

## FY 2016 Secretary of Defense Environmental Awards

# FORT BRAGG, NC

### INTRODUCTION

Established in 1918, Fort Bragg, began as a field artillery training camp, is now the most populous military installation and a most strategically important military installations in the United States for the training and deployment of the airborne and special operations forces. Fort Bragg, including Pope Army Air Field (AAF), Simmons AAF and Camp Mackall, is 10 miles northwest of Fayetteville in the Sandhills region of southeastern NC. Over 53,000 military personnel are stationed at Fort Bragg in 11 commands:

- U.S. Army Forces Command
- US Army Reserve Command
- XVIII Airborne Corps
- Joint Special Operations Command
- U.S. Army Special Operations Command
- 82d Airborne Division
- 1st Special Forces Command
- U.S. Army John F. Kennedy Special Warfare Center and School
- U.S. Army Special Operations Aviation Command
- U.S. Army Civil Affairs and Psychological Operations Command
- 1st Theater Sustainment Command

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**For Open Publication**

Apr 19, 2017

Department of Defense  
OFFICE OF PREPUBLICATION AND SECURITY REVIEW

Fort Bragg is also geographically and demographically important. With a land area of 162,816 acres (254 square miles), the installation supports a population of 261,449 individuals, which mainly includes 53,228 military members, 71,259 Family members and a support force of 14,663 Civilian personnel and 5,552 contractors. The local economic impact of the installation is \$9.8 billion annually.

The success of the Installation Restoration Program (IRP) at Fort Bragg is a direct result of a uniquely qualified multidisciplinary team that brings a diverse knowledge base and a proven track record to the program.

Three types of sites fall under the umbrella of IRP at Fort Bragg: Installation Restoration (IR) sites, Compliance Restoration (CR) sites and Military Munitions Response (MMR) sites. Since inception, 197 sites were identified with known or possible releases to the environment. To date, 67 percent of these sites are now removed from the Fort Bragg Environmental Liabilities List, leaving only 66 sites remaining. More than 1,775 acres have been returned to Fort Bragg as developable land.

### Judging Criteria



**Program  
Management**



**Orientation  
to Mission**



**Impact &  
Outcomes**



**Technical  
Merit**



**Stakeholder  
Interaction**



**Transferability**

## BACKGROUND

Fort Bragg equips, trains, mobilizes and sustains Soldiers for global response at a moment's notice. Construction projects and additional expansion initiatives are key to the mission. The installation relies heavily on the IRP to restore land for use in many high-profile, mission essential projects. Returning usable land to the Fort Bragg inventory and reducing the number of sites monitored helps to ensure the continued viability of the installation; providing the best conditions for Soldiers to train and prepare for the mission.

The Fort Bragg Tier I Partnering team consists of the Installation Program Manager, the North Carolina Department of Environmental Quality (NCDEQ), U.S. Army Environmental Command (USAEC), U.S. Army Corps of Engineers (USACE) and the contracted firms carrying out the work. This partnership of critical stakeholders brings a specialized understanding of restoration concepts and demonstrates their commitment to the program. This collaboration has ensured the successful remediation of Fort Bragg lands since the IRP launched in 1984.

## ACCOMPLISHMENTS

### Accelerated Environmental Cleanup

 To accelerate cleanup and encourage using innovative strategies, the Fort Bragg IRP team uses only performance based contracts (PBCs) to investigate and remediate sites.

   Using PBCs drastically accelerates site clean-up saving time and money. Presently, 76 IRP sites have converted to PBCs. Each of Fort Bragg's technical consultants has worked diligently to develop groundbreaking or alternative remediation strategies to accelerate cleanup of installation sites. The use of PBCs resulted in a 44 percent reduction in cost, or approximately \$7.3M in savings from the original projected cost of \$16.5M on 33 sites. Each site was originally projected to reach site closure in 30 years. On average, this was reduced by 25 years, or 83 percent, per site with accelerated remediation techniques. Since the inception of PBCs on 76 sites, 33 of those sites, or 43 percent, have received No Further Action (NFA). 

