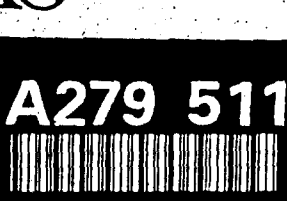

United States General Accounting Office

GAO

Report to the Chairman, Committee on Governmental Affairs, U.S. Senate

April 1994

ENVIRONMENTAL CLEANUP

Too Many High Priority Sites Impede DOD's Program

AO/NSIAD-94-133

GAO

United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-256676

April 21, 1994

The Honorable John Glenn
Chairman, Committee on
Governmental Affairs
United States Senate

Dear Mr. Chairman:

The Department of Defense's (DOD) environmental cleanup program has cost a reported $8.1 billion since the late 1970s; $3.76 billion has been spent on high priority installations.[1] Concerned about the effectiveness of DOD's program, you asked us to review DOD's (1) progress in its cleanup efforts and estimated costs, (2) plans for completing the cleanup at high priority installations, and (3) factors that have affected progress in cleaning up high priority sites.

Background

Military installations are similar to small cities in terms of population, industrial activities, and some types of contaminated sites. However, some cover an area larger than a small state. DOD has operated industrial facilities on its installations for several decades that have generated, stored, recycled, or disposed of hazardous wastes. Many of these activities have contaminated the nearby soil and groundwater. To study and clean up contaminated sites, DOD established the Installation Restoration Program (IRP) in 1975. In 1984, the IRP was made part of the Defense Environmental Restoration Program.

Hazardous waste contamination can significantly contribute to mortality and serious illness or pose a hazard to the environment. Types of hazardous waste found at most DOD installations and most private sector sites, include solvents and corrosives; paint strippers and thinners; and heavy metals, such as lead, cadmium, and chromium found at most industrial operations. Other substances such as nerve agents and unexploded ordnance are found at some military installations. Contamination usually results from improper disposal, leaks, or spills. The primary contaminants found in a majority of all DOD and private sector waste sites are petroleum products or petroleum-related products such as solvents including Trichloroethylene (TCE).

[1]High priority installations include those listed on the National Priorities List, those proposed for listing, those to be closed, and those formerly used installations on the National Priorities List where DOD is the lead agency.

The Superfund Amendments and Reauthorization Act of 1986 (10 U.S.C. 2701) requires DOD to carry out its Defense Environmental Restoration Program in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, commonly referred to as Superfund (42 U.S.C. 9620). CERCLA requires federal entities to comply with the requirements of the law to the same extent as any nongovernmental entity. These requirements, set forth in CERCLA and the National Contingency Plan, require DOD to comply with specific guidelines regarding the degree of cleanup as well as any other applicable federal laws and regulations. DOD must comply with any legally applicable or relevant and appropriate requirements in state environmental laws that are more stringent than federal requirements. As a result, federal facilities must comply with both federal and state laws and regulations unless the Environmental Protection Agency (EPA) grants a site-specific waiver. The act also defines the process that federal facilities must follow to clean up hazardous waste sites and outlines the requirements to be met, state and local government participation, and the procedures for selection and approval of remedial actions.

Cleanup goals and strategies are usually site specific and depend upon cleanup standards, the exposure potential, population exposed, and the nature and extent of contamination. All of these determine the threat to human health and the environment. Remedial actions are taken to prevent or minimize the spread of hazardous substances so that they do not migrate to cause substantial danger to public health or welfare or the environment. DOD gives the highest priority to installations on EPA's National Priorities List (NPL) and those scheduled to close.

The Secretary of Defense delegated cleanup responsibility to the Army, the Navy, the Air Force, and the Defense Logistics Agency (DLA). Cleanup actions are usually accomplished under contract with private firms, which are monitored by the services. Most cleanup actions are funded through the Defense Environmental Restoration Account (DERA)[2] and the Base Realignment and Closure Account.

Results in Brief

Despite spending a reported $3.76 billion as of September 1993, DOD's environmental cleanup program for high priority installations has proceeded slowly over the past 10 years, with relatively few hazardous waste sites having been cleaned up. Most of the time and money has been

[2]Congress established DERA in 1984 to fund the cleanup of inactive contaminated sites on DOD installations.

spent studying the problem. Of the 7,448 sites on 254 high priority installations,[3] remedial actions have been completed at 205 sites and are in operation at another 29. DOD has begun studying most of the sites and is about to begin or has just begun remedial design or actions at 3,873 sites. The cost estimate for cleaning up high priority installations is $18.2 billion.[4] However, this cost estimate is based on preliminary information and is likely to increase.

EPA's system for identifying high priority sites has led to a large number of individual sites on installations with that designation. In addition, some sites not designated as high priority are more contaminated than some of the minor high priority sites and pose a greater risk to human health and the environment than those minor sites on the list, according to DOD officials. EPA usually scores only the four to six worst sites on an installation in determining whether an installation, which may have hundreds of sites, should be placed on the NPL. Many of these sites may have only minor contamination, but DOD program managers must apply the entire CERCLA process to all the sites on an NPL installation, including those with only minor contamination.

