦																										C
Broderick Wood Products – OU 2 (Groundwater)	CO	1992	Remedial																		♦									O
Broderick Wood Products – OU 2 (Soils)	CO	1992	Remedial				♦																							O
Chemical Sales Company – OU 1	CO	1991	Remedial																♦											I
Denver Radium Site – OU 8	CO	1992	Remedial	♦																										C
Lockheed/Martin (Denver Aerospace)	CO	1990	Remedial		♦																									C
Lockheed/Martin (Denver Aerospace)	CO	1990	Remedial	♦																										C
Rocky Flats Plant (Usdoe) – OU 4, Industrial Areas	CO	1992	Remedial	♦																										C
Rocky Mountain Arsenal – Onpost OU	CO	1996	Remedial								♦																			PD
Rocky Mountain Arsenal – Onpost OU, Buried M-1 Pits	CO	1996	Remedial																	♦										C
Rocky Mountain Arsenal – Onpost OU, Former Basin F	CO	1996	Remedial																	♦										D
Rocky Mountain Arsenal – Onpost OU, Hex Pits	CO	1996	Remedial																				♦							C
Rocky Mountain Arsenal – OU 18, Motor Pool Area	CO	1990	Remedial																♦											C
Rocky Mountain Arsenal – OU 25, Basin F Liquids	CO	1997	Remedial					♦																						C
Sand Creek Industrial – OU 1	CO	1989	Remedial																♦											C
Sand Creek Industrial – OU 4	CO	1994	Remedial																♦											C
Sand Creek Industrial – OU 5	CO	1993	Remedial			♦																								C
Summitville Mine – OU 0	CO	1995	Remedial							♦																				O
Summitville Mine – OU 2	CO	1995	Remedial							♦																				C
Summitville Mine – OU 5	CO	2001	Remedial						♦																					D
Woodbury Chemical – OU 1	CO	1985	Remedial		♦																									C
Woodbury Chemical – OU2	CO	1989	Remedial		♦																									C
Anaconda Co. Smelter – Flue Dust	MT	1991	Remedial	♦																										C
Anaconda Co. Smelter – OU 04	MT	1998	Remedial																	♦										BI
Burlington Northern (Somers Plant)	MT	1989	Remedial				♦																							C
Idaho Pole Company	MT	1996	Remedial				♦																							C

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REGION 8

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				TECHNOLOGY TYPE																										
SITE NAME	STATE	FY	ACTION	Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	STATUS
Libby Groundwater Contamination	MT	1989	Remedial				♦																							O
Montana Pole And Treating Plant	MT	1993	Remedial		♦																									C
Montana Pole And Treating Plant	MT	1993	Remedial				♦																							O
Montana Pole And Treating Plant – Area Under Interstate 15/90	MT	1993	Remedial																			♦								O
Silver Bow Creek/Butte Area – Ex Situ Soil	MT	1996	Remedial						♦																					C
Upper Tenmile Creek Mining Area – AMD	MT	2002	Remedial																		♦									PD
Ellsworth AFB – OU 1	SD	1995	Remedial																♦											O
Interim Water Treatment Operations OU-2	SD	2002	Remedial							♦																				PD
Davenport and Flagstaff Smelters- OU 1	UT	2002	Remedial	♦																										PD
Defense Distribution Depot Hill, OU 4 (ROD Amendment)	UT	2000	Remedial																		♦									PD
Hill Air Force Base – OU 2	UT	1991	Remedial		♦																									O
Hill Air Force Base – OU 2	UT	1996	Remedial																♦											PD
Hill Air Force Base – OU 3	UT	1995	Remedial																♦											O
Jacobs Smelter OU 1	UT	1999	Remedial	♦																										C
Ogden Defense Depot (Dla)	UT	1990	Remedial		♦																									C
Ogden Defense Depot (Dla) – OU 3	UT	1992	Remedial		♦																									C
Portland Cement (Kiln Dust #2 & #3) – OU 2, Chromium Bearing Bricks And Contaminated Soils	UT	1992	Remedial	♦																										C
Tooele Army Depot-North Area – OUs 5, 6 ,7, And 10	UT	1994	Remedial		♦																									C
Utah Power & Light/American Barrel	UT	1993	Remedial	♦																										C
Utah Power & Light/American Barrel	UT	1993	Remedial																♦											O
Wasatch Chemical	UT	1991	Remedial				♦																							C
Wasatch Chemical	UT	1991	Remedial																									♦		C

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REGION 9

Source Control Treatment Technology Summary Matrix

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Apache Powder Co.	AZ	1994	Remedial		♦																									PD
Apache Powder Co.	AZ	1994	Remedial	♦																										PD
Hassayampa Landfill	AZ	1992	Remedial																♦											C
Indian Bend Wash Area – North Area (Area 12)	AZ	1991	Remedial																♦											C
Indian Bend Wash Area – North Area (Area 6)	AZ	1991	Remedial																♦											C
Indian Bend Wash Area – North Area (Area 7)	AZ	1991	Remedial																♦											O
Indian Bend Wash Area – North Area (Area 8)	AZ	1991	Remedial																♦											C
Indian Bend Wash Area – South Area (DCE Circuits)	AZ	1993	Remedial																♦											O
Luke AFB – OU 2/Dp23	AZ	1994	Remedial				♦																							C
Luke AFB OU 1	AZ	1999	Remedial																♦											C
Marine Corps Air Station Yuma OU 1	AZ	2000	Remedial																♦											O
Motorola 52nd Street – OU 1	AZ	1988	Remedial																♦											C
Phoenix-Goodyear Airport Area (North Facility)	AZ	1989	Remedial																♦											C
Phoenix-Goodyear Airport Area (North Facility) – OU1	AZ	2002	Remedial																♦											PD
Phoenix-Goodyear Airport Area (South Facility)	AZ	1989	Remedial																♦											O
Tucson International Airport – Sites 1, 2, 3	AZ	1997	Remedial																♦											O
Tucson International Airport Area – OU 03 – Soil West of Site 5	AZ	1998	Remedial																							♦				O
Tucson International Airport Area – Site 4, 5, 6	AZ	1998	Remedial	♦																										C
Williams AFB – OU 2	AZ	1993	Remedial																♦											O
Williams AFB – OU 2	AZ	1996	Remedial																♦											O
Williams AFB – OU 3	AZ	1996	Remedial																♦											I
Williams AFB – OU 3	AZ	1996	Remedial																		♦									O
Advanced Micro Devices (Formerly Monolithic Memories) – OU 1, Subunit 2	CA	1991	Remedial																♦											C
Advanced Micro Devices Inc.	CA	1991	Remedial		♦																									C

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REGION 9

Source Control Treatment Technology Summary Matrix (continued)

SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
Barstow Marine Corps Logistics Base – OU 01	CA	1998	Remedial																♦											O
Brewster Well Field – OU 2	CA	1988	Remedial		♦																									C
Cooper Drum Company	CA	2002	Remedial																							♦				D
Del Amo Facility	CA	1997	Remedial																♦											D
El Toro Marine Corps Air Station – Hangar Area, Interim Rod	CA	1997	Remedial																♦											O
Fairchild Semiconductor (Mt. View) – Bldg 19 (369 N. Whisman Rd)	CA	1989	Remedial																♦											C
Fairchild Semiconductor (Mt. View) – Bldg 9 (401 National Ave.)	CA	1989	Remedial																♦											C
Fairchild Semiconductor (Mt. View) – General Instrument Corp./Siltec Corp (405 National Ave.)	CA	1989	Remedial																♦											C
Fairchild Semiconductor (Mt. View) – Siemens/Sobrato (455 & 487 Middlefield Rd)	CA	1989	Remedial																♦											O
Fairchild Semiconductor (South San Jose)	CA	1989	Remedial																♦											C
Fort Ord – Fort Ord Soil Treatment Area (Fdsta), OU 4	CA	1994	Remedial				♦																							C
George Air Force Base – OU 3 WP-17	CA	1999	Remedial																		♦									O
George Air Force base OU 3 FT19a	CA	1999	Remedial																		♦									O
George Air Force Base Site FT 19c	CA	1999	Remedial																♦											O
Goerge Air Force Base OU 3 OT51	CA	1999	Remedial																♦											O
Hewlett-Packard – 620-640 Page Mill Road	CA	1995	Remedial																♦											O
Ibm (San Jose)	CA	1989	Remedial																♦											O
Intersil/Siemens – Intersil OU	CA	1990	Remedial																♦											C
Intersil/Siemens – Siemins OU	CA	1990	Remedial																♦											O
J.H. Baxter	CA	1998	Remedial	♦																										C
J.H. Baxter	CA	1998	Remedial																		♦									O
J.H. Baxter – Area B	CA	1998	Remedial																		♦									O

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REGION 9
Source Control Treatment Technology Summary Matrix (continued)

SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
Jasco Chemical Co.	CA	1992	Remedial				♦																							C
Lawrence Livermore National Laboratory (USDOE)	CA	1992	Remedial																♦											O
Lawrence Livermore National Laboratory (USDOE) – OU 1	CA	1997	Remedial																♦											O
Lawrence Livermore National Laboratory (USDOE) – Site 300	CA	2001	Remedial																♦											PD
Lorentz Barrel And Drum – OU 1	CA	1993	Remedial																♦											O
March AFB – OU 1, Area 5, Sites 31a And 31b	CA	1996	Remedial																♦											O
March AFB – OU 1, Sites 10 and 15	CA	2000	Remedial				♦																							C
Mather AFB – OU 04	CA	1998	Remedial				♦																							O
Mather AFB – OU 04	CA	1998	Remedial																♦											PD
Mather AFB – OU 04 (86&87)	CA	1998	Remedial	♦																										C
Mather AFB – OU 04 (site 18,23 & 59)	CA	1998	Remedial																		♦									O
Mather AFB – Soil And Groundwater OU, Mather Soils Biofarm	CA	1996	Remedial				♦																							O
Mather AFB – Soil And Groundwater OU, Site 57	CA	1996	Remedial																♦											O
Modesto Groundwater Contamination	CA	1997	Remedial																♦											D/I
National Semiconductor Corp. – OU 1, Subunit 1	CA	1991	Remedial																♦											O
Norton Air Force Base – Cba OU	CA	1994	Remedial																♦											C
Pacific Coast Pipelines	CA	1992	Remedial																♦											C
Phillips [Formerly Signetics (Amd 901) (Trw)]	CA	1991	Remedial																♦											O
Purity Oil Sales, Inc. – OU 2	CA	1992	Remedial																♦											D/I
Raytheon, Mountain View (350 Ellis Street/415 Middlefield Rd)	CA	1989	Remedial																♦											O
Rhone-Poulenc/Zoecon	CA	1992	Remedial																	♦										C
Rhone-Poulenc/Zoecon	CA	1992	Remedial	♦																										C
Sacramento Army Depot	CA	1993	Remedial	♦																										C
Sacramento Army Depot – Burn Pits OU	CA	1993	Remedial																♦											C

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REGION 9

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				TECHNOLOGY TYPE																										
SITE NAME	STATE	FY	ACTION	Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	STATUS
Sacramento Army Depot – OU 3, Tank 2	CA	1992	Remedial																♦											C
Selma Pressure Treating	CA	1988	Remedial	♦																										O
Sharpe Army Depot – Defense Distribution Region West (Ddrw)-Sharpe Site – OU 2	CA	1996	Remedial																♦											C
Southern California Edison, Visalia Pole Yard	CA	1994	Remedial																				♦							C
Southern California Edison, Visalia Pole Yard	CA	1994	Remedial																		♦									O
Spectra-Physics, Inc. – OU 1, System No. 1	CA	1991	Remedial																♦											C
Spectra-Physics, Inc. – OU 1, System No. 2	CA	1991	Remedial																♦											C
Tracy Defense Depot (USArmy) – OU 01	CA	1998	Remedial																♦											O
Valley Wood Preserving, Inc.	CA	1991	Remedial																	♦										O
Watkins-Johnson	CA	1990	Remedial																♦											O
Westinghouse Electric (Sunnyvale Plant)	CA	1992	Remedial		♦																									C

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REGION 10

Source Control Treatment Technology Summary Matrix

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Adak Naval Air Station – OU 2	AK	2000	Remedial			♦																								O
Arctic Surplus	AK	1995	Remedial											♦																PD
Arctic Surplus	AK	1995	Remedial	♦																										PD
Eielson Air Force Base – OU 1 (Power Plant)	AK	1994	Remedial																		♦									O
Eielson Air Force Base – OU 1 (Refueling Loop)	AK	1992	Remedial																		♦									O
Eielson Air Force Base – OU 2 (Fuel Area)	AK	1994	Remedial																		♦									O
Eislson Air Force Base – OU 3 (Refueling Loop Usts)	AK	1994	Remedial																		♦									O
Elmendorf AFB – OU 2	AK	1995	Remedial			♦																								C
Elmendorf AFB – OU 4	AK	1995	Remedial																		♦									O
Elmendorf AFB – OU 5	AK	1995	Remedial				♦																							O
Elmendorf AFB – OU 6 And Source Area Ss19	AK	1997	Remedial																♦											C
Elmendorf AFB – OU 6 And Source Area Ss19	AK	1997	Remedial			♦																								C
Fort Richardson – OU B	AK	1997	Remedial																♦											C
Fort Richardson – OU B	AK	1997	Remedial			♦																								C
Fort Wainwright	AK	1997	Remedial														♦													C
Fort Wainwright – OU 2 – Building 1168 Leach Well	AK	1997	Remedial																♦											O
Fort Wainwright – OU 2 – Drmo Yard	AK	1997	Remedial																♦											O
Fort Wainwright – OU 3	AK	1996	Remedial																♦											O
Fort Wainwright – OU 4	AK	1996	Remedial																♦											O
Fort Wainwright – OU 5 WQFS1	AK	1999	Remedial																♦											O
Fort Wainwright – OU 5 WQFS2	AK	1999	Remedial																♦											O
Fort Wainwright – OU 5 WQFS3	AK	1999	Remedial																♦											O
Standard Steel And Metal Salvage Yard, (USDOT)	AK	1996	Remedial	♦																										C
Bunker Hill Mining And Metallurgical Complex	ID	1992	Remedial	♦																										C
Bunker Hill Mining and Metallurgical Complex – OU2	ID	2002	Remedial															♦												PD

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REGION 10

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Idaho National Engineering And Environmental Lab (USDOE) – OU 23	ID	1992	Remedial		♦																									C
Idaho National Engineering and Environmental Laboratory (USDOE) – OU 11 Power Burst Facility and Auxiliary Reactor Area	ID	2000	Remedial		♦																									PD
Idaho National Engineering and Environmental Laboratory (USDOE) – OU 11 Power Burst Facility and Auxiliary Reactor Area	ID	2000	Remedial															♦												PD
Idaho National Engineering and Environmental Laboratory (USDOE) – OU 11 Power Burst Facility and Auxiliary Reactor Area	ID	2000	Remedial															♦												PD
Idaho National Engineering and Environmental Laboratory (USDOE) – OU 3	ID	2000	Remedial															♦												PD
Idaho National Engineering and Environmental Laboratory (USDOE) – OU 3-13	ID	1999	Remedial	♦																										D
Idaho National Engineering and Environmental Laboratory (USDOE) – OU25	ID	2002	Remedial												♦															PD
Idaho National Engineering and Environmental Laboratory (USDOE) – OU25	ID	2002	Remedial			♦																								PD
Idaho National Engineering Lab (USDOE) – OU 21	ID	1998	Remedial														♦													O
Idaho National Engineering Laboratory (USDOE) – Pit 9, OU 7-10	ID	1993	Remedial											♦																D
Idaho National Engineering Laboratory (USDOE) – Pit 9, OU 7-10	ID	1993	Remedial													♦														D
Idaho National Engineering Laboratory (USDOE) – Power Burst Facility, OU 13	ID	1995	Remedial	♦																										C
Idaho National Engineering Laboratory (USDOE) – Wag 7, OU 7 – 8	ID	1995	Remedial																♦											O
Pacific Hide & Fur Recycling	ID	1988	Remedial	♦																										C

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REGION 10

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**																										**STATUS**
Pacific Hide & Fur Recycling – Amendment	ID	1992	Remedial		♦																									C
East Multnomah County Groundwater Contamination – Cascade Corporation, Troutdale Gravel Aquifer	OR	1997	Remedial																♦											C
Gould, Inc.	OR	1988	Remedial	♦																										C
Northwest Pipe and Casing Company/Hall Process Company OU 1	OR	2000	Remedial			♦																								C
Teledyne Wah Chang	OR	1990	Remedial	♦																										C
Umatilla Army Depot Activity	OR	1992	Remedial				♦																							C
Umatilla Chemical Depot (Lagoons) – OU 1	OR	1993	Remedial	♦																										C
Umatilla Chemical Depot (Lagoons) – OU 3	OR	1994	Remedial																			♦								O
Umatilla Chemical Depot (Lagoons) – OU 4	OR	1994	Remedial	♦																										C
Umatilla Chemical Depot (Lagoons) – OU 6	OR	1994	Remedial	♦																										C
Umatilla Chemical Depot (Lagoons) – OU 7	OR	1994	Remedial												♦															O
Umatilla Chemical Depot (Lagoons) – Soil OU	OR	1992	Remedial				♦																							C
Union Pacific Railroad Tie Treatment – Vadose Zone Soils	OR	1996	Remedial																		♦									D
Union Pacific Railroad Tie Treatment – Vadose Zone Soils	OR	1996	Remedial																		♦									PD
United Chrome Products, Inc.	OR	1986	Remedial																			♦								O
White King/Lucky Lass Superfund Site	OR	2001	Remedial																										♦	O
Bonneville Power Administration – OU A	WA	1993	Remedial				♦																							C
Coal Creek Superfund Site	WA	1991	Remedial					♦																						C
Commencement Bay, Nearshore/Tideflats – Asarco Tacoma Smelter	WA	1991	Remedial		♦																									C
Commencement Bay, Nearshore/Tideflats – OU 3, Tacoma Tar Pits	WA	1988	Remedial	♦																										C
Commencement Bay, South Tacoma Channel (Well 12a)	WA	1985	Remedial																♦											C
Commencement Bay, South Tacoma Channel (Well 12a)	WA	1985	Remedial																♦											C
Commencement Bay, South Tacoma Field	WA	1994	Remedial		♦																									C

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REGION 10

Source Control Treatment Technology Summary Matrix (continued)

Source Control																													
				Ex Situ															In Situ										
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
Commencement Bay, South Tacoma Field	WA	1994	Remedial	♦																										C
Fairchild Air Force Base – Priority 1 OUs (OU 2) Ft-1	WA	1993	Remedial																		♦									O
Fairchild Air Force Base – Priority 2 Sites – Fuel Truck Maintenance Facility, Building 1060 (Ps-10)	WA	1996	Remedial		♦																									C
Fairchild Air Force Base – Priority 2 Sites, OU 3, Sub Area Ps-1	WA	1996	Remedial																		♦									O
FMC Corp. (Yakima Pit)	WA	1990	Remedial					♦																						C
Fort Lewis Logistics Center	WA	1990	Remedial																				♦							D
Fort Lewis Military Reservation – Landfill 4	WA	1993	Remedial																♦											C
Fort Lewis Military Reservation – Solvent Refined Coal Plant	WA	1993	Remedial			♦																								C
Frontier Hard Chrome Inc – OU 1 and 2	WA	2001	Remedial																					♦						D
Frontier Hard Chrome, Inc.	WA	1988	Remedial	♦																										PD
Hanford 1100-Area (USDOE)	WA	1993	Remedial		♦																									C
Hanford 300 Area (USDOE) 300-FF-2 OU	WA	2001	Remedial															♦												O
Hanford 300 Area (USDOE) 300-FF-2 OU	WA	2001	Remedial	♦																										O
Harbor Island- Soil and Groundwater OU	WA	1993	Remedial																♦											O
Jackson Park Housing Complex/Naval Hospital Bremerton – OU 1	WA	2000	Remedial																		♦									O
Jackson Park Housing Complex/Naval Hospital Bremerton – OU 1	WA	2000	Remedial															♦												PD
Naval Air Station, Whidbey Island – Ault Field, OU 5, Areas 1, 31, And 52	WA	1996	Remedial																		♦									C
North Market Street	WA	2000	Remedial			♦																								C
North Market Street	WA	2000	Remedial																		♦									O
Northwest Transformer – Mission Pole	WA	1991	Remedial		♦																									C
Pacific Car And Foundry	WA	1992	Remedial				♦																							C
Pacific Car And Foundry	WA	1992	Remedial	♦																										C

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REGION 10

Source Control Treatment Technology Summary Matrix (continued)

				Source Control																										
				Ex Situ															In Situ											
				Solidification/Stabilization	Incineration (off-site)	Thermal Desorption	Bioremediation	Incineration (on-site)	Chemical Treatment	Neutralization	Soil Washing	Mechanical Soil Aeration	Soil Vapor Extraction	Solvent Extraction	Open Burn/Open Detonation	Vitrification	Phytoremediation	Physical Separation	Soil Vapor Extraction	Solidification/Stabilization	Bioremediation	Flushing	In Situ Thermal Treatment	Chemical Treatment	Phytoremediation	Multi-Phase Extraction	Electrical Separation	Vitrification	Neutralization	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE																										STATUS
US Naval Submarine Base Bangor – OU 1, Site A	WA	1992	Remedial								♦																			C
US Naval Submarine Base Bangor – OU 6 Site D & OU 2 Site F	WA	1994	Remedial				♦																							O
US Naval Submarine Base Bangor – OU 8	WA	2000	Remedial																							♦				O
Wyckoff/Eagle Harbor – West Harbor OU (Amendment)	WA	1996	Remedial	♦																										C
Wycoff/Eagle Harbor – Soil	WA	2000	Remedial																				♦							PD

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REGION 1

Groundwater Treatment Technology Summary Matrix

				Groundwater Technologies										
SITE NAME	STATE	FY	ACTION	Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	STATUS
				TECHNOLOGY TYPE										
Atlas Tack Corp. – OU 1	MA	2000	Remedial					♦						D
Baird & Mcguire	MA	1990	Remedial										♦	PD
Brunswick Naval Air Station	ME	1998	Remedial										♦	O
Burgess Brothers Landfill – OU 01	VT	1998	Remedial	♦										O
CHARLES-GEORGE RECLAMATION TRUST LANDFILL	MA	1988	Remedial										♦	PD
Davis Liquid Waste	RI	1987	Remedial										♦	PD
DOVER MUNICIPAL LANDFILL	NH	1991	Remedial										♦	D
Eastern Surplus Company Superfund Site	ME	2000	Remedial										♦	O
Eastern Surplus Company Superfund Site	ME	2000	Remedial						♦					O
Eastland Woolen Mill	ME	2002	Remedial										♦	PD
Eastland Woolen Mill – OU1	ME	2002	Remedial		♦									D
Eastland Woolen Mill – OU1	ME	2002	Remedial						♦					D
Eastland Woolen Mill – OU1	ME	2002	Remedial								♦			D
GROVELAND WELLS	MA	2000	Remedial										♦	O
Hanscom Field/Hanscom Air Force Base – OU1 Airfield VOC plume	MA	2001	Remedial										♦	O
Hanscom Field/Hanscom Air Force Base – OU1 Site 1 Source Area	MA	2001	Remedial		♦									C
Hanscom Field/Hanscom Air Force Base – OU1, Site 1 Source Area	MA	2001	Remedial						♦					O
Hocomonco Pond	MA	1999	Remedial										♦	SD
Hocomonco Pond	MA	1985	Remedial		♦									C
KEARSARGE METALLURGICAL CORP	NH	1993	Remedial										♦	O
Keefe Environmental Services	NH	1993	Remedial										♦	O
KELLOGG-DEERING WELL FIELD	CT	1996	Remedial										♦	O
Laurel Park	CT	1988	Remedial										♦	O
Linemaster Switch Corporation	CT	1993	Remedial			♦								O
MCKIN CO	ME	1992	Remedial										♦	SD

Status: **PD** = Predesign; **D** = Design; **D/I** = Designed but not Installed; **BI** = Being Installed; **I** = Installed; **O** = Operational; **C** = Complete; **SD** = Shut Down

REGION 1

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
NATICK LABORATORY ARMY RESEARCH, DEVELOPMENT, AND ENGINEERING CENTER	MA	2001	Remedial										♦	PD
NEW LONDON SUBMARINE BASE	CT	1998	Remedial										♦	PD
NORWOOD PCBS	MA	1999	Remedial										♦	SD
NYANZA CHEMICAL WASTE DUMP	MA	1991	Remedial										♦	PD
O'Connor – OU2	ME	2002	Remedial			♦								O
OLD SPRINGFIELD LANDFILL	VT	1994	Remedial										♦	O
Otis Air Natioinal Guard – Fuel Spill 12	MA	1995	Remedial	♦										C
Otis Air National Guard	MA	1995	Remedial										♦	O
Ottati & Goss/Kingston Steel Drum	NH	1987	Remedial										♦	D
PARKER SANITARY LANDFILL	VT	1995	Remedial										♦	PD
PEASE AFB	NH	2000	Remedial										♦	O
Pease AFB – Site 45	NH	1995	Remedial	♦										O
Pease AFB – Zone 2	NH	1995	Remedial	♦										O
Peterson/Puritan Inc.	RI	1993	Remedial										♦	O
Peterson/Puritan Inc. – OU 1, PAC Area	RI	1993	Remedial						♦					C
Picillo Farm Site	RI	1993	Remedial										♦	PD
PINETTE'S SALVAGE YARD	ME	1997	Remedial										♦	SD
Re-Solve Inc	MA	1998	Remedial										♦	O
Rose Disposal Pit	MA	1994	Remedial										♦	O
Savage Municipal Water Supply	NH	1997	Remedial										♦	O
Savage Municipal Water Supply – OU 1, Ok Tool Source Area	NH	1997	Remedial	♦										O
Silresim Chemical	MA	1991	Remedial										♦	O
SOLVENTS RECOVERY SERVICE OF NEW ENGLAND	CT	1983	Remedial										♦	O
Somersworth Sanitary Landfill	NH	1994	Remedial										♦	O
Somersworth Sanitary Landfill	NH	1994	Remedial				♦							O

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REGION 1

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
South Municipal Water Supply Well	NH	1995	Remedial										♦	O
STAMINA MILLS, INC	RI	2000	Remedial										♦	O
SULLIVAN'S LEDGE	MA	2000	Remedial										♦	O
Sylvester	NH	1992	Remedial										♦	SD
Tibbetts Road – OU 01	NH	1998	Remedial					♦						O
Tinkham Garage	NH	1989	Remedial										♦	PD
Union Chemical – OU 1	ME	2001	Remedial		♦									O
Union Chemical Co Inc –	ME	1997	Remedial										♦	O
Wells G&H	MA	1989	Remedial										♦	O
Wells G&H – OU 1 (Wildwood Conservation Trust)	MA	1998	Remedial	♦										O
West Site/Hows Corner Superfund Site	ME	2002	Remedial										♦	PD

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REGION 2

Groundwater Treatment Technology Summary Matrix

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
WINTHROP LANDFILL	ME	1998	Remedial										♦	O
A O Polymer Ground Water Treatment	NJ	1991	Remedial										♦	O
A.O. POLYMER	NJ	1998	Remedial										♦	O
AMERICAN THERMOSTAT CO.	NY	1998	Remedial										♦	O
APPLIED ENVIRONMENTAL SERVICES	NY	1996	Remedial										♦	O
BOG CREEK FARM	NJ	1994	Remedial										♦	O
Brewster Well Field	NY	1986	Remedial										♦	PD
BROOK INDUSTRIAL PARK	NJ	1994	Remedial										♦	D
BROOKHAVEN NATIONAL LABORATORY (USDOE)	NY	2001	Remedial										♦	PD
Brookhaven National Laboratory (USDOE) – OU 4	NY	1996	Remedial	♦										O
Byron Barrel & Drum	NY	1989	Remedial										♦	O
Caldwell Trucking	NJ	1986	Remedial										♦	D/I
CHEMICAL LEAMAN TANK LINES, INC.	NJ	1990	Remedial										♦	D
CHEMSOL, INC.	NJ	1991	Remedial										♦	O
CIBA-GEIGY CORP.	NJ	1989	Remedial										♦	PD
CINNAMISON TOWNSHIP (BLOCK 702) GROUND WATER CONTAMINATION	NJ	1990	Remedial										♦	PD
CIRCUITRON CORP	NY	2000	Remedial										♦	O
Claremont Polychemical	NY	1990	Remedial										♦	O
COLESVILLE MUNICIPAL LANDFILL	NY	1991	Remedial										♦	O
Combe Fill South Landfill	NJ	1986	Remedial										♦	PD
CONKLIN DUMPS	NY	1992	Remedial										♦	PD
CORTESE LANDFILL	NY	1994	Remedial										♦	PD
Cosden Chemical Coatings	NJ	1992	Remedial										♦	PD
Dayco Corp./L.E. Carpenter Co.	NJ	1994	Remedial										♦	PD
De Rewal Chemical	NJ	1989	Remedial										♦	PD

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REGION 2

Groundwater Treatment Technology Summary Matrix (continued)

Groundwater Technologies

SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
Diamond Alkali	NJ	1987	Remedial										♦	O
DImperio Property	NJ	1985	Remedial										♦	O
DOVER MUNICIPAL WELL 4	NJ	1992	Remedial										♦	PD
ELLIS PROPERTY	NJ	2000	Remedial										♦	O
Ellis Property – Groundwater	NJ	1992	Remedial										♦	D/I
ENDICOTT VILLAGE WELL FIELD	NY	1997	Remedial										♦	O
EVOR PHILLIPS LEASING	NJ	1992	Remedial										♦	O
Ewan Property	NJ	1989	Remedial										♦	PD
Ewan Property – OU 2	NJ	1988	Remedial						♦					PD
FAA Technical Center – Area B Navy Fire Testing Facility	NJ	1996	Remedial										♦	D
FAA Technical Center – OU 1, Area D – Jet Fuel Farm	NJ	1989	Remedial		♦									I
Facet Enterprises	NY	1992	Remedial										♦	PD
FIBERS PUBLIC SUPPLY WELLS	PR	1991	Remedial										♦	PD
Florence Landfill	NJ	1986	Remedial										♦	O
FMC CORP. (DUBLIN ROAD LANDFILL)	NY	1997	Remedial										♦	O
FOREST GLEN MOBILE HOME SUBDIVISION	NY	1999	Remedial										♦	PD
Fried Industries	NJ	1994	Remedial										♦	PD
FULTON TERMINALS	NY	1999	Remedial										♦	SD
GARDEN STATE CLEANERS CO	NJ	1999	Remedial										♦	O
GCL Tie and Treating	NY	1995	Remedial										♦	BI
GE Wiring Devices	PR	1988	Remedial										♦	PD
GEMS LANDFILL	NJ	1999	Remedial										♦	O
General Motors/Central Foundry Division	NY	1992	Remedial										♦	D
Genzale Plating Company	NY	1991	Remedial										♦	D
GOOSE FARM	NJ	1993	Remedial										♦	O
Griffiss Air Force Base, Landfill 1, OU 5	NY	2000	Remedial										♦	PD

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REGION 2

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
HAVILAND COMPLEX	NY	1997	Remedial										♦	PD
HELEN KRAMER LANDFILL	NJ	1993	Remedial										♦	O
HERTEL LANDFILL	NY	1991	Remedial										♦	PD
Higgins Disposal Site	NJ	1997	Remedial										♦	PD
HIGGINS FARM	NJ	1998	Remedial										♦	O
Hooker (102nd Street Landfill)	NY	1990	Remedial										♦	O
HOOKER (HYDE PARK)	NY	1986	Remedial										♦	I
Hooker (S Area)	NY	1990	Remedial										♦	PD
Hooker Chemical/Ruco Polymer – OU 3	NY	2000	Remedial		♦									D
IMPERIAL OIL CO., INC./CHAMPION CHEMICALS	NJ	1992	Remedial										♦	D
ISLIP MUNICIPAL SANITARY LANDFILL	NY	1992	Remedial										♦	PD
Janssen Inc.	PR	1997	Remedial										♦	PD
JIS LANDFILL	NJ	1995	Remedial										♦	D
Johnstown City Landfill	NY	1993	Remedial										♦	PD
Jones Chemicals, Inc.	NY	2000	Remedial										♦	PD
KATONAH MUNICIPAL WELL	NY	1992	Remedial										♦	O
Kentucky Avenue Wellfield	NY	1990	Remedial										♦	O
Kentucky Avenue Wellfield – OU 3	NY	1996	Remedial	♦										O
Kin-Buc Landfill	NJ	1988	Remedial										♦	O
KING OF PRUSSIA	NJ	1995	Remedial										♦	O
LANG PROPERTY	NJ	1995	Remedial										♦	O
Liberty Industrial Finishing	NY	2002	Remedial										♦	PD
LONE PINE LANDFILL	NJ	1994	Remedial										♦	O
MANNHEIM AVENUE DUMP	NJ	1994	Remedial										♦	SD
MATTIACE PETROCHEMICAL CO., INC	NY	2000	Remedial										♦	O
Metaltec/Aerosystems	NJ	1990	Remedial										♦	PD

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Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
Mohonk Road Industrial Plant	NY	2000	Remedial										♦	PD
Mohonk Road Industrial Plant	NY	2000	Remedial										♦	D
MONTGOMERY TOWNSHIP HOUSING DEVELOPMENT	NJ	1988	Remedial										♦	D
Myers Property	NJ	1990	Remedial										♦	PD
Nascolite Corp.	NJ	1988	Remedial										♦	PD
Naval Air Engineering Center	NJ	1997	Remedial										♦	PD
Naval Air Engineering Center – Areas A and B Groundwater	NJ	1997	Remedial			♦								O
Naval Air Engineering Station, Areas I and J Groundwater – OU 26	NJ	1999	Remedial		♦									O
Naval Air Engineering Station, Site 28 – Soil And Groundwater OU	NJ	1997	Remedial	♦										O
NAVAL WEAPONS STATION EARLE (SITE A)	NJ	1998	Remedial										♦	PD
Naval Weapons Station Earle (Site A) – OU 03	NJ	1998	Remedial	♦										O
NIAGARA MOHAWK POWER CORP. (SARATOGA SPRINGS PLANT)	NY	1995	Remedial										♦	O
NL Industries, Inc.	NJ	1994	Remedial										♦	D
OLD BETHPAGE LANDFILL	NY	1994	Remedial										♦	O
Olean Well Field	NY	1996	Remedial										♦	PD
ONONDAGA LAKE	NY	2000	Remedial										♦	PD
Pasley Solvents And Chemicals, Inc.	NY	1992	Remedial	♦										O
PICATINNY ARSENAL (USARMY)	NJ	1989	Remedial										♦	O
PLATTSBURGH AIR FORCE BASE	NY	1997	Remedial										♦	PD
Pollution Abatement Services	NY	1993	Remedial										♦	SD
PORT WASHINGTON LANDFILL	NY	1989	Remedial										♦	O
Price Landfill #1	NJ	1986	Remedial										♦	D
RADIATION TECHNOLOGY, INC.	NJ	1994	Remedial										♦	PD
RAMAPO LANDFILL	NY	1992	Remedial										♦	PD
REICH FARMS	NJ	1998	Remedial										♦	O
Richardson Hill Road Landfill/Pond	NY	1997	Remedial										♦	PD

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REGION 2

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
Robintech, Inc./National Pipe Company	NY	1992	Remedial										♦	O
Rockaway Borough Well Field	NJ	1991	Remedial										♦	D
Rockaway Borough Well Field	NJ	1991	Remedial										♦	D
ROCKAWAY TOWNSHIP WELLS	NJ	2002	Remedial										♦	PD
ROCKY HILL MUNICIPAL WELL	NJ	1988	Remedial										♦	D
ROWE INDUSTRIES GROUND WATER CONTAMINATION	NY	2002	Remedial										♦	O
Scientific Chemical Processing	NJ	1990	Remedial										♦	PD
Sealand Restoration. Inc.	NY	1995	Remedial										♦	PD
SHARKEY LANDFILL	NJ	1986	Remedial										♦	PD
SHIELDALLOY CORP.	NJ	1996	Remedial										♦	O
Shore Realty	NY	1991	Remedial										♦	O
Shore Realty (Formerly Applied Environmental Services) – Groundwater OU	NY	1991	Remedial		♦									O
Shore Realty (Formerly Applied Environmental Services) – OU 1	NY	1991	Remedial	♦										O
SIDNEY LANDFILL	NY	1995	Remedial										♦	D
Sinclair Refinery	NY	1991	Remedial										♦	O
Sinclair Refinery – OU 2	NY	1991	Remedial	♦										O
SMS Instruments	NY	1989	Remedial										♦	O
SMS INSTRUMENTS, INC	NY	1996	Remedial										♦	O
Solvent Savers	NY	1990	Remedial										♦	PD
SOUTH JERSEY CLOTHING CO	NJ	1999	Remedial										♦	O
Stanton Cleaners Area Groundwater Contamination Site	NY	1999	Remedial										♦	BI
Syncon Resins	NJ	1986	Remedial										♦	PD
TABERNACLE DRUM DUMP	NJ	1993	Remedial										♦	SD
Tri-Cities Barrel Site	NY	2000	Remedial										♦	PD
Tutu Well Field	VI	1996	Remedial										♦	PD
Universal Oil Products	NJ	1993	Remedial										♦	SD

