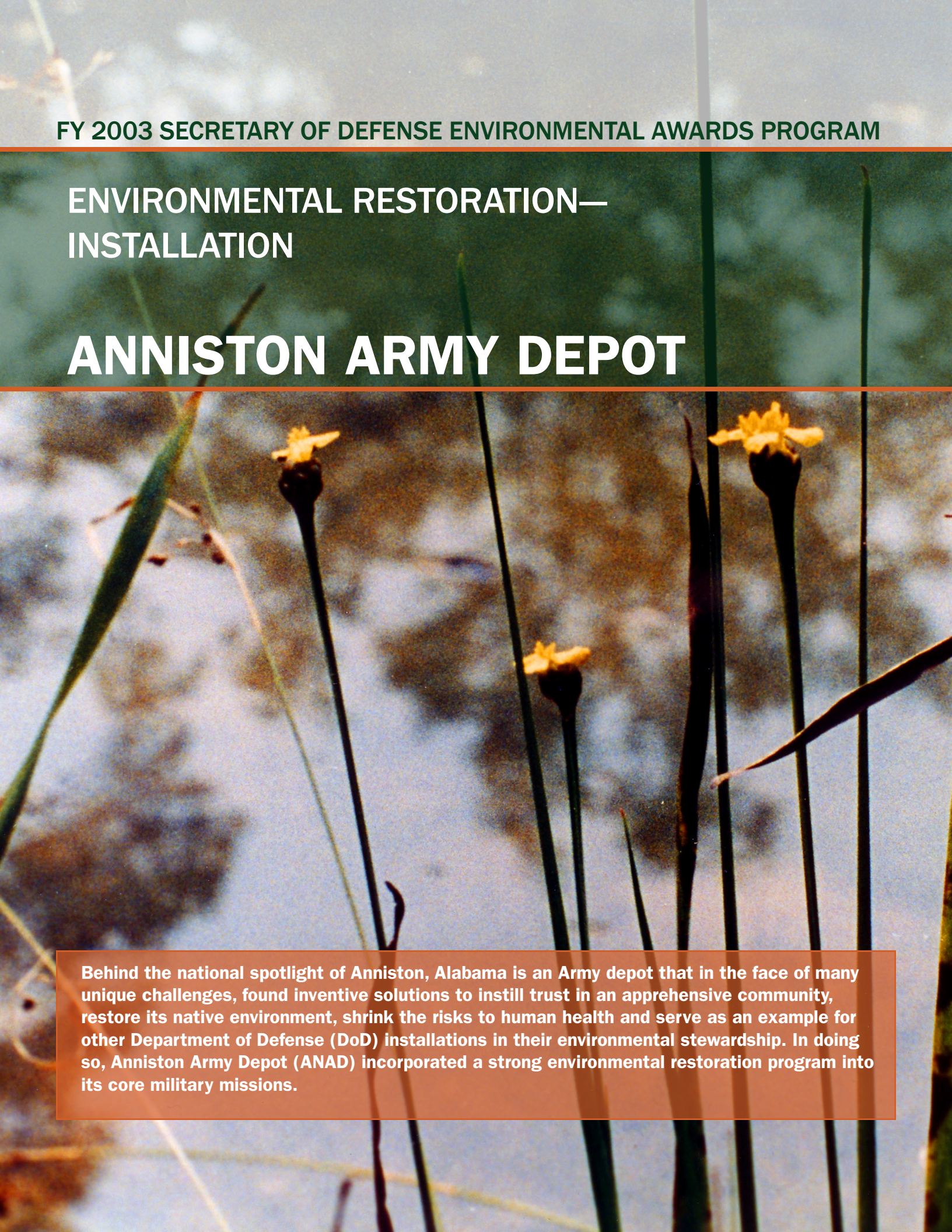
FY 2003 SECRETARY OF DEFENSE ENVIRONMENTAL AWARDS PROGRAM

ENVIRONMENTAL RESTORATION—INSTALLATION

ANNISTON ARMY DEPOT



Behind the national spotlight of Anniston, Alabama is an Army depot that in the face of many unique challenges, found inventive solutions to instill trust in an apprehensive community, restore its native environment, shrink the risks to human health and serve as an example for other Department of Defense (DoD) installations in their environmental stewardship. In doing so, Anniston Army Depot (ANAD) incorporated a strong environmental restoration program into its core military missions.

