



The Corps

Environment

VOLUME 16, ISSUE 2

APRIL 2015

USACE, Department of Energy drive down federal energy costs through governmentwide adoption of performance contracting processes

U.S. Army Corps of Engineers and the U.S. Department of Energy Federal Energy Management Program

The U.S. Army Corps of Engineers (USACE) and the U.S. Department of Energy's Federal Energy Management Program (FEMP) developed a partnership to help drive down the federal government's energy costs through the governmentwide adoption of performance contracting processes.

"As the nation's largest energy consumer, the federal government has a tremendous opportunity and clear responsibility to lead by example," according to a memorandum of understanding the two agencies signed at the end of October 2014 to increase efficiencies and leverage each other's strengths and experience. "Accelerating the use of performance contracting across government agencies will enable agencies to increase their use of renewable energy supplies, reduce energy demand, improve operational effectiveness and reduce greenhouse gas emissions in support of U.S. climate change initiatives."

Both agencies have been executing energy savings performance contract (ESPC) and utility energy service contract (UESC) projects for several years. FEMP has had programmatic responsibility for execution of the larger federal program, and USACE — through its Engineering and Support Center, Huntsville — supports the Army and other Department of Defense (DOD) agencies with the tools to help them achieve federal energy goals and mandates.

Though a great deal of collaboration already exists, a more coordinated effort will capitalize on the existing momentum and more effectively posture the federal government to achieve the President's Performance Contracting

Challenge goal of a governmentwide total investment of \$4 billion in performance-based contracts through 2016.

A primary goal of the partnership is to enable civilian federal agencies to meet or exceed their energy goals by taking advantage of the DOE ESPC acquisition vehicle while leveraging Huntsville Center's expertise to successfully execute the project through its life-cycle. DOD agencies will continue to work directly with Huntsville Center using its ESPC acquisition vehicle and requested project management support services.

The partnership covers, but is not limited to, efforts related to energy and water efficiency and renewable energy. Key partnership activities include:

- Facilitating better education, training and knowledge sharing across the federal government, specifically ESPC and UESC best practices;
- Continuously exploring opportunities to increase uniformity of contract terms and conditions, as well as processes, to create a more efficient business environment and improve cost-effectiveness of the program;
- Exploring opportunities to improve measurement and verification activities;
- Establishing a framework for partnership and collaboration; and
- Providing federal agencies with turn-key contracting and project management support for ESPC and UESC contracts, thereby increasing agency project throughput.

Learn more about the Department of Energy's Federal Energy Management Program at

<http://energy.gov/eere/femp/project-funding>.

Details about the U.S. Army Engineering and Support Center, Huntsville's ESPC Program are available at <http://go.usa.gov/3CBfA>.



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Assistant Secretary of the Army, Installations, Energy & Environment
www.army.mil/asaiee

ARMY EARTH DAY
aec.army.mil/Outreach/PublicInitiatives/EarthDay.aspx

Secretary of the Army recognizes environmental program efforts

Four Army National Guard installations, two arsenals and two teams received fiscal year 2014 Secretary of the Army Awards for their environmental program achievements. These winners will go on to represent the Army in the Secretary of Defense Environmental Awards Program later this year.

Read about all of the awards on [Pages 5-12](#)

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Travis Dodson, a wildlife technician with the Directorate of Public Works' Wildlife Branch at Fort Jackson, South Carolina, installs a fish attractor at Weston Lake. Twelve fish attractors were constructed using Christmas trees collected for recycling. The trees were anchored to the lake bottom by concrete blocks. "The structures will provide benefits to the aquatic community of the lake as well as to recreational fishermen," Dodson said. The branches of the submerged trees will immediately provide escape cover for small bait fish. Over time, algae and aquatic insects will colonize the trees, continuing to attract bait fish by providing them a food source in addition to cover from predators. As the bait fish congregate around the structure, larger predatory fish such as bluegill and largemouth bass will be attracted by the abundance of prey. Read more at www.army.mil/article/143528/. (Photo courtesy Fort Jackson DPW)



APRIL 2015

The Corps Environment

is an online quarterly produced by the U.S. Army Corps of Engineers as an unofficial newsletter under the provisions of AR 360-1. The purpose of this newsletter is to provide information about Corps environmental actions, issues, policies and technologies. Opinions expressed are not necessarily those of the U.S. Army. Inquiries can be addressed to U.S. Army Corps of Engineers, ATTN: CEHNC-PA, P.O. Box 1600, Huntsville, AL 35807-4301. Phone: 256-895-1809.

Lt. Gen. Thomas P. Bostick
Commanding General
Publisher

W. Curry Graham
Director of Public Affairs

Karen Baker
Executive Editor

Candice Walters
Managing Editor

Julia Bobick
Editor

Submissions

The Corps Environment welcomes submissions with an environmental, sustainability or energy focus from USACE and Army units worldwide. Send your articles, photos, events, letters or questions to julia.bobick@usace.army.mil.

Deadline for submissions:

Nov. 15 (January issue)

Feb. 15 (April issue)

May 15 (July issue)

Aug. 15 (October issue)

www.usace.army.mil/Missions/Environmental.aspx

Whenever possible, please
enjoy *The Corps Environment*
without using paper.



45TH ANNIVERSARY OF EARTH DAY BRINGS REFLECTION

By Karen Baker

*Acting Chief, U.S. Army Corps of Engineers
Environmental Division*

This spring I find myself reflecting on a few personal milestones. For example, when I saw that April 22 was the 45th anniversary of Earth Day, I realized it marked 20 years of my involvement with the Army environmental program. In fact, I was the lead for the Army's celebration of the 25th anniversary of Earth Day, working at the Army Environmental Center at Aberdeen Proving Ground in Maryland. Of course, now it's the Army Environmental Command at Joint Base San Antonio — another indicator of just how much has changed in our Army.

Another big milestone for me this year: my hybrid car turns 10 years old. This is personally satisfying because at the time when I bought it, the technology was not yet mainstream. I love chuckling now at the naysayers who warned me it would surely break down on me. At the time, it was a financial leap of faith, demonstrating my personal commitment to environmental stewardship. As a Senior Fellow at the Army Environmental Policy institute, I was immersed in developing new policy to help the Army reduce its reliance on fossil fuels, and I felt I needed to do my part — if only to offset the impact my husband's SUV had on the Baker Family's carbon footprint.

It's no different in the U.S. Army Corps of Engineers where our Environmental Operating Principles reflect our commitment to taking care of the environment and being sustainable.

"The Corps of Engineers is the nation's environmental engineer," said Assistant

Secretary of the Army (Civil Works) Jo-Ellen Darcy when asked to reflect on Earth Day.

"The Army Corps has made environmental protection a top priority. We do not design or build anything without considering the environmental consequences, and we do work every day protecting and restoring the environment. We are also proud of the diversity of the Corps of Engineers' capabilities for the planning, design and construction of our environmental restoration projects. At the Army Corps, every day is Earth Day."

As you can see, Ms. Darcy sees the beliefs and tenets espoused on Earth Day as part of our culture, how we do business every day. It's part of "walking of the talk."

We are making great strides every day to improve our sustainability record. In the short time I've held the position of Acting Chief of the Environmental Division, I have been amazed at the progress our divisions and districts have made in getting us closer to our sustainability scorecard targets. However, to get to the next level, we are going to have to deepen our commitment, expand our investment and harness more innovation.

We need to think about how real change happens. It happens through active leadership — leaders who "lead by example," who are passionate about seeing real change occur, and who know that their actions will speak much louder than any words. They

incorporate the tenets of Earth Day into their daily lives and impart them to those who serve with them through their command emphasis.

For Chief of Engineers Lt. Gen. Thomas Bostick, "Earth Day means taking responsibility for our actions, ensuring that we value our natural resources by not using what cannot be replaced for future generations. Within the Army Corps of Engineers, we have learned that individual actions can have a great impact and that each one of us can make a difference. That is why we continue to ensure we are environmentally responsible and sustainable every day, not just on Earth Day."

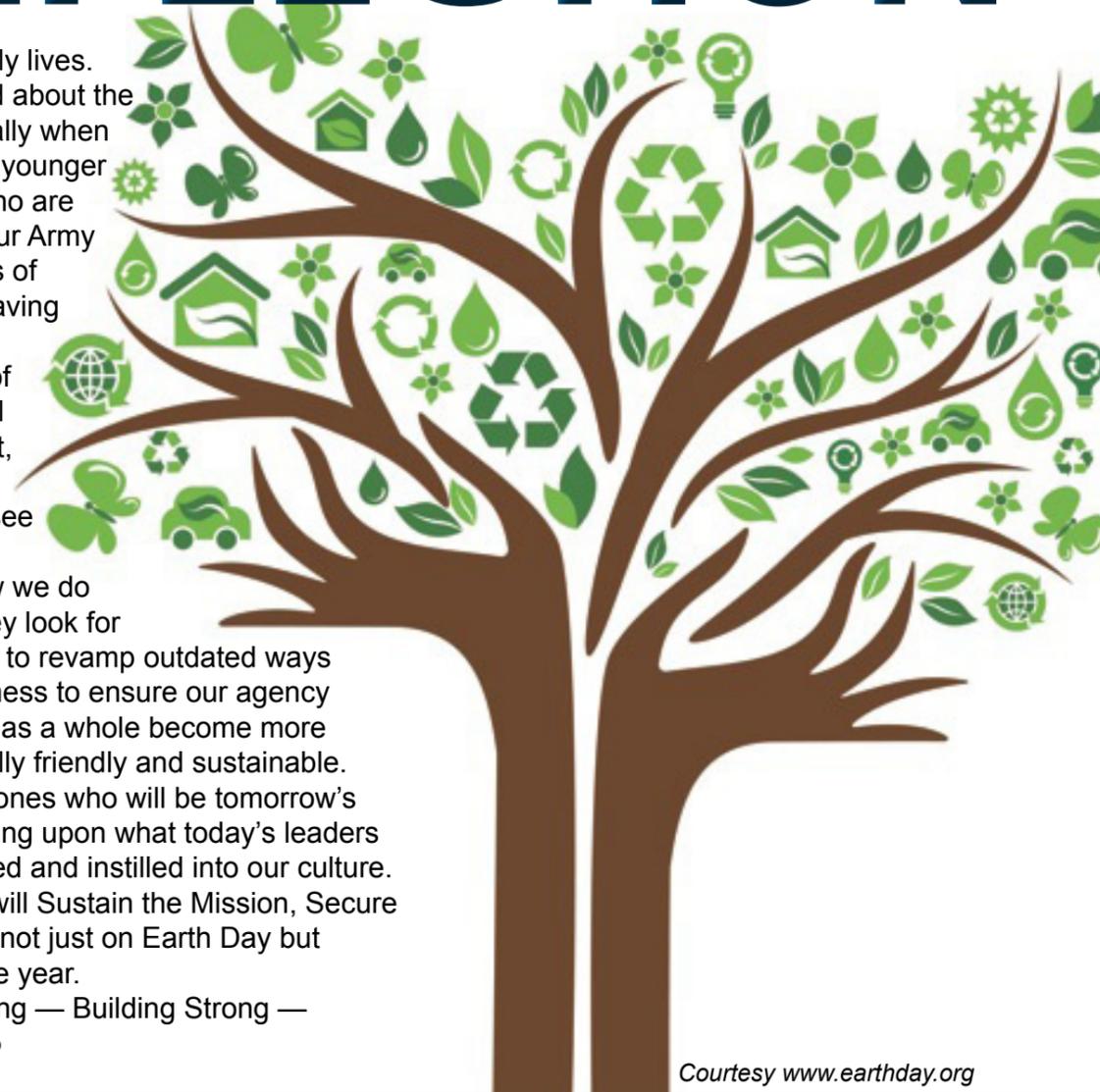
For me, the meaning of Earth Day is embedded in this year's Army Earth Day theme "Acknowledge the Past, Engage the Present, Chart the Future". We need to acknowledge our responsibilities for past practices, but also recognize just how far we have come. Just as important, we need to embrace sustainable practices today to ensure we have the resources we need in the future.

Given USACE's capabilities in providing technical solutions to advance sustainability, it's often easy to forget that some simple solutions require changes in our behavior. Not only do we need to seek energy efficiency technology and renewable energy solutions, we need to reduce energy demand by turning off the lights, using alternative fuel vehicles and taking public transportation. The 3Rs of reduce, reuse, recycle are still important, and we need to continue our focus on them. And we need to think harder about purchasing "green" both in the work we do for USACE,

and in our daily lives.

I'm excited about the future especially when I interact with younger employees who are coming into our Army and the Corps of Engineers. Having been born after the era of environmental enlightenment, they arrive expecting to see sustainability as part of how we do business. They look for creative ways to revamp outdated ways of doing business to ensure our agency and the Army as a whole become more environmentally friendly and sustainable. They are the ones who will be tomorrow's leaders, building upon what today's leaders have embraced and instilled into our culture. Together we will Sustain the Mission, Secure the Future — not just on Earth Day but throughout the year.

Army Strong — Building Strong —
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Courtesy www.earthday.org

ENVIROPOINTS

AEC emphasizing customer support in compliance inspection program

U.S. Army Environmental Command

The Army, along with the rest of the Department of Defense (DOD), is required to conduct environmental compliance inspections every

three years at all installations worldwide. Each service has its own method for conducting these inspections. The Army — including active Army components, the Army Reserve and the Army National Guard — calls these inspections the Environmental Performance Assessment System. For Installation Management Command (IMCOM) installations, EPAS is executed by the U.S. Army Environmental Command (USAEC).

One of the initial actions taken by USAEC Commander, Col. Robert C. Wittig, upon taking command in July 2014, was adding emphasis on customer-focused assistance by adjusting the name of this program for USAEC-executed inspections to EPAAS, the Environmental Performance Assessment and Assistance System. Wittig answered some questions for us here.

Q: From your perspective as a former garrison commander, how do you view these USAEC-led compliance assessments which happen every three years?

A: They are tremendously valuable. They provide the installation extra sets of eyes to ensure they are in compliance and help prevent Army environmental liability.

Q: Why did you feel the need to make this name change for the compliance assessment activities of USAEC?

A: With our declining resources I wanted to ensure the garrison commanders and senior commanders saw USAEC as a resource to meet

their environmental challenges. The only real way to do this is to deliver capability. Adding the focus that assessments will provide detailed solutions to a garrison shows USAEC's commitment.

Q: Were there any other changes in the way USAEC executes this program?

A: We emphasized internally that our assessors must communicate what they learn at each installation to other USAEC staff members. We want to bring best environmental program practices to every site visit. We also bring highly qualified assessors from other installations to serve as guest assessors. In the long term we strive to identify opportunities for garrisons to save money in their environmental programs.



Col. Robert C. Wittig

Q: Are you instituting any other changes at USAEC?

A: We are going through an organizational redesign which will provide multi-functional support to installations and will align USAEC by EPA regions. Gaining and maintaining relationships as we provide this support is critical as it will add consistency and put the Army in a position to resolve issues at the lowest level. Additionally, we are focusing on partnering efforts with other Army and DOD organizations that also support and execute the Army's Environmental Program.

As we move forward in this era of declining resources it will be increasingly important for us to share lessons, solutions to common challenges and resources.

Point of contact for the USAEC's EPAAS Program Management Team is Martin Roberts at (210) 466-1615 or martin.e.roberts.civ@mail.mil.