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REGION 2

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
UPJOHN FACILITY	PR	1998	Remedial										♦	O
Vega Alta Public Supply Wells	PR	1987	Remedial										♦	PD
Vestal Water Supply	NY	1990	Remedial										♦	PD
VESTAL WATER SUPPLY WELL 4-2	NY	1998	Remedial										♦	SD
Vineland Chemical Co., Inc.	NJ	1997	Remedial										♦	PD
VOLNEY MUNICIPAL LANDFILL	NY	2002	Remedial										♦	PD
Waldick Aerospace Devices, Inc.	NJ	1991	Remedial										♦	PD
WARWICK LANDFILL	NY	1991	Remedial										♦	PD
WILLIAMS PROPERTY	NJ	1995	Remedial										♦	O
Woodland Route 532 Dump-Amendment	NJ	1999	Remedial	♦										BI
Woodland Routes 72 Dump (Amendment)	NJ	1999	Remedial	♦										BI
York Oil Co.	NY	1988	Remedial										♦	O

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REGION 3

Groundwater Treatment Technology Summary Matrix

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
A.I.W. FRANK/MID-COUNTY MUSTANG	PA	2001	Remedial										♦	O
Aberdeen Proving Ground	MD	1996	Remedial										♦	PD
Aberdeen Proving Ground (Edgewood Area) J-Field Soil OU	MD	2001	Remedial					♦						O
ABERDEEN PROVING GROUND (MICHAELSVILLE LANDFILL)	MD	2000	Remedial										♦	PD
AMP, INC. (GLEN ROCK FACILITY)	PA	1996	Remedial										♦	O
ARMY CREEK LANDFILL	DE	1994	Remedial										♦	O
Arrowhead Associates/Scovill Corp	VA	2001	Remedial				♦							O
Avco Lycoming	PA	2000	Remedial		♦									C
Avco Lycoming	PA	2000	Remedial										♦	O
BALLY GROUND WATER CONTAMINATION	PA	1989	Remedial										♦	O
Bendix Flight Systems Division	PA	1988	Remedial										♦	O
Berks Sand Pit	PA	1994	Remedial										♦	O
BLOSENSKI LANDFILL	PA	1998	Remedial										♦	O
BOARHEAD FARMS	PA	1999	Remedial										♦	PD
Browns Battery Breaking Site – OU 2	PA	1992	Remedial				♦							O
BUTZ LANDFILL	PA	1992	Remedial										♦	O
Centre County Kepone Superfund Site	PA	1995	Remedial										♦	O
CHEM-SOLV, INC	DE	1998	Remedial										♦	SD
CHISMAN CREEK	VA	1991	Remedial										♦	O
COMMODORE SEMICONDUCTOR GROUP	PA	2000	Remedial										♦	O
CROSSLEY FARM	PA	2001	Remedial										♦	PD
CROYDON TCE	PA	1997	Remedial										♦	O
CRYOCHEM, INC	PA	1998	Remedial										♦	O
Defense General Supply Center (DLA)	VA	1993	Remedial										♦	O
Delaware City PVC	DE	1986	Remedial										♦	O
Delaware Sand & Gravel Landfill	DE	1988	Remedial										♦	PD

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REGION 3

Groundwater Treatment Technology Summary Matrix (continued)

Groundwater Technologies

SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
DELTA QUARRIES & DISPOSAL./STOTLER LANDFILL	PA	1997	Remedial										♦	O
Dover AFB	DE	1993	Remedial										♦	PD
Dover AFB – Target Area 2 Of Area 6	DE	1995	Remedial		♦									O
Dover Gas Light Co.	DE	1994	Remedial										♦	PD
DRAKE CHEMICAL	PA	2000	Remedial										♦	O
DUBLIN TCE SITE	PA	2002	Remedial										♦	PD
E.I. DuPont Newport Superfund Site – South Landfill	DE	2001	Remedial				♦							I
Eastern Diversified Metals	PA	1991	Remedial										♦	PD
ELIZABETHTOWN LANDFILL	PA	1998	Remedial										♦	PD
Fischer and Porter Co	PA	1984	Remedial										♦	O
Greenwood Chemical Co.	VA	1991	Remedial										♦	PD
H & H INC., BURN PIT	VA	2000	Remedial										♦	O
HALBY CHEMICAL CO.	DE	1998	Remedial										♦	PD
HAVERTOWN PCP	PA	1991	Remedial										♦	PD
HELEVA LANDFILL	PA	1999	Remedial										♦	O
HELLERTOWN MANUFACTURING CO	PA	1996	Remedial										♦	O
HENDERSON ROAD	PA	1993	Remedial										♦	O
HUNTERSTOWN ROAD	PA	1993	Remedial										♦	D
INDUSTRIAL LANE	PA	1991	Remedial										♦	O
KEYSTONE SANITATION LANDFILL	PA	1990	Remedial										♦	PD
KIMBERTON SITE	PA	1993	Remedial										♦	O
LINDANE DUMP	PA	1999	Remedial										♦	PD
LORD-SHOPE LANDFILL	PA	1996	Remedial										♦	O
M. W. Manufacturing	PA	1992	Remedial										♦	PD
MALVERN TCE	PA	1998	Remedial										♦	PD
MCADOO ASSOCIATES	PA	1995	Remedial										♦	SD

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REGION 3

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
METAL BANKS	PA	2001	Remedial										♦	PD
MID-ATLANTIC WOOD PRESERVERS, INC.	MD	1991	Remedial										♦	PD
MIDDLETOWN AIR FIELD	PA	1996	Remedial										♦	O
MILL CREEK DUMP	PA	1986	Remedial										♦	O
MODERN SANITATION LANDFILL	PA	2001	Remedial										♦	O
NAVAL AIR DEVELOPMENT CENTER (8 AREAS)	PA	2000	Remedial										♦	O
Naval Surface Warfare Center, Dahlgren, Site 12 – Chemical Burn Area	VA	1997	Remedial	♦										O
NCR Corp.	DE	1991	Remedial										♦	O
NCR Corp.	DE	1991	Remedial	♦										O
NORTH PENN – AREA 1	PA	1998	Remedial										♦	O
NORTH PENN – AREA 12	PA	2000	Remedial										♦	O
NORTH PENN – AREA 6	PA	2000	Remedial										♦	D
OCCIDENTAL CHEMICAL CORP./FIRESTONE TIRE & RUBBER CO.	PA	1993	Remedial										♦	O
OLD CITY OF YORK LANDFILL	PA	1996	Remedial										♦	O
Osborne Landfill	PA	1990	Remedial										♦	PD
PALMERTON ZINC PILE – OU2 & OU4	PA	1988	Remedial										♦	PD
Paoli Rail Yard	PA	1992	Remedial										♦	PD
Patuxent River Naval Air Station	MD	1996	Remedial										♦	PD
RAYMARK	PA	1995	Remedial										♦	O
RECTICON/ALLIED STEEL CORP	PA	2000	Remedial										♦	O
Rentokil Virginia Wood Preserving	VA	1996	Remedial										♦	SD
RESIN DISPOSAL	PA	1991	Remedial										♦	PD
Rhinehart Tire Fire Dump	VA	2000	Remedial										♦	SD
Rodale Manufacturing Co. Inc. Site OU 1	PA	1999	Remedial										♦	PD
Saegertown Industrial Area	PA	1993	Remedial		♦									PD
SALTVILLE WASTE DISPOSAL PONDS	VA	1995	Remedial										♦	PD

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REGION 3

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
SAND, GRAVEL AND STONE	MD	1985	Remedial										♦	O
SAUNDERS SUPPLY CO	VA	2000	Remedial										♦	O
SHRIVER'S CORNER	PA	1995	Remedial										♦	PD
Southern Maryland Wood Treating	MD	1995	Remedial										♦	SD
Standard Chlorine of Delaware, Inc,.	DE	1995	Remedial										♦	D
STANLEY KESSLER	PA	1999	Remedial										♦	O
STRASBURG LANDFILL	PA	1989	Remedial										♦	PD
The Crater Resources Superfund Site	PA	2000	Remedial										♦	PD
Tonolli Corp.	PA	1992	Remedial				♦							O
Tybouts Corner Landfill	DE	1986	Remedial										♦	O
TYSONS DUMP	PA	1998	Remedial										♦	O
U.S. TITANIUM	VA	1997	Remedial										♦	SD
Vienna Superfund Site	WV	2002	Remedial	♦										PD
Washington Gas Light	DC	1999	Remedial										♦	PD
West Virginia Ordnance (US Army)	WV	1988	Remedial										♦	O
WESTINGHOUSE ELEVATOR CO. PLANT	PA	1998	Remedial										♦	O
Whitmoyer Laboratories	PA	1991	Remedial										♦	O
William Dick Lagoons – OU 02	PA	1991	Remedial										♦	D
YORK COUNTY SOLID WASTE/REFUSE LANDFILL	PA	1995	Remedial										♦	O

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REGION 4

Groundwater Treatment Technology Summary Matrix

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
62nd Street Dump	FL	1990	Remedial										♦	SD
Abc One Hour Cleaners	NC	1993	Remedial										♦	O
Aberdeen Pesticide Dumps	NC	1997	Remedial										♦	O
Aberdeen Pesticide Dumps – OU 5	NC	1999	Remedial					♦						O
Aberdeen Pesticide Dumps – OU5 and Route 211 Area	NC	1999	Remedial										♦	PD
AIRCO	KY	1997	Remedial										♦	O
AIRCO PLATING CO	FL	1999	Remedial										♦	O
Alaric Inc. Superfund Site	FL	2002	Remedial										♦	PD
ALLEGANY BALLISTICS LABORATORY (USNAVY)	WV	1998	Remedial										♦	PD
American Creosote Works – OU2 (Phase 1)	FL	1994	Remedial			♦								O
American Creosote Works, Inc. – OU 2 (Phase 2)	FL	1994	Remedial		♦									PD
American Creosote Works, Inc. – Pensacola Pit	FL	1994	Remedial										♦	PD
ANNISTON ARMY DEPOT – SOUTHEAST INDUSTRIAL AREA	AL	1991	Remedial										♦	O
ANODYNE, INC.	FL	1993	Remedial										♦	PD
Arkwright Dump Site	SC	2002	Remedial		♦									PD
B.F. GOODRICH	KY	1997	Remedial										♦	O
Benfield Industries	NC	1992	Remedial										♦	O
Brunswick Wood Preserving Site – OU 1	GA	2002	Remedial						♦					PD
Bypass 601 Groundwater Contamination	NC	1993	Remedial										♦	SD
Cabot/Koppers	FL	1990	Remedial										♦	O
Calhoun Park Area – OU 2	SC	2002	Remedial						♦					D
Cape Fear Wood Preserving	NC	2001	Remedial		♦									O
Cape Fear Wood Preserving	NC	2001	Remedial		♦									O
Cape Fear Wood Preserving	NC	1989	Remedial										♦	O
CAROLAWN, INC	SC	1998	Remedial										♦	O
Carolina Transformer Co.	NC	1991	Remedial										♦	D/I

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REGION 4

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
CARRIER AIR CONDITIONING CO	TN	1996	Remedial										♦	O
Cecil Field Naval Air Station – OU 08	FL	1998	Remedial	♦										O
Cecil Field Naval Air Station – OU 7, Site 16	FL	1999	Remedial	♦										O
CEDARTOWN MUNICIPAL LANDFILL	GA	1994	Remedial										♦	PD
CELANESE CORP. (SHELBY FIBER OPERATIONS)	NC	1993	Remedial										♦	O
CHARLES MACON LAGOON & DRUM STORAGE	NC	1997	Remedial										♦	O
CHEMTRONICS, INC	NC	1993	Remedial										♦	O
Cherry Point Marine Corps Air Station	NC	1997	Remedial										♦	O
Chevron Chemical Company	FL	1996	Remedial	♦										PD
Chevron Chemical Company	FL	1996	Remedial				♦							PD
CIBA-GEIGY CORP. (MCINTOSH PLANT)	AL	2000	Remedial										♦	O
CITY INDUSTRIES, INC	FL	1994	Remedial										♦	O
DISTLER BRICKYARD	KY	1995	Remedial										♦	O
DISTLER FARM	KY	1992	Remedial										♦	O
ELMORE WASTE DISPOSAL	SC	1998	Remedial										♦	O
FCX – Statesville – OU1	NC	1993	Remedial										♦	O
FCX – Statesville – OU 3	NC	1996	Remedial	♦										O
FCX – Washington	NC	1993	Remedial										♦	PD
Fike/Artel Superfund Site	WV	2001	Remedial										♦	PD
FIRESTONE TIRE & RUBBER CO. (ALBANY PLANT)	GA	1998	Remedial										♦	O
Florida Petroleum Reprocessors	FL	2001	Remedial										♦	PD
FLORIDA STEEL CORP	FL	1997	Remedial										♦	O
FORT HARTFORD COAL CO. STONE QUARRY	KY	1999	Remedial										♦	O
GEIGY CHEMICAL CORP. (ABERDEEN PLANT)	NC	1998	Remedial										♦	O
GENERAL ELECTRIC CO./SHEPHERD FARM	NC	2000	Remedial										♦	O
General Electric Company, Shepard Farm Site	NC	1995	Remedial		♦									PD

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REGION 4

Groundwater Treatment Technology Summary Matrix (continued)

SITE NAME	STATE	FY	ACTION	Groundwater Technologies										STATUS
				TECHNOLOGY TYPE										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
GOLD COAST OIL CORP	FL	1992	Remedial										♦	SD
HARRIS CORP. (PALM BAY PLANT)	FL	1998	Remedial										♦	O
HARRIS CORP. (PALM BAY PLANT)	FL	1998	Remedial										♦	O
Helena Chemical Company	SC	1993	Remedial										♦	O
Helena Chemical Company (Tampa Plant)	FL	1996	Remedial										♦	PD
HIPPS ROAD LANDFILL	FL	1994	Remedial										♦	O
HOLLINGSWORTH SOLDERLESS TERMINAL	FL	1993	Remedial										♦	SD
Interstate Lead Co	AL	1995	Remedial										♦	PD
Jacksonville Naval Air Station	FL	1994	Remedial										♦	PD
Jacksonville Naval Air Station – OU3	FL	2000	Remedial	♦										O
Jacksonville Naval Air Station – OU3	FL	2000	Remedial		♦									PD
Jacksonville Naval Air Station – OU3	FL	2000	Remedial						♦					PD
JADCO-HUGHES FACILITY	NC	1997	Remedial										♦	O
JFD ELECTRONICS/CHANNEL MASTER	NC	1992	Remedial										♦	O
KALAMA SPECIALTY CHEMICALS	SC	1999	Remedial										♦	O
KOPPERS CO. INC. (MORRISVILLE PLANT)	NC	1997	Remedial										♦	O
Koppers Co., Inc. (Charleston Plant)	SC	1995	Remedial										♦	O
LANGLEY AIR FORCE BASE/NASA LANGLEY CNTR OU3	VA	1998	Remedial										♦	PD
Leonard Chemical Company	SC	2001	Remedial	♦										PD
Leonard Chemical Company	SC	2001	Remedial	♦										PD
Leonard Chemical Company	SC	2001	Remedial		♦									PD
LEXINGTON COUNTY LANDFILL AREA	SC	1994	Remedial										♦	O
MADISON COUNTY SANITARY LANDFILL	FL	1997	Remedial										♦	O
MALLORY CAPACITOR CO	TN	1996	Remedial										♦	O
Marine Corps Logistics Base – OU 6	GA	2001	Remedial		♦									D
MARTIN-MARIETTA, SODYECO, INC	NC	1999	Remedial										♦	O

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REGION 4

Groundwater Treatment Technology Summary Matrix (continued)

SITE NAME	STATE	FY	ACTION	Groundwater Technologies										STATUS
				TECHNOLOGY TYPE										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
Marzone Inc/Chevron Chemical Company Site – OU 1	GA	2000	Remedial				♦							O
Mathis Brothers Landfill	GA	1993	Remedial										♦	PD
MEDLEY FARM DRUM DUMP	SC	1995	Remedial										♦	O
MEMPHIS DEFENSE DEPOT (DLA) – OU-1	TN	1996	Remedial										♦	O
Memphis Depot – Main Installation Functional Unit 7	TN	2001	Remedial		♦									PD
MIAMI DRUM SERVICES	FL	1993	Remedial										♦	O
Milan Army Ammunition Plant	TN	2000	Remedial										♦	O
MONSANTO CORP. (AUGUSTA PLANT)	GA	1993	Remedial										♦	O
MUNISPORT LANDFILL	FL	1990	Remedial										♦	PD
MURRAY-OHIO DUMP	TN	1994	Remedial										♦	PD
NATIONAL ELECTRIC COIL/COOPER INDUSTRIES	KY	1998	Remedial										♦	O
NATIONAL SOUTHWIRE ALUMINUM CO.	KY	1993	Remedial										♦	O
NATIONAL STARCH & CHEMICAL CORP. – OU1	AL	1994	Remedial										♦	O
NATIONAL STARCH & CHEMICAL CORP. – OU3	AL	1994	Remedial										♦	O
New Hanover County Airport Burn Pit Superfund Site	NC	2000	Remedial	♦										BI
Newport Dump	KY	1987	Remedial										♦	PD
NORTH BELMONT PCE	NC	1997	Remedial										♦	PD
North Carolina State University	NC	1996	Remedial										♦	PD
NORTHWEST 58TH STREET LANDFILL	FL	1987	Remedial										♦	PD
Oak Ridge Reservation	TN	2002	Remedial										♦	PD
Oak Ridge Reservation OU-30	TN	2002	Remedial		♦									PD
OLIN CORP. (MCINTOSH PLANT)	AL	1995	Remedial										♦	O
Paducah Gaseous Diffusion Plant (USDOE) – NE Plume OU	KY	1995	Remedial										♦	O
Paducah Gaseous Diffusion Plant (USDOE) – NW Plume OU	KY	1993	Remedial										♦	O
PALMETTO WOOD PRESERVING	SC	1997	Remedial										♦	O
PARA-CHEM SOUTHERN, INC	SC	2000	Remedial										♦	O

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REGION 4

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
Peak Oil/Bay Drum – OU 2, Site Wide Groundwater	FL	1993	Remedial		♦									PD
PENSACOLA NAVAL AIR STATION	FL	2000	Remedial										♦	PD
Perdido Ground Water Contamination	AL	1988	Remedial										♦	O
PIPER AIRCRAFT/VERO BEACH WATER & SEWER	FL	1998	Remedial										♦	O
Reasor Chemical Company Site	NC	2002	Remedial										♦	PD
Redwing Carriers, Inc. (Saraland) Site	AL	1993	Remedial										♦	D/I
Robins AFB	GA	1995	Remedial										♦	O
Rochester Property	SC	1993	Remedial	♦										O
ROCK HILL CHEMICAL CO	SC	1997	Remedial										♦	O
SANGAMO WESTON/TWELVE-MILE/HARTWELL PCB	SC	1999	Remedial										♦	O
Sapp Battery Salvage	FL	1986	Remedial										♦	PD
Savannah River Site	SC	1996	Remedial										♦	PD
Savannah River Site – OU 28	SC	2000	Remedial									♦		PD
Savannah River Site C Area Rubble Pit	SC	1999	Remedial	♦										PD
SCHUYLKILL METALS CORP	FL	1998	Remedial										♦	SD
SCRDI BLUFF ROAD	SC	1998	Remedial										♦	O
SCRDI DIXIANA	SC	1992	Remedial										♦	O
SHERWOOD MEDICAL INDUSTRIES	FL	1997	Remedial										♦	O
Shuron Inc – OU 01	SC	1998	Remedial	♦										D
SHURON INC.	SC	1998	Remedial										♦	PD
SOLITRON MICROWAVE	FL	2001	Remedial										♦	PD
SOUTHERN SOLVENTS, INC.	FL	1999	Remedial										♦	D
SOUTHERN SOLVENTS, INC.	FL	1999	Remedial						♦					D/I
Stauffer Chemical – OU1	AL	1989	Remedial										♦	O
STAUFFER CHEMICAL CO. (TAMPA PLANT)	FL	2000	Remedial										♦	PD
SYDNEY MINE SLUDGE PONDS	FL	1999	Remedial										♦	O

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REGION 4

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
T.H. AGRICULTURE & NUTRITION CO. (ALBANY PLANT)	GA	1993	Remedial										♦	O
T.H. AGRICULTURE & NUTRITION CO. (MONTGOMERY PLANT)	AL	1998	Remedial										♦	O
Townsend Saw Chain Company	SC	1997	Remedial										♦	O
Townsend Saw Chain Company	SC	1997	Remedial						♦					O
Trans Circuits Inc.	FL	2001	Remedial										♦	PD
Trans Circuits Site	FL	2001	Remedial						♦					PD
TRI-CITY DISPOSAL CO	KY	1996	Remedial										♦	SD
USMC Camp Lejeune Military Base	NC	1995	Remedial										♦	PD
USMC Camp Lejeune Military Base – OU 10, Site 35	NC	1995	Remedial									♦		O
VELSICOL CHEMICAL CORP (HARDEMAN COUNTY)	TN	1998	Remedial										♦	O
Wamchem Inc	SC	1997	Remedial										♦	O
Whitehouse Oil Pits	FL	1992	Remedial										♦	PD
Whitehouse Oil Pits OU 1	FL	1998	Remedial				♦							D
Woolfolk Chemical Works, Inc.	GA	1994	Remedial										♦	PD

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REGION 5

Groundwater Treatment Technology Summary Matrix

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
ACME SOLVENT RECLAIMING INC	IL	1998	Remedial										♦	O
ALGOMA MUNICIPAL LANDFILL	WI	1990	Remedial				♦							PD
Allied Chemical & Ironton Coke	OH	1991	Remedial										♦	O
American Chemical Services, Inc.	IN	1992	Remedial										♦	O
ARROWHEAD REF CO	MN	1997	Remedial										♦	O
AVENUE “E” GROUNDWATER CONTAMINATION	MI	2000	Remedial										♦	SD
BELVIDERE MUNICIPAL LANDFILL	IL	1998	Remedial										♦	SD
BENDIX CORP./ALLIED AUTOMOTIVE	MI	1997	Remedial										♦	PD
BETTER BRITE PLATING CHROME & ZINC	WI	2000	Remedial										♦	O
BIG D CAMPGROUND	OH	1995	Remedial										♦	O
Bofors Nobel	MI	1999	Remedial										♦	O
BUCKEYE RECLAMATION	OH	1991	Remedial										♦	PD
BURROWS SANITATION	MI	1993	Remedial										♦	SD
CENTRAL ILLINOIS PUBLIC SERVICE CO	IL	1995	Remedial										♦	O
CHARLEVOIX MUNICIPAL WELL	MI	1984	Remedial										♦	SD
CHEM-CENTRAL	MI	1995	Remedial										♦	O
CHEM-DYNE CORP	OH	1992	Remedial										♦	O
Chemical Operable Unit – OU2	MI	2002	Remedial		♦									PD
Chemical Operable Unit – OU2	MI	2002	Remedial		♦									PD
CITY DISPOSAL CORP LANDFILL	WI	2000	Remedial										♦	O
Clare Water Supply	MI	1997	Remedial			♦								O
Clare Water Supply	MI	1997	Remedial										♦	PD
Conrail Rail Yard	IN	1994	Remedial										♦	D
CONTINENTAL STEEL CORP.	IN	1998	Remedial										♦	PD
CROSS BROTHERS PAIL RECYCLING (PEMBROKE)	IL	1985	Remedial										♦	SD
DELAVAN MUNICIPAL WELL #4	WI	2000	Remedial										♦	O

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REGION 5

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
DOUGLAS ROAD UNIROYAL INC LANDFILL	IN	2000	Remedial										♦	I
DUELL & GARDNER LANDFILL	MI	1993	Remedial										♦	SD
DUPAGE COUNTY LANDFILL/BLACKWELL FOREST PRESERVE	IL	1998	Remedial										♦	PD
EAST BETHEL TOWNSHIP	MN	2000	Remedial										♦	SD
EAU CLAIRE MUNICIPAL WELL FIELD	WI	1997	Remedial										♦	O
Electrovoice	MI	1992	Remedial										♦	PD
Electrovoice – OU 1	MI	1992	Remedial	♦										C
Enviro. Conservation and Chemical	IN	1987	Remedial										♦	SD
Feed Materials Production Center (USDOE) – Pump & Treat	OH	1996	Remedial										♦	PD
FIELDS BROOK	OH	1997	Remedial										♦	PD
FISHER CALO	IN	1998	Remedial										♦	O
Fisher-Calo	IN	1990	Remedial		♦									C
FMC (Fresno Plant)	MN	1991	Remedial										♦	O
FMC CORP	MN	1992	Remedial										♦	O
FORT WAYNE REDUCTION DUMP	IN	1995	Remedial										♦	O
G & H LDFL	MI	1999	Remedial										♦	O
Galesburg/Koppers – Deep aquifer	IL	2001	Remedial		♦									O
Galesburg/Koppers Shallow Aquifer	IL	1989	Remedial										♦	O
Galesburg/Koppers – Shallow Aquifer OU	IL	2001	Remedial		♦									O
HAGEN FARM	WI	1996	Remedial										♦	O
HEDBLUM INDUSTRIES	MI	1993	Remedial										♦	O
HUNTS DISPOSAL	WI	1997	Remedial										♦	O
IONIA CITY LANDFILL	MI	2000	Remedial										♦	O
K & L Landfill	MI	1990	Remedial										♦	PD
KENTWOOD LANDFILL	MI	1995	Remedial										♦	O
KOHLER CO. LANDFILL	WI	1996	Remedial										♦	O

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REGION 5

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
Koppers Coke – Groundwater OU	MN	1994	Remedial		♦									O
Kummer Sanitary Landfill	MN	1990	Remedial										♦	SD
Kummer Sanitary Landfill – OU 3 (Amendment)	MN	1996	Remedial		♦									C
KYSOR INDUSTRIAL CORP	MI	1996	Remedial										♦	O
Lakeland Disposal Service, Inc.	IN	1993	Remedial										♦	SD
LASALLE ELECTRICAL UTILITIES	IL	1994	Remedial										♦	O
Lauer 1 Sanitary Landfill, (Boundary Road)	WI	1996	Remedial										♦	SD
LEHILLIER MANKATO SITE	MN	1992	Remedial										♦	SD
LEMBERGER LANDFILL INC	WI	1996	Remedial										♦	O
LEMBERGER TRANSPORT & RECYCLING INC	WI	1997	Remedial										♦	O
Lenz Oil Services, Inc. OU1	IL	1999	Remedial										♦	PD
LIQUID DISPOSAL INC	MI	1997	Remedial										♦	O
LONG PRAIRIE GROUNDWATER CON	MN	1997	Remedial										♦	O
Macgillis and Gibbs/Bell Lumber and Pole	MN	1994	Remedial										♦	O
Main Street Well Field	IN	1991	Remedial										♦	PD
MASTER DSPL SERVICE LANDFILL	WI	1997	Remedial										♦	O
MCGRAW-EDISON COMPANY	MI	1998	Remedial										♦	O
MIAMI COUNTY INCINERATOR	OH	1997	Remedial										♦	O
MICHIGAN DISPOSAL SERVICE (CORK STREET LANDFILL)	MI	1991	Remedial										♦	PD
Midco I	IN	1989	Remedial										♦	O
Midco II	IN	1992	Remedial										♦	O
Moss-American Groundwater	WI	1997	Remedial		♦									O
MOTOR WHEEL	MI	1998	Remedial										♦	O
MOUND PLANT (USDOE)	OH	1995	Remedial										♦	O
MUSKEGO SANITARY LANDFILL	WI	1997	Remedial										♦	O
MUSKEGON CHEM CO	MI	1997	Remedial										♦	O

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REGION 5

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
NATIONAL PRESTO INDUSTRIES	WI	1999	Remedial										♦	O
NATIONAL PRESTO INDUSTRIES	WI	1999	Remedial										♦	O
NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT	MN	1990	Remedial										♦	PD
New Brighton/Arden Hills	MN	1993	Remedial										♦	O
New Brighton/Arden Hills	MN	1998	Remedial										♦	PD
NEW LYME LANDFILL	OH	1993	Remedial										♦	SD
Ninth Avenue Dump – OU2	IN	1995	Remedial										♦	O
NORTH BRONSON INDUSTRIAL AREA	MI	1998	Remedial										♦	PD
NORTHERNAIRE PLATING	MI	1996	Remedial										♦	O
Northside Sanitary Landfill	IN	1991	Remedial										♦	PD
NUTTING TRUCK & CASTER CO	MN	1992	Remedial										♦	O
NW MAUTHE COMPANY, INC.	WI	1997	Remedial										♦	O
OAKDALE DUMP SITES	MN	1995	Remedial										♦	O
OCONOMOWOC ELECTROPLATING CO INC	WI	1996	Remedial										♦	O
OLD MILL	OH	1991	Remedial										♦	O
ONALASKA MUNI LANDFILL	WI	1994	Remedial										♦	SD
ORMET CORP	OH	1998	Remedial										♦	O
Ott/Story/Cordova Chemical Co.	MI	1989	Remedial										♦	O
Outboard Marine Company/Waukegan Coke Plant	IL	1999	Remedial										♦	PD
Peerless Plating	MI	1992	Remedial										♦	O
PENTA WOOD PRODUCTS INCORPORATED	WI	2000	Remedial										♦	O
PERHAM ARSENIC	MN	1998	Remedial										♦	O
Powell Road Landfill	OH	1993	Remedial										♦	PD
Pristine, Inc.	OH	1988	Remedial										♦	O
Rasmussens Dump	MI	2001	Remedial						♦					C
RASMUSSEN'S DUMP	MI	1995	Remedial										♦	O

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REGION 5

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**										**STATUS**
REILLY TAR & CHEM (INDIANAPOLIS PLANT)	IN	2000	Remedial										♦	O
REILLY TAR & CHEM ST LOUIS PARK	MN	1997	Remedial										♦	O
REILLY TAR & CHEMICAL CORP (DOVER PLANT)	OH	2000	Remedial										♦	O
Rickenbacker Air National Guard Base	OH	2000	Remedial										♦	PD
Rickenbacker Air National Guard Base – Site 2	OH	2000	Remedial				♦							PD
Rockwell International Superfund Site	MI	2002	Remedial										♦	PD
Rockwell International Superfund Site – OU 2	MI	2002	Remedial				♦							PD
ROSE TOWNSHIP DUMP	MI	1996	Remedial										♦	O
Roto-Finish Co, Inc.	MI	1997	Remedial										♦	PD
Sangamo Electric Dump/Crab Orchard National Wildlife Refuge – OU MISCA	IL	2002	Remedial										♦	PD
5Sangamo Electric Dump/Crab Orchard National Wildlife Refuge – PCB Areas OU	IL	2000	Remedial					♦						D
Sauget Area 2 Superfund Site	IL	2002	Remedial										♦	PD
SCHMALZ DUMP	WI	1993	Remedial										♦	SD
SEYMOUR RECYCLING CORP	IN	1993	Remedial										♦	O
SKINNER LANDFILL	OH	1993	Remedial										♦	SD
South Macomb Disposal Authority	MI	1991	Remedial										♦	O
Southeast Rockford Groundwater Contamination	IL	2002	Remedial	♦										PD
SOUTHWEST OTTAWA COUNTY LANDFILL	MI	1994	Remedial										♦	O
Spartan Chemical Co.	MI	1993	Remedial										♦	PD
Spiegelberg Landfill	MI	1986	Remedial										♦	SD
SPIEGELBERG LANDFILL	MI	1995	Remedial										♦	O
Springfield Township Dump	MI	1990	Remedial	♦										O
SPRINGFIELD TOWNSHIP DUMP	MI	2000	Remedial										♦	O
STURGIS MUNICIPAL WELLS	MI	1997	Remedial										♦	O
SUMMIT NATIONAL LIQUID DISPOSAL SERVICE	OH	1995	Remedial										♦	O

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REGION 5

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**										**STATUS**
Tar Lake	MI	1992	Remedial	♦										PD
Thermo-Chem, Inc.	MI	1991	Remedial										♦	O
Thermo-Chem, Inc. – OU 1	MI	1991	Remedial	♦										O
Thomas Solvent Raymond Road – OU 1	MI	1985	Remedial										♦	O
TIPPECANOE SANITARY LANDFILL, INC.	IN	1997	Remedial										♦	PD
TRI-STATE PLATING	IN	1992	Remedial										♦	SD
TRW INC MINERVA PLT	OH	1994	Remedial										♦	O
UNIVERSITY MINNESOTA (ROSEMOUNT RES CEN)	MN	1994	Remedial										♦	SD
US AIR FORCE WRIGHT-PATTERSON AFB	OH	1999	Remedial										♦	PD
US AVIEX	MI	1993	Remedial										♦	O
Velsicol Chemical Corp.	IL	1982	Remedial										♦	O
VELSICOL CHEMICAL CORP. (ILLINOIS)	IL	1994	Remedial										♦	O
VERONA WELL FIELD	MI	1997	Remedial										♦	O
Verona Well Field – Dual Blocking Well/ Annex/ Paint Shop	MI	1991	Remedial										♦	O
WAITE PARK WELLS	MN	1999	Remedial										♦	O
WASH KING LAUNDRY	MI	1993	Remedial										♦	O
WASHINGTON COUNTY LANDFILL	MN	1991	Remedial										♦	SD
WASTE DSPL ENGINEERING INC	MN	1995	Remedial										♦	O
WASTE INC LDFL	IN	1998	Remedial										♦	O
WAUSAU GROUNDWATER CONTAMINATION	WI	1994	Remedial										♦	O
Wayne Waste Oil	IN	1990	Remedial		♦									O
WAYNE WASTE OIL	IN	1995	Remedial										♦	O
WHITTAKER CORP –	MN	1992	Remedial										♦	SD
WINDOM DUMP	MN	1992	Remedial										♦	SD
WOODSTOCK MUNICIPAL LANDFILL	IL	1993	Remedial										♦	PD
Wright-Patterson AFB Groundwater – OU12	OH	1999	Remedial						♦					C

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REGION 5

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
Zanesville Well Field	OH	1991	Remedial	♦										O
ZANESVILLE WELL FIELD	OH	1996	Remedial										♦	O

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REGION 6

Groundwater Treatment Technology Summary Matrix

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
Air Force Plant 4	TX	1996	Remedial										♦	O
Air Force Plant 4 – Building 181	TX	1996	Remedial			♦								C
Alcoa (Point Comfort)/Lavaca Bay Site	TX	2002	Remedial										♦	PD
American Creosote Works, Inc. – Winnfield Plant	LA	1993	Remedial		♦									O
American Creosote Works, Inc. – Winnfield Plant	LA	1993	Remedial										♦	PD
Arkwood Inc.	AR	1990	Remedial										♦	PD
AT&SF Albuquerque Superfund Site	NM	2002	Remedial										♦	PD
BAILEY WASTE DISPOSAL	TX	1997	Remedial										♦	SD
BAYOU BONFOUCA	LA	1997	Remedial										♦	O
Brio Refining	TX	1997	Remedial										♦	PD
CIMARRON MINING CORP	NM	1992	Remedial										♦	SD
City of Perryton Well #2	TX	1999	Remedial										♦	D
CRYSTAL CHEMICAL CO.	TX	1997	Remedial										♦	O
Delatte Metals Superfund Site	LA	2000	Remedial				♦							BI
FRENCH, LTD	TX	1994	Remedial										♦	SD
Fruit Avenue Plume Site	NM	2001	Remedial						♦					D
Fruit Avenue Plume Site	NM	2001	Remedial										♦	PD
GENEVA INDUSTRIES/FUHRMANN ENERGY	TX	1993	Remedial										♦	O
HARDAGE/CRINER – Pump and Treat	OK	1997	Remedial										♦	O
Highway 71/72 Refinery Site	LA	2000	Remedial										♦	PD
Highway 71/72 Refinery Site	LA	2000	Remedial			♦								PD
Koppers Co Inc – Texarkana Plant	TX	2002	Remedial			♦								O
Longhorn Army Ammunition Plant	TX	1995	Remedial										♦	O
Marion Pressure Treating Company	LA	2002	Remedial										♦	PD
Midland Products	AR	1988	Remedial										♦	O
Mid-South Wood Products	AR	1987	Remedial										♦	O

