Sheer Grit

ARRA Transforms Y-12

By Gail Powell

ARRA funding jump-started seven environmental cleanup shovel-ready projects at Oak Ridge's Y-12 site, which accelerated previously designated work for improving site and public safety, reducing Y-12's footprint and environmental impact, maximizing site security while reducing maintenance costs, and preparing designated areas for future beneficial use.

As part of the $755 million allocated through the American Recovery and Reinvestment Act of 2009 (ARRA) to the U.S. Department of Energy's Office of Environmental Management (EM) program for designated projects in Oak Ridge, Tenn., the portion for the Y-12 National Security Complex was distributed to Y-12's contractor, Babcock & Wilcox Technical Services Y-12 LLC (B&W Y-12). Seven Recovery Act projects at Y-12 were authorized in May 2009 to be completed in September 2011; five of the seven are complete to date. ARRA funding jump-started the seven environmental cleanup shovel-ready projects, which accelerated previously designated work for improving site and public safety, reducing Y-12's footprint and environmental impact, maximizing site security while reducing maintenance costs, and preparing designated areas for future beneficial use, such as expanded employee parking and new construction.

The seven Y-12 projects encompass a range of activities, from legacy material removal from aging facilities long slated for cleanup and demolition, to complete deactivation and decommissioning (D&D) of outdated buildings, to partial D&D of designated structures, to aboveground disposal of mounds of accumulated discarded equipment and chemicals, to remedial action activities belowground that focus on treatment of legacy accumulation of hazardous materials such as mercury.

Specifically, the legacy projects focused on two large multilayered facilities built during World War II—Beta 4 (Building 9204-4) and Alpha 5 (Building 9201-5)—which retained decades-old hazardous materials and equipment that presented challenges for treatment and removal.

Five smaller buildings were marked for complete D&D; four made up the Biology Complex, and one was part of "Engineering Row." Building 9206 Filter House was partially demolished after considerable internal cleanup of long-accumulated equipment and materials.

The Scrap Removal project at the 7-acre Old Salvage Yard (OSY), a decades-old location for discarded equipment and chemicals, cleared the OSY after characterizing, loading, and shipping the multiple types of materials. This area has now been designated for soil remediation and possible reuse.

The seventh project, involving a challenging belowground characterization and remediation, characterizes accumulated mercury in sewer lines and catch basins on the Upper East Fork Poplar Creek watershed left from decades of wartime activities and now being investigated and treated.

The great benefit of the ARRA projects not only for the Y-12 site and its employees, but especially for the Oak Ridge community and surrounding areas, has been its economic stimulus, creating jobs for many available skilled personnel, providing essential technical training as well as challenging on-the-job experience that can be used in succeeding projects.

Small businesses in the East Tennessee area have realized intended benefits of Recovery Act funding almost from the inception of the projects. Of $78.8 million in procurements, nearly one-third of the ARRA funding received at Y-12, some 70 percent has been awarded to small businesses.

As part of the process of identifying qualified personnel for the projects, an unusual and successful agreement was forged between B&W Y-12 and the Atomic Trades and Labor Council (ATLC), which allowed Y-12 to hire more than 100 temporary workers to staff the ARRA projects. Especially valuable in a national "job-needy" environment, the temporary work allowed these personnel

an unprecedented opportunity to obtain clearance to work onsite in protected areas, train for a range of environmental management tasks, and bid on internal job postings for permanent positions.

These agreements and economic stimulus attracted dedicated workers who braved long hours in extreme temperatures in winter and summer months, dressed out in protective garb, to achieve project milestones often ahead of schedule, within budget, and with zero recordable lost-workday-away safety incidents. The spirit with which these personnel approached and completed enormous tasks testifies not only to excellent project planning and execution, but also to sheer grit and determination to finish the jobs in good order.

Project Descriptions—Getting the Work Done

Through outstanding planning and innovative management, Y-12's seven ARRA projects have made remarkable progress toward their September 2011 goal. Five of the seven projects are complete as of this writing (May 2011), and the two remaining are well on their way.