### Revisiting Historical Sites

#### Historical Hardfill Site

Site FTBR-300, also known as Hardfill #2, is a historical site transferred from the Air Force to the Army in 2010. The site consisted of waste left in place and low-level groundwater and surface water contamination. A Record of Decision (ROD) was signed in 2010 and implemented groundwater monitoring for Contaminants of Concern (COC) and maintenance of land use controls (LUCs) until all groundwater and surface water constituents were below applicable regulatory levels. The ROD estimated that the LUCs and monitoring would require 30 years. Although human health and ecological risk assessments did not identify unacceptable risks, historical detections of contaminants in groundwater and surface water exceeded North Carolina standards. Because wastes were left in place above levels that allow for unlimited use and unrestricted exposure, LUCe controls and long-term monitoring (LTM) was determined to be the solution, estimated to take 30 years.

 During a Tier I Partnering meeting in 2015, team members reviewed groundwater analyses for Hardfill # 2. Based on consistent low-level contaminant values, the team determined that a further review of historical data was warranted. This partnering effort revealed that groundwater and surface water data for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) had not exceeded North Carolina standards since 1992. Sporadic detections of metals in the groundwater were 1) attributed to natural background levels or levels that do not represent a release of contaminants for most metals, 2) do not represent a health or ecological risk, and 3) are not associated with hardfill wastes. As a result of the data analysis and the presence of only inert materials, the site was recommended for and received an unrestricted No Further Action (NFA) status in a 2016 ROD Amendment. All groundwater and surface water monitoring on Hardfill #2 is now discontinued and land use restrictions removed. The ROD Amendment

resulted in an estimated \$224K, or 74 percent, lifecycle cost savings. Additionally, the NFA returned 13.15 acres to the installation for unrestricted development 25 years ahead of the original schedule.

### Historical Military Munition Sites

Five historical Munitions Response Sites (MRSs) were identified in an Archives Search Report performed in 2010. It was determined the MRS warranted further evaluation and Site Investigations (SI) were conducted. Based on SI results, two sites had anomalies present in them and an additional investigation was recommended in the reports.

However, through careful records research, review of historical data and discussion between all stakeholders, it was determined that the anomalies detected at these sites were associated with historical and cultural features and not munitions, thus avoiding costly Remedial Investigations (RIs). The technical skills, ability to communicate risk and strong relationship with the NCDEQ helped achieve NFAs for four sites while the other site achieved a No Further Remedial Action Planned (NFAP) status. The NFA and NFAP determinations resulted in a total lifecycle cost savings of \$2.5M and returned the acreage to the installation for unrestricted development 25 years ahead of schedule.

### Former Fire Training Site

A former fire training site contaminated with petroleum impacted soil limited development for one of Fort Bragg's special operations commands. The IRP team worked diligently to come up with a mutually beneficial solution for all stakeholders. The original cleanup choice of natural attenuation at this site was estimated to take 30 years to clean up.

However, the team partnered together to strategically implement soil excavation to aggressively pursue NFA. Approximately 3,900 tons of petroleum impacted soil was removed from the site and NFA was achieved, releasing 2.5 acres for redevelopment. This aggressive site clean-up permitted Fort Bragg to receive an NFA in a period of only months versus years and returned valuable land to one of Fort Bragg's land-challenged special operation compounds.



A cache of munitions recovered from a historical Munitions Response site on Fort Bragg awaits disposal.

### Optimization and Streamlining

Optimizing and streamlining the environmental restoration processes is one of the Tier I Partnering team's top objectives. This was accomplished via a collaborative review of the processes in place at long-term groundwater monitoring sites, whereby it was determined that extending the required sampling frequency at multiple sites would be more efficient. Modifying the sampling frequency at four groundwater monitoring sites resulted in an estimated \$732K, or 53 percent, in lifecycle cost savings.