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REGION 6

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
MOTCO	TX	1989	Remedial										♦	PD
North Cavalcade Street	TX	1988	Remedial										♦	O
North Railroad Avenue Plume Superfund Site	NM	2001	Remedial		♦									D
North Railroad Avenue Plume Superfund Site	NM	2001	Remedial								♦			D
ODESSA CHROMIUM #1	TX	1994	Remedial										♦	O
ODESSA CHROMIUM #2 (ANDREWS HIGHWAY)	TX	1994	Remedial										♦	SD
Odessa Chromium I Superfund Site	TX	1988	Remedial										♦	SD
Odessa Chromium II Superfund Site	TX	1988	Remedial										♦	SD
Odessa Chromium II Superfund Site	TX	1994	Remedial										♦	SD
Odessa Chromium II Superfund Site	TX	2000	Remedial						♦					O
Oklahoma Refining Co.	OK	1992	Remedial										♦	PD
Old Inger Oil Refinery	LA	1984	Remedial										♦	PD
Petro-Chemical Systems, Inc.	TX	1998	Remedial										♦	O
Petro-Chemical Systems, Inc. – OU 2	TX	1998	Remedial		♦									O
Prewitt Abandoned Refinery	NM	1992	Remedial	♦										O
PREWITT ABANDONED REFINERY	NM	1996	Remedial										♦	O
SOL LYNN/INDUSTRIAL TRANSFORMERS	TX	1993	Remedial										♦	O
SOUTH CAVALCADE STREET	TX	2000	Remedial										♦	O
South Valley – OU 3	NM	1996	Remedial										♦	O
South Valley – OU 6	NM	1996	Remedial										♦	O
SOUTHERN SHIPBUILDING	LA	1997	Remedial										♦	SD
Sprague Road Ground Water Plume	TX	2000	Remedial										♦	D
Texarkana Wood Preserving	TX	1993	Remedial										♦	PD
Tinker AFB	OK	1990	Remedial										♦	PD
Tinker AFB – Soldier Creek And Building 3001	OK	1990	Remedial		♦									I
UNITED NUCLEAR CORP	NM	1998	Remedial										♦	O
Vertac, Inc.	AR	1996	Remedial										♦	O

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REGION 7

Groundwater Treatment Technology Summary Matrix

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
10th Street NPL Site	NE	2001	Remedial										♦	PD
10th Street Site – OU 2	NE	2001	Remedial	♦										O
29th and Mead Ground Water Contamination	KS	1992	Remedial										♦	PD
57TH AND NORTH BROADWAY STREETS SITE	KS	1998	Remedial										♦	PD
57th And North Broadway Streets Site – OU 01	KS	1999	Remedial									♦		D
Ace Services	KS	1999	Remedial										♦	BI
BRUNO CO-OP ASSOCIATION/ASSOCIATED PROPERTIES	NE	1998	Remedial										♦	PD
CHEROKEE COUNTY	KS	1997	Remedial										♦	PD
Cleburn Street Well	NE	1996	Remedial										♦	PD
Cleburn Street Well – OU5	NE	2001	Remedial	♦										PD
CONSERVATION CHEMICAL CO	MO	1991	Remedial										♦	O
CORNHUSKER ARMY AMMUNITION PLANT	NE	1994	Remedial										♦	O
DES MOINES TCE	IA	1998	Remedial										♦	O
ELECTRO-COATINGS, INC	IA	2000	Remedial										♦	O
FAIRFIELD COAL GASIFICATION PLANT	IA	1995	Remedial										♦	SD
Findett	MO	1989	Remedial										♦	O
Former Nebraska Ordnance Plant	NE	1997	Remedial										♦	PD
FORT RILEY	KS	1997	Remedial										♦	PD
General Motors Corporation, Former AC Rochester Facility Site	IA	2001	Remedial		♦									PD
Hastings Groundwater Contamination	NE	1993	Remedial										♦	PD
Hastings Groundwater Contamination- Colorodo Ave, OU 1	NE	1991	Remedial	♦										I
John Deere	IA	1989	Remedial										♦	O
Kem-Pest Laboratories	MO	1991	Remedial										♦	PD
Lake City Army Ammu. Plant (NW Lagoon) – OU 3	MO	1998	Remedial				♦							O
LAKE CITY ARMY AMMUNITION PLANT (NORTHWEST LAGOON)	MO	1999	Remedial										♦	PD

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REGION 7

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
LEE CHEMICAL	MO	1994	Remedial										♦	O
Lehigh Portland Cement	IA	1991	Remedial										♦	O
LINDSAY MANUFACTURING CO	NE	1995	Remedial										♦	O
Mason City Coal Gasification Site	IA	2000	Remedial										♦	PD
Mcgraw Edison	IA	1993	Remedial										♦	PD
NORTHWESTERN STATES PORTLAND CEMENT CO	IA	1994	Remedial										♦	O
OBEE ROAD – Pump & Treat	KS	1994	Remedial										♦	O
Ogallala Groundwater Contamination – OU1	NE	1999	Remedial										♦	PD
ORONOGO-DUENWEG MINING BELT	MO	1998	Remedial										♦	PD
Peoples Natural Gas	IA	1991	Remedial	♦										I
SHERWOOD MEDICAL CO	NE	1999	Remedial										♦	O
SOLID STATE CIRCUITS, INC	MO	1994	Remedial										♦	O
STROTHER FIELD INDUSTRIAL PARK	KS	1994	Remedial										♦	I
Valley Park TCE Site – OU2	MO	2001	Remedial										♦	D
Valley Park Tce Site Wainwright – OU1	MO	1994	Remedial										♦	SD
VOGEL PAINT & WAX CO	IA	1994	Remedial										♦	O
WAVERLY GROUND WATER CONTAMINATION	NE	1994	Remedial										♦	SD
Weldon Spring Chemical Plant – OU 2	MO	2000	Remedial						♦					C
Well Number 3 Subsite	NE	2001	Remedial										♦	I
WHITE FARM EQUIPMENT CO. DUMP	IA	1990	Remedial										♦	SD

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REGION 8

Groundwater Treatment Technology Summary Matrix

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	**STATE**	**FY**	**ACTION**	**TECHNOLOGY TYPE**										**STATUS**
Anaconda Co. Smelter	MT	1991	Remedial										♦	PD
ARSENIC TRIOXIDE SITE	ND	1988	Remedial										♦	PD
BAXTER/UNION PACIFIC TIE TREATING	WY	1986	Remedial										♦	O
BRODERICK WOOD PRODUCTS	CO	1996	Remedial										♦	O
Burlington Northern (Somers Plant)	MT	1989	Remedial										♦	O
Burlington Northern (Somers Plant)	MT	1989	Remedial		♦									O
CALIFORNIA Gulch	CO	1988	Remedial										♦	PD
CENTRAL CITY, CLEAR CREEK	CO	1991	Remedial										♦	O
CHEMICAL SALES CO	CO	2000	Remedial										♦	SD
Chemical Sales Company – OU 1	CO	1991	Remedial	♦										I
EAGLE MINE	CO	1993	Remedial										♦	O
Ellsworth AFB	SD	1997	Remedial										♦	PD
Ellsworth AFB – OU 1	SD	1995	Remedial			♦								O
F.E. Warren AFB – OU2	WY	1997	Remedial				♦							O
F.E. WARREN AIR FORCE BASE	WY	2001	Remedial										♦	PD
Hill AFB	UT	1997	Remedial										♦	PD
Idaho Pole Company	MT	1998	Remedial										♦	O
Idaho Pole Company	MT	1992	Remedial		♦									O
Kennecott South Zone Site	UT	2002	Remedial										♦	PD
LIBBY GROUND WATER CONTAMINATION	MT	1993	Remedial										♦	O
Libby Groundwater Contamination	MT	1989	Remedial		♦									O
Lockheed/Martin (Denver Aerospace)	CO	1990	Remedial										♦	PD
Lowry Landfill	CO	1994	Remedial										♦	PD
MARSHALL LANDFILL	CO	1993	Remedial										♦	O
Montana Pole and Treating Plant	MT	1993	Remedial										♦	O
Montana Pole And Treating Plant – Groundwater OU	MT	1993	Remedial		♦									O

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REGION 8

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
MONTICELLO MILL TAILINGS (USDOE)	UT	1998	Remedial										◆	PD
Monticello Mill Tailings (USDOE) – OU 03	UT	1998	Remedial				◆							O
MYSTERY BRIDGE RD/U.S. HIGHWAY 20	WY	1994	Remedial										◆	SD
OGDEN DEFENSE DEPOT – OU2	UT	1995	Remedial										◆	O
Rocky Flats Plant (USDOE)	CO	1997	Remedial										◆	PD
Rocky Flats Plant (USDOE) – Buffer Zone	CO	1992	Remedial				◆							O
Rocky Mountain Arsenal	CO	1996	Remedial										◆	PD
SAND CREEK INDUSTRIAL	CO	1993	Remedial										◆	PD
Sand Creek Industrial – OU 4	CO	1994	Remedial			◆								C
SHARON STEEL CORP. (MIDVALE TAILINGS)	UT	1994	Remedial										◆	PD
Silver Bow Creek/Butte Area	MT	1996	Remedial										◆	PD
Silver Bow Creek/Butte Area – Rocker Timber Framing And Treatment Plant OU	MT	1996	Remedial						◆					C
Summitville Mine	CO	2001	Remedial										◆	PD
URAVAN URANIUM PROJECT (UNION CARBIDE CORP.)	CO	1987	Remedial										◆	O
Utah Power & Light/American Barrel	UT	1993	Remedial										◆	PD
WASATCH CHEMICAL CO. (LOT 6)	UT	1997	Remedial										◆	O
ADVANCED MICRO DEVICES, INC	CA	1993	Remedial										◆	O

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REGION 9

Groundwater Treatment Technology Summary Matrix

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
ADVANCED MICRO DEVICES, INC. – BUILDING 915	CA	1992	Remedial										♦	O
Aerojet-General Corporation	CA	2001	Remedial										♦	PD
ANDERSEN AIR FORCE BASE OU3	GU	1998	Remedial										♦	PD
Apache Powder Co.	AZ	1994	Remedial										♦	PD
APPLIED MATERIALS	CA	1993	Remedial										♦	O
BARSTOW MARINE CORPS LOGISTICS BASE	CA	1998	Remedial										♦	PD
Barstow Marine Corps Logistics Base – OU 01	CA	1998	Remedial	♦										O
BECKMAN INSTRUMENTS – PORTERVILLE PLANT	CA	1993	Remedial										♦	O
Brown & Bryant	CA	1994	Remedial										♦	PD
Castle AFB	CA	1997	Remedial										♦	PD
COAST WOOD PRESERVING	CA	1989	Remedial										♦	SD
Cooper Drum Company	CA	2002	Remedial						♦					D
Cooper Drum Company	CA	2002	Remedial			♦								D
Cooper Drum Company	CA	2002	Remedial										♦	PD
CTS PRINTEX, INC	CA	1992	Remedial										♦	O
DEL AMO	CA	1999	Remedial										♦	PD
Del Norte County Pesticide Storage Area	CA	1986	Remedial	♦										C
DEL NORTE PESTICIDE STORAGE	CA	1992	Remedial										♦	SD
Fairchild Semiconductor (Mt. View) – Siemens/Sobrato (455 & 487 Middlefield Road)	CA	1989	Remedial	♦										O
FAIRCHILD SEMICONDUCTOR CORP (MT VIEW)	CA	1999	Remedial										♦	O
FAIRCHILD SEMICONDUCTOR CORP (S SAN JOSE)	CA	1992	Remedial										♦	O
FIRESTONE TIRE&RUBBER CO. (SALINAS PLANT)	CA	1992	Remedial										♦	O
Former El Toro Marine Corps Air Station	CA	2002	Remedial										♦	PD
FORT ORD	CA	1997	Remedial										♦	PD
Fort Ord – Basewide Sites 2/12	CA	1997	Remedial										♦	PD

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REGION 9

Groundwater Treatment Technology Summary Matrix (continued)

SITE NAME	STATE	FY	ACTION	Groundwater Technologies TECHNOLOGY TYPE										STATUS
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
Fort Ord – OU1 Fire Drill Area	CA	1995	Remedial										♦	O
Fort Ord – OU2 Landfill	CA	1994	Remedial										♦	PD
FRESNO MUNICIPAL SANITARY LANDFILL	CA	1996	Remedial										♦	O
George AFB	CA	1994	Remedial										♦	O
Hassayampa Landfill	AZ	1992	Remedial										♦	O
HEWLETT-PACKARD (620-640 PAGE MILL ROAD)	CA	1997	Remedial										♦	O
Hexcel	CA	1993	Remedial										♦	PD
IBM (San Jose)	CA	1989	Remedial										♦	PD
Indian Bend Wash Area	AZ	2001	Remedial										♦	O
INTEL CORP. (MOUNTAIN VIEW PLANT)	CA	1999	Remedial										♦	O
INTEL CORP. (SANTA CLARA III)	CA	1992	Remedial										♦	O
Intel, Mountain View	CA	1989	Remedial										♦	O
INTERSIL INC./SIEMENS COMPONENTS	CA	1992	Remedial										♦	O
IRON MOUNTAIN MINE	CA	1997	Remedial										♦	PD
J.H. Baxter	CA	1998	Remedial										♦	O
JASCO CHEMICAL CORP	CA	1992	Remedial										♦	PD
Jasco Chemical Corp.	CA	1992	Remedial										♦	O
Koppers – Oroville Plant	CA	1999	Remedial		♦									O
Koppers Company Inc. Site	CA	1989	Remedial										♦	O
Lawrence Livermore National Laboratory	CA	1997	Remedial										♦	PD
Lawrence Livermore National Laboratory (USDOE)	CA	1992	Remedial										♦	PD
LORENTZ BARREL & DRUM CO	CA	1998	Remedial										♦	O
March Air Force Base	CA	1996	Remedial										♦	PD
Marine Corps Air Station	AZ	2000	Remedial										♦	PD
Marine Corps Air Station Yuma – OU 1	AZ	2000	Remedial	♦										O
Mather AFB	CA	1996	Remedial										♦	O

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REGION 9

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
McClellan AFB	CA	1995	Remedial										♦	O
MCCOLL	CA	1993	Remedial										♦	PD
MCCORMICK & BAXTER CREOSOTING CO.	CA	1999	Remedial										♦	PD
Mesa Area Ground Water Contamination	AZ	1991	Remedial										♦	PD
MICRO STORAGE/INTEL MAGNETICS	CA	1992	Remedial										♦	O
Modesto Superfund site	CA	1997	Remedial										♦	I
MOFFETT NAVAL AIR STATION	CA	1996	Remedial										♦	PD
MONOLITHIC MEMORIES	CA	1994	Remedial										♦	O
MONTROSE CHEMICAL CORP.	CA	1999	Remedial										♦	PD
Motorola 52nd Street	AZ	1994	Remedial										♦	PD
Muscoy	CA	1995	Remedial										♦	I
NATIONAL SEMICONDUCTOR CORP	CA	1998	Remedial										♦	O
NEWMARK GROUND WATER CONTAMINATION	CA	1995	Remedial										♦	PD
Norton AFB	CA	1994	Remedial										♦	SD
PACIFIC COAST PIPE LINES	CA	1996	Remedial										♦	O
Phillips [Formerly Signetics (Amd 901) (Trw)]	CA	1991	Remedial										♦	PD
Phoenix Goodyear Airport Area (South Facility) – Subunit A	AZ	1996	Remedial	♦										O
Phoenix-Goodyear Airport Area (North Facility)	AZ	1989	Remedial										♦	PD
PURITY OIL SALES, INC.	CA	1989	Remedial										♦	O
RAYTHEON CORP	CA	1999	Remedial										♦	O
Raytheon, Mountain View	CA	1989	Remedial										♦	O
Riverbank Army Ammunition Plant	CA	1994	Remedial										♦	O
Sacramento Army Depot	CA	1995	Remedial										♦	O
SAN FERNANDO VALLEY (AREA 1)	CA	1989	Remedial										♦	O
SAN FERNANDO VALLEY (AREA 2)	CA	1993	Remedial										♦	O
SAN GABRIEL VALLEY (AREA 2)	CA	1994	Remedial										♦	PD

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REGION 9

Groundwater Treatment Technology Summary Matrix (continued)

SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE Groundwater Technologies										STATUS
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SAN GABRIEL VALLEY (AREA 4)	CA	1998	Remedial										♦	D
San Gabriel Valley Superfund Site	CA	1993	Remedial										♦	PD
Schofield Barracks (US Army)	HI	1997	Remedial										♦	PD
Selma Pressure Treating	CA	1988	Remedial										♦	O
Sharpe Army Depot	CA	1993	Remedial										♦	O
SOLA OPTICAL USA, INC	CA	1992	Remedial										♦	O
Solvent Service	CA	1990	Remedial										♦	PD
Southern California Edison, Visalia Pole Yard	CA	1994	Remedial										♦	O
SPECTRA-PHYSICS, INC	CA	1992	Remedial										♦	O
STRINGFELLOW	CA	1990	Remedial										♦	O
SYNERTEK, INC. (BUILDING 1)	CA	1992	Remedial										♦	O
TELEDYNE SEMICONDUCTOR	CA	1992	Remedial										♦	O
Tracy Defense Depot (US DLA)	CA	1993	Remedial										♦	O
Travis AFB	CA	1998	Remedial		♦									O
Travis AFB – OU 1	CA	1998	Remedial			♦								O
TRAVIS AIR FORCE BASE	CA	1999	Remedial										♦	PD
TRW MICROWAVE, INC (BUILDING 825)	CA	1993	Remedial										♦	O
Tucson International Airport Property	AZ	1997	Remedial										♦	O
Valley Wood Preserving, Inc.	CA	1991	Remedial										♦	O
Van Waters & Rogers	CA	1991	Remedial										♦	PD
WATKINS-JOHNSON CO. (STEWART DIVISION)	CA	1994	Remedial										♦	O
Western Pacific Railroad Co.	CA	1997	Remedial										♦	PD
WESTINGHOUSE ELECTRIC CORP. (SUNNYVALE)	CA	2000	Remedial										♦	O
WILLIAMS AIR FORCE BASE	AZ	1993	Remedial										♦	PD

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REGION 10

Groundwater Treatment Technology Summary Matrix

SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
Adak Naval Air Station	AK	2000	Remedial										♦	PD
AMERICAN CROSSARM & CONDUIT CO.	WA	1993	Remedial										♦	PD
AMERICAN LAKE GARDENS/MCCHORD AFB	WA	1994	Remedial										♦	O
BANGOR ORDNANCE DISPOSAL	WA	1999	Remedial										♦	O
Boomsnub/Airco Superfund Site	WA	2000	Remedial									♦		O
Boomsnub/Airco Superfund Site	WA	2000	Remedial										♦	PD
BUNKER HILL MINING & METALLURGICAL COMPLEX	ID	1992	Remedial										♦	PD
Cascade Corporation – Troutdale Gravel Aquifer	OR	1997	Remedial										♦	PD
Colbert Landfill	WA	1997	Remedial										♦	O
Commencement Bay, Nearshore/Tideflats	WA	1991	Remedial										♦	O
COMMENCEMENT BAY, SOUTH TACOMA CHANNEL	WA	1999	Remedial										♦	O
East Multnomah County Groundwater Contamination	OR	1997	Remedial										♦	PD
East Multnomah County Groundwater Contamination – Cascade Corporation, Troutdale Gravel Aquifer	OR	1997	Remedial	♦										C
EASTERN MICHAUD FLATS CONTAMINATION OU1	ID	1998	Remedial										♦	PD
Elmendorf AFB	AK	1992	Remedial										♦	PD
Elmendorf AFB – OU 6 And Source Area Ss19, Perched Aquifer Groundwater at Sd15	AK	1997	Remedial			♦								O
Fairchild Air Force Base	WA	1993	Remedial										♦	O
Fairchild Air Force Base – Priority 1 OUs (OU 2) Ft-1	WA	1993	Remedial	♦										O
Fort Lewis Logistics Center	WA	1990	Remedial							♦				D
FORT LEWIS LOGISTICS CENTER	WA	1990	Remedial										♦	O
Fort Lewis Military Reservation – Landfill 4	WA	1993	Remedial	♦										C
Fort Richardson	AK	1997	Remedial										♦	PD
Fort Richardson – OU B	AK	1997	Remedial	♦										C
Fort Richardson – OU B	AK	1997	Remedial			♦								C
Fort Wainwright – OU 2 – Building 1168 Leach Well	AK	1997	Remedial	♦										O

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REGION 10

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
Fort Wainwright – OU 2 – DRMO Yard	AK	1997	Remedial	♦										O
Fort Wainwright – OU 3	AK	1996	Remedial	♦										O
Fort Wainwright – OU 4	AK	1996	Remedial	♦										O
Fort Wainwright – OU 5 WQFS1	AK	1999	Remedial	♦										O
Fort Wainwright – OU 5 WQFS2	AK	1999	Remedial	♦										O
Fort Wainwright – OU 5 WQFS3	AK	1999	Remedial	♦										O
Frontier Hard Chrome Inc – OU 1 and 2	WA	2001	Remedial				♦							D
Frontier Hard Chrome Inc – OU 1 and 2	WA	2001	Remedial						♦					D
Frontier Hard Chrome Inc – OU 1 and 2	WA	2001	Remedial						♦					PD
Frontier Hard Chrome, Inc.	WA	1988	Remedial										♦	PD
GOULD, INC.	OR	1997	Remedial										♦	PD
Hanford 200 Area (USDOE)	WA	1995	Remedial										♦	O
Hanford Site – 100 Area	WA	1996	Remedial										♦	O
Hanford Site – 100 Area	WA	1996	Remedial										♦	O
Hanford Site – 100 Area – OU 2	WA	2000	Remedial						♦					O
Harbor Island (Lead)	WA	1993	Remedial										♦	O
Idaho National Engineering and Environmental Laboratory (USDOE)	ID	1995	Remedial										♦	PD
Idaho National Engineering and Environmental Laboratory (USDOE) – Test Area North OU 1-07B	ID	2001	Remedial		♦									PD
Kaiser Aluminum	WA	2002	Remedial										♦	PD
LAKEWOOD SITE	WA	1992	Remedial										♦	O
MARTIN-MARIETTA ALUMINUM CO.	OR	1988	Remedial										♦	O
MCCHORD AFB (WASH RACK/TREATMENT AREA)	WA	1992	Remedial										♦	PD
MCCORMICK & BAXTER CREOSOTING CO. (PORTLAND PLANT)	OR	1996	Remedial										♦	PD
NAVAL AIR STATION, WHIDBEY ISLAND (AULT)	WA	1997	Remedial										♦	SD
NAVAL UNDERSEA WARFARE ENGINEERING STATION (4 WASTE AREAS)	WA	1998	Remedial										♦	PD

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REGION 10

Groundwater Treatment Technology Summary Matrix (continued)

				Groundwater Technologies										
				Air Sparging	Bioremediation	Multi-Phase Extraction	Permeable Reactive Barrier	Phytoremediation	Chemical Treatment	In Situ Thermal Treatment	Flushing	In-Well Air Stripping	Pump and Treat	
SITE NAME	STATE	FY	ACTION	TECHNOLOGY TYPE										STATUS
Naval Undersea Warfare Station (4 Areas) – OU 01	WA	1998	Remedial					♦						O
North Market Street	WA	2000	Remedial	♦										O
NORTHSIDE LANDFILL	WA	1993	Remedial										♦	O
NORTHWEST PIPE & CASING/HALL PROCESS COMPANY	OR	2001	Remedial										♦	PD
Northwest Pipe and Casing Company/Hall Process Company – OU 2	OR	2001	Remedial									♦		PD
Palermo Wellfield	WA	2000	Remedial										♦	PD
Reynolds Metal Company	OR	2002	Remedial										♦	PD
SILVER MOUNTAIN MINE	WA	1990	Remedial										♦	PD
Teledyne Wah Chang	OR	1994	Remedial										♦	O
TULALIP LANDFILL	WA	1996	Remedial										♦	PD
U.S. Naval Submarine Base – OU 8	WA	2000	Remedial		♦									PD
Umatilla Chemical Depot (Lagoons)	OR	1994	Remedial										♦	O
Union Pacific Railroad Tie Treatment	OR	1996	Remedial										♦	PD
UNITED CHROME PRODUCTS, INC	OR	1992	Remedial										♦	O
VANCOUVER WATER STATION #1 CONTAMINATION	WA	1998	Remedial										♦	PD
VANCOUVER WATER STATION #4 CONTAMINATION	WA	1999	Remedial										♦	O
WESTERN PROCESSING CO., INC	WA	1992	Remedial										♦	O
Wyckoff/Eagle Harbor	WA	1994	Remedial										♦	PD
Wycoff/Eagle Harbor – Soil	WA	2000	Remedial							♦				PD

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APPENDIX C

TREATMENT TRAINS WITH INNOVATIVE TECHNOLOGIES

Superfund Remedial Actions:
Treatment Trains with Innovative Technologies

Air Sparging Followed by

Soil Vapor Extraction	Barstow Marine Corps Logistics Base – OU 01	CA
Soil Vapor Extraction	Burgess Brothers Landfill – OU 01	VT
Soil Vapor Extraction	Cecil Field Naval Air Station – OU7, Site 16, SVE	FL
Soil Vapor Extraction	Chemical Sales Company – OU 1	CO
Soil Vapor Extraction	East Multnomah County Groundwater Contamination – Cascade Corporation, Troutdale Gravel Aquifer	OR
Soil Vapor Extraction	FCX – Statesville – OU 3	NC
Soil Vapor Extraction	Fort Lewis Military Reservation – Landfill 4	WA
Soil Vapor Extraction	Fort Wainwright OU 5 WQFS3	AK
Soil Vapor Extraction	Kentucky Avenue Wellfield – OU 3	NY
Soil Vapor Extraction	Naval Surface Warfare Center, Dahlgren, Site 12 – Chemical Burn Area	VA
Soil Vapor Extraction	Otis Air Natioinal Guard – Fuel Spill 12	MA
Soil Vapor Extraction	Pease Air Force Base – Site 45	NH
Soil Vapor Extraction	Southeast Rockford Groundwater Contamination – OU 3	IL
Soil Vapor Extraction	Thermo-Chem, Inc OU1	MI
Soil Vapor Extraction	Vienna Superfund Site	WV

Bioremediation Followed by

Flushing	Eastland Woolen Mill – OU1	ME
Pump and Treat	Petro-Chemical Systems, Inc. – OU 2	TX
Soil Vapor Extraction	Fisher-Calo	IN
Soil Vapor Extraction	Shore Realty (Formerly Applied Environmental Services) – Groundwater OU	NY
Soil Vapor Extraction	Wayne Waste Oil	IN
Solidification/Stabilization	French Limited	TX
Solidification/Stabilization	Gulf Coast Vacuum Services – OU 1	LA
Solidification/Stabilization	Penta Wood Products – OU 01	WI
Solidification/Stabilization	Vogel Paint & Wax	IA

Chemical Treatment Followed by

Multi-Phase Extraction	Cooper Drum Company	CA
Neutralization	Tex-Tin OU 1 (ROD Amendment)	TX
Solidification/Stabilization	JFD Electronics/Channel Master	NC
Solidification/Stabilization	Palmetto Wood Preserving	SC
Thermal Desorption	Wide Beach Development Site	NY

Flushing Followed by

Bioremediation	Montana Pole And Treating Plant – Area Under Interstate 15/90	MT
Bioremediation Followed by Soil Vapor Extraction	North Railroad Avenue Plume Superfund Site	NM

Multi-Phase Extraction Followed by

Bioremediation	American Creosote Works OU2	FL
Soil Vapor Extraction	Fort Richardson – OU B	AK

Soil Vapor Extraction Followed by

Flushing	Jadco-Hughes Facility	NC

Soil Washing Followed by

Bioremediation	Cabot/Koppers - Koppers OU	FL
Thermal Desorption and Chemical Treatment	Myers Property	NJ

Solvent Extraction Followed by

Incineration	United Creosoting Co.	TX
Solidification/Stabilization	Arctic Surplus	AK
Vitrification	Idaho National Engineering Laboratory – Pit 9, OU 7-10	ID

Thermal Desorption Followed by

Chemical Treatment	FCX – Statesville – OU 2	NC
Chemical Treatment	Smith’s Farm – OU 1 (Amendment)	KY

In Situ Thermal Treatment Followed by

Bioremediation	Southern California Edison, Visalia Pole Yard	CA
Incineration	Brodhead Creek	PA
Soil Vapor Extraction and Bioremediation	Petro-Chemical Systems, Inc. – OU 2	TX

Appendix D

Treatment Technologies: Summary of Status Report Updates, Changes, Deletions

Explanation of Appendix D: Summary of Status Report Updates, Changes, and Deletions

This Appendix describes the updates, changes, and deletions made to the database supporting Treatment Technologies for Site Cleanup: Annual Status Report (ASR). The appendix is divided into ten tables, one for each edition of the ASR beginning with the Second Edition (September 1991). Within each table is a description of the updates, changes, and deletions made to the database supporting the ASR from one edition to the next.

These updates, changes, and deletions are generated primarily through contacts with Remedial Project Managers (RPMs) and review of earlier Records of Decisions (RODs), ROD amendments, and Explanations of Significant Differences (ESDs) to identify changes in treatment remedies and mistakes in the database. Due to the large number of new projects based on information gathered from RODs, ROD amendments, and ESDs published since the last edition of the ASR (272 for the 11th edition), the tables in Appendix D do not describe these new projects.

The purpose of Appendix D is to document changes in the ASR database and thereby document changes in treatment remedies at Superfund sites. For each updated, changed, or deleted project, the appendix lists: site identifying information; the specific update, change, or deletion; an explanation of why the update, change, or deletion was made; and a site contact, usually the remedial project manager (RPM).

When new projects are discovered through site contacts and have not yet been documented in a ROD, ROD amendment, or ESD, they are recorded in Appendix D with the specific treatment technology listed in the "Added" column. When a remedy changes from a treatment remedy to one that does not include treatment, the project based on that remedy is listed in Appendix D with a "Yes" in the "Deleted" column. The non-treatment remedy replacing the treatment remedy is described in the "Comments" column. When a remedy changes from one treatment technology to another treatment technology, the new technology is listed in the "Changed To" column.

The database supporting the ASR contains information on specific projects for the treatment of contamination sources and contaminated groundwater at Superfund sites. The database does not track other types of remedies, such as off-site disposal in a landfill or monitored natural attenuation. Therefore, when a remedy is changed from treatment to non-treatment, the project created in the database for that treatment remedy is deleted. Appendix D also shows that project as being deleted.

Each Superfund site may have multiple waste types and multiple areas of contamination, requiring multiple, separate treatments. For each distinct waste type and each distinct area of contamination treated, the ASR database contains a separate treatment project. When a waste is treated through a treatment train, the ASR database contains a separate treatment project for each step in the treatment train. Appendix D reflects this organization or treatment remedies based on specific projects, and may contain multiple rows for the same site. For example, at the Caroll and Dubies Sewage Disposal site in New York, a 1995 ROD indicated that three separate and distinct technologies (bioremediation, soil vapor extraction, and solidification/stabilization treatments) would be used to treat three distinct wastes. Therefore, three separate projects were created in the ASR databse for the Caroll and Dubies Sewage Disposal site. However, the remedy was changed for all of these wastes to off-site disposal. Therefore, all three projects were deleted from the ASR database, and Appendix D contains three entries for the Caroll and Dubies Sewage Disposal site, one for each deleted project.

The eleventh edition of the report adds information about 272 new treatment projects selected for remedial actions in FY 2000, FY 2001, and FY 2002 Records of Decision (RODs), ROD Amendments, and Explanations of Significant Differences (ESDs). These are not listed in Appendix D.
Changes to projects from the tenth edition are listed below.