Beta 4 and Alpha 5 Legacy Material Disposition Projects

Recovery Act funding has made possible cleanup of legacy waste in two 1940s-era multistoried manufacturing facilities so long standing that identification of aging stored materials and equipment was almost a daily discovery. Both the Alpha 5 and the Beta 4 facilities have a distinguished history of usefulness during the World War II years and later during the Cold War. These buildings and others at Y-12 were part of the highly secret, world-changing endeavor of uranium separation. Fostered by the Manhattan Project, activities in Alpha 5 and Beta 4 led to creation of "Little Boy" and "Fat Man," which changed the course of the international conflict.

Beta 4 is one of four "beta" buildings built during the Manhattan Project to create an atomic weapon for the United States. The beta buildings were so designated because they were used in the second and final stage of the process of separating U-235 from U-238. Multiple calutrons were housed in Beta 4 to perform the separation process until December 1946, at which time calutrons were decommissioned in favor of more efficient separation methods: the gaseous diffusion process developed at K-25, followed by the ELEX lithium isotope exchange (electrical exchange) process at Beta 4.

In the late 1950s, the ELEX process was dismantled, and new machining was installed to build large components for nuclear weapons. These included a 7500-ton hydraulic press, several furnaces, and vertical milling machines, which were located in the high-bay area where calutrons had previously resided. Beta 4 was most recently used for disassembly, testing, and storage until its current demolition designation and ARRA cleanup activity.

With an active history supporting the United States in major international conflict, the construction, testing, and final disassembly of weapons components housed in these facilities left legacy materials that challenged inventories and known characterization methods. The Beta 4 ARRA

Beta 4 (Building 9204-4) before clearing the floor of legacy waste.

Beta 4 after legacy waste was removed.

Alpha 5 workers guiding large equipment into shipping container for removal offsite.

project designated only the second floor for removal of legacy materials (nonprocess equipment, containers, tools, and miscellaneous office equipment occupying 82 000 square feet).

The ARRA Legacy Material Disposition Projects

Predictably, considering the history of the facility, equipment was encountered that was too hazardous to dismantle and too big to ship by known methods. The Beta 4 project team rose to the challenge, beginning a loading and shipping process that became useful for the other projects as well—large equipment encased in a soft-sided super-sack and loaded on a trailer bound for the disposal site. (For details, see "Big Blue" in the "Innovations" section, page 28.)

Another primary goal in clearing the facilities is evaluation of legacy material for possible recycling and reuse; this became a recurrent practice in all of the projects. Beta 4 Project Manager Tom Fitzmaurice commented, "In total the team removed and shipped 2528 cubic meters of legacy material. The second floor encompasses 82 000 square feet, so that alone is a sizable accomplishment. However, of that total, 19 percent of the material went to recycling facilities for reuse."

Beta 4 Lead Waste Engineer Dean Williams said, "The team not only safely packaged and removed the materials for disposal, but they also put forth a great effort to recycle as much material as feasible."

Diverting materials from landfills required a concentrated coordination with other Y-12 groups (such as Sustainability and Stewardship and Waste Management).

Williams explained, "Our initial challenge was determining which items were candidates for reuse. That involved identifying subject matter experts and coordinating walkdowns to inspect the materials." As items were identified for recycle or reuse, they were transferred to a staging or storage facility.

A valuable result of evaluating materials for recycling and reuse was identification of four pallets of terra cotta bricks dating to the original construction of the plant. (For details, see "Innovations" section.) In addition to salvaging the bricks, 16 B-25 cases of metal containers were retrieved and sent to a disposal facility where they were melted and reconfigured to usable items. Preliminary to transfer and after each case was opened and inspected for packaging, the cases were radiologically characterized by hand, weighed, and analyzed. Though the melting process may not remove all radiological contamination, the reconfigured metal can be used, for example, in DOE facilities as shield blocks in high-radiation areas.