RACER update available

U.S. Army Engineering and Support Center, Huntsville

The U.S. Army Corps of Engineers (USACE) Environmental and Munitions Center of Expertise (EM CX) has approved the release of a new version of the Remedial Action Cost Engineering and Requirements (RACER®) software. A parametric, integrated cost-estimating application, RACER is designed to provide an automated, consistent and repeatable method to estimate and document the cost for the environmental cleanup of contaminated sites with the information available at the time of the estimate preparation.

"We try to continuously make the program better, to have the most accurate up-to-date cost data incorporated into the system," said Deborah Walker, RACER project manager in the EM CX, part of the U.S. Army Engineering and Support Center, Huntsville, Alabama. "The costs to perform environmental cleanup projects increase every year and it's important the software keeps pace so project managers can accurately calculate their required environmental liability estimates."

Version 11.2 incorporates annual cost data updates, as well as new and re-engineered technologies — most of which enhance the estimates of cleanup costs for hard-rock mining sites. Additionally, the Asbestos Removal Technology was updated to reflect current industry standards.

Both Department of Defense Financial Management Regulation and Defense Environmental Restoration Program guidance provide for the use of electronic cost estimating software in most environmental liability estimating situations. The RACER application is used by DOD and other federal agencies for developing parts of out-year environmental liability estimates and annual budgets. It is also used to prepare individual cost project estimates and to evaluate cost reasonableness of estimates. RACER provides the detail of an engineer's estimate, but it also can be used at early order-of-magnitude stages of cost estimating. It accurately estimates costs for all phases of remediation, from pre-study and design to operations, maintenance and site closeout.

The EM CX manages execution of the contract with AECOM Technical Services Inc. on behalf of the RACER Government Steering Committee, which

includes members from USACE Headquarters, Army Environmental Command, Air Force Civil Engineering Center, Naval Facilities Engineering and Expeditionary Warfare Center, Defense Logistics Agency, U.S. Environmental Protection Agency, Department of Energy, Department of Interior, Federal Aviation Administration and the U.S. Coast Guard.

RACER 11.2 is available to approved users from the members of the Government Steering Committee, including the Army Corps of Engineers, including contractors. To obtain a copy of the update, request a registration form by email from racer@aecom.com and return it to the contractor via fax, mail or email (provided on the registration form). Once approved, USACE users must have the update installed by an ACE-IT technician. Users outside of USACE should follow their own agency approval and installation process.

RACER users can request assistance from the RACER Help Line at (800) 499-2919.

Summary of changes in RACER 11.2

Cost data updates:

Assembly Cost Database: The latest assembly unit price information is included from the 2012 Government Cost Book.

Area Cost Factors: Area cost factors for all continental United States and overseas locations have been updated per USACE PAX Newsletter No. 3.2.1, dated March 20, 2014.

Per Diem Rates: Per diem rates have been updated to reflect current rates obtained from the Department of Defense Travel Management website.

Escalation Factors: Escalation factors have been updated to reflect current rates obtained from the Secretary of the Air Force Escalation Factor calculator (FY15 Indices dated May 20, 2014).

New technologies:

- Earthwork
- Treatment System Building

Re-engineered Technologies:

- Water Treatment Technologies (updated to meet the higher flow rate demand of large-scale mine reclamation projects)
- Asbestos Removal Technology
- Operations and Maintenance and Residual Waste Management technologies (updated to account for related tasks associated with new technologies and these updates)

Innovation, planning enable Alaska District to streamline cleanup

By Rita Hess
for U.S. Army Environmental Command

Unique situations lead to unique solutions and completing environmental restoration work in remote areas of the often frozen Alaskan tundra presents no shortage of distinct challenges. Fortunately, the U.S. Army Corps of Engineers' Alaska District has a team that excels at thinking outside the box and developing innovative and cost-efficient solutions to the difficulties encountered at Northeast Cape Formerly Used Defense Site (FUDS) in Alaska. This ability earned the district FUDS team the 2014 Secretary of the Army award in Environmental Restoration.

"The Alaska District has been dedicated to the completion of the environmental cleanup activities at Northeast Cape since day one," said Ken Andraschko, FUDS program chief. "The collaboration conducted with local communities and other agencies throughout the process has led to success in the form of open communication, logistical cost savings, a stellar safety record, and most importantly, the remediation of the environment. It is a huge accomplishment for everyone involved."

The project site, previously home to a 4,800-acre aircraft control and warning station, was used by the U.S. Air Force in the early 1950s to early 1970s to provide radar coverage to reduce potential vulnerability to bomber attacks in the region. When the facility closed, polychlorinated biphenyls (PCBs), arsenic and fuel that leached into the soil remained. Cleanup of these contaminants involved excavation, transportation and disposal of more than 44,000 tons of contaminated soil: work that could only be accomplished between July and September when weather conditions permitted. During peak operations the crew handled 15,500 tons during two field seasons in 2013 and 2014, logging 93,000 man-hours, with no lost-time incidents or accidents.

Early on the district decided to leave heavy equipment, a remote camp, vehicles and shipping containers on site for the project rather than barging them in and out each year. This not only saved \$1 million, but also



LEFT: Groundwater accumulated during soil excavation activities at the main operations complex for the Northeast Cape FUDS site in Alaska. In the background of the photo is Kangukhsam Mountain. BELOW: Bristol employees Johnny Willis and Albert Kulowiya operate the sediment suction dredge (top left) to remove loose sediment from the wetland. Sediment/water slurry was pumped upslope, flocculant added, transferred to geotextile tubes for dewatering, and excess water treated with GAC units before discharge to ground surface. (Photos by J. Craner)

extended both field seasons by allowing work to begin prior to ice breakup in July and continue into the fall after barge operations typically cease.

Another component of the Northeast Cape project that proved valuable was an on-site laboratory. Technicians analyzed soil samples for PCBs and petroleum compounds, and results were available within 24 hours. Otherwise, these samples would have been flown off-site for testing, resulting in an approximately seven-day delay confirming whether excavations met cleanup levels or whether the area needed additional excavation.

Petroleum-contaminated soil was processed using a rock screen plant to remove oversized rocks greater than 2 inches. This reduced the volume of contaminated soil packaged and shipped off-site because the oversized rock could be left behind and used for backfill. That alone decreased the amount of material disposed of by 30 to 50 percent.

This is one of the highest priority projects overseen by the Alaska Department of Environmental Conservation (ADEC), and Alaska District coordinated closely with ADEC during the remedial action. The district also regularly updated the community on the progress of the project.

Actions at the Northeast Cape site reduce future liability at this property, and the lessons learned there will help lower remediation costs and increase project effectiveness at the sites. ☺



Florida Guard efforts impact local species

By Rita Hess
for U.S. Army Environmental Command

One of the most important military and law enforcement training sites in the Southeast, Camp Blanding Joint Training Center (CBJTC) is also known for its incredibly successful Natural Resources Conservation (NRC) program — so successful that it placed first in the 2014 Secretary of the Army Environmental Awards in the Natural Resources Conservation — Large Installation category.

The 73,000-acre military training installation in northeast Florida is home to 19 federal and/or state listed threatened and endangered (T&E) plant species and 20 T&E animal species. CBJTC is also home to a groundbreaking study on controlling and eliminating disease-causing insects — a study that may save the lives of Soldiers and civilians around the world.

The environment is essential to the installation's NRC program. To provide habitat for native plants and animals, longleaf pine restoration is a priority. For example, as CBJTC switched from using attack helicopters to Chinooks, which require larger landing zones, the NRC program closed smaller landing sites and converted them back to longleaf stands. The NRC program harvests sand or slash pine, generating \$400,000 to \$500,000 each year that supports CBJTC and other forestry programs.

CBJTC has a robust wildlife conservation program. Through involvement on the state Gopher Tortoise Advisory Group, CBJTC can now relocate tortoises within the installation and its Army Compatible Use Buffer (ACUB) land without permits, streamlining management for this state-listed species. The NRC program established a 1,600-acre dedicated parcel within the ACUB for relocating tortoises found in training areas, which eliminates impacts to the species and training restrictions imposed by their presence.

Endangered red cockaded woodpeckers also thrive at CBJTC. CBJTC currently has about 30 active clusters



and now translocates breeding pairs to state and national forests and other preserves.

The installation's Integrated Pest Management Program (IPMP) is gaining international attention, as it brings together partners that conduct entomological research that may someday prevent insect-borne diseases like encephalitis, dengue fever, Lyme disease, West Nile virus and malaria.

"The IPMP has the potential to produce advances that benefit military branches, medical institutions and aid organizations worldwide," said Col. Perry Hagaman, Assistant Adjutant General for the Florida Army National Guard and chair of the Environmental Quality Control Committee. "It brings the Florida Army National Guard together with the World Health Organization, U.S. Navy Entomology Center of Excellence, the U.S. Department



ABOVE: A CH-47 Chinook helicopter flies away after dropping off Soldiers of the Florida and Wisconsin National Guards during the Pathfinder Course field training exercise at Camp Blanding Joint Training Center in September 2014. Conservation efforts are key on the 73,000-acre military training installation, which is home to 19 federal and/or state listed threatened and endangered (T&E) plant species and 20 T&E animal species. (Photo by Master Sgt. Thomas Kielbasa, Florida National Guard) **LEFT:** Camp Blanding's Army Compatible Use Buffer (ACUB) program routinely draws in federal and state resources to secure conservation lands. This program has not only reduced encroachment from development, but also protected endangered species habitat and vulnerable wetlands. This protection has allowed the installation to develop range programs and infrastructure without a net impact to sensitive natural resources by using mitigation from the ACUB lands. (Courtesy photo)

of Agriculture, the U.S. Army Air Reserve and the University of Florida in a partnership that can save countless lives."

Current projects test insect treatment methods — such as application and treatment timing — to prevent, reduce and suppress insects like sand flies, filth flies, mosquitoes and ticks. Such research is crucial to readiness, as many warfighters are removed from duty because of diseases caused by pest insects, and infections like leishmaniasis can be devastating.

Last year, the World Health Organization selected CBJTC as a collaborative center to help independently test and evaluate equipment, materials and techniques for use worldwide.

Closer to home, managing some projects in-house has eliminated the need for costly external contracts. For example, in-house prescribed fire activities annually save CBJTC \$450,000 to \$600,000.

"The savings are significant," said Paul L. Catlett, CBJTC environmental manager. "Additionally, fire promotes Camp Blanding — the preferred habitat for red cockaded woodpeckers — and encourages grasses [and] forbs favored by gopher tortoises."

By partnering with the local water management district, CBJTC incorporated two wetlands parcels into the ACUB, giving the installation an immediate \$2.5 million in wetlands credits. The NRC program has nearly 100 of these credits for future mitigation needs.

Community outreach is also important. The installation provides University of Florida student and faculty researchers access, equipment and sometimes grants. NRC staff members also reach out to high school and college students about environmental management careers. Elementary school students visit the installation for presentations, and CBJTC offers a land management course for teachers. ♻

'Going Green' pays dividends for Minnesota Army National Guard team

By Rita Hess
for U.S. Army Environmental Command

The Minnesota Army National Guard (MNARNG) sustainability team is making a huge impact across the state by showing others the economic and environmental advantages of sustainability practices. The team manages environmental stewardship for Camp Ripley, Arden Hills Army Training Site (AHATS), 63 armories, eight field maintenance shops and two Army aviation support facilities in the state. The team also won the Sustainability award in the 2014 Secretary of the Army Environmental Awards program.

The sustainability team challenged each facility to reduce energy usage by 3 percent from the previous year, with the winner receiving \$10,000 for an energy upgrade, helping to establish AHATS and Camp Ripley as Net Zero installations.

At AHATS, a 40kW solar photovoltaic

helps meet electrical needs, and a solar thermal array preheats water. At Camp Ripley, the installation of a 10MW solar array equates to a 100-acre solar field — the largest in Minnesota and on a National Guard installation nationwide.

"This solar project represents an important milestone for Minnesota," said Minnesota Commissioner of Commerce Mike Rothman. "It's not only a partnership between the National Guard and Duluth-based Minnesota Power, but it fundamentally demonstrates where we are in Minnesota in getting to a clean energy future."

Future phases include backup power generation, making Camp Ripley independent of the electrical grid in emergencies.

Wood chips generated through its forest management program will fuel Camp Ripley to offset 91 percent of the installation's fossil

fuel heating requirements. This will reduce carbon emissions by 2,220 metric tons.

Geothermal heating systems installed at Camp Ripley in 2011 have reduced energy consumption by 45 percent, so MNARNG installed additional systems in 2014 and 2015 at three more buildings: two at Camp Ripley and one at AHATS.

To reach Army Net Zero goals, the team advised facility managers in reducing water use and water-conserving upgrades. As a result, MNARNG reduced water usage by 26 percent (12 million gallons), surpassing the 2 percent annual reduction goal.

MNARNG diverts 55 percent of its waste from landfills. In 2013, 1,800 pounds of working electronics went to a local elementary school for reuse. Eighty tons of recycled small arms brass cartridge casings contributed to diversion and Qualified Recycling Program revenue.

MNARNG's Sustainability Team designs

all new and rehabilitated structures to a minimum of Leadership in Energy and Environmental Design (LEED) Silver standards. The recently completed 107,500 square-foot field maintenance shop at AHATS topped that with a Gold LEED rating. The facility collects rainwater from half of the building and stores it in a 25,000-gallon underground cistern for site irrigation. Rainwater collected on the other half is stored and used in vehicle wash bays.

The team also continued implementation of the Camp Ripley Army Compatible Use Buffer program; last year, it secured funds to permanently protect 2,889 acres within the buffer zone bringing the total protection to more than 15,000 acres.

The team's guiding document is its Joint Sustainability Master Plan, which outlines goals and strategies for reducing energy use, reducing waste and conserving

water. The plan was created after Adjutant General of the Minnesota National Guard Maj. Gen. Rick Nash shared his vision for the future, which includes a commitment to a sustainable infrastructure while achieving Net Zero goals.

"We will use deliberate efforts to reduce energy consumption, effectively manage natural resources and minimize waste streams," Nash said. "This will ensure our ability to sustain our capabilities into the future and remain good stewards of our limited resources and the environment."

During the past two years, team members have been responsible for outreach activities annually impacting thousands of visitors. These outreach activities extend beyond sustainability including environmental tours and hunting and fishing programs for youths and veterans. ☺



The Minnesota National Guard strives to be a steward of the environment with its planning of new buildings to green standards. As an example, the Field Maintenance Shop on the Arden Hills Army Training Site, which includes a 40kW solar photovoltaic system on the roof, achieved a Gold LEED rating. (Photo by Army Sgt. Johnny Angelo, Minnesota National Guard)

Redstone Arsenal Cultural Resources Team takes creative approach to save rich history

By Amanda Hilles
for U.S. Army Environmental Command

Covering 38,125 acres in northern Alabama, Redstone Arsenal is a research and development installation with a rich and robust cultural history. Prior to Army acquisition in 1941, the area included rural communities of yeoman, tenant and sharecropper farms centered around large plantations. Approximately 550 families were displaced when the Army purchased the land before World War II. The arsenal went on to contribute to the U.S. space program in the 1960s.

To document, preserve and share this rich history, Redstone's Cultural Resources Team (CRT) supplemented appropriated funds with grants and volunteer efforts by establishing cooperative programs with partners outside the gates and generating community interest.