Eleventh Edition (September 2003): Additions, Changes, and Deletions from the Tenth Edition (February 2001)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 10TH EDITION)	11TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
1	Linemaster Switch Corporation, CT (7/21/1993)	Soil Vapor Extraction		Yes		This remedy is a component of the multi-phase extraction system at this site. Therefore, this project has been deleted.	William Lovely 617-918-1240 lovely.william@epa.gov
1	New Bedford Harbor, MA (4/27/1999)	Solidification/stabilization			Physical Separation	The site contact indicated that a ROD Amendment changed the remedy to dewatering followed by off-site disposal.	Jim Brown 617-918-1308 brown.jim@epa.gov
1	Otis Air National Guard Area of Contamination CS16 and CS17 OU11, MA (5/5/1999)	Solidification/stabilization		Yes		The site contact indicated that remedy was changed to excavation and off-site disposal.	Bob Lim 617-918-1392 lim.robert@epa.gov
1	Otis Air National Guard Fuel Spill No 9 OU10, MA (7/6/1999)	Solidification/stabilization		Yes		The site contact indicated that remedy was changed to excavation and off-site disposal.	Bob Lim 617-918-1392 lim.robert@epa.gov
1	Otis Air Natioinal Guard – Fuel Spill 12, MA (9/25/1995)	Air Sparging	Yes				Bob Lim 617-918-1392 lim.robert@epa.gov
1	Otis Air National Guard OU 8, MA (8/16/1999)	Solidification/stabilization		Yes		The site contact indicated that remedy was changed to excavation and off-site disposal.	Bob Lim 617-918-1392 lim.robert@epa.gov
2	Brewster Well Field – OU 2, NY (9/29/1988)	Incineration	Yes				Lisa Wong 212-637-4267 wong.lisa@epa.gov
2	Cosden Chemical Coatings, NJ (9/30/1992)	Solidification/stabilization		Yes		A FY 1998 ESD changed the remedy to off-site treatment and/or disposal.	Edward Finnerty 212-637-4367 finnerty.ed@epa.gov
2	General Motors/Central Foundry Division, NY (3/31/1992)	Thermal Desorption			Solidification/ stabilization	Community relations issues	Anne Kelly 212-637-4397 kelly.anne@epa.gov
2	FAA Technical Center – Area B Navy Fire Testing Facility, NJ (9/20/1996)	Air Sparging (in situ) – Groundwater		Yes		Based on subsequent investigations, the groundwater plume was found to be more extensive than initial investigations indicated. The costs to implement this technology became prohibitive.	Bill Roach 212- 637-4335 roach.bill@epa.gov
2	FAA Technical Center – Area B Navy Fire Testing Facility, NJ (9/20/1996)	Soil Vapor Extraction		Yes		Based on subsequent investigations, the groundwater plume was found to be more extensive than initial investigations indicated. The costs to implement this technology became prohibitive.	Bill Roach 212- 637-4335 roach.bill@epa.gov

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Eleventh Edition (September 2003) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 10TH EDITION)	11TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
2	Love Canal, NY (7/1/1982)	Vertical Engineered Barrier		Yes		Slurry wall was considered but not installed.	Damian Duda 212-637-4269 duda.damian@epa.gov
2	Reynolds Metals Company Study Area (RMC), NY (9/27/1993)	Incineration (off-site)			Solidification/ stabilization	Community relations issues	Anne Kelly 212-637-4397 kelly.anne@epa.gov
2	Vineland Chemical Co., Inc. – OU 1, NJ (9/29/1989)	Flushing (in situ)		Yes		The site contact indicated that the remedy was not implemented because it was determined that the technology would not be effective.	Matthew Westgate 212-637-4422 westgate.matthew@epa.gov
3	Browns Battery Breaking Site – OU 2, PA (7/2/1992)	Chemical Treatment	Yes				Christopher J. Corbett 215-814-3220 corbett.chris@epa.gov
3	Brown's Battery Breaking Site – OU 2, PA (7/2/1992)	Passive Treatment Wall		Yes		The site contact indicated that in situ chemical treatment was determined to work better.	Christopher J. Corbett 215-814-3220 corbett.chris@epa.gov
3	Eastern Diversified Metals, PA (3/29/1991)	Solidification/stabilization		Yes		A FY 2001 ROD was issued changing the remedy to capping.	John Banks 215-814-3214 banks.john_d@epa.gov
3	Naval Surface Warfare Center, Site 17, VA (9/30/1998)	Phytoremediation		Yes		The site contact indicated that this technology is not actually phytoremediation but rather an alternative landfill cover.	Paul Leonard 215-814-3350 leonard.paul@epa.gov
3	Ordnance Works Disposal Areas, WV (9/30/1999)	Thermal Desorption			Physical Separation	The site contact indicated that the remedy was not conducted. The coal tar was removed and used as a fuel (classified as physical separation).	Christian Matta 215-814-2317 matta.christian@epa.gov
3	Revere Chemical, PA (12/27/1993)	Vertical Engineered Barrier		Yes		Following SVE treatment of the soil, it was not necessary to install a VEB.	Ruth Scharr 215-566-3191 scharr.ruth@epa.gov
3	Seagertown Industrial Area, PA (1/29/1993)	Air Sparging			Bioremediation (in situ) – Groundwater	The site contact indicated that the technology was changed to enhanced bioremediation.	Christopher J. Corbett 215-814-3220 corbett.chris@epa.gov
3	Saegertown Industrial Area, PA (1/29/1993)	Soil Vapor Extraction		Yes		The site contact indicated that a ROD Amendment has been issued that selects bioremediation.	Christopher J. Corbett 215-814-3220 corbett.chris@epa.gov

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Eleventh Edition (September 2003) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 10TH EDITION)	11TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
3	Standard Chlorine of Delaware, Inc., DE (3/9/1995)	Bioremediation (ex situ) – Other			Thermal Desorption	The site contact indicated that the contingent remedy was implemented because the goals could not be met.	Hilary Thornton 215-814-3323 thornton.hilary@epa.gov
3	Tonolli Corp, PA (3/12/1999)	Bioremediation (ex situ) – Land Treatment		Yes		The site contact indicated that the remedy was not implemented at this site.	John Banks 215-814-3214 banks.john_d@epa.gov
4	Aberdeen Pesticide Dumps (Amendment), NC (9/30/1991)	Thermal Desorption		Yes		This project was listed as a duplicate entry.	Luis E. Flores 404-562-8807 flores.luis@epa.gov
4	Calhoun Park Area – OU 01, SC (9/30/1998)	Chemical Treatment – Oxidation/Reduction		Yes		The site contact indicated the technology changed to excavation and off-site disposal.	Terry Tanner 404-562-8797 tanner.terry@epa.gov
4	Carolina Transformer Co., NC (8/29/1991)	Solidification/stabilization		Yes		The site contact indicated that this technology was replaced by solvent extraction.	Luis E. Flores 404-562-8807 flores.luis@epa.gov
4	Homestead Air Force Base OU 28, FL (8/15/1999)	Solidification/stabilization		Yes		The site contact indicated that remedy was changed to excavation and off-site disposal.	Doyle Brittain 404-562-8549 brittain.doyle@epa.gov
4	Homestead Air Force Base – OU 02, FL (7/16/1998)	Solidification/stabilization		Yes		This technology was a contingent remedy and was to be implemented if excavated soils failed TCLP for lead. This technology was not necessary since the excavated soil passed the TCLP for lead.	Doyle Brittain 404-562-8549 brittain.doyle@epa.gov
4	JFD Electronics/Channel Master, NC (9/10/1992)	Solidification/Stabilization	Yes				Samantha Urquhart-Foster 404-562-8760 urquhart_foster.samantha @epa.gov
4	JFD Electronics/Channel Master, NC (9/10/1992)	Solidification/stabilization		Yes		The estimated volume of contaminated soil decreased from 1,250 cubic yards to 650 cubic yards. Treatment is no longer necessary, and soils will be excavated for off-site disposal.	Samantha Urquhart-Foster 404-562-8760 urquhart_foster.samantha @epa.gov

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Eleventh Edition (September 2003) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 10TH EDITION)	11TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
4	Peak Oil/Bay Drum, FL (6/21/1993)	Bioremediation (in situ) – Other			Solidification/ stabilization	The site contact indicated that the technology was changed to solidification/stabilization followed by capping.	Wesley Hardegree 404-562-8938 hardegree.wes@epa.gov
4	Peak Oil/Bay Drum OU 2 – Site Wide Groundwater, FL (8/9/1993)	Bioremediation	Yes				Wesley Hardegree 404-562-8938 hardegree.wex@epa.gov
4	Peak Oil/Bay Drum – OU 1, FL (6/21/1993)	Flushing (in situ)		Yes		A FY 2001 ESD deleted this remedy.	Wesley Hardegree 404-562-8938 hardegree.wes@epa.gov
4	Savannah River Site USDOE OU 66, SC (9/28/1999)	Solidification/Stabilization	Yes				Ken Feely 404-562-8512 feely.ken@epa.gov
4	Savannah River Site – USDOE – OU 60, SC (9/28/1999)	Solidification/Stabilization	Yes				Ken Feely 404-562-8512 feely.ken@epa.gov
4	Shuron Inc – OU 01, SC (9/9/1998)	Solidification/stabilization		Yes		Based on the FY 1998 ROD, the cost-effectiveness of this technology versus excavation and off-site disposal was determined. Excavation and off-site disposal was selected as the remedy.	Ralph Howard 404-562-8829 howard.ralph@epa.gov
4	Smiths Farm OU2, KY (9/17/1993)	Bioremediation	Yes				Antonio Deangelo 404-562-8826 deangelo.antonio@epa.gov
5	ALGOMA MUNICIPAL LANDFILL, WI (9/29/1990)	Permeable Reactive Barrier	Yes				David Linnear 312-886-1841 linnear.david@epa.gov
5	American Chemical Services, Inc, IN (7/27/1999)	Vertical Engineered Barrier		Yes		Data entry error. This project was entered as a duplicate.	Kevin Adler 312-886-7078 adler.kevin@epa.gov
5	American Chemical Services, Inc. – offsite, IN (7/27/1999)	Soil Vapor Extraction		Yes		Data entry error. This project was entered as a duplicate.	Kevin Adler 312-886-7078 adler.kevin@epa.gov

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Eleventh Edition (September 2003) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 10TH EDITION)	11TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
5	Cliff/Dow Dump, MI (9/27/1989)	Incineration (off-site)		Yes		This remedy was changed to excavation and off-site disposal.	Kenneth Glatz 312-886-1434 glatz.kenneth@epa.gov
5	Conrail Rail Yard – OU 2, IN (9/9/1994)	Air Sparging (in situ) – Groundwater		Yes		The site contact indicated that during the remedial investigation, one hit of contamination was found. However, that one hit has been found since; therefore, the technology will not be implemented.	Brad Bradley 312-886-4742 bradley.brad@epa.gov
5	Macgillis and Gibbs/Bell Lumber and Pole – OU1, MN (9/30/1999)	Chemical Treatment – Oxidation/Reduction		Yes		This technology was listed as the preferred remedy in the FY 1999 ROD. However, no responses (bids) were received to implement the technology.	Darryl Owens 312-886-7089 owens.darryl@epa.gov
5	Macgillis and Gibbs/Bell Lumber and Pole – OU3, MN (9/30/1999)	Bioremediation (ex situ) – Biopile		Yes		Data entry error. This project should not have been listed for OU3, only for OU1.	Darryl Owens 312-886-7089 owens.darryl@epa.gov
5	Macgillis and Gibbs/Bell Lumber and Pole – OU3, MN (9/30/1999)	Chemical Treatment – Oxidation/Reduction		Yes		Data entry error. This project should not have been listed for OU3, only for OU1.	Darryl Owens 312-886-7089 owens.darryl@epa.gov
5	Moss-American Groundwater, WI (4/29/1997)	Bioremediation	Yes				Russell Hart 312-886-4844 hart.russell@epa.gov
5	Motor Wheel Disposal Site, MI (9/30/1991)	Vertical Engineered Barrier		Yes		Further study indicated the slurry wall was not necessary.	Heather Nelson 312-353-0685 nelson.heather@epa.gov
5	Organic Chemicals, Inc. – OU 2, MI (2/5/1997)	Solidification/stabilization		Yes		The site contact indicated an ESD was issued that states the actual volume of soil to be treated was too small to cost-effectively treat using this technology.	Thomas Williams 312-886-6157 williams.thomas@epa.gov
5	Sangamo Electric Dump/Crab Orchard National Wildlife Refuge – Explosives/Munitions Manufacturing Area OU, IL (2/19/1997)	Incineration	Yes				Nanjunda Gowda 312-353-9236 gowda.nanjunda@epa.gov
5	South Macomb Disposal Authority, MI (8/31/1991)	Vertical Engineered Barrier		Yes		Replaced slurry wall with expaned leachate collection system.	David Kline 517-373-8354 klined@state.mi.us

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Eleventh Edition (September 2003) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 10TH EDITION)	11TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
5	Springfield Township Dump, MI (9/29/1990)	Air Sparging	Yes				Kevin Adler 312-886-7078 adler.kevin@epa.gov
5	Springfield Township Dump – OU 01, MI (6/10/1998)	Solidification/stabilization		Yes		The FY 1998 ROD Amendment listed this technology as a contingent remedy. However, this technology will not be implemented.	Kevin Adler 312-886-7078 adler.kevin@epa.gov
5	Springfield Township Dump – OU 01, MI (6/10/1998)	Thermal Desorption		Yes		The FY 1998 ROD Amendment listed this technology as a contingent remedy. However, this technology will not be implemented.	Kevin Adler 312-886-7078 adler.kevin@epa.gov
5	Springfield Township Dump – 90ROD, MI (9/29/1990)	Solidification/stabilization		Yes		The site contact indicated that a ROD Amendment has been issued that deleted this technology.	Kevin Adler 312-886-7078 adler.kevin@epa.gov
5	Tar Lake – Pump & Treat, MI (9/29/1992)	Air Sparging	Yes				Thomas Bloom 312-886-1967 bloom.thomas@epa.gov
5	Thermo-Chem, Inc OU1, MI (9/30/1991)	Soil Vapor Extraction	Yes				Kenneth Glatz 312-886-1434 glatz.kenneth@epa.gov
6	Popile, AR (2/1/1993)	Bioremediation (in situ) – Groundwater		Yes		A FY 2001 ROD Amendment deleted this remedy.	Shawn Ghose 214-665-6782 ghose.shawn@epa.gov
6	Popile, AR (2/1/1993)	Bioremediation (ex situ) – Land Treatment		Yes		A FY 2001 ROD Amendment deleted this remedy.	Shawn Ghose 214-665-6782 ghose.shawn@epa.gov
6	Sheridan Disposal Services, TX (12/29/1988)	Bioremediation (ex situ) – Slurry Phase			Solidification/ stabilization	The site contact indicated that alternatives were to be evaluated due to the length of time that has passed.	Gary A. Baumgarten 214-665-6749 baumgarten.gary@epa.gov
7	Ace Services, KS (5/5/1999)	Bioremediation (in situ) – Groundwater			Pump and Treat	The FY 2001 ROD Amendment changed the remedy due to a change in the use of the treated water and because of an increase in the size of the contaminated plume.	Bob Stewart 913-551-7654 stewart.robert@epa.gov

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Eleventh Edition (September 2003) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 10TH EDITION)	11TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
7	Lake City Army Ammunition Plant Area 18 OU, MO (4/22/1999)	Multi-Phase Extraction		Yes		The site contact indicated that site conditions were identified for which the technology was not implementable.	Scott Marques 913-551-7131 Marquess.scott@epa.gov
7	Peoples Natural Gas, IA (9/16/1991)	Bioremediation (in situ) – Other		Yes		The site contact indicated that this remedy has been discontinued.	Diana Engeman 913-551-7746 engeman.diana@epa.gov
7	Valley Park Tce Wainwright OU1 Ex-situ SVE, MO (4/26/1996)	Soil Vapor Extraction	Yes				Steve Auchterlonie 913-551-7778 auchterlonie.steve@epa.gov
8	Rocky Mountain Arsenal OU 23, CO (5/3/1990)	Vertical Engineered Barrier		Yes		A ROD signed on 6/11/96 eliminated the VEB for groundwater containment.	Laura Williams 303-312-6660 williams.laura@epa.gov
9	Southern California Edison, Visalia Pole Yard, CA (6/10/1994)	Bioremediation	Yes				Shea Jones 415-972-3148 jones.shea@epa.gov
9	Tracy Defense Depot (USArmy) – OU 01, CA (4/14/1998)	Bioventing		Yes		The site contact indicated that this technology was not implemented.	Michael Work 415-972-3024
9	Williams Air Force Base – OU 2, AZ (8/16/1996)	Soil Vapor Extraction	Yes				Michael Wolfram 415-972-3027 wolfram.michael@epa.gov
10	Fort Lewis Logistics Center, WA (9/25/1990)	In Situ Thermal Treatment	Yes				Bob Kievit 360-753-9014 kievit.bob@epa.gov
10	Harbor Island – Soil and Groundwater OU, WA (9/30/1993)	Soil Vapor Extraction	Yes				Neil Thompson 206-553-7177 thompson.neil@epa.gov
10	Harbor Island (Lead) – Soil And Groundwater OU, WA (9/30/1993)	Thermal Desorption		Yes		This remedy was changed to excavation and off-site disposal.	Neil Thompson 206-553-7177 thompson.neil@epa.gov
10	Lockheed Shipyard Facility/ Harbor Island – OU 3, WA (6/28/1994)	Thermal Desorption		Yes		This remedy was changed to excavation and off-site disposal.	Neil Thompson 206-553-7177 thompson.neil@epa.gov
10	Union Pacifice Railroad Tie Treatment – Vadose Zone Soils, OR (3/27/1996)	Bioremediation	Yes				Alan Goodman 503-326-3685 goodman.al@epa.gov

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

The tenth edition of the report adds information about 133 new treatment projects selected for remedial actions in FY 1998 and FY 1999 Records of Decision (RODs), ROD Amendments, and Explanations of Significant Differences (ESDs). These are not listed in Appendix D.

Tenth Edition (March 2001): Additions, Changes, and Deletions from the Ninth Edition (April 1999)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 9TH EDITION)	10TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
1	New Bedford, MA (04/06/90)	Solidification/Stabilization		Yes		RODs from FY 1998 and 1999 changed the remedy from on-site incineration followed by solidification/stabilization to off-site disposal due to community concerns. The incineration portion of the remedy was deleted in the eighth edition based on information provided by the site contact, and does not appear in this table.	Jim Brown 617-573-5779 brown.jim@epa.gov
1	Silresim Chemical, MA (09/19/91)	Solidification/Stabilization		Yes		Specified in a FY 1991 ROD as a contingent remedy to treat soils not effectively treated by soil vapor extraction, but never implemented. Soil vapor extraction treatment is currently treating soil effectively.	Mark Otis 978-318-8895 e-mail address not available
1	Loring Air Force Base - OU 10, Entomology Shop, ME (removal action, no ROD date available)	Bioremediation (in situ) - Bioventing			Soil Vapor Extraction	The site contact indicated that the remedy was changed because bioventing was determined to be unsuitable due to site hydrogeology.	Mike Napilinski 617-918-1268 napilinski.mike@epa.gov
2	Carroll & Dubies Sewage Disposal, NY (03/31/95)	Bioremediation (in situ) - Lagoon		Yes		A FY 1998 ESD changed the remedy to off-site treatment and disposal because additional site investigation revealed that the waste could be easily separated from the underlying soil. The type of off-site treatment has not been determined.	Maria Jon 212-637-3967 jon.maria@epa.gov
2	Carroll & Dubies Sewage Disposal, NY (03/31/95)	Soil Vapor Extraction		Yes		A FY 1998 ESD changed the remedy to off-site treatment and disposal because additional site investigation revealed that the waste could be easily separated from the underlying soil. The type of off-site treatment has not been determined.	Maria Jon 212-637-3967 jon.maria@epa.gov
2	Carroll & Dubies Sewage Disposal, NY (03/31/95)	Solidification/Stabilization		Yes		A FY 1998 ESD changed the remedy to off-site treatment and disposal because additional site investigation revealed that the waste could be easily separated from the underlying soil. The type of off-site treatment has not been determined.	Maria Jon 212-637-396 jon.maria@epa.gov
2	Ellis Property, NJ (09/30/92)	Solidification/Stabilization		Yes		The site contact indicated that the remedy was changed to off-site disposal because additional site investigation revealed that the contaminant levels were lower than expected.	Richard Ho 212-637-4372 ho.richard@epa.gov
2	Ewan Property - OU 2, NJ (09/29/88)	Chemical Treatment - Groundwater		Yes		The site contact indicated that the remedy was changed to groundwater pump-and-treat because treatability studies indicated that in situ chemical treatment was not effective.	Stephen Cipot 212-637-4411 cipot.stephen@epa.gov

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Tenth Edition (March 2001) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 9TH EDITION)	10TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
2	Fried Industries, NJ (6/27/94)	Solidification/Stabilization		Yes		The site contact indicated that the remedy was changed to off-site disposal because additional site investigation revealed large amounts of contaminated debris. The use of solidification/ stabilization on this debris would have been impractical.	Tom Porucznik 212-637-4370 porucznik.tom@epa.gov
2	GCL Tie And Treating - OU 2, NY (3/31/95)	Thermal Desorption		Yes		The site contact indicated that the sediments of OU 2 have been combined with the soils of OU 1 for treatment using thermal desorption. The work is documented in the 10th edition of the ASR as a single project. Therefore, the OU 2 project has been deleted.	Janet Cappelli 212-637-4270 cappelli.janet@epa.gov
2	GE Wiring Devices, PR (9/30/88)	Soil Washing			Incineration (off-site)	A FY 1999 ROD amendment changed the remedy because the cost of soil washing was too high.	Caroline Kwan 212-637-4275 kwan.caroline@epa.gov
2	Lipari Landfill, NJ (9/30/85)	Project not in 9th edition of the ASR. Original ROD did not include this project.	Dual-Phase Extraction			The site contact indicated that dual-phase extraction was added at this site to remove insoluble volatile organic compounds.	Fred Cataneo 212-637-4428 cataneo.fred@epa.gov
2	Reynolds Metals Company - Study Area, NY (09/27/93)	Thermal Desorption			Incineration (off-site)	The site contact indicated that the remedy was changed from on-site thermal desorption to off-site incineration because the cost of thermal desorption was too high.	Anne Kelly 212-637-4264 kelly.anne@epa.gov
2	Tutu Well Field - VI (8/5/96)	Bioremediation (in situ) - Other		Yes		ROD was misinterpreted. The technology used at the site was soil vapor extraction. This is not a distinct project, it is part of the Tutu Well Field Esso project, which is already listed in the ASR database.	Caroline Kwan 212-637-4275 kwan.caroline@epa.gov
3	Avco Lycoming, PA (12/30/96)	Chemical Treatment - Groundwater			Bioremediation (in situ) - Groundwater	ROD was misinterpreted. Technology used stimulates microbes to create an environment in which hexavalent chromium will be reduced to its trivalent state. This technology is more accurately identified as bioremediation.	Jill Lowe 215-814-5336 lowe.jill@epa.gov
3	Brodhead Creek, PA (3/29/91)	Incineration (off-site)		Yes		ROD was misinterpreted. Incineration is of non-aqueous phase liquids collected through in situ thermal treatment process, which is considered treatment of residuals, and not source treatment.	John Banks 215-814-3214 banks.john-d@epa.gov
3	Cryochem, Inc. - OU 3, PA (9/30/91)	Soil Vapor Extraction		Yes		A FY 1998 ESD eliminated the soil vapor extraction portion of the remedy because soil sampling showed that contaminant concentrations were below remediation goals and soil gas assessment showed that the contaminant levels were below typical levels for effective soil vapor extraction treatment.	Joseph McDowell 215-566-3192 mcdowell.joseph@epa.gov

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Tenth Edition (March 2001) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 9TH EDITION)	10TH EDITION ADDED	10TH EDITION DELETED	10TH EDITION CHANGED TO	COMMENTS	CONTACTS/PHONE
3	Delaware Sand & Gravel Landfill, DE (9/30/93)	Incineration (off-site)			Soil Vapor Extraction	The site contact indicated that the remedy was changed because the cost of incineration was too high.	Philip Rotstein 215-814-3232 rotstein.phil@epa.gov
3	Douglassville Disposal, PA (6/30/89)	Incineration (off-site)		Yes		A FY 1999 ROD amendment changed the remedy from a treatment train of incineration followed by solidification/stabilization to solidification/stabilization only, because this technology was determined to be as effective and less expensive.	Victor J. Janosik 215-814-3217 janosik.victor@epa.gov
3	Hunterstown Road, PA (8/2/93)	Incineration (off-site)		Yes		The site contact indicated that this remedy was not implemented because additional site investigations revealed that treatment was not required before off-site disposal of the waste.	John Banks 215-814-3214 banks.john-d@epa.gov
3	North Penn Area 6, PA (9/29/95)	In Situ Thermal Treatment (Hot Air Injection)		Yes		The site contact indicated that treatability testing revealed that treatment goals could not be met. A replacement remedy has not yet been selected.	Gregory Ham 215-566-3194 ham.greg@epa.gov
3	Ordnance Works Disposal Areas, WV (9/29/89)	Bioremediation (ex situ) - Land Treatment			Thermal Desorption	A FY 1999 ROD changed the treatment train of bioremediation followed by solidification/stabilization to thermal desorption because treatability studies revealed that the remedy could not meet cleanup goals.	Chris Matta 215-814-2317 matta.christian@epa.gov
3	Ordnance Works Disposal Areas, WV (9/29/89)	Solidification/Stabilization			Thermal Desorption	A FY 1999 ROD changed the treatment train of bioremediation followed by solidification/stabilization to thermal desorption because treatability studies revealed that the remedy could not meet cleanup goals.	Chris Matta 215-814-2317 matta.christian@epa.gov
3	Whitmoyer Laboratories - OU 3, PA (12/31/90)	Bioremediation (ex-situ) - Other			Thermal Desorption	The site contact indicated that the remedy was changed because additional site investigations revealed arsenic contamination, which could not be effectively treated with bioremediation.	Christoper Corbett 215-814-3220 corbett.chris@epa.gov
4	Aberdeen Pesticide Dumps, NC (9/30/91)	Incineration (off-site)			Thermal Desorption	The site contact indicated that the remedy was changed due to public protest. The remedy change will be documented in a future ROD amendment.	Randy McElveen 919-733-2801 e-mail address not available
4	American Creosote Works - OU 2 Phase 1, FL (2/3/94)	Project not in 9th edition of the ASR. Original ROD did not include this project.	Dual-Phase Extraction			ROD was misinterpreted.	Mark Fite 404-562-8927 fite.mark@epa.gov

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Tenth Edition (March 2001) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 9TH EDITION)	10TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
4	Cape Fear Wood Preserving, NC (6/30/89)	Solidification/Stabilization		Yes		This remedy was part of a treatment train including thermal desorption. The site contact indicated that this remedy was not implemented because thermal desorption treatment met the cleanup goals without solidification/stabilization.	Jon Bornholm 404-562-8820 bornholm.jon@epa.gov
4	Cecil Field Naval Air Station - OU 2, Site 5, FL (6/24/96)	Air Sparging (in situ) - Groundwater		Yes		The site contact indicated that the remedy was changed to monitored natural attenuation because additional site investigations revealed contaminant concentrations much lower than expected.	Debbie Vaughn-Wright 404-562-8539 vaughn-wright.debbie@epa.gov
4	Cecil Field Naval Air Station - OU 2, Site 5, FL (6/24/96)	Bioremediation (ex situ) - Other			Incineration (off-site)	The site contact indicated that the remedy was changed to monitored natural attenuation because additional site investigations revealed contaminant concentrations much lower than expected.	Debbie Vaughn-Wright 404-562-8539 vaughn-wright.debbie@epa.gov
4	Creotox Chemical Products	Bioremediation (ex situ) - Land Treatment		Yes		The site contact indicated that the remedy was changed to off-site incineration because bioremediation could not meet the cleanup goals.	Samantha Urquhart-Foster 404-562-8760 urquhart-foster.samantha@epa.gov
4	Fullco Lumber Company, AL (5/8/95)	Bioremediation (ex situ) - Other		Yes		A report generated for the site indicated that bioremediation could not meet cleanup goals. A replacement remedy has not yet been selected.	Waynon Johnson 404-562-8769 johnson.waynon@epa.gov
4	Chevron Chemical Company, FL (5/22/96)	Air Sparging (in situ) - Groundwater		Yes		The site contact indicated that the remedy was unnecessary because monitored natural attenuation effectively met cleanup goals.	Bill Denman 404-562-8939 denman.bill@epa.gov
4	Chevron Chemical Company, FL (5/22/96)	Permeable Reactive Barrier		Yes		The site contact indicated that the remedy was unnecessary because monitored natural attenuation effectively met cleanup goals.	Bill Denman 404-562-8939 denman.bill@epa.gov
4	General Electric Company - Shepard Farm Site, NC (9/29/95)	Bioremediation (in situ) - Groundwater		Yes		The site contact indicated that the remedy was changed to pump-and-treat of groundwater because treatability testing indicated that bioremediation was not effective.	Giezelle Bennett 404-562-8824 bennett.giezelle@epa.gov
4	Palmetto Wood Preserving, SC (9/30/87)	Project not in 9th edition of the ASR. Original ROD did not include this project.	Chemical Treatment	Yes		The site contact indicated that chemical treatment was added to reduce chromium to its trivalent state prior to treatment by solidification/stabilization.	Al Cherry 404-562-8828 cherry.al@epa.gov

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Tenth Edition (March 2001) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 9TH EDITION)	10TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
4	Tower Chemical Co., FL (7/9/87)	Incineration (on-site)		Yes		The site contact indicated that additional site investigations revealed different contaminants than expected and that incineration would not be appropriate. A revised remedy for the site has not yet been developed.	Galo Jackson 404-562-8937 jackson.galo@epa.gov
5	American Chemical Services, Inc., IN (9/30/92)	Thermal Desorption		Yes		A FY 1999 ROD changed the remedy to installation of an impermeable cap and off-site disposal of some wastes because additional site investigations revealed additional volumes of contaminated soil and debris, making thermal desorption impractical.	Kevin Adler 312-886-7078 adler.kevin@epa.gov
5	Conrail Rail Yard - OU 2, IN (9/9/94)	Soil Vapor Extraction		Yes		The site contact indicated that additional site investigations revealed that contaminant concentrations were lower than expected and soil vapor extraction was unnecessary.	Brad Bradley 312-886-4742 bradley.brad@epa.gov
5	Tar Lake, MI (9/29/92)	Solidification/Stabilization			Thermal Desorption	The site contact indicated that the remedy was changed to reduce costs.	Thomas Bloom 312-886-1967 bloom.thomas@epa.gov
5	Koppers Coke - Groundwater OU, MN (4/21/94)	Bioremediation (in situ) - Groundwater		Yes		The site contact indicated that the remedy was replaced with monitored natural attenuation because treatability testing revealed that bioremediation was not increasing the rate of degradation of contaminants.	Mark Rys 651-296-7706 mark.rys@pca.state.mn.us
5	Macgillis And Gibbs/ Bell Lumber And Pole - OU 1, MN (12/30/92)	Incineration (on-site)			Chemical Treatment Followed by Bioremediation	A FY 1999 ROD amendment changed the remedy to a treatment train consisting of chemical treatment followed by bioremediation (biopile) because incineration was too expensive and difficult to implement.	Darryl Owens 312-886-7089 owens.darryl@epa.gov
5	Macgillis And Gibbs/ Bell Lumber And Pole - OU 3, MN (9/22/94)	Incineration (on-site)		Yes	Chemical Treatment Followed by Bioremediation	A FY 1999 ROD amendment changed the remedy to a treatment train consisting of chemical treatment followed by bioremediation (biopile) because incineration was too expensive and difficult to implement.	Darryl Owens 312-886-7089 owens.darryl@epa.gov
5	Moss-American, WI (9/27/90)	Bioremediation (ex situ) - Slurry Phase			Thermal Desorption	A FY 1998 ROD replaced the treatment train of soil washing followed by slurry phase bioremediation with thermal desorption because the original remedy could not meet cleanup goals. The bioremediation project was changed to thermal desorption and the soil washing project was deleted.	Russell Hart 312-886-4844 hart.russell@epa.gov

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Tenth Edition (March 2001) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 9TH EDITION)	10TH EDITION ADDED	10TH EDITION DELETED	10TH EDITION CHANGED TO	COMMENTS	CONTACTS/PHONE
5	Moss-American, WI (9/27/90)	Soil Washing		Yes		A FY 1998 ROD replaced the treatment train of soil washing followed by slurry phase bioremediation with thermal desorption because the original remedy could not meet cleanup goals. The bioremediation project was changed to thermal desorption and the soil washing project was deleted.	Russell Hart 312-886-4844 hart.russell@epa.gov
5	Refuse Hideaway Landfill, WI (6/28/95)	Bioremediation (in situ) - Groundwater		Yes		The site contact indicated that the remedy was changed to monitored natural attenuation because the contaminants are naturally attenuating.	Anthony Rutter 312-886-8961 rutter.anthony@epa.gov
6	Air Force Plant 4 - Building 181, TX (8/26/96)	Soil Vapor Extraction		Yes		The site contact indicated that the remedy was changed to dual phase extraction and combined with another project at the site already listed in the ASR.	George Walters 937-255-7716 george.walters@wpafb.af.mil
6	Atchison, Topeka, & Santa Fe Clovis/Santa Fe Lake - Tph Soil, NM (9/23/98)	Bioremediation (in situ) - Other		Yes		The site contact indicated that contaminated soil was combined with sediments in an existing ex-situ bioremediation unit at the site. No information is currently available on why this change occurred.	Tetra Sanchez 214-665-6686 sanchez.tetra@epa.gov
6	Baldwin Waste Oil, TX (7/1/92)	Bioremediation (in situ) - Other			Bioremediation (ex situ) - Land Treatment	ROD was misinterpreted.	Gary Guerra 214-665-3120 guerra.gary@epa.gov
6	Double Eagle Refinery Co., OK (9/28/92)	Project not in 9th edition of the ASR. Original ROD did not include this project.	Neutralization			ROD was misinterpreted.	Phillip Allen 214-665-8516 allen.phillip@epa.gov
6	Oklahoma Refining Company - Hazardous Landfill, OK (6/9/92)	Bioremediation (in situ) - Other			Bioremediation (ex situ) - Land Treatment	ROD was misinterpreted.	Earl Hendrick 214-665-8519 hendrick.earl@epa.gov
6	Texarkana Wood Preserving, TX (9/25/90)	Incineration (on-site)		Yes		A FY 1998 ROD changed the remedy to on-site containment through capping because of community concerns.	Earl Hendrick 214-665-8519 hendrick.earl@epa.gov
6	United Creosoting Co., TX (9/29/89)	Solvent Extraction		Yes		A FY 1998 ROD amendment changed the remedy from a treatment train of solvent extraction followed by incineration to off-site disposal because the cost was too high and the capacity of the treatment unit was too small.	Earl Hendrick 214-665-8519 hendrick.earl@epa.gov

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Tenth Edition (March 2001) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 9TH EDITION)	10TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
6	United Creosoting Co., TX (9/29/89)	Incineration (off-site)		Yes		A FY 1998 ROD amendment changed the remedy from a treatment train of solvent extraction followed by incineration to off-site disposal because the cost was too high and the capacity of the solvent extraction treatment unit was too small.	Earl Hendrick 214-665-8519 hendrick.earl@epa.gov
6	Prewitt Abandoned Refinery, NM (9/30/92)	Dual Phase Extraction			Air Sparging	ROD was misinterpreted.	Gregory Lyssy 214-665-8317 lyssy.gregory@epa.gov
7	Hastings Groundwater Contamination- Colorado Ave., OU 1, NE (09/30/91)	Project not in 9th edition of the ASR.	Air sparging (in situ) - Groundwater			ROD was misinterpreted.	Darrell Sommerhauser 913-551-7711 sommerhauser.darrell@epa.gov
7	Hastings Groundwater Contamination- Colorado Ave., OU 1, NE (09/30/91)	Project not in 9th edition of the ASR.	In-Well Air Stripping			ROD was misinterpreted.	Darrell Sommerhauser 913-551-7711 sommerhauser.darrell@epa.gov
7	Midwest Manufacturing/North Farm, IA (2/28/93)	Bioremediation (in situ) - Other		Yes		ROD was misinterpreted.	Diane Easley 913-551-7797 easley.diane@epa.gov
7	Sherwood Medical Co., NE (9/5/1995)	Soil Vapor Extraction (ex situ)			Mechanical Soil Aeration	The site contact indicated that, after mechanical soil aeration was conducted in preparation for ex situ soil vapor extraction, the contaminant concentrations met cleanup goals and soil vapor extraction was unnecessary.	Steve Auchterlonie 913-551-7778 auchterlonie.steve@epa.gov
8	Broderick Wood Products, CO (9/24/91)	Incineration (off-site)		Yes		ROD was misinterpreted.	Armando Saenz 313-302-6359 saenz.armando@epa.gov
8	Lockheed/Martin - Denver Aerospace, CO (9/24/90)	Solidification/Stabilization		Yes		The site contact indicated that the remedy was not required because additional site investigation revealed contaminant levels were below cleanup goals.	Charles Johnson 303-692-3348 Johnson.Charles@State.CO.US
8	Rocky Flats Plant - Buffer Zone, CO (08/10/92)	Soil Vapor Extraction			Permeable Reactive Barrier	The site contact indicated that the remedy was changed because additional contamination was found that was not amenable to soil vapor extraction, including dense non-aqueous phase liquids.	Norma Casaneda 303-966-4226 casaneda.norma@epa.gov
8	Rocky Mountain Arsenal - Onpost OU, Hex Pits, CO (6/11/96)	Thermal Desorption			In Situ Thermal Treatment	ROD was misinterpreted.	Kerry Guy 303-312-7288 guy.kerry@epa.gov

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Tenth Edition (March 2001) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 9TH EDITION)	10TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
8	Rocky Mountain Arsenal - Onpost OU, CO (6/11/96)	Soil Washing		Yes		The site contact indicated that this remedy was specified as a contingent remedy, but never implemented.	Kerry Guy 303-312-7288 guy.kerry@epa.gov
8	Sand Creek Industrial, OU 4, CO (4/2/94)	Soil Vapor Extraction		Yes		ROD was misinterpreted.	Erna Waterman 303-312-6762 waterman.erna@epa.gov
8	Summitville Mine - OU 2, CO (12/15/94)	Project not in 9th edition of the ASR.	Neutralization			ROD was misinterpreted.	Victor Ketellaper 303-312-6578 ketellapper.victor@epa.gov
8	Utah Power & Light/American Barrel, UT (7/7/93)	Solidification/Stabilization		Yes		ROD was misinterpreted.	Paula Schmittdiel 303-312-6861 schmittdiel.paula@epa.gov
9	Navajo Toxaphene, AZ (1/1/95)	Bioremediation (in situ) - Other			Bioremediation (ex situ) - Other	ROD was misinterpreted.	Robert Mandel 415-744-2290 mandel.bob@epa.gov
9	Williams Air Force Base - OU 3, AZ (12/30/92)	Bioventing			Soil Vapor Extraction	The site contact indicated that the remedy was changed because bioventing could not meet cleanup goals.	Sean Hogan 415-744-2334 hogan.sean@epa.gov
10	Queen City Farms, WA (10/24/86)	Solidification/Stabilization		Yes		The site contact indicated that the project was solidification only, and no stabilization occurred. Solidification only projects are not currently tracked in the ASR.	Neil Thompson 206-553-7177 thompson.neil@epa.gov

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Ninth Edition (April 1999): Additions, Changes, and Deletions from the Eighth Edition (November 1996)

The ninth edition of the report adds information about 42 treatment selected for remedial actions in FY 1996 and FY 1997 RODs, – treatment technologies non-Superfund, and innovative technologies selected for two RCRA corrective actions. Other changes are listed below.

