Area Completion Projects

2010 Accomplishments Report

a supplement to the environmental report

Area Completion Projects

The Savannah River Site's (SRS) Area Completion Projects (ACP) is an organization that provides a comprehensive approach to cleaning up areas of the Site, sequencing decommissioning of legacy facilities with the environmental cleanup activities. ACP is responsible for the safe deactivation and decommissioning (D&D) of legacy facilities, as well as the remediation of contaminated surface water, contaminated groundwater and inactive waste sites.

The cleanup program at SRS is regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA). Cleanup is accomplished through the RCRA Permit and the SRS Federal Facility Agreement (FFA), which is a tri-party agreement between the Environmental Protection Agency (EPA), the South Carolina Department of Health and Environmental Control (SCDHEC) and the Department of Energy (DOE). The FFA ensures that SRS satisfies RCRA and CERCLA requirements to investigate and remediate waste units that may pose an unacceptable risk to human health and the environment. The FFA includes cleanup schedules for all SRS waste units and ensures facility decommissioning is performed in an environmentally responsible manner.

During 2010, ACP completed 361 FFA milestones either on or ahead of schedule. This brings the cumulative total of milestones completed to date to 2,921.

ACP successfully completed seven waste units during 2010. Cumulatively, 375 of the total 515 identified and listed waste units have now been completed.

There are 1,054 Gold Metric Facilities in the SRS D&D program. In 2010, 11 Gold Metric Facilities were deactivated and decommissioned, bringing the cumulative total to 261.

ACP participates in monthly presentations to the Citizens' Advisory Board (CAB), which informs the public of current and future SRS activities, and allows the public to address any concerns related to those activities. The CAB can also propose resolutions to the concerns addressed.

Safety Culture

Since the beginning of SRS operations in the 1950s, employee safety has remained the top priority for operations contractors and the DOE. ACP continues this legacy through constant training, effective safety communications, workforce safety Time-Outs, pre-job briefings, monthly safety meetings and more.

A cornerstone to the overall safety culture at SRS is Behavior-Based Safety (BBS). BBS is an industry-recognized safety improvement tool to reduce workplace accidents. Scientific research testifies to the effectiveness of BBS initiatives across a wide range of industries.

Studies show that approximately 90% of accidents are caused by human error. Reducing the accident rate and improving an organization's safety rate can be achieved when individuals focus on avoiding at-risk behaviors.

In BBS observations, trained observers monitor their peers' safety behavior on a regular basis. People being observed are not identified by name, only by activity.