### Innovative Technologies

Utilizing a variety of field techniques, Fort Bragg was able to rigorously limit the number of new IRP sites during underground storage tank (UST) removals. Instead of excavation, soil sampling and screening while performing UST removals has saved approximately \$1M in lifecycle costs at four UST removal sites in 2015 and 2016.

Innovative groundwater sampling methods, such as passive diffusion bag (PDB) sampling, continue to advance remediation on the installation. Using PDBs in place of purging and low-flow sampling methods in groundwater monitoring wells has increased since a PDB pilot study conducted on Fort Bragg demonstrated the effectiveness of this innovative technology to NCDEQ.

The PDB technique uses the principle of diffusion, or the movement of particles from an area of high concentration to an area of low concentration until

equilibrium is reached, and replaces purging and low-flow sampling methods in groundwater monitoring wells being sampled for VOCs. Since the initial study and subsequent approval by the NCDEQ, the PDB process was established as a primary method for groundwater monitoring and has resulted in a 95 percent reduction in investigation derived waste (IDW) and a 75 percent reduction in staffing for sampling and analytical services. The deployment of PDBs has also reduced the carbon footprint associated with groundwater monitoring.

 Using PDB technology at Fort Bragg is transferable across the Army and Department of Defense for groundwater monitoring. This technology is continually recommended at sites on Fort Bragg and has a cost savings of approximately 40 percent per sample on each well, where it can be utilized. Currently, there are eight sites that use the PDB sampling method; one of these was added within the past year.

### Partnerships between Stakeholders

Maximizing the use of the North Carolina Notice of Residual Petroleum (NRP) and Notice of Contaminated Site (NCS) processes allows for minimal investigation of UST and petroleum non-UST spill sites. This eliminates costly assessment work and LTM costs by placement of LUCs on soil and groundwater. LUCs on soil are implemented only at sites where excavation is not technically practical due to the proximity of adjacent buildings. The LUCs on groundwater have no adverse impact to Fort Bragg, since groundwater is not used for potable purposes. The lifecycle cost savings over the past 2 years is estimated at \$1.5M for 5 UST sites and 1 petroleum non-UST spill site.

 To date, Fort Bragg has successfully completed NRPs at 20 former UST sites on Fort Bragg, including Pope Army Airfield, since the process was created, saving \$6M in lifecycle cleanup costs. The usage of the NRP process has been critical to the IRP success and is the first of its kind used in the Army.

### Reducing Risk to Health and the Human Environment

There are several techniques used by Fort Bragg to reduce the risk of exposure and potential harm to



A former landfill site, now capped and closed, is prepared for long-term monitoring.



Soil excavated at an IRP site is covered until it can be properly disposed.



A GeoProbe is deployed to test for contaminants at an IRP site.



The PDB technique, shown deploying here, uses the principle of diffusion, or the movement of particles from an area of high concentration to an area of low concentration until equilibrium is reached, and replaces purging and low-flow sampling methods in groundwater monitoring wells.

humans and the environment. One technique to reduce the risk to human health and the environment is the complete removal of contaminated media through excavation or remediation. Additionally, LUCs prevent unnecessary contact with contaminated media by leaving the contamination in place, then restricting access to these areas through NRPs, fencing or signs. Remediation techniques such as passive aeration/volatilization and bioremediation



treat the contamination in place thus reducing the risk of human and environmental exposure.

The Fort Bragg Work Management System (WMS), a computer-based program, is used as a system of checks and balances, reducing the risk to human health and the environment by informing stakeholders about upcoming construction projects in areas with contaminated media. The WMS ensures project managers are aware of environmental considerations and notify contractors of the location and type of contamination sites within the project limits of construction. Necessary adjustments are then made during construction to prevent disturbance of these areas, or supplementary ways to work with the media are emphasized, while maintaining compliance with all environmental regulations.

### Green Remediation

Fort Bragg's IRP team relentlessly utilized green and sustainable remediation through less intrusive cleanup techniques such as in-situ enhanced anaerobic bioremediation (EAB), passive remediation and sampling, reduced well sampling, natural attenuation and NRPs.