Like Beta 4, Alpha 5 material disposition included safe packaging, removal and recycling, or disposal of all legacy materials from the entire building—process and nonprocess equipment, containers, tools, and miscellaneous office equipment. Important components of the scope of material disposition are responsible project management, quality assurance, compliance oversight, health and safety oversight, regulatory planning and documentation, sampling and analysis of potential contaminants, and coordination of waste shipments to approved disposal sites. ARRA funding accelerated all of these initiatives.

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Alpha 5 is a four-story processing building whose challenges lay in organizing the material and equipment removal floor by floor. The fourth floor was emptied first, followed by the second floor, followed by the third and the first floors. Highlights of the legacy removal follow:

- First Floor—Special materials inventory and radiological characterization. Almost 500 samples have been collected in preparation for shipping and loading. (For details, see "Doug Boxes" in the "Innovations" section, page 29.)
- Second floor—A total of 89 loads of legacy material were shipped to the Y-12 sanitary landfill. Personnel removed a cumulative total of 1661 cubic meters of legacy material.
- Third floor—An existing online drum crusher accelerated packing and shipping.
- Fourth floor—A total of 5430 containers of legacy material were removed.

Building 9735 before demolition began.

The mammoth structure of Alpha 5 presented almost daily challenges for the project team as they pulled together despite unseasonable heat and freezing temperatures to clear individual floors consistently ahead of schedule.

The ARRA D&D Projects

Building 9735. Building 9735 was built in the mid-1940s and initially served as a process development laboratory at Y-12 until it was transferred to Oak Ridge National Laboratory (ORNL) for use as a research services laboratory. ORNL moved out in the mid-1990s, and the building was transferred to Environmental Management. Like other aging buildings at Y-12, deterioration of Building 9735 had been accelerating, making work in and around it increasingly dangerous even for cleanup operations.

Completed in March 2010, D&D of the 15 043-ft^2 building removes an entire row of engineering buildings. The six neighboring buildings that once stood in series as Engineering Row were demolished in 2008. Complete demolition of Engineering Row reduced the Y-12 footprint by approximately 92 690 ft^2.

This project required complete D&D of the building as well as disposition of approximately 68 580 ft^3 (2964 m^3) of legacy waste material to appropriate disposal sites—Y-12 sanitary and industrial waste landfills and the Nevada National Security Site (NNSS). The contaminants of concern were asbestos; perchlorates isolated within chemical hoods; and associated exhaust ducting, lead, and minimal radiological contamination.

Biology Complex and Building 9769 D&D Project (Four Buildings). Including four legacy buildings, the Y-12 Biology Complex and Building 9769 D&D project was one of the earliest completed projects of the seven ARRA undertakings. Originally part of a larger Biology Complex, four of these buildings are now razed, having used ARRA funds. This project is part of Y-12's ongoing effort to significantly reduce its footprint, saving taxpayer dollars in maintenance and security costs, and is the largest

ARRA-funded demolition project at Y-12. The project eliminated 135 812 ft^2 of unneeded building space and the risk associated with deteriorated facilities. The buildings have been vacant since late 2003, when the last remaining research activities moved out.

Primary chemical hazards in these facilities include lead, polychlorinated biphenyls, Freon®, oils, and asbestos. The D&D project was performed in accordance with the requirements of the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) as a time-critical removal action. Buildings 9224 and 9220 were razed in June and July 2010, respectively, and Building 9769 was demolished quickly thereafter in August 2010. The last and largest of the buildings, 9211, was demolished in October 2010.

Building 9211 in the last stages of demolition.

Building 9211 D&D almost complete, with excavator removing rubble from building site.

Building 9206 containment tent for airborne contamination protection.

Building 9206 Filter House—Partial D&D. The Building 9206 Filter House Removal project differs from other Y-12 ARRA D&D projects in that only a section of the building is to be demolished, rather than the complete structure. This project will deactivate the recovery furnace exhaust system.