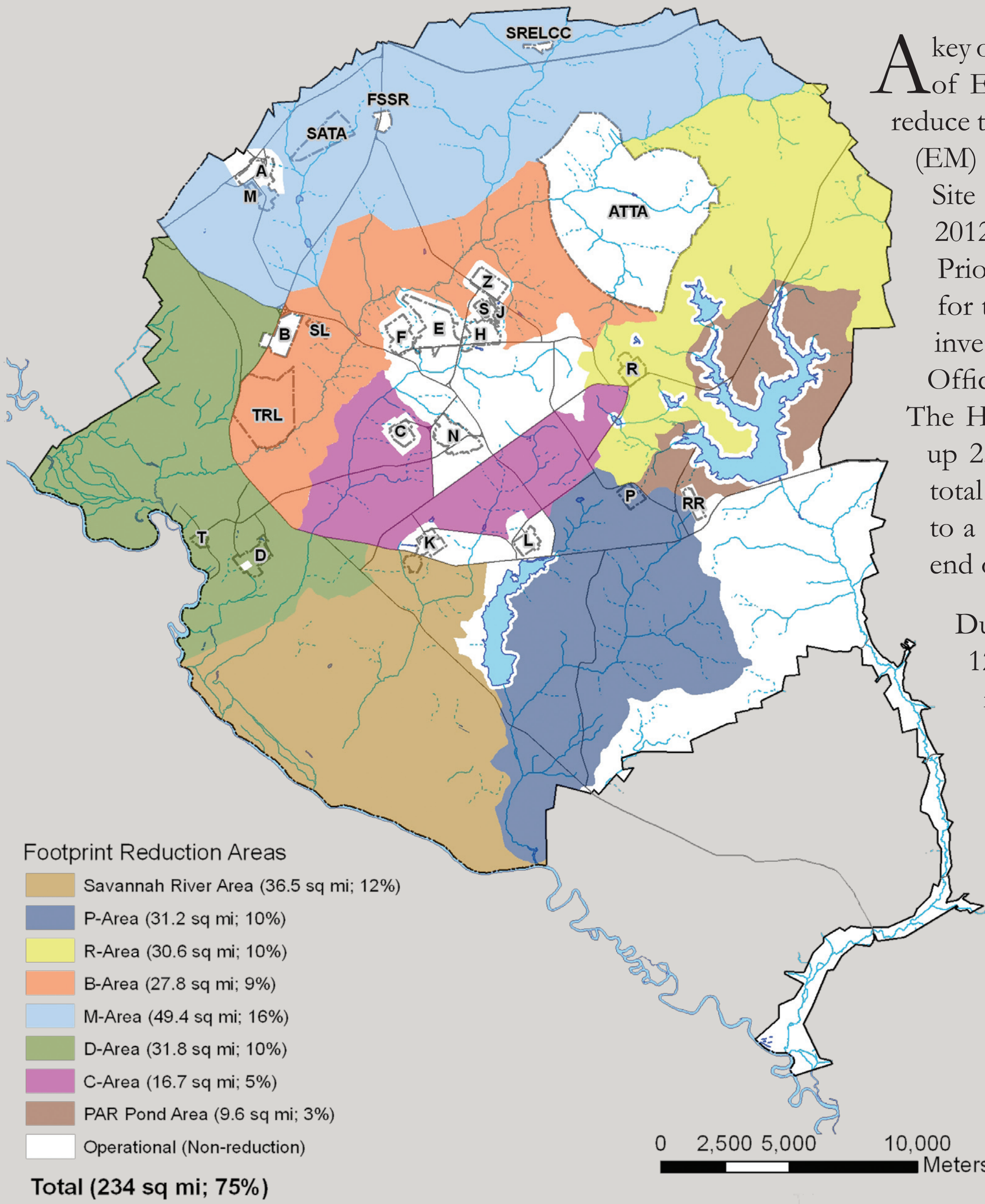
The objective of the observation and the following feedback discussion is to allow the worker to identify the hazards associated with a particular task. Workers also identify hazard mitigations and visualize injuries that could occur if hazards are not allayed.

Observers provide positive reinforcement for safe behaviors and obtain commitments from workers to change specific at-risk behaviors (if at-risk behaviors are observed).

In 2010, ACP performed 1,137 BBS Observations.

BBS AT SRS
MAKING SAFE
CHOICES

Footprint Reduction



A key objective of the U.S. Department of Energy (DOE) is to significantly reduce the Environmental Management (EM) footprint of the Savannah River Site (SRS) by the end of fiscal year 2012. DOE has established a High Priority Performance Goal (HPPG) for the American Recovery and Reinvestment Act (ARRA) with the Office of Management and Budget. The HPPG goal for ACP is to clean up 233.6 square miles of the SRS's total 310 square miles. This equates to a 75% footprint reduction by the end of FY2012.

During 2010, ACP completed 122.2 square miles of footprint reduction in the following areas: P, R, D, M, B and SR Areas; this is equal to 52% of the ARRA goal.

As a result, ACP was recognized for their achievements in a White House commendation on footprint reduction.

"Your hard work, can-do attitude, dedication, loyalty, and achievement in the High Performance Goal for footprint reduction are now recognized directly by the White House. I want to extend my personal, heartfelt appreciation to each of you for your part in this, as well as our continued success."

– Rod Rimando
ARRA Federal Project Director
Savannah River Operations Office

"I am pleased to announce that Environmental Management (EM) has received an official White House commendation for our continued success in meeting quarterly targets for footprint reduction. EM was one of only two DOE programs to be recognized in this way. I want to extend my congratulations to all involved, particularly the teams at the Hanford and Savannah River sites, whose field work and diligent oversight made this possible."

– Thomas Johnson
EM Recovery Act Deputy Director

M Area Operable Unit

Above: The hard work and dedication of a multitude of people contributed to the closure of MAOU.