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 8TH EDITION)	9TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
1	Beacon Heights Landfill, CT (09/28/90)	Incineration (off site)		Yes		At $20 billion, incineration was considered cost-prohibitive. In addition, the community was concerned about the safety of transporting 22 acres of material by truck over switchback mountain roads.	Elise Jakabhazy 617-573-5760
1	Cannon Engineering - Plymouth OU, MA (03/31/88)	Incineration (off site)		Yes		About 264 tons of soil contaminated with lead and PCBs were disposed of at the Adams Center Sanitary Landfill in Fort Wayne, Indiana. Incineration was never used. PRP's contractor was allowed to put soil in a landfill without ROD amendment or ESD.	Dan Coughlin 617-573-9621
1	Charles George Reclamation Trust Landfill, MA (09/29/88)	Solidification/ stabilization		Yes		The contaminated area was capped instead of using solidification/stabilization. The estimated volume of contaminated media had decreased; the technology was no longer effective.	Elaine Stanley 617-223-5515
1	Iron Horse Park - OU 1, MA (09/15/88)	Bioremediation (ex situ) - land treatment		Yes		Land treatment was changed to asphalt batching off site at a state-permitted soil recycling facility. Bioremediation was taking longer than expected; treatment goals could not be met. An ESD was issued in October 1997.	Don McElroy 617-223-5571
1	Salem Acres, MA (03/25/93)	Solidification/ stabilization		Yes		Contaminated soils were excavated and hauled from the site instead of using solidification/stabilization. The estimated volume of contaminated media had decreased; the technology was no longer effective.	Elaine Stanley 617-223-5515
1	Sullivan's Ledge, MA (06/28/89)	Solidification/ stabilization		Yes		Stabilization is no longer part of the remedy. An ESD was issued in 1996 to eliminate that requirement.	Dave Lederer 617-573-9665
1	Sullivan's Ledge, MA (09/27/91)	Solidification/ stabilization		Yes		Stabilization is no longer part of the remedy. An ESD was issued in 1996 to eliminate that requirement.	Dave Lederer 617-573-9665
1	Loring AFB - OU 11, Vehicle Maintenance Building, ME (05/20/96)	Soil vapor extraction		Yes		Never implemented. Soils were excavated and connected to the base laundry SVE; soils were put into rolloff containers with PVC pipe.	Mike Nalipinski 617-223-5503

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Ninth Edition (April 1999) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 8TH EDITION)	9TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
1	O'Connor, ME (09/27/89)	Incineration (off site)		Yes		Problems included high cost for implementation of the technology and equipment or site problems. Contaminated soil was landfilled off site. An ESD was issued on 07/11/94.	Ross Gilleland 617-573-5766
1	O'Connor, ME (09/27/89)	Solidification/ stabilization		Yes		The solidification/ stabilization remedy option provided treatment of lead if incineration was chosen. Incineration was not selected as a remedy. Contaminated soil was landfilled off site. An ESD was issued on 07/11/94.	Ross Gilleland 617-573-5766
1	Union Chemical, ME (12/27/90)	Incineration (off site)		Yes		Misinterpretation of the ROD. The 1990 ROD selected thermal desorption. That remedy was subsequently changed to SVE in 1994. An ESD was issued in April 1994. See page D-36 for more information.	Terrence Connelly 617-573-9638
1	Union Chemical, ME (12/27/90)	Solidification/ stabilization		Yes		Misinterpretation of the ROD. The 1990 ROD selected thermal desorption. That remedy was subsequently changed to SVE in 1994. An ESD was issued in April 1994. See page D-36 for more information.	Terrence Connelly 617-573-9638
1	Ottati & Goss/Kingston Steel Drum - OU 4, NH (01/16/87)	Incineration (on site)			Thermal desorption	A change in cleanup level may be necessary under new risk guidance issued since the ROD was signed. Thermal desorption is more cost effective; the volume of contaminated media had increased. A change in future use from residential to nonresidential would require a ROD amendment.	Richard Goehlert 617-573-5742
1	South Municipal Water Supply Wells, NH (09/27/89)	Soil vapor extraction		Yes		A second ESD, issued in February 1997, granted a technical impracticality waiver. The waiver eliminated SVE because of the presence of DNAPLs. The SVE system has been shut down.	Roger Duwart 617-573-9628 Tom Andrews (NHDES) 603-271-2910
1	South Municipal Water Supply Wells, NH (09/27/89)	In situ air stripping (air sparging)		Yes		The air injection well was not installed deep enough to deliver air below the water table. Because of installation of deeper air injection wells would have caused penetration of a confining layer, that activity was not performed. An ESD was issued on 02/03/97.	Roger Duwart 617-573-9628 Tom Andrews (NHDES) 603-271-2910
1	Davis Liquid Waste, RI (09/29/87)	Solidification/ stabilization		Yes		Solidification/stabilization was proposed in the ROD as a treatment for the residues of incineration, but thermal desorption was used instead of incineration. Therefore, solidification/stabilization was not used. No ROD amendment or ESD was needed.	Neil Handler 617-573-9636

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Ninth Edition (April 1999) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 8TH EDITION)	9TH EDITION			COMMENTS	CONTACTS/PHONE
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2	Cosden Chemical Coatings Corp., NJ (09/30/92)	Solidification/ stabilization		Yes		The estimated volume of contaminated media had decreased; the technology was no longer effective. An ESD is to be issued in the near future.	Edward Finnerty 212-637-4367
2	De Rewal Chemical Co., NJ (09/29/89)	Solidification/ stabilization		Yes		The treatability study indicated that leaching inorganics from the solidified mass would increase contamination of the groundwater. An ESD, issued on 06/12/97, eliminates solidification/ stabilization and provides for off-site disposal.	Lawrence Granite 212-637-4423
2	Ellis Property, NJ (09/30/92)	Incineration (off site)			Solidification/ stabilization	Off-site incineration never was used because of high cost; chemical stabilization was used instead.	Richard Ho 212-637-4372
2	Kauffman & Minteer, NJ (09/27/96)	Incineration (off site)		Yes		No hazardous waste has been detected at this OU. The nonhazardous waste currently is being excavated and disposed of with no treatment. Additional characterization currently is being performed.	Paolo Pascetta 212-637-4383
2	Reich Farms, NJ (09/30/88)	Incineration (off site)		Yes		This was a contingency in the ROD. The ROD specified enhanced volatilization followed by either incineration or on-site disposal. All soil was treated successfully by enhanced volatilization and thus incineration was not necessary.	Jonathan Gorin 212-637-4361
2	Renora, Inc., NJ (09/29/87)	None				Original remedy was not listed in the ASR. The 1987 ROD selected bioremediation (in situ) for groundwater. It was cancelled because treatability studies showed bioremediation to be ineffective in treating PAH-contaminated soils. A ROD Amendment signed on 09/30/94 changed the remedy to off-site disposal.	Jonathan Gorin 212-637-4361
2	Roebling Steel Co., NJ (03/29/90)	Solidification/ stabilization		Yes		Solidification/stabilization was considered and rejected because of the high cost of cleaning up a large area of contamination (10 acres). A ROD amendment is expected in December 1998.	Tamara Rossi 212-637-4368
2	Roebling Steel Co., NJ (09/26/91)	Solidification/ stabilization		Yes		Solidification/stabilization was considered and rejected because of the high cost of cleaning up a large area of contamination (10 acres). A ROD amendment is expected in December 1998.	Tamara Rossi 212-637-4368
2	Swope Oil & Chemical, NJ (09/27/91)	Incineration (off site)		Yes		Remedy included only SVE treatment, and no off-site incineration was conducted. Misinterpretation of ROD.	Joseph Gowers 212-637-4413

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Ninth Edition (April 1999) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 8TH EDITION)	9TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
2	Waldick Aerospace Devices, Inc., NJ (03/29/91)	Incineration (off site)		Yes		Misinterpretation of the ROD. Off-site incineration never was implemented. The ROD specified on-site thermal treatment or thermal desorption.	Daniel Weissman 212-637-4384 George Buc (USACE) 908-389-3040 Dave Modricker (USACE) 717-748-4505
2	Waldick Aerospace Devices, Inc., NJ (09/29/87)	Solidification/ stabilization		Yes		Misinterpretation of the ROD.	Daniel Weissman 212-637-4384
2	White Chemical Corp., NJ (09/26/91)	Solidification/ stabilization		Yes		Misinterpretation of the ROD. ROD specified that the site should be stabilized, referring to the site stabilization process performed during a previous remedial action. This did not mean treatment using stabilization/solidification.	Betsy Donovan 212-637-4369
2	Brookhaven National Laboratory (USDOE) - OU 4, NY (03/25/96)	This is an FY96 ROD that was not listed in the eighth edition.	Soil vapor extraction			Soil vapor extraction was added to enhance the existing in situ air stripping system.	Mary Logan 212-637-4321
2	Circuitron Corp., NY (03/29/91)	Incineration (off site)		Yes		Misinterpretation of the ROD. Soil was excavated and transported to an approved RCRA treatment and disposal facility. Incineration (off site) was selected as the method of treatment to develop a conservative cost estimate.	Sharon Trocher 212-637-3965
2	Hooker (102nd Street Landfill), NY (09/26/90)	Incineration (off site)		Yes		Original ROD specified incineration of sediments outside slurry wall. Slurry has been repositioned to contain any migration of NAPL plumes. The site will be capped instead. ROD Amendment issued 06/9/95.	Paul Olivo 212-637-4280
2	Love Canal - 93rd St. School, NY (09/26/88)	Solidification/ stabilization		Yes		Residents did not want any materials treated on site. Materials were disposed of off site instead. A ROD amendment was issued in 05/91.	Damian Duda 212-637-4269
2	Marathon Battery Corp., NY (09/30/88)	Solidification/ stabilization		Yes		All three solidification/ stabilization projects were conducted as one project, even though three RODs were issued. The work is documented in the ASR as a single project. Therefore, the two other projects have been deleted.	Pam Tames 212-637-4255

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Ninth Edition (April 1999) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 8TH EDITION)	9TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
2	Marathon Battery Corp., NY (09/30/89)	Solidification/ stabilization		Yes		All three solidification/ stabilization projects were conducted as one project, even though three RODs were issued. The work is documented in the ASR as a single project. Therefore, the two other projects have been deleted.	Pam Tames 212-637-4255
2	Mattiace Petrochemicals - OU 1, 5, and 6, NY (06/27/91)	Incineration (off site)		Yes		The ROD identified incineration as a possible method of treatment, but incineration was not the selected remedy.	Edward Als 212-637-4272
2	Olean Well Field - OU 2, NY (09/30/96)	In situ air stripping (air sparging)		Yes		Air sparging was considered for the dry cleaning. A pilot test demonstrated that air sparging was not feasible because of site conditions. Contaminated soil will be excavated instead (a contingency in the ROD, so no ESD or ROD amendment is necessary).	Thomas Taccone 212-637-4281
2	Solvent Savers, NY (09/30/90)	Thermal desorption			Soil vapor extraction	SVE is being conducted as a pilot study, but thermal desorption may be used in the future.	Lisa Wong 212-637-4267
3	Delaware Sand & Gravel Landfill - OU 4 and OU 5, DE (09/30/93)	Soil vapor extraction			Bioremediation (in situ) - bioventing	Treating soil with SVE followed by bioventing would not have enhanced the rate of removal of VOCs from soil. Therefore, bioventing was used without SVE. The remedy was a contingency in the ROD.	Eric Newman 215-814-3237
3	E.I. DuPont-Newport Site, DE (09/23/93)	None				Original remedy was not listed in the ASR. The 1993 ROD selected solidification/stabilization (in situ). However, the waste was much deeper than originally estimated. Due to the increased volume of waste, the cleanup costs were significantly higher than cited in the 1993 ROD. On 08/16/95 EPA issued and ESD to change the remedy to containment with pump-and-treat for groundwater.	Lisa Brown 215-814-5528
3	Halby Chemical Co. - OU 1, Process Plant Area, DE (06/28/91)	Solidification/ stabilization			Chemical treatment	Misinterpretation of ROD; in situ chemical oxidation was used.	Eric Newman 215-814-3237
3	Aberdeen Proving Ground (Edgewood Area) J-Field Soil OU, MD (09/27/96)	This is an FY96 ROD that was not listed in the eighth edition.			Phyto-remediation	Incineration and solidification/stabilization, provided for in the original ROD, was considered dangerous because of the presence of unexploded ordnance. A ROD amendment is to be issued in the near future for a change to phytoremediation.	Steven R. Hirsh 215-566-3352

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Ninth Edition (April 1999) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 8TH EDITION)	9TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
3	Mid-Atlantic Wood Preservers, MD (12/31/90)	Solidification/ stabilization		Yes		The remedy was a contingency in the ROD. Solidification/ stabilization was to be used only if the level of arsenic was above 1000 mg/kg. Results of soil analysis on all samples at the site show levels of arsenic below 1,000 mg/kg.	Eric Newman 215-814-3237
3	Aladdin Plating, PA (09/27/88)	Solidification/ stabilization		Yes		A vendor demonstration of electrokinetics to treat contaminated groundwater and soils will continue. A subsequent ROD issued on 12/30/93 requires institutional controls and monitoring, but no solidification/stabilization.	Gregory D. Hamm 215-566-3194
3	Berks Sand Pit, PA (09/29/88)	Incineration (off site)		Yes		The source of contamination in sediments is being eliminated because of lowering of the water table, eliminating the need for excavation and incineration (off site) of sediments. An ESD has been proposed and will be made final after a public comment period of 30 days.	Bruce Rundell 215-566-3317
3	Brown's Battery Breaking Site - OU 2, PA (07/02/92)	Plasma high- temperature recovery		Yes		Problems with implementation include high cost and equipment or site problems.	Richard Watman 215-566-3219
3	Douglassville Disposal, PA (06/30/89)	Incineration (on site)		Yes		Community concerns prohibited the use of the technology. A feasibility study of solidification/stabilization is being conducted. A ROD amendment is expected in FY99.	Victor J. Janosik 215-566-3217
3	Drake Chemical - Phase II, PA (05/13/86)	Incineration (on site)		Yes		This is a duplicate project. Both the 1986 and the 1988 ROD specified incineration. Incineration (on site) was chosen because of a preference for on-site treatment. The work is documented as a single project.	Gregg Crystall 215-566-3207
3	Hebelka Auto Salvage Yard, PA (09/30/91)	Solidification/ stabilization		Yes		The 1991 ROD refers to solidification/stabilization of lead-contaminated soils completed under the 1989 ROD, but the 1991 ROD specifies monitoring of groundwater only; no solidification/stabilization of additional sites is specified.	Frederick N. Macmillan 215-814-3201
3	M.W. Manufacturing, PA (03/31/89)	Incineration (off site)			Solidification/ stabilization and Thermal Desorption	Results of treatability study showed burning fluff caused potential threat due to emissions of dioxin. Thus, offsite incineration was not implemented. ROD Amendment issued 12/22/97 selected ex-situ stabilization and low temperature thermal desorption.	Bhupendra Khona 215-566-3213

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Ninth Edition (April 1999) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 8TH EDITION)	9TH EDITION			COMMENTS	CONTACTS/PHONE
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3	Publicker Industries, Inc. - OU 3, PA (12/28/95)	Solidification/ stabilization		Yes		The remedy was a contingency. Wastes were disposed of in a landfill.	Frances Costanzi 215-566-3196
3	Greenwood Chemical Co., VA (12/29/89)	Solidification/ stabilization		Yes		Solidification/stabilization of soils contaminated with arsenic would not have been cost-effective for the small volume of waste present. No ROD amendment or ESD was issued.	Philip Rotstein 215-814-3232
3	Rentokil Virginia Wood Preserving, VA (06/22/93)	Incineration (off site)		Yes		Cost too high. A value engineering analysis indicated that contaminants in soil could successfully be contained with a slurry wall and cap. A pump and treat system for dewatering could effectively immobilize contaminants. ROD Amendment issued 08/27/96.	Andrew C. Palestini 215-566-3233
3	Rentokil Virginia Wood Preserving, VA (06/22/93)	Solidification/ stabilization		Yes		Cost too high. A value engineering analysis indicated that contaminants in soil could successfully be contained with a slurry wall and cap. A pump and treat system for dewatering could effectively immobilize contaminants. ROD Amendment issued 08/27/96.	Andrew C. Palestini 215-566-3233
3	Saunders Supply Co., VA (09/30/91)	Solidification/ stabilization		Yes		Solidification/stabilization was a contingency that was found to be unnecessary.	Andrew C. Palestini 215-566-3233
3	Fike Chemical, Inc. - OU 1, WV (09/29/88)	Solidification/ stabilization		Yes		Misinterpretation of the ROD. The ROD called for drainage of water and liquid from the lagoon (referred to as "stabilization" in the ROD). Lagoon sludge then was to be sent off site for incineration.	Katherine Lose 215-566-3240
3	Fike Chemical, Inc.-WV (03/31/92)	Neutralization		Yes		The excavated drums were damaged and were sent off site for disposal. ESD issued 05/13/93.	Katherine Lose 215-566-3240
3	Fike Chemical, Inc. - OU 3 - Drum Removal, WV (03/31/92)	Solidification/ stabilization		Yes		Stabilizing in the ROD referred to stabilizing acidic wastes. The closeout report indicated that all nonhazardous soils were landfilled and hazardous wastes were incinerated. Solidification/ stabilization was a contingency remedy.	Katherine Lose 215-566-3240
4	Ciba Geigy (McIntosh Plant), AL (07/14/92)	Solidification/ stabilization		Yes		Solidification/stabilization was not implemented because it would bring about no cost savings.	Charles L. King, Jr. 404-562-8931

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4	Ciba Geigy (McIntosh Plant) - OU 3, AL (07/25/95)	Bioremediation (in situ) - other			Incineration (on site)	The treatability study was unsuccessful; treatment goals could not be met. Wastes are being incinerated instead.	Charles L. King, Jr. 404-562-8931
4	Anodyne, Inc., FL (06/17/93)	Solidification/ stabilization		Yes		The amount of contaminated soil was less than anticipated, and the soil was excavated and landfilled off site.	Brad Jackson 404-562-8925
4	Brown Wood Preserving, FL (04/8/88)	Solidification/ stabilization		Yes		Contingency. This technology in ROD was to be considered only if ex situ biodegradation - land treatment did not attain the desired cleanup levels for the appropriate indicator chemicals within the two-year time period. Goals were met within 18 months.	Rosalind Brown 404-562-8870
4	Cecil Field Naval Air Station - OU 2, Sites 5 and 17, FL (06/24/96)	Bioremediation (in situ) - groundwater			Air sparging	Bioremediation was begun, but the cleanup goals were revised. A ROD amendment is to be issued soon, and air sparging will be used.	Debbie Vaughn-Wright 404-562-8539
4	Cecil Field Naval Air Station - OU 6, Site 11, FL (09/14/94)	Incineration (off site)		Yes		Wastes were below LDR standards for treatment. Waste was sent off site to a RCRA subtitle C landfill.	Debbie Vaughn-Wright 404-562-8539
4	Cecil Field Naval Air Station - OU 7, FL (07/17/96)	Bioremediation (in situ) - groundwater		Yes		SVE and bioremediation were to be implemented in the downgradient area, but concentrations of contaminants have decreased. Therefore, the remedy will not be implemented.	Debbie Vaughn-Wright 404-562-8539
4	Cecil Field Naval Air Station - OU 7, FL (07/17/96)	Soil vapor extraction		Yes		SVE and bioremediation were to be implemented in the downgradient area, but concentrations of contaminants have decreased. Therefore, the remedy will not be implemented.	Debbie Vaughn-Wright 404-562-8539
4	Coleman-Evans Wood Preserving - Amendment, FL (09/26/90)	Solidification/ stabilization			Thermal desorption	The 1990 ROD amendment selected a technology train of bioremediation, soil washing and S/S. Treatability studies indicated presence of dioxin, which cannot be treated with bioremediation. So, remedy changed to thermal desorption. ROD Amendment 9/25/97.	Randall Chaffins 404-562-8929
4	Gold Coast Oil Corp., FL (09/11/87)	Solidification/ stabilization		Yes		The estimated volume of contaminated media had decreased, and the technology was no longer effective.	Brad Jackson 404-562-8925

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4	Homestead Air Reserve - OU 6, Site SS-3, FL (06/27/95)	Thermal desorption		Yes		Excavation, hauling, and landfilling as a non-RCRA solid waste was less costly, as per the ESD issued on 10/22/97. One 55-gal. drum and 1,350 cu yd of waste were hauled to a non-RCRA landfill. Data in design showed reduced volume of soil.	Patricia Goldberg 404-562-8543 Doyle Brittain 404-562-8549
4	Reeves Southeastern Galvanizing - OU 1, FL (10/13/92)	Solidification/ stabilization		Yes		Implementability (equipment problems and site problems). The PRP could not find a treatment mix that could meet performance standards. An ESD was issued on 04/17/97.	Randall Chaffins 404-562-8929
4	Stauffer Chemical Company, FL (12/01/95)	Bioremediation (ex situ)			Bioremediation (ex situ)-composting	The change was made to identify a specific type of ex situ bioremediation.	Brad Jackson 404-562-8925
4	Whitehouse Oil Pits - Amendment, FL (06/16/92)	Bioremediation (ex situ) - slurry-phase		Yes		Treatment goals could not be met. A ROD amendment was to be issued in mid-September 1998, and a public comment period will be conducted.	Mark Fite 404-562-8927
4	Marine Corps Logistics Base - OU 3, PSC 16 & 17, GA (08/14/92)	Solidification/ stabilization		Yes		Misinterpretation of ROD; soil was mixed with clean fill and then disposed of at a permitted landfill. No solidification/stabilization was performed.	Robert Pope 404-562-8506
4	Marzone Inc./Chevron Co. - OU 1, GA (09/30/94)	Thermal desorption		Yes Yes		Remedy was too costly, the community was opposed to the remedy, and dioxin was discovered. Therefore, the technology was not implemented, and the soil was excavated and disposed of at an off-site landfill. A ROD amendment was issued on 06/18/97.	Annie Godfrey 404-562-8919
4	Mathis Brothers Landfill - South Marble Top Road, GA (03/24/93)	Bioremediation (ex situ) - slurry-phase				Excavation, landfilling, and incineration were less costly and required less time. Soils were excavated and transported off site for landfilling if nonhazardous, and incinerated if hazardous.	Charles L. King, Jr. 404-562-8931
4	Smith's Farm - OU 1, KY (09/29/89)	Solidification/ stabilization		Yes		Solidification/stabilization was planned for the heavy metals remaining in the treated soils after the thermal desorption, but the treatment was not necessary.	Antonio DeAngelo 404-562-8826
4	Aberdeen Pesticide Dumps (Amendment), NC (09/30/91)	Solidification/ stabilization			Incineration (off site)	Arsenic is a contaminant at the site. Because the arsenic was commingled with pesticide wastes, all soil contaminated with arsenic was incinerated, and no soil required stabilization.	Kay Crane 404-562-8795

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4	Cape Fear Wood Preserving, NC (06/30/89)	Soil washing			Thermal desorption	An ESD issued in 1993 changed the remedy from soil washing to thermal desorption.	Jon Bornholm 404-562-8820
4	Chemtronics, Inc., NC (040/5/88)	Solidification/ stabilization		Yes		The project was canceled during the design phase, and the site was capped.	Jon Bornholm 404-562-8820
4	Marine Corps Base, Camp Lejeune - OU 12, Site 3 - The Old Creosote Plant, NC (04/03/97)	Bioremediation (ex situ) - solid-phase		Yes		Treatment goals could not be met during treatability testing, and therefore bioremediation (ex situ) – solid-phase will not be implemented. A ROD amendment that specifies disposal of the contaminated soils in an off-site landfill is being prepared.	Gena Townsend 404-562-8538
4	Sodyeco - Area C, NC (09/24/87)	Soil vapor extraction		Yes		During installation, contaminated drums were encountered, excavated, and removed. Contamination therefore decreased, and SVE no longer was required.	Michael Townsend 404-562-8813
4	Geiger (C&M Oil), SC (6/1/87)	Solidification/ stabilization		Yes		A ROD amendment was issued on 07/13/93.	Sheri Panabaker 404-562-8810
4	Kalama Specialty Chemicals, SC (09/28/93)	Solidification/ stabilization		Yes		The amount of contaminated material was less than originally estimated, so it was excavated and disposed of off site. Contingency in ROD.	Steven Sandler 404-562-8818
4	Kalama Specialty Chemicals, SC (09/28/93)	Mechanical soil aeration		Yes		The amount of contaminated material was less than originally estimated, so it was excavated and disposed of off site. Contingency in ROD.	Steven Sandler 404-562-8818
4	Savannah River (TNX Area), SC	In situ air stripping (air sparging)		Yes		Problems with implementability (equipment problems, on site problems) arose; development of an air recirculation well was not possible. Areas of low permeability precluded formation of the required recirculation cell. An ESD is to be issued in near the future.	Joao Cardoso-Neto (Bechtel) 803-952-6495 Keith A. Collinsworth (SCDHEC) 803-896-4055 Constance A. Jones 404-562-8551

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Ninth Edition (April 1999) (continued)

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4	Savannah River (USDOE) - M Area Settling Basin, SC	In situ air stripping (air sparging)		Yes		This is a demonstration project, not a full-scale application.	Mike Simmons (DOE) 803-725-1627 Brian Looney (WSRC) 803-725-1627
4	Savannah River (USDOE) - OU 1, SC (06/29/92)	Solidification/ stabilization		Yes		The work was completed as a RCRA project that is not applicable to the ASR.	Mike Simmons (DOE) 803-725-1627 Brian Looney (WSRC) 803-725-3692
4	Amnicola Dump, TN (03/30/89)	Solidification/ stabilization		Yes		The volume of soil was much less than had been indicated in the ROD, and it was more cost-effective to dispose of the soil off site.	Robert West 404-562-8806
4	Arlington Blending and Packaging Co., TN (06/28/91)	Solidification/ stabilization		Yes		The estimated volume of contaminated media has decreased; the technology no longer is effective. An ESD is to be issued in near future.	Derek Matory 404-562-8800
4	Wrigley Charcoal, TN (09/30/91)	Incineration (off site)		Yes		The technology was too expensive; disposed of off site in a landfill. A ROD amendment was issued on 02/02/95.	Lisa Montalvo 404-562-8805
4	Wrigley Charcoal, TN (09/30/91)	Solidification/ stabilization		Yes		The technology was too expensive; disposed of off site in a landfill. A ROD amendment was issued on 02/02/95.	Lisa Montalvo 404-562-8805
5	Acme Solvent Reclaiming, Inc., IL (12/31/90)	Incineration (off site)		Yes		The ROD identifies off-site incineration as a contingency. The technology was never implemented.	David Linnear 312-886-1841
5	Belvidere Municipal Landfill - No. 1, IL (06/29/88)	Incineration (off site)		Yes		Incineration off site was included in the ROD to be used if the concentration of PCBs was greater than 50 ppm. Because the concentration was not, PCBs were disposed of off site.	William Ballard 312-353-6083
5	Byron/Johnson Salvage Yard, IL (03/13/85)	Incineration (off site)		Yes		Excavation, hauling, and landfilling were used instead of off-site incineration as indicated in the ROD because of high cost.	Bill Bolen 312-353-6316
5	Savanna Army Depot Activity, IL	Solidification/ stabilization		Yes		This project is a RCRA closure - state oversight.	David Seely 312-886-7058

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5	Fisher-Calo, IN (08/07/90)	Soil vapor extraction			Bioremediation (in situ) - biosparging	Biosparging was determined to be more effective than SVE; no ROD amendment or ESD has been issued.	Jeffrey Gore 312-886-6552
5	Main Street Well Field, IN (03/29/91)	Incineration (off site)		Yes		Off-site incineration was never implemented at this site.	Deborah Orr 312-886-7576
5	Wayne Waste Oil, IN (03/30/90)	Bioremediation (in situ)			Bioremediation (in situ) - biosparging	The technology has been reclassified.	Jeffrey Gore 312-886-6552
5	Wayne Waste Oil, IN (03/30/90)	Solidification/ stabilization		Yes		The technology was determined to be unnecessary. Metals were the only contaminants of concern, and the site had been capped already. Consequently, the risk was minimized. No ROD amendment or ESD was written.	Jeffrey Gore 312-886-6552
5	Wedzeb, IN (06/30/89)	Incineration (off site)		Yes		52,000 drums of PCB capacitors were incinerated off site in 1987 at the Apptus facility in Kansas. Soil was excavated and disposed of off site because the contamination remaining in soil was low. No ROD amendment or ESD was issued.	Kenneth Theisen 312-886-1959
5	Berlin & Farro Liquid Incineration, MI (02/29/84)	Incineration (off site)		Yes		Contingency in the ROD. ROD specified transportation of PCB liquid wastes, if any, to an approved off-site incinerator.	Robert Whippo 312-886-4759
5	Burrows Sanitation, MI (09/30/86)	Solidification/ stabilization		Yes		The volume of contamination was smaller than originally had been estimated. It was more cost-effective to excavate and dispose of off site under removal authority.	Jeffrey Gore 312-886-6552
5	Carter Industrials, Inc., MI (09/18/91)	Incineration (off site)		Yes		1991 ROD specified thermal desorption, not incineration off-site. Misinterpretation of ROD. Amended ROD 2/28/95 canceled remedy because the cost for off-site disposal dropped, there was less soil, and restrictions on interstate transport have decreased.	Jon Peterson 312-353-1264
5	Clare Water Supply, MI (09/16/92)	Thermal desorption		Yes		The remedy should have been listed as SVE. The 1992 ROD specified SVE, not thermal desorption, but SVE was not feasible because of the low permeability of soils. A ROD amendment was issued on 05/15/97.	Jon Peterson 312-353-1264

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5	Duell-Gardner Landfill, MI (09/07/93)	Thermal desorption		Yes		The volume of contaminated material was much smaller than originally had been estimated. Consequently, it was more cost-effective to excavate and dispose of the material off site. A ROD amendment was to be issued in FY98.	Lolita Hill 312-353-1621
5	Electrovoice, MI (06/23/92)	Solidification/ stabilization		Yes		Solidification/stabilization was identified as a contingency remedy in the 1992 ROD. If cleanup goals are not achieved by the SVE system, the soils will be excavated and stabilized. The SVE system is in operation and its performance will be reviewed next year.	Karen Sikora 312-886-1843
5	Forest Waste Products, MI (03/31/88)	Incineration (off site)		Yes		An ESD is to be issued in the near future.	Elizabeth Reiner 312-353-6576
5	H. Brown Company, Inc., MI (09/30/92)	Solidification/ stabilization		Yes		The site was capped with clay and covered with asphalt so that the property could be redeveloped. Two ROD amendments have been issued. The first, issued on 09/29/95, removed solidification/stabilization from the project.	Timothy Prendiville 312-886-5122
5	Thermo-Chem, Inc. - OU 1, MI (09/30/91)	Incineration (off site)		Yes		The concentrations of the contaminants in the soil were low and it was not cost-effective to treat the soil with incineration. The metals could not be treated with incineration. The contaminated soil was excavated and disposed of off site.	James Hahnenberg 312-353-4213
5	MacGillis and Gibbs/Bell Lumber and Pole - OU 3, MN (09/22/94)	Bioremediation (in situ) - groundwater		Yes		The technology is ex situ, not in situ. Groundwater is being pumped and treated above ground.	Darryl Owens 312-886-7089 Miriam Horneff (MPCA) 612-296-7228
5	Ritari Post and Pole - OU 1, MN (06/30/94)	Incineration (off site)			Bioremediation (ex situ) - land treatment	Incineration was too expensive.	Ted Smith 312-353-6571 John Moeger (MPCA) 612-296-9707
5	Ritari Post and Pole - OU 1, MN (06/30/94)	Incineration (off site)		Yes		Incineration was too expensive. Chemical oxidation may be used to treat highly contaminated soils, and land treatment will be used for lower concentrations; the use of off site incineration would move the risk outside the site. An ESD is to be issued.	Ramon Torres 312-886-3010

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5	Allied Chem & Ironton Coke, OH (12/28/90)	Incineration (on site)		Yes		Contaminated soil volume decreased. A ROD amendment was to be issued in May or June 1998. Soil contaminated with soft tar will be excavated, soil that meets the TCLP limit will be recycled for alternative fuel, and soil that fails the TCLP limit will be disposed of at an off-site landfill.	Matthew Mankowski 312-886-1842
5	Fields Brook, OH (09/30/86)	None				The original remedy in the 1986 ROD was not listed in the ASR. The 1986 ROD specified solidification of sediments. EPA issued and ESD on 08/15/97 changed solidification to disposal.	Terese Van Donsal 312-353-6564
5	Summit National Liquid Disposal Service - Amendment, OH (11/02/90)	Incineration (off site)		Yes		The 1988 ROD and the 1990 ROD amendment both specified incineration on site. It is documented as a project under the 1988 ROD.	Anthony Rutter 312-886-8961
5	Mid-State Disposal Landfill, WI (09/30/88)	Solidification/ stabilization		Yes		Solidification/stabilization was identified as a contingency that was to be used only to solidify the sludge lagoon so that a cap could be placed over it. Solidification/ stabilization was deemed unnecessary. A geomembrane cap was used without solidification/ stabilization.	Mary Tierney 312-886-4785
5	Onalaska Municipal Landfill, WI (08/14/90)	Bioremediation (in situ)			Bioremediation (in situ) - bioventing	The technology was reclassified from bioremediation in situ to bioventing.	George Mickelson (WIDNR) 608-267-0858 Kevin Adler 312-886-7078
5	Spickler Landfill, WI (06/03/92)	Solidification/ stabilization		Yes		Results of a test of stabilization/solidification showed that the technology would not provide a significant reduction in the mobility or hydraulic conductivity of mercury wastes. An impermeable cap with synthetic liner was used to eliminate infiltration.	John Fagiolo 312-886-0800
6	Gurley Pit, AR (10/06/86)	Incineration (off site)		Yes		The cost was too high; transportation and safety problems also arose.	Ernest R. Franke 214-665-8521
6	Popile, AR (02/01/93)	Bioremediation (ex situ)			Bioremediation (ex situ) - land treatment	The RI data is being reviewed to determine whether there is a more appropriate remedy. The site was capped under a removal action. FS decisions will be made in 1999.	Shawn Ghose 214-665-6782

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6	Popile, AR (02/01/93)	Bioremediation (in situ)			Bioremediation (in situ) - groundwater	The RI data is being reviewed to determine whether there is a more appropriate remedy. The site was capped under a removal action. FS decisions will be made in 1999. The original remedy had been composting, but the remedy was changed to bioremediation in situ - groundwater.	Shawn Ghose 214-665-6782
6	Vertac, Inc., AR (06/30/93)	Incineration (off site)		Yes		This project has been consolidated with off-site incineration under the 1993 ROD for OU1. All material specified in that ROD was incinerated off site according to a 1995 ESD. See information under the listing for incineration off site at OU1.	Phillip Allen 214-665-8516
6	Vertac, Inc. - Onsite OU 1, AR (05/25/95)	Incineration (on site)			Incineration (off site)	An on-site incinerator was present after use for a previous removal action. The PRP and the incinerator operator could not agree on a price, so EPA allowed the PRP to choose to incinerate the soils off site. An ESD was issued on 05/25/95.	Mike Arjmandi (ADPCE) 501-682-0852 Phillip Allen 214-665-8516
6	Bayou Bonfouca - Source Control OU (Amendment), LA (07/20/95)	Incineration (off site)		Yes		This ROD amendment (07/20/95) actually covered the off-site incineration of waste from the Southern Shipbuilding Corporation site. Therefore, no waste from Bayou Bonfouca was incinerated off site or addressed by this ROD amendment.	Mark Hansen 214-665-7548
6	Pab Oil & Chemical Services, Inc., LA (09/22/93)	Bioremediation (ex situ) - other			Solidification/ Stabilization	Bioremediation was discontinued because of implementability problems. An ESD was issued on 03/12/1997.	Caroline Ziegler 214-665-2178
6	Atchison, Topeka, & Santa Fe Clovis/Santa Fe Lake - TPH lake sediments, NM (09/23/88)	Bioremediation (ex situ) - land treatment		Yes		No information available.	Donald H. Williams 214-665-2197
6	Oklahoma Refining Co., OK (06/09/92)	Bioremediation (ex situ) - other			Bioremediation (ex situ) - land treatment	The type of bioremediation was clarified; there was no actual remedy change.	Kelly Dixon (ODEQ) 405-702-5141 Earl Hendrick 214-665-8519

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6	Bailey Waste Disposal, TX (06/28/88)	Solidification/ stabilization		Yes		Cost too high; treatment goals could not be met; more contamination than planned. New remedy includes excavation and offsite disposal of problematic wastes and installation of a geocomposite cap over mixed industrial and municipal wastes. ROD Amendment 12/16/96.	Chris Villarreal 214-665-6758
6	Brio Refining, TX (03/31/88)	Solidification/ stabilization		Yes		Solidification/ stabilization was considered during the RI/FS stages, but was not included in the ROD because it could not meet treatment levels. No ROD Amendment or ESD therefore was necessary.	John Meyer 214-665-6742
6	Kelly Air Force Base - Site 1100, Phase II, TX	This phase is an addition to the phase listed in the eighth edition.	Soil vapor extraction			No information available.	Bill Hall 210-925-3100
6	Kelly Air Force Base - Site 1100, Phase III, TX	This phase is an addition to the phase listed in the eighth edition.	Bioremediation (in situ)-bioventing			No information available.	Bill Hall 210-925-3100
6	Petro-Chemical Systems, Inc.-OU 2, TX (04/30/98)	This is an FY98 ROD that was not listed in the eighth edition.	Thermal desorption				Chris Villarreal 214-665-6758
6	Petrochemical (Turtle-Bayou), TX (09/06/91)	Incineration (off site)			Soil vapor extraction	Misinterpretation of ROD. SVE currently is being used to remediate four soil areas at the site.	Chris Villarreal 214-665-6758
6	Sheridan Disoposal Services, TX (12/29/88)	Solidification/ stabilization		Yes		Misinterpretation of the ROD.	Gary A. Baumgarten 214-665-6749
6	South Cavalcade Street, TX (09/26/88)	Incineration (off site)		Yes		The 09/26/88 ROD listed incineration (off site) for sludges, if encountered. However, no sludges were not found and therefore incineration was not performed.	Glenn Celerier 214-665-8523
6	South Cavalcade Street, TX (09/26/88)	Soil washing		Yes		A pilot study of soil washing showed that 40 percent of the volume could not be washed to meet goals. Soils contaminated with carcinogenic PAHs at levels higher than 700 ppm will be sealed and contained beneath a six-inch-thick reinforced concrete cap. A ROD amendment was issued on 06/27/97.	Glenn Celerier 214-665-8523