One green remediation technique used to treat chlorinated solvents in groundwater plume source areas is EAB. This technique uses a mixture of water, buffer solution and neat vegetable oil, which is pumped directly into the ground at the source to treat the groundwater in place. This mixture boosts anaerobic microbial activity, which in turn feeds on contaminants, thus speeding up the cleanup process. This method replaces more extrusive techniques such as pump and treat systems which pump contaminated groundwater to the surface where it is treated and then discharged back to the environment. By not exposing humans and the environment to the contaminated groundwater and increasing the carbon footprint, EAB has served as a much greener remediation approach.



Passive sampling and remediation techniques such as PDBs and passive surface water treatment systems are also used at Fort Bragg. These techniques reduce IDW, save energy and can reduce noise impacts of other remediation types. Reducing the number of wells and sampling frequencies also reduces the amount of IDW generated over the course of a site



The use of in-situ enhanced anaerobic bioremediation is a more environmentally friendly and less intrusive method for cleaning an IRP site.

cleanup, along with reduced staffing needs. These green tools save time, money and energy making this practice a greener alternative.

Fort Bragg also utilizes the green remediation methods of natural attenuation and LUCs such as Notice of Residual Petroleum. These techniques allow nature to clean up a site, while monitoring the progress or restricting access to contaminated areas. While these processes are lengthier than other remediations, they are certainly the least intrusive.

## Conclusion

The efforts of the Fort Bragg Tier I partnering team have significantly advanced achievement of site closure for 67 percent of the IRP sites. Pioneering management techniques and the implementation of new monitoring and remediation technologies have resulted in significant successes at Fort Bragg. These accomplishments reduced risk to human health and the environment by removing or limiting exposure to harmful contaminants. Additionally, reductions to lifecycle costs and timelines have been dramatic and are projected for attaining remedial endpoints, while adhering to applicable regulatory requirements.

The Fort Bragg IRP team employed methods resulting in positive impacts to mission requirements. Many remediation sites on Fort Bragg are situated within prime regions of the installation and are critical for future development. Prioritized site remediation has returned over 1,775 acres of land on Fort Bragg and Pope AAF to the overall inventory of developable land on the installation. The operational tempo and construction requirements of Fort Bragg have benefited significantly from this environmental program.

The effective results at the eight passive diffusion bag sampler sites on Fort Bragg and Pope AAF have broad applicability for transference to other remedial programs within the Army. Additionally, the effective use of the NRPs to move sites to Response Complete can serve as a model for other DoD installations facing low levels of contaminants that are either technically or economically infeasible to remove.

Actively engaging stakeholders, such as government agencies, colleagues and the community enhances the installation restoration process. Strong relationships

maintained within the Fort Bragg IRP team have allowed for the development of innovative methods. These methods have decreased site remediation costs significantly, expedited contamination remediation and accelerated the return of developable land, thus paving the way for vital military construction projects.

Regular conference calls and quarterly partnering meetings ensure stakeholders are kept abreast of program developments and remediation activities.



Working closely with the North Carolina Tier II partnering team, installation personnel have shared best management practices and techniques with other military representatives from Army, Air Force and Marine installations in the state.



A robust Community Involvement Plan guides Fort Bragg remediation strategies and affords the public the opportunity for involvement. Decision Documents and RODs outline the plans for remediation sites that have reached long-term management status. These documents and associated remediation strategy documents are reviewed by Fort Bragg Garrison command leadership and are subjected to a 30-day public review and comment process. Fort Bragg maintains paper copies of all required documents for the Administrative Record, which are available for public review. Maintaining program transparency, the IRP Tier I team remains committed to sharing its successes with others.



Strong leadership and engaged Tier I stakeholders have fueled innovative IRP methods, saving valuable natural and fiscal resources for the installation and the Army. By fostering the responsible use and sustainment of its resources, Fort Bragg will ensure its continued viability by providing the best conditions for Soldiers to train and prepare for the mission. The results of the IRP will continue to aid in the success of the installation for years to come.

