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Baltimore District

Spring Valley Glenbrook Road Remedial Action

2022 Secretary of the Army Environmental Awards Nomination Narrative

4825 Glenbrook Road demolition
Nov. 2012

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The Spring Valley Formerly Used Defense Site (FUDS) project team has reached a historic milestone within the Environmental Restoration (ER) program with the completion of the extensive and complex remedial action at the 4825 Glenbrook Road property (aka Glenbrook Road) in Washington, D.C. The team's purpose at this site was to cleanup and restore the residential property containing one of the most unique burials of discarded WWI experimental chemical warfare agents known in the United States. The team has met its goals of protecting human health and the environment by reducing risk in the safest manner possible, while achieving acceptance of the cleanup by regulators and the community. Due to site history, the nature of the contaminants, site condition, and location, the Glenbrook Road team faced daunting technical, engineering, health and safety, regulatory, and community relations challenges beyond those experienced by any other project in the history of the USACE-Baltimore ER program. The completion of cleanup at this FUDS represents many significant accomplishments for the dedicated cross-functional team.

Glenbrook Road is one of many private properties included in the Spring Valley FUDS, having the distinction of being the largest waste burial area associated with work of the American University Experiment Station (AUES). From 1917 to 1918, approximately 1,500 chemists, scientists, and soldiers assembled at AUES to research and develop offensive and defensive capabilities in chemical warfare. As the American military prepared to enter World War I, chemical agents were already in use on European battlefields and the United States was behind in this new way of waging war. On the relatively undeveloped southern portion of the University's campus, laboratory buildings and facilities were quickly built so that work could immediately begin. During the war, there was no military research more urgent or secret than what took place in this corner of the city.

Container of pure Lewisite recovered on the Glenbrook Road property in 2014.

The treaty of November 1918 ending the war came suddenly, and just as quickly as it was built, plans were made and put into place to begin to wind down the work at the AUES. Many of the operations and much of the equipment and supplies on hand were transferred north to the Edgewood Arsenal in Maryland, but there were chemicals, equipment, and items that would not make the trip. Following standard practice at the time, disposal pits and trenches were hastily dug, filled with unwanted and dangerous chemicals and materials, and covered over. The campus was returned to the full control of the University administration, nearby testing fields were returned to private landowners, and the activities that took place with such urgent necessity faded from collective memory.

Decades later, waste material was discovered in 1992 when a developer purchased excess campus acreage along Glenbrook Road and built two large houses, one of which would become the new residence for the President of American University. During construction, site workers experienced unpleasant symptoms as they moved soil around the building sites. Debris and trash which gave off foul odors and irritated the nose and eyes were uncovered. No definitive reason for these findings could be determined and work continued. Then, in January of 1993, at a similar building site one mile to the northwest, at a cul-de-sac dubbed 52nd Court, a disposal pit of military munitions was unearthed during trenching to install utility lines. These munitions were from the World War I era and some contained chemical agents. This discovery kicked off the ER program for the Spring Valley FUDS, named after the residential neighborhood of Washington, D.C. that had grown up after the war years. Many areas of the neighborhood would come to be investigated and remediated, the most complex of which was the Glenbrook Road burial area.

Completion of the Glenbrook Road cleanup represents a significant milestone in support of the Department of Defense (DOD) mission to reduce threats to human health and the environment on non-DOD owned lands resulting from past military use. Achieving the FUDS mission is uniquely challenging, as the private properties are not controlled by DOD and cleanup can be slowed by the nature of restoration property ownership and other unique owner, stakeholder and media interests. Removal of the many hazardous materials at Glenbrook Road (chemical warfare materiel, contaminated laboratory debris, chemical agent contaminated soil, as well as the potential for explosive hazards) represents the exact type of hazard the DOD wished to mitigate when it began the FUDS mission. The successful completion of this project in 2021 represents an important step in fulfilling the DOD promise of mitigating these types of hazards to ensure the safety of the American public.

The final phase of cleanup of Glenbrook Road was undertaken in 2012, after a Decision Document was finalized to remove the house and excavate soil down to bedrock. The cleanup was complex and challenging given the location of the site in a densely populated neighborhood, and the nature of the contaminants. The remedial action led to the recovery of hundreds of military munitions, the unearthing of over a thousand pounds of laboratory glass debris, and the removal of tons of chemical agent contaminated soil.