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Ninth Edition (April 1999) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 8TH EDITION)	9TH EDITION ADDED	9TH EDITION DELETED	9TH EDITION CHANGED TO	COMMENTS	CONTACTS/PHONE
6	South Cavalcade Street, TX (09/26/88)	Flushing (in situ)		Yes		Estimated volume of contaminated soil much less than anticipated, but treatment goals could not be reached anyway. Will cap the site instead. ROD Amendment issued 6/27/97.	Glenn Celerier 214-665-8523
7	Midwest Manufacturing/North Farm (Amendment), IA (09/30/93)	Solidification/ stabilization		Yes		The cost was too high; contaminant levels for both OUs were lower than before. Site risks were evaluated to determine that monitoring with institutional controls would effectively address the contamination at both OUs. The original ROD was issued in 1988.	Diane Easley 913-551-7797
7	Strother Field Industrial Park, KS (03/31/94)	Soil vapor extraction		Yes		The application of SVE technology is impractical at this site because the soil permeability is too low. The remedy proposed in the ESD is a pump-and-treat system with monitored natural attenuation. An ESD was to be issued by 09/30/98.	Paul Roemerman 913-551-7694
7	Ellisville Site - Bliss, MO (09/29/86)	Incineration (off site)				The 1986 ROD called for interim storage of contaminated soil on site and incineration at an off-site commercial facility. The 1991 ROD called for off-site incineration at the Times Beach, MO site operated by the PRPs. A ROD amendment was issued on 09/30/91.	Robert Feilds 913-551-7697
7	Missouri Electric Works, MO (09/28/90)	Incineration (on site)			Thermal desorption	On-site incineration was too expensive. A ROD amendment was issued in September 1995.	Pauletta France-Isetts 913-551-7701
7	Shenandoah Stables, MO (09/28/90)	Solidification/ stabilization		Yes		Misinterpretation of the ROD.	Robert Feild 913-551-7697
8	Broderick Wood Products, CO (03/24/92)	Bioremediation (in situ) - groundwater			Bioremediation (in situ) - bioventing	The remedy was changed to bioventing in the ESD issued on 03/24/95. The pump-and-treat system did not work with LNAPLs; therefore, the cost of implementing it would be high.	Armando Saenz 303-312-6559
8	Fort Carson - Building 9648 OU, CO	Bioremediation (in situ) - other			Bioremedi-ation (in situ) - bioventing	The technology was reclassified.	John Cloonan 719-526-8004
8	Lockheed/Martin - W C Astronautics Facility, CO (09/24/90)	Soil vapor extraction			Thermal desorption	SVE will not be used. All soil will be excavated and treated by thermal desorption. Doing so will allow the site owner to reduce risk, eliminate the need for post-closure care, and clean-close the unit.	George Dancik 303-312-6206 Charles Johnson (CDPHE) 303-692-3348

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Ninth Edition (April 1999) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 8TH EDITION)	9TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
8	Rocky Mountain Arsenal - OU 17, CO (05/14/90)	Solidification/ stabilization		Yes		The ROD was misinterpreted.	Laura Williams 303-312-6660
8	Rocky Mountain Arsenal - OU 28, CO (01/15/93)	Solidification/ stabilization		Yes		OU 28 was the evaluation of alternatives for treatment of various future waste streams at RMA. Solidification/ stabilization was considered, but no actions were taken under OU 28.	Laura Williams 303-312-6660
8	Rocky Mountain Arsenal - OU 29, CO (01/15/93)	Incineration (off site)		Yes		OU 29 was an interim remedial action to address PCB wastes. Both off-site incineration and off-site landfilling were selected as the most preferable alternatives for disposal of PCB wastes. The PCB wastes were ultimately disposed of by landfilling.	Laura Williams 303-312-6660
8	Sand Creek Industrial, CO (09/28/90)	Incineration (off site)		Yes		No information is available.	Erna Waterman 303-312-6762
8	Summitville Mine - OU 0, CO (12/15/94)	Neutralization		Yes		The ROD was misinterpreted.	Victor Ketallappet 303-312-6528
8	Burlington Northern (Somers Plant) - Soil, Base - OU 4, UT (06/14/94)	Bioremediation (in situ) - other		Yes		The ROD was misinterpreted.	James C. Harris 406-441-1150
8	Montana Pole and Treating Plant - Soil OU, MT (09/21/93)	Bioremediation (in situ) - other		Yes		The ROD was misinterpreted.	James C. Harris 406-441-1150 Neil Marsh (MT) 406-444-1420
8	Silver Bow Creek/Butte Area - Rocker Timber Framing and Treatment Plant OU, MT (06/30/92)	Solidification/ stabilization		Yes		Solidification/stabilization treatment was recommended only if chemical treatment was not successful. The estimated volume of contaminated media had decreased; the technology was no longer effective.	Mike Bishop 406-441-1150
8	Ellsworth AFB - Abandoned Fire Protection Area, SD (05/10/96)	Soil vapor extraction		Yes		The FY96 ROD only expanded the dual phase system from the FY95 ROD, but did not add any technologies.	Peter Ismert 303-312-6665

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Ninth Edition (April 1999) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 8TH EDITION)	9TH EDITION			COMMENTS	CONTACTS/PHONE
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8	Hill Air Force Base - OU 4, UT (06/14/94)	Soil vapor extraction		Yes		The bottom half of the landfill is below the water table, and the landfill does not have a slurry wall to divert groundwater flow from it. Therefore, SVE technology could not be implemented. A series of 3 trenches collects leachate from the landfill.	Dr. Dan Atkins (DoD) 801-775-2559 Rob Stites 303-312-6664
8	Utah Power & Light/American Barrel, UT (07/07/93)	Incineration (off site)		Yes		Off-site incineration was specified as a contingent remedy but never was implemented.	Paula Schmittdiel 303-312-6861
9	Fairchild Semiconductor (Mt. View) - Bldg 1-4 (515 & 545 N. Whisman Rd./313 Fairchild Dr.), CA (06/30/89)	Soil vapor extraction		Yes		The water table rose and is now too high for SVE to be effective. A pump-and- treat system currently is being used. No ROD amendment or ESD was issued.	Dennis Curran Smith Env. Tech. Corp. 415-960-1640 Eugenia Chow 415-744-2258
9	FMC Corp. (Fresno Plant), CA (06/28/91)	Solidification/ stabilization		Yes		Removed from proposed NPL listing.	Cynthia Wetmore 415-744-2234
9	Intel, Mountian View, CA (06/09/89)	Mechanical soil aeration		Yes		Soil was excavated and shipped off site.	Eugenia Chow 418-744-2258
9	J.H. Baxter, CA (09/27/90)	Bioremediation (ex situ) - land treatment			Bioremediation (in situ) - bioventing	Ex situ bioremediation was replaced with in situ bioremediation. Landfarming may be used; biomass culture was added to contaminated soil. ESD issued 3/27/98.	Kathy Setian 415-744-2254 Beatriz Bofill 415-744-2235
9	Koppers (Oroville Plant), CA (09/13/89)	Solidification/ stabilization		Yes		Treatment goals could not be met. The concentrations of dioxins were sufficiently high that solidification/ stabilization was not feasible. A ROD amendment was issued on 08/29/96.	Charles Berrey 415-744-2223
9	March AFB - OU 1, Area 5 & Site 4, CA (06/20/96)	Bioremediation (in situ) - bioventing		Yes		No information available.	Richard Russell 415-744-2406
9	March AFB - OU 1, Area 5 & Site 4, CA (06/20/96)	Thermal desorption				No information available.	Richard Russell 415-744-2406

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Ninth Edition (April 1999) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 8TH EDITION)	9TH EDITION			COMMENTS	CONTACTS/PHONE
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9	Mather AFB - Soil and Groundwater OU/Smaller UST Sites, CA	Bioremediation (in situ)			Bioremediation (in situ) - bioventing	The technology was reclassified from bioremediation in situ to bioventing.	Kathleen Salyer 415-744-2214 Terry Winsor (Montgomery Watson) 916-231-4430
9	McColl, CA (06/30/93)	Solidification/ stabilization		Yes		Technology had implementation problems. EPA selected the contingency remedy of RCRA-equivalent closure for the sump wastes. Pilot and full-scale treatability studies were conducted during 1994 and 1995 to determine the feasibility of solidification/stabilization.	Patti Collins 415-744-2229
9	Purity Oil Sales, Inc., CA (09/26/89)	Solidification/ stabilization		Yes		The reason for deletion of the technology is unknown. An ESD was issued in 1995, and capping was performed at the site.	Rosemarie Caraway 415-744-2231
9	Raytheon, Mountain View, CA (06/09/89)	Mechanical soil aeration		Yes		Soil was excavated and shipped off site for disposal.	Eugenia Chow 415-244-2258
9	Roseville Drums, CA (03/03/88)	Bioremediation (in situ)		Yes	Bioremediation (in situ) - bioventing	The technology was reclassified from bioremediation in situ to bioventing.	Bradley Shipley 415-744-2287
9	Sacramento Army Depot, CA (01/17/95)	Solidification/ stabilization		Yes		The 1995 ROD was a base-wide ROD. It reiterated the S/S remedy specified in the 3/29/93 ROD. It did not add another S/S project. Hence there is only one S/S project at SAD.	Marlon Mezquita 415-744-1499
9	Southern California Edison, Visalia Pole Yard, CA (06/10/94)	Bioremediation (in situ) - groundwater			Thermally enhanced recovery	The remedy was implemented as a contingency. The remedy is actually "dynamic underground stripping." Treatment goals could not be met because concentrations were too high for bioremediation to work in a timely manner.	Richard Procunier 415-744-2219 Emmanuel Mensall (CADTSC) 916-255-3704
9	Southern California Edison, Visalia Pole Yard - Groundwater OU, CA (06/10/94)	Bioremediation (in situ) - groundwater		Yes		The remedy implemented was a contingency. Concentrations were too high. Bioremediation could not achieve cleanup levels in a realistic time frame.	Richard Procunier 415-744-2219 Emmanuel Mensall (CADTSC) 916-255-3704

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Ninth Edition (April 1999) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 8TH EDITION)	9TH EDITION			COMMENTS	CONTACTS/PHONE
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9	Valley Wood Preserving, Inc., CA (09/27/91)	Solidification/ stabilization		Yes		The estimated volume of contaminated media had decreased; the technology was no longer effective. A ROD amendment is to be issued in near future.	Michelle Lau 415-744-2227
10	FAA Northway Station, AK	Bioremediation (in situ)			Bioremediation (in situ) - groundwater	The technology was reclassified.	Daniel McKay 603-646-4738
10	FAA Strawberry Point Station, AK	Bioremediation (in situ)			Bioremediation (in situ) - biosparging	The technology was reclassified.	Daniel McKay 603-646-4738
10	Fort Wainwright - OU 1 - Chemical Agent Dump Site, AK (07/20/95)	Neutralization		Yes		Non-invasive geophysical investigations indicated the presence of buried chemical agents. However, when excavation was completed, the agents were undetectable.	David Williams (USACE) 907-753-5657 Dianne Soderlund 907-271-3425
10	U.S. DOE Idaho National Engineering and Environmental Lab - OU 23, ID	Solidification/ stabilization			Vitrification	Solidification/stabilization was never used at the site.	Terrell Smith Lockheed Marietta GW Restoration Dept. 208-526-5692 Wayne Pierre 206-553-7261
10	McCormick and Baxter Creosoting Company (Portland Plant), OR (03/29/96)	Solidification/ stabilization		Yes		Treatment goals could not be met. Decided to dispose offsite. The excavated soil contaminated with F-listed waste will be disposed offsite at a landfill. ROD Amendment to be issued in 1998.	Alan Goodman 503-326-3685
10	Union Pacific Railroad Tire Treatment, OR (03/27/96)	Bioremediation (in situ)			Bioremediation (in situ) - bioventing	Reclassified technology.	Brian McClure (ORDEQ) 541-298-7255 Alan Goodman 503-326-3685
10	American Crossarm & Conduit, WA (06/30/93)	Solidification/ stabilization		Yes		Excavated and transported contaminated soil to a landfill in Arlington, OR. Flyash was added to absorb moisture. ROD called for the material to be solidified off site.	Lee Marshall 206-553-2723

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Ninth Edition (April 1999) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 8TH EDITION)	9TH EDITION			COMMENTS	CONTACTS/PHONE
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10	Commencement Bay, South Tacoma Field, WA (09/29/94)	Soil vapor extraction		Yes		The plume was smaller than had been estimated; contamination levels have decreased. SVE was discussed as an option but never implemented.	Cami Grandinetti 206-553-8696
10	Commencement Bay, South Tacoma Field, WA (09/29/94)	In situ air stripping (air sparging)		Yes		The plume smaller than had been estimated; contamination levels have decreased. Air sparging was never implemented, and no ROD amendment or ESD was issued.	Cami Grandinetti 206-553-8696
10	Harbor Island (Lead), WA (09/30/93)	Incineration (off site)		Yes		Contaminated soil was disposed of at a hazardous waste disposal facility. The technology was a contingency in the ROD.	Keith A. Rose 206-553-7721
10	Queen City Farms, WA (10/24/85)	None	Solidification/ Stabilization			This remedy was not listed in the ASR.	Neil Thompson 206-553-7177
10	Western Processing Co., Inc., WA	Thermal desorption		Yes		Contaminated soil was excavated and transported off site to a landfill in Arlington, OR. The remedy was contingent and never implemented.	Lee Marshall 206-553-2723
10	Western Processing Co., Inc. - ESD, WA (12/11/95)	Bioremediation (in situ) - other		Yes		Natural attenuation already was occurring at site. Bioremediation would not enhance the degradation of contaminants. An ESD will be issued to note the change.	Lee Marshall 206-553-2723
10	Western Processing Co., Inc. - Phase I, WA (08/05/84)	Incineration (off site)		Yes		Contaminated soil was excavated and disposed of off site. Incineration was not required. The specified remedy in the ROD was off-site disposal or incineration, so no amendment or ESD was required.	Lee Marshall 206-553-2723
10	Western Processing Co., Inc. - Phase II, WA (09/25/85)	Solidification/ stabilization		Yes		The technology never was specified in the ROD as the preferred remedy and therefore never was used at the site. Flyash was added to the soil to absorb moisture for easy transportation. The soil was excavated and disposed of off site.	Lee Marshall 206-553-2723

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Eighth Edition (November 1996): Additions, Changes, and Deletions from the Seventh Edition (September 1995)

The eighth edition of this report added information about 38 innovative treatment technologies selected for remedial action under FY 1995 RODs and two treatment technologies at non-Superfund DoD and DOE sites, and two innovative treatment technologies selected for two RCRA corrective actions. Other changes are listed below.

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 7TH EDITION)	8TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
1	New Bedford, MA (04/06/90)	Incineration (on site)		Yes		Remedy canceled because of community concerns. No alternative selected at this time.	David Dickerson 617-573-9632
1	Norwood PCBs, MA (09/29/89)	Solvent extraction		Yes		Remedy not implemented because of space constraints on-site, cost, and safety issues. New cleanup goals based on future land use and changes in risk assessment methodologies. Site will be capped instead. ROD Amendment issued on 5/17/96.	Bob Cianciarulo 617-573-5778
1	Wells G&H, MA (09/14/89)	Incineration (on site)			Incineration (off site)	Remedy changed to off-site incineration because of community concerns. Explanation of significant difference (ESD) signed 04/25/91.	Mary Garren 617-573-9613 Paula Fitzsimmons (MA) 617-223-5572
1	Wells G&H, OU1, MA (09/14/89)	Soil vapor extraction	Soil vapor extraction and in situ air sparging	Yes		Adding air sparging to existing SVE project to enhance pump-and-treat. Conducting SVE on a new area (New England Plastics). ESD to be issued.	Mary Garren 617-573-9613
1	Davis Liquid Waste, RI (09/29/87)	Incineration (on site)			Thermal desorption	Thermal desorption cheaper and more effective based on performance data. ESD signed on 7/19/96.	Neil Handler 617-543-9636
2	Brook Industrial Park, OU 1, NJ (09/30/94)	Incineration (on site)		Yes		Misinterpretation of ROD. Will conduct off-site incineration or disposal.	Donna Vizian 212-637-4295
2	De Rewal Chemical, NJ (09/29/89)	Incineration (on site)		Yes		Remedy changed to off-site disposal because more cost-effective. Much less volume of contaminated material than originally projected.	Romona Pezzella 212-637-4385
2	Lipari Landfill, NJ (07/11/88)	Incineration (on site)			Thermal desorption*	ROD specified thermal treatment of marsh sediments. Thermal desorption was selected as the treatment.	Fred Cataneo 212-637-4428
2	Applied Environmental Services, OU 1, NY (06/24/91)	Bioventing		Yes		Misinterpretation of ROD.	Maria Jon 212-637-3967 Gerald Ridder (NY) 518-457-0927

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Eighth Edition (November 1996)(continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 7TH EDITION)	8TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
2	Circuitron Corporation, OU 1, NY (03/29/91)	Soil vapor extraction		Yes		Further investigation indicated that VOCs were below action levels.	Miko Fayon 212-637-4250 Thomas Simmons (USACE) 816-426-2296
2	Love Canal, NY (10/1/87)	Incineration (on site)			Incineration (off site)	PRP was conducting on-site incineration at another site. Waste was transported to that site for incineration. ESD issued 11/96.	Damian Duda 212-637-4269 Doug Carbarini 212-637-4263
2	Sarney Farm, NY (09/27/90)	Incineration (on site)			Thermal desorption*	Misinterpretation of the ROD.	Kevin Willis 212-637-4271
3	Delaware Sand & Gravel, DE (04/22/88)	Incineration (on site)			Soil vapor extraction* and bioremediation (in situ)*	Remedy was revised to address previously unrecognized site conditions. ROD amendment signed on 09/30/93. SVE subsequently changed to bioventing.	Eric Newman 215-566-3237
3	Southern Maryland Wood Treating, MD (06/29/88)	Incineration (on site)			Thermal desorption	Remedy changed to thermal desorption, because of cost and community concerns. ROD issued on 09/08/95.	Stephanie Dehnhard 215-566-3234
3	Eastern Diversified Metals, PA (03/29/91)	Incineration (on site)			Incineration (off site)	ROD specified on or off-site incineration. Off-site being conducted because of reduced amount of material to be treated.	Steven Donohue 215-566-3215
3	MW Manufacturing, PA (06/29/90)	Incineration (on site)		Yes		Pilot-scale trial burn could not achieve emission standards. Remedy to be determined; considering solidification/ stabilization at this time.	Bhupi Khona 215-566-3213
3	Sagertown Industrial, PA (01/29/93)	Incineration (on site)			Incineration (off site)	Remedy changed because of cost and faster treatment time. ESD signed on 03/09/95.	Steven Donohue 215-566-3215
3	Whitmoyer Laboratories, OU 2, PA (12/17/90)	Incineration (on site)			Incineration (off site)	Remedy changed because the volume of wastes was less than originally projected. ESD signed on 12/28/94.	Chris Corbet 215-566-3220

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Eighth Edition (November 1996)(continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 7TH EDITION)	8TH EDITION			COMMENTS	CONTACTS/PHONE
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3	Rentokil, VA (06/22/93)	Thermal desorption		Yes		Groundwater modeling indicated that there would be no further groundwater contamination if source soils were left in place. Site will be capped. ROD amendment issued on 8/27/96.	Andrew Palestini 215-597-1286
3	Saunders Supply Co., 0U 1, VA (09/30/91)	Dechlorination and Thermal desorption			Incineration (off site)	Remedy changed to off-site incineration due to implementability, short-term effectiveness, and cost. ROD Amendment issued on 9/27/96.	Andrew Palestini 215-597-1286
3	Ordnance Works Disposal, WV (03/31/88)	Incineration (on site)		Yes	Bioremediation (ex situ)*	Remedy changed because of community concerns. ROD amended in 1/89.	Melissa Whittington 215-566-3235
4	Ciba-Geigy (McIntosh Plant), OU 2, AL (09/30/91)	Thermal desorption			Incineration (on site)*	Treatability study showed that incineration was more cost-effective.	Charles L. King, Jr. 404-562-8931
4	Ciba-Geigy (McIntosh Plant), OU 2, AL (09/30/91)	Flushing (in situ)		Yes		Treatability study showed percolation from precipitation was just as effective. Minimal benefit would be gained from flushing (in situ).	Charles L. King, Jr. 404-562-8931
4	Ciba-Geigy (McIntosh Plant), OU 4, AL (07/14/92)	Thermal desorption			Incineration (on site)	Treatability study showed that incineration was more cost-effective.	Charles L. King, Jr. 404-562-8931
4	Ciba-Geigy (McIntosh Plant), OU 4, AL (07/14/92)	Flushing (in situ)		Yes		Treatability study showed percolation from precipitation was just as effective. Minimal benefit would be gained from flushing (in situ).	Charles L. King, Jr. 404-562-8931
4	Mowbray Engineering, AL (09/25/86)	Incineration (on site)		Yes	Solidification/ stabilization	Remedy changed because of cost.	Tim Woolheater 404-347-2643
4	American Creosote Works, Inc., OU 2, FL (02/03/94)	Surfactant flushing - groundwater		Yes		Determined that pump-and-treat alone would be effective.	Mark Fite 404-562-8927
4	Zellwood Groundwater, FL (12/17/87)	Incineration (on site)			Solidification/ stabilization*	Remedy changed because of community concerns and because the state would not concur with incineration. ROD amendment issued on 03/01/90.	Pam Scully 404-347-6246

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Eighth Edition (November 1996)(continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 7TH EDITION)	8TH EDITION			COMMENTS	CONTACTS/PHONE
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4	Mathis Brothers Landfill (South Marble Top Road), GA (03/24/93)	Incineration (on site)			Incineration (off-site) and bioremediation (ex-situ)*	Remedy changed because of community concerns, cost-effectiveness, and decreased waste volume from original ROD. Bioremediation will treat dicamba wastes. Incineration (off site) will treat all other wastes.	Charles L. King.Jr. 404-562-8931
4	Smith's Farm Brooks, KY (09/29/89)	Incineration (on site)			Dechlorination*, thermal desorption* and, Solidification/ stabilization*	Remedy changed because of community concerns. Amended remedy is dechlorination and thermal desorption followed by solidification/stabilization. ROD amendment issued on 09/30/91.	Antonio DeAngelo 404-562-8826
4	Aberdeen Pesticide Dump Fairway, NC (06/30/89)	Incineration (on site)			Thermal desorption *	Remedy changed because of community concerns, cost, and a preference for using an innovative technology. ROD amendment signed on 09/30/91.	Kay Crane 404-562-8795 Randy McElveen (NC) 919-733-2801
4	Cape Fear Wood Preserving, NC (06/30/89)	Bioremediation (ex situ) - slurry-phase		Yes		Original remedy called for soil washing followed by slurry-phase bioremediation of fines, based on an 80% reduction in volume of contaminated soil achieved by soil washing. Soil washing bidders claimed a 96% reduction in volume of contaminated soil, thus making slurry-phase bioremediation too costly for the 0.4% of contaminated fines remaining.	Jon Bornholm 404-562-8820
4	Geiger/C&M Oil, SC (06/01/87)	Incineration (on site)			Solidification/ stabilization*	Further investigation found that organics were not present at their previous levels. ROD amendment issued 07/13/93.	Sherry Panabaker 404-562-8810
4	Para-Chem Southern, Inc., SC (09/27/93)	Bioremediation (ex situ) - slurry-phase		Yes		Remedy canceled because of concerns about feasibility, performance, and treatment time. Will excavate and dispose off-site.	Judy Canova 803-896-4046
4	American Creosote Works (Jackson Plant), TN (01/05/89)	Incineration (on site)		Yes		Action completed as a removal by excavating and disposing off site. ESD issued in 1992.	Femi Akindale 404-347-7791
5	Acme Solvent Reclaiming, IL (09/27/85)	Incineration (on site)		Yes		PRPs excavated and disposed of soil off-site.	Deborah Orr 312-886-7576
5	Fort Wayne Reduction, IN (08/26/88)	Incineration (on site)			Incineration (off site)	Remedy changed to ROD contingency off-site incineration because of community concerns, cost, and implementability.	Fred Mickey 312-886-5123

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Eighth Edition (November 1996)(continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 7TH EDITION)	8TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
5	Ninth Avenue Dump, IN (06/30/89)	Incineration (on site)			Soil vapor extraction	Remedy changed because of cost. Soil vapor extraction will treat larger area than soil flushing remedy that was completed in 1994. Soil flushing removed most of the heavier contaminants. ROD amendment signed on 9/13/94.	Bernard Schorle 312-886-4746
5	Bofors Nobel, MI (09/17/90)	Incineration (on site)		Yes		Remedy changed from on-site incineration to disposal in an on-site landfill because of cost. Volume of material to be treated much greater than expected. ROD amendment signed on 07/22/92. Now proposing containment via slurry wall because of cost.	John Fagiolo 312-886-0800
5	Forest Waste Products, MI (03/31/88)	Incineration (on site)			Incineration (off site)	Original ROD specified either on-site or off-site incineration as the remedy. ESD signed on 05/04/93.	Beth Reiner 312-886-6337
5	Ott/Story/Cordova Chemical, MI (09/27/93)	Thermal desorption		Yes		The state revised the cleanup goals. Consequently, the amount of soils requiring remediation was reduced. Also shallow groundwater present at the site would continue to contaminate clean backfilled soil. Cost was also a factor. No alternative remedy has been selected at this time.	John Fagiolo 312-886-0800
5	Springfield Township Dump, MI (09/29/90)	Incineration (on site)		Yes		Remedy canceled because of community concerns. ROD amendment projected to be issued in Fall 1996. Remedy to be determined.	Kashual Khanna 312-353-2663
5	Thermo-Chem, Inc., OU 1, MI (09/30/91)	Soil vapor extraction	Air sparging			Added to enhance SVE system.	Jim Hahnenberg 312-353-4213
5	Arrowhead Refinery Co., MN (09/30/86)	Incineration (on site)			Solvent extraction*	Remedy was changed to solvent extraction because of cost-effectiveness and short-term effectiveness. ROD amendment signed on 02/09/94.	Edwin Smith 312-353-6571
5	Ritari Post and Pole, OU 1, MN (06/30/94)	Incineration (on site)			Incineration (off site)	Misinterpretation of ROD. Remedy now being reconsidered. Capping is a contingency.	Ramon Torres 312-886-3010
5	Fields Brook, OH (09/30/86)	Incineration (on site)			Incineration (off site)	Remedy changed because of cost, community concerns, and reduced concentration. ESD issued on 8/15/97.	Ed Hanlon 312-353-9228
5	Pristine, OH (12/31/87)	Incineration (on site)			Soil vapor extraction* and thermal destruction*	Misinterpretation of ROD specified in situ vitrification. This remedy was changed to SVE and thermal destruction. Thermal desorption was selected as the thermal destruction technology. ROD amendment issued on 03/30/90. (see below)	Tom Alcamo 312-886-7278
5	Pristine, OH (03/30/90) (Amendment)	Incineration (on site)			Thermal desorption*	1990 ROD amendment specified thermal destruction. Thermal desorption selected as the thermal destruction technology.	Tom Alcamo 312-886-7278

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Eighth Edition (November 1996)(continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 7TH EDITION)	8TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
5	Skinner Landfill OU 2, OH (06/04/93)	Soil vapor extraction		Yes		Further investigation through a feasibility study indicated that the site conditions would not be amenable to SVE. Will cap instead.	Jamey Bell 312-886-6436
5	Van Dale Junkyard, OH (03/31/94)	Bioremediation (in situ) - other		Yes		Predesign sampling indicated that contaminant levels had decreased. No active bioremediation is occurring. The site will be capped and will rely on natural attenuation with monitoring.	Lawrence Schmitt 312-353-6565 James Campbell 412-351-6132
5	Zanesville Well Field, OH (09/30/91)	Soil vapor extraction	Air sparging			Implemented by PRPs to accelerate groundwater remediation.	Dave Wilson 312-886-1476
5	Zanesville Well Field, OH (09/30/91)	Soil washing		Yes		Will excavate and dispose off-site because soil volume was much smaller that originally projected.	Dave Wilson 312-886-1476
5	City Disposal Corporation Landfill, WI (09/28/92)	Soil vapor extraction		Yes		Rise in groundwater table prevented implementation of SVE. Remedy changed to capping with gas collection.	Russ Hart 312-886-4844 Mike Schmoller (WI) 608-275-3303
5	Hagen Farm, Groundwater Control OU, WI (09/30/92)	Bioremediation (in situ) - groundwater		Yes		Treatability studies indicated that bioenhancement would not provide any additional benefit. Relying on natural attenuation. Explanation of Significant Differences (ESD) signed on 08/27/96.	Steve Padovani 312-353-6755
6	Vertac, AR (09/27/90)	Incineration (on site)		Yes		Incinerator would not function properly. Community preferred landfilling and was cheaper. ROD amendment issued 9/17/96.	Phillip Allen 214-665-8516
6	Gulf Coast Vacuum Services, OU 1, LA (09/30/92)	Incineration (on site)			Bioremediation (ex situ)- land treatment	Agreement between PRPs and EPA to meet the treatment standards using bioremediation.	Kathleen Aisling 214-665-8509
6	MOTCO, TX (03/15/85)	Incineration (on site)			Incineration (off site)	Remedy changed because of contractor problems and cost. ESD has been issued.	Mary Ann Abramson 214-665-6754
6	Petro-Chemical Systems, Inc. OU 2, TX (09/06/91)	Air sparging			Bioremediation (in situ)- groundwater	Bioremediation thought to be more effective.	Chris Villarreal 214-665-6758

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Eighth Edition (November 1996)(continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 7TH EDITION)	8TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
7	People's Natural Gas, IA (06/16/91)	Bioremediation (in situ) - other	Air sparging				Diana Engeman 913-551-7797
7	Hastings Groundwater Contamination (East Industrial), NE (09/28/90)	Incineration (on site)			Incineration (off site)	Remedy changed because volume of soil was less than originally projected. More cost-effective to incinerate off-site. ROD amendment issued 02/28/95.	Ron King 913-551-7063
7	Sherwood Medical, NE (09/28/93)	Thermal desorption			Soil vapor extraction (ex situ)	Soil vapor extraction (ex situ) will be more cost-effective. ESD issued 09/05/95.	Steve Auchterlonie 913-551-7778
7	Valley Park TCE Site, Wainwright OU, MO (09/29/94)	In situ air stripping		Yes		Air sparging would be difficult to implement and nearby residences might be adversely affected. Will do pump-and-treat instead. ESD issued on 04/02/96.	Steve Auchterlonie 913-551-7778 Dave Mosby (MO) 573-751-1288
7	Valley Park TCE Site, Wainwright OU, MO (09/24/94)	Thermal desorption			Soil vapor extraction (ex situ)*	Soil vapor extraction (ex situ) more cost-effective. ESD issued on 04/02/96.	Steve Auchterlonie 913-551-7778 Dave Mosby (MO) 573-751-1288
8	Broderick Wood Projects, CO (06/30/88)	Incineration (on site)		Yes	Incineration (off site)*	Remedy canceled based on new technical data and cost. Will excavate and recycle and incinerate off-site. ROD amendment signed on 09/24/91.	Armando Saenz 303-312-6559
8	Lockheed/Martin (Denver Aerospace), CO (Remedial Action) (09/24/90)	Soil vapor extraction and thermal desorption		Listing as a Superfund remedial action has been deleted.		Remedial action being handled as a RCRA corrective action.	George Dancik 303-312-6935 Charles Johnson (CO) 303-692-3348
8	Idaho Pole Company, MT (09/28/92)	Flushing (in situ)			Bioremediation (ex situ) - land treatment*	Further investigation indicated flushing (in situ) would not be effective. Soils were excavated and will be treated as part of the land treatment remedy. ESD issued on 05/21/96.	Jim Harris 406-441-1150

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Eighth Edition (November 1996)(continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 7TH EDITION)	8TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
8	Summitville Mine, OU 1, CO (12/15/94)	This is a FY 1995 ROD and was not listed in the seventh edition. The FY 1995 ROD specified bioremediation (in situ)		Yes		When heap leach pad rinsed with water, cyanide concentrations were reduced and bioremediation was not necessary. ESD issued on 6/4/97.	James Hanley 303-312-6725 Victor Ketellepepper 303-312-6578
9	Motorola 52nd Street, AZ (09/30/88)	Soil vapor extraction	Air sparging				Fred Schauffler 415-744-2359 Mana Font 602-207-4194
9	Seal Beach Navy Weapons Station, IR Site 14, CA (DoD Action)	Soil vapor extraction		Yes		Research project, not a full-scale cleanup.	Ken Reynolds 619-532-2912
9	Hexcel, CA (09/21/93)	Air sparging, bioremediation (in situ) - groundwater, soil vapor extraction		Yes		Hexcel was removed from the National Priorities List (NPL) on November 1, 1993.	Mark Johnson 510-286-0305
9	Intel Mountain View (355 Middlefield Road), CA (06/09/89)	Soil vapor extraction		Yes		Groundwater table rose, leaving too little unsaturated soil to warrant SVE. Soils were excavated and aerated.	Elizabeth Adams 415-744-2235 Michael Maley 510-450-6159
9	Koppers Company, Inc. (Oroville Plant), CA (09/13/89)	Soil washing		Yes		Further analysis determined soil washing would be ineffective, more dioxins discovered and land use scenario changed. Soil will be disposed of in a landfill with the potential for two percent of the most contaminated soil treated through solidification/stabilization. ROD amendment issued on 8/29/96.	Fred Schauffler 415-744-2359
9	Koppers Company, Inc. (Oroville Plant), CA (09/13/89)	Bioremediation (in situ) - other		Yes		Presence of metals and dioxins made bioremediation infeasible, and land use scenario changed. Soil will be disposed of in a landfill with the potential for two percent of the most contaminated soil treated by solidification/stabilization. ROD amendment issued on 8/29/96.	Fred Schauffler 415-744-2359
9	Middlefield-Ellis-Whisman (MEW) - Siemins/Sobrato (455 & 487 Middlefield Road), CA (06/30/93)	Soil vapor extraction	Air sparging				Elizabeth Adams 415-744-2235

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Eighth Edition (November 1996)(continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 7TH EDITION)	8TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
9	Van Waters and Rogers, CA (09/30/91)	Soil vapor extraction		Yes		Site was proposed for listing on the NPL but has been removed. Responsibility was picked up under RCRA and subsequently dropped from RCRA authority.	Belinda Wei 415-744-2280 Duazo Ricco 510-268-0837
10	Eielson AFB, OUs 3, 4, and 5, AK (9/22/95)	This is a FY 1995 ROD and was not listed in the seventh edition. The FY 1995 ROD specified bioventing and soil vapor extraction.		Yes		Remedy changed to institutional controls because there was not enough contamination present to warrant active remediation. Groundwater also was contained, preventing risk due to groundwater.	Mary Jane Nearman 206-553-6642
10	Idaho National Engineering Laboratory, Pit 9 (OU7-10), ID (09/23/93)	Solvent extraction	Vitrification			Misinterpretation of the ROD.	Mary Jane Nearman 206-553-6642
10	USDOE Hanford 100 Area, OUs 100-BC-1, 100-DR-1, 100-HR-1, WA (9/27/95)	This is a FY95 ROD that was not listed in the seventh edition. The FY95 ROD specified thermal desorption for soil contaminated with organic compounds		Yes		Remedy changed to on-site disposal because further investigation did not indicate that organics were present.	Doug Sherwood 509-376-9529 Audrey Dove 509-376-6865

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Seventh Edition (September 1995): Additions, Changes, and Deletions from the Sixth Edition (September 1994)

The seventh edition of this report added information about 42 innovative treatment technologies selected for remedial action under FY 1994 RODs and eight innovative treatment technologies selected for seven RCRA corrective actions.