"Public involvement with cultural preservation efforts is a fundamental aspect of the success of the Cultural Resources Team," said Redstone Garrison Commander Col. Bill Marks. "By raising awareness of the importance of these sites, we can generate participation from people within the community to help preserve our past for future generations."

The CRT was so successful at meeting arsenal goals that its efforts won a 2014 Secretary of the Army Environmental Award in the Cultural Resources Management Team category.

How did the CRT accomplish so much? The team developed an Integrated Cultural Resources Management Plan (ICRMP) in 2013. One way the team mitigated research costs was by relying on innovative historic imagery, LiDAR data and predictive modeling to re-delineate recorded archeological sites and conduct targeted re-surveys of areas presenting conspicuous gaps in site density, dramatically reducing inadvertent discoveries. The CRT conducted rescue excavations on six historic sites that were eroding along the Tennessee River bank along the southern boundary of the arsenal. Most work was performed in-house, resulting in cost savings.

The team also partnered with the Alabama State Historic Preservation Office to preserve structures on post eligible for listing on the National

Register of Historic Places (NRHP). Restorations and repairs (within NRHP standards) of historic buildings rely on Legacy Funds, so there was minimal cost to the garrison. Certain historical structures placed on the demolition list are first scoured for historically salvageable materials, and descendants of original owners are invited for a final viewing before the demolition. Grants awarded to the CRT include \$1,886 from Legacy National Public Lands Day and a \$500 research grant from the Alabama Archaeological Society.

Oral archival history represents the bulk of significant information from rural historical sites. The proposal to reevaluate 142 historic sites that date from the late 19th to early 20th centuries for NRHP eligibility could save the Army nearly \$6,390,000 on archaeological evaluations. Volunteer labor provided by students, professors, service members, civilian volunteers, unpaid interns and the CRT could save \$30,000 to \$50,000 annually.

The ICRMP opens another historical chapter for the area, as it includes prehistoric context and environmental descriptions, including paleontological resources.

The arsenal works closely with 16 federally recognized Native American tribes and completed inventories of all cultural and potentially cultural items of relevance within the arsenal collection. In 2013, the CRT completed an inventory of human remains collected since 1990; it included an extensive examination of unanalyzed bone from earlier projects. Repatriation and reburial occurred Oct. 29, 2014.

To generate public interest in the archaeological resources, the CRT worked with the Archaeological Institute of America to develop community education events on International Archaeological Day. The 2013 event attracted 50 participants, and grew to more than 300 attendees in 2014.

Other outreach and education efforts include geocache field trips, college credit and unpaid internships, online outreach, public library exhibits, improved public access, and outreach to descendants of minority populations displaced by Army acquisition of the land.

Redstone Arsenal's Cultural Resources Division includes 971 archaeological sites, 1,434 individual historical architectural structures, 715 structures from the World War II era and 717 from the Cold War era. ☺



A prehistoric shell pit lies exposed in the Tennessee River bank before the rescue excavation by the Redstone Arsenal, Alabama, Cultural Resources Team. In consultation with the state historic preservation office and federally recognized Native American tribes, the team conducted rescue excavations on 15 such eroding features at six sites between 2009 and 2013. The excavations doubled as formal Phase II evaluations of the sites while preserving significant archaeological data and mitigating the effects of flooding along the installation's southern boundary. (Photo by Ben Hoksbergen, Redstone Arsenal)

Missouri Guard's environmental management: Success starts at top

By Rita Hess
for U.S. Army Environmental Command

The Missouri Army National Guard Environmental Quality Program, which is overseen by the Missouri Guard's environmental office, is responsible for the environmental quality of 19 unique industrial facilities that provide equipment and vehicle maintenance for the Missouri Guard and regional support for aviation equipment across 14 states.

That may sound ordinary, but what the MOARNG Environmental Management Office has accomplished during the past two years is anything but ordinary. During the most recent external Environmental Performance Assessment System audit by the National Guard Bureau, the program's industrial installations received high marks for environmental compliance and stewardship, including zero findings at the Combined Support Maintenance Shop and positive findings at the Aviation Classification Repair Activity Depot.

Even better, in the same audit, the environmental management program tied the highest marks ever assessed, with 44 of 46 findings positive. These achievements earned the team the 2014 Secretary of the Army Environmental Award in the Environmental Quality — Industrial Installation category.

"For Missouri's Environmental Program to be recognized not only as the best in the National Guard, but the best in the Army is a tremendous achievement," said Maj. Gen. Steve Danner, Adjutant General of the Missouri National Guard.

"I'm very proud of the great efforts by our Soldiers, who are responsible for 19 industrial facilities across the state, including an Aviation Classification Repair Activity Depot. These Missouri Guardsmen have successfully integrated environmental stewardship into all levels of operations at all phases — enhancing our readiness while optimizing our responsible resources usage."



In 2014, the Missouri Army National Guard environmental quality staff provided annual environmental training to nearly 400 personnel statewide, including approximately 150 assigned environmental coordinators. (Courtesy photo)

The program also achieved important milestones, such as conducting internal environmental performance assessments at 100 percent of the industrial installation facilities each year, well beyond the mandated 25 percent review. These internal inspections not only led to exemplary compliance, but also allowed program's staff to develop effective working relationships with each facility's staff. A continued commitment to integrate the program into all operations also contributed to its success.

"Our success can be contributed to our Environmental Management System," said Lt. Col. John D. Jurgensmeyer, environmental management officer. "Our [environmental management program]

"I'm very proud of the great efforts by our Soldiers ... These Missouri Guardsmen have successfully integrated environmental stewardship into all levels of operations at all phases — enhancing our readiness while optimizing our responsible resources usage."

— Maj. Gen. Steve Danner
Adjutant General, Missouri National Guard

involves leadership through our Environmental Quality Control Committee (EQCC), which is chaired by Brig. Gen. James Robinson, the chief of staff, [and involves] directorates and senior commands. This coupled

with our extensive environmental training and annual audit programs provide valuable feedback to the EQCC. None of this is possible without the cooperation and involvement from our Soldiers. Together through our [environmental management program], we have been able to consistently meet our environmental goals."

Program staff members each have an area of specialty including hazardous waste management and recycling to clean air management and others. They work with unit environmental coordinators at each site and facility to ensure compliance and continual improvement, as well as provide training to 375 to 400 environmental coordinators and support staff statewide each year.

In addition to their daily duties, program staff help the program manager set objectives in their area of specialty and formulate strategies to achieve them.

Fostering strong working relationships with Missouri Department of Natural Resources also has allowed the program to reduce environmental compliance costs for the installation. For example, the Environmental Quality Program negotiated a statewide Clean Water Act land disturbance permit that eliminates the need for individual permits in the course of ordinary operations, saving the Missouri Army National Guard \$3,000 to \$5,000 annually.

In 2013, the program was key to five military construction projects, investing nearly \$20 million in installations. Program staff was involved in the process from conception through completion to encourage adoption of sustainable features and ensure full compliance. The program reviews every proposed action for construction and maintenance and, at any point in the process, can check the Missouri Army National Guard's SharePoint site and see the project status. ☺

Installation squeezes savings from sewage sludge, recyclables

By Rita Hess
for U.S. Army Environmental Command

Fort Indiantown Gap (FTIG) Warrior Training Grounds is a 17,150-acre military training installation providing a natural training environment of open fields, forests and modern training simulators. The Pennsylvania installation may be small in size but is able to squeeze out big environmental and energy savings across the installation — so big, in fact, they earned it the 2014 Secretary of the Army Environmental Award in the Sustainability — Non-Industrial Installation category.

This Pennsylvania National Guard (PNG) facility is the only live-fire maneuver military training facility in the state. It supports more than 19,000 Pennsylvania Guard personnel each year. Members of other branches and components of the military, as well as government and law enforcement entities training at the installation swell that number of users to more than 230,000 each year.

“All Fort Indiantown Gap sustainability program projects are intended to protect and enhance training and readiness capabilities now and in the future,” said Lt. Col. Robert Hepner, garrison commander. “Sustainability is instilled in all departments and directorates, promoting organization-wide accountability and ownership. The sustainability ethic and extensive training help ensure full environmental compliance at Fort Indiantown Gap.”

The installation’s sustainability program achieved several milestones during the past two years. One is its reuse of recovered sewage sludge for sustainable landscaping. A sludge press was installed at its wastewater treatment plant in

2010; the following year, a permit was obtained that allowed the installation to reuse the resulting sludge (biosolids). From 2012 to 2014, the sludge fertilized approximately 25 acres. The fields produce Timothy hay, which is used for sedimentation control, erosion repair, construction and land stabilization. This eliminates costs associated with disposing of the sludge and the cost of purchasing hay for construction projects. Diversion of sewage sludge from the landfill alone saves nearly \$20,000 each year.

Another milestone is the installation’s recycling efforts as waste diversion is a key PNG goal.

Last year, FTIG exceeded its goal and should meet or exceed this year’s target. Everything except glass is recycled, including batteries, tires, oil and antifreeze. Qualified Recycling Program (QRP) revenue from items such as kitchen grease, cardboard and brass amounted to more than \$281,000 in 2013 alone and supports expansion of the recycling program; health and safety initiatives; and morale, welfare and recreation purchases.

One unique challenge for the training site was what to do with the rubber backstops used behind targets on the firing ranges. Blocks capture the lead rounds and prevent ground contamination but are then lead-contaminated. Sustainability Program staff located a specialty smelter in Minnesota



Fort Indiantown Gap purchased this brass crusher so expended brass casings could be recycled. In 2013, 94,000 pounds of expended brass casings were recycled. In 2014 the installation generated more than \$280,000 in revenue from the entire Qualified Recycling Program. (Courtesy photo)

that grinds the block, recovers the lead residue and recycles all the components. The Pennsylvania National Guard pays to transport the blocks but spends about 70 percent less than disposing of the hazardous waste.

For several years, the installation has focused on eliminating heating oil tanks in favor of natural gas conversion — a greener, cheaper alternative.

“In one year, the conversion saved the installation over \$1 million in utility costs,” said Hepner. “Additionally, over 400 storage tanks were removed, which saves hours of inspections and servicing, improves the heating systems’ efficiency and minimizes environmental liability.”

Rather than routinely firing up the installation’s many emergency generators to



Fort Indiantown Gap has consistently been recognized for its efforts to maintain the balance between providing exceptional training support and implementing the best practices aimed at preserving the natural beauty and delicate ecosystems of the installation. Nature enthusiasts from across the U.S. toured Fort Indiantown Gap in July 2014 to capture a glimpse of a Regal Fritillary, a rare species of butterfly found almost exclusively there. FTIG hosts annual tours featuring the Regal Fritillary, as well as other indigenous plant and animal species. FTIG is home to 112 Pennsylvania Wildlife Action Plan priority species. It also provides a wide variety of habitats for 36 species of mammals, 143 breeding species of birds, 34 species of reptiles and amphibians, 25 species of fish, 792 species of plants, and many notable species of invertebrates including 85 species of butterflies. The installation also features 1,000 acres of scrub oak and pitch pine barrens and more than 4,500 acres of native grassland habitat — the largest in the state. (Photo by Tom Cherry, Pennsylvania National Guard)

test and maintain them, sustainability staff members work with local utilities so these events supply energy for the installation during peak demand times. In return, FTIG receives energy-cost subsidies. Staff members also conduct energy audits on-site and elsewhere in the state to identify energy hogs, develop costs of retrofitting older facilities and acquire more energy efficient equipment.

Local, regional and state involvement is also a priority. Sustainability staff members share their expertise with environmental committees in the region and at the National Guard Bureau level. Sustainability program accomplishments do more than free up resources to support other mission needs. They reflect the importance PNG places on sustainability and ensure FTIG remains an environmental leader in the region. ☞

Creating award-winning product not as easy as it looks

By Rita Hess
for U.S. Army Environmental Command

The Halon Extinguisher Replacement Program for Aviation Weapon Systems Integrated Product Team (IPT) spent several years researching, developing and testing replacements for the current aviation hand-held fire extinguisher (HHFE) charged with the ozone-depleting substance (ODS) Halon 1301. These efforts earned a 2014 Secretary of the Army Environmental Award for Environmental Excellence in Weapon System Acquisition.

The Aviation Ground Support Equipment (AGSE) Product Office within the Program Executive Office for Aviation at Redstone Arsenal, Alabama, qualified a non-ODS fire suppression agent and an associated hardware configuration. The AGSE Product Office led a group of subject matter experts within the U.S. Army Aviation and Missile Command and the U.S. Army Test and Evaluation Command to spearhead a team of stakeholders, at which time the IPT was created.

Required for mission readiness, hand-held fire extinguishers must be installed on all Army rotary wing aircraft and verified during the pre-flight checklist to be mission capable. But more than that, installed HHFEs must be effective fire suppression tools and perform as expected when needed.

The IPT wanted to provide war fighters with an environmentally friendly replacement that had the same fire suppression capability as the Halon 1301, while not increasing size or operational difficulty and with only minimal increase to the weight. The team tested a standard sodium bicarbonate powder, which led to the use of special sodium bicarbonates (SBCS), a particle produced at less than 2 microns in diameter.

When agent development was finalized, two types of extinguishing agent with SBCS blends met the JP8 fuel pan fire capabilities of the Halon 1301 configuration being replaced, which was critical to developing a drop-in replacement. The team then developed accelerated aging test protocols to ensure the quality of the extinguishing agent (the SBCS constituent) would not degrade when subjected to temperature cycling. No test like this existed, so the team developed accelerated aging test criteria, including high-pressure glassware and fixturing hardware.

Next up, the team tested nozzles but discovered that the best extinguishing performance was with ones they developed — commercial nozzles were simply not as effective in fire suppression tests using the new agent mixture. The team also worked with specialized commercial labs to develop tests to measure critically important quality parameters of

SBCS and measure moisture content. To measure and document the cross-sectional area and throw range of the replacement discharge, the team developed a test that also was useful when comparing the developed configurations' agent throw range with the Halon configuration.

The final configuration was documented in a technical data package that included 42 drawings. The final test report and supporting documentation was shared with all IPT members and ultimately submitted to the Defense Logistics Agency for procurement.

Core IPT members and other subject matter experts played a vital role in the review and coordination of the specifications developed and finalized in December 2012.

The product will launch on the Consolidated Aviation Portal and Storage website when sufficient quantities of the extinguisher are in stock to support fielding.

The contract for the first production of the non-ODS HHFE should occur soon, and fielding to the aviation community (about one year after contract award) is expected early in fiscal year 2016. Implementation of the non-ODS HHFE will ultimately eliminate 30,000 pounds of Halon from Army aviation systems.

Test equipment and configurations developed during this program will be used at the Aberdeen Test Center in Maryland to evaluate aging hand-held extinguishers used on the Abrams main battle tank. In addition, Naval Aviation Systems Command personnel in the IPT have expressed interest in the non-ODS HHFE once Navy testing is conducted. The FAA Fire Research Branch invited team members to attend meetings with FAA contractors and assist in discussions related to fire suppression. ☛



ABOVE: The U.S. Army Test and Evaluation Command performed hundreds of pan-fire tests during the developmental phase of the program. More pan-fire tests will be performed on the first non-ozone depleting substance hand-held fire extinguishers produced, prior to fielding. Performance qualification is required by the procurement contract. **RIGHT:** A Soldier outfitted in the fire resistant environmental ensemble, heavy flight gloves and other flight gear demonstrates a successful discharge operation and function of the non-ozone depleting substance hand-held fire extinguisher. (Courtesy photos)



Arsenal salvaging history in rural New Jersey

By Amanda Hilles
for U.S. Army Environmental Command

Nestled in the northern Highlands of Morris County, New Jersey, a gold mine of historic artifacts needed rescue. Because of its location within the 6,500-acre Picatinny Arsenal — the Joint Center of Excellence for Armaments and Munitions — documenting the gems required balancing the military mission with the historic preservation of the cultural resources. That balancing act earned Picatinny's Cultural Resources Program (CRP) a Secretary of the Army Environmental Award in Cultural Resource Management.