In 2010, ACP safely completed the M Area Operable Unit (MAOU), which was the first SRS Area Completion under ARRA. This completion contributes 39.5 square miles to DOE-EM's overall footprint reduction initiative. A total of 288 regulatory milestones were achieved on or ahead of schedule. MAOU is located in the northwest portion of SRS.

M Area Production

Special nuclear materials were produced at SRS in the Production Areas between 1952 and 1988. The major facilities used in this capacity were buildings 313-M, used for production of depleted uranium targets; 320-M, used for the production of lithium-aluminum targets; and 321-M, used to produce fuel and targets.

D&D activities were used to remove facilities to the concrete slabs and soil remediation addressed trichloroethylene (TCE), tetrachloroethylene (PCE) and uranium as primary constituents of concern.

Test Reactor Area

The test reactor area is comprised of buildings 305-A and 777-10A, which contained multiple test reactors used to determine the appropriate properties for the fuel elements and target assemblies needed for new models to be placed into production. Building 305-A, which housed two test reactor, was removed to the concrete slab. Building 777-10A contained four experimental reactors, along with laboratories, shops and offices.

Salvage Yard

The salvage yard managed excess material and equipment. The salvage yard soil and gravel was used as construction fill under the cover at the A-Area Ash Pile (788-2A) as part of a removal action. The contaminants of concern were arsenic, polychlorinated biphenyls and polyaromatic hydrocarbons.

MAOU is the second operable unit to be addressed under the SRS area completion strategy. This strategy integrates D&D activities with soil remediation to complete cleanup in large industrial areas of SRS. D&D of more than 30 M-Area facilities began in 2003. Other completion activities in the area included two removal actions, the remediation of 19 waste units and the removal of a 1,500-acre groundwater plume source.

SRS worked with SCDHEC and the EPA to accelerate cleanup efforts by two years. SRS, EPA and SCDHEC worked closely with the public and the SRS CAB to ensure all stakeholders supported area completion efforts in M Area. This collaboration was key to achieving successful execution of the M Area project.

Celebration

The closure of M Area was cause for a celebration to be held to honor the dedication of all the individuals involved. Dr. Ines Triay, DOE's Assistant Secretary for Environmental Management, said, "M Area cleanup marks a significant step toward meeting our environmental commitments at SRS, and toward reducing the operating footprint associated with the Site's past mission."

New Missions

The completion of M Area made space available for new missions at SRS. One currently underway is a collaboration between SRNL and Homeland Security to detect radiation levels in shipping containers used to transport materials to the U.S.

Below: The removal of MAOU structures such as 777-10A opened the area for new missions at SRS.

185-3K Cooling Tower

On May 26, 2010, the 450-foot-tall 185-3K Cooling Tower was imploded. The Tower, which was situated just south of K Reactor, was built in 1992 to cool the water used by the once-active reactor in support of national defense initiatives. More than 3,860 explosive charges were placed within pre-drilled holes along the lower 250 feet of the Tower's concrete exterior. The charges were detonated in a controlled fashion involving precise sequencing and timing to ensure it fell in the selected impact zone. The 185-3K Cooling Tower was the second largest hyperbolic cooling tower structure demolished worldwide. After the Tower was brought to the ground, the resulting rubble was transported to an on-site landfill for permanent disposal. With the demolition of the Tower, 36.5 square miles were added to the overall ARRA footprint reduction initiative.

These time-lapse photos capture the implosion of the 185-3K Cooling Tower.

P Area Operable Unit

Above: P Reactor building before stack implosion.

Inset, above right: The reactor stack during implosion.

Inset, below right: The gantry crane was cut into pieces and removed.

P Reactor, the second of SRS's production reactor buildings, was operational from 1954 to 1991, when it was determined that national defense-related initiatives associated with the Cold War were no longer needed. The entire area, collectively referred to as P Area, comprises approximately 100 acres, includes 17 FFA-listed waste units, and at one time contained 42 buildings and ancillary structures. These facilities included the reactor building, maintenance buildings, the administrative building, cooling water basin, pump house and a coal-fired powerhouse. The purpose of the reactor was to produce tritium, plutonium, and other special nuclear materials for national defense.