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 6TH EDITION)	7TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
1	Linemaster Switch Corporation, CT (07/21/93)	Soil vapor extraction			Dual-phase extraction	Groundwater also is being treated with this technology.	Elise Jakabhazy 617-573-5760
2	American Thermostat, NY (06/29/90)	Thermal desorption	Thermal desorption (phase 2)			Project is being conducted in two phases. Phase 1 has been completed and is listed as a separate project.	Christo Tsiamis 212-637-4257
2	GCL Tie and Treating, NY (Removal Action)	Bioremediation (ex situ) - Composting			Thermal desorption (being implemented as a remedial action with the ROD signed 09/30/94)	Site is not amenable to composting because of the presence of long-chain PAHs and the time constraints of the removal process. A treatability study achieved over 90% reduction but little degradation of long chain carcinogenic hydrocarbons occurred.	Joe Cosentino 908-906-6983
2	General Motors Central Foundry Division (OU 1 and OU 2), NY (12/17/90) & (03/31/92)	Bioremediation (ex situ) - slurry-phase			Thermal desorption	Both OUs were combined under the thermal desorption remedy. ROD amended to combine both OUs under a thermal desorption remedy.	Lisa Jackson 212-637-4274
2	Pasley Solvents and Chemicals, Inc., NY (04/24/92)	Flushing (in situ) and soil vapor extraction	Air sparging		Soil vapor extraction and air sparging	SVE, in combination with air sparging, will eliminate the need for soil flushing. ROD amendment was signed 05/22/95.	Sherrel Henry 212-637-4273
3	Bendix, PA (09/30/88)	Soil vapor extraction			Mechanical aeration	It was determined that SVE was not a viable remedy; soil was too tightly compacted. No alternative has been selected. ESD issued on 11/22/95.	Jim Harper 215-597-6906
3	Brown's Battery Breaking Site, OU 2, PA (07/02/92)	Fuming gasification			Plasma high-temperature metals recovery	The name of the technology was changed to reflect the treatment process more accurately.	Richard Watman 215-566-3219
4	Helena Chemical, SC (09/08/93)	Bioremediation (ex situ) and dechlorination		Yes	Incineration (off site)	Technologies could not meet cleanup goal.	Bernie Hayes 404-562-8822
5	Carter Industries, MI (09/18/91)	Thermal desorption		Yes		Thermal desorption was too costly (approximately $300 per cu yd). It is less expensive to dispose of the wastes at TSCA landfill (approximately $186 per Ton).	Jon Peterson 312-353-1264

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Seventh Edition (September 1995) (Continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 6TH EDITION)	7TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
5	Cliffs/Dow Dump, MI (09/27/89)	Bioremediation (ex situ)		Yes		Remedy could not reduce concentrations of benzo(a)pyrene to acceptable level. Contaminated soil was excavated and placed in a permitted landfill.	Ken Glatz 312-886-1434
5	Electro-Voice, OU 1, MI (06/23/92)	Soil vapor extraction	Air sparging			Technology actually is a combination of SVE and air sparging called the Subsurface Volatilization and Ventilation System™.	Eugenia Chow 312-353-3156
5	Ionia City Landfill, MI (09/29/89)	Vitrification (in situ)		Yes		Remedy was canceled. Conditions at the site had changed since 1989. Project was implemented as a time critical removal action.	Michael Gifford 312-886-7257
5	Seymour Recycling, IN (09/30/86)	Bioremediation (in situ groundwater)		Yes		Bioremediation of groundwater was not actively pursued. Contamination degraded through natural attenuation.	Jeff Gore 312-886-6552
5	Verona Well Field OU 2, MI (06/28/91)	Soil vapor extraction	Soil vapor extraction			Conducting soil vapor extraction at two separate sites under this ROD: Annex area and Paint shop area. Projects are listed as separate entries in the ASR seventh edition.	Janice Bartlett 312-886-5438
5	Wayne Reclamation and Recycling, IN (03/30/90)	Soil vapor extraction	Air sparging			Air sparging was added under the existing ROD to treat groundwater.	Duane Heaton 312-886-6399
6	Koppers/Texarkana, TX (09/23/88)	Soil washing		Yes		Volume of soil was not as large as originally had been projected. The small volume did not warrant bringing a soil washing unit on-site. Will excavate and dispose of soil off-site.	Ursula Lennox 214-665-6743
6	Koppers/Texarkana, TX (09/23/88)	Flushing (in situ)		Yes		Flushing (in situ) was never intended as a treatment at the site. Misinterpretation of the ROD during ROD analysis.	Ursula Lennox 214-665-6743
8	Chemical Sales Company (OU 1), CO (06/27/91)	Soil vapor extraction	Air sparging			Air sparging was added under the existing ROD to treat groundwater.	Armando Saenz 303-312-6559
8	Mouat Industries, MT (Removal Action)	Chemical treatment		Yes		Reducing chromium VI to chromium III not considered innovative.	Ron Bertran 406-449-5720

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Seventh Edition (September 1995) (Continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 6TH EDITION)	7TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
9	Phoenix-Goodyear Airport Area (North and South Facilities), AZ (09/26/89)	Soil vapor extraction	Soil vapor extraction			Site is divided into 2 areas: North area & South area. Each area is listed as an individual project in the seventh edition ASR.	Craig Cooper 415-744-2370 Rusty Harris-Bishop 415-744-2365 Nancy Moore (AZ) 602-207-4180
9	Fairchild Semiconductor, CA (06/30/89)	Two listings for soil vapor extraction	Three more soil vapor extraction projects			Soil vapor extraction systems are being implemented at 5 different areas at the site.	Elizabeth Adams 415-744-2235
9	Indian Bend Wash, AZ (09/27/93)	Soil vapor extraction	Four distinct areas using soil vapor extraction			SVE is being conducted at four distinct areas; areas 6, 7, 8, and 12, at the site. Each site is considered as an individual project.	Emily Roth 415-744-2247
9	Intersil, CA (09/27/90)	Soil vapor extraction				Site renamed to Intersil/Siemens (Intersil)	Belinda Wei 415-744-2280
9	Solvent Service, CA (09/27/93)	Soil vapor extraction			Soil vapor extraction under RCRA corrective action	Project was changed from a Superfund remedial action to a RCRA corrective action.	Tony Mancini 510-286-0825
10	Fairchild AFB Priority 1 OUS (OU 1) Craig Rd Landfill, WA (02/13/93)	Soil vapor extraction		Yes		Remedy was not implemented because of the following concerns: •Generation of combustible gases •Heterogeneous stratigraph •Reluctance to put holes into the landfill, which could lead to leaching of contaminants	Cami Grandinetti 206-553-8696
10	Gould, Inc., OR (03/31/88)	Soil washing		Yes		Will cap the landfill and conduct pump-and-treat operations. Remedy was shown to be ineffective due to varying site conditions and problems with the technology.	Chip Humphries 503-326-2678

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Seventh Edition (September 1995) (Continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 6TH EDITION)	7TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
10	Naval Submarine Base, Bangor Site A, OU 1, WA (12/10/91)	Soil washing			Flushing (in situ)	Will excavate and place soil in a lined pit. Soil will be sprayed with water and leachate and will be collected and treated.	Harry Craig 503-326-3689 Craig Thompson (WA) 360-407-7234 Chris Drury (Navy) 206-396-0062
10	Union Pacific Railroad Sludge Pit, ID (09/10/91)	Flushing (in situ)		Yes		Remedy was not implemented. Excavation of sludge did not indicate that contaminants were present. Amended ROD was signed 9/94. Will excavate and treat off-site, in addition to a pump-and-treat operation.	Ann Williamson 206-553-2739 Clyde Cody (ID) 208-334-0556
10	Fort Lewis Military Res. Landfill 4 and Solvent Refined Coal Plant, WA (09/24/93)	Soil washing			Thermal desorption	ROD specified soil washing or thermal desorption as the remedy. Thermal desorption was selected based on the results of a treatability study.	Bob Kievit 206-753-9014
10	Eielson Air Force Base, AK (9/29/92)	Bioremediaiton (in situ)-bioventing and soil vapor extraction		Soil vapor extraction		Soil vapor extraction written into ROD as a contingency.	Mary Jane Nearman 206-553-6642 Rielle Markey (AK) 907-451-2117

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Sixth Edition (September 1994): Additions, Changes, and Deletions from the Fifth Edition (September 1993)

The sixth edition of this report added information about 53 innovative treatment technologies selected for remedial action under FY 1993 RODs. Other changes are listed below.

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 5TH EDITION)	6TH EDITION ADDED	6TH EDITION DELETED	6TH EDITION CHANGED TO	COMMENTS	CONTACTS/PHONE
1	Union Chemical Co., OU 1, ME (12/27/90)	Thermal desorption (In situ)			Soil vapor extraction	It was determined that SVE would be the more cost-effective of the two. ESD was signed April 1994.	Terry Connelly 617-573-9638 Christopher Rushton (ME DEP) 207-287-2651
1	Tibbetts Road, NH (09/29/92)	Flushing (in situ)		Yes		Misinterpretation of ROD during ROD analysis. Soil was not targeted for treatment.	Darryl Luce 617-573-5767 Mike Robinette (NH) 603-271-2014
2	Ewan Property, OU 2, NJ (09/29/88)	Soil washing and solvent extraction		Yes		Reevaluation of site found significantly less contaminated soil than originally had been estimated. Soil will be disposed of off-site. ESD was signed July 1994.	Kim O'Connell 212-637-4399
2	Naval Air Engineering Center, OU 7, Interim Action, NJ (03/16/92)	Flushing (in situ)		Yes		Misinterpretation of the ROD during ROD analysis.	Jeff Gratz 212-637-4320 Robert Wing 212-264-8670
2	Solvent Savers, NY (09/28/90)	Soil vapor extraction		Yes		Soil vapor extraction is a secondary remedy that may be used instead of thermal desorption, the primary remedy, if treatability studies show it to be effective.	Lisa Wong 212-637-4267
3	U.S. Titanium, VA (11/21/89)	Flushing (in situ)			Neutralization with lime (ex situ)	Treatability studies indicated that the technology was not feasible. ESD is under preparation.	Vance Evans 215-597-8485 Jeff Howard (VA) 804-762-4203
3	L.A. Clarke & Sons, OU 1 (Soils), VA (03/31/88)	Bioremediation (in situ)		Yes		Facility is no longer in operation, and excavation can be done. Remedies being considered include thermal desorption.	Andy Palestini 215-597-1286

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Sixth Edition (September 1994)(continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 5TH EDITION)	6TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
3	L.A. Clarke & Sons, OU 1 (Soils), VA (03/31/88)	Flushing (in situ)		Yes		Facility is no longer in operation, and remedies being considered include thermal desorption.	Andy Palestini 215-597-1286
3	L.A. Clarke & Sons, Lagoon Sludge OU, VA (03/31/88)	Bioremediation (ex situ)			Reuse off-site as fuel	Technology changed because of uncertainty about the ability of bioremediation to reach treatment goals. ESD was signed on 3/94.	Andy Palestini 215-597-1286
3	Henderson Road, PA (06/30/88)	Soil vapor extraction		Yes		Conducted air injection only to facilitate pump-and-treat system. Vapors were not extracted. Further investigation revealed that the vadose zone was not an area of concern.	Joe McDowell 215-566-3192
4	Cabot Carbon/Koppers (Groundwater), FL (09/27/90)	Bioremediation (in situ) - groundwater		Yes		Groundwater is not being treated; only soil is being treated.	Patsy Goldberg 404-562-8543
4	Benfield Industries, NC (07/31/92)	Soil washing and bioremediation (ex situ) (slurry-phase)			Bioremediation (ex situ) - land treatment	Land treatment was determined to be a more cost-effective technology.	Jon Bornholm 404-562-8820
4	Charles Macon Lagoon, Lagoon #10, NC (09/31/91)	Bioremediation (ex situ)		Yes		Treatability study indicated that the technology could not treat the contaminants of concern because of materials problems. Will excavate and dispose of wastes off-site. ROD amendment was signed in 3/94.	Geizelle Bennett 404-562-8824 David Lown (NC) 919-733-2801
4	Palmetto Wood Preserving, SC (09/30/87)	Chemical treatment		Yes		Waste will be disposed of more cost-effectively off-site.	Al Cherry 404-342-7791
4	Arlington Blending & Packaging Co., OU 1, TN (06/28/91)	Dechlorination		Yes		Another disposal method is likely to be used.	Derek Matory 404-562-8800
5	South Andover Salvage Yard, OU 2, MN (12/24/91)	Bioremediation (ex situ)		Yes	Thermal treatment	Technology changed to off-site thermal treatment (either thermal desorption or incineration) because of reduced volume of contamination found during RD investigations. ROD amendment was signed 5/31/94.	Bruce Sypniewski 312-886-6189
5	Allied Chem & Ironton Coke, OU 2, OH (12/28/90)	Bioremediation (in situ)	Bioremediation (ex situ) (magnetically enhanced land farming)			Adding technology to treat more highly contaminated soil. ROD Amendment issued on 9/4/97.	Tom Alcamo 312-886-7278

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Sixth Edition (September 1994)(continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 5TH EDITION)	6TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
5	Allied Chem & Ironton Coke, OU 2, OH (12/28/90)	Bioremediation (in situ)		Yes		Adding technology to treat more highly contaminated soil. ROD Amendment issued on 9/4/97.	Tom Alcamo 312-886-7278
5	United Scrap Lead/SIA, OH (09/30/88)	Soil washing		Yes		Determined to be too expensive. Soil disposed off-site if lead levels above 1,550 ppm; containment of soil below this level. ROD amendment issued on 6/27/97.	Anita Boseman 312-886-6941 Timothy Hull (OH) 513-285-6357
5	MacGillis and Gibbs Co./Bell Lumber and Pole Co., MN (12/31/92)	Soil washing and bioremediation (ex situ) of fines		Yes	Incineration (on site)	Incineration was contingency remedy in ROD. State had concerns about effective means of soil washing, and cost of incineration has decreased. ESD will be signed in fall 1994.	Daryl Owens 312-886-7089
6	Fruitland Drum, NM (09/08/90)	Dechlorination			Incineration (off site)	Dechlorination is not being pursued because of cost considerations.	Gregory Fife 214-655-6773
6	Holloman AFB, Main POL Area, NM	Bioremediation (in situ) - groundwater		Yes		Groundwater remediation is not planned for this area.	Ron Stirling (USACE) 402-221-7664
6	Holloman AFB, Main POL Area, NM	Air sparging		Yes		Groundwater remediation is not planned for this area.	Ron Stirling (USACE) 402-221-7664
6	South Valley, NM (09/30/88)	Soil vapor extraction		Yes		Determined there was insignificant concentration to warrant remediation. No further action.	Bert Gorrod 214-655-6779
6	Tinker AFB (Soldier Creek Bldg. 3001), OK (08/16/90)	Soil vapor extraction		Yes		Determined that SVE was not viable. No alternative has been selected.	Susan Webster 214-655-6784 Major Richard Ashworth (USAF) 405-734-3058
8	Rocky Mountain Arsenal, M-1 Basins (OU 16), CO (02/26/90)	In situ vitrification		Yes		Remedy has been canceled because of problems with the contractor. New ROD is being negotiated.	Connally Mears 303-293-1528
8	Portland Cement Co. (Kiln Dust No. 2 and No. 3) OU2, UT (03/31/92)	Chemical treatment		Yes		Technology is not considered innovative.	Mike McCeney 303-293-1526

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Sixth Edition (September 1994)(continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 5TH EDITION)	6TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
9	Mesa Area Groundwater Contamination, AZ (09/27/91)	Soil vapor extraction		Yes		Site has been removed from National Priorities List (NPL), referred to the state	Maurice Chait 602-962-2187 Richard Oln 602-207-4176
9	Castle Air Force Base, OU 1, CA (08/12/91)	Bioremediation (in situ) - groundwater		Yes	Pump and treat with air stripping	Bench-scale test indicated that the technology did not work. No ESD or ROD amendment is being issued.	David Roberts 415-744-1487 Brad Hicks (USAF) 209-726-4841
9	Teledyne Semiconductors (Spectra Physics), CA (03/22/91)	Soil vapor extraction		Yes		ROD was misinterpreted. SVE was intended only for Spectra Physics, the adjacent site.	Sean Hogan 415-744-2233 Carla Dube 510-286-1041
9	FMC (Fresno), CA (06/28/91)	Soil washing		Yes		Soil washing did not work because the soil contained too many fines. Thermal desorption and solidification and stabilization are being considered as possible remedies.	Tom Dunkelman 415-744-2296 Mike Pfister (CA) 209-297-3934
9	Signetics (Advanced Micro Devices 901), CA (09/11/91)	Soil vapor extraction		Yes		Site is subject to a combined ROD for Signetics, AMD 901/ 902 and TRW Microwave site. SVE is not being done at the TRW OU. ROD was misinterpreted.	Darrin Swartz-Larson 415-744-2233 Kevin Graves (CA) 510-286-0435
9	Sacramento Army Depot, Oxidation Lagoons, OU 4, CA (09/30/92)	Soil washing		Yes		Technology canceled because of cost; solidification is being considered as an alternative.	Marlin Mezquita 415-744-2393
10	McChord AFB Washrack Treatment Area, AK (09/28/92)	Bioremediation (ex situ)		Yes		Additional studies showed that treatment is not needed.	Marie Jennings 206-553-1173

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Fifth Edition (September 1993): Additions, Changes, and Deletions from the Fourth Edition (October 1992)

The fifth edition of this report added information about 49 innovative treatment technologies selected for remedial action under FY 1992 RODs and 15 innovative treatment technologies used in removal actions. Other changes are listed below.

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 4TH EDITION)	5TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
1	Re-Solve, MA (09/24/87)	Dechlorination		Yes		Pilot study showed that dechlorination increased the volume and that the waste still required incineration. An ESD to incinerate residuals off-site is in peer review.	Joe Lemay 617-573-9622
1	Pinette's Salvage Yard, ME (05/30/89)	Solvent extraction		Yes		Will incinerate off-site.	Ross Gilleland 617-573-5766
2	Naval Air Engineering Center, OU 1, NJ (02/04/91)	Flushing (in situ)		Yes		Remedy involves pump-and-treat system, with on-site discharge. Soil is not being targeted.	Jeff Gratz 212-637-4320
2	Naval Air Engineering Center, OU 2, NJ (02/04/91)	Flushing (in situ)		Yes		Remedy involves pump-and-treat system, with on-site discharge. Soil is not being targeted.	Jeff Gratz 212-637-4320
2	Naval Air Engineering Center, OU 4, NJ (09/30/91)	Flushing (in situ)		Yes		Remedy involves pump-and-treat system, with on-site discharge. Soil is not being targeted.	Jeff Gratz 212-637-6320
2	Caldwell Trucking, NJ (09/25/86)	Thermal desorption		Yes		Thermal desorption is not necessary because highly contaminated soil will be incinerated off-site. Remainder of soil will be stabilized. ESD issued.	Ed Finnerty 212-637-4367
3	Tobyhanna Army Depot, PA (Non-Superfund project)	Bioremediation (in situ)		Yes		Will conduct ex situ passive volatilization.	Drew Lausch 215-597-3161 Ross Mantione (Tobyhanna) 717-894-6494
4	Smith's Farm Brooks, KY (09/30/91)	Dechlorination	Thermal desorption			Will alter chemistry to achieve dechlorination during thermal desorption.	Tony DeAngelo 404-562-8826
4	American Creosote Works, FL (09/28/89)	Soil washing		Yes		Bench-scale study of soil washing showed that the concentrations of carcinogenic PAHs were not reduced adequately. Dioxins also were discovered at much higher concentrations.	Mark Fite 404-562-8927

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Fifth Edition (September 1993) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 4TH EDITION)	5TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
4	American Creosote Works, FL (09/28/89)	Bioremediation (ex situ)		Yes		Bench-scale study of bioremediation (ex situ) showed that the concentrations of carcinogenic PAHs were not reduced adequately. Dioxins also were discovered at much higher concentrations.	Mark Fite 404-562-8927
4	Hollingsworth Solderless, FL (04/10/86)		Soil vapor extraction			Listed as soil aeration in the third edition.	John Zimmerman 404-562-8936
5	Cliffs/Dow Dump, MI (09/27/89)	Bioremediation (in situ)		Yes		Bioremediation (in situ) was a misinterpretation of the ROD. All soil will be excavated and treated by bioremediation (ex situ).	Ken Glatz 312-886-1434
6	Tenth Street Dump/Junkyard, OK (09/27/90)	Dechlorination		Yes		Remedy has been suspended because of difficulties in implementation and escalating cost; Actual cost was double the cost projected in ROD. ROD amendment to cap in place is being issued.	Mike Overbay 214-655-8512
7	Fairfield Coal & Gas, IA (09/21/90)	Bioremediation (in situ)		Yes		Pilot study showed in situ bioremediation was too costly. It appears that the present pump-and-treat system will achieve cleanup levels.	Bruce Morrison 913-551-7755
8	Sand Creek Industrial OU 5, CO (09/28/90)	Soil washing			Thermal desorption	Soil washing did not meet performance standards and was expensive. ROD amendment was issued in early September 1993.	Erna Acheson 303-312-6753
9	Koppers Company (Oroville), CA (04/04/90)	Bioremediation (ex situ)		Yes		Misinterpretation of ROD during ROD analysis.	Fred Schlauffler 415-744-2359
9	Signetics (AMD 901) TRW OU, CA (09/11/91)		Soil vapor extraction			Remedy added.	Joe Healy 415-744-2331
9	Teledyne Semiconductors, CA (03/22/91)		Soil vapor extraction			Dropped by mistake from fourth edition.	Kevin Graves (CA) 510-286-0435 Sean Hogan 415-744-2233

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Fifth Edition (September 1993) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 4TH EDITION)	5TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
10	IDEL Warm Waste Pond, ID (12/05/91)	Acid extraction		Yes		Treatability study of acid extraction did not achieve good extraction rates. Did not reduce the volume of waste. Will excavate, consolidate, and cap.	Linda Meyer 206-553-6636 Nolan Jenson (DOE) 208-526-0436
10	IDEL Warm Waste Pond, ID (12/05/91)	Soil washing		Yes		Treatability study of soil washing did not achieve acceptable results. Did not reduce the volume of waste. Will excavate, consolidate, and cap.	Linda Meyer 206-553-6636 Nolan Jenson (DOE) 208-526-0436

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Fourth Edition (October 1992): Additions, Changes, and Deletions from the Third Edition (April 1992)

The fourth edition of this report added information about 10 innovative treatment technologies selected for remedial action under FY 1992 RODs and 21 innovative treatment technologies implemented at non-Superfund sites. Other changes are listed below.

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 3RD EDITION)	4TH EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
2	Lipari Landfill Marsh Sediment, NJ (07/11/88)		Thermal desorption			Missed during original ROD analysis.	Tom Graff 816-426-2296
2	GE Wiring Devices, PR (09/30/88)	Thermal desorption			Soil washing		Caroline Kwan 212-637-4275
5	University of Minnesota, MN (06/11/90)	Thermal desorption		Yes	Incineration (in the fifth edition)	An ESD was issued in August 1991 to change remedy to thermal desorption *or* incineration. Incineration was chosen because it was the less expensive of the two.	Darrel Owens 312-886-7089
6	Sol Lynn/Industrial Dechlorination Transformers, TX (03/25/88)	Dechlorination		Yes		Discontinued because of difficulties in implementation.	John Meyer 214-667-6742
6	Koppers/Texarkana, TX (09/23/88)	Soil washing	In situ flushing			Remedy added by ROD amendment.	Ursula Lennox 214-655-6735
9	Poly Carb, NV (Removal)	Bioremediation (in situ)			Bioremediation (ex situ)	Reclassified technology.	Bob Mandel 415-744-2290
9	Teledyne Semiconductors, CA (03/22/91)	Soil vapor extraction		Yes		Mistakenly deleted from report.	Sean Hogan 415-744-2233
10	Gould Battery, OR (03/31/88)	Soil washing	Soil washing			Missed during original ROD analysis.	Chip Humphries 503-326-2678

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Third Edition (April 1992): Additions, Changes, and Deletions from the Second Edition (September 1991)

The third edition of this report added information to the 70 innovative treatment technologies selected for remedial actions under FY 1991 RODs. Other changes are listed below.

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 2ND EDITION)	3RD EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
2	Marathon Battery, NY (09/30/88)	Thermal desorption		Yes		During design, soil gas concentration at hot spots was below state standards. Groundwater monitoring will continue.	Pam Tames 212-264-1036
2	Goose Farm, NJ (09/27/85)	Flushing (in situ)		Yes		Incorrectly classified. A pump-and -treat system with reinjection of treated water is being used.	Laura Lombardo 212-264-6989
2	GE Wiring Services, PR (09/30/88)	Soil washing			Thermal desorption	Possible pre-wash of debris with surfactants.	Caroline Kwan 212-637-4275
4	Coleman-Evans Wood Preserving, FL (09/26/90)	Soil washing		Yes	Incineration	Problems due to the presence of furans; incineration is likely.	Tony Best 404-347-2643
5	Sangamo/Crab Orchard National Wildlife Refuge, IL (08/01/90)	In situ vitrification			Thermal desorption	ROD specified the remedy as in situ vitrification <u>or</u> incineration; incineration was chosen.	Nan Gowda 312-353-9236
5	Anderson Development, MI (09/28/90)	In situ vitrification		Yes		Because of concern on the part of the community, the remedy was changed. A ROD amendment was signed on 9/30/91, and an ESD was signed on 10/2/92.	Jim Hahnenberg 312-353-4213
5	U.S. Aviex, MI (09/07/88)	Flushing (in situ)		Yes		Cleanup levels were reached by natural attenuation.	Robert Whippo 312-886-4759
6	Atchison/Santa Fe/Clovis, NM (09/23/88)	Bioremediation (ex situ)		Yes			Ky Nichols 214-655-6783
6	Crystal Chemical, TX (09/27/90)	In situ vitrification		Yes		Remedy was reconsidered after commercial availability of the technology was delayed. Revised remedy will consist of capping and off-site disposal and consolidation of soils.	Lisa Price 214-655-6735
9	Solvent Service, CA (09/27/90)	Bioremediation (in situ)		Yes		ROD was misinterpreted during ROD analysis.	Kevin Graves 510-286-0435 Steve Morse (CA) 570-286-0304

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Third Edition (April 1992) (continued)

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 2ND EDITION)	3RD EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
9	Poly Carb, NV (Removal)	Bioremediation (ex situ)			Bioremediation (in situ)	Reclassified technology.	Bob Mandel 415-744-2290

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

Second Edition (September 1991): Additions, Changes, and Deletions from the First Edition (January 1991)

The second edition of this report added information about 45 treatment technologies selected for remedial actions in RODs signed during fiscal year (FY) 1990 and 18 innovative treatment technologies used in removal actions. Other changes are listed below.

REGION	SITE NAME, STATE (ROD DATE)	TECHNOLOGY (LISTED IN 1ST EDITION)	2ND EDITION			COMMENTS	CONTACTS/PHONE
			ADDED	DELETED	CHANGED TO		
1	Re-Solve, MA (09/24/87)	Chemical extraction		Yes	Dechlorination	Reclassified technology.	Lorenzo Thantu 212-637-4240
2	GE Wiring Services, PR (09/30/88)	Chemical treatment			Soil washing	Reclassified technology.	Caroline Kwan 212-637-4275
2	SMS Instruments (Deer Park), NY (09/29/89)	Chemical treatment				ROD was misinterpreted during ROD analysis.	Miko Fayon 212-637-4250
3	Leetown Pesticides, WV (03/31/86)	Bioremediation		Yes		No further action. Risk was re-evaluated and it was determined that risk was not sufficient for remedial action.	Andy Palestini 215-597-1286 Philip Rotstein 215-566-3232
3	Harvey-Knott Drum, DE (09/30/85)	Flushing (in situ)		Yes (changed to soil vapor extraction in third edition)		During remedial design, sampling indicated VOCs were no longer present in the soils. Heavy metals remained at the surface. An ESD was issued in December 1992. Remedy will consist of capping the site.	Kate Lose 215-566-3240
6	Sol Lynn/Industrial Transformers, TX (03/25/88)	Thermal desorption			Dechlorination	Reclassified technology.	John Meyer 214-665-6742
10	Northwest Transformer, WA (09/15/89)	In situ vitrification		Yes		Technology dropped because commercial availability was delayed.	Christine Psyk 206-553-6519

Information on the date and issuance of Explanations of Significant Differences (ESDs) and ROD Amendments is not complete.

APPENDIX E

SUPERFUND REMEDIAL ACTIONS: RODS SELECTING NATURAL ATTENUATION

Superfund Remedial Actions:

RODs Selecting Monitored Natural Attenuation

Region	Site Name	State	ROD Date
1	Atlas Tack Corp. Superfund Site	MA	3/10/2000
1	Barkhamsted-New Hartford Landfill	CT	9/28/2001
1	BRUNSWICK NAVAL AIR STATION	ME	9/30/1994
1	Brunswick Naval Air Station Site 9 OU6	ME	9/28/1999
1	BURGESS BROTHERS LANDFILL – OU 01	VT	9/25/1998
1	Cannon Engineering	MA	3/31/1988
1	COAKLEY LANDFILL	NH	9/30/1994
1	Dover Municipal Landfill	NH	9/10/1991
1	FLETCHER'S PAINT WORKS & STORAGE – OU 01	NH	9/30/1998
1	FORT DEVENS – OU 05	MA	2/18/1998
1	Fort Devens, Areas of Contamination (AOC) 43G and 43J	MA	10/17/1996
1	Gallup's Quarry	CT	9/30/1997
1	Mottolo Pig Farm	NH	3/29/1991
1	Natick Laboratory Army Research, Development, and Engineering Center	MA	9/19/2001
1	NEW HAMPSHIRE PLATING CO. – OU 01	NH	9/28/1998
1	PEASE AIR FORCE BASE – OU 4	NH	6/26/1995
1	PEASE AIR FORCE BASE – OU 4	NH	9/26/1995
1	PEASE AIR FORCE BASE – OU 6	NH	9/18/1995
1	Peterson/Puritan	RI	9/30/1993
1	Picillo Farm	RI	9/27/1993
1	PSC Resources	MA	9/15/1992
1	Saco Municipal Landfill	ME	9/29/2000
1	Savage Municipal Water Supply	NH	9/27/1991
1	TIBBETTS ROAD – OU 01	NH	9/28/1998
1	Town Garage Radio Beacon	NH	9/30/1992
1	West Site/Hows Corner Superfund Site	ME	9/24/2002
1	Western Sand & Gravel	RI	4/16/1991
2	Carroll and Dubies Sewage Disposal	NY	9/30/1996
2	Conklin Dumps	NY	3/29/1991
2	DUPONT /NECCO PARK – OU 01	NY	9/18/1998
2	Forest Glen Subdivision Ous 2 & 3	NY	9/30/1999
2	Global Sanitary Landfill – OU 2	NJ	9/29/1997
2	GOLDISC RECORDINGS, INC. – OU 02	NY	9/30/1998
2	Islip Municipal Sanitary Landfill	NY	9/30/1992
2	Johnstown City Landfill	NY	3/31/1993
2	Jones Chemicals, Inc.	NY	9/27/2000
2	JUNCOS LANDFILL	PR	10/5/1993
2	Kin-Buc Landfill	NJ	9/28/1992
2	Malta Rocket Fuel Area	NY	7/13/1996
2	Marathon Battery	NY	9/30/1988
2	NAVAL AIR ENGINEERING CENTER	NJ	1/5/1995
2	Naval Air Engineerining Station Areas I & J groundwater OU 26	NJ	9/27/1999
2	Naval Weapons Station Earle – OU 2, Site 19	NJ	9/25/1997
2	NAVAL WEAPONS STATION EARLE (SITE A) – OU 03	NJ	9/29/1998
2	PLATTSBURGH AIR FORCE BASE	NY	3/31/1995
2	Preferred Plating Corporation (ROD Amendment)	NY	9/30/1997
2	Renora	NJ	9/29/1987
2	Ringwood Mines/Landfill	NJ	9/29/1988
2	Robintech, Inc./National Pipe Company	NY	7/25/1997
2	ROSEN BROTHERS SCRAP YARD/DUMP – OU 01	NY	3/23/1998
2	Sarney Farm	NY	9/27/1990
2	Tutu Wellfield	VI	8/5/1996
2	Woodland Routes 72 Dump and 532 Dump	NJ	7/1/1999
2	YORK OIL CO. – OU 02	NY	9/29/1998
3	ALLEGANY BALLISTICS LABORATORY (USNAVY) – OU 05	WV	6/30/1998
3	BELL LANDFILL	PA	9/30/1994
3	DOVER AIR FORCE BASE – OU 10	DE	9/26/1995
3	DOVER AIR FORCE BASE – OU 11	DE	9/26/1995
3	Dover Air Force Base, Fire Training Area 3, East Management Unit	DE	9/30/1997
3	Dover Air Force Base, Landfill 13, East Management Unit	DE	9/30/1997
3	Dover Air Force Base, Liquid Waste Disposal Area 14 and Landfill 15, Area 1, East Management Unit	DE	9/30/1997
3	DOVER GAS LIGHT CO	DE	8/16/1994
3	East Mt. Zion	PA	6/29/1990
3	MALVERN TCE – OU 01	PA	11/26/1997
3	Mid-Atlantic Wood Preservers	MD	12/31/1990
3	New Castle Spill	DE	9/28/1989
3	OHIO RIVER PARK – OU 03	PA	9/17/1998
3	Old City of York Landfill	PA	3/31/2000
3	OSBORNE LANDFILL – OU 02	PA	12/30/1997
3	Rodale Manufacturing Co. Inc. Site OU 1	PA	9/30/1999
3	The Crater Resources Superfund Site	PA	9/27/2000
3	Tobyhanna Army Depot	PA	9/28/2000
3	Tobyhanna Army Depot – OU OU 1, Areas A & B	PA	9/30/1997
3	Westline	PA	6/29/1988
3	Woodlawn Landfill Site	MD	9/30/1999
4	Aberdeen Pesticide Dumps OU 5	NC	6/4/1999
4	AGRICO CHEMICAL CO.	FL	8/18/1994

Superfund Remedial Actions:

RODs Selecting Monitored Natural Attenuation (continued)

Region	Site Name	State	ROD Date
4	Anodyne	FL	6/17/1993
4	Arlington Blending and Packaging (ROD Amendment)	TN	7/24/1997
4	B&B CHEMICAL CO., INC.	FL	9/12/1994
4	BMI-TEXTRON	FL	8/11/1994
4	Camp Lejeune Military Reservation	NC	9/26/2000
4	CECIL FIELD NAVAL AIR STATION – OU 06	FL	9/25/1998
4	CECIL FIELD NAVAL AIR STATION – OU 08	FL	8/27/1998
4	Cecil Field Naval Air Station – OU 2	FL	6/24/1996
4	Cecil Field Naval Air Station (Site 8) OU 3	FL	8/25/1999
4	Cecil Field Naval Air Station OU 7	FL	5/12/1999
4	Cedartown Industries	GA	5/7/1993
4	CEDARTOWN MUNICIPAL LANDFILL	GA	11/2/1993
4	Cherry Point Marine Air Corps Station OU 2	NC	9/29/1999
4	Cherry Point Marine Corps Air Station	NC	10/24/2000
4	Chevron Chemical Company	FL	5/22/1996
4	DAVIE LANDFILL	FL	8/11/1994
4	DAVIS PARK ROAD TCE – OU 01	NC	9/29/1998
4	Davis Park Road TCE Site	NC	9/27/2000
4	DIAMOND SHAMROCK CORP. LANDFILL	GA	5/3/1994
4	Dubose Oil Products	FL	3/29/1990
4	FCX, Inc. (Statesville Plant) – OU 3	NC	9/30/1996
4	FLANDERS FILTERS INC – OU 01	NC	9/18/1998
4	Florida Petroleum Reprocessors	FL	3/1/2001
4	GEIGER (C & M OIL) – OU 01	SC	9/9/1998
4	Hercules 009 Landfill	GA	3/25/1993
4	Homestead Air Force Base Ous 18, 26, 28, & 29	FL	3/15/1999
4	Interstate Lead (ILCO)	AL	9/30/1991
4	INTERSTATE LEAD CO. (ILCO) – OU 3	AL	9/29/1995
4	Jacksonville Naval Air Station	FL	9/28/2000
4	JACKSONVILLE NAVAL AIR STATION – OU 01	FL	8/3/1998
4	Marine Corps Logistics Base	GA	9/19/2001
4	MURRAY-OHIO DUMP	TN	6/17/1994
4	NATIONAL STARCH & CHEMICAL CORP.	NC	10/6/1994
4	Naval Air Station (NAS) Cecil Field	FL	4/24/2001
4	Naval Air Station Cecil Field	FL	1/11/2000
4	Normandy Park Aparments	FL	5/11/2000
4	Potter's Septic Tank Service Pits	NC	9/27/2000
4	Redwing Carriers/Saraland	AL	12/15/1992
4	Reeves Southeastern Galvanizing – OU 2	FL	9/9/1993
4	Ross Metals, Inc.	TN	9/17/2002
4	Sanford Gasification Plant	FL	6/12/2001
4	Savannah River Site	SC	6/22/2001
4	SAVANNAH RIVER SITE (USDOE) – OU 27	SC	8/14/1998
4	Solitron Microwave	FL	11/1/2000
4	STANDARD AUTO BUMPER CORP.	FL	12/10/1993
4	TAYLOR ROAD LANDFILL	FL	9/29/1995
4	Townsend Saw Chain Co.	SC	12/19/1996
4	WHITEHOUSE OIL PITS – OU 01	FL	9/24/1998
4	Wingate Road Municipal Incinerator Dump and Landfill	FL	5/14/1996
4	Yellow Water Road Dump	FL	6/30/1992
4	Zellwood Ground Water Contamination Site	FL	8/23/2000
5	A & F Materials Reclaiming	IL	8/14/1986
5	Adams County Quincy Landfill #2 & #3	IL	9/30/1993
5	AGATE LAKE SCRAPYARD	MN	1/13/1994
5	ALBION SHERIDAN TOWNSHIP LANDFILL	MI	3/28/1995
5	Alsco Anaconda	OH	9/30/1992
5	Bendix Corp/Allied Automotives Site	MI	9/30/1997
5	Charlevoix Municipal Well Field	MI	9/30/1985
5	Cliff/Dow Dump	MI	9/27/1989
5	Dakhue Sanitary Landfill	MN	6/30/1993
5	DUPAGE COUNTY LANDFILL/BLACKWELL FOREST – OU 01	IL	9/30/1998
5	Electro-Voice OU2	MI	9/21/1999
5	Fadrowski Drum Disposal	WI	6/10/1991
5	GALEN MEYER'S DUMP/DRUM SAL	IN	9/29/1995
5	H.O.D. LANDFILL – OU 01	IL	9/28/1998
5	HECHIMOVICH SANITARY LANDFILL	WI	9/6/1995
5	Industrial Excess Landfill	OH	3/1/2000
5	Ionia City Landfill	MI	9/28/2000
5	Kohler Company Landfill	WI	6/26/1996
5	Metamora Landfill	MI	9/27/2001
5	MIG/DeWane Landfill	IL	3/30/2000
5	Oak Grove Sanitary Landfill	MN	12/21/1990
5	Outboard Marine Company/Waukegan Coke Plant	IL	9/30/1999
5	PENTA WOOD PRODUCTS – OU 01	WI	9/29/1998
5	PETOSKEY MUNICIPAL WELL FIELD – OU 01	MI	9/30/1998
5	PRESTOLITE BATTERY DIV	IN	8/23/1994
5	Rasmussen's Dump	MI	7/20/2001
5	Reilly Tar and Chemical (Indianapolis Plant) – OU 5	IN	6/30/1997
5	Roto-Finish Co, Inc.	MI	3/31/1997
5	Sangamo Electric Dump/Crab Orchard National Wildlife Refuge Site	IL	6/23/2000
5	South-east Rockford groundwater contamination	IL	6/11/2002
5	Tippecanoe Sanitary Landfill, Inc.	IN	9/30/1997