The installation's roots date back to the end of the Civil War, when it provided storage space for large quantities of powder and explosives. Since then, its various tenants and missions point to the military's advancement of weapons systems and munitions.

Leading the CRP is Jason J. Huggan, a registered

professional archaeologist who has worked at Picatinny since 2007. So far, 83 properties across five historic districts have been deemed eligible for the National Register of Historic Places.

Among Picatinny's archaeological sites are 22 of Native American origin evidenced as rock shelters, campsites and lithic scatters. Another 32 are historic in nature, ranging from 18th century iron forge remains, colonial farmsteads and homesteads, 19th century mining sites, as well as stonewalls and associated land tracts.

Functionality of the installation's historic properties is critical to the mission's research and development focus. The CRP works extensively with mission tenants to perform adaptive reuse of facilities recognized as historic properties. For example, the CRP established color standards on structures located within the 600 Ordnance Testing Area Historic District. One such structure was recently reactivated for storage and reuse with appropriate colors and materials that met

State Historic Preservation Office standards.

One reason for Picatinny's success was thoughtful planning. The installation's Historic Property Component Plan covers expected outcomes for 2013 through 2018, while the Integrated Cultural Resources Management Plan covers 2014 through 2019. These and other documents, including a master planning oriented programmatic agreement, ensure streamlined cultural resource management remains in place for the future.

Many stakeholders were involved throughout the process, and the CRP provides them with project-by-project and biennial updates of master planning projects allowing for

transparency of the Arsenal's Section 106 compliance.

Picatinny successfully executed several mitigation projects, including establishing historic district viewsheds and signage, salvaging bricks from historic buildings for reuse as part of Picatinny's Pollution Prevention Plan, and coordinating a traveling museum exhibit.

Their most recognized project is a historic district narrative website that includes historical accounts of structures, professional photographic documentation and original building plans. Audio clips from interviews with current and former employees provide accounts adding to the already rich and historically relevant content. The site, www.pica.army.mil/ead/Cultural/PicatinnyHistoricDistricts/index.html, is a digital inventory of all historic district structures and documents those slated for demolition. Compared to the conventional method of such documentation, the website saved more than \$250,000 and helped eliminate ongoing safety issues at abandoned facilities earlier than anticipated. The site earned Picatinny a 2013 New Jersey State Historic Preservation Award.

In addition to the website, public outreach efforts include tours of the Arsenal, Walton Burial Ground and artifact curation room for the Picatinny workforce and new employees, as well as public and local organizations. On Memorial Day, events honor Revolutionary War soldiers laid to rest at the Walton Burial Ground.

The arsenal's CRP is also responsible for managing the Revolutionary War-era Walton Burial Ground located on post. During 2012 and 2013 the CRP photographed each gravestone and is now trying to ascertain the identity of the 100 to 150 souls buried there.

The CRP's focus for the coming years includes additional historic building surveys, archaeological evaluation of sites at risk by future development, ongoing documentation of cultural resources and continued identification of Walton Burial Ground occupants. ☺



ABOVE: A screen shot of the Picatinny Arsenal Cultural Resources Program historic district narrative website, which includes historical accounts of structures, professional photographic documentation and original building plans. Audio clips from interviews with current and former employees provide accounts adding to the already rich and historically relevant content. The site earned Picatinny Arsenal a 2013 New Jersey State Historic Preservation Award. **RIGHT:** Pre-1918 view of Buildings 3250 and 3316 located at the former Lake Denmark Naval Ammunition Depot, Picatinny Arsenal. This photo was gathered during archival research as part of a Cultural Landscape Analysis completed by the Picatinny Arsenal Cultural Resources Program. (Photo courtesy of the National Archives)



Philadelphia District employee earns national recognition for coastal work

By Steve Rochette

U.S. Army Corps of Engineers Philadelphia District

Philadelphia District's Operations Project Manager Monica Chasten received a national award on Capitol Hill for her efforts to help re-establish coastal navigation and restore degraded marsh in New Jersey in the wake of Hurricane Sandy.

Chasten was honored with the Army Corps of Engineers Award by the American Shore and Beach Preservation Association (ASBPA) during a ceremony at the Rayburn House Office Building in Washington, District of Columbia, in February. The association bestows the honor to an individual who makes significant contributions to coastal projects.

The ASBPA citation said Chasten "epitomizes the role of a public servant and has been a tireless advocate for Regional Sediment Management practices."

"Two days after Hurricane Sandy hit, we went to New Jersey coastal areas with a survey team, and none of us had seen anything like it in terms of the devastation. It was a humbling experience," Chasten said.

Chasten said Philadelphia District began working with the U.S. Army Engineer Research and Development Center (ERDC), the state of New Jersey and several non-profit organizations on ways to dredge for coastal navigation purposes and use the material in a beneficial way to help restore impacted shorelines as well as degraded marsh in back bay environments.

"Sometimes a storm can change the approach and that's what happened in this case," Chasten said. "The hope is that these methods can be a model for future projects."

Demonstration Projects

The district partnered with the state and non-profit organizations on two marsh restoration and habitat creation demonstration projects along the New Jersey Intracoastal Waterway. The Army Corps of Engineers, New Jersey Division of Fish and Wildlife, The Nature Conservancy and the Green Trust Alliance joined efforts in 2014 on the initiative.

The first demonstration project involved dredging the federal channel of the Intracoastal Waterway near Stone Harbor and Middle Township, New Jersey. The Army's contractor Barnegat Bay Dredging Company removed approximately 7,000 cubic yards of fine-grain sand from a critical shoal in the waterway. The clean material was then pumped through a series of pipes and placed on degraded marsh.

Coastal marshes are vulnerable to degradation as a result of subsidence and sea-level rise, which causes a loss of marsh grasses and nesting habitat for birds. The first demonstration project targeted the creation of habitat for the state-endangered black skimmer species. The

project also incorporated thin layer placement, a technique designed to pump several inches of clean fine-grained sediment onto marsh, providing a foundation for marsh grasses to take root. This method can be a sustainable solution when dredging small quantities of sediment.

A second demonstration project took place near Avalon, New Jersey, where Barnegat Bay Dredging Company removed 6,000 cubic yards of material from the federal navigation channel and placed the sediment on nearby degraded marshes. Chasten said the second project required a combination of filling in eroded pool and panne areas of the marsh as well as conducting more thin-layer placement.

The projects were completed in 2014 and have been monitored for ecological benefits by the New Jersey Division of Fish and Wildlife and The Nature Conservancy.

"These projects are examples of the Regional Sediment Management approach — we try to balance the need for dredging for navigation purposes with the fact that sediment can be a resource for ecological benefits and shore protection purposes," Chasten said. "We need to keep clean sediment in the system when possible to restore critical habitats and build overall system resilience."

Future Efforts

Chasten said USACE plans to award a contract this spring to dredge critical shoals in two different areas of the Intracoastal Waterway: near Avalon and Beach Haven, New Jersey.

"We're working with the state now on beneficial use options for the material in these areas," said Chasten, who added that material could be used again for marsh restoration purposes in the respective areas.

Dredging is necessary along the New Jersey Intracoastal Waterway to ensure safe maritime navigation. When the dredged material is clean and suitable sediment, USACE looks for opportunities to reuse the material. In the past, dredged

material was pumped into confined disposal sites cut off from coastal processes.

Chasten credited partner organizations, including the state, ERDC, The Nature Conservancy, the Wetlands Institute and Barnegat Bay Dredging Company, for persistence and innovation as the team worked through various challenges.

Dredging and placement activities are funded by the Disaster Relief Appropriations Act of 2013 (Public Law 113-2, also referred to as the Hurricane Sandy Relief Bill) through an existing district contract with Barnegat Bay Dredging Company. Partner organizations were funded through a U.S. Department of Interior grant administered by the National Fish and Wildlife Foundation. ☺



Philadelphia District Project Manager Monica Chasten discusses dredging and placement operations with USACE Inspector Charlie Yates and Joe Hill, owner of Barnegat Bay Dredging Company. The Army Corps of Engineers has partnered with the state of New Jersey and several non-profit organizations on a dredging and marsh restoration project along the New Jersey Intracoastal Waterway. The demonstration project involves dredging critical shoals from the waterway and restoring ecological habitat. (Photo by Tim Boyle, Philadelphia District)

Engineering coastal recovery from Hurricane Sandy

By Louis Fioto
U.S. Army Corps of Engineers North Atlantic Division

Late in 2012, Hurricane Sandy struck and devastated parts of the Northeastern United States causing more than \$50 billion in damage to communities and infrastructure. The storm's effect on the coastlines was equally devastating, with millions of cubic yards of sand raked away from the coast, making many coastal communities extremely vulnerable to future storms.

In January 2013, the president signed the Disaster Relief Appropriations Act of 2013, authorizing and funding the U.S. Army Corps of Engineers to take steps to reduce that vulnerability through repairing, restoring and constructing coastal storm risk management projects in the Northeast.

Although a lot of engineering goes into planning, designing and constructing hard structures such as levees, walls, tidal barriers and pump stations, engineering is crucial to building and replenishing beaches, as well.

Beaches are important features for coastal storm damage risk management. Bluffs, dunes, berms and offshore sand bars reduce the risk of damage to property and infrastructure by absorbing and dissipating the energy of breaking waves. The Corps of Engineers' beach projects are designed and engineered to work like a natural beach, allowing sand to shift continuously in response to changing wave action and water levels.

Beach nourishment will reduce but not eliminate risks because storm severity is unpredictable and can exceed risk reduction design levels. To ensure a beach continues to meet its design criteria and purpose, additional sand must be added periodically to a nourishment project. These nourishment cycles provide opportunities to reevaluate beach performance and sea-level change.

The Army Corps of Engineers' beachfill projects, authorized and funded after Hurricane Sandy, incorporate the latest science, including sea-level change, future adaptation of hard features and lessons learned from Hurricane Katrina. Changing sea levels throughout the Northeast coupled with improving coastal flood risk analysis technologies can lead to changes in project planning, design and nourishment.

To address these changes, USACE has institutional

mechanisms in place that allow for adjustments in project dimensions during the life of the project to maintain the design level of coastal storm risk management.

Beachfill projects can account for changes in sea levels by adjusting elevations, widths and volumes, based on the best currently available information, explained Jeffrey Wisniewski, a senior engineer for the Sandy Recovery Program.

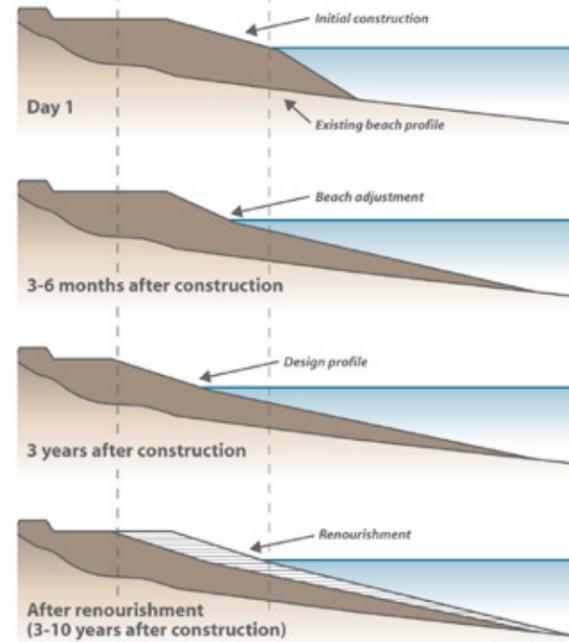
"Sandy beachfill projects funded by the Disaster Relief Appropriations Bill typically provide for periodic beach renourishment and monitoring over the life of the project," Wisniewski said. "We have the flexibility to make adjustments with regard to the height of that beach berm or dune to take into account the latest available information on sea levels."

USACE recently completed a report designed to help local communities better understand changing flood risks associated with climate and sea-level change and provide tools to help communities attain improved resiliency by better preparing for future flood risks.

