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FY 2002 – ANNUAL REPORT

U.S. ARMY ENVIRONMENTAL CENTER

U.S. ARMY ENVIRONMENTAL CENTER

Pollution Prevention, Compliance, Acquisition and Technology Division

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13. SUPPLEMENTARY NOTES

14. ABSTRACT

This report summarizes projects carried out during Fiscal Year 2002 by the U.S. Army Environmental Center's Pollution Prevention/Compliance, Acquisition and Technology Division. The report describes each project's participants, results, requirements, milestones, and products. PCATprovides support to Headquarters, Department of the Army (HQDA), Major Army Commands (MACOMS, Installation Management Agency (IMA), and installations on the implementation and maintenance of Pollution Prevention initiatives; provide technical expertise and guidance on regulatory issues; ensure all weapons systems programs comply with Environmental, Safety, and Occupational Health requirements; and conduct demonstrations of new and innovative environmental technologies and transfer successful technologies to the field.

15. SUBJECT TERMS

Annual Report, Demonstration, Technology, Technology Transfer, Evaluation, Projects, Summary Range XXI, FY02, Pollution Prevention, Conservation, Compliance, Restoration.

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Table of Contents

RANGE XXI FOCUS

Range XXI: Acquisition Interface

Range XXI: Impact Area Evaluation

Range XXI: Small Arms Range Technology

Range XXI: Training Range Area Sustainment

Range XXI: Training and Test Emissions Management

TECHNOLOGY TRANSFER

APPENDICES

Appendix A

Appendix B

Introduction

This report describes current projects at the U.S. Army Environmental Center's (USAEC's) Pollution Prevention, Compliance, Acquisition and Technology Division (PCAT) during fiscal year (FY) 2002. These summaries will help readers to better understand the division's efforts and capabilities.

Technology is a major weapon in the Army's efforts both to defend the nation and to sustain its environment. Through the programs described in this report, USAEC gives the Army access to the most effective and affordable environmental tools available.

PCAT focuses on conservation, compliance and cleanup technologies, bolstering the USAEC commitment to saving money and quickly putting innovative ideas to work for its Army and Defense Department customers.

What's Inside? The FY 2002 PCAT Annual Report is organized by the following categories:

- Pollution Prevention/Compliance Program
- Pollution Prevention Team
- Compliance Team
- HSMS Team
- Acquisition Program
- Technology Implementation Program
- Cleanup Technologies
- Pollution Prevention/Compliance Technologies
- Range XXI Focus
- Technology Transfer
- Appendices

Project descriptions are organized into several sections:

Purpose What problem does the project address?

Benefits How does the project help its users?

Technology Users Who will use the technology?

Description Why was this technology developed? How does it work?

What results have been achieved so far?

Limitations What might affect use of this technology?

Accomplishments and Results What additional requirements are anticipated?

Point of Contact Who may be contacted for more information?

Program Partners What organizations are participating in the project? (Appendix B contains a consolidated list of partners.)

PUBLICATIONS

What publications relate to the project?

(Section headings that do not apply to the project are omitted.)

POLLUTION PREVENTION/ COMPLIANCE PROGRAM

Pollution Prevention/Compliance program teams support initiatives to merge pollution prevention into Army missions, such as aiding efforts to buy and use materials that don't pollute the environment; integrating pollution prevention practices into training; fielding systems and methods to manage hazardous materials and reduce generation of hazardous waste; helping major commands and installations prepare and pay for P2 plans; and partnering with state and federal regulatory officials.

EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ASSISTANCE

In CY 1999, Army installations met and exceeded the Toxic Release Inventory (TRI) reduction goal of 50 percent. Data on CY 2001 TRI releases have been collected from Army installations, and a new baseline of approximately 5 million pounds has been established for the next TRI reduction goal of 40 percent by CY 2006 (according to Executive Order 13148). On-site Emergency Planning and Community Right-to-Know Act (EPCRA) training for four to six sites annually is planned to assist installations in their TRI reporting of all activities (including munitions activities), ensure compliance with the EPCRA TRI requirements, improve reporting accuracy, and meet TRI reductions goals.

Department of Defense (DoD) installations began reporting munitions – demilitarization activities under the EPCRA on 1 July 2000. Munitions and range-training activities began reporting EPCRA TRI releases on 1 July 2002. Efforts have been underway by the TRI-Workgroup (a DoD working group) and a software package developed to assist installations in their munitions-related EPCRA reporting efforts. This project continues to seek, collect and place actual field measurement data on certain EPCRA toxic chemicals into this software package for installation use and provide technical guidance to installation points of contact on EPCRA reporting.

PURPOSE

To develop technical guidance for EPCRA reporting, provide munition emissions data to the TRI-Workgroup's EPCRA reporting software, and provide site-specific training to installations reporting EPCRA TRI releases.

BENEFITS

Cost-effective and consistent EPCRA reporting. Compliance with EPCRA and DoD reporting requirements.

TECHNOLOGY USERS

Army and DoD installations.

DESCRIPTION

DoD has required EPCRA reporting of munitions-demilitarization activities beginning 1 July 2000 and munitions and range training activities beginning 1 July 2002. This project seeks to assist in the identification of EPCRA toxic chemicals in munitions, training activities, and those released by munitions-demilitarization activities and incorporate this information into the software data-delivery system for installation use.

The Army, U.S. Army Environmental Center, Air Force, Navy, Marine Corps and Deputy Under Secretary of Defense jointly funded this effort for Environmental Security.

ACCOMPLISHMENTS AND RESULTS

The Range XXI program is developing accurate emissions data based on actual field-testing and measurements. Literature research and software evaluations are complete; designing and populating have been completed with updates ongoing.

The software was beta-tested during summer 1999 and has been utilized by the DoD for reporting of CY 1999 and CY 2000 activities.

FOLLOW-ON PROGRAM REQUIREMENTS

- Revise the software according to beta-testing results; perform routine maintenance and update of the TRI-Data Delivery System (DDS) Web site.

- Software estimate emission factors for reporting now available on the TRI-DDS Web site (http://www.dod-tridds.org/tri-web.htm).
- EPCRA Munitions Reporting Handbook generated by GAIA Corp. for the U.S. Army August 2000. Latest update published spring 2002, http://www.denix.osd.mil/denix/DOD/Library/Munitions/EPCRA/munireporting.pdf.
- On-site EPCRA training visits planned in CY 2003 for targeted Army installations sponsored by USAEC.
  Schedule: White Sands/Fort Bliss – week of 10 February,
  Rock Island – week of 10 March
  Fort Drum – week of 5 May
  Milan AAP – week of 7 April
  Radford – week of 21 April

Point of Contact

Craig Peters

Program Partners

U.S. Army
U.S. Navy
U.S. Air Force
U.S. Marine Corps
Deputy Under Secretary of Defense for Environmental Security
Science Applications International Corporation
URS – Radian International
GAIA Corporation

Publications

Emergency Planning and Community Right-to-Know Act (EPCRA) Munitions Reporting Handbook for the U.S. Army. May 2002.
http://www.denix.osd.mil/denix/DOD/Library/Munitions/EPCRA/munireporting.pdf.

Updated Guidance on Applying EPCRA to Munitions to Meet Requirements for EO 12856. March 1998
http://www.denix.osd.mil/denix/Public/ESprograms/Pollution/EO12856/epcra2.html.

DoD EPCRA Data Source Evaluation Report. January 1998.

DoD Munitions EPCRA TRI Calculation Methods. December 1998.

Toxic Release Inventory Data Delivery System User's Guide. June 1999.

Questions and Answers Regarding TRI Reporting for Range Training and Demilitarization Activities. 31 October 2001.

Pollution Prevention Plans Review

In accordance with Executive Order (EO) 13148, Army installations and major Army commands (MACOMs) must update pollution prevention (P2) plans by March 2002. The U.S. Army Environmental Center reviewed existing P2 plans in July 1999 to ensure their compliance with several Army and federal government requirements. Existing plans should be updated with the new EO 13148 requirements and measures of merit and submitted to USAEC for review in 2002.

Purpose

To review Army installation and MACOM P2 plans as directed by the Assistant Chief of Staff for Installation Management (ACSIM)/Office of the Director of Environmental Programs.

Benefits

In addition to providing direction to installation and MACOM P2 and compliance efforts, effective P2 plans ensure compliance with EO 13148, Army Regulation 200-1, and ACSIM guidance. Additionally, P2 plans provide detailed pollution and cost accounting estimates and performance for personnel and managers responsible for tracking goal accomplishment.

Technology Users

MACOMs, installations, operators of pollution-generating processes, and opportunity assessment teams.

Description

USAEC continues to monitor compliance. Any P2 plans updated before April 2000 do not count against the new requirement mandated in EO 13148.

Accomplishments and Results

USAEC staff reviewed plans from the Army MACOMs and installations in 1998 and 1999. Comments and recommended changes were distributed to the MACOMs for P2 plan inclusion. As of December 2002, 145 of 214 plans have been received. The majority of the delinquent submissions are known to be in an "in-progress" status; however, we are still awaiting a response from seven installations. All plans that have been received have been reviewed in accordance with ODEP guidance.

Follow-On Program Requirements

USAEC staff will review MACOM and installation P2 plans in the second quarter of FY 2002.

Point of Contact

Doenee Moscato

Environmental Program Requirements Support

The Environmental Program Requirements (EPR) is a reporting system and database that provides the primary means for identifying and documenting all current and projected environmental requirements and resources needed to execute the Army's environmental program. The EPR report satisfies the Army's and Defense Department's environmental budget reporting requirements to Congress as specified in executive orders and other federal directives. Support to this Headquarters, Department of the Army (HQDA) program includes technical guidance to Installation Management Activity (IMA) regions and installations, comprehensive quality assurance/quality control (QA/QC) reviews of the submitted data, identification of program and budget shortfalls, and analysis of programmatic data to support the budget process and track progress towards Army environmental goals.

Purpose

The EPR report is used at all levels to manage the Army's environmental program. This program is used to plan, program, budget, and forecast costs, and to attain and maintain compliance with environmental laws and regulations. The program documents past accomplishments and expenditures, tracks project execution, validates budget year requirements, supports the budget process, and allocates resources consistent with Army priorities. The U.S. Army Environmental Center (USAEC)

provides technical support to all aspects of the program.

Benefits

- Ensures cost-effective environmental stewardship.
- Ensures resources are allocated with congressional, Department of Defense (DoD) and Army priorities.
- Tracks project-level details associated with installation environmental initiatives.
- Identifies program shortfalls and validates budget year requirements.
- Supports budget development process.
- Tracks project execution.

Technology Users

The EPR report is used by installation commanders and environmental managers at all levels, including major subordinate commands (MSCs), major Army commands and HQDA. The data and supporting analyses are also used to respond to audits and congressional inquiries.

Accomplishments and Results

The USAEC provides year-round continuous technical support to the program as well as comprehensive QA/QC reviews of active environmental must-fund requirements on a semi-annual basis. Compliance projects are typically reviewed to ensure that most of the requirements for the Program Objective Memorandum (POM) have been adequately examined to support and defend resource management submissions. This level of review typically focuses on projects with requirements greater than $300,000 over the POM or any project with requirements over $100,000 in any given year. This threshold also helps to ensure that projects that may encounter congressional inquiry have been thoroughly examined. Pollution prevention (P2) requirements are completely reviewed during the EPR QC. All active pollution prevention projects requiring any amount of environmental funding over the course of the POM are examined to ensure that P2 initiatives are being addressed per Army directives.

Follow-On Program Requirements

Perform comprehensive QA/QC reviews of active must-fund environmental projects semi-annually. Provide technical support to the development of guidance and tools such as the EPR Project Catalog on a periodic basis.

Point of Contact

Stan Childs

Program Partners

Installations
Major Army commands
Headquarters, Department of the Army
Department of Defense

Publications

Policy and Guidance for Identifying U.S. Army Environmental Program Requirements. HQDA, Office of the Director of Environmental Programs (ODEP). February 2002.

Project Catalog: CONUS Installations. HQDA, ODEP and USAEC. August 2000.

The U.S. Army Environmental Program Requirements Project Catalog: OCONUS Installations. HQDA, ODEP and USAEC. August 2002.

Field Assistance Support and Technology Transfer Team

The Field Assistance Support and Technology Transfer (FASTT) team is a pollution prevention (P2) and environmental field assistance team initiated by the Navy. FASTT is helping operations and maintenance personnel meet environmental requirements while performing their missions on schedule yet at a lower cost. Since its inception, the team has grown in its membership and site evaluations. The FASTT team consists of members from the Navy, Army (including the U.S. Army Environmental Center), Air Force and Marines.

Purpose

The FASTT mission is to reduce the cost of environmental compliance and improve maintenance work processes utilizing the best technology and management practices available. P2 plans and updates are required of all Army installations by Army Regulation 200-1 and Executive Order 13148. Sound environmental planning involving pollution prevention has been deemed the most economical and practical means of addressing environmental compliance concerns. Identifying pollution prevention opportunities at installations will assist in efforts to comply with Army mandates as well as legal requirements. Since the site report contains cost-benefit data, it can serve as an addendum to your P2 plan. Emphasis is placed on finding, developing and implementing only those material substitutions, work process changes and technology acquisitions that will decrease the burden on the serviceman.

Benefits

When funding is available, Army FASTT team members coordinate visits at participating Army installations. All site surveys are scheduled through the activity environmental offices. Once an installation is selected, a small team visits the activity to conduct a pre-survey. This enables the FASTT team to formulate a team best suited to meet the activity's needs. A few weeks later, a FASTT team will return to conduct the site survey. At the exit briefing with the activity commanding officer, the team presents a written report targeting opportunities for maintenance process improvement, waste reduction and cost avoidance. The ideas and suggestions in the report can be used to reduce business costs through reductions in waste streams, labor, and costs associated with environmental compliance.

Technology Users

Army installations and major Army commands as well as other service (Navy, Air Force and Marines) members.

Accomplishments and Results

To date, more than 66 Department of Defense (DoD) sites (six of which belong to the Army) have been visited, and recommendations have been made with an estimated cost savings over $200 million. Additionally, this effort has served to significantly increase collaboration, information sharing, and networking between the various DoD P2 communities.

Limitations

All recommendations made during an Army site visit are left to installation personnel to initiate and prioritize based on available resources and need unless otherwise indicated in the report. Each service handles the recommendations somewhat differently. For instance, in the Navy, all FASTT recommendations and equipment needs are implemented as priority.

Follow-On Program Requirements

A follow-up/Return on Investment (ROI) visit is planned for two Army depots in FY 2002. ROI visits also measure projected savings with actual results achieved. The return visit is used to assess the effectiveness of implemented technologies and make adjustments in the program to meet the customer need. A schedule for initial FASTT site visits for FY 2003 is still pending.

Point of Contact

Doenee Moscato

Program Partners

U.S. Navy
U.S. Air Force
U.S. Marine Corps
National Aeronautics & Space Administration

Environmental Quality Report Support

The Environmental Quality Report (EQR) is a Web-based data collection and reporting system that serves as the primary source of information for conveying the Army's environmental status. The EQR is used to track Army adherence to environmental laws for pollution prevention (P2), compliance, pest management, and cultural and natural resources. Program metrics and indicators monitored through the EQR program include inspections, enforcement actions, permits, Conservation Management Plans, archeological and Native American resources, wetlands, and threatened and endangered species. Data are collected on a quarterly and annual basis. USAEC support to this Headquarters, Department of the Army program includes technical guidance to major Installation Management Activity (IMA) regions, and installations, comprehensive quality assurance/quality control (QA/QC) reviews of the submitted data, identification of program shortfalls, data analysis, and support with status reports to Department of Defense (DoD) and Congress.

Purpose

The EQR is used at all levels to provide the status of the Army's environmental program. This program is used to plan, program, attain and maintain compliance with environmental laws and regulations. The Compliance and Pollution Prevention Branch provides technical support to all aspects of the EQR program.

Benefits

- Ensures sound environmental stewardship with accurate status reporting.
- Identifies program shortfalls and areas for improvement.
- Tracks progress towards achieving Measures of Merit goals.
- Generates data for the Environmental Quality Reports to DoD and Congress, as well as the Quarterly Army Performance Review to the Secretary of the Army.

Technology Users

The EPR report is used by installation commanders, environmental managers at all levels, DoD, other federal agencies, and Congress.

Accomplishments and Results

The Compliance and Pollution Prevention Branch provides year-round continuous technical support to the EQR program as well as comprehensive QA/QC reviews.

Follow-On Program Requirements

Perform comprehensive QA/QC reviews of all P2 information on a quarterly and annual basis. Provide technical guidance and tools to the field on a periodic basis.

Point of Contact

Stan Childs

Program Partners

Installations
Major Army commands
Headquarters, Department of the Army
Department of Defense

Publications

Environmental Quality Report QA Handbook. U.S. Army Environmental Center. September 1999.

Overseas Environmental Program Support

The U.S. Army Environmental Center (USAEC) provides direct support to the Army's overseas environmental programs at the regional and installation levels. The overseas environmental program also works directly with Headquarters, Department of the Army (HQDA) to assist in the analysis, management and oversight of these programs.

Purpose

As part of its mission to support the effective and comprehensive management of all aspects of the Army's environmental programs, USAEC has sought to better support the unique environmental needs and obligations of the Army's overseas installations. Environmental requirements arising from international agreements and host nation regulation are changing rapidly. For this reason, it is imperative that USAEC and HQDA be involved in the developments associated with outside the continental United States (OCONUS) environmental programs. As USAEC is expected to validate and support the requirements submitted by overseas commands, a dedicated point of contact has been established to improve our coordination with the OCONUS regions and support the Office of the Director of Environmental Programs (ODEP) in the tracking and management of programs related to overseas environmental concerns.

Benefits

- Establishes constructive relationships and communication exchanges with OCONUS regions.
- Directly supports both USAEC and ODEP in the communication and recognition of unique issues and situations related to overseas environmental programs.
- Ensures that Army environmental policy and guidance takes issues related to OCONUS requirements into account.
- Improves USAEC staff understanding of overseas and international environmental requirements and legal drivers affecting the Army.
- Monitors pending international agreements or host nation laws to ascertain possible impacts on the Army and its installations.
- Better supports the Program Objective Memorandum (POM) development process for OCONUS installations and helps to develop more defensible environmental requirements.

Technology Users

Information and analyses from the overseas environmental support program is primarily used by USAEC, ODEP, the Office of the Assistant Chief of Staff for Installation Management, and the Korea, Europe, and Pacific Regional Offices of

the Installation Management Activity (IMA). OCONUS data and analyses are also used to support Environmental Program Requirements reviews; Environmental Program Assessment System (EPAS) schedules; and inquiries from higher headquarters, Department of Defense, and Congress.

The overseas environmental support program involves the issuance of technical guidance to OCONUS commands and installations, participation in staff assistance visits to Regional Offices, major Army commands (MACOMs), and installations; participation in concurrent requirement reviews; comprehensive quality assurance/quality control reviews of all OCONUS-related environmental data; identification of programmatic, management, or budget shortfalls; support to annual HQDA level In-Progress Reviews; and analysis of command and OCONUS-wide data to support the development and refinement of Army policy and guidance.

Accomplishments and Results

USAEC provides year-round programmatic support to the overseas regions and HQDA. During 2002, USAEC participated in three OCONUS staff assistance visits, including visits to 12 installations. Policy clarification and issue communication was facilitated for numerous significant programmatic issues related to overseas compliance and pollution prevention, including:

- Host nation equivalents of Notices of Violation (NOVs)
- Environmental funding of sewer surveys in OCONUS regions
- Aboveground storage tank replacement in Korea
- Repair of hardstand maintenance areas in Germany
- NOVs related to hazardous materials storage in the Europe Region
- Turn-in procedures for PCB waste in Japan

Follow-On Program Requirements

This is an ongoing and recurring program that will continue to support the Army's overseas environmental programs. The bullets below identify significant actions planned for FY 2003:

- Participate in two to three staff assistance visits to OCONUS regional commands and installations, including participation in concurrent reviews, issue identification, and program management oversight and guidance.
- Directly support annual HQDA Overseas In-Progress Review.
- Participate in OCONUS EPAS assessments (overall quality review).
- Continue to monitor changes in Final Governing Standards, the Overseas Environmental Baseline Guidance Document, host nation laws, and international agreements that may impact Army environmental requirements and obligations.
- Prepare comments and suggest changes to Army environmental policy and guidance to address unique situations, limitations, and requirements of OCONUS installations.

Point of Contact

Anthony Maranto

Program Partners

OCONUS installations
OCONUS IMA regional offices
OCONUS MACOMs
Headquarters, Department of the Army
Department of Defense

ENVIRONMENTAL PERFORMANCE ASSESSMENT SYSTEM PROGRAM

The U.S. Army's Environmental Performance Assessment System (EPAS) Program is a centrally funded environmental audit program developed by Headquarters, Department of the Army (HQDA). The program includes the active Army (continental and outside continental United States), the U.S. Army National Guard (USARNG), and the U.S. Army Reserves (USAR).

PURPOSE

The EPAS Program is designed to help Army installations achieve and maintain compliance with federal, state and local laws and regulations through periodic external performance evaluations (assessments) and by providing tools to perform internal assessments. Installations are provided suggested corrective actions and cost estimates to correct deficiencies.

BENEFITS

EPAS auditors conduct on-site visits at Army installations, usually every three or four years, to identify environmental compliance deficiencies and assist in the development of corrective actions. Installations continue the assessment process by conducting internal audits each of the years between the external audits.

TECHNOLOGY USERS

Installations are the primary benefactors, receiving an Environmental Compliance Assessment Report (ECAR) at the end of the external assessment as well as a draft Installation Corrective Action Plan (ICAP), which the installation expands in the intervening years by adding newly discovered deficiencies, the appropriate corrective actions, and status of compliance. The Installation Management Activity (IMA) Regions, as well as HQDA, use the data to identify Army environmental performance with the intention of focusing resources and support where they are most effective in reducing noncompliance.

DESCRIPTION

The active Army performs approximately 40 external assessments each year, the USARNG performs assessments at facilities in approximately 18 states each year, while the USAR conducts assessments at approximately 300 facilities throughout the United States and five installations.

Staying in environmental compliance is good business for the U.S. Army. EPAS external assessments help installations stay in compliance by uncovering environmental deficiencies and recommending practical and up-to-date corrective actions. This proactive approach limits and/or eliminates deficiencies that regulators can uncover during their inspections, thus saving money that might otherwise have been spent on paying fines. Also, environmental factors have tremendous influence on installation operations. A successful environmental program correlates closely with mission effectiveness.

EPAS is an excellent tool for maintaining good community relations. The surrounding community is likely to be less adversarial if they understand that the installation has invested in monitoring itself and is being a good environmental steward. If serious problems are discovered during an EPAS audit, the installation has the opportunity to disclose the news itself in a non-sensational mode.

Since audits are performed regularly on Army installations, it is likely that outside audits will find any new serious environmental deficiencies. Thus, a good report

card from a regulator will further aid in building confidence of the local community.

The U.S. Army Environmental Center chooses who will perform the EPAS external audits. Installation personnel perform internal audits. HQDA policy requires each assessing team to follow the same audit procedures using a common set of federal, state, and organizational protocol supplements, with reports forwarded to HQDA.

All external assessments, or audits, have three distinct phases: Phase I (pre-assessment) – auditors obtain and familiarize themselves with the installation's mission, organization, operations, past assessments, findings, and their current ICAP; Phase II (on-site assessment) – auditors assess the compliance performance posture of a sampling of the installation and brief the installation/garrison commander prior to leaving the site; and Phase III (post-assessment) – a draft findings report is prepared by the auditors and provided to the installation and IMA Region environmental staffs, where they have the opportunity to respond to the findings. When all responses have been received and reviewed by the assessor (usually within 11 weeks of the on-site visit), the report is considered final (ECAR) and a copy is sent to the installation, IMA Region and HQDA.

Accomplishments and Results

Over the past 10 years, the number of Finding Category - Class I findings (non-compliance with existing federal, state and local laws and regulations findings) has decreased for each major Army command in all 13 media areas for each of the external assessment cycles. HQDA leadership continues to sponsor the EPAS program and installation/garrison commanders have endorsed the continuation of the program.

Limitations

Cost to execute the entire program in 1991 was $21 million. For the past three years, the Army has been able to perform the same number of external assessments for only about $9.3 million.

Follow-On Program Requirements

The EPAS external assessment supports the Army installation/garrison commander with a periodic (usually three to four years), objective and professional evaluation of environmental performance. The Army plans to complete approximately 27 external assessments in FY 2003. The Army internal assessment program is managed by in-house personnel and is an ongoing effort to improve performance by tracking corrective actions to completion during the years between external assessments. The management tool for the internal assessments is the annual ICAP.

Point of Contact

Matthew Andrews

Program Partners

U.S. Army Corps of Engineers Construction and Engineering Research Laboratory
U.S. Army Center for Health Prevention and Preventive Medicine
U.S. Army Corps of Engineers, Hawaii
U.S. Army Material Command, Installation and Services Activity
U.S. Army National Guard Bureau
U.S. Army Reserve Command
Installation Management Activity Regions

Publications

Environmental Compliance Assessment Reports.

Annual EPAS Summary Report.

Program Information Notebook (discontinued in FY 1999).

ECAS Business Process Guide (Final Draft - November 2002).

Hazardous Waste Program

The USAEC Hazardous Waste Program expanded in FY 2003 to integrate our compliance and pollution prevention support to Headquarters, Department of the Army (HQDA) and installations. In combining these efforts, we can better help installations reduce compliance requirements with pollution prevention (P2) solutions.

Purpose

Support HQDA, Installation Management Activity (IMA), major Army Commands (MACOMs), and installations in meeting hazardous waste compliance and P2 needs.

Benefits

- Provide current information on changing hazardous waste (HW) regulations.
- Inform and influence the Environmental Protection Agency (EPA) on rulemaking issues of concern to Department of Defense (DoD).
- Analyze HW data and issues for HQDA.
- Provide information on P2 solutions to HW problems.

Technology Users

HQDA, MACOMs, installations.

Description

The USAEC HW program provides support to the Office of the Director of Environmental Programs (ODEP), IMA, MACOMs and Army installations. ODEP support includes analysis of Army HW issues, validation of HW data in Army environmental database, e.g., Environmental Program Requirements and Environmental Quality Reports, and support in meeting DoD's Resource Conservation and Recovery Act (RCRA) lead agent responsibilities. USAEC has been tasked by ODEP to support RCRA lead agent functions, which consist largely of supporting the DoD HW Management Subcommittee and managing the development of Army/DoD comments on RCRA rulemakings. The USAEC also provides technical support to MACOMs, IMA regions and installations on HW regulations and reducing waste through P2 initiatives.

Accomplishments and Results

The HW program systematically reviews all federal HW regulations and informs Army MACOM and the DoD HW Subcommittee of potential DoD impact. In FY 2002, we reviewed all RCRA entries in the Federal Register; we provided summaries and guidance on six RCRA rulemakings that have potential significant impacts on Army installations; and we submitted Army/DoD comments to EPA on three HW rules.

Follow-On Program Requirements

In FY 2003, we will again monitor all RCRA rulemakings, and based on EPA's regulatory agenda, expect to see eight rulemakings with potential Army impacts. We will keep HQDA, IMA, MACOMs, and the DoD HW Subcommittee informed. Summaries and comments will be prepared as necessary. Some important rules on HW manifesting and reductions of RCRA permitting and reporting requirements are expected in FY 2003. In P2, we will continue promoting compliance through P2 and will publish appropriate guidance. We are currently working with

Communications Electronics Command to improve guidance on managing lithium sulfur dioxide batteries.

Point of Contact

Robert Shakeshaft

Program Partners

U.S. Army Corps of Engineers Center of Expertise
for Hazardous Toxic and Radiological Waste
U.S. Army Center for Health Promotion and Preventive Medicine

Pollution Prevention Solid Waste Management

The Army generates municipal solid waste at places where soldiers live and work; industrial waste where the Army produces, stores, repairs and reconditions military materials and equipment; and construction or demolition waste where structures are needed or not needed. The Army reduces generation of waste, and re-uses and recovers materials where economically beneficial.

The federal government regulates solid waste handling under the Resource Conservation and Recovery Act (1976) and later amendments. Also the government regulates a "Qualified Recycling Program" and related sale proceeds under the Military Construction Codification Act. States have the primary responsibility for devising solid waste rules and carrying out enforcement. States and regional authorities prepare solid waste management plans. The plans identify the adopted solid waste/recycling strategy, create management organizations, set funding procedures, and provide the reasoning and legal basis underlying the handling rules.

