

2014 Secretary of Defense Environmental Awards
Environmental Restoration – Installation
Fiscal Years 2012-2013
Defense Logistics Agency
Defense Supply Center Richmond

Introduction:

Defense Supply Center Richmond, located along the I-95 corridor in Chesterfield County, Virginia, has been a consistent and dependable supplier of quality goods and services to those defending freedom around the world since its activation in 1942.

Defense Supply Center Richmond is the home of DLA Aviation which is the aviation demand and supply chain management team within the Defense Logistics Agency (DLA). DLA Aviation serves within the Department of Defense (DoD) supply chain as the primary source of supply for nearly 1.1 million repair parts and operating supply items. More than 444,000 of the items managed are aviation parts, including spares for engines on fighters, bombers, cargo aircraft and helicopters; airframe and landing gear parts; flight safety equipment; and propeller systems. Defense Supply Center Richmond's core mission is to supply products with a direct application to aviation. These items support more than 1,800 major weapons systems utilized throughout the DoD.

With over 600 acres and approximately 80 warehousing, utility and administrative buildings, totaling more than 4.5 million square feet, Defense Supply Center Richmond is host to a number of other DoD, Federal and State organizations. The largest of these tenants are the 350-acre DLA Distribution Richmond Virginia, DLA Distribution Mapping; the Virginia Army National Guard Vehicle Maintenance Shop. DLA Aviation and these additional tenant activities employ more than 3,000 civilians, service members, and contractor personnel whose mission is to provide critical material support across the DoD and other Federal agencies.

Background:

Defense Supply Center Richmond's inclusion on the National Priorities List (NPL) of the Federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (also known as "Superfund") was promulgated in 1987. In 1990, DLA, Defense Supply Center Richmond, the U.S. Environmental Protection Agency (USEPA), and the Commonwealth of Virginia entered into a Federal Facilities Agreement (FFA), which directs restoration activities at the site. The FFA designated DLA as the lead agency responsible for the evaluation, selection and implementation of necessary, feasible, and reasonable response actions to ensure protection of human health and the environment. DLA Installation Support at Richmond is currently tasked with oversight of on-site restoration and remedial activities. DLA Installation Support at Richmond coordinates restoration activities with the USEPA, Virginia's Department of Environmental Quality (VADEQ) and DLA Installation Support Staff through quarterly meetings of the restoration planning team.

Thirteen operable units (OUs), which consist of both soil and ground water impacted by past site operations, have been identified on the installation. Investigations have been ongoing at

these OUs since the mid-1980s. The complex properties of the local alluvial, sediments coupled with the entrenched dense volatile contaminants, make environmental restoration challenging. Heavy organic clays retard and sequester contaminants, making them difficult to assess, contact, and remediate over time. Yet, the DLA Installation Support at Richmond has managed to reduce contamination and resultant risks by using remediation technologies that take advantage of the innate physical and chemical properties of the soils.

While previous methods were not as effective, recent years have brought about more focused studies and construction of long term sustainable remedies. During the first two decades of program execution, four Records of Decision (RODs), which document the negotiated remediation actions, were signed. Over the past two fiscal years, Defense Supply Center Richmond has advanced forward with several environmental restoration agreements, coupled with dynamic and innovative remedial actions. All RODs have now been signed.

Rather than addressing the individual operable units as independent undertakings, the Center has focused on addressing contamination from a holistic approach. This approach ensures larger issues are tackled in the right priority, preventing or eliminating the persistent sources of long term liabilities. The priorities are clearly listed, for transparency's sake, in the Defense Supply Center Richmond's Management Action Plan (MAP). This Plan gives the stakeholders a clear and concise document which details the history, context, and studies conducted. It also helps stakeholders understand the budget formulation, and program planning process.