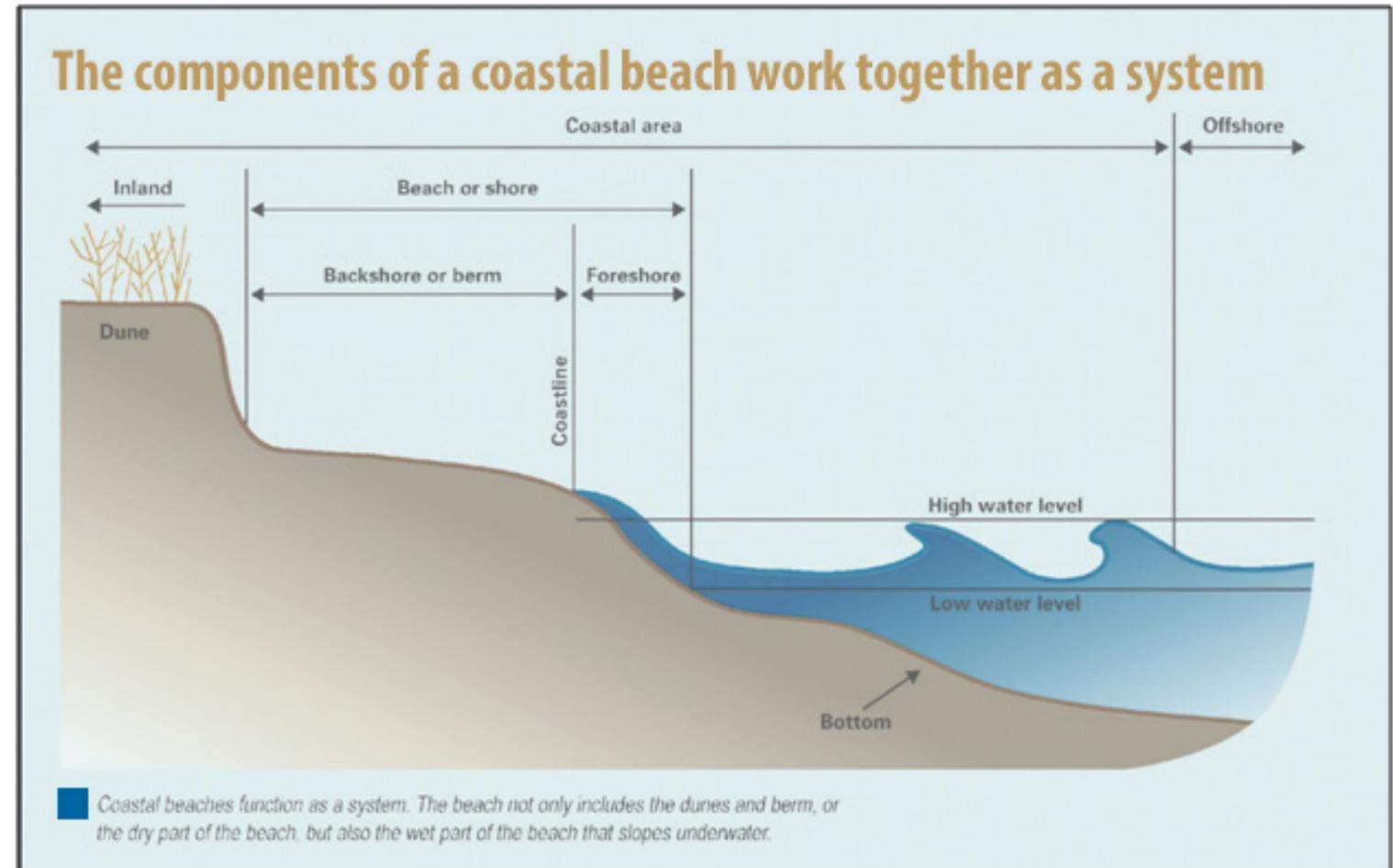
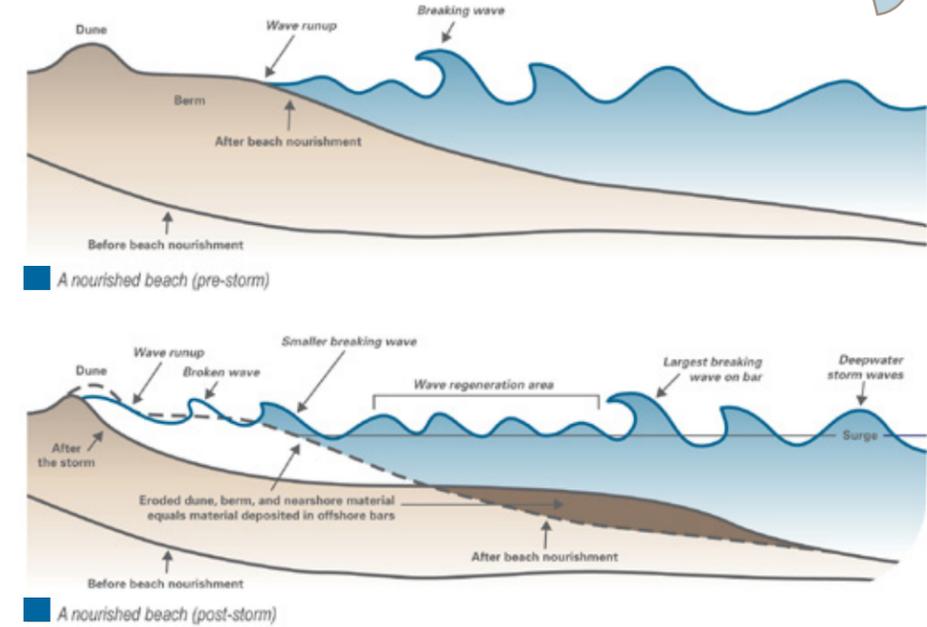
The North Atlantic Coast Comprehensive Study builds on lessons learned from Hurricane Sandy and attempts to bring to bear the latest scientific information planning tools and models available for state, local and tribal planners, as well as the NACCS Framework and technical products that can be applied throughout the North Atlantic and to other coastlines in the United States and internationally.

The conclusions of the report, including various coastal storm damage risk management strategies communities can use to adapt to increased flood risk, is online at www.nad.usace.army.mil/compstudy.

Shore protection projects are designed to retain and rebuild natural systems such as bluffs, dunes, wetlands and beaches and to protect structures and infrastructure landward of the shoreline. Coastal engineers expect that large storms will induce sediment transport from the nourished beach and move sand offshore. When this happens, waves begin to break farther from the shoreline, thus weakening their force before they reach the shoreline itself. In this way, beach nourishment projects help protect dunes and property from further erosion, decrease flooding and limit how far ashore storm surge will go. A wide, flat beach berm with a sufficient volume of sand keeps the erosive power of the waves from reaching and destroying the dunes and structures and can reduce damages significantly from waves, inundation and erosion.



After a beach nourishment project is constructed, coastal engineers expect the beach to change gradually over time and assume a more natural form.



Buffalo District establishes Chronic Beryllium Disease Prevention Program

By Andrew Kornacki

U.S. Army Corps of Engineers Buffalo District

Beryllium is a light-weight metal used for its exceptional strength and high heat-absorbing capability. It is used in the defense and aeronautics industries in missile and radar systems, nuclear devices and navigational systems, as well as commercially in audio equipment, bicycle frames, spark-proof tools, springs and surgical equipment.

Pulmonary disease associated with inhaling beryllium has been recognized and studied since the 1940s, and an occupational guideline for limiting exposure to beryllium has been in place since 1949. It is well established that exposure to beryllium can cause beryllium sensitization and chronic beryllium disease.

“Beryllium is arguably the most toxic, non-radioactive chemical substance to which workers will ever be exposed to,” said Bill Pioli, Buffalo District safety specialist.

Given how widely used beryllium is, and recognizing its harmful effects, the Buffalo District assumed the responsibility of establishing its own unique disease prevention program.

Dec. 18, 2014, represents a watershed day in USACE and the Great Lakes and Ohio River Division. After two years of research, meetings, discussions and negotiations, a Union-Management Memorandum of Agreement was signed establishing the Buffalo District Chronic Beryllium Disease Prevention Program (CBDPP).

Modeled after a similar program enacted by the U.S. Congress for the U.S. Department of Energy, Buffalo District’s CBDPP represents the first of its type within not only USACE, but also the Department of Defense.

“The Buffalo District saw a need for the CBDPP

because beryllium is the primary chemical of concern within the Luckey, Ohio, remediation project,” said Steve Bousquet, Buffalo District environmental health team leader. The Luckey project is part of the Formerly Utilized Sites Remedial Action Program.

“We are fortunate to have the level of expertise and knowledge within the Buffalo District to design and implant such a complex program,” he said.

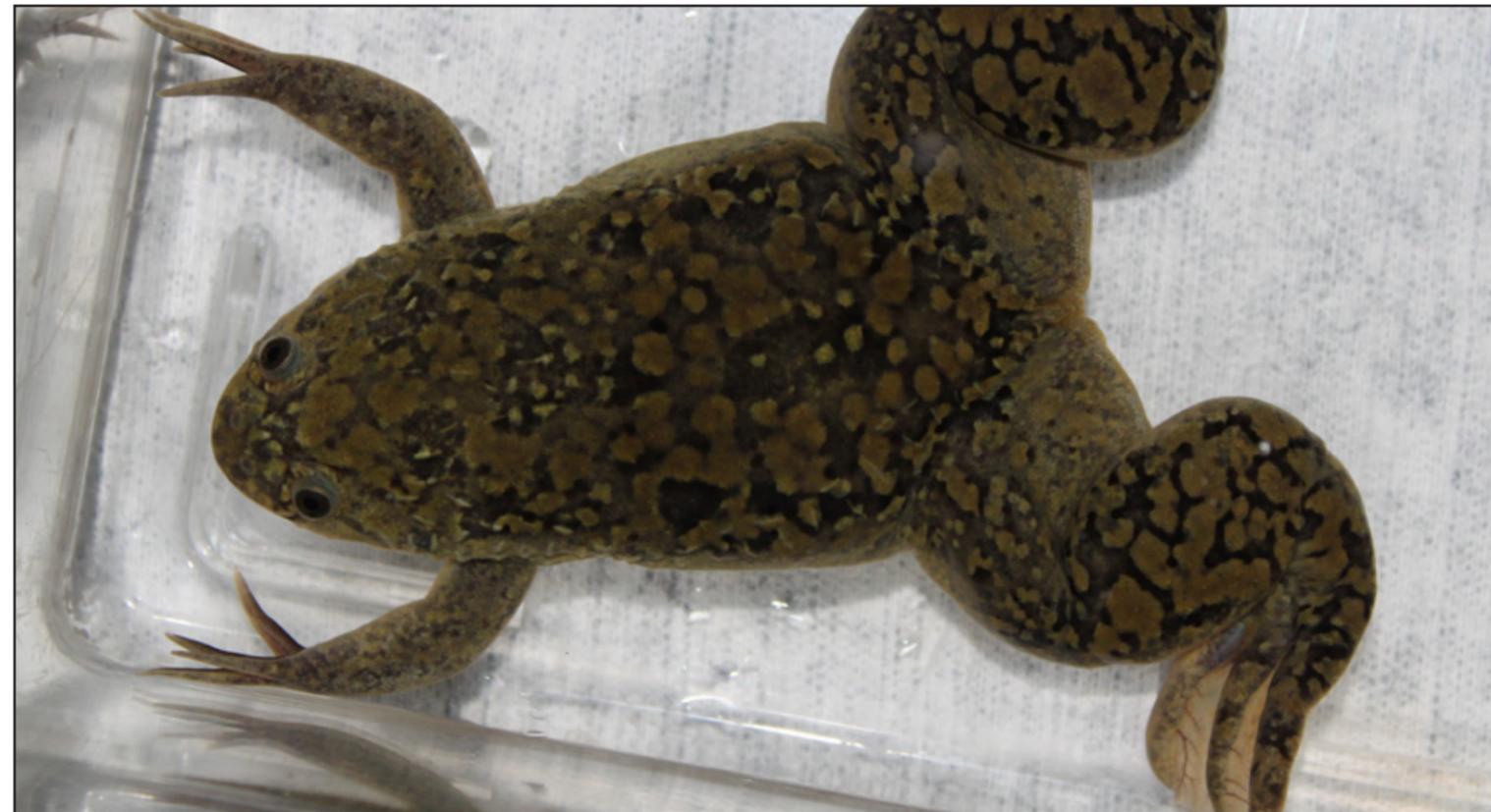
Design of the CBDPP began in the summer of 2012 when proactive, risk-based decision making indicated that a programmatic approach was required to control beryllium exposures. USACE safety and occupational health staff researched available control paradigms and quickly found that the DOE had decades of experience in managing beryllium exposures.

“The draft Buffalo District CBDPP was developed using a comprehensive team approach involving USACE Headquarters, Centers of Expertise, a Department of Energy consultant and multi-disciplinary Buffalo District staff,” Pioli said.

The final Buffalo District CBDPP covered roles and responsibilities, risk assessment, the Buffalo District CESO-approved occupational exposure level variance request, exposure monitoring, exposure reduction, exclusion/contaminant reduction/administrative zones, hygiene practices, engineering controls, personal protective equipment, release criteria, medical surveillance and worker counseling upon removal.

“We met regularly with James Dean, Buffalo District union president and hammered out a mutually agreeable settlement that resulted in the enactment of a critically important program,” Bousquet said.

“The Buffalo District now has a rigorous, protective program to mitigate the health impacts associated with beryllium exposure both district-wide and specifically at the Luckey remediation project site.” ☞



The U.S. Army Center for Environmental Health Research located at Fort Detrick, Maryland, is housing African clawed frogs to study toxicity levels in periodate, a compound that could be used to replace perchlorate. (Courtesy photo)

Army Environmental Health Research Center feeling froggy

By Lisa L. Morris

U.S. Army Medical Research and Materiel Command

The U.S. Army Center for Environmental Health Research welcomed the African clawed frog (*Xenopus laevis*) back into its laboratory in February to study the level of toxicity in periodate, a compound that could be used to replace perchlorate. Most commonly used for propellants in rockets and fireworks, perchlorate has been shown in an increasing number of studies to have negative effects on the environment and human health.

Together with the U.S. Army Institute of Public Health, USACEHR scientists at Fort Detrick, Maryland, will conduct an Amphibian Metamorphosis Assay to determine any toxic effects of periodate on the normal functions of the hypothalamic-pituitary-thyroid axis, which is part of the endocrine system responsible for metabolism.

The AMA is a well-studied Tier 1 screening protocol used to evaluate chemicals that potentially interact with the estrogen, androgen or thyroid systems, and the only assay that detects thyroid activity in an animal undergoing morphological development. The Environmental Protection Agency uses the AMA as part of a larger Endocrine Disruptor Screening Program to help with regulatory decision-making.

The EDSP formed as a result of the Food Quality Protection Act and the Safe Drinking Water Act amendments in 1996 in an effort to identify chemicals that produce negative effects on the endocrine system, potentially leading to diabetes, thyroid disease, growth disorders and more.

The USACEHR’s role in the study itself includes an extensive preparation period and three 21-day test periods, all of which will take approximately one year to complete.

“We’re really looking forward to this because within the USAMRMC, we’re the only lab with this capability,” said Col. Thomas Timmes, USACEHR commander. “We have a very unique aquaculture mission.”

The center’s unique aquaculture facilities allow their scientists to house and study frogs as opposed to other USAMRMC labs that may study rodents or other small mammals. With other USAMRMC labs attracted to the USACEHR’s unique capabilities, the USACEHR will invite other veterinarians to visit and learn from the study. ☞

Designing better buildings using energy modeling

**By Reynold Chun
and Keane Nishimoto**
U.S. Army Corps of Engineers
Pacific Ocean Division

With more than 350,000 buildings, the federal government is the nation's largest energy consumer, according to the U.S. Department of Energy. We cannot totally eliminate the need for energy — it takes energy to meet the mission. However, we can all be aware of what uses the most energy and identify conservation opportunities — especially as we design future buildings. Energy modeling is a means to predict the energy usage of a building by examining the parameters that affect a building's energy consumption and comparing energy saving strategies between a baseline and proposed building. Energy modeling helps a design team identify the respective building components, systems and equipment necessary to achieve specified energy reduction targets.

To help the U.S. Army Corps of Engineers lead the way in sustainable building practices, the USACE Energy Modeling Center of Expertise in Sustainability, located at Pacific Ocean Division, provides technical guidance across the Corps on how to use commercially available energy modeling software to develop energy models that will help us achieve high performance sustainable and energy efficient buildings.

Modeling

Building simulation energy models attempt to make predictions of a buildings performance over time, but a model is just a model. For our sustainability goals, an energy model can highlight which areas of a facility or building use more energy than others. At USACE, we have been modeling facilities for more than 25 years. During that time, modeling has become more structured and well recognized.

So what does a building model entail? It incorporates such inputs as weather simulation data, site plan, building orientation, conditioned areas, utility rates, building envelope (roof, walls, windows), occupancy and usage, lighting and schedules, plug loads and schedules and mechanical equipment and efficiencies. Again, a model is just a model, but it's the best we have.

At USACE, we have checks in place to ensure consistency, and protocols are set up so we are comparing apples to apples. So, when we say we are 30, 40 or 50 percent better than a baseline, we know what the baseline includes, and we know how we made the comparison.

Now, does the model predict reality — as in, actual energy use? The answer lies in how close the prediction is to estimating the variables. Models are only as accurate as the accuracy in predicting the inputs. We do have weather simulation data based on years and years of historic weather data. We do have independent, scientific tests showing particular wall assemblies have particular U-values and solar heat gain coefficients. We do have an estimate of expected use of the building and occupied space. However, does the estimated, expected use of the building reflect reality?