As a part of the executive branch of the federal government, the Department of Defense (DoD) carries out the requirements stated in executive orders. The DoD guidance in DoDI 4715.4, Pollution Prevention, requires the services to:

"Establish and execute cost-effective waste prevention and qualified recycling programs to reduce the volume of non-hazardous solid waste in accordance with 10 U.S.C. 2577 and E.O. 12873." (Federal Acquisition, Recycling, and Waste Prevention); and "establish procedures governing qualified recycling programs." (E.O. 12873 is superceded by E.O. 13101, Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition.)

Purpose

To provide Armywide compliance and Pollution Prevention Solid Waste Management Program oversight and technical support. To emphasize pollution prevention solutions to compliance requirements.

Benefits

- Explanation of the meaning and impact of existing and future solid waste regulations.
- Proposed, environmental strategy for meeting solid waste operations, and regulatory and pollution prevention requirements.
- Program status information and analysis for Headquarters, Department of the Army (HQDA) staff.
- Accurate environmental data and tracking systems.
- Armywide, environmental budget review and development.

- Solid waste operations cost avoidance.
- Recycle sale proceeds information.
- Tools and guidance.
- Information exchange and shared success stories.

Technology Users

HQDA (Assistant Chief of Staff for Installation Management [ASCIM], Directorate of Facilities and Housing, Director of Environmental Programs, and Community and Family Support Center), Headquarters, Installation Management Activity (IMA), IMA Regions, MACOMs, installations, and Army environmental support agencies.

Description

The Pollution Prevention Solid Waste Management Program exists to reduce or avoid environmental noncompliance, reduce Army construction and operations cost, and to increase the quantity of materials diverted from disposal in landfills or by incineration. The current Armywide diversion rate is in the 30 to 40 percent range. The DoD goal solid waste diversion rate is 40 percent by the end of FY 2005. The anticipated rate, beyond that, is 50 percent or more. Some American communities including military installations anticipate achieving a zero disposal rate in 15 to 20 years.

The Pollution Prevention Solid Waste Program uses traditional HQDA staff coordination of planning, budgeting and implementation activities to accomplish the program intent. The program is closely coordinated with the Solid Waste (operations) program including recycling managed by HQDA, ACSIM, Directorate of Facilities and Housing.

Accomplishments and Results

- Hosted seven monthly Army Solid Waste/Recycling Work Group Teleconferences since February 2002.
- Prepared draft Pollution Prevention Solid Waste Macroanalysis.
- Coordinated the design and construction of a public display for HQDA and U.S. Army Corps of Engineers use.
- Reviewed and validated Environmental Quality Report, Independent Status Report, Environmental Compliance Assessment System and Solid Waste Annual Reporting databases by sampling.
- Reviewed 98 Pollution Prevention Solid Waste budget preparation documents (Environmental Program Requirements exhibits).
- Participated in DoD development, testing and fielding of new Solid Waste/ Recycling software.

Limitations

- Program funding.
- Availability of Solid Waste/Recycling facilities and equipment.
- Rate of change in population behavior.

Follow-On Program Requirements

- Continue to analyze and influence rulemakings.
- Strengthen program coordination among IMA Region Solid Waste/Recycling program managers.
- Increase the diversion rate to meet the anticipated, increased DoD goal.
- Increase recycling capacity with structures, equipment, and agreements.
- Emphasize pollution prevention solutions to compliance requirements.

Point of Contact

Charles Harris

HQDA
IMA
MACOMs
Installations
Other Army organizations
Defense Logistics Agency
Defense Reutilization and Marketing Service
Defense Finance and Accounting Service

Clean Air Act Team

The Army Clean Air Act (CAA) Team helps ensure that the military can comply with the current and upcoming CAA regulations.

Purpose

To ensure that U.S. Environmental Protection Agency (EPA) writes CAA regulations that allow the Army to accomplish its mission, and that the Army is prepared to comply with these rules.

Benefits

Many new CAA regulations have the potential to interfere with the Army's mission. U.S. Army Environmental Center's (USAEC's) Clean Air Act Team helps ensure that the Army achieves its mission while protecting clean air. As the EPA develops new rules, USAEC advises EPA on how they can regulate the Army without compromising training. Once the rule becomes law, USAEC ensures that installations receive all the help required for them to comply with the new rule.

Technology Users

Army facilities subject to Clean Air Act rules.

Description

New air pollution regulations will, eventually, regulate most Army training and maintenance. The USAEC's CAA Compliance Program strives to ensure that Army can train while complying with these regulations. The team helps EPA write rules that accommodate Army activities, and prepares the Army to comply with upcoming rules.

An example of how the Army CAA Team is helping the Army both train and comply with rules is the program addressing CAA rules limiting soot and dust. These rules have the potential to limit Army maneuver and obscurant training. Vehicles driving across ranges stir up dust. Army obscurant clouds are made up of soot-sized particles. Over the next three years, EPA and state environmental regulators will be preparing new regulations intended to further reduce the amount of soot and dust in our country's air. As these regulations have the potential to limit how far and where Army vehicles can go, as well as the amount of obscurant used for training, it is important to make sure that these rules accommodate training while protecting air quality. The USAEC strategy for preserving this training is to help coordinate negotiations between EPA, the states, Army and Department of Defense (DoD) over requirements affecting training. USAEC will help the Army and DoD use current data on air emissions from maneuver training and obscurant use to show EPA how the air can be improved while Army fulfills its training mission.

The CAA rules governing industrial processes are another example. Current and

upcoming rules regulate several Army industrial activities vital to national defense, including painting, demilitarization of weapons, and vehicle repair and maintenance. These rules have the potential to interfere with Army vehicle and equipment maintenance, as well as treatment of unusable munitions. Because USAEC, Army and DoD engage with the EPA while they are still writing these rules, we have ensured that these rules allow us to continue our industrial activities. For instance, EPA has written rules to accommodate military-unique requirements such as special kinds of military paints, the requirements of military specifications, and the explosive properties of military munitions.

In addition to the activities described above, regulations resulting from the Clean Air Act Amendments (CAAA) of 1990 affect many other kinds of Army activities and equipment. These include changing mission or kinds of equipment used at an installation, the kinds of engines used in Army vehicles, fuels content, power and steam production, and even cleaning clothes. Most Army activities must consider at least one of the new or upcoming CAA regulations.

Once EPA promulgates a regulation, USAEC helps installations build their compliance program for this rule. To comply with a rule, the activities at an installation and, frequently, off-installation, must change how they conduct their activities or provide new policy or equipment to the installation. Examples of changes to activities include using different materials (such as less polluting paints), collecting additional data (such as the amount of time a particular piece of equipment operates), or determining changes to air emissions resulting from new construction. Installations have required and will continue to require that weapons systems program managers, DoD laboratories and centers, and other headquarters offices provide them with materials or equipment required by new environmental regulations. To ensure that installations build a rule-compliance program that receives the cooperation of these other organizations, USAEC has provided, and will continue to provide, installations with the following support:

1) Informing Army headquarters, agencies, laboratories, and other centers and offices of the potential requirements of upcoming regulations, and the kinds of new materials, equipment, or other support that Army will need to comply with the rule.

2) Working with the Office of the Director of Environmental Programs to update Army policy.

3) Providing to installations guidance documents on setting up compliance programs.

4) Conducting discussions of rule-compliance programs via video tele-conferencing, conference meeting sessions, and telephone conferences and e-mail discussion groups.

Ensuring that Army installations can comply with the hundreds of CAA rules that continue to be promulgated under the CAAA of 1990 requires both that the rule requirements be possible for Army to comply with, and that all Army personnel and organizations whom the rule will affect be aware of the actions that these rules require of them.

Accomplishments and Results

Army organizations affected by CAA rules are aware of the actions they must take to ensure that Army complies with these rules. Rule requirements are written so that Army can comply with them. Support to the Army includes providing Air Emissions Inventories to Army installations, guidance papers on all new rules and significant CAA issues, discussion forums for determining the best compliance strategies for new rules, and support from Army laboratories, centers, offices and headquarters to provide installations with the new materials and technologies necessary to comply with these new rules.

Points of Contact

Paul Josephson
Denean Summers

Program Partners

U.S. Army Environmental Center
U.S. Army Center for Health Promotion and Preventive Medicine
U.S. Army Office of the Directorate of Environmental Programs
U.S. Army Acquisition and Pollution Prevention Support Office
U.S. Army Engineering Research and Development Center
Major Army commands
Naval Facilities Engineering Support Center

Compliance: The Watershed Management Program (Clean Water Act & Safe Drinking Water Act)

The Clean Water Act (CWA) was enacted in 1972 as the Federal Water Pollution Control Act, and was amended in 1977 and 1987. The objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing the discharge of pollutants and toxics into the waters of the United States, thereby ensuring fishable and swimmable waters. The Safe Drinking Water Act (SDWA), which regulates and establishes standards for pollutant levels in drinking water from surface and ground water, was enacted in 1974 and was amended in 1986 and 1996. The purpose of the U.S. Army Environmental Center (USAEC) Watershed Management Program is to integrate the CWA, SDWA and all regulatory programs (Resource Conservation and Recovery Act; Federal Insecticide, Fungicide and Rodenticide Act; Comprehensive Environmental Response, Compensation, and Liability Act [Superfund]; Toxic Substance Control Act, etc.) driven by regulatory standards to protect water quality for its intended purpose (fishing, swimming, drinking). This program will assist the Army in achieving the objectives of the CWA, while also representing the Army and protecting Army interests when proposed environmental regulations under this Act could negatively impact training, Army financial resources, or overall mission success. The Watershed Management Program provides comments to the federal U.S. Environmental Protection Agency (EPA) on proposed rules that may impact the Army, provides technical and information support to the Headquarters, Department of the Army, and provide environmental guidance and support to major Army commands and Army installations to ensure compliance with CWA regulations.

Watershed Management Program

Recent Environmental Protection Agency rulemakings and guidance clearly demonstrate that future regulations under the CWA will be approached from a watershed perspective. CWA regulations are now "pulling in" requirements from other laws in order to move the regulated community towards watershed management and planning, as well as towards pollution prevention. Additionally, both CWA and SDWA rules for water quality are being revised at an escalating rate, and these revisions, numerous revised Acts, executive orders, and initiatives (e.g., former-Vice President Al Gore's 1998 Clean Water Action Plan Initiative that inspired the development of the Unified Federal Policy for watershed management, along with many other water management actions), are directing the Army to adopt a watershed protection approach to site management.

In response to these challenges, the USAEC Watershed Management Program looks collectively at the CWA and SDWA, other environmental regulatory requirements, and other installation management programs, such as pollution prevention, conservation, facility planning, range management and technology. The program approaches new regulatory requirements from a watershed perspective by consolidating information, identifying and prioritizing focus areas within installation boundaries, and overlaying and incorporating the compliance goals of the Army with the water quality goals of the overall watershed.

Purpose

To support and assist installations in meeting all current and future compliance requirements and goals that impact water quality by promoting and implementing watershed management and planning; to identify and assess installation activities to develop baselines of installation land use categories that may affect the watershed; and to use watershed assessment as a tool to determine project funding priorities.

Benefits

Successful watershed management will enable installation environmental program managers to work with other installation personnel to consolidate environmental and installation data; better identify and prioritize problem areas on an Army installation; determine applicable regulations that impact their activities; form federal, state and local partnerships in the watershed; promote the automation of information collection, reporting, and sharing; and implement more effective and holistic solutions by linking projects to quantifiable solutions (pollution prevention methods, best management plan, conservation, effluent trading, Environmental Management Systems [EMS], and partnerships). An effective watershed management program will also reduce Enforcement Actions and help the Army to delineate installation impacts on watershed vs. impacts from other landowners.

Technology Users

Assistant Chief of Staff for Installation Management and the Office of the Director of Environmental Programs at Headquarters, Department of the Army, installation environmental and other program managers, major Army commands, Army installations, and federal, state, and local partnerships.

Description

The Watershed Management Program is divided into three CWA and SDWA programs: (1) Water Quality Standards, including Total Maximum Daily Loads (TMDLs), and effluent guidelines, (2) Source Water Assessment and Protection, and Drinking

Water Maximum Contaminant Levels (MCLs), and (3) storm water. The program was developed following the initiation of numerous watershed protection strategies by the EPA. First, the SDWA amendments in 1996 required states to identify vulnerable sources of drinking water and use this information as one of the possible criteria for determining under the CWA which waterbodies were impaired and should be placed on the state-303d list (CWA-TMDL regulation), and what standards should be set for drinking water. This led to the development of the federal Multi-Agency Source Water Agreement, to nurture existing or new partnerships between federal agencies for preparing and implementing source water assessments and drinking water protection programs. Additionally, other new and proposed rules were developed as compliance tools for encouraging water management by watershed, including the CWA TMDL rule, the CWA Storm Water Phase I and II regulations, the SDWA Source Water Assessment and Protection rule, and the Drinking Water Management Team).

Accomplishments and Results

Accomplishments include TMDL analysis and impact to installations; Storm Water Phase II analysis and impact to installations; and development of the DoD Watershed Protocol and Guidance to address installation compliance and impact to their watershed. Results include increased awareness to major Army commands and installations on watershed conditions and requirements.

Limitations

Integration across Army pillars and central funding for compliance, reorganization of the Army, as well as future management through an EMS for water, are limitations to the program.

Follow-On Program Requirements

To adequately address future CWA and other environmental compliance requirements that regulate or manage discharges to waterbodies for various purposes (e.g., Resource Conservation Recovery Act; Clean Air Act [Deposition]; SDWA; Federal Insecticide, Fungicide and Rodenticide Act; Endangered Species Act; Comprehensive Environmental Response, Compensation, and Liability Act; Coastal Zone Management Act; Sikes Act, etc.). Army installations must have the capability to evaluate the activities that impact a watershed, develop pollution prevention and/or restoration plans, and address and correct impairments to a watershed caused by Army activities. However, the current and future regulatory climate of complicated, and often overlapping, environmental regulations may overwhelm installation range and environmental managers. These managers often need to balance Army training needs with environmental compliance responsibilities and increasing encroachment from outside installation boundaries.

To achieve environmental compliance goals and ensure that all program areas on an installation are better informed, there is an Army need to consolidate and manage many programs, and to provide program managers with access to the larger compliance picture on an installation. The DoD has developed a Watershed Assessment Protocol as part of an integrated watershed management tool to comply with CWA, SDWA, and other regulatory requirements. This watershed management tool is designed to help installation environmental, planning, and engineering programs to work together to improve the conditions on their installation and in their watershed. Compliance for facility activities is likely to be focused more on water quality impairment (drinking water/source water), endangered species, critical habitat, and other laws and priorities. Consolidating these programs

will help to reduce redundancy and allow for a quick response to Armywide issues.

Point of Contact

Georgette Myers

Program Partners

U.S. Army Corps of Engineers Construction and Engineering Research Laboratory
U.S. Army Center for Health Promotion and Preventive Medicine
Headquarters, Department of the Army
Army Environmental Policy Institute
Universities
Other federal agencies
Regional offices
State offices

Publications

Water Quality Standards, including TMDLs, and effluent guidelines

- *Effects of Total Maximum Daily Loads (TMDLs) on Army Installations.*

Source Water Assessment and Protection, and Drinking Water Maximum Contaminant Levels

- *Source Water Assessment Guide and Templates.*
- *Fort Meade Source Water Assessment.*
- *Meeting the Requirements of the Wellhead Protection Program.*
- *Wellhead Protection Plan Model SOW.*

Storm Water

- *Army Storm Water Permit Implementation Handbook.* May 1994.
- *Storm Water Permits for Construction Activities: A Guide for Installations.* March 1996.
- *Storm Water Management Trainers Guide and Video Package.* September 1996.
- *DoD Implementation Guidance for Storm Water Phase II Regulations.* September 2000.
- *Regulatory Summary and Analysis: Re-issuance of the NPDES Storm Water Multi-sector General Permit for Industrial Activities.* May 2001.
- *Army Storm Water Short Fall Analysis.* December 2002.
- *Regulatory Summary and Analysis: Effluent Guidelines and New Source Performance Standards for the Construction and Development Category.* December 2002.

Watershed

- *DoD Watershed Assessment Protocol Template, Model Watershed Implementation Plan (management of program, partnering, and funding), and Users Guide.*

SDWA Initiatives Related to Watershed Management

- *UIC Information Paper: Army Guidance for Implementing the Class V Underground Injection Control Rule Revisions.* April 2000.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) is legislation governing the quality of public drinking water supplies within the United States. Under the SDWA, the Environmental Protection Agency is authorized to establish federal requirements for public water systems (PWSs). States and local authorities within their jurisdictions may also dictate standards that are more stringent than federal requirements. The U.S. Army owns and operates many PWSs that are subject to federal, state, and local drinking water regulations. The basic drinking water program management structure within the Army comprises several organizations, including the Office of the Director of Environmental Programs (ODEP), U.S. Army Environmental Center (USAEC), U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), U.S. Army Corps of Engineers (USACE), and major Army commands (MACOMs). USAEC serves several functions, including providing information and updates on upcoming rules, performing impact analyses, partnering with other agencies to develop guidance documents, and supplying data quality reviews.

Purpose

The USAEC SDWA Program provides support to Army installations and commands to help ensure that the quality and quantity of drinking water to installations meet regulatory requirements and are protective of Army soldier well-being.

Benefits

The USAEC develops tools and guidance that can be used to help the Army effectively manage and monitor its ability to meet current and future compliance requirements. By doing so, the Army is able to direct limited financial resources to the areas of most concern and can also avoid costly fines and penalties for noncompliant systems and/or activities.

Technology Users

Installations, Installation Management Activity (IMA) Regions, major commands, different Army agencies (ODEP, USACE, USACHPPM). Information is also shared with other SDWA points of contact at the Navy, Air Force, Marines, the Defense Logistics Agency, and Department of Defense (DoD).

Description

Overall, the Army has been able to satisfactorily meet the major objectives of the water quality management program. However, there are several challenges that may be faced at the installations. One of the major challenges is the aging and deteriorating infrastructures of most drinking water systems. This can have an impact on a system's ability to comply with current and upcoming regulations. Since sovereign immunity was waived in the 1996 SDWA amendments, this issue can also result in large noncompliance fines and penalties. In recent years, fiscal constraints have resulted in limited funding for repair and upgrade of drinking water systems.

Another high-visibility issue that is currently related to drinking water is the impact of Army training and mission-essential activities on drinking water sources. Any Army activities that are being conducted within an area that may impact a water source must be coordinated and planned so as to have as little impact as possible. As has been seen at some installations, mission-essential training activities can be stopped or severely limited by a regulatory agency.

USAEC addresses the above challenges by conducting the following activities:

1. Identifying all permitted systems and assessing Army water systems' compliance with current and future regulations.
    - Continue to update permit system information in a USAEC water database in order to determine impacts and budget requirements for future SDWA requirements.
    - Review new and revised regulations and prepare comments and/or impact assessments on proposed or final rules.
    - Assist other USAEC program managers who work on watershed protection, range management, etc., by providing information and data gathering support.
2. Developing guidance that will assist installations in determining the effect that current, amended or new compliance rules have on their water system operations to ensure adequate funds are programmed. This guidance is provided to HQ, IMA Regions, MACOMs and installations.
3. Evaluating privatization of the Army's water systems as an alternative to funding modernization projects using government funds.
4. Developing training tools and/or classes to keep Army installation personnel aware of new requirements or new tools that will assist them in meeting water regulations.
5. Assessing water needs (to help minimize and conserve water resources) and encouraging recycling/reuse of water. Integrate and assess SDWA compliance requirements at installations and pollution prevention initiatives.

Accomplishments and Results

USAEC has partnered with several other Army agencies (such as USACHPPM and USACE) and other DoD services to develop several guidance documents and tools that have been used at the installation level. By pooling financial and technical resources, more information and guidance documents have been developed for use DoD and Armywide. These tools help installations comply with new requirements (such as that for the Consumer Confidence Reports). Impact analyses for regulations have also been used by both Army management (ODEP, IMA Regions, and MACOMs) and installations to help prepare and budget funds for upcoming requirements. Similar efforts will also be conducted in the future.

Limitations

Due to the workload, support contractors are needed to help execute the program. This support will be needed in the foreseeable future.

Follow-On Program Requirements

Perform regulatory review, guidance and policy recommendations, quality assurance and quality control review of Army data reporting systems, support to ODEP, representation on DoD committees, etc. on a continual basis.

Point of Contact

Misha Turner

Program Partners

Installations
IMA Regions
Major Army commands

U.S. Army Center for Health Promotion and Preventive Medicine
U.S. Army Corps of Engineers
Headquarters, Department of the Army
U.S. Navy
U.S. Air Force
U.S. Marine Corps
Defense Logistics Agency
Department of Defense

Publications

Information Paper. Requirements of the Public Health Security and Bioterrorism Preparedness and Response Act of 2002, Title IV-Drinking Water Security and Safety. USAEC. 2002.

Guidance For U.S. Army Installations To Comply With The Arsenic Final Rule. USAEC. 2002.

Guidance For Conforming to the Requirements of the Long Term 1 Enhanced Surface Water Treatment Rule. USAEC & USACHPPM. 2002.

Information Paper. Executive Summary, National Primary Drinking Water Regulations for Radionuclides Final Rule. USAEC. 2000.

Information Paper: Army Guidance for Implementing the Class V Underground Injection Control Rule Revisions. USAEC. 2000.

Guidance for Meeting Operator Certification Requirements Pursuant to the Safe Drinking Water Act (Water Supply Management Information Paper No. IP-31-023). USAEC & USACHPPM. 1999.

Guidance for Conforming to the Requirements of the Interim Enhanced Surface Water Treatment Rule and the Disinfectant/Disinfection Byproducts Rule (Water Supply Management Information Paper No. IP-31-024). USAEC & USACHPPM. 1999.

Safe Drinking Water Act Compliance Document. Joint Department of Defense document. 1999.

Safe Drinking Water Act Handbook. Joint Department of Defense document. 1999.

Model Wellhead Protection Plan. Joint Department of Defense document. 1999.

Consumer Confidence Report Template. Joint Department of Defense document. 1999.

Model Source Water Protection Plan. Joint Department of Defense document. 1999.

Safe Drinking Water Act (SDWA) Compliance Chart. Joint Department of Defense Poster. 1999.

Potable Water Emergency/Contingency Plan (Water Supply Information Paper No. IP 31-020). USAEC and USACHPPM. 1998.

Drinking Water System Compliance Assessment Protocol. USAEC and USACE. 1998.

Wellhead Protection Model Schedule of Services. USAEC and USACE. 1998.

Cross Connection Control Program Model Schedule of Services. USAEC and USACE. 1998.

Guidance for Providing Safe Drinking Water at Army Installations (USACHPPM Technical Guide No. 179). USACHPPM & USAEC. 1995.

Environmental Legislative and Regulatory Analysis and Monitoring Program

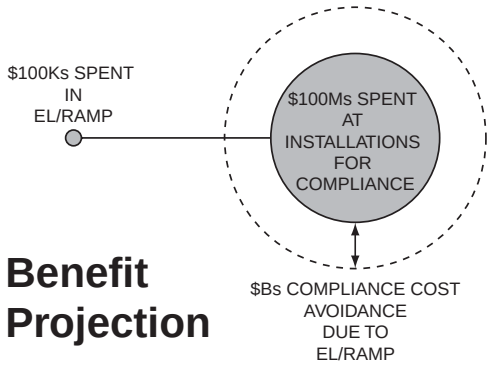
The military, like other federal agencies and the private sector, must comply with all relevant and applicable environmental laws and regulations, including future new requirements. To attempt to ensure that new environmental requirements are reasonable, based on sound science, and do not inadvertently impact military missions through unintended consequences, each military service monitors and analyzes various legislative and regulatory actions. In the Department of the Army, these actions are accomplished under the Environmental Legislative and Regulatory Analysis and Monitoring Program (EL/RAMP). In striving for these objectives, EL/RAMP actively educates the developers of environmental requirements and, for new requirements, positions the military to develop effective compliance strategies in a timely manner. For the Army, these programs support the four environmental pillars identified in the U.S. Army Environmental Strategy into the 21st Century (1992): Compliance, Restoration, Prevention, and Conservation.

Purpose

- Actively participate in the development of environmental requirements (e.g., treaties, Final Governing Standards, legislation, regulation) through a process of educating federal, state, and local legislators and regulators on the nature and impacts of proposed requirements on Army operations, readiness, and costs.
- Track, analyze, and prepare comments, statements, testimony, or position papers on proposed environmental requirements in federal, state, and local legislative and regulatory proceedings.

Benefits

Legislators and regulators issue new environmental requirements with awareness of their impacts on the Army, and the Army can meet new environmental requirements in a proactive and effective manner.



Benefit Projection

Applicability to Technology Users

Legislators and regulators who are contemplating placing new environmental requirements that will impact the Army; and commanders and environmental managers at all levels in the Army as they receive early warning information that will enable them to prepare to meet new environmental requirements in a proactive and effective manner.

Description

EL/RAMP is designed to inform Army leadership of new environmental requirements at their conception. As new environmental requirements are developed that have the potential to significantly impact the Army, EL/RAMP produces requirement summaries, information papers, impact analyses, and, to the organization developing the proposed requirement, comments. These requirements include those from the president, congress, federal regulatory agencies, states, territories, and local governments. This involves the military in critical stages of the lawmaking and regulation-writing processes.

Execution of EL/RAMP is a coordinated process accomplished with input and support from a variety of organizations including, for example, Headquarters, Department of the Army's Office of the Director of Environmental Programs; the Army Environmental Policy Institute; major Army commands; the other military services; the U.S. Army Center for Health Promotion and Preventive Medicine; and the U.S. Army Corps of Engineers' Hazardous, Toxic and Radioactive Waste Center of Expertise. For state legislative and regulatory activities, EL/RAMP actions are accomplished by the U.S. Army Environmental Center's (USAEC's) Regional Environmental Offices (REOs). Additionally, execution of EL/RAMP involves personnel from a wide variety of disciplines – environmental engineers, environmental scientists, natural resources specialists, acquisition specialists, program managers, and lawyers, just to mention a few.

Accomplishments and Results

The bullets below capture the more significant actions accomplished within the Pollution Prevention, Compliance, Acquisition and Technology (PCAT) Division in FY 2002. Note that it does not include any EL/RAMP actions related to state legislative and regulatory activity, as that is executed by the REOs.

- Reviewed, summarized requirements, identified Army impacts, and commented on a variety of proposed federal regulations. Reviewed and summarized requirements of a variety of new federal regulations. The lead for accomplishing these actions was executed by the appropriate technical media manager within the USAEC (e.g., Conservation Division for Endangered Species Regulations). Within the PCAT Division in FY 2002, these actions were executed for the Clean Air, Clean Water, Oil Pollution, Resource Conservation and Recovery, Safe Drinking Water, and Toxic Substances Control Acts. Army participation in the rulemaking process shows results, with the most significant action occurring on the proposed Surface Coating of Miscellaneous Metal Parts and Products rule as well as the proposed Surface Coating of Plastic Parts and Products rule. Communication with the Environmental Protection Agency (EPA), prior to the publication of the proposed rules, resulted in EPA planning to exclude the military from these rules and develop a military-specific rule instead. This change, as of the end of FY 2002, has a potential compliance cost avoidance to the Army alone of at least $300 million.

- Tracked and prioritized over 700 actions planned by federal regulatory agencies developing new environmental regulations (review of biannual Unified Agenda of Regulatory and Deregulatory Actions [Unified Agenda] for actions related to all four Army environmental pillars). Tracked the FY 2002 Federal Register activity related to these actions (55 regulations). Using the Unified Agenda analysis data, planned resulting Army courses of action. Identified and tracked planned and accomplished Army actions. Tracking was accomplished through the use of two related databases – the Semiannual Regulatory Screening (SARS) database and the Activity Planner and Tracker database. These two databases are the program's major reporting and analysis tools, enabling the USAEC to prioritize federal regulatory activities and plan our courses of action, regardless of which USAEC Division executes each action. Other FY 2002 accomplishments included fine-tuning these databases to improve use of the data for planning, tracking, and reporting. Two examples of this fine tuning are (1) incorporating a feature that ensures resources are not wasted on tracking nonpriority actions, and (2) enabling faster and easier identification of actions with a potential impact on the Army, which are reported in the Unified Agenda for the first time.
- Prepared draft testimony, in full coordination with the Office of the Director of Environmental Programs, to inform Congress about the Army's FY 2003 environmental requirements. Summarized the environmental requirements of the FY 2002 Department of Defense (DoD) Authorization and Appropriations Acts. Summarized the environmental requirements of the bills leading up to the passage of the FY 2003 DoD Authorization and Appropriations Acts, an action that will be finalized in FY 2003 upon passage of the acts.
- Promoted the establishment of an Army Environmental Legislative Committee. The Committee is to serve as the coordinating body within the Army, facilitating effective participation and representation of the Army's interest in all federal environmental legislative processes. This Committee is to be officially established by the Deputy Assistant Secretary of the Army for Environment, Safety, and Occupational Health in FY 2003.