Over the course of the project, the team would detect seven different chemical agents (HD, L, SA, DA, CN, CX, and ED) and six different chemicals with unique military applications (white phosphorus, arsenic trichloride, magnesium arsenide, chloroacetone, hexachloroethane, and dichloronapthalene). It would turn out that Glenbrook Road was the only site in the United States where weaponized arsine (SA), recovered in 75 mm projectiles, would be encountered and remediated.

Singularly important among the Spring Valley and Glenbrook Road accomplishments was the team's development of strong partnerships and interactions with stakeholders, made possible by a robust program management system. With support at all management levels, the team collaborated with internal offices including Real Estate, Office of Counsel, and fund managers at the District as well as higher levels in USACE and Department of the Army to assure that all regulatory and legal requirements were met and that adequate funds were available for the Glenbrook Road cleanup. Collaboration with regulators and the community went above and beyond regulatory requirements, such that stakeholders would come to have a comprehensive understanding of site hazards and the cleanup process, and decisions were reached with as much transparency and consensus as possible.

The overall Spring Valley ER program commenced with remedial investigation (RI) activities in 1993, after the completion of the Army-led Operation Safe Removal, during which munitions were removed from the 52nd Court Area. Findings of the initial RI activity were relatively minimal, and there was a pause in activity at the overall FUDS in June 1995. However, continuing concern over the site led to the restart of studies of the site in 1998 through review of historical aerial and amateur photos. Subsequently, the team performed geophysical investigations on several properties adjacent to the southern portion of the American University campus and discovered several significant anomalies, two of which were determined to be chemical waste burial pits in the Glenbrook Road area, adjacent to the 4825 property.

Community feedback had become energized over these and other Spring Valley concerns in the neighborhood, and there was backlash over the period of inactivity, with allegations of an Army cover-up and conspiracy theories from activist groups. Several congressional inquiries came about, and media interest and coverage intensified. During the period of 2000 - 2008, the Spring Valley project team faced intense public visibility and scrutiny, as well as mounting technical complexities. The team met these growing challenges head-on with poise, professionalism, and sound decisive action.

The team created an interdisciplinary management cadre consisting of several project managers, ensuring robust project support. The team introduced an unprecedented level of transparency into project communications, creating a formal community outreach support team. In May 2001, a Spring Valley Restoration Advisory Board (RAB) was formed, and formal partnering with regulatory agencies and key stakeholders was embraced for project direction and decision-making. In addition to the monthly RAB meetings, the team met each month with regulators at a formal "Partners" meeting that allowed frank discussion of project challenges and decisions. While these meetings were not open to the public, RAB members, local elected officials and community representatives were invited. Complete and detailed meeting minutes were posted to the project website following each Partners meeting. Regulators were included on all mailings to the community and the team also reached out to the Partners by phone and email in real time as significant events occurred.

Of foremost concern was the safety of the community, both those who lived close to the project site and those from the larger community who had interest in this high visibility project. Those living closest to the site participated in a Shelter in Place (SIP) program in case of a site emergency during removal of recovered chemical warfare materiel (RCWM) items. The team visited each property owner, training them in SIP procedures, enrolling all phone numbers and email addresses in an automated mass call-down system. In certain cases, and upon request of the owner, audible alarms at the site were synchronized with audible alarms placed in the home so occupants would be sure to hear site sirens.