Reality

A planner, designer and constructor can only anticipate the use of the building and plan, design and build to form and function. The function, use, operation and maintenance of the building can change after the beneficial occupancy date. Or, the building may not be used as predicted. In energy usage terms, the demand for energy may be more or less than what is calculated by the model. Also, external factors, such as

Climate Zone Type	Possible Strategies
Cooling intensive climates	<ul style="list-style-type: none"> • Reduce solar heat gain • Reduce lighting/power schedule • Demand-controlled ventilation
Temperate climates	<ul style="list-style-type: none"> • Economizer • Reduce lighting/power schedule
Heating intensive climates	<ul style="list-style-type: none"> • Increased insulation • Minimize infiltration • Minimize ventilation

The National Geospatial Intelligence Agency at Fort Belvoir, Virginia, was designed as a LEED Gold facility — the largest in the federal government. The roof is composed of a fluorine-based plastic designed to protect against corrosion and provide substantial strength over a wide temperature range. At 1 percent the weight of glass, its translucent nature allows light into facilities and helps control heat gain, thus reducing amounts of electricity used within the facility. Baltimore District managed construction of the 2.4 million-square-foot facility. (Photo courtesy Baltimore District)

[Learn more about the Energy Modeling CXS at www.usace.army.mil/Missions/Sustainability/CentersofExpertiseinSustainability/EnergyModeling.aspx](http://www.usace.army.mil/Missions/Sustainability/CentersofExpertiseinSustainability/EnergyModeling.aspx)

weather, may not occur exactly as depicted in the model. Knowing that a model has a finite amount of variables but reality has an unlimited amount of influences, is the model even a valid prediction tool?

USACE has found building simulation models are useful as tools in identifying opportunities for energy conservation and sorting out those factors with the best potential benefits. The model categorizes and identifies which areas contribute the most to building energy usage. For example, we can estimate the building envelope might contribute about 10 percent to total building energy use, while lighting might contribute 30 percent. The project delivery team can then effectively focus on energy conserving building features.

Strategies

Reducing lighting power and schedule can be done with daylighting and energy efficient lighting, such as solid state lighting, energy efficient fluorescent lighting and lighting controls. An HVAC control strategy would be running your air distribution system without your chiller or boiler.

Action

What can we all do to “beat the model?” Remember, the model? The model inputs include a lighting schedule. The lighting schedule anticipates the use of lights based on the anticipated use of the spaces. Energy performance is improved by turning on fewer lights, implementing dimmable or zoned lighting, or by having reactionary lights (such as motion detection or light detection). We can also go to the extreme of de-lamping, or removing light bulbs from existing light fixtures to reduce the lighting power levels in a particular space. De-lamping could be done in spaces where there is additional, sufficient lighting provided for the intended function. For example, if sufficient lighting on a work surface is provided with task lighting, the overhead light fixtures can be de-lamped to reduce ambient lighting power because ambient lighting level requirements are lower than work surface lighting requirements. Just check with your safety/ergonomic officer before de-lamping.

These actions can be similarly applied to other systems. One option is to turn off

air conditioning and use natural ventilation. Another is to minimize plug loads — which is basically anything you can plug in, such as a computer, coffee pot, microwave oven, refrigerator, etc. Now, we can model plug loads, but similar to lights, if you purchase the cheapest, least energy efficient refrigerator and leave the doors open all the time, your energy consumption will not be less than the model. On the other hand, if you buy the refrigerator with the nice energy star label and keep the door closed, you will use less energy as modeled. So, take action and practice energy efficient behavior. Be aware of your energy use and you can help make the meter beat the model.

Way forward

Headquarters USACE is proposing to turn in an energy and sustainability report card at the same time the building is turned over to the garrisons. The report card highlights energy conservation features including modeled energy use per square foot. This may be used as a benchmark as a comparison to actual energy used, such as energy measured by the electric meter. ☞

Low water stream crossings in Alaska use new technique

By Curtis Fey

Environmental Technology Branch,
U.S. Army Environmental Command

Two new low water stream crossings at Fort Wainwright's Donnelly Training Area in Alaska improve access to thousands of acres of training land and demonstrate the effectiveness of articulated concrete mats as a technique to improve low water crossings.

The purpose of a hardened low water stream crossing is to provide a stable and reliable road base through the stream for vehicles, while minimizing harmful effects to the environment. Unhardened vehicle stream crossings create a location for extensive erosion, greater sediment discharge, stream habitat fragmentation, increased maintenance expenditure and safety concerns during high water events.

The existing low water stream crossing sites were repaired by replacing the floor of the stream bed with articulated concrete block mats, a process referred to as hardening. The mats comprise a series of trapezoidal concrete blocks connected together with stainless steel cables and cable clamps. The linked mats are keyed to the stream bed. To minimize erosion and suspended sediments, the abutments were re-vegetated with native Alaskan plants.

The two low water crossings were upgraded by Salcha Delta Soil and Water Conservation District as a part of a technical demonstration project funded by Army Environmental Command. Installation of the articulated concrete block mats at the 12 Mile Crossing of Jarvis Creek was completed in two phases to support the follow-on evaluation of the design; the southern approach was installed in September 2010 and the low water crossing in the main body of Jarvis Creek was installed in October 2012. A second low water crossing over a smaller creek that flows into Jarvis Creek near 12 Mile Crossing was also installed late in the summer of 2013.

To validate the effectiveness and durability of the designs, inspection of the completed 12 Mile Crossing was conducted by the U.S. Army Aberdeen Test Center in the summer of 2013 and both crossings were inspected in June 2014. After many months of training use and winter ice cover, both crossings were observed to perform as designed and retain overall structural integrity. Inspection of the concrete blocks did not reveal any significant cracking, surface damage or block movement, nor were there any indications of broken, sheared or frayed cables in the main roadway. Some minor shifting occurred in a couple of off-road, side blocks of the mat installed during the first phase of 12 Mile Crossing, due to an installation issue and not from any shortfalls in the design.

The availability of the hardened low water stream crossings are expected to result in increased tactical movement between the major training facilities for improved training scenarios. Troop movements will no longer be forced off military land and onto the public road, Richardson Highway, to navigate around the previously unhardened low water stream crossing sites. Access to critical training areas including the Donnelly Drop Zone and Battle Area Complex will be reduced by approximately 10 miles one way.

The final project reports with crossing design information have been provided to the U.S. Army Engineering and Support Center, Huntsville, Alabama, which is designated the Army Corps of Engineers' Range and Training Land Program Mandatory Center of Expertise, for incorporation into its repository of range design guides and specifications. The U.S. Army Environmental Command (USAEC) funded and provided guidance to successfully implement this project.

Questions or comments regarding this or other low water stream crossing projects may be directed to USAEC's Environmental Technology Branch. To learn more, visit www.aec.army.mil/Services/Support/EnvironmentalTechnology.aspx. For more information about Huntsville Center's range design guide repository, visit <http://go.usa.gov/3CvZR>.



ABOVE: A smaller scale hardened low water stream crossing with a steel cable tied concrete block mat structure was installed on 33-Mile Loop Road across the 11 Mile Crossing in the Donnelly Training Area at Fort Wainwright, Alaska.

LEFT: A hardened low water stream crossing with a steel cable tied concrete block mat structure was installed on 33-Mile Loop Road across Jarvis Creek at the 12 Mile Crossing in the Donnelly Training Area. The structure provides a stable base to allow vehicles to cross the stream while reducing erosion and suspended sediments.

The stream crossings were part of a technical demonstration project funded by the U.S. Army Environmental Command. (Photos by Carl Johnson)

Buffalo District: A proving ground for Engineering with Nature

By **Andrew Kornacki**
U.S. Army Corps of Engineers
Buffalo District

Buffalo District has been named as one of two proving grounds for the U.S. Army Corps of Engineers' Engineering with Nature (EWN) program.

Defined as the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic environmental and social benefits through collaborative processes, EWN is based on the following four fundamental elements.

1. Use natural processes to maximize benefits, thereby reducing demand on limited resources, minimizing the environmental footprint of projects and enhancing the quality of project benefits.

2. Use science and engineering to produce operational efficiencies supporting sustainable delivery of projects benefits.

3. Broaden and extend the base of benefits provided by projects to include substantiated economic, social and environmental benefits.

4. Use science-based collaborative processes to organize and focus interests, stakeholders and partners to reduce social friction, resistance and project delays while producing more broadly acceptable projects.

The EWN team conducted a successful proving ground implementation workshop with Buffalo District Dec. 1-3. Approximately 30 USACE team members from Buffalo District and both the Environmental Laboratory and Coastal and Hydraulics Laboratory of the Engineer Research and Development Center (ERDC) collaborated in this effort. Along with the Galveston District, the Buffalo District has agreed to serve as an EWN Proving Ground for district-wide implementation of the EWN principles and practices.

Participants shared information about EWN and ongoing projects and worked in collaborative teams to identify opportunities to implement EWN principles and practices within the district's current and future projects.

"Our association with the EWN program affords an excellent opportunity to exercise our regional leadership while demonstrating our commitment to USACE Environmental Operating Principles," said Lt. Col. Karl Jansen, Buffalo District commander. "Stakeholder partnering and collaboration builds trust with the public we serve, and balancing human development with natural systems will preserve the Great Lakes Navigation System's infrastructure and environment for future generations."

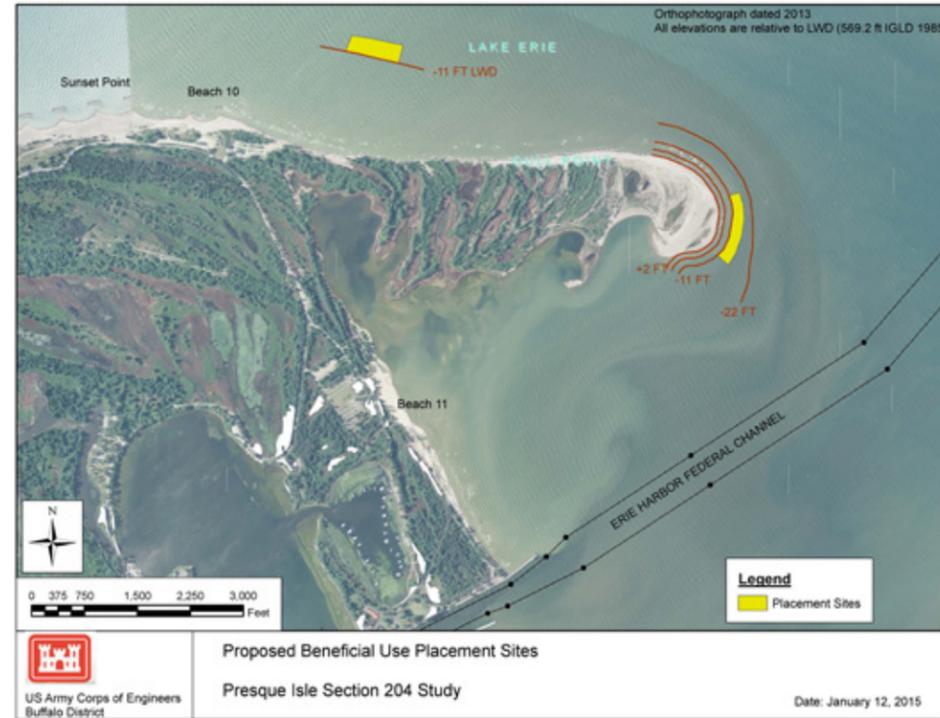
"We're excited to have Buffalo District, including all of their talent and opportunities, as an EWN Proving Ground," said Dr. Todd Bridges, Army senior research scientist for environmental science and program manager for USACE's EWN Program. "The district's commitment to advancing and promoting EWN within the Great Lakes is going to create value regionally and nationally."

Many Buffalo District projects have already been identified as potential EWN projects, including the following three.

Cleveland Harbor Green Breakwaters Project

Off of the shores of Cleveland Harbor, rising out of Lake Erie like a wave of concrete and stones, sits the Cleveland Breakwater offering 24,570 feet of safe navigation and protection for the harbor.

The existing breakwaters provide some habitat for fish and invertebrates, but that result is purely an indirect and unplanned consequence. The habitat that exists usually consists of refuge provided by spaces between concrete or rock sections, while the rest of the structure is relatively inhospitable for most



organisms due to the featureless nature of the materials.

The Cleveland Harbor Breakwater project involves modifying the design of the standard concrete toe blocks used for breakwater maintenance at the Cleveland Harbor East Arrowhead breakwater to provide features that will create habitat opportunities for Great Lakes fish and invertebrates that would not otherwise be present.

The study is examining the opportunities to create substantially more habitat surface on the breakwater by modifying the shape and surface texture of the constructed blocks using textured liners or modified walls in the concrete block forms. Three separate block modifications are being installed and studied to see how they perform as habitat:

- Grooved block surface texture to provide invertebrate and juvenile fish refuge,
- Dimpled block surface texture to provide invertebrate habitat, and
- A protected indented shelf to serve as fish refuge and potential spawning areas.

Samples are currently being analyzed from the initial installations of blocks in the spring of 2012 and 2014. Early indications are that some differences among the block types are evident, with the grooved block and indented shelf block often exhibiting the greatest abundance of algae (*Cladophora spp.*) and a variety aquatic invertebrates (Dreissenid mussels, oligochaetes, amphipods, etc.) colonized on them when compared to the dimpled or unmodified blocks.

Successful implementation of the approach has considerable potential to be replicated at other Great Lakes breakwaters that routinely undergo operation and maintenance.

Presque Isle Beneficial Use

Presque Isle Peninsula, on the southern shore of Lake Erie in the City of Erie, Pennsylvania, acts as a natural breakwater to form and protect Erie Harbor, Pennsylvania, and is home to Presque Isle State Park.

The demonstration concept involves placement of one to three scows of Erie Harbor sediment at three locations at the end of Presque Isle, off shore of Gull Point (placement sites pictured above) to prevent continued loss of habitat critical to the recovery of Great Lakes breeding populations of piping plover and other species. Erie Harbor dredging uses bottom dump scows that hold 1,500 cubic yards of sediment and require a minimum of 8 feet of water to open. The project will monitor, analyze and evaluate the fate and transport of both the sand and silty clay fractions

based on results of a tracer study to be performed as part of 2015 Erie Harbor dredging.

"In the past we have placed more than 200,000 cubic yards of material in an open lake placement site 3.3 miles away," said Craig Forgette, Great Lakes Regional Sediment program manager. "The demonstration project will document how well natural littoral drift sorts the sediment and place coarser grained sediments near the shore to help restore Gull Point."

Niagara Falls Storage Site

The Niagara Falls Storage Site is located in Lewiston, New York, on a 191-acre, federally owned remnant of the larger Lake Ontario Ordnance Works site, which produced trinitrotoluene (TNT) during World War II. The site was used later by the wartime Manhattan Engineer District to manage and store radiologic residues derived from the early atomic weapons programs.

The EWN concepts for this project focus on phytoremediation techniques that would address uranium contamination in groundwater. Plantings would be designed to maximize evapotranspiration from the soil fill around impacted sanitary sewer lines and penetrate the abandoned sewer lines to scavenge residual water. Plants will be evaluated for radionuclide uptake for use in other areas of the site where surface soils are impacted. The intended outcome will minimize the transport of radionuclides from source media and lessen the potential for environmental cross contamination using non-invasive plants to mitigate radiologic exposures in the environment.