DOD will not be able to efficiently institute cleanup efforts until it and EPA evaluate the large number of sites currently on the NPL or the closure list and determine which should be designated as high priority. Even a relatively few high priority sites could strain resources and force difficult choices. The Deputy Under Secretary of Defense (Environmental Security) has proposed a new approach to solving cleanup problems, which includes developing cooperative rather than adversarial relationships with regulatory agencies, setting priorities based on risk, and trying to accelerate cleanups.

We also identified other key factors that have affected DOD's cleanup of high priority installations in a timely and cost-effective manner.

- The complex and time-consuming CERCLA study and cleanup process.
- Prolonged study of hazardous waste sites rather than cleanup.
- Disagreements with regulatory agencies over the extent of cleanup required.

[3]Of the 254 installations, 92 are current installations on the NPL, 10 are on formerly used installations, 25 have been proposed for the NPL, and 127 are scheduled to be closed. Seventeen installations are on both the NPL and the closure list, and 5 closure installations are proposed for the NPL.

[4]The estimated cost to clean up DOD installations is based on data provided by the installations, commands, and services.

- Addressing issues during the CERCLA process, such as liability, that generally do not pertain to governmental installations.
- Scarce resources, including limited technology and expertise.

Cleanup Efforts Have Gone Slowly, and Costs Are Likely to Increase

According to DOD's 1993 Annual Report to Congress, DOD has identified nearly 20,000 potentially contaminated sites on 1,722 DOD installations and 8,000 potential sites on 1,632 formerly used installations in the United States. Of the 28,000 sites, DOD has determined that 9,245 sites on current installations and 6,189 sites on formerly used installations require no further action. Of the 10,449 active sites on current installations, 5,507 sites are on 244 installations considered as high priority. For the 2,815 active sites on formerly owned installations, only 66 sites are on 10 NPL installations. DOD has initiated or completed the study phases (preliminary assessment/site inspection and/or the remedial investigation/feasibility study) at 7,445 of the 19,694 sites, 3,825 sites have reached the remedial design/action phase. Of the high priority sites, 205 sites have had remedial action completed, and another 24 have the remedy in place and operating. As of March 1994, none of the 92 NPL installations and 10 formerly used NPL installations had all sites cleaned up.

There are 2,521 potential sites on 149 installations scheduled to be closed. Seventeen closing installations are listed on the NPL, and another 5 are proposed for listing. There are 862 potential sites on closing NPL installations, with 518 in the remedial design/remedial action phase. As of September 1993, 21 of the sites had remedial actions completed and no further action was required at 85 sites (see app. II for discussion). Table 1 shows the status of DOD's hazardous waste sites.

Table 1: Status of DOD's Hazardous Waste Sites

		Sites					
Type of installation	Total	Reached study phase	With IRA[a]	Reached RD/RA[b]	RIP[c]	RA complete	Response complete
Active NPL	4,230	4,228	566	2,300	18	104	1,111
Closing NPL	733	733	114	474	0	20	79
Proposed NPL	631	631	64	288	5	21	221
Closing proposed NPL	129	129	21	44	0	1	6
Closing non-NPL	1,659	1,558	124	719	1	59	458
Total	**7,382**	**7,379**	**889**	**3,873**	**24**	**205**	**1,867**
All sites	**19,694**	**19,631**	**1,239**	**12,274**	**62**	**571**	**9,255**

[a]IRA—Interim remedial action.

[b]RD/RA—Remedial design/remedial action.

[c]RIP—Remedial action in place and functioning as intended.

Source: DOD's Annual Report to Congress, March 31, 1994.

Of the 19,694 potential sites identified on the 1,722 current installations, DOD has closed out almost half of these sites as requiring no further action and has 10,449 active sites remaining; 3,773 are on 92 NPL installations, and 533 are on 25 proposed NPL installations. Of the 8,004 sites on formerly used installations, DOD has closed out all but 2,815 active sites. Of these, 66 are on 10 NPL installations. Regulatory agencies have not concurred in all of DOD's "no further action" decisions and may not concur with DOD's position at times. For example, EPA did not agree to the sites closed out on the Pearl Harbor Complex. In fact, of the six sites EPA used in scoring the complex for inclusion on the NPL, two were sites the Navy had determined to require no further action.

DOD has spent over $3.76 billion to study and begin clean up of the sites on the high priority installations. The estimated cost to complete the studies, investigations, and remedial actions is $18.2 billion. DOD's estimates of future costs have been based on very limited information. As a result, it is difficult to accurately estimate the remediation costs for a contaminated site before (1) the nature and extent of contamination is known and (2) DOD selects the remediation options and cleanup goals that regulatory agencies must agree to. However, it may be possible to estimate costs in ranges to reflect alternative cleanup options. Also, cleanup costs will depend on the extent of the cleanup required and the remediation options

selected. Table 2 shows DOD's estimates to clean up high priority installations.