Limitations

A significant number of new environmental requirements are proposed annually by federal, state, and local legislators and regulators. The EL/RAMP process involves sifting through all the proposed requirements and identifying those that are environmental in nature, those that have the potential to impact the Army, and the nature and significance of the impact. The challenge for an efficient implementation of EL/RAMP is to maximize the return on investment by focusing only on those proposed requirements where Army participation in the development process (1) reduces or eliminates Army impacts, or (2) enables the Army to meet new requirements in a proactive and effective manner.

Follow-On Program Requirements

This is an annual recurring program that will continue as long as new environmental requirements are being issued by legislators and regulators. The bullets below identify the more significant FY 2003 actions planned.

- Review, summarize requirements, identify Army impacts, and/or comment on a variety of proposed and final federal regulations. PCAT Division activity is planned against at least 68 proposed/final federal environmental regulations that are to be published in FY 2003. The EL/RAMP team will also be documenting USAEC activity on 23 additional regulations during the fiscal year, where lead activity is in another division. Continue to improve communication with impacted Army activities to enable, among other actions, timely identification of requirements in the Programmatic Objective Memorandum.
- Review and prioritize actions planned by federal regulatory agencies developing new environmental regulations (two reviews of biannual Unified Agenda). Identify/revise planned Army courses of action. Track planned and accomplished Army actions through the SARS and Tracker databases.
- Enhance EL/RAMP tracking tools to track USAEC actions accomplished against actions other than just federal regulations (e.g., against federal legislative activity).
- Review, summarize requirements, identify Army impacts, and/or draft testimony on proposed federal environmental legislative activity with the potential to significantly impact the Army. This action will be done in support of the future Army Environmental Legislative Committee. Additionally, summarize the environmental requirements of FY 2003 and, as it's being developed, the FY 2004 DoD Authorization and Appropriations Acts.
- In light of the accessibility of e-mail and the difficulties encountered in obtaining Defense Message System addresses, evaluate the continued need for the DMS Mail List Address Group used to send Environmental Alerts to major Army commands and installations.

Point of Contact Pamela M. Klinger

Program Partners U.S. Army Environmental Center
Army Environmental Policy Institute

Compliance: The Clean Water Act

The Clean Water Act (CWA) was enacted in 1972 as the Federal Water Pollution Control Act, and was amended in 1977 and 1987. The objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing the discharge of pollutants and toxics into the waters of the United States, thereby ensuring fishable and swimmable waters. The U.S. Army Environmental Center (USAEC) Watershed Management Program and Wastewater Management Program work closely together to assist the Army in achieving the objectives of the CWA, while also representing the Army and protecting Army interests when proposed environmental regulations under this Act could negatively impact training, Army financial resources, or overall mission success.

The Wastewater Management Program provides comments to the federal U.S. Environmental Protection Agency (EPA) on proposed rules that may impact the Army, provide technical and information support to Headquarters, Department of the Army (HQDA), and provide environmental guidance and support to major Army commands (MACOMs) and Army installations to ensure compliance with CWA regulations.

Wastewater Management Program

Recent Environmental Quality Data have demonstrated that the majority of Army CWA Enforcement Actions (ENFs) result collectively from domestic wastewater treatment systems, industrial wastewater treatment systems, storm water systems, and discharges to publicly owned treatment works (POTWs). However, while the Army is confronted with the enormous cost of maintaining, upgrading, and replacing deteriorating wastewater treatment and pretreatment systems, collection systems, and infrastructure, the number and complexity of water quality and effluent standards regulations are continually increasing. In addition, newly promulgated and amended environmental regulations under the CWA are now also "pulling in" requirements from other environmental programs and moving the regulated community towards a total watershed management approach to include more planning and pollution prevention (P2).

In response to these challenges, the USAEC Wastewater Management Program provides technical support and guidance to the Assistant Chief of Staff for Installation Management (ACSIM) and Office of the Director of Environmental Programs (ODEP) at the HQDA, Installation Management Activity (IMA) Regions/MACOMs, and installations, in the areas of domestic and industrial wastewater systems, National Pollution Discharge Elimination System (NPDES) permits, pretreatment standards for discharges to POTWs, Army-owned wastewater treatment systems (WWTS), and federally owned treatment works (FOTWs), and sludge (bio-solids and residual solids) management.

Purpose

To support installation CWA compliance goals through pollution prevention (e.g., process changes, elimination or consolidation of pollutant sources, and the institution of pollution prevention treatment processes); to reduce the need for, and number of, NPDES permits on Army installations; to provide technical assistance and environmental guidance to Army installation wastewater treatment and pretreatment activities; to reduce ENF and environmental funding requirements; and to encourage and assist installations with conducting compliance capability assessments on WWTS (e.g., via Wastewater Compliance Assessment Protocols and other pretreatment/treatment system devices (e.g., oil/water separator (OWS) compliance assessments through the Joint-Service OWS Guidance/Training Support Package (TSP)).

Benefits

Successful wastewater management includes providing compliance capability assessments for WWTS and oil/water separators as a cost-effective means of comprehensively assessing the capability of systems to meet regulatory requirements. Other benefits of the Wastewater Management Program include increased Army representation in evaluating new environmental regulations, increased use

of pollution prevention to meet compliance, the reduction of NPDES permits and associated costs, more effective bio-solids and residual solids use, and improved CWA training through the distribution of environmental guidance for environmental program managers and installation personnel.

Technology Users

ACSIM and ODEP at HQDA, installation environmental and other program managers, IMA Regions/MACOMs, Army installations, and federal, state, and local partnerships.

Description

The primary legal driver behind the Army's Wastewater Management Program is the CWA. The major areas included in the program are domestic and industrial wastewater systems; NPDES permits; pretreatment standards for discharges to POTWs, Army-owned WWTS, and FOTWs (if applicable); and sludge (bio-solids and residual solids) management.

The most significant regulatory action anticipated to impact the Army Wastewater Management Program in the near future is the Effluent Guidelines and Standards for the Metal Products and Machinery (MP&M) Category, Phases 1 and 2. The MP&M proposed rule, released by the EPA on 3 January 2001, proposes effluent limitations guidelines and pretreatment standards for some wastewater discharges associated with the operation of new and existing MP&M facilities. However, as required under federal law, the National Pretreatment Standards regulate pollutant discharges to POTWs only. Therefore, pretreatment standards under MP&M could apply to Army activities that discharge to a POTW, Army wastewater systems that have been privatized and are then owned and operated by a POTW, or Army activities that have pretreatment requirements outlined in an existing NPDES permit. Examples of Army operations that are likely to be affected under MP&M include repair and maintenance areas at motor pools and aircraft hangars, electroplating operations, painting/paint-stripping operations for vehicles or equipment, and repair and maintenance areas for weapons, ammunition, and other ordnance. A future MP&M rule could require installations to install process changes, new wastewater and/or pretreatment systems, and/or employ more innovative treatment technologies. The final rule was scheduled to be promulgated 31 December 2002.

New regulations promoting watershed management, like the EPA's Total Maximum Daily Loadings (TMDLs), are another significant regulatory action that is likely to affect the wastewater management program and increase restrictions on NPDES permitted activities. Army installations that maintain (an) NPDES permit(s) for their wastewater treatment system(s) will most likely be impacted by the TMDL regulations if they discharge wastewater to an "impaired" water body (see Watershed Management Program description). TMDL requirements are likely to require increased discharge monitoring requirements, and potentially more stringent discharge limits, for Army wastewater treatment systems. In some cases, this may require pollution prevention measures, such as process changes (e.g., cutbacks or elimination of processes if possible, and/or the elimination or substitution of certain chemicals) to reduce or prevent hazardous materials from entering wastewater systems. In other cases, this may ultimately require plant and system upgrades for facilities that do not currently have the compliance capabilities to meet the new discharge limit. This rule may also increase the number of NPDES permits the Army is required to maintain.

The Wastewater Management Program evaluates and prioritizes these and other

relevant proposed and final rules, develops Army comments, works with other Department of Defense (DoD) components to develop DoD comments, and generates information papers and guidance documents to support wastewater compliance. Environmental reporting quality assurance and quality control and analyses are also accomplished under the program.

Accomplishments and Results

The USAEC Wastewater Management Program managers worked in partnership with the DoD Clean Water Act Services Steering Committee to develop and distribute the Joint-Service OWS Guidance TSP. This comprehensive guidance and training will encourage P2 in the field, provide focused training for OWS users and operations and maintenance/ inspection personnel, and supply comprehensive OWS reference information to environmental program managers, decision-makers, and others on DoD installations. The OWS Guidance/TSP was distributed to major Army commands, installations, and other DoD components, including the Navy, Air Force, and Marines, in August 2001. In October 2002, USAEC implemented the OWS Guidance/TSP at Fort Bliss, Texas. This field implementation of the OWS Guidance/TSP was conducted to help the installation to realize significant cost savings and increased wastewater and pretreatment system compliance. Additional goals for field implementation of the OWS Guidance/TSP include reducing repair/ replacement costs of OWSs and grease traps in the environmental program requirements, promoting pollution prevention on Army installations and encouraging comprehensive evaluation and proper maintenance of OWSs.

Limitations

Ever-increasing regulations, reductions in personnel and resources, and deteriorating systems hinder MACOM and installation ability to implement and manage effective programs. The extent to which the wastewater management program can be integrated with watershed management initiatives will also determine, in large part, the future success of the program.

Follow-On Program Requirements

Proper fielding of the Joint-Service OWS Guidance/TSP at select Army installations will provide invaluable benefits towards improving compliance and reducing environmental funding requirements. The same is true regarding continual evaluation of Army WWTS by installation environmental program mangers.

Achieving new program goals for compliance will also require early planning, programming, and increased coordination with Army and multi-service action groups, as well as increased involvement in watershed management initiatives.

Point of Contact

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Program Partners

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U.S. Army Center for Health Promotion and Preventive Medicine
Headquarters, Department of the Army
Army Environmental Policy Institute
Universities
Other federal agencies
Regional offices
State offices

PUBLICATIONS

Wastewater Management Program

- *Joint-Service Oil/Water Separator Guidance and Training Support Package.* June 2001.
- *Proposed Rule, Metal Products and Machinery NPDES Effluent Guidelines and Pretreatment Standards, Executive Summary and Regulatory Analysis Paper.* February 2001.
- *Information Paper: Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards for the Transportation Equipment Cleaning Point Source Category; Final Rule.* October 2000.
- *Wastewater Systems Compliance Assessment Protocol.* December 1998.
- *Notice of Data Availability, Metal Products and Machinery Effluent Guidelines and Pretreatment Standards Regulatory Evaluation and Comments.* July 2002.
- *Update to the protocol for the preparation of Installation Pretreatment Programs.* February 2002.
- *Notice of Data Availability Standards for the Use or Disposal of Sewage Sludge, Regulatory Analysis.* August 2002.
- *Final Rule, NPDES: Regulations Addressing Cooling Water Intake Structures for New Facilities (Phase I), Regulatory Analysis.* January 2002.
- *Intake Structures for Existing Facilities (Phase II), Regulatory Analysis.* May 2002.
- *Sewage Sludge (Biosolids) Management Manual for Army Facilities.* April 1996.
- *TEC Guidance.*

To Be Published:

- *Fielding the Joint-Service Oil/Water Separator Guidance and Training Support Package to Select Installations.*
- *Final Rule, NPDES: Regulations Addressing Cooling Water Intake Structures for Existing Facilities (Phase II).*
- *Proposed Rule, NPDES: Regulations Addressing Cooling Water Intake Structures for Existing Facilities (Phase III).*
- *Proposed Rule, NPDES: Requirements for Municipal Sanitary Sewer Collection Systems, Municipal Collection Systems, and Sanitary Sewer Overflows.*
- *Effluent Limitations Guidelines, Pretreatment Standards for the Iron and Steel Manufacturing Point Source Category, Executive Summary.*

THE ARMY HAZARDOUS MATERIAL MANAGEMENT PROGRAM

The Army Hazardous Material Management Program (HMMP) is an integrated program that consists of 11 business practices that encompass multiple facets of hazardous material (HM) and hazardous waste (HW) management. With significant logistic, safety, and environmental concerns associated with HM and HW, a successful HMMP requires ongoing cooperation between the logistics and environmental communities. A fundamental aspect of an effective HMMP is the centralized management of HM/HW. To support this initiative, the Army selected the Department of Defense (DoD)-developed software tool, Hazardous Substance Management System (HSMS), as the automation tool for HM/HW management at installations Armywide.

PURPOSE

The purpose of the Army's HMMP is to reduce and prevent pollution by controlling and reducing the acquisition, use, handling and disposition of hazardous material and generation of hazardous wastes consistent with Army Environmental Management System (EMS) and sustainability objectives. The Army HMMP streamlines and consolidates existing tasks and provides data critical to the compliance with Executive Order (EO) 13148 and environmental regulatory guidelines.

The HMMP mission is an established regulatory requirement: Army Regulations 710-2, 200-1. Each garrison, area support group, unit and Army activity is responsible for reviewing business practices and ensuring the HMMP business practices are incorporated into day-to-day operations.

BENEFITS

Installations with an effective HMMP, who centrally manage and control their HM, have reduced inventories and improved personnel safety. Implementation of better business practices has helped many installations reduce HW quantities and disposal costs. Use of the HSMS software, in conjunction with improved business practices, has provided increased visibility and control of HM, enabled better shelf-life management and facilitated material reuse programs. These initiatives have helped the Army avoid millions of dollars of HW disposal and HM procurement costs. Additionally, the use of HSMS software as an automated tool to track HM and HW has aided installations in meeting their environmental reporting requirements.

TECHNOLOGY USERS

Department of Defense facilities that handle HM and HW and require an automated tracking/management system as part of a centralized or regional management concept. Approximately 180 Department of the Army, Navy, Marine Corps and Cost Guard sites are currently using HSMS Version 2.4.1.

DESCRIPTION

In the late 1980s, early 1990s, and again in 2000, commanders faced increased challenges relative to environmental management and tracking requirements mandated by EO 12856 and EO 13148, the Emergency Planning and Community Right-To-Know Act, as well as Occupational Health and Safety Administration requirements. DoD installations also recognized that lack of adequate HM visibility and control led to excessive HM inventories, which, in turn, led to high waste-disposal costs and unnecessary personnel exposures. Additionally, commanders faced potential strict criminal liabilities under the Resource Conservation and Recovery Act.

To address these issues, installations were developing nonstandard, ad hoc automated tools to assist HM/HW management. In response, DoD decided to eliminate redundancy and unnecessary costs by developing a standard, automated tracking tool: HSMS. The intent was to field HSMS in conjunction with other business practices to help installations manage HM while enhancing pollution prevention opportunities and environmental compliance. This management approach is referred to as HMMP/HSMS.

The fundamental purpose of the Army HMMP is to minimize, track, and control the ordering, storing, distribution, use and disposition of hazardous materials through effective use of single point control. It also facilitates tracking of hazardous wastes from generation to final disposal. The HMMP includes the management of and tracking the distribution of ozone-depleting substances (ODSs). Essential to the program is the requirement to obtain and maintain updated copies of manufacturers' Material Data Safety Sheets for all hazardous materials brought onto the installation.

Army policy letters in 1995 and 1996 directed that HSMS software be the only authorized HM/HW tracking system, and funding for technical and software support is only provided to sites using HSMS. However, installations operating other systems can continue to use those systems. With the Transformation of Installation Management and the establishment of the Installation Management Activity Regions (IMA-R), Assistant Chief of Staff for Installation Management (ACSIM) is looking to field a standard set of business practices in FY 2004 that focus on centralized or regional management of HM/HW, Armywide. These practices will include the use of an automated tracking tool to best meet functional and technical requirements. The fielding of standardized HMMP business practices will ensure that Army installations have the maximum opportunity to integrate best management practices, environmental compliance, and other regulatory requirements into daily activities in accordance with EMS and sustainability objectives.

Accomplishments and Results

The Army began fielding the HMMP/HSMS Program to selected installations in early FY 1996. By the end of FY 2002, 65 sites in the continental and outside continental United States achieved an initial operational capability. Over $12 million in HM/HW cost avoidance has been reported to date as a result of implementing this program. Although successful, the initial operating capability represents an incomplete implementation of HMMP. Consequently, there is a large degree of variation in the way in which installations are operating their programs. Working with all stakeholders, in FY 2002 USAEC developed a standard HMMP that could be implemented at all Army sites. If approved by ACSIM and the Office of the Deputy Chief of Staff for Logistics, and implemented, this HMMP will allow the installations to maximize the benefits achievable from centralized management practices. Also, this approach will provide higher authorities the ability to monitor program performance at a regional or Department of the Army level. Following the (anticipated) approval of the HMMP in the second quarter of FY 2003, USAEC will work with the installations, IMA-R and the U.S. Army Corps of Engineers to develop a fielding plan and schedule that will ensure that the standard HMMP is implemented in a cost-effective way.

Concurrently, USAEC is assisting ODEP in the development of any necessary revisions to AR200-1 and PAM AR200-1 related to the standard HMMP. USAEC will also continue to support the Army's HMMP by helping installations develop and implement their

programs by identifying training requirements and providing other functional sustainment assistance related to HMMP/HSMS.

Follow-On Program Requirements

The immediate requirement is to obtain approval of the standard HMMP document. Approval of this document will allow USAEC to coordinate with ODEP/ACSIM and the installations to identify (1) funding requirements for fielding the program, and (2) funding requirements necessary to maintain Standard Levels of Service for the operation of HMMP at an installation. The current plan is to complete fielding of a standard HMMP to the Army in FY 2004 to FY 2007. USAEC will work with stakeholders to develop a cost-effective fielding plan in the second or third quarter of FY 2003. USAEC will then initiate coordination with the installations, IMA-R and the U.S. Army Corps of Engineers to develop a schedule that will ensure efficient fielding of the standard HMMP.

The long-term program requirement is to maximize the data in the HSMS database for environmental compliance reporting, pollution prevention opportunity assessments and program performance.

Point of Contact

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Program Executive Office, Standard Army Management Information Systems, HSMS Project Office


ACQUISITION
PROGRAM

Environmental Quality Life Cycle Cost Estimate

Purpose

In response to the 1995 Defense Appropriations Act requirements, which requires the Program Manager's Office (PMO) to generate an Environmental Quality Life Cycle Cost Estimate (EQLCCE), the Department of Defense (DoD) and the Services were interested in developing methodologies and databases for the analysis of environmental costs of major defense acquisitions. Responsibility for performing environmental costs analysis of Major Defense Acquisition Programs (MDAPs) in the Army is borne by the responsible PMO, U.S. Army Cost and Economic Analysis Center (CEAC) and various DoD agencies. Program managers (PMs) who acquire, fund, produce and maintain weapon systems, in accordance with DoD 5000.2-R, must determine environmental costs and impacts of weapon systems from conception through disposal.

Because of rising concerns about hidden environmental costs associated with Army weapon systems, a number of studies, including audits performed by the DoD Inspector General (IG) and the Army Audit Agency (AAA), have examined the Environmental, Safety and Health (ESH) aspects of weapon systems acquisition. An Office of the Assistant Secretary of the Army for Installations, Logistics and Environment (OASA (ILE)) briefing to OASA Research, Development and Acquisition (RDA) on 9 September 1997 stated that over 75 percent of all Army pollution is caused directly or indirectly by weapon systems. Approximately 1.8 percent of the Army's Total Obligation Authority is spent annually on restoration, conservation, compliance and pollution prevention. Consequently, every effort should be made to reduce the various costs when possible.

Benefits

The most significant benefits of performing an EQLCCE for a weapon system are:

- Improving the visibility of proven and potential environmental impacts and costs of the weapon system
- Providing opportunities for the PM, developer and fielding installations to identify and reduce environmental costs and determine alternative decisions associated with the weapon system
- Reducing the potential risk of remediation or restoration of environmental impacts, with potential cost savings to the Army
- Providing an independent cost estimate acceptable to CEAC for validation
- Assisting the PM in defining compliance issues with federal environmental regulations and DoD acquisition requirements.

Technology Users

Program executive officers (PEOs), PMs, other acquisition officials and CEAC.

Description

The EQLCCE identifies and quantifies environmental costs over the entire life cycle for a weapon system. The EQLCCE is prepared in accordance with the latest version of CEAC's Cost Analysis Manual (CAM). The EQLCCE information can be used to identify areas of improvement such as material substitution, process changes and/or recycling, and potentially reduce the overall cost of the weapon system. An environmental Work Breakdown Structure (WBS) format is used to compile individual environmental cost elements and total costs for the entire program. The WBS includes all weapon system cost elements associated with environmental

and regulatory compliance.

The U.S. Army Environmental Center (USAEC) has completed many EQLCCEs for different types of weapon systems. The USAEC continues to develop environmental costing information on weapon systems. This effort will greatly improve environmental costing for weapon system PMs.

Accomplishments and Results

The USAEC has completed the following EQLCCEs for each type of weapon system:

- Aviation Systems: RAH-66 Comanche, CH-47F Chinook, AH-64D Apache, Tactical Unmanned Aerial Vehicle and UH-60 Blackhawk
- Ground Combat Systems: Bradley M2A3 Infantry Fighting Vehicle, Excalibur, Stryker and Crusader
- Electronic/Automated Software/Communication Systems: Joint Tactical Radio System, Warfighter Information Network-Terrestrial, Joint Simulation System, Joint Land Elevated Netted Sensor, Adv. Threat Infrared Countermeasure Common Missile Warning System, and Global Combat Support System
- Artillery/Missile Systems: Tactical High Energy Laser, Patriot Advanced Capability-3, Guided Multiple Launch Rocket System, High Mobility Artillery Rocket System, Army Tactical Missile System – Brilliant Anti-Armor Submunition, Multiple Launch Rocket System, and Theater High Altitude Aerial Defense Radar
- Soldier Support Systems: Land Warrior

The USAEC plans on developing EQLCCEs for these types of weapon systems in the future:

- Ground Tactical Systems
- Engineer/Construction Systems
- Individual and Crew-Served Ground Weapon Systems

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U.S. Army Cost and Economic Analysis Center
Various program manager offices

NEPA Manual for Materiel Acquisition

Recent government audits of selected Defense Department acquisition programs revealed that compliance with the National Environmental Policy Act (NEPA) had not been properly factored into the acquisition management process. This manual will provide information to help program managers (PMs) consider NEPA during materiel acquisition.

Purpose

To provide advisory information for integrating the requirements of NEPA and Army Regulation (AR) 200-2, Environmental Analysis of Army Actions, into the materiel

acquisition process.

Benefits

This manual will simplify the NEPA process so PMs understand when to use a Categorical Exclusion (CX) or Record of Environmental Consideration (REC), an Environmental Assessment (EA) or Environmental Impact Statement (EIS), and feel comfortable with each approach.

Technology Users

Department of Defense (DoD) PMs and program executive officers (PEOs).

Description

NEPA requires the identification and analysis of potential environmental impacts of certain federal actions and alternatives before those actions can be initiated. The law also contains specific requirements for informing and involving other federal and state agencies and the public. NEPA requires a systematic, interdisciplinary approach to analyzing and considering environmental factors when planning or conducting federal agency programs and projects. The process for implementing the law is codified in Council on Environmental Quality Regulations, 40 Code of Federal Regulations (CFR) Parts 1500-1508.

Recent government audits revealed that NEPA compliance had not been properly factored into several DoD acquisition programs. This was likely due, in part, to the false assumption that NEPA is primarily of concern only to installation and facility engineers.

This manual will provide advisory information for integrating the requirements of NEPA and AR 200-2 into the materiel acquisition process. The information will assist PEOs and PMs with the implementation of NEPA policies and procedures as they pertain to Army materiel acquisition.

There is a significant effort within DoD to reduce the number of mandatory policies, procedures and practices for the acquisition of weapon systems and other Army materiel. This manual will offer PEOs and PMs flexibility in satisfying the goals of NEPA.

This manual is one of a set of four instructional manuals covering the integration of NEPA into Army activities. Previously published manuals cover base realignment and closure, installation operations, and on- and off-post training NEPA considerations. The manual represents a "living document" that will change as future improvements to the acquisition process occur.

Accomplishments and Results

The U.S. Army Environmental Center completed the final *NEPA Manual for Materiel Acquisition*. This edition, dated November 2000, updates the July 1999 *Final Draft NEPA Manual for Materiel Acquisition*. It incorporated the most current information contained in AR 70-1 (Army Acquisition Policy) and from the latest updates to DoD 5000.2-R (Mandatory Procedures for Major Defense Acquisition Programs and Major Automated Information System Acquisition Programs) and AR 200-2 (Environmental Effects of Army Actions). The USAEC has prepared a fact sheet for the *NEPA Manual for Materiel Acquisition* and has placed the fact sheet and a full copy of the manual on the USAEC Web page (http://aec.army.mil/).

Follow-On Program Requirements

NEPA compliance formerly provided by AR 200-2 has also been updated in 32 CFR Part 651; an approved updating of AR 200-2 is also anticipated in the near future. The *NEPA Manual for Materiel Acquisition* and supporting fact sheet are to

be updated by 30 September 2003 on the USAEC Web page to capture all changes to DoD Directive 5000.1 and DoD Instruction 5000.2, to AR 200-2, and to the updated guidance in the DoD Acquisition Deskbook.

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U.S. Army Space and Missile Defense Command
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Programmatic Environmental, Safety and Health Evaluation Guide

Department of Defense (DoD) Regulation 5000.2-R requires that all programs, regardless of acquisition category, include a programmatic environmental, safety and health (ESH) evaluation in their acquisition strategy. The regulation does not set a format for this evaluation but requires it to describe a program manager's (PM's) strategy for meeting ESH requirements, establishing responsibilities and tracking progress. Developing a guide for such evaluations will help PMs plan, execute and document actions that fulfill the ESH requirements of DoD 5000.2-R.

Purpose

To develop a guide for analyzing six specific ESH areas: National Environmental Policy Act (NEPA), Environmental Compliance, System Safety and Health, Hazardous Materials, Pollution Prevention, and Explosives Safety.

Benefits

The development of an ESH evaluation helps ensure that those actions that and documented.

Technology Users

DoD PMs and program executive officers (PEOs).

Description

DoD 5000.2-R requires that all programs, regardless of acquisition category, include a programmatic ESH evaluation in their acquisition strategy. The PM must initiate the ESH evaluation at the earliest possible time in support of a program initiation decision (usually Milestone I) and update the evaluation throughout the program's lifecycle.

The *Programmatic Environmental, Safety and Health Evaluation (PESHE) Guide* can assist PMs in meeting ESH integration requirements by providing a description of techniques, practices, and processes for integrating ESH-related activities into the systems engineering program design process. It can help to document a program's current ESH status, establish a process for monitoring changing compliance requirements, integrate ESH requirements into the program's acquisition strategy and other program documentation, and establish a plan of action to meet future ESH requirements. The guide is intended to provide information that will help make the ESH evaluation a useful tool for PMs in carrying out their responsibilities to consider ESH requirements and issues early in the design process and will make sure potential program showstoppers are identified and resolved early in the acquisition process.

Accomplishments and Results

- Received and incorporated comments on the draft *PESHE Guide*.
- Developed the coordinating draft of the *PESHE Guide* and distributed it for comments.
- Obtained PEO comments.
- Developed an updated guide (July 1999) based upon PEO comments.
- Because of recent changes to the DoD 5000 Series, and concurrent changes to the DoD Acquisition Deskbook, initiated updates to the *PESHE Guide*.
- Published October 2001 *Final PESHE Guide* that incorporated information from the updated and approved DoD 5000.2-R.
- Prepared a fact sheet on the October 2001 *Final PESHE Guide* and placed the updated *PESHE Guide* on the USAEC Web page.