"EWN gives us the opportunity to rethink traditional approaches to ongoing programs," said Tony Friona, Great Lakes liaison for ERDC. "To be successful we need to focus on opportunities rather than constraints and use the language of opportunity." ☺

Journey to a process: Restoring oil, gas well sites close to original condition

By Cheryl A. Moore

U.S. Army Corps of Engineers Omaha District

The silhouettes of oil rigs pumping through the night are a common sight across the rural North Dakota landscape. But when an oil or gas well is no longer producing and is ready to be plugged and abandoned, the well site needs to be reclaimed and restored as close as possible to its original condition. This includes identifying, segregating and removing contaminated soils from the site before and during the re-vegetation/re-contouring process.

Omaha District has developed an Oil and Gas Management Plan to address current and future reclamation requirements for non-producing oil wells on U.S. Army Corps of Engineers project lands.

In 2012 when oil and gas company Petro-Hunt approached the Garrison Project Office in Riverdale, North Dakota, asking for requirements to begin reclamation of two old well sites there were no USACE guidelines or standards for oil and gas reclamation.

“It was definitely a learning process and an experience as far as balancing Corps and operator interests,” said Hattie Payne, former natural resource specialist in the Garrison Project Office.

The Garrison Project Office used guidelines from the State of North Dakota, Industry Best Management Practices and other collaborative agencies such as the United States Forest Service, Bureau of Land Management and the Environmental Protection Agency.

Older wells did not include a reclamation plan as part of the Application for Permit to Drill, so the district relies upon North Dakota state standards.

The company submitted a reclamation plan, and they were required to clean out the drilling mud from where they drilled the well, known as the reserve pits. These well facilities were in a relatively flat area along Lake Sakakawea.

“One of the challenges was not being aware what these sites looked like pre-construction and all the activities taking place during its use,” Payne said.

One well site was drilled in 1955 and the other site in 1980, requiring an investigation to uncover the unknown about these sites. Payne pointed out that an investigation may not be needed for wells drilled more recently.

The investigation on the Petro-Hunt site revealed three live pipeline corridors running through one of the well sites, making cleanup tricky.

“The lesson learned here is you will not have perfect cleanups, but acceptable cleanups,” Payne said.

“Considerable quantity and funding was expended to clean up this location,” said Casey Buechler, lake manager in the Garrison Project Office.

The following basic items are to be taken care of when reclaiming any well pad.

- Removal of all production equipment and piping.
- Removal of all buried equipment and piping. Pipes leading off the pad



Garrison Project Office staff completed final reclamation of multiple oil well locations on the south shore of Lake Sakakawea in North Dakota. Hundreds of tons of soil had been excavated to meet USACE standards. (Photo courtesy of Army Corps of Engineers) RIGHT: Hattie Payne, natural resource specialist, tests soil for petroleum contamination, using a photoionization detector or PID gas meter on the oil well site in the Charlson Oil Field in McKenzie County, North Dakota. (Photo courtesy of Doug Hanson, Petro-Hunt)

shall be capped and abandoned in place at the edge of the location.

- Identify soil strata or layers of the soil.
- Removal of electrical power (above ground appurtenances) .
- All compacted areas remaining shall be ripped to a depth of 12 inches or to a depth based on the soil borings.
- If there is not a definite stockpile of topsoil on the site, all retrievable topsoil on location will be piled and distributed on the disturbed area.
- If there is not adequate topsoil it will need to be purchased from a certified weed-free source nearby and distributed as needed.
- Install erosion control (weed-free filters, waddles).
- The disturbed area will be prepared and seeded during the appropriate time with an approved seed mix.
- Present a time line after on-site with the USACE and the contractor.

Payne said that since these facilities were very old and the original company did not use liners for its operations area, tank battery or reserve pits, it was decided that a Subsurface Soil Assessment needed to be performed to determine if soils on the surface or subsurface were impacted. She said that oil and gas operations by nature can be messy.

A work plan was developed for a Limited Phase II Subsurface Soil Assessment and once that was performed a Reclamation Work Plan was developed based on those Phase II results. The work plan consisted of the sundry notices, location, geology, site safety plan, utility clearances, sample location maps and description of how the soils would be sent to



labs and analyzed.

The contaminated soil was transferred and disposed at approved landfills. Payne said the subsoil was not impacted, nor were loads of new subsoil. Since topsoil stockpiles were not identified in the immediate areas, 700 loads of new certified weed-free topsoil were brought in and spread over all of the locations.

Native seed mixes will be certified weed free and approved by the district prior to applications. Seed, fertilizer and mulch will be distributed by appropriate methods as dictated by the topography on the site.

“Analysis from initial soil sampling will be used to determine fertilizer application rates,” Payne said.

Now that initial work is done on the well sites and the journey to the oil and gas process is ongoing, the sites will be monitored for erosion and vegetation management for a minimum of three years.

Reclamation will be considered accomplished by the district when there is a weed-free establishment of 90 percent vegetative cover, consisting of grasses and nutritious flowering plants known as forbs.

“This is the last phase for our agency. Reclaiming the land restores many natural resource values such as wildlife habitat, recreation and native plant communities,” Buechler said. “It’s our objective to return the land to a condition similar to that which existed prior to disturbance, and the company has worked hard to accomplish that objective.” ☞

Lighting upgrade program to save \$400,000 in energy, maintenance costs

By Anthony Ricchiazzi
Tobyhanna Army Depot,
Pennsylvania

New lights promise to save more than \$400,000 in energy and maintenance costs during the next 15 years at Tobyhanna Army Depot in Pennsylvania.

Installation Planning and Maintenance Division contractors are installing LED (light emitting diode) lighting fixtures throughout the depot as part of a five-year program to increase energy efficiency while reducing maintenance costs. The depot lighting upgrade presently under contract will replace all

exterior lighting with new energy efficient LED lighting that has a 10-year, 100 percent factory warranty, according to Joseph Merli, an electrical engineer in Tobyhanna's Installations Services Directorate.

The new lights are projected to save more than \$337,000 per 40,000 square foot bay in energy, maintenance and re-lamping costs during a 15-year period. Energy savings alone will exceed \$94,000.

To date, lighting fixtures have been replaced in all parking lots, the truck gate at the intersection of Squier Street and Hap Arnold Boulevard, the main electrical substation and the fitness center, as well as in several warehouse bays. LEDs are semiconductor devices that produce high lighting output with minimal energy consumption as compared to other types of exterior lighting fixtures. Merli noted the initial investment is higher than other types of lighting, but will save money for the depot in the long run. Payback is usually between five to 10 years depending on use.

"The Building 1A modernization project now underway includes LED technology in the building lighting design," said George Rittenhouse, an engineering technician in the Installation Services Directorate. "The LEDs are typically guaranteed for 225,000 hours of maintenance-free service. Before we had to re-lamp lighting fixtures every three years, on average, in order to maintain design specified lighting levels."

"The conversion to LED lighting has numerous benefits for the depot," said Russel Dunkelberger, Environmental Safety and Occupational Health Branch chief. "Not only are they longer lasting, more durable and energy efficient than incandescent and fluorescent lighting, they are also free of toxic chemicals, require less maintenance and are extremely adaptable." ❧



Joe Decindio conducts a final inspection on an air surveillance antenna under the bright light of new LED fixtures at Tobyhanna Army Depot, Pennsylvania. (Photo by Steve Grzedzinski)

Fort Carson expo delivers 'green' knowledge

Story and photo by Scott Prater
Fort Carson, Colorado

Acquisition managers, government purchase card holders and contract specialists packed Elkhorn Conference Center at Fort Carson, Colorado, in February for its first Sustainable-Green Procurement Expo and Workshop to learn about federal sustainability requirements and compliance policies.

Hosted by the Fort Carson Installation Sustainability Resource Office (FCISRO), the event featured a guidance briefing from U.S. Army Public Health Command (USAPHC).

"We have seven long-term sustainability goals and three of those are to be Net Zero as an installation in energy, water and waste by 2020," said Mary Barber of FCISRO. "There are a lot of different executive orders and statutes that we at Fort Carson are required to follow. This expo was a great way for people who buy things to learn about those requirements."

Dave Asiello, Department of Defense Sustainability Program manager, traveled from Washington, District of Columbia, to advise event organizers and meet Fort Carson staff.

"We travel to a lot of military installations around the country to help educate folks about laws, regulations and compliance requirements," Asiello said. "But, we also want to relay the benefits of going sustainable. Many of these products work better, they're better for the mission and lessen negative health impacts."

Beth Martin, USAPHC supervisory environmental scientist, informed attendees about the types of products covered by federal compliance requirements and how to obtain more information from vendors and government agencies.

"We want people to come away from the expo with an understanding that not only are sustainable procurement practices good for the installation, they're easy to implement," she said. "Yes, there are several preference [areas] including recycled content, bio-based products and energy efficient products, in all, about 180 categories. But, a specific buyer may only be involved with four of them."

A buyer simply needs to determine his needs first. Then his sustainment product research is significantly limited.

Martin advised attendees on different sustainability statutes and regulations, such as reducing the use of petroleum-based products and substituting them with bio-based versions.

"The fact is that much of the petroleum used in the U.S. is in making products," she said. "Plastics are heavily petroleum based. So, when we buy bio-based products, we reduce our dependence on foreign oil."

Buying recycled-content products also helps create a market for those products, she explained.

It's one thing to separate paper, cans and plastic, throw them into blue bins and then have them shipped off somewhere. But, if no one buys the products created from recycled content, that paper, aluminum and plastic has nowhere to go.

"Besides the tree hugger reasons, people need to understand that sustainable procurement is the law," she said.

Following their briefing, attendees got a chance to learn about specific products from dozens of sustainable product vendors and government agency representatives.

Many of the attendees were responsible for acquiring products for the post in some way, but the expo was open to everyone and people from all walks of life, including Colorado College and Pikes Peak Community College students who strolled through the information booths and watched product demonstrations.

Despite wintry weather that hampered attendance, Barber

and Asiello were pleased with the expo's production and its turnout, especially as a first-time event.

"We're all about outreach and educating people," Asiello said. "This format is a good way to reach the many different types of procurement people on an installation." ❧



Mary Barber, Fort Carson, Colorado, installation sustainability resource officer and Arleen Kinder GSA Federal Acquisition Service customer service director, share information during the inaugural Fort Carson Sustainability Expo at the Elkhorn Conference Center Feb. 26.

Corps gets batty over endangered species

By Mark Rankin
*U.S. Army Corps of Engineers
Nashville District*

The U.S. Army Corps of Engineers' Nashville District and Engineer Research and Development Center (ERDC) hosted a bat conference Jan. 28-29 at the Nashville District Headquarters for Corps districts and other federal agencies to discuss endangered bat species.

The two-day event was mainly conducted because the U.S. Fish and Wildlife Service (USFWS) proposed Endangered Species Act protection in December for the northern long-eared bat, which is located in 39 states. Many U.S. bat populations have been rapidly declining in recent years because of a disease called white-nose syndrome (WNS), a newly discovered fungus causing the death of hibernating bats.

According to the USFWS, the disease causes wing scarring and forces bats to use up stored fat during hibernation; they eventually die.

Eric DeFosse, recreation and environment stewardship manager for the Great Lakes and Ohio River Division, said the conference was an information meeting that provided definitive insight for how agencies can work together.

The northern long-eared bat is found in the United States from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, reaching into eastern Montana and Wyoming. In some caves in the Northeast, northern long-eared bat populations have declined by up to 90 percent. White-nose syndrome or the fungus causing the disease is found in much of the northern long-eared bat's range.

"This is an important meeting that helps us plan for the future," DeFosse said. "We will take all this information we have gathered and brief the division and

headquarters and share it with districts on the issues we discussed here."

The disease is named for the white fungus evident on the muzzles and wings of affected bats, according to the USFWS. The disease has spread to 22 states and five Canadian provinces. The pathogenic fungus, which biologists believe was introduced from Europe, grows on the noses and wings of hibernating bats and appears to cause severe dehydration, disruption of crucial electrolyte levels and frequent arousal from hibernation, leading to premature depletion of fat reserves. Scientists estimate nearly 7 million bats have died, and the disease has affected seven bat species.

"One of the main reasons for this workshop is to be proactive and talk about the impact of this listing," said Eric Britzke, a research wildlife biologist from ERDC in Vicksburg, Mississippi. "We wanted to get as many folks from the U.S. Army Corps of Engineers and other agencies that would be impacted by this."

Britzke is a bat expert who has studied them for 20 years. He said his role in the workshop was to provide species ecology, natural history and give insight to the Corps on how districts can assist with the proposed Endangered Species Act protection.

"We have various types of bats on Corps property all over the state of Tennessee," said Kim Franklin, an environmental biologist with the Nashville District. "Knowing the correct procedures on how to protect these bats on our Corps properties is a major concern for us."

"Despite negative typecasts, bats are important to us for pest control and help balance the ecosystem," Franklin said, "Bats eat lots of mosquitoes and are efficient predators of insects, and worldwide they pollinate flowers and disperse the seeds of hundreds of plants."

The district's effort has united experts

to collaborate on ideas and solutions how to share information and seek measures to address WNS and bat conservation.

According to the USFWS, an endangered designation indicates a species is currently in danger of extinction throughout all or a significant portion of its range; a threatened designation means a species is likely to become endangered in the foreseeable future.

For species listed as threatened, the USFWS may issue a rule to provide protections that are deemed necessary and advisable for conservation of the species. This rule ensures private landowners and citizens abide by regulations.

Britzke said colonies of the northern long-eared bat affected by white-nose syndrome have in many cases experienced almost 90 percent mortality. Protection for the bats is the result of the proposed listing and hopefully will save the species and help districts better manage containment areas.

Fort Campbell, Tennessee, first reported the white-nose syndrome within its caves and boundaries in 2012, according to Wildlife Program Manager Gene Zirkle.