Table 2: Estimated Cost to Clean Up High Priority Installations

Dollars in millions

Source/activity	Estimated cost
Fiscal Year 1992 Annual Report to Congress	
73 NPL installations[a]	$8,579
17 NPL installations on Base Closure List	1,819
90 NPL installations (subtotal)	**10,398**
Additional or updated DOD data	
For 73 existing NPL installations	3,642
For 17 NPL installations on Base Closure List	229
For four new NPL installations	608
Increased costs	4,479
94 NPL installations (subtotal)	**14,877**
Proposed DOD installations	
20 installations proposed for the NPL	820
5 proposed installations on Base Closure List	230
NPL and proposed installations (subtotal)	**15,927**
6 formerly used NPL installations	217
Non-NPL closing installations (all 3 rounds)	2,072[b]
Estimated total cost	**$18,216[c]**

[a]Includes two formerly used sites.

[b]We generated data using DOD estimating factors for some of the smaller closing installations.

[c]Data used from DOD's Annual Report to Congress contained some errors that could have a minor effect on the total projected costs.

In comparison, DOD has spent a reported $8.1 billion to study, investigate, and clean up all DOD installations through fiscal year 1993. DOD's 1991 official cost estimate, which is the most recent one available, for studying and cleaning up about 20,000 potential hazardous waste sites on more than 1,722 installations was $24.5 billion. The estimated cost contained in the Annual Report for 1991 to clean up the NPL installations was $10.4 billion. DOD officials, in June 1993, stated the estimate to clean up all sites had risen to about $30 billion.

Until the fiscal years 1993 and 1994 appropriations, Congress had funded DOD's cleanup program usually near the level DOD requested. In 1993, Congress reduced DOD's budget request by $313 million and appropriated $1.2 billion. In 1994, Congress reduced DOD's budget request by $347 million and appropriated $2 billion.

It is too early in the cleanup process to accurately project the final cost, according to DOD officials. DOD's cost estimates for each NPL installation are based on the scope of work called for in the Federal Facilities Agreements.[5] However, these agreements are usually signed prior to the completion of the remedial investigation/feasibility studies. Until the studies are completed, usually little is known about the nature and extent of contamination at known sites and before many sites have been identified. Even then, after the nature and extent of the contamination is known, cleanup costs may vary dramatically, depending upon the cleanup goals and alternatives selected.

DOD has 14 high priority installations where the cleanup estimate is over $200 million each; 3 are over $1 billion. A number of these installations have significant contamination problems and could incur greater cleanup or remediation costs. For example, Congress directed the Rocky Mountain Arsenal to be a wildlife refuge after the cleanup has been completed. Congress also directed that the Arsenal would be cleaned up in accordance with CERCLA. However, Colorado wants the Arsenal to do additional clean up. Table 3 depicts the cost to clean up some large problem installations.

[5]Federal Facilities Agreements made between DOD and the regulatory agencies establish comprehensive installation-specific schedules for DOD's waste cleanup activities. Federal Facilities Agreements have been signed for 93 of the 102 NPL installations and are being negotiated for the other 9, as of September 30, 1993.

Table 3: Cost to Clean Up Selected Large Problem Installations

Dollars in billions

Installation	DOD Annual Report costs	Installation estimated potential costs[a]
Rocky Mountain Arsenal	$2.1	$10 to $20
McClellan Air Force Base	1.7	5 to 10
Aberdeen Proving Grounds	0.8	2 to 4
Jefferson Proving Grounds	[b]	5 to 10

[a]Potential costs are estimates provided by installation officials and are based usually on the worst-case scenario. There are no legal requirements for DOD to implement the worst-case scenarios.

[b]No estimate included in the 1992 Annual Report to Congress.

In June 1993, DOD officials testified before Congress that too much of DOD's environmental cleanup program was devoted to studying the problem rather than cleaning up installations. Because only 416 sites had been cleaned up at that time, including the 196 sites on high priority installations, DOD has devised a new approach for protecting the environment. This approach is to

- create environmental partnerships with regulatory agencies and other stake holders,
- set priorities based on reducing real risk,
- focus efforts on getting cleanups done quicker,
- use existing and emerging technology to solve routine problems,
- increase management attention, and
- improve environmental funding process.

On July 2, 1993, the President announced a five-part program[6] to aggressively reinvest in communities and create jobs where installations are being closed. One part the President plans to implement will involve "Fast Track Cleanup using a common sense approach." The plan calls for a team of DOD, EPA, and state regulatory agency representatives at each installation, as appropriate, who will be empowered to run the cleanup program. Parcels with no contamination or with contamination below cleanup levels will be identified quickly and made available for transfer. The cleanup team will conduct a bottom-up review of all schedules and

[6]We will be reporting on this program in a later report.

plans to speed up the planning, construction, and installation of cleanup remedies and will build, publish, and implement an action plan.

System for Identifying High Priorities Is Ineffective

DOD has 254 high priority installations that contain 7,448 sites. In accordance with the National Contingency Plan, EPA has designated 102 of these installations as NPL or Superfund sites, which includes 5,029 individually contaminated sites. Another 25 installations with 760 sites are proposed NPL sites. Under current procedures, every one of the 5,800 individual sites are subject to CERCLA's study and cleanup requirements. As of September 30, 1992, 3,154 of the 5,800 sites had reached the remedial design phase. The majority of the sites on DOD's NPL installations are not large enough or badly enough contaminated to be considered Superfund sites, and many would go undetected in the private sector, according to DOD and EPA officials.