Today, the reactor building and cooling water basin are the only remaining structures in this area. The reactor has been approved for in-situ decommissioning, a precedent-setting closure method that allows most of the reactor building to remain in place. All below-grade areas within the reactor building were filled with grout, fully entombing the reactor and thus preventing hazardous constituents from affecting the environment. In 2010, a concrete batch plant was constructed in P Area to provide the grout needed to fill the below-ground levels of both P and R Reactors.

During 2010, a 200-ton steel gantry crane that once was used for lifting the shield door to P Reactor was demolished and removed, and the 145-foot-tall, 700-ton reactor exhaust stack was safely imploded, demolished and removed.

P Area Operable Unit

During reactor operations, rail cars were used to transport materials from P Reactor to other Site facilities. This resulted in sections of railroad tracks becoming contaminated. In 2010, the remediation of the P Area Cask Car Railroad Tracks waste unit was completed by excavating the radiologically contaminated sections of track and soil and disposing of them at an off-site facility.

Between March 2010 and September 2010, ACP installed ten industrial evaporators and completed removal of 3.9 million gallons of water from the P Reactor Disassembly Basin.

Through the completion of construction and fieldwork or the submittal of regulatory documents for five FFA-listed waste units, P Area was credited with 19.5 square miles of footprint reduction in 2010.

The evaporator stacks can be seen in operation here, releasing clean steam to the atmosphere.

P Area Operable Unit

In 2010, vegetation removal, chipping, hydroseeding and soils stockpiling was completed at the 44-acre P Ash Basin and the P-007 Outfall. Removal of the vegetation was required for remediation that will consist of ash consolidation within the basin and covering the ash with clean backfill material, topsoil and sod.

Above: Vegetation removal activities before ash consolidation begins in the P-007 Outfall.

Left: The P Ash Basin was hydroseeded to reduce erosion while work was commencing in other areas of the Ash Basin.

The P Area Groundwater Characterization Project installed 21 remediation wells to extract and treat solvents that are present in the vadose zone and shallow groundwater. The project also included borings with soil sampling and cone penetrometer testing (CPT) pushes with groundwater sampling to define groundwater plume conditions.

Left: Workers characterize contamination in the groundwater in P Area using a drilling rig.

Below: Groundwater remediation wells run off of solar energy, which reduces the environmental impact of the wells.

R Area Operable Unit

The stack removal (above, right) and disassembly basin demolition (left) in R Reactor (above left) were two activities that have brought the building closer to final closure.

R Area Operable Unit (RAOU) is located in the east central area of SRS, approximately seven miles from the P Area Operable Unit. The R Reactor facility, the largest of the five SRS reactors, is situated within the RAOU.

R Reactor became operational in on December 28, 1953, making it the first fully functional production reactor at the Site. In 1964, it was shut down. The R Reactor was one of four SRS legacy reactors to be addressed by the 2009 issuance of an Early Action Record of Decision for the In-Situ Decommissioning of C, K, L and R Reactor facilities.

The in-situ decommissioning method utilized in R follows the precedent-setting in-situ closure of P Reactor. This decommissioning process allows the concrete structure of the building to remain in place, while minimizing hazards to human health and the environment.

As was the case with P Area, rail cars were used to transport materials from R Reactor to other Site facilities during operations. This resulted in sections of the railroad tracks becoming contaminated. In 2010, the remediation of the R Area Cask Car Railroad Tracks waste unit was completed by excavating the radiologically contaminated sections of track and soil, and disposing of the remnants at an off-site facility.

Through the completion of construction and/or fieldwork, or the submittal of regulatory documents, R Area was credited with 14.4 square miles of footprint reduction in 2010.

R Area Operable Unit

Above: The final step for closure of R Ash Basin was to install sod.