Follow-On Program Requirements

Effective 30 October 2002, DoDD 5000.1 and DODI 5000.2 were replaced by interim guidance and DoD 5000.2-R was cancelled. The Secretary of Defense has determined that these documents "required revision to create an acquisition policy environment that fostered efficiency, flexibility, creativity, and innovation." Replacement documents for DoD Directive 5000.1 and for DoD Instruction 5000.2 shall be issued prior to 1 March 2003. The revision of three documents (several hundred pages) to two documents (34 pages) has occurred. The major program requirements (total life cycle management and cost including sustainment and disposal, inclusion of environmental costs in program budget, management of hazardous materials, NEPA, and compliance with domestic and international laws and treaties) are still in place. NEPA compliance formerly provided by AR 200-2 has also been updated in 32 CFR Part 651; an approved updating of AR 200-2 is also anticipated in the near future. The DoD Environment, Safety and Occupational Health Integrated Process Team discussed simplifying the "suggested" PESHE Outline included in the former DoD 5000.2-R (which now will be retained as guidance information in the DoD Acquisition Deskbook) and providing the PMs with flexibility in how they provide the necessary information, as long as the ESH risks (ESOH Compliance, NEPA, Safety and Health, Hazardous Materials Management, Pollution Prevention, and Explosives Safety) are identified, a strategy for integrating ESH considerations into the systems engineering process is identified, ESOH roles and responsibilities are identified, a method for tracking progress is included, and a compliance schedule for NEPA is included. This streamlined PESHE Outline should be finalized by March 2003. USAEC shall update the *PESHE Guide* and the fact sheet (on the USAEC Web page) by September 2003 to capture all changes to DoD Directive 5000.1 and DoD Instruction 5000.2, to AR 200-2, and to the updated PESHE Guidance in the DoD Acquisition Deskbook.

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Bradley A3 Upgrade Program Environmental Quality Life Cycle Cost Estimate

The Department of Defense (DoD) requires weapon system program managers (PMs) to integrate environmental considerations into their acquisition strategies and include environmental costs in their program cost estimates. The U.S. Army Environmental Center (USAEC) has been asked to assist the Bradley A3 Upgrade program office and the U.S. Army Cost and Economic Analysis Center (CEAC) in the development of life cycle environmental costs for the Bradley A3 Upgrade ground combat system.

Purpose

To develop and verify the environmental lifecycle costs for the Bradley A3 Upgrade ground combat system.

Benefits

By identifying program environmental cost elements, weapon system PMs can make informed decisions on environmental issues by evaluating their impacts on long-term costs. Identification of environmental costs helps the Army develop more accurate and complete life cycle cost estimates for weapon system acquisition programs.

Technology Users

Program Executive Officer (PEO)-Ground Combat Support Systems, PM-Bradley A3 Upgrade and the U.S. Army CEAC.

Description

In a 1997 audit, the DoD Inspector General found that environmental costs were not fully included in the Comanche program's cost estimates. In fact, the Inspector General found the Comanche helicopter cost estimate might be understated. As a result of the audit, PM-Comanche and CEAC requested USAEC assistance in identifying and estimating life cycle environmental costs.

After completing the environmental life cycle cost estimate for the PM-Comanche, USAEC provided similar data collection and coordination efforts with PM-Apache (AH-64D) and with PM-Chinook (CH-47F/Improved Cargo Helicopter) to develop environmental life cycle cost estimates for these programs. USAEC is also developing an environmental life cycle cost estimate handbook for rotary wing aircraft.

USAEC's next step was to gather environmental life cycle cost estimates for ground combat systems with the Bradley A3 Upgrade program selected as the first system and Crusader selected as the second. There are two versions of the Bradley Fighting Vehicle Systems (BFVS): an M2 Infantry Fighting Vehicle (IFV) and an M3 Cavalry Fighting Vehicle (CFV). A total of 1,109 Bradleys will be modified to the A3 configuration. On 17 March 2000, a meeting was conducted at the PM-Bradley to coordinate the preparation of the Bradley A3 modification environmental life cycle cost estimate. This project required analysis of the entire acquisition plan for the Bradley A3 Upgrade ground combat program, identification of all activities with environmental impacts, and estimation of all associated environmental costs. Costs were correlated to a work-breakdown structure for the program and documented using CEAC-approved cost-documentation formats.

Lessons learned from this and other projects on ground combat systems will be included in a ground combat system environmental cost handbook. The handbook will serve as a guide for PEOs and PMs to estimate their programs' environmental

life cycle costs.

Accomplishments and Results

USAEC conducted data collection efforts at United Defense Limited Partnership (UDLP) Lemont Furnace, Pennsylvania, and UDLP-York Pennsylvania, at PM Bradley A3 (Warren, Michigan), at Fort Hood, Texas, and in Germany, Korea, and Alaska. The environmental life cycle cost estimate for the Bradley A3 Upgrade program was completed in February 2001 in preparation for the Cost Review Board (CRB) and the Acquisition Review meetings that took place in March 2001. The Bradley A3 Upgrade program successfully completed their CRB and Army Systems Acquisition Review Council/Committee reviews with no problems regarding successful integration of ESOH considerations into the system design and accurate quantification of environmental quality life cycle quality costs.

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U.S. Army Cost and Economic Analysis Center
PM-Bradley A3 Upgrade
United Defense Limited Partnership
Fort Hood
U.S. Army Europe
U.S. Army Pacific

Methodology for CARD Environmental Quality Input

The U.S. Army Environmental Center (USAEC) prepared a Methodology for Developing Environmental Quality Requirements for Cost Analysis Requirements Description (CARD). The document was prepared for materiel acquisition program/project office personnel charged with the responsibility of documenting environmental quality activities so that their cost can be estimated in program life cycle cost estimates (LCCEs).

Purpose

The basic CARD structure outline is presented in DoD 5000.4-M – Cost Analysis Guidance and Procedures. The CARD outline, as presented, fragments environmental quality requirement inputs in several sections and does not facilitate quantification of all requirements. The methodology prepared recommends that CARD authors develop an environmental quality appendix for the more complete identification of a program's life-cycle environmental quality requirements.

Benefits

DoD 5000.2-R (contained in the DoD Acquisition Deskbook as guidance information) requires that environment, safety and occupational health (ESOH) be integrated into the systems engineering process that translates operational needs and requirements into a system solution including design, manufacturing, test and evaluation, and support processes and products. This recent guidance to environmental quality costing policy states that the cost estimate must present evidence that the environmental quality costs are adequately accounted for. In order for environmental quality costs to be adequately analyzed and included in the LCCE, all environmental quality requirements must be clearly identified in a program's

CARD. This CARD methodology is expected to make it much easier for the program manager (PM) to anticipate and include the environmental quality requirements that need to be included in the CARD. Chapter 6 of The Army Cost and Economic Analysis Center's (CEAC's) Cost Analysis Manual (CAM) shall also be used to assist PMs in preparing their Environmental Quality LCCE.

Technology Users

Department of Defense (DoD) PMs and program executive officers (PEOs), and Department of the Army and DoD cost analysts.

Description

Preparation of the environmental quality appendix is simplified by guiding the author of the CARD to quantify program data in accordance with six matrices (tables). Matrices presented include:

- Compliance
- Hazardous Material Management
- Pollution Prevention
- Conservation
- Remediation and Restoration
- Demilitarization and Disposal

Authors may use the matrices as templates to aid in documenting environmental quality program data for CARD input.

Accomplishments and Results

USAEC completed the draft *Methodology for Developing Environmental Quality Requirements for Cost Analysis Requirements Description (CARD)* in May 2001. USAEC reviewers forwarded their comments on the draft *Methodology for Developing Environmental Quality Requirements for Cost Analysis Requirements Description (CARD)*, and the final *Methodology for Developing Environmental Quality Requirements for Cost Analysis Requirements Description (CARD)* was published in November 2001. A fact sheet for the *Methodology for Developing Environmental Quality Requirements for Cost Analysis Requirements Description (CARD)* is included under the Acquisition tab on the USAEC Web site.

Follow-On Program Requirements

Place the *Final Methodology for Developing Environmental Quality Requirements for Cost Analysis Requirements Description (CARD)* on the USAEC Web site and inquire as to whether the DoD Acquisition Deskbook Integrated Process Team would be interested in placing this guide on the Deskbook or provide a link to the guide. Forward this guidance manual to the DoD Cost Analysis Independent Group for potential source material for the anticipated update during FY 2003 to DoD 5000.4-M (DoD Manual Cost Analysis Guidance and Procedures).

Point of Contact

Louis Kanaras

Program Partners

U.S. Army Environmental Center
U.S Army Cost and Economic Analysis Center
U.S. Army Space and Missile Defense Command
Teledyne Solutions Incorporated

Description of Proposed Action and Alternatives Development Guide

The Description of Proposed Action and Alternatives (DOPAA) forms the framework for conducting an environmental impact analysis in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. Comprising much of the beginning portions of any Environmental Assessment (EA) or Environmental Impact Statement (EIS), the DOPAA defines the scope of the action as well as viable or reasonable alternatives, and serves as the basis on which to predict potential impacts. Development of the DOPAA helps in early coordination with other Army offices and outside agencies and, in the case of the EIS, provides the foundation for conducting formal scoping. Most importantly for the decision maker, the DOPAA serves as the basis for understanding alternative approaches to meeting mission needs. A flawed or incomplete DOPAA can mislead or delay the NEPA analysis process, and open the way for public controversy or, in rare instances, a court order stopping the action.

Purpose

To provide proponents, preparers, and other NEPA analysis participants with a more structured approach to creating DOPAAs that lead to more effective and defensible environmental documents (EAs and EISs).

Benefits

By following the approach and procedures presented in this guide, users can reduce or eliminate the typical problems often associated with NEPA analyses, such as reanalysis of a constantly changing DOPAA, project delays, and cost overruns.

Technology Users

Department of Defense (DoD) program managers and program executive officers.

Description

Following the introduction of the guide in Chapter 1, Chapters 2 through 4 provide comprehensive guidance and information on DOPAA development. Chapter 2 identifies key players and describes their level of involvement in the DOPAA development process; Chapter 3 describes the components of a DOPAA, recommended formats to use, and the types of information that are normally included; Chapter 4 describes a multi-step process that can be used in the development of DOPAAs for larger and more complex Army actions (e.g., research and development projects, the fielding of new weapon systems, and large training exercises), including a review of methodologies for defining the proposed action and identifying possible alternatives.

Accomplishments and Results

The U.S. Army Environmental Center completed the draft *Guide to Development of the Description of Proposed Action and Alternatives (DOPAA)* in June 2001. USAEC forwarded review comments on the DOPAA manual and published the final *Guide to Development of the Description of Proposed Action and Alternatives (DOPAA),* available by November 2001. The final *Guide to Development of the Description of Proposed Action and Alternatives (DOPAA)* was posted on the USAEC Web site.

Follow-On Program Requirements

Inquire as to whether the DoD Acquisition Deskbook Integrated Process Team would be interested in placing this guide on the Deskbook or provide a link to the guide. Update the guide (if necessary) to capture all changes to DoD

Directive 5000.1 and DoD Instruction 5000.2, to AR 200-2, and to the updated guidance in the DoD Acquisition Deskbook.

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ESOH Compliance Guide for Army Weapon Systems

The U.S. Army Environmental Center (USAEC) has initiated development of the *Guide to Environmental, Safety, and Occupational Health (ESOH) Compliance for Army Weapon Systems*. This guide is being prepared for Army Program Offices and their environmental support personnel to assist them in maintaining program ESOH compliance throughout the life of each system.

Purpose

The guide is intended to provide information that will help clarify ESOH compliance for program managers (PMs) in carrying out their responsibilities to consider ESOH requirements and issues early in the design process, and throughout the program life cycle.

Benefits

By providing increased awareness and understanding of ESOH requirements, the use of this guide will assist PMs, and their staff, to maintain regulatory compliance throughout the acquisition life cycle and reduce the chance of program delays and cost overruns. It will also assist the PMs in completing the Environmental Compliance portion of their *Programmatic Environmental, Safety and Health Evaluation Guide*.

Technology Users

Department of Defense (DoD) PMs and program executive officers.

Description

Environmental requirements contained in statutes, standards, regulations, and executive orders require compliance and constitute an external constraint beyond the Program/Project/Product Manager's (PM's) control. The recent update to DoD Regulation 5000.2-R (contained in the DoD Acquisition Deskbook as guidance information) specifies that the PM "shall ensure a system design that can be tested, operated, maintained, repaired, and disposed of in accordance with ESOH statutes, regulations, and policies…."

ESOH requirements and constraints must be identified and communicated to all program activities from concept to disposal, in the same manner as any other system requirement. A weapon system design cannot be considered successful if ESOH requirements are not integrated into its overall life cycle. Often, ESOH requirements prescribe what must be done and how to do it. Examples include prohibitions on the use of ozone-depleting chemicals (ODCs), consultation requirements where endangered species or historic properties may be affected, requirements relating to the management and disposal of hazardous materials and wastes, and air and water permitting requirements. These requirements can be costly to comply with early in a program, such as during testing, and even more

so later in operations and support of the system. To facilitate compliance, ESOH requirements should be fully evaluated early in the program, and then periodically reevaluated. In accordance with DoD 5000.2-R (Defense Acquisition Deskbook), the PM must regularly review ESOH compliance requirements and evaluate their impact on the program.

The guide is organized into six chapters as follows:

- Chapter 1 provides an introduction to the guide, and includes a list of sources for additional ESOH-related assistance, guidance, and information.
- Chapter 2 provides an overview of the acquisition life cycle.
- Chapter 3 describes the importance of identifying program life-cycle activities when determining applicable ESOH compliance requirements. Specific program issues to consider are described along with discussions on the elements and unique activities associated with each Army weapon system category (commodity).
- Chapter 4 provides a comprehensive summary of those federal, DoD, and Army ESOH-related regulatory requirements common to most acquisition programs, along with those requirements unique to specific weapon system categories (commodities). A brief overview of state and local agency, and foreign nation, regulatory requirements is also provided.
- Chapter 5 identifies ESOH-related activities and documentation requirements normally associated with each life-cycle phase.
- Chapter 6 lists the references that were used in preparation of the guide.

Accomplishments and Results

The U.S. Army Environmental Center completed the draft *Guide to Environmental, Safety, and Occupational Health (ESOH) Compliance for Army Weapon Systems* in October 2001. The USAEC conducted an internal review on the *Guide to Environmental, Safety, and Occupational Health (ESOH) Compliance for Army Weapon Systems*. USAEC comments were incorporated in the *Guide to Environmental, Safety, and Occupational Health (ESOH) Compliance for Army Weapon Systems* in September 2002.

Follow-On Program Requirements

USAEC will be working with Army Environmental Policy Institute and Office of Director of Environmental Programs to add guidance on European Union and other outside continental United States environmental laws and regulations that PMs might need to consider during weapon system design to ensure that stationing and training of the weapon systems will not be limited. These additions are to be added to the *Guide to Environmental, Safety, and Occupational Health (ESOH) Compliance for Army Weapon Systems* by September 2003 and sent out for final comment.

Point of Contact

Louis Kanaras

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U.S. Army Space and Missile Defense Command
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TECHNOLOGY IMPLEMENTATION PROGRAM

IN SITU CHEMICAL OXIDATION TREATMENT SYSTEM AT LETTERKENNY ARMY DEPOT

The *in situ* chemical oxidation treatment we are pilot testing at Letterkenny Army Depot ensures effective and efficient removal of contaminants of concern over the existing pump-and-treat system.

PURPOSE To design and implement an effective treatment system for Letterkenny Army Depot, an installation on the National Priorities List.

BENEFITS If installed successfully, this treatment system will help remove volatile organic compound contamination at the source area, and help reduce long-term treatment requirements.

TECHNOLOGY USERS Letterkenny Army Depot, Chambersburg, Pennsylvania

DESCRIPTION Peroxone was injected into the karst aquifer through a network of carefully placed wells. The system is designed to displace the underlying water and treat volatile constituents bound to the soil media. Utilizing this *in situ* oxidation technique, we are evaluating the performance of this technology to successfully remediate contaminants at the source. The U.S. Army Environmental Center has conducted a successful bench-scale test, and is currently awaiting final results from the pilot test of this system.

ACCOMPLISHMENTS AND RESULTS Testing was completed at Rocky Spring, allowing us to rule out the use of a C-Sparge treatment system, and move forward with the *in situ* chemical oxidation approach. Additionally, we have eliminated the use of Fenton's Reaction at this particular site, and were able to choose a more practical chemical oxidant.

POINTS OF CONTACT Scott Hill
Rick Williams

PROGRAM PARTNERS U.S. Army Corps of Engineers
Interstate Technology Regulatory Council

FIELD ANALYTICAL TECHNOLOGY

The major source of error associated with an analytical result is derived from sampling, yet little has been done to improve the process. A cost-effective method to accurately determine the distribution of contaminants will benefit Army site remediation efforts.

PURPOSE To create a procedure whereby the error associated with collecting soil samples can be applied correctly to the analytical results; to develop a strategy and procedure to determine explosives contamination at impact ranges; and to adapt it to other analytes when appropriate.

BENEFITS A cost-effective method to determine the distribution of contaminants will benefit

the site remediation process. Because they contain unexploded ordnance (UXO), impact ranges present a unique cleanup challenge. Some Records of Decision require the Army to deal with explosives before addressing UXO. The developed strategy will allow installations to handle this scenario.

Technology Users

Army installations with explosives-contaminated soils.

Description

The major source of error associated with an analytical result is derived from sampling, but little has been accomplished to improve the process. Previous sampling was based on a specified grid approach, using a limited set of discrete samples, which resulted in extreme sampling error for nonhomogenous distributed contaminants such as explosives. True and cost-effective determination of the distribution of contaminants is essential to the site remediation process.

A site contaminated with cyclotetramethylene (HMX) and trinitrotoluene (TNT) will be assessed. A final report will document the sampling and analytical errors associated with short-range and longer-range analyte distributions for this site. The report also will document improvements in site characterization that result from the use of a composite-based sampling procedure and on-site analysis, and address whether this approach reduced sampling error to acceptable levels for this site.

Additional sampling and analysis studies will be conducted to demonstrate the effectiveness of the combination of on-site analytical methods and simple composite sampling procedures. Sites contaminated with Royal Demolition Explosive (RDX) and nitroguanidine will be sampled (if available), as well as a non-explosives-contaminated site, to assess whether levels of heterogeneity at these sites are similar to those observed for sites contaminated with TNT, dinitroluene (DNT), ammonium picrate and HMX. An evaluation will be performed between field analytical results and laboratory analytical results.

Accomplishments and Results

In Phase 1 of this project, several explosives-contaminated sites were intensely sampled to obtain information on the short-range heterogeneity of analyte distribution as a function of the specific contaminant, mode of contamination and soil type. The samples were analyzed both on- and off-site.

These results were used to compute overall analytical error. The on-site analytical methods for TNT, DNT and picric acid provided adequate data for site assessment at much lower costs. Based on these results, various strategies to minimize sampling error were considered, and a larger-scale sampling strategy was proposed.

This approach was evaluated in Phase 2 at a site contaminated with HMX and TNT. Analysis of larger-scale sampling and analytical results indicated that an approach based on discrete grab sample collection and analysis could not adequately describe analyte concentrations. A rapid compositing approach was assessed, and the analysis of these results showed this was the best approach for sampling nonhomogenous distributed contamination. This approach was further validated at a site contaminated with RDX and TNT. It also underwent preliminary testing at an impact range.

In the next phase, a pilot study on applying the sampling strategy learned from the previous effort was performed at an inland impact range at Fort Ord, California.

Because of the UXO issue, the strategy was modified to include actual sampling being performed by Explosive Ordnance Disposal personnel. Sampling was also modified to address the effects of long-range heterogeneity. Experiments were conducted to assess the utility of a gas chromatograph-nitrogen/phosphorous detector method for on-site analysis of explosives in soil. Results were promising in that they allowed measurement of RDX in the presence of large amounts of HMX, a contaminant situation often encountered at anti-tank firing ranges.

The field analysis using the gas chromatographic (GC) method was further tested with both a nitrogen/phosphorus detector and an electron capture detector. Various archived samples were checked by the GC technique, with good results when compared to standard explosives analyses. To field test the technology, participation was sought and received from the U.S. Army Environmental Protection Agency (EPA) for their Environmental Technology Program for the Evaluation of Explosive Field Analytical Techniques at the Oak Ridge National Laboratory. A new version of the GC was tested at this time. The chromatograph was configured so that air could be used as the carrier gas, which allowed for extreme portability of the system. At the same time, a thermionic ionization detector, a new detector more sensitive to explosives, was tested. Preliminary results show very good correlation for the TNT analyses. However, some breakdown in the RDX analysis occurs when using air as the carrier gas.

In FY 2000, modifications to the gas/injector system were made. The performance of the chromatograph was much improved when using nitrogen as the carrier gas, while continuing to use air for the detector. The instrument was used in two field trials (at Fort Leonard Wood and at the Umatilla Army Depot) and was able to demonstrate the ability to differentiate between 2,4-DNT, TNB, TNT, RDX and HMX. Some of the breakdown products of TNT, not usually detectable by existing field tests (aminodinitrotoluenes and diaminonitrotoluenes) were determined by this technique. Participation in a second EPA Environmental Technology Validation demonstration has shown the much-improved performance of the gas chromatographic system. There was good correlation between the results from the field gas chromatographic system and the results from a reference laboratory.

In FY 2001, the field gas chromatographic system was further validated at additional sites, including Fort Leonard Wood and Fort Greely. Results compared very favorably with those on samples submitted to the laboratory, with analysis being performed using the standard high performance liquid chromatography (8330) and gas chromatography (8095) methods. A number of drafts of the guide on the field sampling and analysis of explosives were prepared, reviewed, and revised to address comments. The guide will be usable for the sampling and analysis of explosives at any site by field personnel. An Internet seminar entitled "Field Based Analytical Methods for Explosives" was developed and presented through the U.S. Army Environmental Protection Agency Technology Innovation Office.

Results from previous studies have documented the extreme spatial heterogeneity that is present for explosives residues in soil at a wide variety of explosives-contaminated sites. To obtain representative samples for estimating mean concentrations, multi-increment (composite) samples are necessary. The number of individual increments that are necessary to obtain a mean value with an acceptable level of uncertainty, however, is not known for any of the types of sites that the Army

needs to characterize.

In FY 2002, soil samples were collected at several explosives-contaminated sites. At each site, a sampling zone of about 10 meters x 10 meters was selected based on on-site measurements or historical information, to ensure that the site is contaminated with explosives residues. Surface composite soil samples were randomly collected within this zone using 1, 5, 10, 20 and 40 individual increments. Five replicate samples for each increment number were collected. The samples were mechanically ground and triplicate 10-gram replicates of each sample analyzed to reduce the subsampling and determinative variances so that the variability obtained will be predominantly due to the sampling method.

The data were analyzed using analysis of variance techniques, and the sampling uncertainties were computed as a function of the number of increments. These data will be used to select the appropriate sampling strategy for a given type of site and provide estimates of the magnitudes of sampling uncertainty that are to be expected when these types of sites are characterized. A report, in production, will provide the results of the study.

Past studies have also indicated that the uncertainty associated with site characterization for explosives-contaminated areas is largely due to the inability to collect representative samples and obtain a representative subsample for analysis. In the laboratory, samples can be air-dried and thoroughly homogenized, thereby minimizing the uncertainty introduced by the necessity of subsampling to provide the proper mass of soil for extraction and analysis. In order to use on-site methods, though, subsampling must be done using moist soil and without the types of equipment available in many laboratories. The inability to obtain proper subsamples in the field is one reason why data from on-site analysis and laboratory analysis often do not agree very well. The on-site methods are often blamed for these differences when, in fact, portions of soil with very different analyte contents are analyzed.

The intent of this sub-task was to evaluate various on-site, soil subsampling strategies. The sampling literature was assessed to develop a list of alternate strategies. An initial field study evaluated the most promising alternatives. Results from that study were used to refine the alternatives, which were then evaluated in a second field study. A report, in production, will provide the results of these studies and a recommendation will be made to promote the strategy that should be used in the field.

Follow-On Program Requirements

The sub-sampling strategy that has been developed for sub-sampling in the field has only been tested on some types of soils. The developed procedures need to be tested at sites that contain most types of soils that are encountered. Additional effort needs to be expended on methodology for the field determination of army typical contaminants in the environment.

Point of Contact

Martin Stutz

Program Partners

U.S. Army Environmental Center
U.S. Army Engineer Research and Development Center-Cold Regions Research and Engineering Laboratory

PUBLICATIONS

Assessment of Sampling Error Associated with Collection and Analysis of Soil Samples at Explosives-Contaminated Sites. CRREL Special Report 96-15.

EPA ORD/OSWER. Field Sampling and Selecting On-Site Analytical Methods for Explosives in Soil - EPA Federal Facilities Forum Issue. Report EPA/540/R97/501. November 1996.

Assessment of Sampling Error Associated with Collection and Analysis of Soil Samples at a Firing Range Contaminated with HMX. CRREL Special Report 97-22.

Site Characterization of the Inland Firing Range Impact Area at Fort Ord. CRREL Special Report 98-9.

Determination of Nitroaromatic, Nitramine, and Nitrate Ester Explosives in Water Using Solid-Phase Extraction and GC-ECD: Comparison with HPLC. CRREL Special Report 98-2.

Determination of Nitroaromatic, Nitramine, and Nitrate Ester Explosives in Soils by Gas Chromatography-Electron Capture Detection. CRREL Special Report 99-12.

On-Site Method for Nitroaromatic and Nitramine Explosives in Soil and Groundwater Using GC-NPD. CRREL Special Report 99-9.

Field Gas Chromatography/Thermionic Detector System for On-Site Determination of Explosives in Soils. ERDC-CRREL Special Report TR-01-9.

Explosives Detection Technology, SRI Instruments Model 8610C, Gas Chromatograph/ Thermionic Ionization Detection. Environmental Technology Verification Report. EPA/600/R-01/065. August 2001.

Guide For Energetic Materials Contaminated Site Characterization. ERDC/CRREL Report TR-02-1.

Field Based Analytical Methods For Explosives. Internet Seminar. Available at http://www.clu-in.org/.

GROUNDWATER EXTRACTION AND TREATMENT EFFECTIVENESS REVIEWS

The U.S. Army spends millions of dollars each year to operate and maintain major groundwater pump-and-treat systems, but most of the systems have no defined measures of effectiveness. The Groundwater Extraction and Treatment Effectiveness Reviews (GWETER) will help installations determine how well a system is performing, when the system has reached the end of its usefulness, or whether another method could meet remediation goals at lower costs.

PURPOSE

To institute an Armywide program for developing clear remediation objectives and measures of effectiveness for planned and installed groundwater pump-and-treat systems. For systems where remedial objectives cannot yet be obtained, the program will reevaluate and renegotiate the objectives using risk-based approaches and reasonable land-use scenarios.

Benefits

Optimization of existing systems and the proper setting of objectives could help the Army avoid costs of $100 million in the next 10 years.

Technology Users

Major Army commands and installations with operating or proposed pump-and-treat systems.

Description

The U.S. Army operates major groundwater pump-and-treat systems at 35 installations, with a yearly operations and maintenance cost of approximately $25 million. Each major system costs about $3 million to build and is expected to last at least 30 years, with some lasting up to 100 years. Of the systems with a definable objective, more than half were designed to contain plumes, not restore aquifers. Most of the systems have no defined measures of effectiveness; the Army, therefore, has little or no ability to determine how well a system is performing or when a system has reached the end of its usefulness. In addition, approximately 70 major pump-and-treat systems are in the planning stages within the Installation Restoration, Base Realignment and Closure (BRAC) and Formerly Used Defense Sites (FUDS) programs.

An Army Science Board study on the effectiveness of groundwater and soil treatments recommended that a team of independent experts review the Army's largest groundwater pump-and-treat remediation programs (according to cost-to-complete estimates). The study also recommended implementing a groundwater cleanup strategy to reduce the number of pump-and-treat systems being proposed in the Army's environmental program.