In the private sector, a site that scores 28.5 under EPA's Hazard Ranking System[7] is subject to being placed on the NPL. However, at each DOD installation, EPA usually scores four to six of what appears to be the worst contaminated sites based on available data and combines their scores for the installation's composite score. If this composite score is 28.5 or higher, the entire installation is subject to being placed on the NPL. The majority of the 7,448 contaminated sites on DOD's high priority installations are not Superfund type sites. All but a few of these 7,448 sites were given high priority status simply because they are located on a military installation with a small number of badly contaminated sites.

EPA's process for identifying the highest priority cleanup sites is not being applied in the best way for DOD installations that contain significant and insignificant cleanup sites. EPA resources are too limited to provide CERCLA oversight for about 20,000 sites on 1,722 DOD installations and about 8,000 potential sites on 1,632 formerly used installations. As a result, EPA has curtailed its CERCLA oversight on non-NPL installations by limiting its oversight to NPL and Base Realignment and Closure installations. Even so, EPA provides regulatory oversight for over 7,400 DOD sites on NPL and closing installations. With this number of DOD sites subject to the CERCLA process, it is nearly impossible for EPA to meet all procedural requirements at all current installations with existing resources. EPA also provides oversight on non-NPL sites in those cases where cleanup is accomplished

[7]The Hazard Ranking System is a mathematical evaluation methodology that EPA uses to assess sources of contamination, pathways, and receptors (i.e., groundwater, surface water, air, and soil) to determine if a hazardous waste site should be placed on the NPL.

through the Resource Conservation and Recovery Act corrective action procedures.

DOD officials believe there are some non-NPL installations, which contain a large number of individual contaminated sites, that are contaminated enough to qualify for the NPL, but none of these installations have been listed because EPA lacks the resources to evaluate additional DOD installations. EPA officials said they can add only about 10 federal installations per year to the NPL due to limited oversight resources. In January 1994, EPA proposed an additional nine DOD installations for the NPL. As a result, DOD officials believe that some of their worst sites are on non-NPL installations, and thus, are not considered high priority sites or given high priority and access to limited resources.

In testimony before the Senate Committee on Governmental Affairs, the Deputy Director of the Office of Management and Budget said that her office and the White House Office on Environmental Policy will work with the responsible federal agencies to help develop and carry out a coordinated strategy for federal facilities waste management and cleanup activities. To do this, a policy-level interagency group was created to help develop and implement a coordinated approach for federal facilities waste management and cleanup programs, including analysis and resolution of cross-cutting issues. Office of Management and Budget and EPA officials stated that one issue to be addressed is the setting of priorities for determining which hazardous waste sites are to be cleaned up first.

By including the minor sites on NPL installations in its oversight program, EPA is spreading its limited resources quite thin. The program managers and others are tied up looking at NPL installations, including the minor sites, and do not have the time to look at other sites on other non-NPL installations that are more contaminated than the minor sites on NPL installations. As a result, many of DOD's contaminated sites, including some of the worst contaminated sites, are being remediated without the regulatory oversight EPA believes is needed.

In order to ensure adequate cleanup funding, DOD has worked with EPA to set up procedures to include all sites on DOD's NPL installations, including minor sites, in the NPL cleanup program. As a result, DOD unnecessarily expends significant time and resources applying the CERCLA process to the minor sites. These valuable resources could be better used remediating the worst sites that have the greatest potential for risk to humans. By requiring DOD to consider the minor sites on NPL installations, seriously

contaminated sites on non-NPL installations are allowed to worsen while less seriously contaminated sites on NPL installations receive priority access to DOD and EPA resources.

In cases where a site only has limited contamination and may not require all CERCLA implementing procedures, CERCLA has provisions where shortcuts can be made and work completed quicker. It allows DOD to reduce the level of effort at some sites. However, EPA Region VI officials believe it is essential to keep all sites under the CERCLA process as long as possible because the site could be contaminated more than originally thought.

Officials at 9 of the 20 installations we visited stated they have had difficulty getting EPA to agree to remove sites from the CERCLA process. Installation officials stated that EPA is requiring them to continue to do additional investigative work at some sites. Further, EPA has not agreed to the reduced cleanup program at the sites where DOD believes a reduced cleanup effort would be sufficient.

For example, Schofield Barracks officials believe about 80 of nearly 100 sites could be excluded from a portion of the CERCLA process. At a number of these sites, quick actions could be taken and the site eliminated from further CERCLA work. EPA officials told us that they had not agreed to these reduced requirements because installation officials have not provided enough information for EPA to make the final decisions. EPA and Schofield have begun working toward identifying which sites could be closed out with a minimum of action.

mited Cooperation etween Agencies an Exacerbate oblems

At the commands and installations we visited, officials stated that, historically, regulatory agencies have taken an adversarial oversight approach similar to that taken with the private sector. They stated cooperation was hindered by EPA offices often being hundreds of miles away, and the regulators made infrequent trips to see the sites. Rapid turnover of EPA's staff often meant the same person seldom visited a site more than once. As a result, EPA and DOD were unable to develop the level of communication and trust needed to build good working relationships. Also, EPA officials were unable to gain the first-hand site knowledge needed to make cleanup decisions.