Built in 1964, Building 9206 originally housed uranium processing and recovery systems. In the mid-1980s, Y-12 replaced the facility's aging recovery furnace and focused on recovering enriched uranium from combustible items. In 1993, Y-12 began decommissioning the building; the following year, all uranium operations ended.

This ARRA project includes deactivating the recovery furnace system equipment and removing the residual in-process and holdup material. The project also includes demolition and disposal of the systems ash removal system, secondary chamber, heat exchanger, bag filter house, and associated support equipment and structures. Approximately 114 m^3 of contaminated waste were removed in this project.

After removal of the recovery furnace system, the recovered in-process and holdup (radiologically contaminated) material was transferred to an onsite storage facility for later disposal. Remaining waste generated from system demolition was characterized and disposed of at an approved offsite facility. By deactivating and demolishing the recovery furnace system, Y-12 reduced potential inadvertent releases from out-of-service equipment. Deactivation also eliminated the expense of daily monitoring and required inspections of the out-of-service systems.

Like other ARRA projects, Building 9206 confronted unusual challenges, one of which was containment of airborne contamination, which required construction of a tent within a tent. Located in the "Rubb tent," the large external containment structure, a second FiberFrax® containment tent surrounded the area of airborne contamination, thus successfully protecting workers from airborne contamination during removal and handling of legacy material confronted after the area had been accessed.

Old Salvage Yard Scrap Removal Project. The Y-12 OSY is located at the west end of the Y-12 site, within and outside of the high-security boundary. Established in the early 1970s, the 7-acre site was used for storing scrap metal and liquid hazardous wastes from Y-12 operations until 1999. ARRA funding accelerated removal and dispositioning of all legacy materials at OSY.

The OSY cleanup project removed approximately 23 700 m^3 of potentially radioactively contaminated scrap metal stored in large piles, or mounds, and more than 1100 containers (B-24 boxes and B-25 containers) of radioactive scrap metal. The OSY received scrap into open mounds until 1995, when new procedures required that all scrap metal be placed inside containers. Primary contaminants of concern were uranium and thorium. Forklifts, an abandoned crane, and other equipment were removed, calling into practice the soft-sided packaging used first at Beta 4 with the "Big Blue" mill. Waste meeting acceptance criteria was disposed of at the Environmental Management Waste Management Facility (EMWMF), which saved transportation costs. Large radiologically contaminated

Old Salvage Yard East, showing accumulated legacy waste, November 2009 (left) and after waste removal, January 2011 (right).

Old Salvage Yard West before mounds of waste were removed, December 2009 (left) and after the waste was shipped offsite, February 2011 (right).

items, such as the abandoned crane, were shipped across country to the NNSS.

Like the previously discussed projects, OSY confronted and solved the particular challenges of characterizing the legacy mounds before clearing of the East and West yards could proceed. A most useful approach was termed "peeling the onion," a highly descriptive term reflecting the mystery of peeling the mounds layer by layer to discover what lay beneath. As a result, extensive chemical sampling was required before dump truck loads could be characterized and released offsite.

Waste characterization then assumed a primary role in clearing the OSY, as each destination, whether EMWMF, NNSS, or an interim facility, required specific and exacting waste acceptance criteria (WAC) be met before loads were accepted. This characterization led the way to the follow-on work in soils characterization to determine what effect the legacy material storage left in the ground under the piles/mounds. Consequently, as areas of the OSY were cleared (an activity complete in February 2011), soil characterization was initiated and additional ARRA funding awarded, which enabled the current focus of OSY activities to be completed by September 2011.

When visiting the site in mid-February 2011, Administrator of the National Nuclear Security Administration Tom D'Agostino exclaimed, "It's unbelievable! There used to be giant scrap heaps—big pieces of stuff that had been accumulating there for 30 or 40 years. That is gone now. It's clean. It's down to the ground. It's unbelievable." OSY's landscape is now remarkably transformed, cleaned and readied for new uses.