The GWETER will:

- Validate the objectives of remediation systems
- Determine measures of effectiveness
- Collect the data necessary to measure system effectiveness
- Examine the remediation objectives and compare these goals to appropriate human and ecological risk levels for the current and future site use
- Create a process for acquiring the resources to implement system modification and/or replacement where significant long-term cost savings are identified
- Provide "lessons learned" to the field and Army Headquarters
- Produce cost savings of 10 to 20 percent and make systems more cost-effective

An effectiveness review team is made up of individuals experienced in the design, operation and optimization of pump-and-treat systems, as well as in the regulatory aspects of Record of Decision (ROD) development and modification. Depending on the installation's technical and regulatory situations, the team uses different mixes of in-house and outside experts. The disciplines that might be required include:

- Groundwater modeling and hydraulic optimization
- Hydrogeology
- Environmental law and ROD development
- Process and chemical engineering
- Innovative technology
- Risk assessment
- Natural attenuation processes
- Community relations

A contractor handles the team's administrative requirements, such as collecting data, preparing the site for the visit and preparing reports. Team members could be drawn from the U.S. Army Environmental Center; the U.S. Army Center for Health Promotion and Preventive Medicine; the Groundwater Modeling Support Program at the U.S. Army Engineer Research and Development Center – Waterways Experiment Station; the U.S. Geological Survey; Environmental Protection Agency laboratories; the Department of Energy; and nongovernmental entities. Local regulatory agencies and community representatives may be involved in the later stages of a site visit.

Accomplishments and Results

Teams have been involved at active and proposed pump-and-treat systems during the past year. These included: Sacramento Army Depot (AD), California; Picatinny Arsenal, New Jersey; Aberdeen Proving Ground, Maryland; Camp Stanley Storage Activity, Texas; Fort Devans, Massachusetts; Milan Army Ammunition Plant, Tennessee; Fort Ord, California; Red River Army Depot, Texas; Stratford Army Engine Plant, Connecticut; Tooele AD, Utah; Tar Heel Army Missile Plant, North Carolina; and Pueblo Chemical Depot, Colorado. The teams identified are helping to implement approximately $90 million in potential life cycle cost avoidances.

Limitations

Reviews are labor intensive; only a few can be accomplished each year.

Point of Contact

Ira May

Program Partners

U.S. Army Environmental Center
Major Army commands
Installations with operating or proposed pump-and-treat systems

Publications

Evaluation of the Effectiveness of Existing Groundwater and Soil Treatments. Army Science Board. 1998.

Many studies on individual installation pump and treat systems.

Groundwater Modeling System and Support Center

When it comes to groundwater treatment, state-of-the-art tools and techniques can save installations vast amounts of money. The Groundwater Modeling System (GMS) and Support Center provides technical expertise to installations and other users of groundwater modeling technologies.

Purpose

To provide groundwater modeling technical expertise to installations and other users of groundwater modeling technologies.

Benefits

State-of-the-art modeling can save vast amounts of money, as can a system to help ensure that proper remedial actions are carried out.

Technology Users

Army installations, U.S. Army Corps of Engineers districts, laboratories, and their contractors.

Description

The Groundwater Modeling Technical Support Program, sustained jointly by the

U.S. Army Environmental Center (USAEC) and the U.S. Army Corps of Engineers Military Programs Office (CE-MP), has been assisting agencies and Army installations for several years. The program is administered by the Groundwater Modeling Technical Support Center at the U.S. Army Engineer Research and Development Center-Waterways Experiment Station (WES) and is overseen by a technical advisory group from the funding agencies. The program has provided technical expertise and products to a rapidly expanding group of users, evidenced by over 3,000 support calls during the last three years. The technical expertise made available through the program has led to more efficient remediation projects.

Many of the calls have come from Army installations looking for Department of Defense GMS support. The GMS was developed specifically to address groundwater remediation projects in the U.S. Army. Although USAEC has been the largest supporter of the system, other agencies, including the Environmental Protection Agency (EPA) and the Department of Energy, have followed the Army lead by supporting GMS technology.

Consequently, several federal and local government agencies have accepted GMS as their standard modeling system for addressing groundwater remediation. The GMS has over 1,000 users in the United States and is accepted by the EPA's Superfund and Wellhead Protection programs. The EPA also uses GMS in all 10 of its regional offices.

The rapid increase in technical support requests demonstrates widespread acceptance of GMS technology. The acceptance is largely based on the system's advanced technology, and its development by government institutions such as USAEC, CE-MP, WES and the EPA. Equally significant are the high quality control standards and technical support programs that ensure the maintenance and improvements necessary for software longevity – an important consideration for installations where cleanup actions can take many years.

Accomplishments and Results

- Released Version 4.0 of GMS. The new version includes an interface to the new MODFLOW 2000 model, new site characterization tools, enhanced parameter estimation options and a new suite of stochastic modeling tools. The interface was also updated, including spreadsheet controls, a data tree control for exploring project data, and improved plotting capabilities.
- Continued providing groundwater modeling technology transfer assistance to Army users. This support included distributing GMS software and manuals, and providing training as needed.
- Provided groundwater-modeling assistance to the Army's Groundwater Extraction and Treatment Effectiveness Reviews program.
- Provided telephone support and on-site technical assistance, as necessary, to installations conducting groundwater remediation activities. Site assistance was typically limited to less than one man-week of labor (per site) and travel costs.
- Distributed results from the demonstration projects to installation personnel to ensure technology transfer within the Army.
- Provided groundwater-modeling services to Milan Army Ammunition Plant, Tennessee; Red River Army Depot, Texas; Pueblo Chemical Depot, Colorado; the former Sacramento Army Depot, California; Tooele Army Depot, Utah; Stratford Army Engine Plant, Connecticut; and Aberdeen Proving Ground, Maryland.

Limitations

Due to resource limitations, users can only receive support for less than one person-week without providing their own additional resources.

Follow-On Program Requirements

USAEC institutional support is necessary for the continued success of the program.

Point of Contact

Ira May

Program Partners

U.S. Army Environmental Center
U.S. Army Engineer Research and Development Center-Waterways Experiment Station
U.S. Army Engineer Research and Development Center-Cold Regions Research and Engineering Laboratory

Publications

Groundwater Modeling System, Version 4.0.

Many individual modeling reports at specific installations.

http://chl.wes.army.mil/software/gms/gms4.0.htm
(Web site for the modeling system).

Remediation Technologies Screening Matrix and Reference Guide

Several Web-based tools exist that aid environmental project managers in making intelligent, informed decisions on cleanup technologies, but few are as comprehensive as the *Federal Remediation Technologies Roundtable (FRTR) Remediation Technologies Screening Matrix and Reference Guide.* The FRTR developed this guide to serve as a neutral platform from which to evaluate technologies from all media areas.

Purpose

To manage and update the *FRTR Remediation Technologies Screening Matrix and Reference Guide, Version IV*. Enhance user-friendliness, increase awareness of the document, foster close cooperation between government agencies, and provide an improved technology transfer product to both environmental technology users and the research and development community.

Benefits

The guide serves as a "one-stop shopping" document, allowing remediation project managers to sort through volumes of information in a direct and guided manner, saving time and effort. The guide is also recognized as a comprehensive source for environmental restoration technology information.

Technology Users

Remediation project managers, government agencies, private organizations and academia.

Description

In the past, numerous government agencies, divisions and branches produced documents as tools for their environmental project managers. The FRTR sponsored production of the *FRTR Remediation Technologies Screening Matrix and Reference*

Guide, Version III to eliminate the duplication of effort among its member agencies.

The document is Web-based, allowing for quick and easy updating. The update effort encourages Roundtable members to work together, leverage funds and resources and prevent duplication of effort.

The committee representatives, who have the option to serve as a review entity for each technology, select technologies to be included in the guide. After the document is written and reviewed, the information is formatted in HTML, integrated with all necessary hyperlinks and placed on the Internet for universal use. Currently, members of the committee are in the process of completing the *Remediation Technologies Screening Matrix and Reference Guide, Version IV*.

The current Internet version of the *FRTR Remediation Technologies Screening Matrix and Reference Guide*, located on the FRTR home page, replaced Version III. Web technology advancements enable the Roundtable the opportunity to update and modify this "living" document. Each week, the guide is reviewed for inactive links and outdated or incorrect information. New information is reviewed and evaluated for validity. This regular maintenance ensures the document's integrity.

Accomplishments and Results

This project helps to demonstrate and foster cooperation among many federal agencies. Committee members established the personal relationships necessary to coordinate the update effort. There was a successful leveraging of resources from the Army, Navy and Air Force. The Environmental Protection Agency donated significant support. Other agencies dedicated numerous in-house personnel hours toward the effort.

The document was released on the Web at www.frtr.gov in November 1997.

Limitations

The document is an electronic Web file, so there is no conveniently accessed paper version. Links must be continually monitored and information updated.

Follow-On Program Requirements

Environmental technologies are continually changing and being improved. Updates to the current version are ongoing and will be published in October 2003. Committee members have decided the most effective way to keep the guide current and useful is to conduct annual meetings and reviews of existing material.

Point of Contact

Rick Williams

Program Partners

U.S. Army Environmental Center
Federal Remediation Technologies Roundtable
Naval Facilities Engineering Service Center
Air Force Center for Environmental Excellence
Environmental Protection Agency
U.S. Geological Survey
Department of Energy

Publications

Federal Remediation Technologies Screening Matrix and Reference Guide, Version IV. April 2002.

ALTERNATIVE CLEANER MATERIAL COMPATIBILITY AND PERFORMANCE EVALUATION PROGRAM

The U.S. Army Environmental Center (USAEC) and the U.S. Army Aberdeen Test Center (ATC) have partnered in the Alternative Cleaner Material Compatibility and Performance Evaluation Program to facilitate test and evaluation of alternative cleaners proposed as substitutes for hazardous, toxic and flammable solvents.

PURPOSE

The purpose of the Alternative Cleaner Material Compatibility and Performance Evaluation Program is to provide a mechanism to collect data and evaluate alternative cleaner applicability in U.S. Army/Department of Defense (DoD) maintenance, cleaning and repair activities. Associated goals include quantifying and qualifying user needs; maintaining a protocol for material compatibility and performance evaluation test and evaluation; conducting and providing defensible data through test and evaluation; documenting results and lessons learned; facilitating the development and use of a usage decision tool; targeting proven results to meet user specific needs; and promoting participation within public, private and academic sectors.

BENEFITS

The primary benefit derived from the Alternative Cleaner Material Compatibility and Performance Evaluation Program has been the development of the program's test and evaluation protocols. The development, endorsement and use of set of uniform protocols by the various Army commodity commands prevents the need to test products several times under differing methods and criteria and thus reduces the possibility for duplication of effort. This benefit reduces the needless expenditure of time, resources and manpower that could otherwise be used for acquisition, infrastructure, or training.

Better understanding of user needs and dissemination of knowledge of the approval process throughout the Department of the Army are a critical component and major benefit of the Alternative Cleaner Material Compatibility and Performance Evaluation Program. To realize ultimate success, it is vitally important that purchasing organizations and field activities be made aware of the detrimental effects the use of unproven and unauthorized cleaners can have on their mission, material and readiness.

The Army will be better able to preserve readiness, save money and avoid bad decisions by knowing which alternative cleaning products meet its stringent requirements for performance, soldier safety and environmental compliance. Participation will help vendors and manufacturers maximize marketing resources and will alleviate the need to do product-specific evaluations at the direction of each potential user or customer, thus saving significant time, money and resources. In addition, vendors and manufacturers will have an accepted process for evaluating their products for possible defense procurement.

TECHNOLOGY USERS

Results, products and efforts originating from this program will benefit project and product managers throughout the acquisition community, environmental staffs at major U.S. Army commands and installations, other DoD services and government agencies, and Original Equipment Manufacturers.

DESCRIPTION

A couple decades ago, no one expected the use of solvents in general maintenance, cleaning and repair operations to come under the scrutiny it did. The long-term effects of solvent use on worker health and the environment and the impact that regulations would have on procurement, storage, use and disposal were unknown. Many federal, state and local laws and regulations limit the use, storage and disposal of hydrocarbon-based cleaning solvents due to their classification as hazardous, flammable, and toxic substances. Unfortunately, the Army and other defense agencies rely on these solvents to maintain unique, mission-critical systems and materiel.

The transition from the use of solvents to more environmentally friendly alternatives is a relatively recent phenomenon. Alternative cleaners have the potential to reduce solvent use and provide significant economic benefits. Unfortunately, an environmentally friendly designation is in no way associated with a product's ability to perform a particular task (e.g., cleaning, stripping or polishing). Nor is it an indication of whether it is compatible with the object to be clean, polished or stripped.

Alternative cleaners have the potential to reduce solvent use and provide significant economic benefits. An inherent problem in selecting and using alternative cleaners, however, is that selection mistakes are often made because many products marketed are listed in Defense Logistics Agency catalogs as "environmentally friendlier" or have a General Services Administration contract number. Although an alternative cleaner may have an environmentally friendlier designation, that designation does not mean that the product's performance has been verified or that it is authorized for military use. In many instances, assumptions based on these designations have led purchasing organizations to procure alternative cleaners without realizing the potential impact to soldiers who use them, the materiel items they are used on, and ultimately, readiness.

Another problem is that many purchasing organizations are unaware of the approval process or that validation is needed before making any changes to maintenance procedures or cleaning regimens. As a result, the uncontrolled replacement of solvents with environmentally friendly products has resulted in a number of use, approval and material compatibility problems. Problems such as these have driven the need to better understand performance requirements, establish evaluation standards, prevent duplication of effort, and facilitate expeditious review and approval of alternative cleaner use where appropriate.

The compatibility and performance of alternative cleaners proposed as substitutes for solvents currently used must be determined and demonstrated and their use approved by the respective commodity managers of weapon systems. The Alternative Cleaner Material Compatibility and Performance Verification Program put in place mechanisms to achieve this objective.

Building on past experience and lessons learned, the Army has launched a project that will allow manufacturers to evaluate the performance of alternative cleaning solvents on military equipment. Using the protocol developed recently in partnership with commodity managers, USAEC and ATC are leading an initiative to comprehensively test several cleaning products and gather data the Army and other DoD services can use to make procurement and usage decisions.

The current program test protocol can be found on the USAEC Web page at

http://aec.army.mil. It should be noted that the protocol performance requirements and test methods may change at any time as directed by commodity command approval authorities. However, if any changes are made to the protocol before, during or after testing, due notice of those changes shall be given.

The Alternative Cleaner Material Compatibility and Performance Evaluation Program requires that potential technologies submitted for evaluation satisfy certain selection criteria. Alternative cleaners submitted for evaluation must be environmentally beneficial compared to hydrocarbon solvents currently being used, have obvious economic benefit, and have pollution prevention qualities that can be tested and presented as valuable evaluation factors to the commodity approval authorities. Cleaners to be tested should also be commercially ready for implementation. This means that they should be beyond the conceptual stage, and logistically available, maintainable, supportable and reliable. The concept of commercially ready will be evaluated on a case-by-case basis and will be dependent on availability for the target user and volume of delivery required by the user. An attractive aspect of the program is that a pre-screening regimen has been developed that will assist private industry participants in determining if it is economically beneficial to proceed with full-scale performance evaluation.

Each product submitted for testing will be reviewed to determine if the submission meets the above criteria. Candidates for evaluation testing will be selected based on several factors, including passing a pre-screening, having demonstrated and documented success in private or private sectors in the past, having virtually non-existent environmental impact, low economic risks for implementation, realistic potential to meet performance requirements, and practicality of implementation.

Meetings with potential private industry participants are scheduled. The meetings will ensure understanding of program objectives, private industry roles and the test and evaluation scope, including environmental evaluation factors, performance and quality evaluation factors required for approval, user implementation decisions, data valuable to technology providers to promote products, and data valuable to end users of the product. For evaluation testing, USAEC and ATC will include all interested private industry participants whose products meet the defined requirements and who are willing to provide the fee determined after all responses have been received.

Testing is being jointly funded; cleaner manufacturers will pay for the tests on their specific products, while the Army will maintain overall test capabilities and purchase materials needed to conduct the test. Private industry participants will be required to contribute funds towards completion of testing. Under the terms of the program, private industry participants will be required to pay for compatibility and performance testing of their specific products while government funds will be used to qualify manufacturer/vendor furnished data, to perform test set-up, to purchase military unique materials required for testing, and to conduct material compatibility and performance evaluation testing. Alternative solvent manufacturers will realize significant cost savings under this program due to economies-of-scale and cost sharing. The minimum private industry contribution for evaluation will be determined by the amount of funds available to support testing, the cost to perform the testing per product, and the number of technology providers participating.

Participants involved in the evaluation process will go through a thorough screening process to decide which products to put through the full range of material compatibility and performance evaluation tests. ATC will conduct compatibility and performance evaluation allowing technology providers to participate as observers on designated occasions. Parameters evaluated will focus on, constituent evaluation, material compatibility, and environmental quality benefits reflective of the alternative cleaner in Phase II and performance evaluation in Phase III. The result of compatibility and performance evaluation testing will be a final report that shall be prepared by ATC for private industry participant consumption and the commodity manager approval process.

Government evaluation testing by ATC will be performed pursuant to a Test Support Agreement executed by ATC with each participating private party. Evaluation testing will be executed by ATC staff at ATC's facilities unless ATC does not have the existing capabilities to do so. In this case, another laboratory having the desired expertise will be used. Confidential or proprietary information may be required to be released for government consumption only as necessary to evaluate constituents or to determine a cleaner's potential impact on the environment, safety and occupational health. It is recommended that this type of information be kept to a minimum until as required to permit, begin and perform testing.

ATC is responsible for maintaining the evaluation protocols (i.e., making changes and tracking review and comment); evaluating and verifying data; conducting the evaluation testing; preparing a draft evaluation report for review and comment by commodity approval authorities and private industry participants; and preparing and disseminating the final report and any other related information. Final reports provided to private industry participants shall be a sanitized version containing the industry participant's data and results only. The version of the final report provided to the commodity commands shall be used to identify solvent substitutes that meet stringent military maintenance, cleaning, service and repair performance requirements and to update or prepare Qualified Products Lists.

The test and evaluation process is considered complete when the final report has been provided to commodity approval authorities. Follow-on requirements after testing include facilitating the decision process regarding acceptable alternative cleaner usage. A workgroup has been established that includes representatives from the user, approval authority and private industry communities. Private industry participants will have the opportunity to provide input to future program direction and protocol development. The public/private partnership seeks to prevent duplication of effort, encourages the acceptance of alternative cleaners where appropriate and helps to identify the most viable markets for technology insertion.

The program has an aggressive strategy for information dissemination. Results of the evaluation will be distributed to all applicable users as deemed appropriate by commodity command approval authorities to increase awareness of technically and commercially viable alternative cleaners (this ensures the maximum exposure and visibility of the results of the evaluation). Although the U.S. government can endorse no verified product, the DoD or its agencies completing performance evaluation testing will enhance the acceptance and use of alternative cleaners. This program promotes pollution prevention by providing a viable mechanism to facilitate performance evaluation of solvent substitutes through active participation

from users, private industry and approval authorities.

Applicability

Many federal, state and local regulations limit the use, storage and disposal of hydrocarbon-based cleaning solvents. This program supports initiatives in response to the 1990 Pollution Prevention Act and Executive Order 12856 that mandate federal agencies implement measures to address waste reduction and pollution prevention at the source.

Limitations

Unfortunately, it is unlikely that an alternative cleaner drop-in replacement will be found for hydrocarbon solvents currently used in U.S. Army/DoD maintenance, cleaning and repair activities. Although manufacturers and vendors will realize substantial benefits participating in the Alternative Cleaner Material Compatibility and Performance Evaluation Program, they may still have to be actively involved in optimizing potential solutions to meet specific user requirements. This may involve tasks such as performing on-site demonstrations, training installation staff, or reconfiguring and refining equipment and processes.

Point of Contact

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Program Partners

U.S. Army Environmental Center
Aberdeen Test Center
U.S. Army Forces Command
U.S. Army Research Laboratory
U.S. Army Petroleum Center
U.S. Army Aviation and Missile Command
U.S. Army Armament, Development, and Engineering Center
U.S. Army Center for Health Promotion and Preventive Medicine
U.S. Army Tank Automotive and Armament Command
U.S. Army Tank Automotive Research and Development Center
U.S. Army Pollution Prevention Support Office
U.S. Army Integrated Product Teams
National Defense Center for Environmental Excellence
Naval Facilities Engineering Service Center
Naval Cognizant Field Activities
Naval Air Warfare Centers
Marine Corps Systems Command
U.S. Air Force Center for Environmental Excellence
U.S. Air Force Corrosion Prevention & Control Office

Conclusion

Environmental laws, regulations, practices, initiatives and lessons learned during the last century have permanently changed today's military-industrial complex and how it deploys troops, maintains bases and adheres to laws. Today more than ever, we understand the tremendous financial cost and know the unfortunate environmental, health and safety risk associated with the routine use of hazardous, toxic and flammable solvents.

Those lessons having been learned, USAEC and ATC have established the Alternative Cleaner Material Compatibility and Performance Evaluation Program to promote and enable evaluation, approval and routine use of environmentally acceptable solvent substitutes where their use can be technically and physically

proven to not adversely affect military readiness, soldiers or materiel.

This program promotes pollution prevention by providing a viable mechanism to facilitate performance evaluation of solvent substitutes through active participation from approval authorities, users, private industry and academia. The program is quickly gaining wide acceptance among the tri-services as well as throughout private industry

Accomplishments and Results

Success in the program to date includes the establishment of materials compatibility test protocols developed in cooperation with and endorsed by major commodity commands responsible for approving solvent substitute use on Army materiel items.

Publications

Technical Protocol

- *Alternative Cleaner Compatibility and Performance Evaluation Test Protocol.* July 2000. SFIM-AEC-ET-TR-99062.

Technical Reports

- *Abbreviated Test Plan of the ChemFree Enzyme-Based Aqueous Solvent Performance Test.* January 1998. SFIM-AEC-ET-CR-98041.
- *Evaluation of Automatic Aqueous Parts Washers.* December 1997. USACERL Technical Report 98/16.
- *Evaluation of Effects and Environmental Compliance of Cleaning Compounds on Air Force Corrosion Prevention Phase I Final Report Aqueous Parts Washer Survey.* 10 December 1999. AFRL/MLS-OLR Report, Kaldon, Looper, Clark, et al.
- *Field Demonstration for P-D-680 Solvent Replacement.* October 1996. TARDEC Technical Report No. TR-13730.
- *Field Demonstration for P-D-680 Solvent Replacement (Part II).* May 1998. TARDEC Technical Report No. TR-13751.
- *Replacement of P-D-680 For Army General Maintenance of DoD Equipment.* September 1995. TARDEC Technical Interim Report No. 13643.
- *Replacement of P-D-680 For Army Ground Vehicle and Equipment Applications.* October 1993. BRDEC Letter Report Number 94-1.
- *Review of Candidate Replacements for Mil-C-372C, (Cleaning Compound, Solvent for Bore of Small Arms and Automatic Aircraft Weapons.* August 1997. TARDEC Interim Report TFLRF No. 314.

Technical Reports

- *Corrosion Testing for Alternative Solvent Substitution Performance Validation.* November 1999. Newton, Ziegler and Walker.
- *A Study of the Applicability of an Aqueous Cleaning Agent as a Drop-In Replacement for P-D-680 at Fort Campbell.* November 1996.

- *1,1,1 Trichloroethane Replacement Study.* March 1996. ARDEC Report. Brescia, DePiero and Meyler.
- *Evaluating the Impact of Environmentally Friendly Alternative Cleaners on System Readiness.* April 2001. Ziegler and Walker.
- *Developments in US Army's Alternative Cleaner Compatibility and Performance Evaluation Program.* May 2001. Ziegler and Walker.
- *Alternative Cleaning for DOD Applications.* June 2001. Ziegler.

FLASHJET® Coatings Removal Process

The Defense Department is looking for coating removal alternatives to chemical removal and media blasting. The FLASHJET® coatings removal process, a xenon-flashlamp and frozen carbon dioxide combination, patented by The Boeing Company, is a cost-effective and timesaving technology with potential military application. The Boeing Company sold the patent rights to Flash Tech Inc. in late 2001. The latest information can be found online at http://www.flashtech-inc.com.

Purpose

To demonstrate the FLASHJET® coatings removal process for military use.

Benefits

The FLASHJET® process offers low life cycle costs, saves time, and reduces the amount of hazardous waste generated during depainting.

Technology Users

Department of Defense (DoD) depots and depot-level maintenance shops.

Description

Efforts are underway within DoD to find alternatives to chemical paint removal and media blasting. In the *U.S. Army Environmental Requirements and Needs Report*, requirements for finding alternatives to chemical paint removal and media blasting include Contaminated Blast Media (2.3.n); Hazardous Air Pollutant (HAP) Emission Control (2.1.g); and Alternate Paint Stripping Chemicals of Military Interest (3.2.h). The U.S. Navy requirements relating to depainting activities include Control/Reduce Emissions from Coating, Stripping and Cleaning Operations (2.I.1.g); Control of Volatile Organic Compound and HAP Emissions (2.I.1.q); and Non-hazardous Coating System Removal (3.I.5.a). U.S. Air Force depainting requirements include Substitute for Methylene Chloride Paint Strippers (449); Decreased Waste Generation from Plastic Media, Sand, Walnut Hull and Other Blasting Depaint Operations (808); and New Paint-Stripping Methods Have to Be Identified to Reduce Hazardous Waste and Cost (814). All these requirements are considered high-ranking needs within their respective service.

As an environmentally preferred coatings-removal process, FLASHJET® eliminates the use of HAP chemicals and blasting media. The FLASHJET® process does not use any hazardous materials during the coating-removal stage, thus minimizing the potential for hazardous airborne dust and cutting the cost of paint removal.

FLASHJET® combines two depainting technologies in one process: a xenon-flashlamp and a continuous stream of recycled carbon dioxide pellets. The process also includes an effluent capture system that collects effluent ash and organic vapors.

Effluent ash is captured by a series of high efficiency particulate air (HEPA) filters; organic vapors are processed through an activated charcoal tank. The process is fully automated and requires limited worker involvement.

The FLASHJET® system includes six components: the flashlamp and stripping head; the manipulator robotic arm; the computer processed cell controller; the effluent capture system; the carbon dioxide pelletizer; and the flashlamp power supply. The xenon-flashlamp is the primary coatings-removal step. The xenon-flashlamp emits low-pressure xenon gas and creates a high-intensity flash that ablates the coating from the surface. Light energy generated from the xenon-flashlamp pulses four to six times per second. The amount of coating ablated is directly proportional to the amount of energy put into the system. The process can be controlled to remove as little as .001 inches of coating and as much as .004 inches of coating. This control factor can be an asset when topcoat removal is required, but the underlying primer must remain on the substrate.

The carbon dioxide pellet-blasting technology is not a direct form of pellet blasting. The continuous stream of carbon dioxide pellets has two purposes. First, it cools and cleans the substrate, keeping the substrate at an acceptable temperature while the xenon-flashlamp ablates the coating. Second, the stream keeps the flashlamp clear of any coating by "pushing" the coating away from the flashlamp and toward the effluent capture system. All carbon dioxide emitted during the process is captured from other industrial type sources, converted into liquid carbon dioxide and reused.

The effluent capture system collects all effluent ash and organic vapors generated during ablation. Effluent ash is vacuumed into the capture system, separated by size in a particle separator, and captured in a series of HEPA filters. Organic vapors are captured and processed through an activated charcoal scrub and emitted to the atmosphere with less than 5 parts per million light hydrocarbon emission.

The FLASHJET® process has several advantages over other commonly used depainting technologies. The only wastes generated are coating ash and spent HEPA filters. Compared to common media blasting and chemical paint-removal operations used at military depots, the FLASHJET® process has the potential to substantially reduce the amount of waste a facility generates.

The former McDonnell Douglas Corporation conducted life cycle cost comparisons for the F/A-18A fighter aircraft. The estimated life cycle cost for FLASHJET® was $2.89 per square foot. Plastic media blasting was calculated at $15.40 per square foot, and chemical depainting was calculated at $33.61 per square foot. Although the FLASHJET® process has a high acquisition cost, it is offset by an attractive life cycle cost. These costs are calculated over a 15-year period.

The process is beginning to gain acceptance within DoD. The Air Force installed a system at the Warner-Robins Air Logistics Center in Georgia for stripping off-aircraft components. Corpus Christi Army Depot installed a system for stripping the Army UH-60 Black Hawk and the Navy SH-60 Seahawk rotary wing aircraft. The FLASHJET® system installed at the Naval Air Station Kingsville, Texas, for the Navy's T-45 program has operated since summer 1999. All three Naval Aviation Depots have a FLASHJET® system in their facility equipment plans.

Accomplishments and Results

FLASHJET® has undergone more than 14 years of extensive metallic and composite substrate panel testing by various agencies for qualification purposes. The Navy approved the process for use on metallic and composite fixed-wing aircraft. Since all the high-cycle fatigue tests have been successfully completed for aluminum substrates, approval is expected from the services for metallic substrates on rotary-wing aircraft.