Superfund Remedial Actions:

RODs Selecting Monitored Natural Attenuation (continued)

Region	Site Name	State	ROD Date
5	Twin Cities AF Reserve (SAR Landfill)	MN	3/31/1992
5	Wheeler Pit	WI	9/28/1990
5	WOODSTOCK MUNICIPAL LANDFILL – OU 01	IL	7/15/1998
5	Wright-Patterson Air Force Base – OU 2, Spill Sites 2, 3 & 10	OH	9/30/1997
6	Arkwood	AR	9/28/1990
6	Brio Refining	TX	3/31/1988
6	City of Perryton Well No. 2	TX	9/26/2002
6	DUTCHTOWN TREATMENT PLANT	LA	6/20/1994
6	Fourth Street Abandoned Refinery	OK	9/30/1993
6	French Limited	TX	3/24/1988
6	Gulf Coast Vacuum Services – OU 1	LA	9/30/1992
6	Gulf States Utilities – North Ryan Street Site	LA	9/27/2000
6	Hardage/Criner (Amendment)	OK	11/22/1989
6	Koppers (Texarkana Plant)	TX	9/23/1988
6	Koppers (Texarkana Plant) (Amendment)	TX	3/4/1992
6	KOPPERS COMPANY, INC (TEXARKANA PLANT)	TX	8/20/2002
6	Monroe Auto Pit (Finch Road Landfill)	AR	9/26/1996
6	Mosley Road Sanitary Landfill	OK	6/29/1992
6	PETRO-CHEMICAL SYSTEMS, (TURTLE BAYOU) – OU 02	TX	4/30/1998
6	Sikes Disposal Pit	TX	9/18/1986
6	SOUTH 8TH STREET LANDFILL – OU 01, 02	AR	7/22/1998
6	United Creosoting	TX	9/30/1986
7	Bee Cee Manufacturing	MO	9/30/1997
7	Cleburn Street Well	NE	6/7/1996
7	Cornhusker Army Ammunition Plant	NE	12/14/1999
7	Cornhusker Army Ammunition Plant (CHAAP)	NE	9/26/2001
7	Farmers' Mutual Cooperative	IA	9/29/1992
7	Hastings Groundwater Contamination Site	NE	9/28/2000
7	Mason City Coal Gasification Site	IA	9/19/2000
7	Ogallala Ground Water Contamination OU 1	NE	4/23/1999
7	Quality Plating	MO	9/28/1999
7	Ralston	IA	9/30/1999
8	ANACONDA CO. SMELTER – OU 04	MT	9/29/1998
8	Chemical Sales Company Superfund Site	CO	3/27/2000
8	Denver Radium – OU 8	CO	1/28/1992
8	HILL AIR FORCE BASE – OU 01	UT	9/29/1998
8	Hill Air Force Base – OU 6	UT	9/30/1997
8	Kennecott South Zone Site	UT	12/13/2000
8	MURRAY SMELTER – OU 00	UT	4/1/1998
8	Mystery Bridge at Highway 20	WY	9/24/1990
8	PORTLAND CEMENT (KILN DUST 2 & 3) – OU 03	UT	8/17/1998
8	Rocky Mountain Arsenal – OU Offpost OU	CO	12/19/1995
8	Rocky Mountain Arsenal – OU Onpost OU	CO	6/11/1996
8	SMELTERTOWN SITE – OU 02	CO	6/4/1998
8	Utah Power & Light/American Barrel	UT	7/7/1993
9	ANDERSEN AIR FORCE BASE – OU 03	GU	6/16/1998
9	Camp Pendleton Marine Corps Base, Site 9-41 Area – OU 1	CA	12/7/1995
9	Del Norte County Pesticide Storage Superfund Site	CA	8/29/2000
9	George Air force Base OU 3	CA	10/5/1998
9	INDIAN BEND WASH AREA – OU 03	AZ	9/30/1998
9	Lawrence Livermore National Laboratory	CA	2/23/2001
9	Marine Corps Air Station	AZ	9/8/2000
9	Operating Industries, Inc. Landfill	CA	9/30/1996
9	TRAVIS AIR FORCE BASE – OU 01	CA	12/3/1997
9	Travis Air Force Base West/Annexes/Basewide OU (WABOU)	CA	3/16/1999
10	Adak Naval Air Station	AK	3/31/2000
10	EIELSON AIR FORCE BASE – OU 03, 04, 05	AK	9/29/1998
10	Fairchild Air Force Base – OU Priority 2 Sites	WA	12/20/1995
10	Fort Richardson – OU OU A & B	AK	9/15/1997
10	Fort Wainwright – OU 1	AK	6/27/1997
10	Fort Wainwright – OU 2	AK	3/27/1997
10	Fort Wainwright – OU 3	AK	4/9/1996
10	Fort Wainwright – OU 4, Fairbanks	AK	9/24/1996
10	Hanford 1100–Area (DOE)	WA	9/24/1993
10	Idaho National Engineering and Environmental Laboratory Test Area North (TAN)	ID	9/19/2001
10	Monsanto Chemical Company	ID	4/30/1997
10	Naval Air Station, Whidbey Island – Ault Field – OU OU 5, Areas 1, 52, and 31	WA	7/10/1996
10	NAVAL UNDERSEA WARFARE STATION (4 AREAS) – OU 01	WA	9/28/1998
10	North Market Street	WA	12/14/1999
10	Northwest Pipe and Casing Company/Hall Process Company	OR	9/27/2001
10	U.S. Naval Submarine Base–OU 8 Bangor	WA	9/27/2000
10	USAF EIELSON AIR FORCE BASE – OU 6	AK	9/27/1994
10	USAF ELMENDORF AIR FORCE BASE – OU 4	AK	9/26/1995
10	USAF ELMENDORF AIR FORCE BASE – OU 5	AK	12/28/1994
10	Wyckoff/Eagle Harbor, (Amendment) – OU West Harbor OU	WA	12/8/1995

Appendix F

Identification of Remedy and Record of Decision Types for Superfund Remedial Actions

F.1 BACKGROUND

On December 11, 1980, Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which is known as the "Superfund" act. The act created the Superfund program, which was established to clean up abandoned hazardous waste sites around the United States. Section 105(a)(8)(B) of CERCLA, as amended, requires that EPA prepare a list of national priorities among the known sites throughout the United States at which releases or threatened releases of hazardous substances, pollutants, or contaminants may occur. This list is known as the National Priorities List (NPL).

The remedies selected for an NPL site are documented in a record of decision (ROD). Remedies implemented at NPL sites or NPL equivalent sites in accordance with RODs are known as Superfund remedial actions, and such sites are known as Superfund remedial action sites. Because selected remedies vary in the type of media addressed and the methods used to address those media, confusion can arise when assigning a type to a particular remedy. Categorizing remedies by types can facilitate the transfer of experience and technology by making it easier to identify sites at which similar remedies are applicable. Establishing and applying a methodology for classifying remedy types can provide a consistent and comprehensive approach for reviewing and comparing remedies used in RODs. In addition, use of such an approach can lead to more consistent data collection and reporting and assist remedial project managers (RPMs), On-Scene Coordinators (OSCs), and other regulatory and remediation professionals in the transfer of experience and technology among Superfund sites and in identifying sites implementing similar remedies. This document describes an approach that can be used to classify remedies and RODs.

Remedies should be classified by reviewing the remedies selected in RODs. Although RODs are written using an overall format that is consistent, RODs are prepared by individual RPMs and other staff of the 10 EPA regions. In addition, the management practices and techniques used to remediate sites have evolved over time and continue to evolve. Therefore, the words, phrases, and descriptions applied to the same or similar remedies may differ from ROD to ROD. To facilitate the identification of remedy types, this document includes both descriptive definitions of remedy types and lists of key words and phrases that may be used to refer to each remedy type.

The definitions of remedy types provided in this document are based on a review of definitions and lists of media, remedies, and technologies provided in the following resources:

- The CERCLA Information System (CERCLIS 3) database
- ROD Annual Reports for fiscal years (FY) 1989 through 2002
- The Federal Remediation Technologies Roundtable (FRTR) Technology Screening Matrix
- Treatment Technologies for Site Cleanup: Annual Status Report (Eleventh Edition) (ASR)

The remedy type definitions were reviewed and augmented by a working group of personnel of the U.S. Environmental Protection Agency (EPA) Office of Solid Waste and Emergency Response (OSWER) who are experienced in site remediation and ROD preparation and review.

F.2 CLASSIFYING REMEDIES AND RODS

Remedy types should be identified by first dividing remedies into three categories (source control, groundwater, and no action) based on the media treated and the type of action. Within each of these categories, the remedies should then be further divided into the following 10 specific remedy types:

Source Control Remedies:

1. Source control treatment
2. Source control containment
3. Source control other
4. Source control monitored natural attenuation

Groundwater Remedies:

5. Groundwater in situ treatment
6. Groundwater pump and treat
7. Groundwater containment barriers
8. Groundwater other
9. Groundwater monitored natural attenuation

No Action Remedies:

10. No action or no further action (NA/NFA)

RODs should be classified using the 10 remedy types listed above. When more than one remedy type is selected in the same ROD, the ROD should be assigned all of the remedy types that are identified.

The definitions that should be used to identify each remedy type are provided in the "Definitions" section below. When definitions include specific technologies and those technologies commonly are referred to by more than one word or phrase, the most commonly used word or phrase is listed first, followed by synonyms in parentheses.

F.3 DEFINITIONS USED TO IDENTIFY REMEDY TYPES

F.3.1 General Definitions

The definitions of treatment technology and the different types of treatment technologies (physical, chemical, thermal, and bioremediation treatment) apply to both source control and groundwater remedies.

Treatment Technology - Any unit operation or series of unit operations that alters the composition of a hazardous substance, pollutant or contaminant through chemical, biological, or physical means so as to reduce toxicity, mobility, or volume of the contaminated materials being treated. Treatment technologies are an alternative to land disposal of hazardous wastes without treatment (Federal Register, volume 55, page 8819, 40 CFR 300.5: Definitions). Treatment technologies are grouped into five categories. The definitions for four of the categories (physical treatment, chemical treatment, thermal treatment, and biological treatment) are based on definitions provided in the FRTR Technology Screening Matrix. The fifth category, other or unspecified treatment, includes those technologies that do not fit into the first four categories. The five treatment technology categories are:

Physical Treatment - Uses the physical properties of the contaminants or the contaminated medium to separate or immobilize the contamination.

Chemical Treatment - Chemically converts hazardous contaminants to non-hazardous or less toxic compounds or compounds that are more stable, less mobile, and/or inert. Even though a chemical reaction is not always involved in chemical precipitation, chemical precipitation is typically included in this category.

Thermal Treatment - Uses heat to: separate contaminants from contaminated media by increasing their volatility; destroy contaminants or contaminated media by burning, decomposing, or detonating the contaminants or the contaminated media; or immobilize contaminants by melting and solidifying the contaminated media.

Bioremediation Treatment - Includes adding or stimulating the growth of microorganisms, which metabolize contaminants or create conditions under which contaminants will chemically convert to non-hazardous or less toxic compounds or compounds that are more stable, less mobile, and/or inert.

Other or Unspecified Treatment - Treatment that cannot be classified as physical treatment, chemical treatment, thermal treatment, or bioremediation treatment. For example, some RODs select physical/chemical treatment of a source without specifying the particular physical/chemical treatment. In such cases, the ROD should not be definitively classified as physical or chemical treatment and should be classified as other or unspecified treatment, unspecified physical/chemical treatment.

F.3.2 Source Control

Source Media - A source medium is defined as a material that acts as a reservoir, either stationary or mobile, for hazardous substances. Source media include or contain hazardous substances, pollutants, or contaminants that may migrate to the groundwater, to surface water, to air, (or to other environmental media) or act as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material although non-aqueous phase liquids (NAPLs [occurring either as residual- or free-phase]) may be viewed as source materials. (A Guide to Principal Threat and Low Level Threat Wastes, Superfund publication 9355.3-02FS, USEPA OSWER 1991). Source media include soil, sediment, sludge, debris, solid-matrix wastes, surface water, NAPLs, equipment, drums, storage tanks, leachate, landfill gas, and any other contaminated media other than groundwater that can act as a potential source of contamination.

Source Control Remedy - any removal, treatment, containment, or management of any contaminant source or contaminated medium other than groundwater.

1. Source Control Treatment

Any process meant to separate and remove, destroy, or bind contaminants in a source medium. Key words used in RODs to identify these processes are listed below. Additional detail about these technologies can be found in the ASR at http://clu-in.org/asr or on the Federal Remediation Technologies Roundtable website at http://www.frtr.gov.

Physical Treatment

- Acid extraction
- Air stripping
- Carbon adsorption (liquid-phase carbon adsorption)
- Clarification (sedimentation)
- Decontamination
- Dewatering
- Electrical separation (electrokinetic separation)
- Evaporation
- Filtration
- Flushing (soil flushing and surfactant flushing)
- Ion exchange
- Magnetic separation
- Membrane filtration (microfiltration, nanofiltration, reverse osmosis, ultrafiltration)
- Multi-phase extraction (free product recovery)
- Oil/water separation (free product recovery)
- Physical separation (component separation and materials handling)
- Soil vapor extraction (vacuum extraction and vapor extraction)
- Soil washing
- Solidification/stabilization (asphalt batching, immobilization, and microencapsulation)
- Solid-phase extraction
- Solvent extraction (chemical stripping)
- Steam stripping
- Super-critical fluid extraction
- Volatilization (aeration, mechanical soil aeration, and tilling)

Chemical Treatment

- Chemical oxidation (cyanide oxidation, oxidation, and peroxidation)
- Chemical reduction (reduction)
- Chemical treatment (chemical reduction/ oxidation and remedy type not further specified)
- Dehalogenation (dechlorination)
- Flocculation
- Metals precipitation
- Neutralization (pH neutralization)
- Permeable reactive barrier (chemical reactive barrier, chemical reactive wall, leachate reactive wall, and passive treatment wall)
- Ultraviolet (UV) oxidation

Thermal Treatment

- Flaring (gas flaring)
- High energy corona
- Open burning/open detonation
- Plasma high-temperature recovery (fuming gasification and high-temperature metals recovery)
- Thermal desorption
- Thermal destruction (incineration and pyrolysis)
- Thermal treatment (remedy type not further specified)
- In situ thermal treatment (conductive heating, Contained Recovery of Oily Wastes [CROW®], dynamic underground stripping, electrical resistance heating, hot air injection, in situ thermal desorption, microwave heating, radio frequency heating, steam injection, and thermally enhanced soil vapor extraction)
- Vitrification (slagging)

Bioremediation

- Aeration (for purpose of bioremediation, tilling)
- Biopile
- Bioreactor
- Bioremediation (biological treatment, remedy type not further specified)
- Bioslurping
- Bioventing
- Co-metabolic treatment
- Composting
- Controlled solid phase

Continued on next page

Bioremediation (continued)

- Fixed film reactors
- Landfarming
- Microbial injection (addition of microorganisms)
- Nitrate enhancement
- Nutrient injection
- Oxygen enhancement with air sparging (biosparging)
- Oxygen enhancement with hydrogen peroxide (H_2O_2)
- Permeable treatment bed (for purpose of bioremediation)
- Slurry-phase bioremediation (bioslurry, activated sludge)
- White rot fungus

Other or Unspecified Treatment

- Air emission treatment
- Fracturing (pneumatic fracturing, hydraulic fracturing)
- Gas collection and treatment (off-gas treatment)
- Hot gas decontamination
- Leachate treatment
- Phytoremediation
- Publicly owned treatment works (POTW)
- Recycling
- Surface water treatment
- Treatment of residuals
- Unspecified physical/chemical treatment
- Unspecified treatment

2. Source Control Containment

Any process or structure designed to prevent contaminants from migrating from a source media into groundwater, to surface water, to air, (or to other environmental media) or acting as a source for direct exposure. Key words used in RODs to identify source control containment remedies are listed below:

Capping and Cover

- Cap (impermeable barrier)
- Cover material
- Evapotranspiration cover

Bottom Liner

- Clay
- Geosynthetic material
- Liner (impermeable barrier)

Drainage and Erosion Control

- Engineering control (remedy type not further specified)
- Hydraulic control
- Impermeable barrier
- Revegetation
- Slope stabilization
- Subsurface drain (leachate control)
- Surface water control (dike, berm, drainage controls, drainage ditch, erosion control, flood protection, and levee)

On-Site Landfilling

- On-site consolidation
- On-site disposal
- On-site landfilling (remedy type not further sepcified)

Off-Site Landfilling

- Off-site consolidation
- Off-site disposal
- Off-site landfilling (remedy type not further specified)

Vertical Engineered Barrier

(When used as a remedy for a source medium [including subsurface NAPLs]. Vertical subsurface engineered barriers used to control or contain groundwater should not be considered source control containment.)

- Grout (grout curtain)
- Impermeable barrier
- Sheet piling
- Slurry wall
- Subsurface barrier
- Vertical barrier

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Other or Unspecified Containment

Containment (consolidation, disposal, landfilling, and removal)

Encapsulation (overpacking)

Leachate control (leachate collection, leachate discharge, leachate recovery wells, leachate reinjection)

Liquid waste management (liquid waste collection, liquid waste discharge, liquid waste recovery wells, liquid waste reinjection)

Permanent storage

Repair (pipe repair, sewer repair, and tank repair)

Surface water management (surface water collection, surface water discharge, surface water recovery wells, surface water reinjection)

3. Source Control Other

Source control remedies that do not fall into the categories Source Control Treatment or Source Control Containment.

Institutional Control

The classification of institutional controls has been revised based on *Institutional Controls: A Site Manager's Guide to Identifying, Evaluating, and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups, OSWER 9355.0-74FS-P, EPA 540-F-00-005, September 2000.* The remedy definitions outlined in this guidance differ from those historically used to classify institutional control remedies. This classification system groups institutional controls into 4 categories. Listed below are these four categories. Beneath each category, the terms historically applied to institutional controls that are most likely to fall under the categories are listed. The list below also adds a fifth category, "Institutional control (remedy type not further specified)" for cases where the particular institutional control selected is not recorded in a ROD.

1. **Governmental control**
    - Access restriction
    - Drilling restriction
    - Fishing restriction
    - Guard (security)
    - Recreational restriction
    - Surface water restriction
    - Swimming restriction
    - Water supply use restriction
2. **Proprietary control**
    - Deed notification
    - Deed restriction
    - Land use restriction
3. **Enforceable agreement**
    - Access agreement
4. **Informational device**
5. **Institutional control (remedy type not further specified)**

Engineering Control

Dust suppression

Engineering control (remedy type not further specified)

Fencing

Water table adjustment

Wetland replacement

Source Monitoring

Monitoring

Sampling

Population Relocation

Population relocation

Surface Water Supply Remedies

Alternate water supply (alternate drinking water and bottled water)

Carbon at tap

Well-head treatment

4. Source Control Monitored Natural Attenuation (MNA)

The reliance on natural attenuation processes (within the context of a carefully controlled and monitored approach to site cleanup) to achieve site-specific remediation objectives within a time frame that is reasonable, compared with that offered by other, more active methods. The "natural attenuation processes" that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in situ processes include biodegradation; dispersion; dilution; sorption; volatilization; radioactive decay; and chemical or biological stabilization, transformation, or destruction of contaminants (Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites, USEPA, Office of Solid Waste and Emergency Response, Directive Number 9200.4-17P, 1999).

A remedy should be considered source control MNA if it includes "natural attenuation" or "monitored natural attenuation" for a source (e.g., contaminated soil).

F.3.3 Groundwater Remedies

Groundwater Remedy - Management of groundwater. Groundwater remedies can include in situ treatment, pump and treat, containment using vertical engineered barriers, MNA, and other measures to address groundwater.

Groundwater Media - One or more aquifers beneath or proximal to a source medium, contaminated by migration of contaminants, such as leachate, or by other sources.

5. Groundwater In Situ Treatment

Treatment of groundwater without extracting it from the ground. Key words used in RODs to identify groundwater in situ treatment remedies are listed below:

Physical Treatment

Air sparging

Electrical separation (electrokinetic separation)

In-well air stripping (well aeration and air stripping)

Multi-phase extraction (free product recovery)

Surfactant flushing

Vapor extraction

Chemical Treatment

Chemical oxidation (cyanide oxidation, oxidation, and peroxidation)

Chemical reduction (reduction)

Chemical treatment (chemical reduction/ oxidation and remedy type not further specified)

Dehalogenation (dechlorination)

Permeable reactive barrier (chemical reactive barrier, chemical reactive wall, and passive treatment wall)

Thermal Treatment

In situ thermal treatment (conductive heating, CROW®, dynamic underground stripping, electrical resistance heating, hot air injection, hot water or steam flushing and stripping, in-situ thermal desorption, microwave heating, radio frequency heating, steam injection, and thermally enhanced soil vapor extraction)

Bioremediation

Aeration (for purpose of bioremediation)

Bioremediation (biological treatment, remedy type not further specified)

Bioslurping

Bioventing

Co-metabolic treatment

Continued on next page

Bioremediation (continued)

- Microbial injection (addition of microorganisms)
- Nitrate enhancement
- Nutrient injection
- Oxygen enhancement with air sparging (biosparging)
- Oxygen enhancement with hydrogen peroxide (H_2O_2)

Other or Unspecified Treatment

- Fracturing (pneumatic fracturing, hydraulic fracturing)
- Phytoremediation
- Treatment of residuals
- Unspecified physical/chemical treatment
- Unspecified treatment

6. Groundwater Pump and Treat

Extraction of groundwater from an aquifer followed by treatment above ground. Key words used in RODs to identify groundwater pump and treat remedies are listed below:

Physical Treatment

- Aeration (air stripping)
- Carbon adsorption (liquid phase carbon adsorption)
- Clarification (sedimentation)
- Coagulation
- Component separation
- Equalization
- Evaporation
- Filtration
- Ion exchange
- Membrane filtration (microfiltration, nanofiltration, reverse osmosis, ultrafiltration)
- Oil/water separation (free product recovery)

Chemical Treatment

- Chemical oxidation (cyanide oxidation, oxidation, and peroxidation)
- Chemical reduction
- Chemical treatment (chemical reduction/oxidation and remedy type not further specified)
- Flocculation
- Metals precipitation
- Neutralization (pH neutralization)
- Ultraviolet (UV) oxidation

Biological Treatment

- Biological treatment (remedy type not further specified)
- Bioreactors
- Fixed film reactors
- Oxygen enhancement with hydrogen peroxide (H_2O_2)

Other or Unspecified Treatment

- Centralized waste treatment facility
- Fracturing (pneumatic fracturing, hydraulic fracturing)
- Publicly owned treatment works (POTW)
- Pumping and unspecified ex-situ treatment
- Treatment of residuals
- Unspecified ex-situ physical/chemical treatment
- Unspecified treatment

Groundwater Extraction

The process of removing groundwater from beneath the ground surface, including the following methods of groundwater extraction:

Continued on next page

Groundwater Extraction (continued)

- Directional well (horizontal well)
- Pumping (recovery well, vertical well)
- Recovery trench (horizontal drain)
- Subsurface drain

Groundwater Discharge and Management

A method of discharging or otherwise managing extracted groundwater, including the following discharge methods and receptors:

- Deep well injection (Class I well)
- Recycling
- Reuse as drinking water
- Reuse as irrigation water
- Reuse as process water
- Surface drain reinjection (infiltration basin, infiltration trench)
- Surface water discharge (National Pollutant Discharge Elimination System [NPDES] discharge)
- Vertical well reinjection (into contaminated aquifer)

7. Groundwater Containment

Containment of groundwater, typically through the use of vertical engineered barriers. Key words used in RODs to identify groundwater containment remedies are listed below:

Vertical Engineered Barrier

- Deep soil mixing (barrier installation technique)
- Geosynthetic wall
- Grout (grout curtain)
- High-density polyethylene (HDPE) wall
- Impermeable barrier
- Sheet piling
- Slurry wall
- Subsurface vertical engineered barrier (subsurface barrier, subsurface vertical barrier)

Other or Unspecified Containment

Plume containment (hydraulic containment of plume, plume management, plume migration control)

8. Groundwater Other

Groundwater remedies that do not fall into the categories Groundwater In Situ Treatment, Groundwater Pump and Treat, Groundwater Containment, or Groundwater Monitored Natural Attenuation.

Institutional Control

The classification of institutional controls has been revised based on *Institutional Controls: A Site Manager's Guide to Identifying, Evaluating, and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups, OSWER 9355.0-74FS-P, EPA 540-F-00-005, September 2000.* The remedy definitions outlined in this guidance differ from those historically used to classify institutional control remedies. This classification system groups institutional controls into 4 categories. Listed below are these four categories. Beneath each category, the terms historically applied to institutional controls that are most likely to fall under the categories are listed. The list below also adds a fifth category, "Institutional control (remedy type not further specified)" for cases where the particular institutional control selected is not recorded in a ROD.

1. Governmental control

- Access restriction
- Drilling restriction
- Fishing restriction
- Groundwater restriction
- Guard (security)
- Recreational restriction
- Surface water restriction
- Swimming restriction
- Water supply use restriction

Continued on next page

Institutional Control (continued)

2. Proprietary control

Deed notification

Deed restriction

Land use restriction

3. Enforceable agreement

Access agreement

4. Informational device

5. Institutional control (remedy type not further specified)

Engineering Control

Engineering control (berm, dike, drainage ditch, levee)

Water table adjustment

Wetland replacement

Groundwater Monitoring

Monitoring

Sampling

Population Relocation

Population relocation

Water Supply Remedies

Alternate water supply (alternate drinking water and bottled water)

Carbon at tap

Extend piping to existing water main

Install new surface water intake

Install new water supply wells

Seal well (close well)

Treat at use location

Well-head treatment

9. Groundwater MNA

The reliance on natural attenuation processes (within the context of a carefully controlled and monitored approach to site cleanup) to achieve site-specific remediation objectives within a time frame that is reasonable, compared with that offered by other, more active methods. The "natural attenuation processes" that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in situ processes include biodegradation; dispersion; dilution; sorption; volatilization; radioactive decay; and chemical or biological stabilization, transformation, or destruction of contaminants (*Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites*, USEPA, Office of Solid Waste and Emergency Response, Directive Number 9200.4-17P, 1999).

A remedy should be considered groundwater MNA if it includes "natural attenuation" or "monitored natural attenuation" of groundwater.

F.3.4 No Action Remedies

10. NA/NFA

The designation used for remedies that indicate no action or no further action will be taken. When determining overall ROD type, the designation should be used only for RODs under which NA/NFA is the only remedy selected. If a ROD selects NA/NFA for only part of a site and another remedy for another part of a site, the ROD should be given the classification corresponding to that selected remedy and should not be given an NA/NFA designation.

F.4 SPECIAL CASES

This subsection provides a list of some special cases and descriptions of how remedy types should be assigned in those cases:

Decontamination:

- The remedy type for decontamination of buildings, equipment, tanks, debris, boulders, rocks, or other objects should be considered source control treatment. For example, abrasive blasting or scarifying a concrete pad to remove the contaminated surface layer of the pad should be identified as source control treatment.
- Decontamination of equipment used to clean up a Superfund site is a normal activity that

occurs at many Superfund sites and should not be considered a remedy. For example, high-pressure water washing of a front end loader used to excavate contaminated soil should not be considered a remedy and should not be given a remedy type.

Phytoremediation:

- Phytoremediation involves the use of macroscopic plants to destroy, remove, immobilize, or otherwise treat contaminants. While this technology may include the use of microorganisms in conjunction with plants, it is distinguished from bioremediation in that bioremediation does not use macroscopic plants. Remedies that used microorganisms without macroscopic plants should be identified as bioremediation.
- The use of plants to control surface water drainage at a site is not phytoremediation. Such remedies should be identified as engineering controls (source control other or groundwater other).

Remedies Based on Site Characteristics - If a ROD indicates that a certain remedy be implemented based on certain site characteristics, the ROD should be considered to have selected the remedy. For example, a ROD may specify that if soils exceed a certain level of contamination they will be incinerated, but if they do not exceed that level, no further action will be taken. In such a case, the ROD should be considered to have selected incineration and therefore should be considered a source control treatment ROD.

Vertical Engineered Barriers - Some of the technologies used for vertical engineered barriers are also used to control surface water and surface drainage (for example, slurry walls and sheet piles). Where these remedies are used to contain groundwater, they should be identified as groundwater containment.

Solidification/Stabilization - Some of the technologies used for solidification/stabilization can be used for either treatment or containment. For example, "encapsulation" of a waste in plastic drums is source control containment. "Encapsulation" of a waste by mixing with a monomer and then causing it to polymerize, resulting in microencapsulation, is source control treatment. In general, containment involves isolating bulk wastes, while solidification/stabilization involves incorporating the contaminants into a matrix so that their leachability is reduced.

Water Table Adjustment - Where water table adjustment is used to prevent the groundwater from coming into contact with a contaminated source medium, it should be identified as source control other, engineering control. Where water table adjustment is used to treat groundwater, it should be classified as groundwater other, engineering control.

Subsurface Drain - When a subsurface drain is used in order to prevent contact of precipitation runoff with a source or to prevent erosion, it should be considered source control containment, drainage and erosion control. When a subsurface drain is used to extract groundwater prior to treatment of the groundwater, it should be classified as groundwater pump and treat, groundwater extraction.

Treatment of Residuals - Residuals are the matter that results from a treatment process. For example, the residuals from incineration of soil can include ash, off-gasses, and scrubber blowdown from off-gas treatment. In the preceding example, treatment of off-gasses using a scrubber should be classified as treatment of residuals. Where treatment of residuals is specified in a ROD, the existence of residuals treatment should be identified, but additional information on the treatment of residuals should not be collected.

Air Media - Air media include sources that are in a gaseous form, such as landfill gas or hazardous gasses stored in compressed gas cylinders. When remedies for air media are selected in a ROD they should be identified as source control remedies. For example, collection and treatment of landfill gas should be classified as source control treatment. Air emissions from equipment used to treat sources or groundwater are not air media. For example, a ROD may specify that groundwater will be extracted and treated by air stripping, and the off-gas generated by the air stripping must be treated by activated carbon adsorption. In such a case, the ROD would be classified as groundwater pump-and-treat (both physical treatment, aeration [air stripping]; and other or unspecified treatment, treatment of residuals), but would not be classified as a source control treatment ROD.

APPENDIX G

REASONS FOR SHUT DOWN OF 63 GROUNDWATER PUMP AND TREAT SYSTEMS

Superfund Remedial Actions:

Reasons for Shut Down of 63 Groundwater Pump and Treat Systems

EPA Region	Site Name, State	Reasons for Shut Down
1	Hocomonco Pond, MA	Treatment system shut-off due to technical problems
1	McKin Co., ME	Replaced with MNA
1	Norwood PCBs, MA	Replaced with cap
1	Pinnettes Salvage Yard, ME	Replaced with institutional controls
1	Sylvester, NH	Met project cleanup goals
2	Fulton Terminals, NY	Met project cleanup goals
2	Mannheim Avenue Dump, NJ	Met project cleanup goals
2	Pollution Abatement Services, NY	Met project cleanup goals
2	Tabernacle Drum Dump, NJ	Met project cleanup goals
2	Universal Oil Products, NJ	Replaced with cap
2	Vestal Water Supply Well 4-2, NY	Met project cleanup goals
3	Chem-Solv, Inc., DE	Met project cleanup goals
3	McAdoo Associates, PA	Met project cleanup goals
3	Rentokil Virginia Wood Preserving, VA	To be determined
3	Rhinehart Tire Fire Dump, VA	To be determined
3	Southern Maryland Wood Treating, MD	Met project cleanup goals
3	U.S. Titanium, VA	To be determined
4	62nd Street Dump, FL	Replaced with cap
4	Bypass 601 Groundwater Contamination, NC	To be determined
4	Gold Coast Oil Corp., FL	Met project cleanup goals
4	Hollingsworth Solderless Terminal, FL	Met project cleanup goals
4	Schuylkill Metals Corp., FL	Replaced with source treatment and engineering controls
4	Tri-City Disposal Co., KY	To be determined
5	Avenue "E" Groundwater Contamination, MI	Met project cleanup goals
5	Belvidere Municipal Landfill, IL	Met project cleanup goals
5	Burrows Sanitation, MI	Met project cleanup goals
5	Charlevoix Municipal Well, MI	To be determined
5	Cross Brothers Pail Recycling (Pembroke), IL	Met project cleanup goals
5	Duell & Gardner Landfill, MI	Met project cleanup goals
5	East Bethel Township, MN	Met project cleanup goals
5	Enviro. Conservation and Chemical, IN	Treatment system shut-off due to technical problems
5	Kummer Sanitary Landfill, MN	Replaced with MNA
5	Lakeland Disposal Service, Inc., IN	To be determined
5	Lauer 1 Sanitary Landfill, (Boundary Road), WI	To be determined
5	Lehillier Mankato Site, MN	Met project cleanup goals
5	New Lyme Landfill, OH	Treatment system shut-off due to technical problems
5	Onalaska Municipal Landfill, WI	Replaced with MNA
5	Schmalz Dump, WI	To be determined
5	Skinner Landfill, OH	To be determined
5	Spiegelberg Landfill, MI	To be determined
5	Tri-State Plating, IN	Met project cleanup goals
5	University Minnesota (Rosemount Res Cen), MN	Met project cleanup goals
5	Washington County Landfill, MN	Met project cleanup goals
5	Whittaker Corp., MN	Met project cleanup goals
5	Windom Dump, MN	Met project cleanup goals
6	Bailey Waste Disposal, TX	Replaced with cap
6	Cimmaron Mining Corp., NM	Treatment system shut-off due to technical problems
6	French, Ltd., TX	Replaced with MNA
6	Odessa Chromium #2 (Andrews Highway), TX	To be determined
6	Odessa Chromium I Superfund Site, TX	To be determined
6	Odessa Chromium II Superfund Site, TX	To be determined
6	Odessa Chromium No 2 Pump and Treat 2nd Unit, TX	To be determined
6	Southern Shipbuilding, LA	Met project cleanup goals
7	Fairfield Coal Gasification Plant, IA	Met project cleanup goals
7	Valley Park TCE Site Wainwright, MO	Treatment system shut-off due to technical problems
7	Waverly Groundwater Contamination, NE	To be determined
7	White Farm Equipment Co. Dump, IA	Replaced with cap
8	Chemical Sales Co., CO	To be determined
8	Mystery Bridge Rd/U.S. Highway 20, WY	Met project cleanup goals
9	Coast Wood Preserving, CA	To be determined
9	Del Norte Pesticide Storage, CA	Treatment system shut-off due to technical problems
9	Norton Air Force Base, CA	Met project cleanup goals
10	Naval Air Station, Whidbey Island (AULT), WA	To be determined

MNA = Monitored natural attenuation

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