West End Mercury Area (WEMA) Storm Sewer Remediation—in Progress. After considerable effort identifying various subcontractors for the parcels of project work, the WEMA project began preliminary analysis for mercury reclamation from storm sewers using fiber-optic analytic techniques. The Safety and Ecology Corp. (SEC), subcontractor for storm sewer remediation, is performing cleaning, lining, video inspection, dewatering, and waste staging for designated areas. In addition, Miller Pipeline, a subtier contractor to SEC, has mobilized to assist with initial research. All generated waste will be sent to the mercury reclamation system for processing.

WEMA staff reviewing plan for sewer lines.

Y-12 ARRA Innovations

The size and complexity of the Y-12 Recovery Act projects invited innovation as the projects progressed. Imaginative solutions to project challenges not only accelerated their completion, maximized worker safety, and minimized project costs, but also established new practices to be adapted to future projects. Often unusually large pieces of equipment, intact leftover materials, and shipping and loading considerations were necessarily addressed in new ways. Here we describe only a sample of the innovations that the Y-12 ARRA projects entailed—"Big Blue" mill and recycled terra cotta bricks from Beta 4 and the "Doug boxes" for clearing Alpha 5.

"Big Blue"

The huge blue mill immediately nicknamed "Big Blue" encountered in the high-bay area of Beta 4 had to be safely removed from the facility and prepared for cross-country shipping to NNSS. Because of its size and weight (25 620 pounds, or five times the weight of a midsized car), Big Blue required and received special treatment in its transit from Beta 4 to its disposal destination.

Unlike other unusually large Y-12 legacy machines, Big Blue's configuration far exceeded the dimensions of a standard intermodal shipping container. Consequently, a customized soft-sided container (a super-sack, resembling a large mailing envelope) accommodated the mill simply and safely. Personnel removed the lead counterweights and the transmission for the drive train to accomplish the

Left: Blue mill (Big Blue) being lowered from Beta 4 high-bay area.
Below: Big Blue mill ready to ship, wrapped in super-sack and loaded on trailer.

disposal process, attesting to thorough advance planning by Facilities, Infrastructure, and Services personnel, part of the Beta 4 project team. With that preparation, Big Blue began its transit.

A smooth transfer of the blue mill was accomplished from the high-bay area through a conveyance that accessed the loading dock two floors below, thus avoiding use of a critical lift, an option entailing added equipment, time, expense, and paperwork. Encased in its super-sack, on May 25, 2010, Big Blue was lowered directly onto the trailer, where it was mounted and sent to NNSS.

Beta 4 Terra Cotta Bricks Recycle

During ARRA cleanup of Beta 4, workers discovered four pallets of terra cotta bricks originally destined for disposal at NNSS. Aware that reusing or recycling the bricks was preferable to burial at NNSS, the Beta 4 project team partnered with Y-12 Environmental Compliance to preserve the bricks in accordance with National Historic Preservation Act (NHPA) guidelines and U.S. Department of the Interior standards on rehabilitating historic facilities.

Jennifer Dixon, Y-12 NHPA coordinator, explained, "Preserving the terra cotta blocks would save future projects, which involve historic facilities, time, and money by replacement with in-kind material. Absence of the blocks would adversely affect the physical feature of the property and would require additional consultation with the State Historic Preservation Office."

Dixon and David Mabry, Beta 4 Environmental Compliance lead, preserved history and protected the environment by saving the bricks. Dixon commented, "Many of Y-12's Alpha, Beta, and support facilities built in the 1940s were constructed of these bricks. The ones the ARRA Beta 4 team found were still on their original pallets."

Saving the bricks was worthwhile for many reasons. Mabry commented, "This was a win-win situation in that we were able to salvage useful materials for future use, conserve landfill space and associated disposal costs, and recognize the Beta 4 project team for enabling the NHPA and Y-12 pollution prevention sustainability initiatives."

Beta 4 Project Manager Tom Fitzmaurice added, "They helped to ensure historic preservation is considered while moving forward with the ARRA projects as a team effort."