INTRODUCTION

Since 1941, the depot has served the United States in times of war and peace. The initial mission was ammunition storage, but over the decades, it evolved into serving as the Army's premiere vehicle and weapon maintenance and repair facility. ANAD is the only Army depot capable of performing maintenance on both heavy and light tracked combat vehicles and is designated as the Center of Technical Excellence for the M1 Abrams Tank. The depot also performs maintenance on individual and crew-served weapons as well as land combat missiles and small arms. The depot continues to store and maintain conventional ammunition and missiles and also stores seven percent of the nation's chemical munitions stockpile. One of eight stockpile sites in the United States, ANAD began destroying its M55 rockets filled with nerve agent in 2003. The chemical demilitarization program in Anniston gained local as well as national attention because of potential program risks and resulting community concerns.

▲ An aerial view showing the depot's industrial complex.

The depot is the largest employer in the city of Anniston, which lies 10 miles to the east. Anniston is an industrial and agricultural area of approximately 26,000 residents. ANAD has more than 5,300 employees including tenants and contractors. The depot is located on 15,279 acres in Calhoun County in northeastern Alabama and is surrounded by small communities clustered primarily along its southern and eastern boundaries. Land use around the base is primarily residential, with approximately 3,900 residents living near the facility.

ANAD Profile

- 110 miles west of Atlanta
- 50 miles east of Birmingham
- 15,279 total acres
- 15,000 acres of woodland
- 10 acres of lakes and streams
- 4,784 total employees
- 2,850 depot employees

▲ M1 Abrams Tanks are lined up to be upgraded before being returned to soldiers.

BACKGROUND

Environmental Restoration Challenges

The historical mission of the depot left its present day leadership challenged to address soil and groundwater contamination that spread beyond installation boundaries, possibly impacting local water sources. Primary contaminants of concern at the depot are trichloroethylene (TCE), a common degreaser used to clean metal, and other dense non-aqueous phase liquids (DNAPLs), which are chemicals in a sludge-like form that exist throughout the environment. In several places, complex geology as well as the nature of the contaminants have led to increased technological hurdles.

ANAD faces these challenges in a community with pre-existing sensitivities due to nationally publicized industrial polychlorinated biphenyl contamination in the area as well as ANAD's chemical demilitarization mission.

As such, ANAD's leadership recognizes that successfully implementing environmental restoration requires the full involvement of a variety of stakeholders, including the local community and state and federal regulators. Through its Installation Action Plan (IAP), the depot takes a vigorous approach to environmental restoration that incorporates strong working partnerships with the Army, regulatory agencies and the public.

Complex Geology and Nature of Contamination

The U.S. Environmental Protection Agency (EPA) placed ANAD's Southeast Industrial Area (SIA) on the National Priorities List in 1989, recognizing it as a top priority hazardous waste site. This area, although only representative of a small percentage of the depot's total land area (about 600 acres), is also one of the Army's top five most complicated areas due to complex geology and the nature of the contamination.

On-site disposal of industrial chemicals from 1950 to 1981 resulted in soil and groundwater contamination from DNAPLs throughout the SIA. The diverse nature of the earth's subsurface and the physical characteristics of DNAPLs make its migration very unpredictable and difficult to model. Because DNAPLs tend to sink below the water table to reach layers of low permeability within fractured bedrock, the dense liquids are difficult to remove.

The industrial area is located close to the installation's southeastern boundary adjacent to private drinking water wells and within one mile of Coldwater Spring, the area's water source. Over the years, monitoring confirmed that plumes of contamination from the facility have migrated beyond the installation boundaries and have impacted (or may eventually impact) groundwater used by the surrounding communities.

Technological Challenges

Contamination within fractured bedrock was detected at depths of 400 feet below ground surface. Because of geological challenges presented by the nature of the bedrock and depth of contamination, current technology may not offer cost-effective solutions. The depot's environmental specialists have taken action to seek out new and developing technologies to help overcome this challenge.