The FLASHJET® Coupon Protocol Test Plan details what type of coupons were tested under what conditions. All high-cycle fatigue tests have been successfully completed and results detailed in the test reports. The high-cycle fatigue qualification testing was completed in May 2001.

The military vehicle and equipment demonstrations were completed in FY 2000. The vehicle and equipment demonstration included stripping of the hull of M113 Armored Personnel Carrier. The Aircraft demonstration on an SH-60 Seahawk began on 13 October 1999 and finished 16 December 1999.

Limitations

The system has two major limitations. The main limitation of the FLASHJET® process is its high acquisition cost. One system costs $3.2 million (in 2001), not including the expense of retrofitting an existing structure or constructing a new building. The other major limitation is that the system cannot access angles and tight corners due to the configuration of the stripping head; this could result in using more than one pass and increasing the xenon-flashlamp energy input, which could reduce the coating removal rate. The stripping head is approximately 15 inches wide, including the xenon-flashlamp, the carbon dioxide pellet stream nozzles, the containment shroud and the bump sensors. A secondary depainting process is needed for areas inaccessible to the stripping head. This problem, however, is commonly found with other depainting technologies. Currently the DoD Environmental Security Technology Certification Program (ESTCP) is funding a demonstration/validation on a series of hand held laser coating removal systems for spot coating removal. One minor limitation is that lighter colored paint is harder to strip than darker pigmented paint. Although not a large problem, it does require that the operator pay closer attention to the process, especially during the initial setup of the equipment. The operator must also pay close attention to the equipment settings to ensure the substrate does not become over heated if additional passes are required to remove the light colored paint.

Follow-On Program Requirements

The draft final report was submitted to ESTCP in January 2002. Comments were received and incorporated and the final report was submitted in April 2002. However, there remains a need to conduct FLASHJET® testing on composites materials. Several agencies have submitted requests for funding this type of work from various sources over the last year or so, but it is unknown if any have been funded.

Point of Contact

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Program Partners

U.S. Army Environmental Center
Environmental Security Technology Certification Program
Department of Defense program managers
Anniston Army Depot
Aberdeen Test Center

Corpus Christi Army Depot
Patuxent River Naval Air Station
Naval Aviation Depot - Cherry Point
Warner-Robins Air Logistics Center
Fort Hood
National Defense Center for Environmental Excellence
The Boeing Company

Publications

Conducting Force Controlled Constant Amplitude Axial Fatigue Tests of Metallic Materials. ASTM E466. 1997.

Briehan, David W., *Xenon Flashlamp and Carbon Dioxide Advanced Coatings Removal Prototype Development and Evaluation Program.* MDC 92B0479. McDonnell Douglas Corp. for Warner-Robins Air Logistics Center. 1992.

Bonnar, G.R., and J.R. Hollinger. *Qualification of Xenon-Flashlamp/CO2 Paint Removal Procedures for Use on Douglas Commercial Aircraft Components.* 93K0296. McDonnell Douglas Corp. for Douglas Aircraft Co. 1993.

Briehan, David, and James Reilly. *Xenon-Flashlamp and Carbon Dioxide Coatings Removal Development and Evaluation – U.S. Navy Add-on Program Final Report.* MDC 93B0341. MCD Corp, for NADEP Jacksonville. 1993.

Berkel, Tom R. *Xenon Flashlamp & Carbon Dioxide Advanced Coatings Removal Development and Evaluation Program – U.S. Navy Follow-On Program.* MDA 96X0019. McD Corp. for the Naval Air Warfare Center. 1996.

Pink Water Treatment Technology Research Task

Army ammunition plants produce explosives-contaminated water known as pink water. The plants meet discharge requirements by using granular activated carbon (GAC) to remove contaminants from pink water. The explosives-laden GAC – classified as a hazardous waste – is either regenerated or incinerated. Other treatment technologies are being sought to avoid the generation of this hazardous waste.

Purpose

To evaluate alternatives to GAC treatment of pink water.

Benefits

A cost-effective alternative to GAC absorption that does not generate hazardous waste when treating pink water will help Army installations meet stringent regulations pertaining to water effluent quality.

Technology Users

Army ammunition plants.

Description

Army ammunition plants perform two functions that generate a waste stream known as pink water. These functions are 1) load, assemble and pack (LAP), and 2) demilitarization of munitions. Associated housekeeping and processing operations create the wastewater stream. Typical sources are wash down and wash out of munitions and laundering workers' clothing. Pink water typically contains photo-chemically active trinitrotoluene (TNT). The photoreactive products color the water.

Besides TNT, pink water usually contains Royal Demolition Explosive (RDX) and cyclotetramethylene (HMX). The composition of pink water varies, depending on process materials and operations. The reference value established in this work is 200 parts per million (ppm) dissolved energetic-related materials.

Army ammunition plants meet discharge requirements by using GAC to remove contaminants from pink water. The explosives-laden GAC, classified as a K045 hazardous waste, is either regenerated for reuse or incinerated for disposal. Technologies are being sought to avoid the generation of this hazardous waste, which is difficult to handle and expensive to dispose of.

Concurrent Technologies Corporation (CTC), the operating contractor of the National Defense Center for Environmental Excellence, under the initial Statement of Work (SOW) from the U.S. Army Environmental Center (USAEC), was tasked to identify and evaluate the technologies as Phase I. This entailed surveying literature, assessing regulatory issues related to pink water, identifying candidate technologies, developing performance criteria and evaluation methods, selecting candidates for detailed evaluation, selecting the five best technologies based on the performance criteria, and issuing a Phase I final report. The five technologies selected were Large Aquatic Plants (Biological) Treatment, GAC Thermophilic (Biological) Process (TBP), Fenton's Chemistry Process (Advanced Oxidation Process), Electrolytic Process (Mixed Oxidants) and Fluidized Bed Bioreactor Process.

Under Phase II, CTC was tasked to perform bench-scale tests on the five technologies using pink water generated from LAP operations at McAlester Army Ammunition Plant, Oklahoma, and pink water generated from demilitarization activities at Milan Army Ammunition Plant (MLAAP), Tennessee. This entailed identifying vendors for the selected technologies, requesting test plans and safety plans from the vendors, determining critical process parameters and evaluation criteria, demonstrating and validating the bench-scale technologies, evaluating the technologies against the performance criteria, recommending the three best technologies for the pilot-scale demonstration and issuing a Phase II final report. The three best technologies identified were the Fluidized Bed Bioreactor Process, the GAC TBP and the Large Aquatic Plants (Biological) Treatment (Phytoremediation)

Under Phase III, CTC was tasked to plan for operation of up to three technologies at 2 gallons per minute (gpm). This entailed developing detailed engineering specifications, submitting an outline of a test and implementation plan, submitting an outline of a demonstration and validation proposal, and issuing a Phase III final report. Due to a limitation in funding, the U.S. Army selected the GAC TBP as the pink water treatment technology that would be evaluated during the pilot scale demonstration. This technology had the best efficacy and estimated treatment cost.

USAEC wrote an SOW to direct CTC to perform Phases IV through VI. Phase IV included the design, installation and debugging of the GAC TBP demonstration plant. Activities included selecting an engineering design subcontractor, preparing a detailed design estimate, finishing the detailed design, selecting an ammunition plant demonstration location, fabricating the TBP demonstration plant, and issuing a Phase IV final report. Phase V consisted of operating and evaluating the TBP demonstration plant. Activities included operating the TBP plant for 180 days,

evaluating the TBP according to the test plan and issuing a Phase V final report. Phase VI consisted of finalization and follow-through. Activities included revising operating documentation based on lessons learned in the pilot-scale demonstration(s), providing follow-on training, and providing follow-through support.

Accomplishments and Results

The TBP has undergone testing of loading and regenerating energetics-laden from 24 August 1998 through 15 March 2000 in accordance with the Pink Water Treatment Technology Test Plan for the TBP Pilot Scale Equipment (17 August 1998). The TBP was evaluated in accordance with the evaluation criteria specified in the test plan. As a result of these qualification tests completed at MLAAP, the following conclusions were reached:

- The TBP is technically sound, economically viable and environmentally safe.
- Under the optimized conditions, the TBP technology degraded over 90 percent of the nitrobodies from the loaded GAC. During loading, the discharge of nitrobodies from the regenerated GAC in the column gave slightly higher (better) percent removals of nitrobodies compared to that of loading with virgin GAC.
- The water discharged is non-toxic, according to the toxicity testing.
- The TBP's estimated cost is lower than current treatment costs for GAC, allows for the reuse of GAC from 5 to 23 times, and has an estimated 1½ to 6 year payback period.

Researchers successfully transferred the TBP technology to Iowa Army Ammunition Plant (IAAP) for loading and regenerant testing with IAAP pink water. IAAP had been experiencing some difficulty with the GAC system for the treatment of pink water at the high temperature production level. The GAC system worked well when the process was conducted at low temperatures; however, it became inefficient when the operation was used at higher temperatures, which generated waste at a quicker rate – increasing disposal costs. Testing of the TBP process at IAAP demonstrated a process that would regenerate the GAC loaded with explosives. A report detailing the results of this testing was published in September 2001. Hawthorne and Crane AAPs have also expressed potential interest in the transfer of this technology.

Point of Contact

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Program Partners

U.S. Army Environmental Center
Concurrent Technologies Corporation
National Defense Center for Environmental Excellence
McAlester Army Ammunition Plant
Milan Army Ammunition Plant

Publications

Pink Water Treatment Options. May 1995. SFIM-AEC-ETD-CR-95036.

Pink Water Treatment Options Technical Report. November 3, 1997. SFIM-AEC-ET-CR-99064.

Safety/Health Plans to Build Thermophilic (Biological) Process Pilot Scale Equipment. June 22, 1998.

Test Plan for Thermophilic (Biological) Pilot-Scale Equipment. August 17, 1998.

Pilot-Scale Thermophilic (Biological) Process, Interim Test Results. December 22, 1998.

Pilot-Scale Thermophilic (Biological) Process, Results from 6th though 11th Loadings and Regeneration. May 21, 1999.

Pilot-Scale Thermophilic (Biological) Process, Results from 12th and 13th Loadings and Regeneration. July 21, 1999.

Pilot-Scale Thermophilic (Biological) Process, Results from 14th, 15th, and 16th Loadings and Regeneration, Draft. October 12, 1999.

Thermophilic (Biological) Process System Procurement and Fabrication Guide, and Cost and Performance Report. April 30, 2000.

Pilot-Scale Thermophilic (Biological) Process Final Technical Report. June 15, 2000.

RANGE XXI FOCUS

GREEN AMMUNITION (LEAD-FREE SMALL ARMS)

Millions of small arms rounds are fired annually on military ranges during training and testing activities. These projectiles contain lead, a federally listed toxic material, and may pose an environmental risk to soil, sediments, surface water and groundwater. Replacing lead in conventional projectiles with a tungsten-based core will minimize environmental compliance impacts on training and help avoid costly cleanup efforts.

PURPOSE

To provide the Department of Defense (DoD) with small-caliber service ammunition that will meet U.S. and NATO performance standards while eliminating lead in the projectile core.

BENEFITS

This program will revolutionize small-caliber ammunition. The next generation of ammunition, while benign to the environment, potentially offers enhanced lethality and functionality. Environmental restrictions on training U.S. military personnel will be minimized. Training realism and effectiveness will be greatly enhanced, while future cleanup costs may be eliminated. Furthermore, DoD will be the international leader in these technologies, and the environmental stewardship shown will enhance both public image and trust.

TECHNOLOGY USERS

U.S. Army Armament Research, Development and Engineering Center (ARDEC), Small Caliber Ammo Branch
U.S. Army Infantry Center
Army Research Laboratory (ARL)
Naval Surface Warfare Center-Crane (NSWC)
Department of Energy (DOE)
Oak Ridge National Laboratory (ORNL)

DESCRIPTION

Lead in soil, sediment, surface water and groundwater has been confirmed through investigations at Army, Navy, Marine Corps and Air Force small arms ranges throughout the United States and Europe. Lead uptake studies in vegetation at a Marine Corps range in Quantico, Virginia, showed lead levels as high as 23,200 parts per million. Remediation has proven to be extremely expensive. Furthermore, inspections of National Guard indoor ranges from 1986 to 1988 resulted in 812 ranges being shut down due to high levels of lead contamination, both surface and airborne. Those ranges will require costly renovations to meet Environmental Protection Agency and Occupational Safety and Health Administration standards.

About 689 million rounds of small arms ammunition (.22-caliber through .50-caliber) are fired annually during DoD training, with an additional 10 million rounds fired annually by DOE. The annual amount of heavy metal introduced into the environment from this training is approximately 3 million pounds.

The lead projectile cores and compounds used in primers create dust and fumes when fired, exposing shooters and range operators to dangerously high levels of airborne lead. Studies from the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) show that projectiles account for 80 percent of airborne lead released on firing ranges, while the remaining 20 percent comes from primer

combustion. The studies also indicate that 40 percent of inhaled lead is dissolved in the bloodstream, and 10 percent is absorbed directly by the body. Once in the body, lead is very difficult to remove.

In an attempt to address environmental concerns with DoD munitions, the Joint Service Non-Toxic Ammunition Working Group was established in 1995 by ARDEC as a multi-service cooperative forum of DoD, DOE, private industry and academia experts to investigate alternate projectiles and propellants. Other programs followed and eventually the Green Ammunition Project was created to provide "greening" of small caliber ammunition through re-design of ammunition components (e.g., cartridge primer) and production processes. The Small Caliber Ammunition Group within ARDEC partnered with the U.S. Army Environmental Center (USAEC) and other Joint Working Group agencies to specifically replace lead cores in small arms.

In the Lead-Free Small Arms Program, the focus has been elimination of the lead buildup from rounds in small arms range impact areas, which could result in noncompliance with environmental laws and regulations. In this partnership, USAEC works to secure funding and is responsible for overall program management. The Small Caliber Ammunition Group within ARDEC is responsible for program execution for the efforts to eliminate lead from projectile cores. Funded programs consist of replacement of lead cores for the 5.56 and 7.62-millimeter (mm) projectiles, elimination of a lead disc in the aft end of the 50-caliber projectile, and replacement of the lead bullet for the 9-mm projectile.

These next generation small arms projectiles rely on innovative materials to reproduce and improve upon the physical, ballistic and mechanical properties of lead. Composite materials, such as metal powders (tungsten) in nylon or high-density metal particulates (tungsten) bonded with light metals (tin), are being developed as the nontoxic replacements for lead.

Of primary concern at outdoor ranges are the introduction and dispersion of tungsten throughout the environment. Development of the toxicity and environmental recovery information to support recycling or closed-loop use of the materials and data on environmental effects has been determined. Leaching, environmental corrosion and biological uptake tests have been performed to fully define stability and mobility characteristics. Study results are being used to provide guidance for projectile formulation such that all materials will be stable and recoverable. Projectile design, constituent materials and processing will be optimized to support the maximum recovery and ensure this next generation of projectile materials can be recycled. USAEC will specify recovery and recycle methods and provide for the pilot-scale demonstration. Adequate information regarding the use, release and mobility of the high-density constituents under consideration, specifically tungsten, is considered crucial for acceptance.

Demonstrating the producibility of the lead-free projectile is as critical as the performance demonstrations. If the items cannot be produced in a cost-effective, environmentally compliant fashion, the technology will fail. Lake City Army Ammunition Plant (LCAAP) in Missouri is the Army's principal supplier of small-caliber ammunition. The producibility testing of the proposed nontoxic projectile is being performed at LCAAP. Additionally, other environmental issues regarding production methods, machinery and support materials for small-caliber ammunition

manufacture will be addressed.

Results from the producibility testing will be used to minimize production costs and provide feedback to the projectile and primer designers. Production rates of 1,200 items per minute require special consideration in item design and manufacture. Performing producibility tests will assure that item unit-costs stay within 10 percent of current ammunition production costs.

In the initial phase of the program, the USAEC provided funding for qualification tests and type classification of the new 5.56-mm ball cartridge for Armywide implementation. At the start of Phase II, the composite materials identified in Phase I were refined. Approximately 100,000 rounds of the successful candidates from Phase I (i.e., tungsten/nylon and tungsten/tin) were purchased from Texas Research Institute and Powell River Laboratories. A task order contract was prepared for LCAAP to assemble and load M855 cartridges using the composite projectiles. Cartridges from each lot were subjected to standard production verification testing to ensure their safety and performance. All cartridges were then shipped to the NSWC in Crane, Indiana, for qualification testing.

Qualification test requirements and ammunition quantities were finalized. Tests not conducted during Phase I that had the highest likelihood of revealing projectile-related deficiencies were conducted first. Some of these tests included environmental conditioning (hot and cold temperature cycling), rough handling and barrel erosion. The remainder of the testing included, but was not limited to, electronic pressure, velocity and action time, dispersion and penetration. Two candidates meet all requirements, and both were determined to be qualified materials.

During Phase III, the technology is being transitioned to the 7.62-mm and the 9-mm projectiles, and demonstration/testing of those configurations will be performed. Concurrent with the manufacture and testing activities, a corrosion and lifecycle cost analysis will be performed for all three calibers. This effort will examine product cost from raw material processing through manufacture, use and eventual disposal or recycling.

Accomplishments and Results

During Phase I, USAEC and ARDEC demonstrated the viability of seven nondevelopmental item formulations to replace lead in the 5.56-mm ball projectiles. Composite materials tested during Phase I consisted of tungsten bonded with light metals (i.e., tin and zinc) or synthetics (i.e., nylon). Composites were subjected to a high-speed assembly and loading process to produce net shape cores with physical properties similar to lead. Projectiles underwent ballistics performance testing for dispersion, penetration, electronic pressure and velocity and action time. Phase I isolated two candidates suitable for replacing the current 5.56-mm ball service round. Toxicity studies on tungsten were completed and analyzed at ORNL and USACHPPM.

The final report of the demonstration of lead-free alternatives for 5.56-mm ball ammunition was submitted to USAEC in February 1997. Both configurations advanced through Phase II into production. At present, a 50-million-round tungsten-nylon 5.56-mm (ball) core production lot has been manufactured.

Preliminary designs for the 5.56-mm tracer and the 7.62-mm ball and tracer cores

have been completed. A core Demonstration Plan has been developed and tentatively approved by the Environmental Security Technology Certification Program. Twenty-five thousand quantity lots of tungsten-nylon and tungsten-tin demonstration cores are being produced for evaluation. The 50-caliber demonstration program has been completed and the Engineering Change Proposal accepted into production. Additionally, the 9-mm demonstration has been completed and analysis of the data is underway.

Follow-On Program Requirements

- Complete Phase III (transition the technology to other calibers).
- Evaluate tungsten recycle.

Point of Contact

James G. Heffinger, Jr.

Program Partners

U.S. Army Environmental Center
U.S. Army Armament Research, Development and Engineering Center
Lake City Army Ammunition Plant
Oak Ridge National Laboratory
Naval Surface Warfare Center

Changing Dyes in Smokes

Regulatory enforcement of environmental laws and regulations continues to expand with regards to munitions production and military range operations. Particularly, a rapid trend has developed towards the increased accountability of the Department of Defense (DoD) for the emissions from the use of munitions items during training and testing operations.

Purpose

In 1997, the need to quantify the emissions resulting from munitions use, and to assess the risk to human health and the environment from these emissions, was identified as a critical issue for the U.S. Army and the other services. Environmental Protection Agency (EPA) Region 1 requested information on the emissions and residues from the use of munitions at the Massachusetts Military Reservation (MMR). DoD was unable to provide the requested data and thus could not present any valid assessment of the impacts from the use of munitions there. Since that time, additional data requirements, such as Emergency Planning and Community Right-to-Know Act-Toxic Release Inventory (EPCRA-TRI) reporting, have evolved.

In September 1997, the Chief of Staff of the Army directed the Assistant Chief of Staff for Installation Management (ACSIM) to establish a general officer steering committee to address the implications of the restrictions on operations at MMR. The ACSIM directed and funded the U.S. Army Environmental Center (USAEC) to gather emissions data. The USAEC has developed a comprehensive program to identify the emissions resulting from range operations that involve weapons firing, smoke and pyrotechnic devices, and exploding ordnance, and to assess the environmental and health hazard impacts resulting from their use. In the execution of that program, it was identified that two of the colored signal smoke grenades and one of the smoke pots contain and emit toxic and carcinogenic dyes in significant quantities. These signaling items are critical to training operations and

provide a method to immediately cease operations in the event that safety issues are identified. These dyes and smokes may present a risk to the soldier, any nearby receptors, and to the production and test personnel as well. It is in the best interest of the Army and DoD to demonstrate and implement a material substitution for the dyes and smokes in these specific munitions items.

Benefits

The substitution of dyes in the smoke grenades and the HC smoke pots will complete efforts for the elimination of carcinogenic materials from the signaling and smoke devices. This will provide reduced risk to soldiers, the environment and surrounding communities. In addition, this will reduce the potential for restricted operations and for fines and penalties associated with the impacts of these items. Training realism will be enhanced and maintained due to the lessening of restrictions. This next generation of colored smokes, while having less impact on the environment, will also provide an enhanced operational capability to the soldier.

Technology Users

Soldiers
Installations
Police
Department of Transportation

Description

Several alternative materials have been identified, but funding is required to validate the functional and operational capabilities of these items with the alternative (less toxic) dye materials prior to their implementation.

Accomplishments and Results

As of yet, the project is in the planning stage. The new grenades are expected to be produced in CY 2003.

Limitations

The new smoke grenades must meet military standard criteria. To complete the transition, the new smoke formulations must meet Soldiers Observer and Maintainer Test and Evaluation requirements. This requirement includes a color comparison, part of the Production Validation Test (PVT). The color comparison includes soldiers testing the items on the ground as well as helicopters flying over to ensure the color is accurate from the sky. The actual PVT is a testing of the item that was produced outside the normal line type production. After completion of the PVT, an Environmental Fate Assessment will occur. Upon completion of the environmental testing, an Inhalation and Toxicology testing or assessment occurs. After all of these have been completed, the Material Change Approval is issued. Upon the change in formulation, a phased-in production occurs. The first article states that a large sample of the items is to be tested to ensure they can be made by line operators and function as intended. After this final testing, the material is released for full-scale production and use.

Points of Contact

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Howard Beardsley
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Program Partners

Environmental Security Technology Certification Program
West Deseret Test Center
Pine Bluff Arsenal

Edgewood Chemical and Biological Center
Environmental Protection Agency

PUBLICATIONS

Planned publications are for Production Quality Testing and Environmental Design Tests.

UNEXPLODED ORDNANCE CORROSION

Testing and training operations using exploding ordnance continue to play a key role in maintaining the readiness of the warfighter. Roughly 3.5 percent of the rounds used in these operations malfunction, resulting in unexploded ordnance (UXO). Many of these UXO contain high explosives (HE). UXO exists at impact areas on the surface and buried in soil, in wetlands sediment and in water, under both aerobic and anaerobic conditions. Data on the condition of existing UXO and its impacts on the environment have not been collected or evaluated. Additionally, factors that may affect the condition of UXO (such as munition type, soil type, aqueous conditions and pH) have not been evaluated. This study evaluates the rate and mode of UXO corrosion. It will also collect soil explosives concentrations beneath a small number of ordnance on five to 10 ranges.

PURPOSE

Provide the U.S. Army with a tool to assess the site-specific years to perforation for UXO, and evaluate under what conditions, if any, UXO might place explosives into soils on ranges.

BENEFITS

This project will enable installation range managers to evaluate the potential risk from UXO corrosion and release of munitions-related compounds on their installations. We are developing a user-friendly computer tool that provides the number of years to perforation for a user-specified thickness of metal. This computer tool can be used as a program management aid, giving the range manager information to manage the need and timing for range maintenance. Environmental restrictions on training U.S. military personnel will be minimized. Future cleanup costs may be reduced. Furthermore, the environmental stewardship observed will enhance both public image and trust.

TECHNOLOGY USERS

U.S. Army installations
Aberdeen Test Center
U.S. Army Corps of Engineers
Risk assessment community

DESCRIPTION

The Army has a growing need to respond to regulatory questions about the environmental impact of UXO in and around firing ranges. As a result, the University of Louisiana at Lafayette, Praxis Environmental Technologies, the Naval Research Laboratory, and the U.S. Army Corp of Engineers in Huntsville, under the direction of the U.S. Army Environmental Center, has established a program to address these issues. The Strategic Environmental Research and Development Program funds the project, in part. The data to be gathered for this program provide information on the likelihood of UXO to degrade to the point of perforation. This work addresses if and how conventional UXO on military test ranges corrodes over time and provides the parameters, assumptions and constraints of the modeling techniques being used in the development of this UXO Corrosion Model. Current modeling efforts will involve using first principles and literature-reported rates of steel corrosion in soils, and UXO pit depths from a variety of soil and climate types to revamp the 1999 UXO version of the UXO corrosion empirical algorithm. Corrosion modeling based on soil type and any corrosion byproducts will be performed using techniques under development at the University of Louisiana at Lafayette. The results of this

modeling effort will provide input (time to perforation) in future range risk assessments.

Initial efforts encompassed an extensive data search, data evaluation, development of test methodology, objectives and data quality standards. The focus of this effort was to perform an extensive data search, evaluate the available data for adequacy, quantitatively analyze the data, and document findings. Seven UXO were also sampled and used to create an empirical algorithm in a personal computer format. Ongoing work will gather additional UXO corrosion data (200 UXO) from five to 10 sites where the UXO age is well constrained and over a variety of soil and environmental conditions that may influence corrosion rates. The data generated will support the U.S. Army and Army installations in assessing the environmental impact of weapons firing as a part of testing and training operations.

Accomplishments and Results

Initial efforts developed a low fidelity model. The final report for the initial effort was to be concluded in December 2002. Along with the report will be a Corrosion Model and a user's manual. This tool may be used by installation range managers to assess the time to perforation on their ranges.

The second phase of the program has completed the following milestones:

1. The program plan has been written.
2. The work plan (sampling plan, health and safety plan, quality assurance/quality control plan) has been written and accepted.
3. Sampling at five installations has been completed, with 48 new UXO items sampled.
4. The database (Microsoft Access) has been drafted and data entered for the first two sites.
5. Draft model analytical equations have been submitted for review.

Follow-On Program Requirements

- Complete initial effort: write reports.
- Continue follow-on data collection effort:
    1. Collect data from a variety of ranges.
    2. Revise model and write final report with basis for revised model.

Point of Contact

Bonnie Packer

Program Partners

U.S. Army Environmental Center
Strategic Environmental Research and Development Program
Praxis Environmental Technologies
U.S. Army Engineer Research and Development Center-Cold Regions Research and Engineering Laboratory
Louisiana State University-Lafayette, Corrosion Research Center
Naval Research Laboratory
U.S. Army Corp of Engineers
U.S. Army Center for Health Promotion and Preventive Medicine
Cedric Adams and Associates

UXO Technology Demonstration Program

The Department of Defense (DoD) needs to continue advancing methods to detect, locate, discriminate, neutralize, recover and dispose of unexploded ordnance (UXO). The UXO Technology Demonstration Program was initially conducted at Jefferson Proving Ground (JPG), Indiana. The success of that program has necessitated that a new program be instituted this past year, the Standardized UXO Technology Demonstration Site Program. The experience gained from the Standardized UXO Technology Demonstration Site Program will provide the UXO technology developer with sites for the UXO sensor/system technology testing and demonstration. Other products resulting from the program include a screening matrix of system performance, a standardized target repository, standardized protocols for performing geophysical prove outs and a variety of technology transfer and marketing materials.

Purpose

To evaluate, establish and advance UXO technology performance and make it available to the stakeholders.

Benefits

This program has created an in-field experience for the evaluation of UXO technologies under realistic controlled conditions. Baseline technologies were established under the JPG program, and now technology users will be able to advance these baseline technologies using established standardized UXO technology demonstration sites located at the Aberdeen Proving Ground in Maryland and the Yuma Proving Ground in Arizona (March 2003). In addition, data collected at these sites will support the development of software algorithms for the detection and discrimination of buried UXO. This program will contribute to the safer and more efficient remediation of UXO sites.

Technology Users

Military installations with sites that contain UXO will contract the remediation efforts through civilian Explosive Ordnance Disposal contractors.