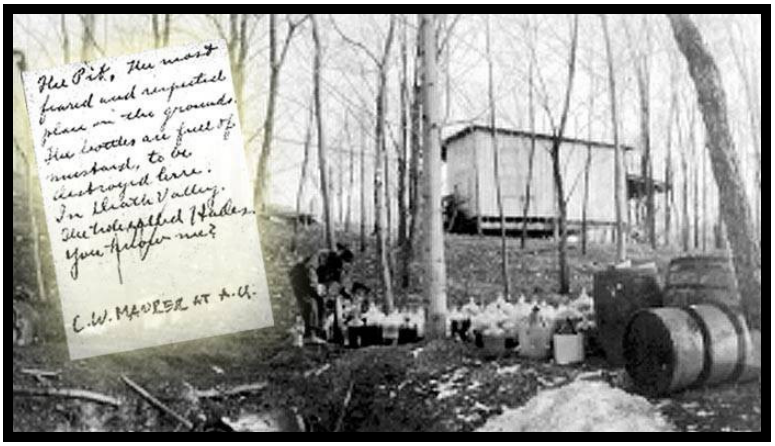
To further educate the community, a series of videos were produced by the District's Corporate Communication Office on topics such as work procedures and site technology, as well as a "day-in-the-life" video of site operations. These videos were uploaded to YouTube and linked via the project website. The entire community received monthly email updates on the project, and a smaller group of more concerned community members received weekly updates from the team with progress photos. Early on, the team considered the use of a live-feed, web-based "dig cam" that would allow any community member to check on site activity in real time; operational security concerns around the potential for RCWM and munitions handling activities led the team to rule out this practice.

Screenshot of one of the Corporate Communication YouTube videos created to help educate the local community.

The program management system evolved and improved over the years, with project managers working with other USACE offices and technical Army agencies. The management approach routinely involved the Army Chain of Command, for which the team generated a list of Army leaders who had an immediate need to know of any significant developments. The team sent hundreds of scheduled updates

(daily, weekly, and monthly) and real time notices of progress and incidents at the site. Included on this list of leaders were Baltimore District supervisors, the District Commander, Division Headquarters, USACE Headquarters, Deputy Chief of Staff G-9 (formerly Assistant Chief of Staff for Installation Management or ACSIM), and the Deputy Assistant Secretary of the Army, Environment, Safety, & Occupational Health (DASA-ESOH).

The team invited and hosted stakeholders at the project site so that the function and operation of this unique effort could be directly seen and understood by those affected. The team realized that the best way to communicate the commitment to excellence and safety by the field staff was for stakeholders to meet face-to-face with these highly trained, dedicated individuals. The hard work and preparation done by the team, and the high quality of the field staff, then sold itself.



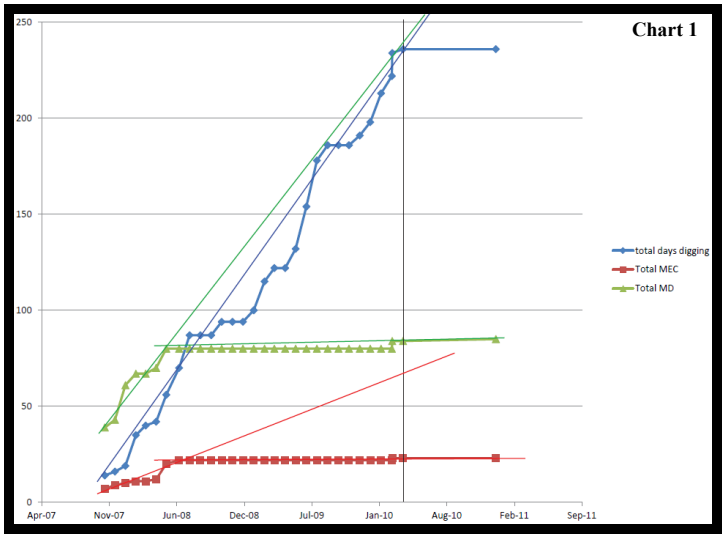
Historical Sgt Mauer pit photo (dated 1918) used to identify the location of the disposal area.

Aerial photography study conducted in 2007 of the original AUES fenceline as it existed in 1918.

Another significant accomplishment for the Glenbrook Road project was the application of several innovative techniques to solve the technical challenges posed by Glenbrook Road. These innovations strongly demonstrate the many technical merits of the team's approaches to the remedial action. First, the team performed an in-depth aerial photography study of the original AUES fence line in 2007, using all available historical photos and other information to identify the location of a disposal area depicted in a 1918 photo (the only historical documentation of burial pits). The team determined that the pit (dubbed the Sgt Mauer pit, for the soldier shown in the photo) was located on the 4825 Glenbrook property, in close proximity to the house that was built in 1992. Although not conclusive, this in-depth study closely corroborated disposal history.