Alpha 5 "Doug Boxes"

In fall 2010, Fitzmaurice authorized the Alpha 5 project team to begin using tailor-made plywood boxes to supplement the B-24 and B-25 containers currently in use. Though the idea had been suggested earlier in the project in detail submitted by Doug Lawson (hence the nickname "Doug boxes") as a possible productivity improvement, the beneficial effect of the boxes had not yet been proven on the floor.

By using the boxes, project metrics rose, as waste could be loaded faster using fewer people. Despite a short-lived plywood shortage, the boxes have clearly been an effective solution to loading and shipping anomalous and non-

Loaded and inspected plywood box being lowered into super-sack for shipment offsite.

Doug box in super-sack prepared for shipment to disposal site.

conforming legacy waste. Quite simply, the Doug boxes are proportioned to meet disposal facility requirements. For example, EMWMF restricts material height to be placed in a disposal cell, so the Doug boxes, handily available in four different dimensions, are built to stated height requirements. Lawson explains, "This mistake-proofing concept ensures that material does not exceed stringent WAC requirements."

Lawson designed four plywood boxes in sizes corresponding to the stated WAC. He explains, "For compactable material, the boxes are built to collapse when rolled over by compaction equipment used in the disposal cell. Boxes placed in B-24 containers are built to the internal dimensions of the container and allow for stacking so that efficient use of B-24 volume is realized."

Alpha 5 project team members built the boxes using 0.75-inch plywood surrounded by a 0.75-inch steel band for additional support. Lined with 6-mil plastic and moved to active legacy material removal areas, the boxes are filled in the area in a disposal path much like an automated production line. After loading, the box undergoes a quality inspection and package certifier approval to verify that its contents comply with the intended disposal pathway. The box is then sealed in a plastic liner, and waste management personnel label the liner to identify the disposal path, indicating that the container is ready to load. Using a forklift, the boxes are then placed in a nonradiological area and put into an open super-sack. A forklift on the "clean" side loads the super-sack for transport to the disposal facility—an operation especially efficient and safe for moving contaminated waste.

Says Lawson, "We don't have to handle items of waste multiple times anymore."

Before deploying the boxes, personnel hand-carried material from all areas in the building to segregation/staging areas. They then moved material from the segregation areas and loaded it across the line (by hand) while the quality and package certifier verified compliance with the intended WAC. This inspection took place as each piece was loaded, requiring full-time support from inspection personnel.

Safety—A Primary Focus

In 2009, before much of the onsite work began, the formation of safety teams successfully initiated Y-12's outstanding safety record of more than 1.6 million hours of zero lost-workday-away incidents on ARRA projects. In November 2009, B&W Y-12's president and general manager, Darrel Kohlhorst, met with representatives of the environment, safety, and health (ES&H) organization and the ARRA program to stress the common goal of enforcing safety within the ARRA work. "I expect you to have an injury-free career," Kohlhorst said, and stressed the use of safety requirements such as integrated safety management and personal protective equipment (PPE) to make the expectation a reality. He also stressed that workers must watch out for their teammates as well as themselves to monitor daily activities, especially considering the enormity of the planned ARRA projects.

Bob Warther, Y-12 vice president of Environmental Management, explained how ARRA work differs from other work, including administrative and engineering controls and work conditions. He stressed one factor as a constant: "The only way to achieve production," he said, "is

through safety." He reminded employees to increase their awareness of the safety pause—"Do not be afraid of the pause."

Personalizing these messages, employees shared their individual insights on safety on the job. One comment from ironworker apprentice Brandy Ward compared her coworkers to family. "Communication and trust are really important; the guys I work with have become my 'work family,'" she said. "Y-12 is known for being a safe place. Workers should focus on completing the job safely so we can go home and enjoy our families outside the gates."