With concurrence from the US EPA Region III, Defense Supply Center Richmond completed a major program milestone with the recording of a final ROD signed for Operable Unit 6 (OU-6). This site, located in the central portion of the installation, consists of impacted ground water underneath and down gradient of a former landfill, an open storage area and a vehicle maintenance operation. The open storage area, designated separately as Operable Unit 1, was the site of numerous spills from storage activities and a recouplement operation including three separate malathion spills. The former landfill area, designated separately as Operable Unit 2, is a 13-acre tract of land that had previously been home to a ravine used to dispose of bulk liquid chemicals, construction debris and scrap metal. The vehicle maintenance operation for the National Guard, designated separately as Operable Unit 3, has previously included a degreasing area, a wastewater treatment sludge disposal area and several underground storage tanks. The agreed upon plan will focus on *in situ* bioremediation using injections of emulsified vegetable oil to stimulate naturally occurring microbial growth which then treat the contaminants in the groundwater through natural attenuation processes.

DLA Installation Support at Richmond also implemented the final ROD signed for OU-13, which consists of soils impacted by a spill from an above-ground storage tank in 1978. The agreed upon plan consists of a removal action of contaminated soils and institutional controls. The project manager worked with the local natural resources and master planners to ensure the removal action design was respectful of the installation's only remaining natural ecological preserve to develop a remedial design that was cost effective, protective of the sensitive ecology in the area and met the cleanup criteria. The remedy was implemented in 2013 and is awaiting final closure documentation.

DLA Installation Support at Richmond is also in the process of implementing the ROD for OU-7. OU-7 is the contaminated groundwater found in three separate plumes resulting from past fire fighter training activities. The remedy for OU-7 is *in situ* bioremediation coupled with Land Use Controls and Long Term Monitored Natural Attenuation. In 2013, DLA Installation Support at Richmond installed twenty three new injection wells in eight separate transects. More than a total of 22,300 gallons of Emulsified Vegetable Oil substrate was injected into these wells to stimulate naturally occurring bacterial growth which in turn provides enzymatic breakdown of the contaminants of concern.

More recently, DLA Installation Support at Richmond has undertaken a substantial amount of sampling and analysis regarding its northernmost contaminated groundwater plume, OU-8. This testing allowed the installation to better delineate the extent and movement of the



Figure 1: Trailer used for mixing and injection of Emulsified Vegetable Oil

plume, which subsequently affords more effective and timely remediation efforts. Through careful and diligent coordination with offsite stakeholders, including the United States Army Reserves 80th Division's Dervishian Installation and the Virginia Department of Transportation, DLA Installation Support at Richmond has successfully characterized the full extent of contaminated groundwater stemming from two previously unknown sources within Operable Unit 8, allowing for remedial actions to proceed. The Remedy for OU-8 had been Long Term Monitored Natural Attenuation with a contingency remedy of *in situ* bioremediation if certain criteria triggered the need for it. One of the criteria which could trigger

additional remedial action is the migration of contaminated groundwater offsite. In 2013, DLA Installation Support at Richmond finalized a Remedial Design Addendum to institute *in situ* bioremediation and installed twelve injection wells and injected approximately 11,700 gallons of Emulsified Vegetable Oil substrate to stimulate naturally occurring bacterial growth which in turn provides enzymatic breakdown of the contaminants of concern. Additional injection wells are planned as well, as a pilot study within the confines of the Dervishian Army Reserves Center to aggressively treat contaminated groundwater going offsite via *in situ* Chemical Oxidation to address contaminated groundwater that had already migrated off of the installation.

In an effort to continually keep its neighbors informed of remediation actions, Defense



Figure 1: RAB members participate in meetings and tours of the installation

Supply Center Richmond established a monthly Restoration Advisory Board (RAB) in January 2002. The RAB consists of community members, a DLA Installation Support at Richmond co-chair, a US Environmental Protection Agency representative and a Virginia Department of Environmental Quality representative. The primary objectives of the RAB are to inform the community on the restoration activities at Defense Supply Center Richmond and to obtain community input regarding these activities and the proposed remedies for the OUs. In 2008, Defense Supply Center Richmond

decreased the frequency of RAB meetings from monthly to quarterly due to its effectiveness in educating the public. In 2013, the frequency was further decreased to once a year. Ms. Janet Moe, the community co-chair, stated, “We hold Defense Supply Center Richmond to be good stewards of the land and water on and surrounding Defense Supply Center Richmond.” The Community Involvement Plan (CIP) is updated with input from interested citizens of the surrounding community. In addition to the annual meetings of the RAB, DLA Installation Support at Richmond has provided periodic updates to the Bensley Community, specifically residents whose properties have been impacted by contaminated groundwater from OU-8 to ensure they are fully aware of the current status of activities surrounding the cleanup activities pertaining to OU-8 and to provide opportunities for answers to any questions that may arise. DLA Installation Support at Richmond has provided these updates through mailings, door to door delivery of notifications and an update provided during a meeting of the Bensley Civic Association.