In planning for the remedial action, several innovative techniques led to sound decisions that would accelerate cleanup. First, the team developed a solid argument for delineating certain portions of the 4825 property as not likely to contain RCWM as opposed to assuming the entire site was likely to contain such materials. Using data from previous investigations, the team drew detailed maps and convinced stakeholders that several areas could be considered to have a low probability of containing RCWM, saving significant time and money required for the stringent and complex safety procedures applied to high probability areas.

The team also applied an innovative technique for the high probability areas by advocating for the use of a large tent as an engineering control structure to control airborne release of hazardous chemicals, as opposed to the smaller blast structures used previously to protect against high explosive items. The latter technology was favored by regulatory agencies, but careful analysis by the team of the preceding investigative period revealed a pattern showing that the site had passed a significant milestone in June 2008, when the probability of finding explosive items at the site significantly dwindled. The team used graphical presentations of the data to convince regulatory agencies to support the Army in this determination (see Chart 1). If the smaller blast structures had been used as engineering control structures, more time and money would have been needed to complete the excavation and remediation.



A third innovation demonstrating technical merit was the use of the Army Miniature Chemical Agent Monitoring System (MiniCAMS) in concert with commercial off the shelf monitors to provide real time or near real time monitoring for the highly varied and unique chemical hazards in the burial pit. Working with the U.S. Combat Capability Development Command (DEVCOM) Chemical Biological Center, the team tackled the challenge of providing immediate monitoring data to on-site safety professionals so the operation could proceed safely. The Army's standard near real time monitoring system, the MiniCAMS, was able to provide data on Mustard, Lewisite, phosgene, cyanogen chloride, and chloropicrin. The team also desired to monitor for arsine, hydrogen cyanide, arsenic trichloride, and total volatile organics in a real time manner. The team worked with vendors to find and integrate off the shelf and customizable commercial monitors to measure air concentrations of these hazards as the field crews worked. This flexibility and adaptability of the team's safety plans also allowed the nearby community to be reassured that their safety was not being left to chance.

The team accelerated the cleanup by employing another innovative technique after a safety incident occurred in August 2017. While excavating a low probability area, site workers noticed a distinct odor and became nauseous. A safety shutdown was immediately imposed, and a Board of Investigation was formed to determine what had occurred. Exhaustive inquiry, to include medical testing of the affected workers, led to the conclusion that an unknown compound had caused the incident. The team implemented additional safety precautions to protect workers but given the desire to improve efficiency and continue working in "open air," the team used the inherent hazardous nature of the site and proposed the use of representative compounds. A representative compound was selected for each of the major categories of WWI chemical agents. A comparison of the chemical properties of these "worst case" representatives led the team to select Lewisite to represent the unknown compound. This, combined with the observed maximum concentrations of contaminants in the soil, allowed the team to provide downwind hazard distance computer modeling to regulators and community stakeholders. The modeling demonstrated that even in the event of a reoccurrence of the 2017 release, no downwind hazard could reach beyond the boundaries of the site. Public safety was assured, and the strategy of using representative compounds to represent a potential unknown hazard allowed the team to safely return the site to work under low probability conditions. The alternative would have significantly slowed down work that did not need to be done under high probability conditions.

The team reduced risk to human health and the environment by improving several techniques that can be readily adopted within or outside of DoD. For one, the team applied health and exposure standards previously not used by the Army. At other WWI era sites addressed prior to Spring Valley, the Army had clear standards for the "common" chemical agents, Mustard and Lewisite, that were accepted by regulators. For this project, the team was dealing with much less common hazards (e.g. arsine and arsenic trichloride) due to the unique research and development (R&D) mission of AUES. The team researched and advocated the use of health standards not typically employed to include the Acute Exposure Guideline Levels standards developed by the U.S. EPA and Oakridge National Laboratories, and the Temporary Emergency Exposure Limits developed by the Department of Energy. The flexibility and willingness of the team to conduct this research provided quantitative safety planning that allowed for the development of detailed and precise airborne hazard modeling to protect workers and the public. This innovation can now be used on other RCWM sites that are undergoing cleanup, should these hazards be encountered.