Feasibility studies are underway for *in-situ* chemical flushing technologies. These technologies involve injecting a liquid through the contaminated zone for dissolution, displacement or chemical destruction. *In-situ* chemical oxidation involves an exchange of electrons between chemical species. This exchange of electrons affects the oxidation state of the chemical species involved, by breaking the carbon bonds. The organic compounds are either completely destroyed or converted to smaller and typically less hazardous compounds.

Other technologies such as air-sparging, in-well air stripping, dual phase extraction, thermal treatment and electrokinetics are also being evaluated.

Community Challenges

Community members in Anniston have voiced their concerns about the environmental condition of the area. Faced with a community with pre-existing sensitivities toward contamination as well as the depot's chemical demilitarization mission, ANAD took an aggressive, proactive approach to include community relations in all of its environmental restoration initiatives.

Organization and Management Approach

To address its unique challenges, ANAD took an inventive approach to overall program management that stresses partnership building, coordination and communication.

This approach led to the establishment of a two-tiered *Partnering Team*, comprised of state and federal regulators, scientific experts and Army staff that has a significant role in guiding

the environmental restoration program. It also stresses community outreach and involvement. The local Restoration Advisory Board (RAB) actively serves as a forum for citizens of local communities, representatives of the installation and regulatory agencies to discuss and exchange information about the environmental restoration program.

▲ Anniston Partnering Team.

To ensure that the depot's mission is not jeopardized by environmental contamination issues, ANAD's approach fosters communication within the installation as well. Specifically, the Installation Restoration Program (IRP) manager meets with other directorate representatives to coordinate any excavation or dewatering activities associated with construction projects. The IRP manager provides the guidance needed to facilitate and expedite construction, while ensuring appropriate protection for human health.

The environmental restoration staff routinely works with installation engineers and production staff to support their requirements in mission capability and completion. They also work hand-in-hand with the public works department during construction activities by providing them with support to evaluate hazardous conditions and evaluate and dispose of removed materials.

The depot is an active participant in the DoD IRP, which was established to identify and evaluate past hazardous waste sites and to control the migration of hazardous contaminants from these sites. ANAD's Directorate of Risk Management (DRK) manages the program with oversight provided by the U.S. Army Environmental Center (USAEC).

Agreements and Plans

In June 1991, ANAD entered into a Federal Facility Agreement (FFA) with the Alabama Department of Environmental Management (ADEM) and the EPA. This agreement establishes a procedural framework and schedule for developing, implementing and monitoring appropriate response actions to contamination problems at the SIA and other areas of the depot.

The IAP is updated annually and was last updated in October 2003. ANAD gathers input and insights from many organizations to ensure the most efficient roadmap for the IRP program. The *Partnering Team*, the U.S. Army Corps of Engineers (USACE) Mobile District, the U.S. Geological Survey, and community groups all participated in this coordinated effort to construct the plan. It provides a detailed path for the IRP program by defining the requirements, proposing a comprehensive approach and identifying associated costs to conduct future investigations and remediation at the depot. Additionally, the IAP establishes current project funding to ensure that all remedies are in place by the end of 2007.

ANAD, through the *Partnering Team*, completed draft Records of Decision (RODs) for operable units that comprise several significant sites at the depot. These units include the Ammunition Storage Area, the SIA Soils Operable Unit and the SIA Shallow Groundwater Operable Unit.

PROGRAM SUMMARY

ANAD's IRP mission began in 1978. Remedial Action (RA) completion is scheduled for 2007. All clean-up objectives and operation and maintenance are scheduled to be completed by 2032. Objectives include:

- conducting a remedial investigation/feasibility study for all applicable SWMUs within ANAD;
- developing and implementing Remedial Design (RD) and RA in an approved ROD; and

- completing these activities on schedule in order to protect human health and the environment.

Of the 47 sites registered in the AEDB-R, 25 have completed responses (either remedial strategies chosen and approved or the designation that no further action is required). Fifteen sites have a Remedy in Place with either long-term monitoring or remedial action operation/long-term operation. The depot's fiscal year 2003 IRP budget was $4.74 million.

The depot met, or is on schedule to meet, DoD cleanup objectives listed in the Financial Management Regulation. ANAD will also meet DoD's goal to have remedial systems in place for all high relative risk sites by 2007.