Officials at 4 of the 5 EPA regional offices responsible for oversight of the 20 installations agreed with the need for teamwork and a less adversarial

approach. Officials from these four regions said they are attempting to build the better working relationship needed to instill trust and cooperation and provide oversight. Some regions have set up a separate group of regulators specializing in cleanups of federal facilities, including military installations. Both EPA and DOD officials believe a better working relationship could greatly reduce the amount of time and money required to study and clean up contaminated sites under the CERCLA process. However, federal facilities officials in the fifth region opposed the non-adversarial approach. They believed EPA should be tougher.

One EPA region has implemented a cooperative program at two installations we visited. At Fort Wainwright, Alaska, EPA and the state relocated their installation program managers closer to the installation. All three program managers stated that being in close proximity to each other has enabled them to develop a good working relationship by meeting regularly. This allows them to deal with the small problems before they became big ones, and each representative has the authority to make decisions for their agency. They check with their supervisors on difficult decisions to make sure they make the right decision. In addition, they each have technical experts they can turn to for assistance. They also have less formal meetings that allow them to resolve difficult problems and understand each other's views. This cooperative effort has worked so well at Fort Wainwright that the Army uses it in its training program as an example of how things should and can work.

Despite its success at Fort Wainwright, other DOD installations have not benefited from this management approach. Air Force and EPA Region X officials said that without frequent meetings and a good working relationship, the time to study and clean up installations can be lengthy and cost more. They cited McChord Air Force Base as a case where, at each decision point, the agencies used contractors to prepare the backup data used to formulate each agencies' positions and to present them to the other participants in reports rather than the agencies' officials dealing with each other directly.

According to Air Force officials, the CERCLA review process delayed the remedial investigation/feasibility study phase of the program. McChord officials told us that EPA has issued a lot of guidance documents for the CERCLA process that requires the installation to conduct studies, prepare reports, submit draft reports to EPA for review, and incorporate EPA's comments in the reports and plans. They stated this process is a problem because EPA wants the installation to develop an iron-clad case that will

stand up to public scrutiny. McChord officials stated EPA has told them that in order to stand up to public scrutiny, it will require the documentation to make the case stand up in the courts.

Each part of the process usually involves several review steps to issue reports or plans. For example, a preliminary draft is prepared and submitted to EPA for review and comment. EPA develops its comments using the technical expertise of its contractors. McChord then has to get its contractor to review EPA's comments and incorporate the changes and resubmit it to EPA as a final draft. Again, EPA's contractors review and comment on this draft. McChord's contractor then incorporates these comments into the final report. At any one of these steps, more than one version could be required. EPA officials told us that they are trying to implement changes in how issues are resolved with McChord. Both EPA and McChord officials told us that the working relationship between the agencies is improving.

From July 1988 through September 1991, McChord officials analyzed the time spent preparing and revising documentation submitted to EPA. During that time, 25 documents were prepared and often included multiple versions incorporating EPA's and the state's comments. Each version of a plan or report usually costs $20,000 to $30,000. The reports and other documents required for the remedial investigation/feasibility study have cost $3.1 million and have taken over 37 months; the study is not expected to be completed until the end of 1994. McChord officials did not know what the total remedial investigation/feasibility study costs would be.

EPA and the state are requiring McChord to make a risk assessment for the contaminated areas—American Lake Garden Tract and the Washrack Treatment Area. Even though industrial activity continues in the Washrack Treatment Area and is expected to continue, McChord officials stated that EPA officials told them to assume in this risk assessment that condos will be built on the site and children will be playing on it. Based on instructions from EPA, according to McChord officials, they are also to assume that all people living in these condos will get their drinking water from the shallow aquifer. However, this aquifer is not used in any place in the area because the water is contaminated by runoff from agricultural uses and other small generators such as service stations and dry cleaners. The current source of drinking water is the lower aquifers. Even though this scenario was required for the risk assessment, it does not mean that EPA will require McChord to clean up to residential standards.

McChord provides piped-in drinking water for the American Lake Garden Tract from the adjoining regional water system. This has been done even though the Air Force does not believe it is necessary because the risk is low.

Appendix III discusses other factors affecting DOD's cleanup program, including CERCLA requirements, limited technical knowledge and expertise, cleanup standards and goals, and restricted funding.

Recommendations

We agree with DOD's proposals to establish a more cooperative partnership in the environmental community but believe fundamental changes are necessary to ensure meaningful results. We recommend that the Secretary of Defense and the EPA Administrator

- revise the system for designating high priority sites and reduce the number of high priority sites currently included as part of the high priority program to a more manageable number by including only those DOD sites that would qualify as NPL sites in the private sector and
- modify EPA's process for applying National Contingency Plan requirements to all DOD sites.