Program Summary:

DLA Installation Support at Richmond’s environmental restoration program for Defense Supply Center Richmond strives to attain timely and cost effective risk reduction. To accomplish this goal, we must ensure that our selected remedies are *performing as designed* and will achieve cleanup goals and a “response complete” status in a reasonable time frame. Therefore, DLA Installation Support at Richmond periodically assesses the performance of a given remedy against clearly established metrics.

These metrics may include decreases in contaminant concentration or mass flux and changes in ground water geochemical conditions or similar environmental parameters. When the remedy is performing as designed, the cleanup goals should be met within the design’s time frame. Failure to meet the performance metrics suggests that the remedy is not performing as designed and alternative courses of action should be considered.

DLA Installation Support at Richmond has a prescribed analytic decision-making process to evaluate prudent courses of action when a remedy is not performing adequately. First, the DLA Installation Support at Richmond evaluates techniques to optimize the current remedial technology. Optimization begins with a review of system performance and design and an analysis of the root causes of sub-optimum performance, followed by design or operational changes intended to overcome the adverse, site-specific conditions. If the current technology proves technically non feasible, which has occurred in practice many times, selection of a substitute technology or approach is evaluated. DLA Installation Support at Richmond has replaced several ineffective highly engineered remedial technologies with more passive less energy consumptive remediation solutions. Recently, an ineffective ‘Pump and Treat’ system was replaced by an in-situ bioremediation technology which augments the natural attenuation processes already lessening contamination in place. Once the ineffective technology has been replaced, the performance goals and



Figure 3: Environmental investigations help optimize ground-water monitoring schedules

expectations are revised so that the DLA Installation Support at Richmond has the means to evaluate the new technology from a baseline perspective.

Program Accomplishments

DLA Installation Support at Richmond designed and implemented a performance-based remedy for OU-8 to address the impacted ground water beneath, and downgrade of the former acid neutralization pits (ANPs). These ANPs were concrete settling tanks in the northern part of the facility that received wastewater from metal-cleaning and degreasing activity from 1958 to the early 1980s. This remedy has since been expanded to include OU-7 and per the Record of Decision signed in 2013, will be expanded to include OU-6 as well.

The performance-based remedy for ground water is unique because it is intended to be less rigid than conventional decision documents. It is part of the results-based cleanup strategy for Defense Supply Center Richmond that uses improving knowledge to iteratively check and refine decisions about remediation. This ultimately expedites cleanup and protects human health and the environment.



Figure 4: Scientist inject edible oil into the subsurface through monitoring wells to promote bioremediation

A three-year Treatability Study proved the efficiency of using *in-situ* bioremediation technology to remediate chlorinated solvents in the ground water. *In-situ* bioremediation uses native micro-organisms to decompose contaminant chemicals into innocuous end products. DLA Installation Support at Richmond has successfully pilot-tested a remediation system which nourishes these native microbes so that they can decrease chemical concentrations by several orders of magnitude. The bio-wall treatability system, installed in 2007, has proven highly effective at reducing contaminant concentrations.

The remedy relies partially on closely Monitored Natural Attenuation (MNA) to achieve restoration goals. This is the treatment approach of allowing natural processes to reduce contaminant concentrations to acceptable levels over time. Monitored natural attenuation involves physical, chemical, and biological processes that act to reduce the mass, toxicity, and mobility of subsurface contamination. This passive, less engineered remedy is unobtrusive and allows for maximum mission capability. The area is being currently used as both a critical mapping facility and, as a recreational field.



Figure 5: Scientists monitor vapor pressure inside installation facilities

The remedy also includes *in situ* bioremediation. The restoration planning team studied the results of the first three years of remedial action operation at OU-8 and determined that current technology, natural attenuation, was not sufficient to meet restoration goals in a reasonable timeframe.