Description

Congress mandated the UXO Technology Demonstration Program. Advancements in UXO detection and discrimination technologies are necessary to support the operation, restoration and transfer of the DoD's ranges. UXO characterization technologies can be affected by variations in site terrain, geology, natural or man-made materials, vegetative cover, and weather conditions encountered. The establishment of standardized UXO technology demonstration sites will allow users and developers to define the range of applicability of specific UXO technologies, gather data on sensor and system performance, compare results, and document realistic cost and performance information.

To satisfy both the research and development community and the technology demonstration community, the standardized sites are made up of three areas: a calibration lane, a blind test grid, and an open field site. The calibration lane will allow demonstrators to test their equipment, build a site library, document signal strength, and deal with site-specific variables. The blind test grid allows the demonstrator to operate the sensor system without platform, coordinate system, or operational concerns. The open field site will document the performance of the entire system in simulated range conditions.

The program will also have a repository of standardized targets (munitions or calibration targets) that have the same model type, configuration, and relative magnetism to each other. These items are available for temporary loan for technology developers to build signature libraries of sensor system performance under various conditions (i.e., soil, climate, geographic, vegetative). In addition, these targets are available to support geophysical prove outs for the remediation of DoD facilities.

The program has also established a standardized protocols manual for performing geophysical prove outs. This is a guidance manual that outlines the process of site selection, site construction, test operations, demonstrators' data and field requirements, performance scoring and site closure procedures. The Standardized UXO Technology Demonstration Site Protocols is a collaboration of several organizations and builds on the experience and expertise of each of the participants to establish realistic and cost-effective standardized demonstration sites. These goals are defined and described in the protocols manual.

Accomplishments and Results

Results from this program will be used across the United States to aid in the development and use of sensor system technologies for the detection and discrimination of buried UXO and the remediation of UXO sites.

Follow-On Program Requirements

- Technology enhancements
- Technology application
- Technology performance
- Technology transfer
- Identification of support to continue demonstration activities

Point of Contact

George Robitaille

Program Partners

U.S. Army Environmental Center
Aberdeen Test Center
U.S. Army Corps of Engineers Engineer Research and Development Center
Environmental Security Technology Certification Program
Strategic Environmental Research and Development Program

Low-Cost Hot Gas Decontamination of Explosives-Contaminated Firing Range Scrap

The Department of Defense (DoD) has numerous training, target, bombing, and firing ranges at active installations, Formerly Used Defense Sites (FUDS) and Base Realignment and Closure (BRAC) sites that have accumulated a substantial amount of contaminated scrap metal. Range sweeps generate piles of high-value recyclable scrap metal. Contrary to popular belief, many of these items still contain explosives residues after detonation. Explosive incidents involving scrap metal from training and firing ranges have occurred over the years.

Purpose

Use hot gas technology to achieve an analytically clean level (5X) for explosives-contaminated material by thermally desorbing and destroying the explosives.

Benefits

Hot gas technology has been demonstrated in the past as an effective technology for decontaminating explosives-contaminated materials. Application of this technology was limited to fixed facilities that were effective but expensive to operate. This application of the technology takes the decontamination process to the field where the scrap is located and decontaminates the scrap in place at a much cheaper price than a fixed facility.

Technology Users

All DoD installations, BRAC sites and FUDS sites can use this technology. The technology can be applied by installation personnel or can be contracted out.

Description

Hot gas technology is a proven technology that will achieve an analytically clean level (5X) for explosives-contaminated material by thermally desorbing and destroying the explosives. All materials and equipment used in this process are off-the-shelf and readily available. Application of this process to piles of contaminated range scrap involves placing thermocouples in the pile, covering the pile with an insulating blanket, connecting a gas burner to the pile, heating the pile until all of the thermocouples reach the set temperature, and holding the temperature for a set period of time, usually four to six hours.

Accomplishments and Results

The demonstration tests have been successfully completed, and the final technical report is in review. The final report will be available in March 2003.

Limitations

This process cannot be used on unexploded ordnance or other items that are still explosively configured in any way. It is not intended for use on combustible materials.

Follow-On Program Requirements

All reports and manuals are scheduled for completion in March 2003. Technology transfer to the services and interested users will be accomplished during 2003.

Point of Contact

Wayne E. Sisk

Program Partners

U.S. Army Environmental Center
Naval Ordnance Center
Aberdeen Test Center
Parsons Engineering Science

Publications

Design Guidance Manual for Low-Cost Disposable Hot Gas Decontamination System for Explosives-Contaminated Equipment and Facilities. November 1998. Parsons Engineering Science. SFIM-AEC-ET-CR-98046.

Demonstration Results of Hot Gas Decontamination for Explosives at Hawthorne Army Depot, Nevada. September 1995. Tennessee Valley Authority Environmental Research Center. SFIM-AEC-ET-CR-95031.

Hot Gas Decontamination of Explosives-Contaminated Items Process and Facility Conceptual Design. January 1995. Tennessee Valley Authority Environmental Research Center. SFIM-AEC-ET-CR-94118.

SHOCK-ABSORBING CONCRETE PERFORMANCE AND RECYCLING DEMONSTRATION

Recovering lead and other bullet fragments from conventional soil berms is often difficult. As a result, lead and other heavy metals may leach into groundwater, potentially resulting in a remediation effort. Bullet traps constructed from shock-absorbing concrete (SACON) will retain bullets and reduce leaching while providing an easy-to-recycle berm material.

PURPOSE

To assess the use of SACON to reduce the potential of off-site migration of lead and other heavy metals.

BENEFITS

SACON may provide a means to recycle projectiles and prevent buildup of heavy metals in range soils. SACON could also mitigate the excessive soil erosion experienced on outdoor ranges caused by bullet impacts. Erosion control and soil stabilization would help prevent migration of heavy metals off the range, and alleviate the recurring costs of land rehabilitation on the ranges. In addition, SACON may reduce or eliminate safety problems caused by ricochets of natural or other materials.

TECHNOLOGY USERS

The Army – primarily Forces Command and Training and Doctrine Command installations – as well as the National Guard, Navy, Marine Corps, Air Force and Coast Guard.

DESCRIPTION

Numerous Department of Defense small arms ranges contain lead and other metals in soils. In some cases, those inorganic materials may "migrate" to surface water or groundwater. The Army operates approximately 1,400 outdoor small arms ranges in the continental United States while the Navy (including Marine Ranges) and the Air Force run approximately 270 and 200 outdoor small arms ranges, respectively. The U.S. Army Environmental Center, U.S. Army Training Support Center and U.S. Army Engineer Research and Development Center-Waterways Experiment Station seek ways to reduce the potential of off-site migration of lead and other heavy metals.

SACON has been used as a bullet-stopping material since the 1980s. It has been extensively field tested with a variety of small arms, including military and civilian automatic and semi-automatic weapons. The Army and other federal and state agencies have fabricated "training villages" from SACON. However, SACON has not been demonstrated as a berm material on conventional small arms ranges.

SACON can be used to build safe, durable, low-maintenance barriers that can hold spent bullets in a low-permeability, alkaline matrix that will minimize escape of potentially harmful metals into surrounding soil or groundwater. After use, the SACON bullet traps can be recycled. The SACON is crushed and the bullet fragments separated from the crushed material. The aggregate developed from the crushed SACON can be used to recast blocks in a new foamed concrete mixture. The bullet fragments can be recycled.

Demonstration objectives focused on identifying and validating the performance, cost, safety, logistics, training realism and recycling aspects of the SACON bullet

trap material. Field demonstration of SACON was conducted at the United States Military Academy in West Point, New York, from April through November 1997 and at Fort Knox, Kentucky, from March 1997 through January 1998. SACON recycling was demonstrated at Engineer Research and Development Center, Vicksburg, Mississippi, in October 1997. Accelerated durability and ricochet testing was conducted at the Aberdeen Test Center, Maryland in March 1998.

Accomplishments and Results

Field demonstrations were completed in March 1998. A final technical report was issued in August 1999, and a Cost and Performance Report was completed. A summary of performance results follows:

SACON does provide range managers with a means of effectively capturing and containing lead on small arms ranges. SACON offers significant benefits in comparison to current Commercial Off-the-Shelf (COTS) technologies. It exhibits an ability to inhibit the leaching of lead corrosion products. Other COTS bullet traps and soil berms lack this lead stabilization capability. The waste generated from the use of SACON is not classified as a hazardous waste and can be disposed of as a solid waste. SACON is not flammable and can be formed in any shape, making it adaptable to more range applications than standard COTS technologies. However, like all bullet traps, SACON is an expensive means of mitigating the risk of lead transport from ranges and should be considered only as a last resort for keeping ranges environmentally compliant. Other methods of reducing lead transport risk should be investigated prior to installing any bullet trap technology. New methods of stabilizing the lead on the range and mitigating physical lead transport in storm water runoff are being developed and may provide more cost-effective means of reducing lead transport risk and bioavailability.

Limitations

Use of SACON to capture rounds may result in:

- Increased maintenance costs for ranges
- Increased construction costs for new or refurbished ranges
- Reduced range use flexibility (SACON must be designed for specific calibers of ammunition).

Follow-On Program Requirements

Disseminate the demonstration results through articles.

Point of Contact

Kimberly Watts

Program Partners

U.S. Army Environmental Center
Combat Training Support Directorate, Deputy Chief of Staff-Training, Training and Doctrine Command
U.S. Army Engineer Research and Development Center-Waterways Experiment Station
U.S. Military Academy
Fort Knox
Environmental Security Technology Certification Program
Aberdeen Test Center

Publications

"Management of Spent Bullets and Bullet Debris on Training Ranges." Presentation for the American Defense Preparedness Association (ADPA) 1997 Waste Management Conference.

"Chemical Containment of Heavy Metals from Bullet Debris in Shock-Absorbing Concrete (SACON) Bullet Barriers." Paper presented at the 23rd ADPA Environmental Symposium.

"Design of Modular Bullet Trapping Units Using Shock-Absorbing Concrete (SACON)." Paper presented at the 1997 Tri-Service Environmental Workshop.

Final Report, Demonstration of Shock-Absorbing Concrete (SACON) Bullet Trap Technology. August 1999. SFIM-AEC-ET-CR-99017.

Small Arms Range Bullet Trap Demonstrations

Lead from bullets fired on small arms ranges may contaminate groundwater and soil. Such lead contamination could lead to range closure and long-term cleanup costs. Capturing the bullets will prevent the lead from entering the environment. The use of bullet traps on small arms ranges may prevent pollution and result in greater range availability for training and environmental protection.

Purpose

To reduce the potential of off-site migration of lead and other heavy metals, to reduce the impacts on the environment, and to promote training readiness through pollution prevention methods that reduce environmental compliance impacts.

Benefits

Bullet traps may provide a means to recycle projectiles and prevent contamination of ranges and the surrounding environment. Bullet traps would also mitigate excessive soil erosion on outdoor ranges caused by the impact of the projectiles. Erosion control and soil stabilization on the ranges would help prevent the off-range migration of heavy-metal contaminants.

Technology Users

Army and Department of Defense installations with small arms ranges. There may also be civilian applications.

Description

The Army operates approximately 1,400 outdoor small arms ranges in the continental United States; the Navy runs approximately 270 outdoor small arms ranges (including Marine ranges); and the Air Force operates approximately 200 outdoor small arms ranges.

Future regulatory focus may restrict testing and training activities and force the closure of valuable small arms range facilities unless methods are implemented to capture and recycle projectile material and prevent contamination of the range and the surrounding environment. Bullets from small arms are primarily lead, listed as a toxic material under the federal Resource Conservation and Recovery Act (RCRA). Once in soil, bullets may corrode, and the lead may enter groundwater or surface water, resulting in a potential violation of RCRA or other laws. Cleanup of water contaminated with lead is costly, and contamination may result in range closures or restricted use.

Bullet traps can reduce the amount of lead and other metal compounds that end up in soil. Use of bullet traps is presently limited to only a handful of military installations and primarily confined to indoor ranges. This project assesses the performance capabilities of three commercially available bullet traps for use at outdoor military ranges.

Techniques that limit the volume of soil containing heavy metals at small arms ranges also will limit cleanup costs and prevent regulatory restrictions of testing and training activities at active sites. Bullet traps that capture and contain projectiles for recycling will limit or possibly prevent soil contamination on training sites.

Accomplishments and Results

Accelerated testing was completed on three commercially available bullet traps. The following types of traps were tested in a 25-meter range backstop scenario: composite rubber block trap; granular (or shredded) rubber trap; and steel decelerator-type trap.

The consensus is that the bullet traps do not meet their manufacturers' performance claims. Problems ranged from ill-defined usage limitations to lead-dust containment and exposure concerns. A report documenting the traps' performance, environmental benefits and cost analyses is available.

Limitations

Use of bullet traps to capture lead may result in:

- Increased maintenance costs for ranges
- Increased construction costs for new or refurbished ranges
- Reduced training realism (in some cases)
- Reduced range use flexibility (some bullets or weapons might damage the traps)
- Increased environmental and personnel exposure risks (if the selected trap is not suited for the type of ammunition used on the range).

Follow-On Program Requirements

Publicize the demonstration results through articles.

Point of Contact

Kimberly Watts

Program Partners

U.S. Army Environmental Center
U.S. Army Training Support Center
Aberdeen Test Center

Publications

Final Report, Bullet Trap Feasibility Assessment and Implementation Plan, Technology Identification Report. March 1996. SFIM-AEC-ET-CR-96005.

Final Report, Bullet Trap Feasibility Assessment and Implementation Plan, Evaluation Criteria Report. April 1996. SFIM-AEC-ET-CR-96142.

Final Report, Bullet Trap Feasibility Assessment. December 1996. SFIM-AEC-ET-CR-96195.

Final Report, Bullet Trap User's Guide. December 1996. SFIM-AEC-ET-CR-96201.

Advanced Small Arms Range Best Management Practices Guidance Document

Metals such as zinc, copper and lead that exist on small arms ranges can migrate from the range to adjacent water sources and pose a human health risk. Lead is of most concern because of the high quantities that accumulate on the range and its ability to persist in the environment. To continue operations of these ranges, the Army must obtain information on containing metals on the range and making this information accessible to range managers.

Purpose

To develop a small arms range best management practice guidance document that will allow range managers the ability to accurately determine if there is a risk potential of lead migration on the installation's ranges and a step-by-step solution process for mitigating this potential risk.

Benefits

Range sustainability while protecting human health and the environment.

Technology Users

Installation range managers

Description

Fort Jackson has been selected as the demonstration site. The primary objective of this demonstration is to apply specific range maintenance techniques and technologies to an active small arms range and evaluate their effectiveness for possible inclusion in the best management practice guidance manual. This will be accomplished through various designs of structured bullet pockets technologies, as well as range modifications land rehabilitation efforts that will combine to serve as an overall improved method of storm water management. The specific goals of the range modifications are to reduce the overall potential for lead migration, reduce soil erosion, minimize bullet ricochet from impact berms, reduce range maintenance requirements, improve the ease of potential future lead recovery actions, and maintain the overall long-term sustainability of a small arms range.

Post range modification monitoring will continue for nine months. Monitoring is expected to consist of monthly field inspections to gather information from automated monitoring equipment and to visually inspect the range for deterioration. Quarterly sampling to monitor lead distribution on the range will also occur.

A draft guidance manual will be developed that will include a discussion of lead mobility on small-arms ranges; regulatory and logistical drivers for improved range management practices; water-shed assessment methodology, technology identification and selection methodology; technology performance assessment methods; technology economic cost analysis guidance; and potential funding sources for range environmental improvements.

The Aberdeen Test Center is conducting this project.

Accomplishments and Results

The program plan was completed and the assessment portion of the document was developed.

Follow-On Program Requirements

- Collect data from Fort Jackson.
- Review data and select range sites for the demonstration.
- Determine positions to monitor for sediment movement and lead deposits.
- Determine locations and methods of ground water sampling.
- Revise and correct draft guidance manual as deemed necessary.

Point of Contact

Kimberly Watts

Program Partners

U.S. Army Environmental Center
Aberdeen Test Center
Fort Jackson

VEGETATION WEAR TOLERANCE

Erosion can affect the quality of training sites and the environment on Army installations. Revegetating eroded areas with species able to tolerate heavy vehicle and troop traffic will reduce erosion, keep lands open for training and maneuvers, and save time and money.

PURPOSE

To demonstrate the effectiveness of new germplasms (plants) for northern desert climates to tolerate wear and prevent erosion from troop and vehicle traffic on individual installations.

BENEFITS

Revegetating eroded areas with species able to tolerate heavy vehicle and troop traffic will reduce erosion, keep lands open to training and maneuvers, and save precious time and funding. Northern desert regions are particularly susceptible to erosion, due to wear from tactical vehicle traffic.

TECHNOLOGY USERS

Installation range and natural resource managers.

DESCRIPTION

Demonstrations will compare resiliency of new plants by comparing the improved plants to plant mixtures traditionally used at the facility. The evaluation is being conducted at two western training facilities: Yakima Training Center (Washington) and Camp Guernsey (Wyoming). Planting at the two facilities took place in the fall of 2002. It was delayed a year due to drought conditions.

Researchers will monitor these demonstration sites for three years. The demonstrations will involve controlled troop and vehicle traffic, submitting the plants to diverse levels of wear. Based on the test results, certain species will be recommended for installations with similar soil and climate conditions. Information on these species will be available on the VegSpec computer program, so natural resource and range managers can easily identify and select the plants best suited for their revegetation needs.

Researchers are conducting this demonstration in cooperation with the Natural Resources Conservation Service (NRCS).

ACCOMPLISHMENTS AND RESULTS

The project planting has been completed. Data are being collected with regard to soil compaction, numbers of plants, plant heights, etc. at both field sites.

LIMITATIONS

- Monitor project; make sure vehicle and foot traffic is applied according to the project plan.
- Record results, summarize data, prepare technical report and publish results.

POINT OF CONTACT

Bonnie Packer

PROGRAM PARTNERS

U.S. Army Environmental Center
Natural Resources Conservation Service
Fort Leonard Wood

ORDNANCE EMISSIONS CHARACTERIZATION PROGRAM

Military installations need to characterize the emissions generated by munitions during training and testing activities. The Ordnance Emissions Characterization Program will provide the Army and Defense Department with data to help them assess the environmental impacts from munitions use, as well as to build various models and health and risk assessments.

PURPOSE

- To obtain data and identify models that quantify the emissions generated from munition items.
- To provide the U.S. Army with data to assess the potential air emissions.
- To create defensible data to be used for fate, transport and effect work.

BENEFITS

The data generated from this effort will help the Army and Army installations assess the environmental impacts of using munitions during training and testing operations. The emissions data can be used to feed various models (such as air, fate and transport) and support the generation of health and risk assessments. Installations can also use the data to meet Emergency Planning and Community Right-to-Know Act or the Toxic Release Inventory reporting requirements. Environmental restrictions on training U.S. military personnel will be minimized, due to more scientific data. Future cleanup costs may be reduced. Furthermore, environmental stewardship shown will enhance both public image and trust.

TECHNOLOGY USERS

Army and Department of Defense installations
U.S. Army installations
U.S. Army Research Laboratory
U.S. Army Corps of Engineers – Waterways Experiment Station

DESCRIPTION

The U.S. Army Environmental Center (USAEC) has developed a test program to identify and quantify the emissions that result from weapons firing and from the use of pyrotechnic devices. The data to be gathered will provide information on the concentrations of the emission products. The requirement for this information was identified as a result of the Administrative Orders issued by the Environmental Protection Agency (EPA) Region 1, which severely restricted training operations at the Massachusetts Military Reservation. The Army questioned the validity of the claims made by the EPA Region 1, but was unable to provide data regarding training range emissions and the fate and transport of those emissions in the environment. This test program is focused on obtaining and developing data such that the Army will be able a present an incontrovertible case for the continuation of operations or at least limit the breadth of restrictions to those activities that are in fact causing peril. The three distinct but related project areas to quantify emissions have been developed as follows:

1) Firing Point Emission Study

This effort will develop data on the emissions resulting from weapons firing at the firing position and associated emissions factors. The focus of the effort will be to quantify the emissions, develop emissions factors and evaluate the fate of emissions from representative U.S. Army weapon

system ammunition classes. The data generated will support the U.S. Army and U.S. Army installations in assessing the environmental impact of weapons firing as a part of training and testing operations. Limited data exist on the emissions associated with weapons firing. Research efforts such as those conducted by IIT Research Institute on small caliber (5.56 millimeter [mm]) and large caliber (105 mm) were very limited in scope. A phased approach has been developed. Phase I will encompass a data search and analysis, test matrix and methodology development, model development, and an interim report. An important objective of Phase I will be to establish item similarities and data crossover so that the item test matrix and costs are minimized. Phase I was completed in October 1998. Phase II involves actual weapons firing at the Aberdeen Test Center, Aberdeen Proving Ground, Maryland, with sampling and analysis results used to develop emission factors for specific weapons systems and ammunition types.

2) Characterization of Smoke and Pyrotechnic Emissions

This effort will develop data on the emissions resulting from smoke grenades and flare use during training and testing. A phased approach will be used to accomplish this task. Phase I encompasses a comprehensive data search followed by actual testing to develop data on the emissions resulting from smoke grenade and flare use. The emissions will be characterized in the Bang Box at the Dugway Proving Ground, Utah, for various smoke grenades (colored and uncolored) and flare devices (colored and uncolored). Results of these characterization efforts will then be used to generate emission factors for the various items. The emission factors can then be used in conjunction with standard dispersion models to estimate downwind concentrations and rates of deposition.

3) Exploding Ordnance Emissions

This effort identifies and evaluates the fate of explosive compounds in projectiles that have properly functioned during training and testing operations. Efforts will be focused to assess and document the completeness of reaction, and to quantify the emission residuals and byproducts from explosive detonation of military projectiles. The dispersal of the residuals and byproducts in air, soil and water will be evaluated, as well as factors affecting their environmental degradation and transport. A phased approach is planned. Phase I efforts will consist of a significant data search and review, test matrix and methodology development, and model identification. One aspect of test methodology will be to assess the potential of using small-scale detonations that mimic much larger sized ordnance. It is envisioned that at least one full-scale detonation will be required, and those results will be used for verification of the test methodology. Phase II will provide for the actual testing and for the development of emission factors.

Phase III for all studies in this effort involves a comprehensive study on the environmental fate and transport of the emission products in the environment.

For all of the emissions studies, it is known that in perfect combustion of an organic (carbon-containing) substance, only carbon dioxide and water are created. However, because explosions and other types of combustion do not always take place under optimum conditions, and because there are other substances included in these items, researchers look for many other substances in addition to carbon dioxide and water. During testing, the item being evaluated is placed in the testing chamber, and the system used to collect the emissions from the ignition of the item is activated. Upon detonation, the emission products are collected through a vacuum system. The samples collected are then processed by chemists to determine amounts of any substances present. Chemists analyze the samples collected for over 300 different substances that can be byproducts of any combustion. The airborne compounds sampled during these tests included total suspended particulate, particulate matter that was smaller than 10 microns, metals, volatile organic compounds, dioxins and furans, carbon monoxide, and similar compounds that might lead to public health concerns.

The tests were also meticulously videotaped with high-speed film, enabling researchers to play back the video and measure the fire plumes and smoke patterns from the detonations. The temperature and velocity of the firing are also being measured. The information obtained can be used by modelers to determine what is ultimately happening to the emissions and their effects, if any.

Accomplishments and Results

Testing of 104 items for emissions characterization was completed. Reports are being generated recording emission factors, actual concentrations and analysis of emissions.

Thirty-three health risk assessments and fact sheets have been produced based on the emission factors generated.

The EPA-Research Triangle Park (EPA-RTP) has been reviewing Detailed Test Plans prior to the firing or detonating of the ordnance. EPA-RTP's comments and approval of the plans has added great validity to the testing.

Follow-On Program Requirements

- Complete 45 various tests in FY 2002 at Dugway Proving Ground and the U.S. Army Aberdeen Test Center.
- Complete documents publishing emission factor results.
- Publish emission factors in the EPA's standard document (AP-42).
- Publish fact sheets and technical documents for each item tested (with descriptions of the item, its emissions and a generic health risk assessment).

Points of Contact

Tamera Rush
James Morris

Program Partners

U.S. Army Environmental Center
Aberdeen Test Center
U.S. Army West Deseret Test Center
Environmental Protection Agency
U.S. Army Center for Health Promotion and Preventive Medicine

Emission Source Modeling and Health Risk Assessment

When conducting site-specific evaluations of munitions emissions, installations may request guidance in gathering pertinent data. A handbook that details the types of modeling information necessary to perform site-specific assessments would be helpful. USAEC has been characterizing ordnance emissions; these those numbers can be compared with health risk assessment toxicity levels to determine if there is a potential health risk from the use of those munition items at the installation.

Purpose

Develop a handbook to be used by an installation to collect pertinent data for performing site-specific evaluations and health risk assessments. This handbook is not intended to be used as a guide for conducting site-specific modeling; instead, it identifies the information that would be needed if such an analysis were desired. Specifically, the handbook includes a general overview of the selected model; identifies parameters (e.g., wind speed) that are needed to perform a site-specific evaluation; and provides sources where information may be obtained, if applicable. Recommendations on possible modifications to make the model more applicable for Army use may also be included as appropriate (e.g., ability to use item-specific emissions data).

Benefits

Installation-specific health risk assessment for the use of munitions.

Technology Users

Installation personnel
Air modelers

Description

Identifies needs and provides estimated hours and costs to perform site-specific assessments of munitions emissions and associated risks, if any.

Accomplishments and Results

Final handbook is available for installation use.

Limitations

Air models are not capable of modeling different point sources.

Follow-On Program Requirements

Validation is required at the installation level.

Points of Contact

Tamera L. Rush
James Morris

Program Partners

U.S. Army Center for Health Promotion and Preventive Medicine
Environmental Protection Agency

UXO Technology Demonstration Program – National Defense Center for Environmental Excellence

The UXO 2001 Report to Congress estimates that over 11 million acres in the United States may be contaminated with unexploded ordnance (UXO). This includes

approximately 763 Formerly Used Defense Sites that must be cleared of UXO by the Department of Defense (DoD) for civilian use and 23 Base Realignment and Closure (BRAC) installations that must be cleared of UXO for reuse and others requiring restricted access. A mixture of political, regulatory, and budgetary drivers, and present technology limitations force the need to improve the Army's ability to remediate UXO sites.

Purpose

The purpose of this program is to more fully document UXO issues involved in closure and turnover of BRAC installations.

Benefits

This program provides support to the research and development community's efforts to improve the capabilities and reduce the limitations of sensor technologies in detecting, discriminating and remediating UXO-contaminated sites.

Technology Users

The products from this program will support the UXO technology research and development community and ultimately military installations with sites that contain UXO.

Description

This program will 1) document state-of-the-art UXO neutralization and remediation technologies, 2) identify data gaps to enable the Army to better focus and direct future UXO research, development, test and evaluation efforts, 3) increase understanding of UXO movement through subsurface soil due to natural thermal cycling effects, 4) assess electromagnetic induction effect on electronic fuzes, 5) assess munitions corrosion susceptibility, 6) evaluate land use controls for UXO sites, and 7) develop quality control protocols for UXO technology operators.

Accomplishments and Results

Results from this program will help research and development efforts across the United States to aid in the development of technologies and protocols for the remediation of UXO sites.

Follow-On Program Requirements

Contingent on congressional funding support.

Point of Contact

George Robitaille

Program Partners

U.S. Army Environmental Center
U.S. Navy Explosive Ordnance Disposal Technology Division
Aberdeen Test Center
U.S. Army Corps of Engineers Engineer Research and Development Center
Environmental Security Technology Certification Program
Strategic Environmental Research and Development Program
U.S. Air Force Robotics Laboratory
U.S. Army Corps of Engineers
U.S. Army Corps of Engineers Waterways Experiment Station
Department of Defense Explosives Safety Board
U.S. Air Force Research Laboratory
U.S. Navy Naval Facilities Engineering Service Center
Joint UXO Coordination Office

PUBLICATIONS

The Army Environmental Quality Technology Program Operating Principles of October 2001.

Chairman of the Joint Chiefs of Staff Instruction 3170.01B. 15 April 2001.

Army Regulation 71-9 Requirements Generation.

Department of Defense Directive 5000.1 2002.

MIL-STD-331B (Military Standard Fuzes and Fuze Components).

UXO Multi-service Procedures for Operations in an Unexploded Ordnance Environment, FM 100-38/MCRP 4-5/WP TP 3-02.4.1 ACCPAM 10-752/PACAFPAM 10-752/USAFEPAM 10-752. July 1996.