ACCOMPLISHMENTS

ANAD demonstrates its leadership in environmental stewardship in the service of both the community and the depot mission. The Anniston Chemical Demilitarization Facility (ANCDF) has begun destroying its chemical munitions stockpile through incineration, which is a point of contention for various community members and community groups in Anniston. A key focus of the environmental restoration program is community participation, which aligns with the community involvement essential to chemical demilitarization.

Leaders of ANAD's environmental initiatives work closely with the depot's public affairs team to jointly facilitate public meetings. Working together to effectively address community concerns provides a unified presence for the depot and positively impacts the installation's ability to accomplish its mission.

Through its many partnerships, ANAD implemented a program that achieved reasonable cost-effective remediation strategies to support environmental restoration. Both the EPA and ADEM recognized the program for its proactive approach to environmental cleanup.

ANAD is currently not a base realignment and closure installation; therefore, no specific fast track projects took place during the award time period. ANAD makes every effort to expedite cleanup projects to the highest extent possible.

Innovative Technology Demonstration/Validation and Implementation Innovation

State-of-the-Art Groundwater Treatment Facility

ANAD completed construction and began operation of its new Centralized Groundwater Treatment Plant (GWTP) in early fiscal year 2002. The GWTP and associated groundwater extraction wells are designed to treat contaminated groundwater and control plume migration through state-of-the-art treatment technology. The technology combines chemical oxidation and aeration to treat organic and inorganic contaminated groundwater, resulting in treated water that meets drinking water standards.

Using this technology, the depot saved thousands of dollars per year in operation and maintenance costs compared to the previous pump and treat system. Much of the equipment and infrastructure needs of the new GWTP were effectively converted from a former chromium treatment facility, substantially reducing the initial capital costs.

The new GWTP is a success story resulting from the partnering efforts that are a vital part of the IRP. *Partnering Team* efforts ensured the operation of the plant met federal and state regulatory requirements and is supported by the EPA Region IV and ADEM. The RAB actively participated in the design and construction of the GWTP, reviewing the progress and having on-going discussions with the installation risk managers.

Hydrogen Peroxide Injection

During the award period, a report was finalized and published on the first large-scale use pilot study of in-situ chemical oxidation in the Army, which ANAD completed. The report was distributed to other installations to use as a model and at least six installations requested the report. In the pilot study, which began in 2000, ANAD used chemical oxidation with a 50 percent hydrogen peroxide mixture and proprietary catalyst to neutralize contamination from solvent and waste oil sludge

lagoons that were closed in 1978. As part of this project, an emergency removal action of 7,200 cubic yards of soil in the area was undertaken. The objective was to use *in-situ* chemical oxidation on soils to remove waste chemical constituents that were contributing to an increase in health concentration limits in soil and area groundwater.

Hydrogen peroxide injection proved to be effective in reducing soil contaminant concentrations to below Site Screening Levels. The cost of the *in-situ* chemical oxidation was approximately one-fourth the cost of the excavation and disposal of the contaminated soil for a savings of almost $3 million. The depot now uses the site for vehicle storage.

Sampling/drilling techniques

The complex geologic features of contamination sites at ANAD required certain drilling technologies to install monitoring wells. These technologies resulted in large quantities of drilling fluids and Investigation Derived Waste (IDW). Disposal of large quantities of this waste were cost-prohibitive.

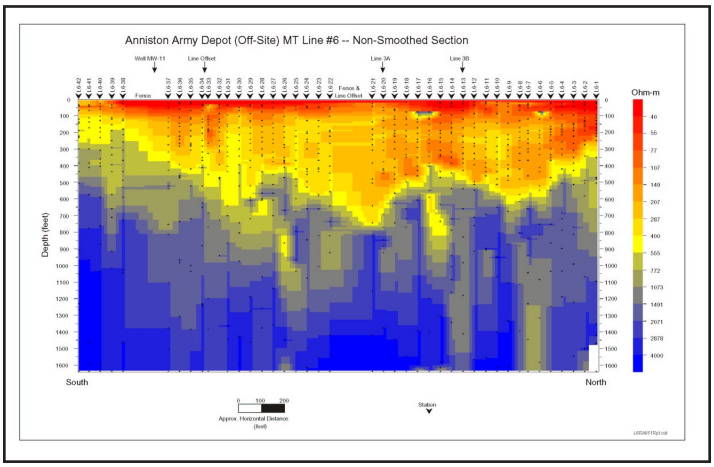
Subsequently, the depot employed an innovative IDW treatment technology and ambitious sampling plan that allowed direct discharge to surface water. Although treating water contaminated with volatile organic compounds is a common technology, high concentrations of sediment and suspended solids in the drilling fluid required removal prior to discharge to surface water. The IDW treatment technology filters out the sediment before it is discharged. ANAD closely monitored the program by taking frequent samples to ensure that the treated water achieved water-quality discharge standards. This treatment technology will now be used when drilling in contaminated areas. The technology allows significant cost savings in IDW disposal costs while complying with the Clean Water Act.