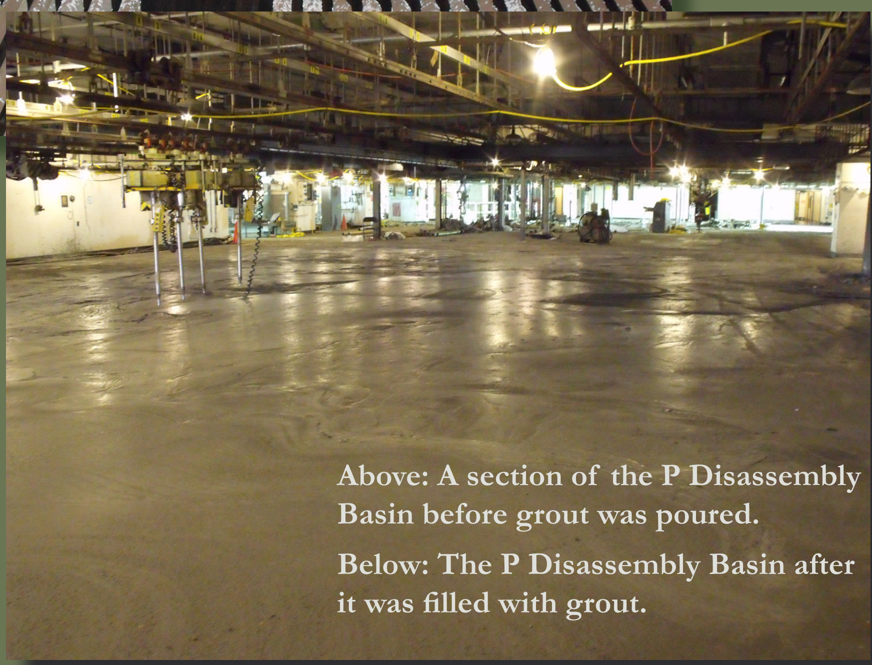
Left: ACP installs wells near the R Seepage Basin.

The R Area Groundwater Remedial Action was completed in August with the installation of eight new wells north of the R Seepage Basins to support Monitored Natural Attenuation and two new wells for monitoring a tritium plume north of the R Reactor Seepage Basin.

The first ARRA Capital Asset Project to be completed at SRS was the R Ash Basin. This was accomplished after removing vegetation, consolidating ash, placing 83,000 cubic yards of soil backfill, constructing a soil cover and laying 17 acres of sod. Deemed mechanically complete in November, this project finished under budget and eight months ahead of the baseline schedule. ARRA funding accelerated the completion of this project by five years.

In-Situ Reactor Decommissioning

The DOE is conducting in-situ decommissioning (ISD)/closure (entombment) at a number of facilities throughout the complex. This strategy presents a safer and more cost-effective closure methodology than complete removal and transport to a disposal facility.



Above: A section of the P Disassembly Basin before grout was poured.

Below: The P Disassembly Basin after it was filled with grout.

Among the largest closure actions currently underway are the closures of P and R nuclear reactors at SRS. The SRS reactor facilities are structurally robust and complete demolition was determined to be unnecessary. In these facilities, subgrade open spaces and the reactor vessels are being stabilized with specially-formulated grouts; this ensures the long-term structural integrity of the facilities and permanently immobilizes and isolates residual contamination.

The large size and structural complexity of these facilities presented a wide variety of challenges for the identification and selection of appropriate fill materials. Considerations for grout formulations had to account for flowability, long-term stability, set times, heat generation and interactions with materials within the structures, in addition to other technical requirements. ACP and the Savannah River National Laboratory (SRNL) utilized a systems engineering approach to identify functions and requirements of fill and capping materials.

Three grout mixes, having certain characteristics of concrete, grout and controlled low strength material, were developed and tested by SRNL researchers for filling the massive below-grade voids/rooms.

These grouts utilize zero-bleed, flowable structural fill technology developed at SRNL. The grouts are based on a Portland cement - fly ash binder and were specified for bulk filling, restricted placement and underwater placement. These materials were designed to meet the requirements for mass pour structural fill, have a low carbon footprint (the amount of Portland cement was limited) and utilize by-product materials (fly ash). All materials performed extremely well and exceeded all requirements and necessary functional characteristics.

All proved to be self-leveling, zero-bleed, easily pumpable over long distances and very flowable. The underwater mix proved to be flowable and self-leveling for a radius of 24 feet from the point of placement, while for the dry area bulk placement material the radius was 50 feet from the point of placement.

Successful research and development efforts to develop these new materials are enabling ACP to successfully complete these projects on an accelerated schedule. These new materials are also now available for deployment on other projects at SRS and across the DOE complex.

293-F Stack Reduction

In 2010, ACP completed clean out and biohazard waste removal of the 293-F stack. The 75-foot-high stack was then reduced by 47 feet to a final height of 28 feet. Demobilization and cleanup of the debris were completed, including roll back of the contamination area.