Lending structure to workers' mutual concern are the ES&H employee teams formulated as constant reminders of safe conduct. Sam Easterling of ES&H commented on Y-12's employee teams: "We have about 150 teams. About seven of these teams are devoted to ARRA work. Employee teams are an opportunity to put safety at work for yourself and coworkers on the front line."

The concept of teamwork was instilled early and has yielded outstanding results for the ARRA projects, especially in light of the unusual conditions the projects have presented—from safe handling of huge legacy equipment (e.g., Big Blue) to safely clearing contaminated areas (e.g., the FiberFrax containment tent within a tent and the surrounding unexpected airborne contamination at Building 9206) to carefully reviewing the day's work and lessons learned each morning in plan-of-the-day meetings.

Stressing safety from the beginning of the ARRA projects with all personnel, subcontractors, and temporary workers throughout hot summer months and cold winter days that sometimes required extra PPE, special measures for heat stress, and extraordinary determination, has ensured worker safety and won more than 1.6 million safe hours for ARRA Y-12.

Legacy of Hope

The efforts of Y-12 to clean up waste remaining from the Manhattan Project and its Cold War missions provided work for many Americans affected by the recent economic downturn. Recovery Act funding for the seven complex environmental management projects required a diversely skilled and dedicated labor force. The experiences of four Y-12 employees in various venues personalize and clarify this message.

Through a unique agreement with the ATLC, which facilitated hiring of temporary workers for limited-duration projects, Y-12 was able to meet project requirements for skilled craft workers and provide jobs for more than 125 individuals. For instance, electrician Steven Poole was hired to dismantle old equipment in the Alpha 5 and Beta 4 buildings after being unemployed for six months after a layoff. "Since this position was temporary, I thought I'd work here until I heard from my previous employer," said Poole. When he later saw an opening at Y-12 for a permanent electrician, he applied and now holds a position in computer services, installing and repairing equipment.

The Y-12 project also acquired the help of B&W Clinch River employees who were affected by the downsizing of USEC Inc.'s manufacturing plant. Through requests for outside services, Y-12 has employed Clinch River employees to support Recovery Act projects in various capacities, such as project controls, radiological control, maintenance and environment, safety, and health. Sara Templin's experience in project controls made her an excellent fit for a Recovery Act job. "My primary responsibility is waste and reporting monthly for each of the seven ARRA projects," said Templin, whose duties continue to expand since she accepted a permanent position at Y-12.

The Y-12 apprenticeship program, restarted in 2008, has proven invaluable for ARRA projects. Jonathan Bowling, a second -year apprentice in the air-conditioning and refrigeration (A/C&R) program, began supporting the projects in summer 2010, already familiar with Y-12. "I started in 2001 working in the Y-12 garage," said Bowling, "and then I applied for the apprenticeship program because it was such a good opportunity. I'd always wanted to learn A/C&R." The ARRA projects have allowed Bowling to broaden those skills with the extensive training required for working in a hazardous materials environment.

In project areas in which specific technical expertise is required, Y-12 has subcontracted with local companies to meet those needs. Joe Birchfield, a senior compliance specialist with Link Technologies, serves as site liaison for the CERCLA concerns central to ARRA waste management since the projects' inception. Having worked for the DOE EM in Oak Ridge since 1993, Birchfield commented, "I have never been involved with such a challenging, historically significant cleanup effort. This truly is a massive team effort!" Birchfield's enthusiastic support of the Recovery Act projects typifies their positive effect on local community and personnel.

As September 2011 approaches with the end of many of the ARRA projects at many sites in the Nuclear Security Enterprise (NSE), the DOE will mark a historic era of safe cleanup and environmental management that will be an example for project approaches in years to come. Transformation has now been strongly initiated in the NSE not only in demolishing aging and contaminated buildings, but also in restoring land for productive reuse. And transforming the sites has transformed the personnel who contributed to these invaluable projects. ■

Gail Powell is a senior writer and editor in the Publications Communications section at the Y-12 National Security Complex. For additional information, she can be reached at powellge@y12.doe.gov.