Initially in March 2010, *in-situ* bioremediation was instituted to supplement the current remediation technology. Approximately 5,000 gallons of edible oil substrate was injected into the source zone of contamination through injection wells. The edible oil substrate provides fodder for microbes to biochemically reduce chlorinated volatile organic compounds concentrations in the area. The MNA approach, coupled with the bioremediation contingency process, will allow the Defense Supply Center Richmond to find the smartest and fastest way to achieve cleanup goals. These initial injections were followed up by additional injections totaling approximately 11,800 gallons of edible oil substrate in 2013. Injections were completed in areas down gradient of the original source area to include contaminated groundwater contributions from newly discovered source areas. Injections were also completed in the source areas for the three contaminated groundwater plumes making up OU-7 totaling more than 22,300 gallons of edible oil substrate.

The remedies for Operable Units consisting of contaminated soils often require a different approach, given the limited transport opportunities available on the molecular level.



Figure 6: Precision Excavation Within Operable Unit 13

The remedy for Operable Unit 13 required the excavation and removal of contaminated soils to reduce the overall ecological risk to an acceptable level. The areas of excavation took place in ecologically sensitive wetlands and wooded areas making a wholesale excavation ineffective. Through careful analysis and field delineation of soils with levels of contaminants contributing to an overall unacceptable ecological risk, DLA Installation Support was able to conduct a limited precision excavation that minimized the impact the remedy would have on the surrounding area while still achieving cleanup goals and minimizing disposal costs.

Judging Criteria

Program Management: The Center showed tremendous improvement by implementing low cost sustainable remedies at its high risk sites. These remedies replaced highly engineered ineffective campaigns which were providing ineffective risk reduction. By eliminating these systems, the Agency was able to save on operation and maintenance contracts totaling over \$700,000 per year. The Installation Restoration Program worked diligently with the Center's Community Planner to integrate protective Land Use Controls (LUCs) in the Master Plan in a transparent and easily recognizable manner. This effective program management allowed all employees of DLA Aviation and other tenant activities to focus their efforts toward supporting the warfighter.

Technical Merit: Through on-site testing and development, DLA Installation Support at Richmond successfully implemented cost effective and innovative remediation techniques. DLA Installation Support at Richmond uses the TRIAD approach to characterization which allows for dynamic planning and field-based decision making. The stakeholders are privy to nearly

instantaneous vital field-based test environmental sampling results which helps them make quick well-informed decisions.

Orientation to Mission: The effectiveness of the remedies being implemented resulted in several acres of previously contaminated land being restored to a state where it can now be used to support the needs of the installation. Additionally, the green and sustainable remedies, like Natural Attenuation and Bioremediation, were installed as low profile actions which promote military readiness and civil works mission. All aspects of Defense Supply Center Richmond's Installation Restoration Program are pursued in full compliance with all applicable Commonwealth of Virginia and Federal environmental regulators.

Transferability: A significant percentage of the remedies being pursued within Defense Supply Center Richmond's Installation Restoration Program are natural and sustainable. They involve the relatively non-technical use of sustainable native vegetation plantings, low impact landscaping, and the injection of edible oil substrate. The simplicity of these effective and low cost remedies, and the ease of their sustainment, facilitates their continued use long into the future. The broadness of these remedies also allows for their adoption by other DoD facilities.

Stakeholder Interaction: Defense Supply Center Richmond's Restoration Advisory Board has proven to be an effective means of involving our surrounding community, state and local organizations, as well as non-governmental organizations since 2002. Each informational meeting is opened to the public and is often attended by individuals and businesses. The Installation gives regular briefings, detailing the ongoing projects at each of the relevant restoration sites. Throughout the past several years, the installation has achieved a friendly rapport with the local RAB members, which allows for casual and transparent discussions regarding concerns and project status. We borrowed many lessons learned from the experience of others. Additionally DLA Installation Support at Richmond routinely meets with regulatory stakeholders at both the State and Federal level to ensure the program maintains forward momentum and to streamline the solution for any problems that may arise during restoration efforts.