The 293-F Stack (left) is depicted in various stages of completion.

The 710-B Facility (above) was demolished in July of 2010.

710-B SRTC Hazardous Waste Storage Facility

The safe deactivation and decommissioning of the 710-B SRTC Hazardous Waste Storage Facility was completed in July 2010. Removal of this facility contributed seven square miles to the 2010 footprint reduction total.

D Area Process Sewer Lines

The D-Area Inactive Process Sewer Line was closed following the abandonment and grouting of 40 manholes along the inactive process sewer line network. Footprint reduction of 5.3 square miles resulted from this closure.

The D-Area Process Sewer Lines are depicted on the left, with a large cement cap labeled with a placard.

Lower Three Runs Integrated Operable Unit (LTR IOU)

In 2010, ACP completed surveying soil and sediment samples at 41 transects by using lanthanum bromide (LaBr) gamma detectors. In total, approximately 700 samples were collected from various media and locations throughout the LTR IOU. The various sampling media included sediment, soils, surface water and fish. The project was completed six months ahead of the baseline schedule.

Above left: A member of the survey crew uses an LaBr gamma detector on a sample of vegetation.

Above right: A handheld computer is used to record the results of the LaBr survey.

Early Construction and Operational Disposal Sites (ECODS) B-3 & B-5

Mechanical completion of ECODS B-3 and B-5 was achieved on December 29, 2010, when all backfilling activities, final grading, placement of topsoil and seeding were completed. These trenches were used between 1951 and 1955 as land disposal pits for waste material associated with the construction of SRS. The purpose of the removal action was to prevent human exposure to contaminants in surface soils and friable asbestos buried in subsurface soils.

Below: The ECODS B-3 & B-5 were spread with grass seed after the remediation work was completed.

Above: The ECODS B-3 & B-5 were backfilled and graded for mechanical completion.

Gunsites 012 & 218

In 2010, the Gunsite 012 project team recommended that land-use controls would be the final remedy for this unit. Asbestos floor tiles were removed from multiple slabs for excavation and disposal, as well as contaminated debris next to the pads. After cleanup, EPA and SCDHEC approved the No Further Action Record of Decision for this unit.

Gunsite 218 also underwent the removal of asbestos floor tiles that remained on multiple concrete building slabs. Asbestos soil piles were removed and contaminated debris next to the pads were excavated and disposed. ACP achieved a waste unit completion at the Gunsite 218 Rubble Pile upon approval of the No Further Action Record of Decision.

On the right, workers can be seen wearing protective coveralls and respirators while they clean up asbestos floor tiles from a concrete building pad left at Gunsite 012.

Small Arms Training Area (SATA)

The Small Arms Training Area (SATA) was built in the 1950s for small arms weapons training for security personnel. Since 1951, approximately 15 to 20 million rounds of copper-jacketed lead rounds and solid lead rounds were shot into the earthen berm behind the firing range. The proposed removal action included the removal and disposal of six contiguous areas of the firing range, including the large backstop berm. In August 2010, D&D of the patrol training building and rifle and pistol range (661-G) and five ancillary buildings was completed. Complete site restoration is anticipated during 2011.

The firing ranges for SATA are depicted in the photographs on the left and below. The berm behind received the majority of the shells fired during operations.

Hand-Held Computers

Area Completion Projects began utilizing ruggedized hand-held computers for groundwater sample collection in 2005. The hand-held computers are state-of-the-art field computers that can withstand the day-to-day activities of samplers in the field. They run the latest Windows® operating system and are equipped with GPS receivers that are integrated with mapping software for locating existing wells, and providing coordinates for new locations. Using the GPS on the hand-held computers has proved a time-saver in locating wells not visited on a regular basis.

Numerous applications based on hand-held technology are used to assist in the collection of groundwater, soil and air samples.

The application allows samplers to download the sample information and history for the wells they will be sampling. Information collected in the field is compared by the application to historical data and the sampler is alerted of potential anomalies.

For soil collection activities, the sampler is prompted to provide collection depths, soil description and other comments about the sample. Once the samples have been collected, the sampler prints the bottle label and chain of custody using a portable label printer. Upon return from the field, the data is reviewed and uploaded into the environmental database.