Scope and Methodology

To develop the information contained in this report, we reviewed applicable procedures and records maintained by DOD, EPA, and the state regulatory agencies. We interviewed officials from the Defense agencies, the Army, the Navy, the Air Force, and the Defense Logistics Agency at the headquarters level in Washington, D.C.; at major military commands, engineering field divisions, and service organizations; and selected installations. Appendix I lists the organizations and installations we visited.

We conducted our review from September 1992 to March 1994 in accordance with generally accepted government auditing standards. As requested, we did not request formal agency comments on a draft of this report. However, we did discuss its findings, conclusions, and recommendations with EPA and DOD representatives and have included their comments where appropriate.

Unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after its issue date. At that time, we

will send copies to congressional committees; the Secretary of Defense; the Administrator, EPA; and the Director of the Office of Management and Budget. We will also make copies available to others upon request.

If you or your staff have any questions concerning this report, please call me on (202) 512-8412. Major contributors to this report are listed in appendix IV.

Sincerely yours,

Donna M. Heivilin, Director
Defense Management and NASA Issues

Contents

Tables

Abbreviations

CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DERA	Defense Environmental Restoration Account
DLA	Defense Logistics Agency
DOD	Department of Defense
EPA	Environmental Protection Agency
IRP	Installation Restoration Program
NPL	National Priorities List
TCE	Trichloroethylene

Locations and Organizations Visited

Army

Headquarters offices
Army Material Command
U.S. Army Pacific, Honolulu, Hawaii
Army Environmental Compliance Center, Maryland
Aberdeen Proving Grounds, Maryland
Fort Lewis, Washington
Fort Sill, Oklahoma[1] Fort Wainwright, Alaska
Letterkenny Arsenal, Pennsylvania
Rocky Mountain Arsenal, Colorado
Schofield Barracks, Hawaii

Navy

Headquarters offices
Naval Facilities Engineering Command
Chesapeake Engineering Field Division
Pacific Engineering Field Division
Southwest Engineering Field Division
Naval Surface Warfare Center, Dhalgren, Virginia
Pearl Harbor Naval Complex, Hawaii
North Island, San Diego Naval Complex, California[1]
Yorktown Naval Weapons Center, Virginia

Air Force

Headquarters offices
Air Force Center for Environmental Excellence, Texas
Air Force Materials Command, Ohio
Hickam Air Force Base, Hawaii[1]
Kelly Air Force Base, Texas[1]
Mather Air Force Base, California
McChord Air Force Base, Washington
McClellan Air Force Base, California
Tinker Air Force Base, Oklahoma
Vance Air Force Base, Oklahoma[1]

Marine Corps

El Toro Air Station, California
Tustin Air Station, California

[1]Although these are neither National Priorities List (NPL) nor closure installations, we visited them because of unique contamination problems including, contamination of groundwater. Data from these were not included in our cost and site analyses.

Environmental Protection Agency

Headquarters offices
Region III, Philadelphia, Pennsylvania
Region VI, Dallas, Texas
Region VIII, Denver, Colorado
Region IX, San Francisco, California
Region X, Seattle, Washington
Environmental Protection Agency (EPA) Environmental Research Laboratory, Oklahoma

State Regulatory Agencies

Alaska
California
Pennsylvania
Oklahoma
Texas
Virginia
Washington

Comprehensive Environment Response, Compensation and Liability Act Process

Preliminary Assessment	The initial stage of the cleanup program is an installation wide study to determine if sites are present that pose hazards to public health or the environment. Available information is collected on the source, nature, extent, and magnitude of actual and potential hazardous substance releases at sites on the installation.
Site Inspection	The next step consists of sampling and analysis to determine the existence of actual site contamination. Information gathered is used to evaluate the site and determine the response action needed. Uncontaminated sites do not proceed to later stages of the process.
Remedial Investigation	Remedial investigation may include a variety of site investigative, sampling, and analytical activities to determine the nature, extent, and significance of the contamination. The focus of the evaluation is determining the risk to the general population posed by the contamination.
Feasibility Study	Concurrent with the remedial investigations, feasibility studies are conducted to evaluate remedial action alternatives for the site to determine which would provide the protection required.
Remedial Design	Detailed design plans for the remedial action alternative chosen are prepared.
Remedial Action	The implementation of the chosen remedial alternative is implemented.
Interim Remedial Action	Remedial actions can be taken at any time during the cleanup process to protect public health or to control contaminant releases to the environment.
Remedy in Place and Functioning as Intended	The remedial action is functioning properly and performing as designed. These include such actions as the operation of pump-and-treat systems that will take decades to complete cleanup.

Other Factors Affecting Cleanups

Other factors affecting DOD's cleanup program include Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) requirements, limited technical knowledge and expertise, cleanup standards and goals, and restricted funding.

CERCLA Requirements to Determine Liability

The Superfund remedial process is applicable to 1,100 private sector NPL sites that are made up of a small number of sources, yet it is applied to nearly 7,448 sites on 254 high priority Department of Defense (DOD) installations. The study and cleanup of each site must comply with CERCLA requirements, which are time-consuming.