Yet another improvement that reduced risk was the use of the Chemical Agent Filtration System (CAFS) to filter non-standard hazards at the site. The Army had developed the CAFS to filter a multitude of chemical agents and had done the R&D necessary to certify the system for those agents. However, when arsenic trichloride was found at the site in measurable quantities, it was discovered that DEVCOM had not certified the system for this compound. The project team engaged with DEVCOM and funded a study to certify the CAFS for arsenic trichloride in time for the team to filter for the hazard. This filter can be used by other teams dealing with the same contaminant. Additionally, the CAFS work best and most efficiently when they can run 24/7 while in use at a project site. At Glenbrook, in the middle of a quiet residential neighborhood, the decibels coming from the large electric motors of the three CAFS units required presented a big problem. The team designed, built and deployed unique sound suppression structures that housed the motors and allowed the filters to "run quiet." This truly impressive achievement will allow other DOD sites to exploit this development and realize time and cost savings by avoiding the previous daily need of the start-up and shutdown procedures of these complex pieces of equipment.

Sound suppression structures designed and built by the team to allow the noisy CAFS filters to run quietly overnight in the residential neighborhood.

The Glenbrook Road site pushed the DOD to expand the capabilities of its on-site RCWM destruction technology (the Explosive Destruction System or EDS). The site team worked with the Army Chemical Materials Agency to test and certify the EDS for new hazards. Specifically, certification of the technology for arsine, white phosphorus, and magnesium arsenide was driven by the needs of the Glenbrook site.

In addition to these technical applications, the ability of the team to reduce the risks of a major RCWM operation in a densely populated residential neighborhood adjacent to a major university campus provides unique lessons and opportunities to share knowledge with organizations within and outside of DOD. To transfer knowledge and innovations, the team made a special effort to open the site up to anyone who had an interest in the operation and see how it was being conducted. The project had multiple individuals from other DOD agencies who came to work on some aspect of the project and who would go on to support other highly critical mission essential DOD tasks. One example is a junior project manager from DEVCOM who assisted the team in the destruction of conventional and chemical items and was subsequently assigned to assist with the highly sensitive mission of destruction at sea of CWM turned over by the Syrian government.

The team hosted numerous DOD engineering interns, West Point cadets, and foreign engineering officers who came to the site for in-depth briefings on technologies being employed and tours of the operation. The team made the conscious decision to engage with interested members of the media to proactively tell the Army/DOD side of the story on this project. During project execution, the team welcomed the embedding of a member of the media affiliated with the New York Times, who wrote several favorable articles about the project detailing the effort and commitment of the team. This reporter went on to write a well-received book (Emery, T. (2017) Hellfire Boys, Little, Brown and Company) about the story of the American military's efforts in chemical warfare in WWI, in which he specifically thanked project managers and field staff from this project for their assistance in helping him tell an accurate story.

Aside from making the Glenbrook Road property and surrounding community safer, impacts of the project include direct contributions to research and development, leading to an improvement in state-of-the-art practices with respect to the DOD's expertise in RCWM operations and capabilities. These include the previously highlighted expansion of the CAFS capability via certification to filter arsenic trichloride and to operate in the "run quiet" mode when needed, as well as certification of the Army's Multiple Round Containers for certification to safely hold and transport items filled with liquified arsine gas. An additional important contribution of the project (during both the investigations and the cleanup) was the design and use of engineering control structures in a wide variety of sizes and configurations to provide safety and control of both chemical hazard release and unintended detonations from a work site.

The Glenbrook Road project pushed the FUDS and RCWM programs to develop new technologies and methods to deal with unique circumstances and provided opportunities to plan and design new work practices and techniques to allow successful accomplishment of the remedial action objectives set forth in the 2012 Decision Document. By the conclusion of the project at 4825 Glenbrook Road in August 2021, the team had remediated, removed, or recovered 556 munition items (23 of them filled with chemical agent), 2,139 pounds of laboratory debris, 53 intact and sealed glass containers of chemical agent, and 7,500 tons of contaminated soil. All of this was accomplished in close proximity to occupied private properties, a major university campus, and public streets. The legacy of the team's dedication to an expertly-conducted ER project is documented in the many work plans, safety submissions, and final reports that are safely preserved in permanent project files as well as in the administrative record file. This will forever ensure that future teams and interested parties can access and read what this remarkable team accomplished, and how they did it.