Above: A handheld computer is used in the field to make data updates easier and to streamline the process for new well installations.

ACP has experienced more efficient sampling and data collection using these applications. This provides for more efficient data uploading, and improves data source integrity. Another benefit is the reduction in transcription errors, which has minimized duplication of effort. ACP has experienced improved communication between samplers and the technical team. The technical team can respond faster to unexpected conditions as samplers encounter them in the field.

Hand-held computers are continuing to progress with newer and faster technology. New applications are being developed to collect data for electronic round sheets, well maintenance and inspection, and electronic program plans. The use of a broadband modem is also being pursued to send and receive data in the field.

Edible Oil Injection Studies

Operational areas in SRS's T Area released contamination into the environment and groundwater. The facilities and contamination sources in T Area have been removed, and the operational areas are now covered by a low permeability cap system. The primary groundwater contamination at T Area is chlorinated volatile organic compounds (cVOCs).

Since 1996, SRS operated a pump-and-treat system in T Area to contain the cVOC contamination in the groundwater. The pump-and-treat system operated for over a decade and resulted in a 95% reduction in the cVOC concentration within the plume. In 2006 it became apparent that the pump-and-treat system was no longer effective. In response, a plan was developed to test the ability of edible oil injection to remediate the remaining dilute cVOC plume. The treatability study for edible oil injection was approved by regulators in November 2007.

The edible oil injection plan called for the injection of soybean oil and water emulsion. The pH of the groundwater was also buffered from a pH of 5 to approximately 6 to support the growth of microbes that destroy contamination. The injection of oil was expected to facilitate the treatment of cVOC at the base of the vadose zone, and the oil emulsion was to treat the cVOCs within the groundwater plume.

Oil injection began in February 2008, with the first phase completed by May 2008. By the end of the injection period, significant reductions in cVOC concentration occurred in the plume in the injection area.

Within a few months the groundwater became oxygen-depleted (anaerobic) and most of the cVOCs were destroyed. Since the initial deployment, SRS has performed an additional injection of oil emulsion in one well to treat a somewhat persistent part of the plume.

In 2010, trichloroethylene concentrations are less than 50 parts per billion (ppb) within the plume, where the starting concentration was over 500 ppb.

SRS believes that the edible oil treatment has been very successful. The contamination in the heart of the plume appears to be almost completely destroyed. Modeling predictions indicate that the contamination in the groundwater will be below drinking water standards established by regulatory authorities in less than a decade.

The edible oil is deployed in a well in SRS's T Area by ACP employees, which has been shown to reduce the amount of cVOCs in groundwater plumes.

Thermal Detritiation

The Savannah River Site's (SRS) D Area consists of surface units and source areas that are potentially responsible for contaminating groundwater and soils. Past investigations have found relatively large, dilute and depleting plumes, with primary contamination caused by tritium. The tritium was released as a result of historical defense-related operations in the area.

SRNL began researching treatment methods to address the tritium contamination and discovered a pioneering technology developed in France. Known at SRS as Thermal Detritiation, ACP began work in 2009 in D Area with a single cell treatability study that demonstrated that the technology was a viable treatment for tritium-laden soils and concrete in the area, after which three additional cells were constructed.

Thermal detritiation utilizes a simple concrete block structure, capped with an engineered roof system, in which heaters are placed. The tritium-contaminated concrete is placed first, then covered with tritium-contaminated soil. The heating elements heat the concrete to a target temperature of 1,500°F to dehydrate and evaporate the tritiated water from the concrete matrix. The soil is heated to a minimum of 212°F to evaporate the tritiated water from the pore spaces.

After each heating cycle, confirmation samples are collected and submitted for analysis. All sample results are required to show a tritium activity below the contaminant migration level, or the heating time is extended. As of December 2010, SRS has treated approximately 400 cubic yards of a total of 1,650 cubic yards of contaminated concrete and soils at the D Area facility.

This project has demonstrated an innovative technology for treatment of tritiated concrete and soil, and was able to safely return the treated materials to the environment rather than shipping it off-site for disposal. The project is scheduled for completion in September 2011.

Above: SRS workers complete the electrical connections to the thermal detritiation unit heating elements.

Above: A thermal detritiation unit is seen in the background, with the switchgear and control room seen in the foreground.

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