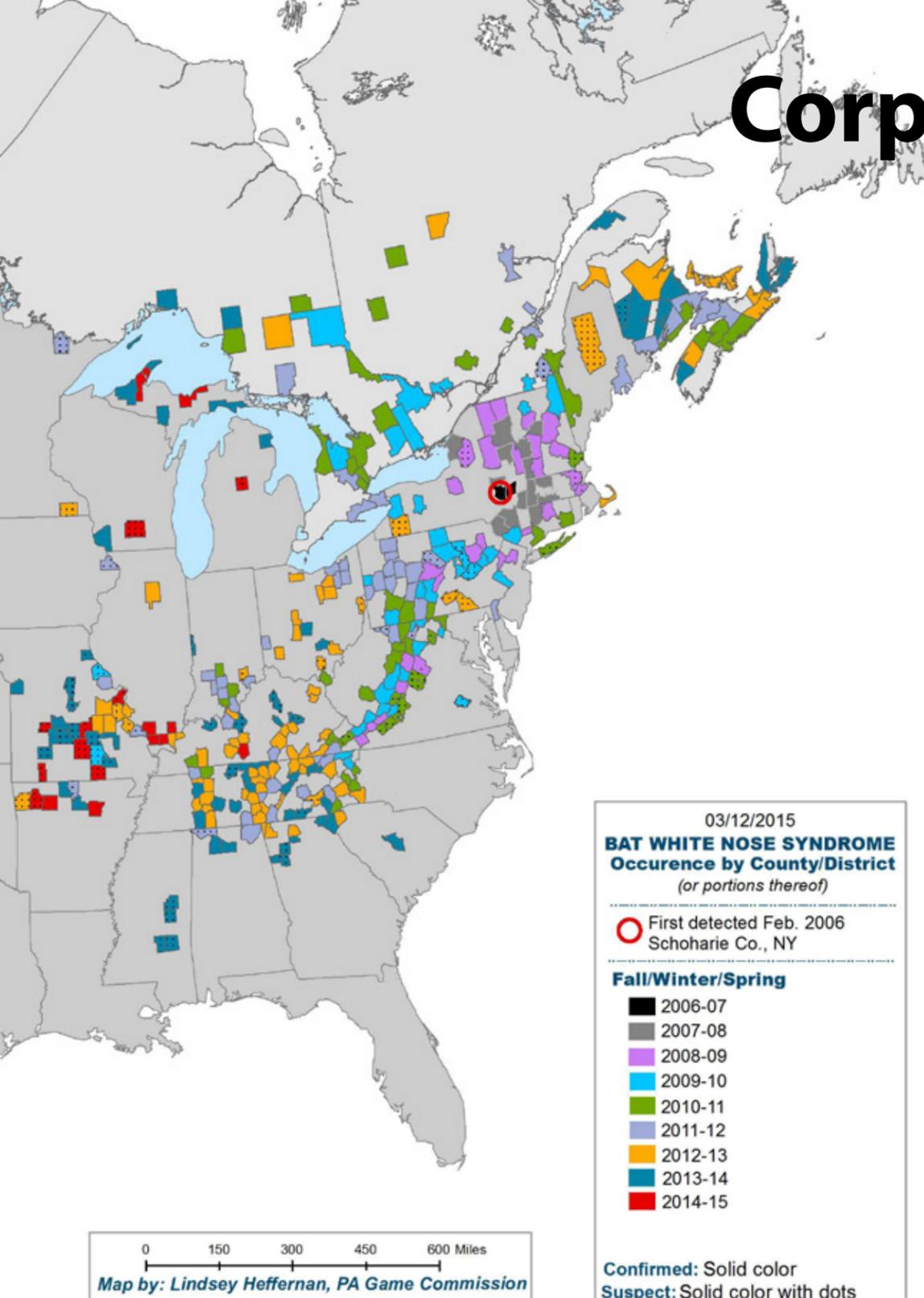
"The cave where the affected bats live is now gated, locked and closed to the general public. The only access is by wildlife specialists," he said.

The USFWS offers the following advice to help prevent the spread of the disease. Cavers should observe all cave closures and advisories and avoid caves, mines or passages containing hibernating bats to minimize disturbance to the bats.

There is no easy way to stop the spread of WNS, according to Britzke.

"We must keep learning how we can manage our resources and the most important factor is distributing this information ... out to districts that did not attend," Britzke said.

Franklin said awareness is the first step to slowing and maybe even stopping the spread of white-nose syndrome. ☪



For more information on white-nose syndrome, visit the U.S. Fish and Wildlife Service website at www.fws.gov/ or North America's Response to the Devastating Bat Disease website at www.WhiteNoseSyndrome.org.

Watertown FUDS property remediated, returned to residents

By Ann Marie R. Harvie

Project photos by Maryellen Iorio

U.S. Army Corps of Engineers New England District

The successful remediation of the General Services Administration (GSA) Watertown Formerly Used Defense Site (FUDS) marks the completion of the last remaining site associated with the Watertown Arsenal, Massachusetts, cleanup. The site was restored from a hazardous waste site to a lush, green recreation space allowing the federal government to return the property to the people of Massachusetts after 94 years. New England District was the lead agency for the cleanup and worked closely with the Massachusetts Department of Environmental Protection (DEP), Department of Conservation and Recreation (DCR) and GSA to ensure the site was suitable for its future use as park land.

A ribbon cutting ceremony to mark the occasion took place Dec. 3, 2014, at the Commander's Mansion in Watertown. New England District Commander Col. Christopher Barron joined congressional, federal, state and local partners in celebrating the land turnover.

Anna Shpigel, Special Assistant to the GSA Regional Administrator, served as master of ceremonies. Representing Congresswoman Katherine Clark during the event, Natalie Kaufman said, "The congresswoman is so pleased the project came to fruition — there was an incredible partnership to make it happen."

Barron told the audience that New England District has been involved with the project since May 1991.

"That was when the site was determined to be eligible for remedial investigation under the Formerly Used Defense Site program," he said. Barron also thanked Anne Malewicz, Massachusetts DEP, calling her "a great friend of the Corps."

He concluded his remarks by thanking the entire team of partners for the success of the project. "You made the transfer of a 13-acre hazardous waste site into usable green space possible."

Other speakers included Gary Moran, deputy commissioner for operations and environmental compliance at Massachusetts DEP, Kevin Whalen, Massachusetts DCR deputy director, and Robert Zarnetske, GSA's regional administrator.

Glenn Rotando, GSA's Regional Commissioner

for the Public Buildings Service New England Region, closed the ceremony.

"In 1920 the U.S. Army acquired this site from the state of Massachusetts with the promise to return it to the state when it was no longer needed," Rotando said. "Now, 94 years later, the property is being returned. Job well done by everyone. Enjoy the parcel."

Following the speeches, the partners gathered in the foyer for the official ribbon cutting. New England District was responsible for completing remedial activities at the site under the FUDS program.

With the exception of one building that was demolished with GSA funding, the \$3.68 million project was completely funded under FUDS.

The GSA property was part of Watertown Arsenal, where during World War II the U.S. Army constructed five structures to store various materials and equipment. As part of the Manhattan Project, the site was used to stabilize depleted uranium to allow for it to be shipped for disposal off-site.

Since 1991 a variety of investigations and removal actions have been performed by the New England District. In May 2012, the decision document was signed, paving the way for the remediation of the site.

Charter Environmental of Boston and its subcontractor, Nobis Engineering of Concord, New Hampshire, mobilized to the site in November 2012. Remedial action work on the site included demolishing all of the unoccupied and deteriorated structures, excavation and off-site disposal of 450 cubic yards of PCB contaminated soil above 50 parts per million, and construction of a 2-acre soil cover and 2-acre compensatory wetland. All work was completed in July 2014.

As part of long term monitoring to ensure the remedy performs as designed, New England District will perform inspections of the wetlands twice a year for five years and inspections of the soil cover annually.

The Commonwealth plans to use the site for passive recreation like walking trails and bird watching. ☺



Monitoring eagle populations across the nation

By Lee Roberts

U.S. Army Corps of Engineers Nashville District

Nurturing baby American Bald Eagles in a man-made crib atop a 23-foot tower seems like a tall tale, but that is exactly how biologists carried out a conservation plan in the late 1980s to restore the nation's symbol to the upper Cumberland region.

From 1987 to 1991 a total of 44 eagles were transplanted from nests in Alaska, Minnesota and Wisconsin, and then reared, tagged and released on the shoreline of Dale Hollow Lake near Irons Creek in Tennessee. The team used a technique called hacking to care for and then release the birds of prey in hopes they would someday return to the vicinity of where they first took flight to nest and reproduce.

Patty Coffey, deputy chief of the Nashville District Operations Division and the project manager of the Eagle Restoration Program nearly three decades ago, said that eagles declined in Tennessee between the 1950s and 1970s because of the use of the insecticide DDT, which caused infertility or thin egg shells that would break under the weight of adult birds. Following the ban of DDT and restoration efforts, there are now more than 200 eagle nests across the state of Tennessee, Coffey said.

A lot of different agencies and people were involved with the logistics of locating and obtaining young eagles, transplanting them, site preparation and building the hacking tower at Dale Hollow Lake, caring for eagles, and tracking them initially upon their release to ensure a smooth transition into the wild.

Today, American Bald Eagles can be seen flying overhead all year round at Dale Hollow Lake and surrounding waterways, and the district conducts annual eagle watch programs in January. Learn more at <http://go.usa.gov/3CNsV> and watch a video about its history at <http://youtu.be/iGWFtsK9Ssw>.

By Elizabeth Lockyear

U.S. Army Corps of Engineers
Albuquerque District

Twenty-one die-hard volunteers braved frigid morning temperatures Jan. 3 at Abiquiu Lake, New Mexico, to participate in its annual eagle watch event.

"The event was a tremendous success despite the cold weather," said Austin Kuhlman, Abiquiu Lake park ranger. "The eagle watch has become a great way to start the year. The event encompasses so much of what we work so hard for throughout the year. It is a chance to interact with and involve members of the community and help foster a spirit of ownership and community participation."

Katherine Eagleson, executive director of the New Mexico Wildlife Center, kicked off the event with a presentation on eagles. The volunteers then moved outside where they met Maxwell and his handler Scott Bol. A non-releasable bald eagle, Maxwell is used by the Wildlife Center to educate the public about eagles.

The official eagle count started at 10 a.m. Park rangers said eagle sightings began coming in right away and continued throughout the count. Between the two boats moving in opposite directions around the shore line and the powerful spotting scopes being used at the fixed viewing posts the radios buzzed with reports of sightings.

"With all the activity it can be difficult to maintain an accurate count and avoid double counting, but with good communication and use of a grid and sector map of the area an accurate count can be made," Kuhlman said.

The official count at the end of the event was 18 bald eagles — 12 adults and 6 immature eagles — an increase from previous years' counts: 13 in 2014; 12 in 2013 and 17 in 2012.

"This event serves as a good reminder of the importance of partnerships and what we can achieve with the help of our partners," Kuhlman said. "But perhaps most important is it reminds us of the responsibility we have to maintain and care for the environment we are entrusted with, not just for our needs but the needs of these amazing animals, as well." ☺



Scott Bol of the New Mexico Wildlife Center presents Maxwell, the center's non-releasable bald eagle, to the volunteers participating in Abiquiu Lake's 2015 Eagle Watch Jan. 3 in New Mexico. Center staff gave a short presentation about eagles before the official count began. Learn more about the bald eagle preservation program at <https://youtu.be/EpE8dBIZ200>. (Photo courtesy Abiquiu Lake Staff)

By Amanda Rominiecki

Aberdeen Proving Ground, Maryland

During the most recent count of Aberdeen Proving Ground bald eagles in early January, 177 were spotted along the installation shorelines; indicating a thriving eagle population on post.

For nearly 30 years, APG personnel have monitored, tracked and protected the lively — and growing — population of bald eagles who call the installation home.

Lynda Hartzell, a Directorate of Public Works Natural Resources Branch employee, has served as one of APG's eagle gurus for the past six years, during which time she says the eagle population has "really just exploded." While the count is slightly lower than the five-year average of 206, Hartzell said it still indicates "a robust eagle population." On a second aerial survey in late January, 10 new eagle nests were identified, in addition to the 75 nests they were already tracking.

These aerial surveys are just a fraction of the work done by Hartzell, her coworker Jessica Baylor, and many of the installation's tenants to monitor the APG's bald eagle population. Other activities include workforce education, population and nest tracking, and protection and responding to downed eagles.

As a result of a positive working relationship with the U.S. Fish and Wildlife Service and extensive historical data outlining the eagle population and the impact — or lack thereof — of APG activities on the nesting birds, APG has some flexibility in terms of managing and protecting the eagles, Hartzell said. It's that flexibility that has helped to maintain and nurture a successful population alongside APG's many missions, and that impact is being felt beyond the gate.

"What we're doing on the installation to protect the eagles is impacting birds as far north as Labrador, Canada, and as far south as Florida," Hartzell said. "We're having birds come to us from such great distances to either spend the winter or the summer. That's pretty wild to see."

Hartzell and APG Environmental Engineer David Goad continued to monitor APG's bald eagles during the egg-laying season. This month they will have an idea of how many of the 85 identified nests will produce eggs and how many of those eggs will hatch successfully.

Read more about APG's eagle program at www.army.mil/article/143736. For eagle monitoring updates, visit www.facebook.com/APGMD.

Saving America's Cultural Resources



By Jim Frisinger

U.S. Army Corps of Engineers Fort Worth District

The historic Walter Reed Army Medical Center is a ghost town now. Deer, foxes and other wildlife roam the 66-acre campus where 10,000 people once lived and worked. It was here in the nation's capital that untold thousands of Soldiers — and presidents, too — were treated for 102 years.

The sprawling facility in Washington, District of Columbia, was closed in 2011 under the 2005 Base Realignment and Closure Commission (BRAC) process. The medical facilities by then had already relocated seven miles away to the new Walter Reed — the Walter Reed National Military Medical Center in Bethesda, Maryland.

Today a skeleton crew keeps the lights on at the former Walter Reed — but it's only temporary. The campus is being repurposed with new tenants in old buildings, but Walter Reed's storied past won't be forgotten.

Joseph Murphey, a historical architect for the Regional Planning and Environmental Center, made sure of that as part of a larger team of environmental professionals.

Mobile District, which is the U.S. Army Corps of Engineers lead in BRAC compliance under the National Environmental Policy Act (NEPA), brought in Murphey to be the lead on NEPA's cultural resource requirements. Walter Reed was one of the largest facilities shuttered under BRAC 2005, along with Fort Monmouth, New Jersey, and Fort McPherson and Fort Gillam in Atlanta, Georgia.

For the first time in its history, Murphey completely inventoried and identified everything at Walter Reed and determined what was historic. He then, as part of the NEPA team, negotiated a memorandum of agreement with the DC State Historic Preservation Office and local historic preservation societies to mitigate the effect of the BRAC closure on the



Click to watch an interview with Joseph Murphey, a historical architect for the Regional Planning and Environmental Center, talk about the historical panels telling the story of the former Walter Reed Army Medical Center. For more photos of the former Walter Reed Army Medical Center, visit www.flickr.com/photos/wramc/sets.

historic resources, which fulfilled NEPA requirements.

"The mitigation primarily consisted of nominating Walter Reed to the National Register of Historic Places, photo documenting the entire facility for the National Archives and producing interpretive panels for the public," Murphey said. "The interpretive panels are to be placed on site and tell the storied history of Walter Reed as an institution."

Murphey collaborated in the development of these 14 storyboards, which will be displayed on seven free-standing panels along a walking tour of the campus. It narrates the 150-year story of the site back to its pre-med days as a Civil War battlefield.

The first panel outlines the Battle of Fort Stevens in 1864. President Lincoln came under fire from sharpshooters in trees that later became part of the medical complex. It was the only time a sitting U.S. president would come under fire during battle, Murphey said.

The walking tour panels narrate the dream of Maj. William Cline Borden, more than 100 years ago, to consolidate four different medical facilities located in south and central District of Columbia into a single site. The Army surgeon named the complex for his friend and colleague, Maj. Walter Reed, who led the team that helped eradicate yellow fever by identifying the mosquito as carrier of the disease. Reed died in 1902. (While the hospital named for Walter Reed was built in 1909, Borden's vision would not be fully realized until 1955.)

Walter Reed later become home to what was considered the first school of public health and preventive medicine in the world, and developed vaccines to prevent hepatitis A, meningococcal meningitis and adenovirus.

As part of the cultural resources mitigation, Murphey compared his new photographs with historic photos and original construction drawings. The data will aid the Local Redevelopment Authority.

"The information that we gave them formed the baseline for them to start the work on the restoration," Murphey said. "It forms a time capsule on what it looked like when the Army left Walter Reed."

For some shots, Murphey used a large-format camera, which makes 4-inch by 5-inch negatives. The camera and tripod, with a hood that covers the operator, resembles the equipment Matthew Brady's team used to photograph the Civil War. One hundred of these photos will be delivered to the Library of Congress Historic American Buildings Survey, which requires a negative processed to last at least 500 years.

Note: Fort Worth District Public Affairs Specialist Clay Church contributed to this article. ↻