Following the installation of these monitoring wells, ANAD installed Flexible Liner Underground Technology (FLUTe) systems. The FLUTe system seals bore holes with a pressurized flexible liner, but leaves open intervals or ports for future sampling. This new technology increases the number of zones that can be sampled throughout different depths of the monitoring wells. These groundwater depth samples provide key information on the zones that are experiencing contaminant migration.

▲ A FLUTe liner is installed.

In addition, ANAD is using the following state-of-the-art technologies and practices to define the condition and distribution of the DNAPL masses:

- Seismic refraction for mapping the bedrock surface, locating surficial fractures and establishing their orientation.
- Resistivity and Magneto Tellurics, to locate fractures in the bedrock.
- Hydrophysics on selected boreholes to identify all fractures that produce water.

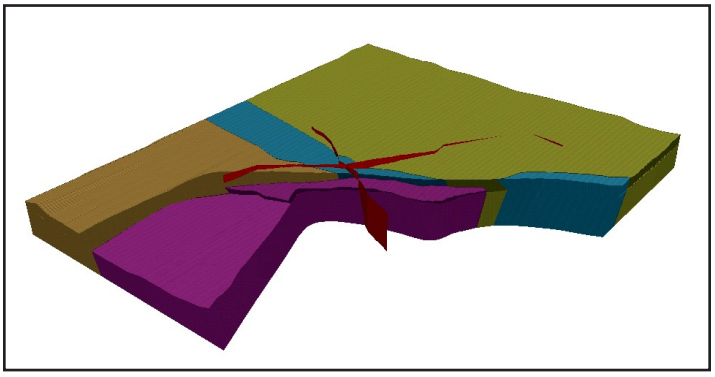


▲ Results of Magneto Tellurics used to determine potential drilling locations.

The use of hydrophysics is a relatively new approach. The open borehole is filled with deionized water and a probe is inserted to measure conductivity. The conductivity indicates the depth of the location of water flow zones, which is vital information for determining contaminant migration. All of these techniques are approved through the *Partnering Team* process, streamlining implementation.

Optimization of Modeling Techniques

The current phase of the RI focuses on migration pathways to waterways and defining the remaining sources of DNAPL. Because of the complex geology and expensive drilling techniques to install monitoring wells, ANAD agreed to use an advanced modeling and simulation approach. Modeling and simulation supported critical installation restoration decisions that addressed reducing the risks of contamination to acceptable levels at dramatically lower costs. Information from the model provides greater input to the technical impracticality (TI) zone delineation, expands the groundwater contaminant transport prediction parameters and refines the predictions to the TCE plume.



▲ Three-dimensional model depicts geologic units and fractures.

In the past, plume delineation was based on monitoring well installation and sampling, which became cost prohibitive. Using the modeling and simulation approach, ANAD was able to identify processes that significantly reduce risk or decrease uncertainty and reduce RI costs. This information helps the team avoid unnecessary costs and refocus efforts to more beneficial processes. In addition, ANAD expects to reduce the quantity of complex and expensive data collection activities in fractured rock conditions.

The depot also developed a site-wide conceptual model of subsurface geology, hydrogeology and groundwater chemistry. Based on the model, numerical flow and transport simulations were analyzed. The results allowed ANAD to eliminate six deep monitoring wells from the investigation for a total estimated cost savings of $500,000. Future modeling results will assist in identifying the most appropriate wells for long-term monitoring. Prediction of the plume migration allows ANAD to be proactive in protecting potential receptors.