UXO TECHNOLOGY DEMONSTRATION PROGRAM – ENVIRONMENTAL QUALITY TECHNOLOGY

The UXO 2001 Report to Congress estimates that over 11 million acres in the United States may be contaminated with unexploded ordnance (UXO). This includes approximately 763 Formerly Used Defense Sites (FUDS) that must be cleared of UXO by the Department of Defense (DoD) for civilian use and 23 Base Realignment and Closure (BRAC) installations that must be cleared of UXO for reuse and others requiring restricted access. A mixture of political, regulatory, and budgetary drivers, and present technology limitations force the need to improve the Army's ability to remediate UXO sites. The screening, detection, and discrimination of UXO at closed, transferring, and transferred ranges is the Army's highest priority Environmental Restoration requirement.

PURPOSE

The purpose of this program is to take a multi-tiered approach to improve the current state of technology and arrive at reliable and cost-effective solutions to the UXO screening, detection, and discrimination problem.

BENEFITS

The Army's Environmental Quality Technology (EQT) Program focuses specifically on ground-based and shallow water UXO detection and discrimination technologies The EQT program managers and researchers are actively involved in the DoD's Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP) funded UXO-related projects, and applicable results from these programs will be leveraged to the fullest extent.

Many of the underlying science and engineering principles associated with the detection and discrimination of UXO as it relates to environmental restoration are similar to those associated with the countermine, explosive ordnance disposal, active range clearance, and humanitarian demining mission areas. Research, development, testing and evaluation (RDT&E) activities addressing these mission areas are coordinated through the Joint UXO Coordination Office. The EQT program managers are cognizant of the ongoing activities in related mission areas and will ensure conservation of RDT&E resources by coordinating across mission areas as appropriate and leveraging RDT&E conducted in other mission areas where possible to meet UXO remediation needs.

Technology Users

The technologies will be, for the most part, employed by private industry that will use the technologies to provide UXO remediation services to the DoD. The use of the technologies will need regulatory and user acceptance to ensure that the technology, if properly implemented, will meet the established performance metrics. Therefore, within this program, regulatory concerns, buy-in and input will be sought and incorporated.

Description

Current technology cannot effectively or efficiently cover large tracts of land and wide areas under all weather and geophysical conditions for the purpose of screening and identifying areas that potentially contain UXO. The lack of efficient wide-area characterization technologies makes site-specific planning and remediation difficult. The Army EQT program will rely on ESTCP/SERDP programs to advance the state-of-the-art in wide-area survey and will develop advanced sensing, analysis, and positioning technologies that could transition to airborne platforms.

Accomplishments and Results

The program performance metrics are based on testing to be conducted at the standardized UXO technology demonstration sites. The standardized UXO technology demonstration sites are found at Aberdeen Proving Ground and Yuma Proving Ground. Descriptions, standardized procedures and protocols are clearly established in the Standardized UXO Technology Demonstration Site Program Protocols, January 2002. This was a decision based on the need for absolute levels in the exit criteria. The only approach to ensure repeatable testing and realistic test scenarios is to use standardized sites because of the known ground truth and the stability of the sites. Additional demonstrations will be conducted at live sites to be established through the EQT program, to ensure a correlation between the validated capabilities at the live sites and the standardized sites.

The technologies developed and demonstrated under this program shall be required to operate in a wide range of environments where ambient temperatures may range from -30 to +50 degrees Celsius and relative humidity can reach 99 percent. The systems must be capable of operating in the vicinity of power lines and other sources of electromagnetic interference. In addition, ground-based systems must be water resistant to allow operation during rain or snow conditions. Systems shall have sufficient battery and data storage capacity to allow for five hours of continuous operation without recharging/downloading.

Follow-On Program Requirements

To be determined.

Point of Contact

George Robitaille

Program Partners

U.S. Army Environmental Center
U.S. Army Corps of Engineers Engineer Research and Development Center
U.S. Army Corps of Engineers, Engineering and Support Center

Publications

Standardized UXO Technology Demonstration Site Program Protocols. January 2002.

The Army Environmental Quality Technology Program A (1.6.a) UXO Screening, Detection, and Discrimination Management Plan. April 2002.

The Army Environmental Quality Technology Program A (1.6.a) UXO Screening, Detection, and Discrimination AERTA Requirement. July 1999.

TECHNOLOGY TRANSFER

Fifth Environmental Technology Symposium and Workshop

In this age of decreasing funds, it is important for military services, state organizations and industry to leverage available resources and information. The Environmental Technology Symposium and Workshop provides such an opportunity. The symposium is a forum for technical exchange and interaction on environmental technology strategies, initiatives, demonstrations and products. This year, the symposium is jointly hosted by the Tri-Services and the Interstate Technology Regulatory Council (ITRC).

Purpose

To provide a forum for technical exchange and interaction on environmental technology strategies, initiatives, demonstrations and products.

Benefits

By combining efforts with the Navy, Air Force and ITRC, the Army reduces its funding needs of the symposium's total cost. The symposium also helps disseminate information across the services, reducing the "reinventing the wheel" syndrome. Combining what could be three conferences into one also reduces personnel travel expenses and time away from the office.

Technology Users

Department of Defense (DoD) installations

Description

In 1995, the U.S. Army Environmental Center (USAEC) hosted the DoD Environmental Technology Workshop. Bringing together the three military environmental support centers, this venue offered the opportunity for a unified position on environmental technology. The services recognize the need to share information. Since then, the Tri-Service Environmental Support Centers Coordinating Committee has supported the prior Tri-Service Environmental Technology Workshops and ITRC has joined us in improving our venue to include state and federal regulatory partnerships, guidance documents, and training sessions. This most recent symposium will also host the third annual Environmental Quality Technology (EQT) Workshop, which will offer technology team breakout sessions and examine FY 2003 initiatives.

The three services and ITRC comprise the organizational committee, where USAEC has resided as the chair. The committee's main role is to review and select abstracts for platform presentation; it performs other functions as necessary. The USAEC and the support contractor, TRI, handle the balance of the effort.

Symposium presentations focus on mature technologies of timely interest to participants. Emphasis is placed on technologies that are "field ready," are currently being demonstrated, or have been demonstrated.

Accomplishments and Results

The 2001 Tri-Service Environmental Technology Symposium was held 18-20 June 2001 in San Diego, California. The symposium attracted over 300 attendees and included 46 exhibitors, 54 platform presentations, and 30 posters. The 2003 Environmental Technology Symposium will be held 24-28 March in Charlotte, North Carolina. We are expecting 500 attendees and a combined total of 70 exhibitors and posters.

Follow-On Program Requirements

The 2003 event is currently in the planning process. Efforts are also underway to secure a 2004 Environmental Technology Symposium.

Point of Contact

Rick Williams

Program Partners

U.S. Army Environmental Center
Office of the Director of Environmental Programs
Naval Facilities Engineering Service Center
Air Force Center for Environmental Excellence
Interstate Technology Regulatory Council

Publications

Proceedings from 1996 workshop. SFIM-AEC-ET-CR-96187.

Proceedings from 1997 workshop. SFIM-AEC-ET-CR-9705.

Proceedings from 1998 workshop available at http://aec.army.mil/.

U.S. Army Environmental (User) Requirements and Technology Assessments

During the first 15 years of Army environmental research, most research, development, test and evaluation (RDT&E) goals and objectives were established through informal coordination within the Army development community. Given greater emphasis on relevance to Army users, a more rigorous, requirements-based approach was developed in the early 1990s. Since 1993, the environmental user requirements process has been formalized into a two-year cycle aligned with the Program Objective Memorandum process.

Purpose

U.S. Army Environmental (User) Requirements and Technology Assessments (AERTA) serves as the Headquarters, Army central repository for environmental user requirements and related information in support of the Army's Environmental Quality Technology (EQT) Program. AERTA facilitates the Army's validated and prioritized environmental user requirements to help the RDT&E community identify opportunities for developing and demonstrating improved environmental systems and identify applicable off-the-shelf technologies to help Army users make informed decisions on technologies that are better, faster and more cost-effective.

Benefits

In addition to satisfying the annual Department of Defense (DoD) tri-service reporting requirement to the Environmental Security Technology Requirements Group (ESTRG), the AERTA process enhances communication between the "users" of environmental technologies and the Army's environmental RDT&E community. It gives the RDT&E community a better understanding of users' environmental technology requirements with associated performance metrics, their priorities, and the Army's cost of living with the problem, all of which provide the basis for developing RDT&E environmental technology management plans. AERTA provides Army installations with information on the development and availability of faster and more cost-effective environmental technologies. Organizations with technology requirements can use AERTA to identify and share "lessons learned" in a time of shrinking resources.

Technology Users

Army and DoD major commands and installations use technologies to satisfy their environmental requirements. The AERTA Web site documents technology needs

from four user communities: 1) users responsible for installation infrastructure, 2) users responsible for weapons systems acquisition, 3) major commands that use these weapons systems, and 4) agencies responsible for collecting and tracking needs related to infrastructure and weapons systems.

Description

The initial database contained approximately 200 environmentally related operational problems throughout the Army. These were screened to focus on those requiring long-term research and development. These were then prioritized based on six ranking criteria: 1) environmental impact, 2) impact on readiness, 3) annual cost of operating with the unresolved requirement, 4) extent of the problem throughout the Army, 5) impact on quality of life, and 6) regulatory time limits.

The Office of the Assistant Chief of Staff for Installation Management (ACSIM), through the U.S. Army Environmental Center (USAEC), refined and updated these requirements from 1995 through 1997, expanding the scope of the effort into the Technology User Needs Survey (TNS). The Army's environmental databases were analyzed to maximize existing user environmental reporting, and several site visits were conducted across Army installations and major commands. These actions refined the qualitative and quantitative data on user needs and allowed requirements to be compiled in a common format that supports the DoD Tri-Service Environmental Quality Requirements Strategy (prepared by ESTRG). The updated requirements were presented at technology team meetings in 1996 and 1997 for review and validation. The list was narrowed to 142 requirements in 1997 and further focused to 44 requirements in 1999, which were prioritized within each program area (i.e., pillar) by the user community.

The TNS was retailored as a database, tailored to Internet access and renamed AERTA. AERTA is a database that is kept current through the Army's EQT and ACSIM's user-requirements process and schedule. As the technology teams develop and execute RDT&E programs in response to these needs, the user representatives and stakeholders will adjust the need statements and related performance metrics (i.e., measurements for determining when the need is considered completely satisfied). On a biennial basis, the user representatives assess each program area to determine if a readjustment of the need statements, performance metrics and supporting documentation is warranted. Completion of the first cycle for user-requirement development, under the formal AERTA process, was accomplished in April 1999.

The AERTA database can be accessed and reviewed on the Defense Environmental Network and Information eXchange (DENIX) at http://www.denix.osd.mil/denix/DOD/Policy/Army/Aerta. The advantage of storing information on the DENIX Web site is that access is restricted to DoD employees and contractors with approved accounts and passwords. To address problems of data management, two versions of the Army's environmental technology requirements are maintained. The first version contains unfiltered information and is maintained on the DENIX Web site. A second version, from which "sensitive" information not readily needed by the public has been deleted, is on the ESTRG Web site at http://xre22.brooks.af.mil/estrg/estrgtop.htm. The ESTRG site will also identify primary points of contact (one to two per program area, per service) as a gateway for interested parties outside DoD.

Accomplishments and Results

This year we completed a thorough review of the requirements; much of the momentum from this review stemmed from the annual EQT Workshop held in April 2002, in Atlanta, Georgia. During the workshop, the EQT membership worked on requirements revisions for each of the pillar technology teams. This year's AERTA process resulted in a refined requirements list of 42 validated mission-critical environmental needs. The AERTA data were refined and validated in FY 2002 with the cooperation of numerous user and RDT&E community representatives across the four program pillars. The requirements portion of AERTA is updated biennially in the even fiscal years, with the technology assessments portion updated annually.

Limitations

The technology teams are responsible for screening out needs for which the solutions clearly do not involve technology.

Point of Contact

Scott Hill

Program Partners

U.S. Army Environmental Center
Members of the Army RDT&E community
Army technology users

Publications

Army Technology Needs Survey.

Army Environmental Requirements and Technology Assessments. (http://www.denix.osd.mil/denix/DoD/Policy/Army/Aerta).

Fiscal Year 2002 Army Environmental Requirements and Technology Assessments, Final Report. October 2002.

Unexploded Ordnance/Countermine Forum 2002

In a concerted effort to bring together the best minds from all corners of the world, the annual Unexploded Ordnance (UXO)/Countermine Forum 2002 addressed technology, policy and regulatory issues related to countermine and UXO. Participants acquired a greater understanding of UXO and countermine issues, how they affect our world today, and the implications for the 21st century.

Purpose

To produce, manage and host a conference that addresses countermine and UXO technology, policy and regulatory issues.

Benefits

The conference brings together a diverse audience to exchange ideas and information on countermine and UXO.

Description

The UXO/Countermine Forum 2002 addressed technology, policy and regulatory issues related to UXO.

The UXO/Countermine Forum 2002 was sponsored by the Department of Defense Explosives Safety Board (DDESB) and hosted by the U.S. Army Environmental Center (USAEC), in cooperation with the Office of the Project Manager for Close Combat Systems, the Unexploded Ordnance Center of Excellence, Night Vision Electronic Sensors Directorate, Communications Electronics Command (CECOM), the

Environmental Security Technology Certification Program, the Strategic Environmental Research and Development (R&D) Program Office, the U.S. Army Program Manager for Non-Stockpile Chemical Materiel, the Headquarters U.S. Army Corps of Engineers R&D, the Naval Explosive Ordnance Disposal Technology Division, the U.S. Air Force Research Laboratory, the U.S. Army Aberdeen Test Center, the Office of the Assistant Secretary of Defense Special Operations & Low-Intensity Conflicts, Defense Threat Reduction Agency, and the National Association of Ordnance and Explosive Waste Contractors. The DDESB will also sponsor the next UXO/Countermine Forum to be held March 2004.

Accomplishments and Results

USAEC produced and hosted the UXO/Countermine Forum 2002 in Orlando, Florida, from 3-6 September 2002. Approximately 1,000 individuals attended.

Follow-On Program Requirements

Include the five Joint UXO Coordination Office mission areas into the UXO/Countermine Forum 2002. Plan and conduct the next UXO/Countermine Forum in St. Louis, Missouri, March 2004.

Point of Contact

Darlene Edwards

Program Partners

U.S. Army Environmental Center
Department of Defense Explosives Safety Board
Office of the Project Manager for Close Combat Systems
Unexploded Ordnance Center of Excellence
Office of the Assistant Secretary of Defense Special Operations and Low-Intensity Conflicts
U.S. Army Program Manager for Non-Stockpile Chemical Materiel
Naval Explosive Ordnance Disposal Technology Division
U.S. Air Force Research Laboratory
Headquarters, U.S. Army Corps of Engineers Research and Development
National Association of Ordnance and Explosive Waste Contractors
Night Vision Electronic Sensors Directorate, CECOM
Environmental Security Technology Certification Program
Strategic Environmental Research and Development Program
Aberdeen Test Center
Defense Threat Reduction Agency

Publications

UXO Forum 1997, 1998, 1999, 2000, 2001, and 2002 conference proceedings.

U.S. Army Environmental Center Support to Executive Agent for the National Defense Center for Environmental Excellence

The U.S. Army Environmental Center (USAEC) is providing support to the Department of Defense (DoD) Executive Agent for the National Defense Center for Environmental Excellence (NDCEE). The Executive Agent is the Deputy Assistant Secretary of the Army (Environment, Safety and Occupational Health). USAEC is providing Contracting Officer's Representative (COR) and Technical Working Group (TWG) support.

The COR cell is made up of a team of eight people: the COR, the Alternate COR

(ACOR) and two Department of Army civilians and four contractor personnel providing additional contracting technical assistance. The COR team has three main functions: reviewing and approving all deliverables, ensuring that all invoices are acceptable, and providing oversight of the contract mechanisms and technical program. This is done by working with the program director and technical monitors (TMs) selected from the appropriate DoD organization for a given task.

The TWG is chartered in the approved NDCEE Operating Principles. The Operating Principles provide for a three-tiered management process to ensure integration among the DoD components: an Executive Advisory Board, an Executive Advisory Working Group, and the TWG. The TWG members are the high level technical experts from each service and the Defense Logistics Agency (DLA) who are authorized to speak for the service on high priority needs that the NDCEE can address. The TWG identifies the service TMs for each NDCEE program and oversees the development of the technical effort for each congressionally directed program. The USAEC provides the chairperson for the TWG and the coincidental administrative support.

The NDCEE is working on three congressionally directed FY 2002 funded projects: UXO in Support of Military Readiness, Technologies to Reduce Non-Hazardous Solid Waste, and Managing Army Technology Environmental Enhancements. The purpose of the first two is apparent. The third is a project that uses state-of-the-art technology to provide process and environmental information to installation managers over the installation's intranet. The current work is being done at the Radford Army Ammunition Plant. The USAEC NDCEE team, as part of their COR responsibilities, is coordinating the technical level efforts across the Department of Defense.

The NDCEE also performs reimbursable technology demonstrations and validations for DoD organizations. Some examples from this past year are Demonstration of Plastic Media Blasting of Landing Gear at Ogden Air Logistics Center, Inorganic Sludge Dryer demonstration at Tobyhanna Army Depot and Geographical Information System demonstration at Tobyhanna Army Depot.

POINT OF CONTACT Richard L. Eichholtz

APPENDICES

APPENDIX A

ACRONYMS

AAA	Army Audit Agency
ACOR	Alternate Contracting Officer's Representative
ACSIM	Assistant Chief of Staff for Installation Management
AD	Army depot
ADPA	American Defense Preparedness Association
AEPI	Army Environmental Policy Institute
AERTA	U.S. Army Environmental Requirements and Technology Assessments
AO	Administrative Order
AR	Army Regulation
ARDEC	U.S. Army Armament Research, Development and Engineering Center
ARL	Army Research Laboratory
ATC	Aberdeen Test Center
BFVS	Bradley Fighting Vehicle System
BRAC	Base Realignment and Closure
CAA	Clean Air Act
CAAA	Clean Air Act Amendment
CAM	Cost Analysis Manual
CARD	Cost Analysis Requirements Description
CEAC	U.S. Army Cost and Economic Analysis Center
CECOM	Communications Electronics Command
CE-MP	U.S. Army Corps of Engineers Military Programs Office
CEMP	Comprehensive Environmental Management Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
CFR	Code of Federal Regulations
CFV	Cavalry Fighting Vehicle
CONUS	continental United States
COR	Contracting Officer's Representative
COTS	Commercial Off-the-Shelf
CRB	Cost Review Board
CTC	Concurrent Technologies Corporation
CWA	Clean Water Act
CX	Categorical Exclusion
DA	Department of the Army
DDESB	Department of Defense Explosives Safety Board
DDS	Data Delivery System
DENIX	Defense Environmental Network and Information eXchange
DLA	Defense Logistics Agency
DNT	dinitroluene
DoD	Department of Defense
DoDI	Department of Defense Instruction
DOE	Department of Energy
DOPAA	Description of Proposed Action and Alternatives

EA	Environmental Assessment
ECAR	Environmental Compliance Assessment Report
ECAS	Environmental Compliance Assessment System
ECP	Engineering Change Proposal
EIS	Environmental Impact Statement
EL/RAMP	Environmental Legislative and Regulatory Analysis and Monitoring Program
EMS	Environmental Management System
ENF	Enforcement Action
EO	Executive Order
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
EPAS	Environmental Performance (or Program) Assessment System
EPA-RTP	EPA-Research Triangle Park
EPCRA	Emergency Planning and Community Right-to-Know Act
EPR	Environmental Program Requirements
EQLCCE	Environmental Quality Life Cycle Cost Estimate
EQR	Environmental Quality Report
EQT	Environmental Quality Technology
ESH	Environmental, Safety and Health
ESOH	Environment, Safety and Occupational Health
ESTCP	Environmental Security Technology Certification Program
ESTRG	Environmental Security Technology Requirements Group
FASTT	Field Assistance Support and Technology Transfer
FOTW	Federally Owned Treatment Works
FRTR	Federal Remediation Technologies Roundtable
FUDS	Formerly Used Defense Site
FY	fiscal year
GAC	granular activated carbon
GC	gas chromatographic
GMS	Groundwater Modeling System
gpm	gallons per minute
GWETER	Groundwater Extraction and Treatment Effectiveness Reviews
HAP	Hazardous Air Pollutant
HE	high explosives
HEPA	high efficiency particulate air
HM	hazardous materials
HMMP	Hazardous Material Management Program
HMX	cyclotetramethylene
HQDA	Headquarters, Department of the Army
HSMS	Hazardous Substance Management System
HW	hazardous waste
IAAP	Iowa Army Ammunition Plant
ICAP	Installation Corrective Action Plan
IFV	Infantry Fighting Vehicle
IG	Inspector General

IMA	Installation Management Activity
IMA-R	Installation Management Activity Regions
IPT	Integrated Process Team
ITR	independent technical review
ITRC	Interstate Technology Regulatory Council
JPG	Jefferson Proving Ground
LAP	load, assemble and pack
LCAAP	Lake City Army Ammunition Plant
LCCE	Life Cycle Cost Estimate
MACOM	Major Army command
MCL	Maximum Contaminant Level
MDAP	Major Defense Acquisition Program
MLAAP	Milan Army Ammunition Plant
mm	millimeter
MMR	Massachusetts Military Reservation
MP&M	Metal Products and Machinery
MSC	Major Subordinate Command
NDCEE	National Defense Center for Environmental Excellence
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NGB	U.S. Army National Guard Bureau
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NSWC	Naval Surface Warfare Center
OASA (ILE)	Office of the Assistant Secretary of the Army for Installations, Logistics and Environment
OCONUS	outside the continental United States
ODC	ozone-depleting chemical
ODEP	Office of the Director of Environmental Programs
ODS	ozone-depleting substance
ORNL	Oak Ridge National Laboratory
OWS	oil/water separator
P2	pollution prevention
PCAT	P2 Compliance Acquisition Technology
PEO	program executive officer
PESHE	Programmatic Environmental, Safety and Health Evaluation
PM	program (product or project) manager
PMO	Program Manager's Office
POL	petroleum, oil and lubricant
POM	Program Objective Memorandum
POTW	publicly owned treatment works
ppm	parts per million

PVT	Product Validation Test
PWS	public water system
QA/QC	quality assurance/quality control
R&D	research and development
RCRA	Resource Conservation and Recovery Act
RDA	Research, Development and Acquisition
RDT&E	Research, Development, Test and Evaluation
RDX	Royal Demolition Explosive
REC	Record of Environmental Consideration
REO	Regional Environmental Office
ROD	Record of Decision
ROI	Return on Investment
SACON	shock-absorbing concrete
SDWA	Safe Drinking Water Act
SERDP	Strategic Environmental Research and Development Program
SOW	Statement of Work
TBP	Thermophilic (Biological) Process
TM	technical monitor
TMDL	Total Maximum Daily Load
TNS	Technology User Needs Survey
TNT	trinitrotoluene
TRI	Toxic Release Inventory
TSP	Training Support Package
TSP	total suspended particulate
TWG	Technical Working Group
UDLP	United Defense Limited Partnership
UIC	Underground Injection Control
USACE	United States Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Prevention and Preventive Medicine
USAEC	U.S. Army Environmental Center
USAR	U.S. Army Reserves
USARNG	U.S. Army National Guard
UXO	unexploded ordnance
WBS	Work Breakdown Structure
WES	Waterways Experiment Station
WWTS	wastewater treatment system

APPENDIX B

PROGRAM PARTNERS

Aberdeen Test Center
Air Force Center for Environmental Excellence
Anniston Army Depot
Army Environmental Policy Institute
Army technology users

Boeing Company

Cedric Adams and Associates
Combat Training Support Directorate, Deputy Chief of Staff
– Training, Training and Doctrine Command
Concurrent Technologies Corporation
Corpus Christi Army Depot

Defense Finance and Accounting Service
Defense Logistics Agency
Defense Reutilization and Marketing Service
Defense Threat Reduction Agency
Department of Defense
Department of Defense Environmental Security Technology Certification Program
Department of Defense Explosives Safety Board
Department of Defense Program Managers
Department of Energy
Deputy Under Secretary of Defense for Environmental Security

Edgewood Chemical and Biological Center
Environmental Protection Agency
Environmental Security Technology Certification Program

Federal Remediation Technologies Roundtable
Fort Hood
Fort Jackson
Fort Knox
Fort Leonard Wood

GAIA Corporation

Headquarters, Department of the Army
Headquarters, U.S. Army Corps of Engineers Research and Development

Installations
Installation Management Activity Regions
Interstate Technology Regulatory Council

Joint UXO Coordination Office

Lake City Army Ammunition Plant

Louisiana State University – Lafayette, Corrosion Research Center

Major Army commands
Marine Corps Systems Command
McAlester Army Ammunition Plant
Members of the Army RDT&E community
Milan Army Ammunition Plant

National Aeronautics & Space Administration
National Association of Ordnance and Explosive Waste Contractors
National Defense Center for Environmental Excellence
Natural Resources Conservation Service
Naval Air Warfare Centers
Naval Aviation Depot
Naval Cognizant Field Activities
Naval Explosive Ordnance Disposal Technology Division
Naval Facilities Engineering Service Center
Naval Facilities Engineering Support Center
Naval Ordnance Center
Naval Research Laboratory
Naval Surface Warfare Center
Night Vision Electronic Sensors Directorate, Communications Electronics Command

Oak Ridge National Laboratory
OCONUS IMA regional offices
OCONUS installations
OCONUS MACOMs
Office of the Assistant Secretary of Defense Special Operations
and Low-Intensity Conflicts
Office of the Director of Environmental Programs
Office of the Project Manager for Close Combat Systems
Other federal agencies

Parsons Engineering Science
Patuxent River Naval Air Station
Pine Bluff Arsenal
PM-Bradley A3 Upgrade
Praxis Environmental Technologies
Program Executive Office, Standard Army Management Information Systems,
HSMS Project Office
Program manager offices

Regional offices
Risk assessment community

Science Applications International Corporation
State offices
Strategic Environmental Research and Development Program

Teledyne Solutions Incorporated

Unexploded Ordnance Center of Excellence
United Defense Limited Partnership
Universities
URS – Radian International
U.S. Air Force
U.S. Air Force Center for Environmental Excellence
U.S. Air Force Corrosion Prevention & Control Office
U.S. Air Force Petroleum Office
U.S. Air Force Research Laboratory
U.S. Air Force Robotics Laboratory
U.S. Army
U.S. Army Acquisition and Pollution Prevention Support Office
U.S. Army Armament Research, Development and Engineering Center
U.S. Army Aviation and Missile Command
U.S. Army Center for Health Promotion and Preventive Medicine
U.S. Army Corps of Engineers
U.S. Army Corps of Engineers Center of Expertise for Hazardous, Toxic and Radiological Waste
U.S. Army Corps of Engineers Construction and Engineering Research Laboratory
U.S. Army Corps of Engineers, Engineering and Support Center
U.S. Army Corps of Engineers, Hawaii
U.S. Army Corps of Engineers Waterways Experiment Station
U.S. Army Cost and Economic Analysis Center
U.S. Army Engineer Research and Development Center – Cold Regions Research and Engineering Laboratory
U.S. Army Engineer Research and Development Center – Waterways Experiment Station
U.S. Army Environmental Center
U.S. Army Europe
U.S. Army Forces Command
U.S. Army Infantry Center
U.S. Army Integrated Product Teams
U.S. Army Material Command, Installation and Services Activity
U.S. Army National Guard Bureau
U.S. Army Office of the Directorate of Environmental Programs
U.S. Army Pacific
U.S. Army Petroleum Center
U.S. Army Pollution Prevention Support Office
U.S. Army Program Manager for Non-Stockpile Chemical Materiel
U.S. Army Research Laboratory
U.S. Army Reserve Command
U.S. Army Space and Missile Defense Command
U.S. Army Tank Automotive and Armament Command
U.S. Army Tank Automotive Research and Development Center
U.S. Army Training Support Center
U.S. Army West Deseret Test Center
U.S. Corp of Engineers Hawaii

U.S. Geological Survey
U.S. Marine Corps
U.S. Military Academy
U.S. Navy
U.S. Navy Explosive Ordnance Disposal Technology Division
U.S. Navy Naval Facilities Engineering Service Center

Warner-Robins Air Logistics Center
West Deseret Test Center