Most contaminated sites being remediated under DOD's Installation Restoration Program and eligible for Defense Environmental Restoration Account funds are subjected to CERCLA cleanup requirements. CERCLA requirements were designed to ensure Superfund sites were cleaned up and to establish who was responsible for cleanup costs. Superfund sites usually are considered (1) to be the worst contaminated sites in America and (2) to pose a significant risk to human health and the environment. As a result, according to DOD officials, CERCLA cleanup procedures are numerous, time-consuming, costly, complex, exacting, and call for a three-way decision-making process by DOD, EPA, and state officials.

Who is liable for the cleanup costs at private sector NPL sites is nearly always a concern. For example, the owners of landfills on the NPL have often gone bankrupt or are no longer in business, and EPA wants to get the individuals or firms, including federal agencies, that contributed hazardous waste to the landfills to pay for the cleanup. Establishing liability requires extensive testing and sampling to determine the source of contaminants and the responsibility for the contamination. Establishing liability also involves a great deal of legal and administrative effort that is not required if there is no question of liability.

Contaminated DOD sites usually do not involve any party other than DOD to contribute to cleanup costs. Liability concerns as to who should pay for the cleanup only arise at DOD installations when (1) the contamination migrates beyond installation boundaries and other sources of contamination commingle with that generated on the installation, (2) a private firm or contractor that was allowed to use military facilities generated the contamination, (3) a plume of contamination has migrated onto the installation, (4) a contractor operates a government-owned facility and there is a dispute as to whether the contractor was responsible

for the contamination, and/or (5) property on closing installations is transferred and the new owners can file claims for cleanup at a later time. Because liability is usually not a concern at DOD installations, performing all of the CERCLA required steps may not be needed.

New Technology and Expertise

Cleaning up contaminated sites is a relatively new area of endeavor, with the vast majority of all site remediation occurring in the last 5 years. Knowledge and expertise is especially limited when confronted with massive amounts of contaminated soil or groundwater. Expertise and technology are increasing, but so far it is often not technically possible or economically feasible to return a large complex site to pristine condition. Sometimes, it may be necessary to protect human health by removing "hot spots" of high contaminant concentrations and/or limiting exposure to the contaminants while awaiting the development of better technology.

Remediation strategies for contaminated soil are designed to remove the *contamination*, prevent its migration to groundwater, limit human exposure, and protect environmental interests such as ecological considerations. Timely remedial actions can prevent contaminant migration into drinking water and save millions in cleanup costs. However, such actions depend upon the elapsed time since the spill or leak occurred, the speed of migration,[1] the depth of the water table, and DOD's ability to respond quickly. Cleaning up the soil or preventing contaminant migration also depends upon the developing technologies. DOD is working with EPA on a number of these.

Natural remediation of highly contaminated drinking water aquifers could take hundreds of years. According to EPA officials, cleaning up aquifers is a relatively new field and efforts to speed up the process have been expensive and have achieved limited success. Few such cleanup efforts have advanced beyond the study phases in the private sector and on DOD installations. Technologies used include pump-and-treat systems and new bio-remediation[2] methods designed to enhance natural remediation. Groundwater experts believe it is necessary to isolate the contamination source and then by using various methods, including natural remediation and pump-and-treat systems, confine the spread of the pollution and clean up the groundwater.

[1]Migration speeds depend upon, among other things, contaminants liquidity, weight, and volume; soil permeability; and the amount of rainfall.

[2]Bio-remediation consists of using micro-organisms to neutralise the contaminants.

EPA and DOD officials believe pump-and-treat systems can be used to contain the spread of the contamination plume,[3] although experts believe it is nearly impossible to bring a highly contaminated aquifer to drinking water standards. Human health can also be protected by treating contaminated water extracted for drinking purposes. For example, Schofield Barracks installed an air stripping treatment system that reduces the amount of Trichloroethylene (TCE) in drinking water from 40 parts per billion to less than 1 part per billion. Tinker Air Force Base plans to install a carbon filtration system to remove TCE from the water used at the installation where TCE contamination has been tested as high as 300,000 parts per billion.

Cleanup Standards and Goals

The "how clean is clean" question is now being debated across the nation and in the courts, and the answer depends upon who sets the cleanup standards and goals and what criteria were used. The President has introduced in his CERCLA reauthorization legislation, a requirement for the development of standard cleanup levels. Because national standards do not exist for most contaminants in soil, DOD must work with EPA and state governments to negotiate and set cleanup goals for each site. Under CERCLA, a state may set the cleanup standard if its cleanup standard is more stringent than EPA's and the standards meet all other CERCLA tests as applicable or relevant and appropriate requirements. State laws may also determine what is considered a hazardous substance, and therefore, subject to the cleanup process. For example, petroleum products are considered hazardous waste in California and Alaska, but not in Oklahoma.

Cleanup studies include risk assessments to ascertain the threat posed by a specific site. These assessments consider the cleanup standards, exposure to contaminants, and methods of limiting the exposure. In selecting a remedy, DOD must consider the risk and the technology or other approaches available to accomplish the cleanup or protect human health and the environment. Exposure can be avoided by limiting access to the contaminated area with fences and other barriers, treating drinking water to remove contamination before it is consumed, and restricting use of the property. The exposure risk is often greater for residential property where people may live 24 hours per day for a lifetime than for nonresidential property such as a forest preserve.