Technical Impracticability Waiver

Although ANAD strives to remediate contamination at all sites, the lack of reasonable, cost-effective technologies that address the depot's site-specific challenges can cause difficulties. In these instances, ANAD focuses on the more practical goal of preventing future migration of contaminants. Therefore, the depot is pursuing a cutting-edge process that will serve as a model for other DoD installations, once complete. The depot is in the process of obtaining a TI waiver as a remedial alternative for the groundwater contamination existing within defined portions of the depot's SIA and other specific sites within the area. If successful, the waiver will be approved by regulators and will declare that the restoration of the area to appropriate standards is unachievable from an engineering perspective. Emphasis on this site will be on preventing migration of contaminants. When a cost-effective, reasonable technology is developed, the depot will then use its resources to pursue restoration the right way the first time, at a reasonable cost. If obtained, the TI waiver will save the Army millions of dollars because ineffective technologies will not have to be implemented.

Partnerships Addressing Environmental Cleanup Issues

Partnering Team

ANAD formed the *Partnering Team* in April 1997 to facilitate and help coordinate the planning and implementation of environmental restoration initiatives among the Army, regulatory agencies and the public. The *Partnering Team's* mission is to restore, to the maximum extent possible, all historically contaminated groundwater and soil sites, both on or off depot, along with the primary goal to reduce risks to levels that are protective of human health and the environment.

The *Partnering Team* was a key player in the many different environmental restoration initiatives undertaken during this award period, including completing draft RODs and updating the IAP. This partnership, while not a legally binding relationship, represents a commitment and an agreement among the parties to work together to achieve mutually beneficial goals.

The *Partnering Team* consists of two levels of stakeholders:

- Tier I consists of depot, EPA and ADEM personnel who actively participate in site-specific decisions on a weekly basis. The Tier I team meets every quarter to reach a consensus on the continued direction of the program on a site-by-site basis.
- Tier II consists of high-level depot, ADEM and EPA personnel who also meet on a quarterly basis to discuss broader restoration issues, such as land use controls and technology applications, and support the Tier I team as needed.

Members of the following organizations make up ANAD's *Partnering Team*

- Installation Restoration Program Manager, ANAD
- U.S. Army Corps of Engineers, Mobile District
- Alabama Department of Environmental Management
- U.S. Environmental Protection Agency
- Gannet Fleming, Inc.
- Science Applications International

Issues raised during Tier I team meetings are discussed through a facilitation process. As a consensus is reached, the decisions are documented. If issues arise that are not able to reach consensus through the Tier I team, the issue is raised to Tier II team members. Since the initiation of the partnering program, ANAD has yet to formally raise any issues to the Tier II level. This displays the *Partnering Team's* ability and dedication to work through issues and achieve mutually agreeable solutions.

Stakeholder Involvement Creates Partner of Opposition Group

The RAB recently joined forces with a former grass-roots opposition group, Community Against Pollution (CAP) to educate local residents about TCE. This unprecedented partnership stems from the commitment of the depot, the *Partnering Team* and the RAB to share information and take responsibility for protecting the health of its neighbors.

CAP helped conduct an opinion survey of community residents in September 2003. Overseen by ANAD, this effort gauged community concerns about groundwater contamination and provided a basis for defining community involvement initiatives to support emergency response planning. The survey covered a 25-mile radius from the Anniston city center, representing a diverse cross-section of the community. In just under one month, CAP helped interview property owners, business owners, elected officials, citizen interest groups, residents, school officials, government representatives and religious leaders. Survey questions touched upon the level of concern regarding community water and TCE, the level of interest in receiving more information on the issue, the preferred methods and frequency of information distribution, specific areas of interest and perceptions of ANAD. In response to the survey results, ANAD placed even more emphasis on its community outreach efforts and is able to better focus on community needs.

RESTORATION ADVISORY BOARD

To achieve greater community and outside agency involvement in the environmental restoration process, ANAD established a Technical Review Committee (TRC) in 1993. The TRC was converted to a RAB in May 1998. The RAB meets quarterly to provide advice on cleanup, discuss key issues, review plans and reports, identify proposed project requirements and recommend priorities.