[3]Pathway of chemical constituent flow in the underground water system.

EPA's policy for CERCLA implementing regulations call for residential cleanup standards as the starting point at sites where the eventual use of the site is residential or unknown. Residential standards are usually more stringent than cleanup standards for contaminated sites in industrial areas. Most contaminated sites on DOD installations were created by industrial operations and are located in industrial areas.

Industrial sites on installations that will remain open will continue to operate after the contaminated site is cleaned up. Where DOD installations remain open, DOD can control future land use and limit access and/or exposure to protect human health and the environment. For installations designated to close, it probably will be necessary to clean up to the reuse plan, which could include residential purposes.

Cleanup standards are usually the same for small lightly contaminated sites and large heavily contaminated sites. The cleanup standard can be achieved at the small simple sites by removing and or treating a relatively small amount of contaminated soil. However, it is often not technically possible or economically feasible to remove or treat the huge volume of contaminated groundwater and soil found at large complex sites, such as those on McClellan Air Force Base, Rocky Mountain Arsenal, and Aberdeen Proving Grounds.

For example, at the direction of Congress, the Army plans to reduce human exposure to the contaminants on Rocky Mountain Arsenal by its conversion to a fish and wildlife preserve where people will likely only visit for a few hours, infrequently. However, the United States Court of Appeals for the Tenth Circuit ruled that Colorado can impose its hazardous waste management laws and regulations. Colorado considers the Arsenal to be a storage and disposal site for hazardous waste. This is being done despite the fact that there is a CERCLA cleanup underway. All parties agree on the plan to make the Arsenal a fish and wildlife preserve after the cleanup. EPA officials also pointed out that in some cases the cleanup required may be more extensive where some endangered species could be affected. Addressing the state standards could result in significantly higher costs for cleanup of DOD installations.

On March 2, 1994, the long-standing United States verses Colorado litigation was continued when the Army sued Colorado over what it considered too stringent a cleanup standard for the chemical DIMP.

Funding

The cost of cleaning up DOD installations can be affected by the point in time during the fiscal year that funding is made available to installation commanders. Most hazardous waste cleanup projects are funded with Defense Environmental Restoration Account (DERA) funds. A separate fund, the Base Realignment and Closure Account, has also been established for closure bases. DERA appropriations have risen from $150 million in fiscal year 1984 to $1.96 billion in fiscal year 1994.[4] DOD has requested $2.18 billion for DERA in fiscal year 1995. Cleanup funds are allocated to the installations through the Army and the Air Force major commands. The Navy Engineering Field Divisions administer Navy DERA funds. Under current funding procedures, DOD installations must obligate these DERA funds in the fiscal year received.

At 6 of the 20 installations we visited, officials stated that when they receive the funds in the latter part of the fiscal year, it makes it difficult to get project planning, analysis, and the contracting process accomplished in a short period of time. Sometimes they had to choose between (1) timely actions to obligate the funds and (2) properly completing study requirements and the necessary contracting procedures. DOD officials told us that some installations use a minor amount of discretionary funds to get the pre-contract work done for selected projects in anticipation of receiving year-end DERA funds.

Installation and command officials said funds are often received late in the fiscal year for a number of reasons, including funds becoming available when other projects are canceled. Installation officials said they need a full year from the time the funds are received to do all of the prerequisite work to get a contract signed and the funds obligated.

Office of the Secretary of Defense and command officials said it is necessary to hold a certain percentage of funds for unforeseen problems. Also, some projects are delayed for unforeseen reasons, such as contracting problems or changes in regulatory requirements.

Government contracting procedures are designed to obtain the best quality for the best price but are often time-consuming. Taking shortcuts to save time in order to obligate year-end funds can increase the price and lead to disagreements with the contractors over what needs to be done. This can lead to inadequate contractor performance and increased costs.

[4]Congress reduced DOD's fiscal year 1993 budget request by $313 million and appropriated $1.2 billion. In fiscal year 1994, DOD requested $2.3 billion, but Congress reduced the DERA appropriation by $347 million.

For example, at the Pearl Harbor Naval Complex, the Pacific Division's[5] contracting office received two-thirds of its funding in August and September. This resulted in the Pacific Division staff working overtime to negotiate and award contracts for this money at the end of the year. Because the fee proposals and contract review period is compressed, the Navy's ability to evaluate the contractors' proposals is constrained. In addition, contractors generally come in with a high cost estimate because they do not have time to itemize and effectively determine a scope of work needed to remediate a site. As a result, the Navy does not have assurance that it received the best cost for the required work.

[5]The Pacific Division of the Naval Facilities Engineering Command does the contracting for Pearl Harbor.

Major Contributors to This Report

National Security and International Affairs Division	David R. Warren, Associate Director Uldis Adamsons, Assistant Director Jacob W. Sprouse, Jr., Adviser
Kansas City Regional Office	Robert G. Hammons, Evaluator-in-Charge Robert Jones, Evaluator