There are currently 23 voting members representing the diverse makeup of the Anniston community. Membership includes representatives from the affected community, the installation, EPA Region IV, ADEM, other state and federal agencies and interest groups, as well as interested individuals. Co-chairpersons are Colonel Gerald Bates, commander, Anniston Army Depot and Dr. Barry Cox, a Jacksonville State University professor representing the civilian community.

In addition to participating in discussions of ongoing IRP activities, the RAB plays an active role in public meetings and implementing ANAD's community outreach plan. In 2003, the RAB developed fact sheets and brochures with community friendly language designed to educate stakeholders on the health affects of TCE.

The RAB also contributed key information to ANAD's environmental restoration programs. It provided a private well and spring inventory, which was used for the On-Post Groundwater Operable Unit Plan to treat hot spots and the Combined Groundwater RI.

REDUCING RISKS TO HUMAN HEALTH AND THE ENVIRONMENT

ANAD-Utility Partnership Demonstrates Commitment to Public Health Protection

The depot took a proactive approach to help protect the community's drinking water sources. In 2003, the depot entered into a partnership with the Anniston Water Works and Sewer Board (AWWSB) to expand the Board's water treatment facility. Additionally, ANAD worked with the Department of the Army (DA) during fiscal year 2003 to gain approval for funds to be provided to the AWWSB to treat Coldwater Spring. The funding provides for the installation of air stripping equipment that will remove TCE from the waterway, even though the TCE levels that appear in the spring are well below the maximum contaminant level set by EPA and ADEM.

RI studies conducted by ANAD in the 1990s and recent monitoring data indicate that groundwater quality degraded, as TCE concentration levels in Coldwater Spring steadily rose. While there is no current threat to human health, the predictable increase in contaminant levels led to the conclusion that there will eventually be an unacceptable risk to human health at this site for which the Army is responsible. With funds approved and provided, AWWSB plans to complete installation of the air strippers in fiscal year 2004.

▲ A homeowner's private well water is sampled.

Established Base-Wide Standard Operating Procedure (SOP) for Land Use Controls

ANAD developed an internal Standard Operating Procedure (SOP) for land use controls that became a model for other installations. The depot was able to develop this comprehensive document and gain EPA approval even though a land use control (LUC) dispute remained unresolved between the DoD and EPA. This management tool establishes responsibilities, restrictions on land use and mechanisms for implementation. Developed with input from the DoD LUC working group, ANAD's SOP also details new approaches to control land use.

The IRP program manager is responsible for implementing the SOP with the cooperation of the Directorates of Risk Management, Production Engineering, Public Works and Law Enforcement and Security.

This SOP supports mission readiness while maintaining compliance with applicable federal cleanup regulations. For example, ANAD needed to expand its power train facility to better meet demands, but opportunities for expansion were limited to a known contaminated site. The SOP provided the rigorous guidance needed to facilitate and expedite construction on this site, while providing appropriate protection for human health.

Opportunities for Small and Small Disadvantaged Business in Environmental Restoration

The depot's leadership and decision-makers understand that, as Anniston's largest employer, the installation has a responsibility to support the economic development of the community. For this reason, ANAD consistently exceeded goals for contracting with local small and small disadvantaged businesses. In fiscal years 2002 and 2003, 100 percent of the subcontracts awarded through the IRP program were given to small or small and disadvantaged businesses. In addition, every goal for small and small and disadvantaged business participation was exceeded.

IRP Goals for Small and Small Disadvantaged Business Participation

Business Type	USACE-Mobile Goal	Actual
Small business	69.3%	77.63%
Small disadvantaged business	12%	17.4%
Women-owned business	7%	19.6%

CONCLUSION

Cost-effective, innovative techniques and aggressive management of ANAD's IRP resulted in improved protection for human health and the environment and enhanced the depot's ability to fulfill mission requirements. ANAD took a proactive approach to protecting the community's raw water source through new modeling techniques, state-of-the-art groundwater treatment and innovative technologies for treating drilling water.

The depot's inventive management approach, which includes active participation and collaborative partnerships with key stakeholders, embodies a vision to go beyond mere "rubber stamp" participation. This synergy streamlines implementation, encourages innovation and reduces costs while fully supporting the overall mission of the installation.