

## **Y-12 National Security Complex's Sustainable Recovery and Transformation – 12420**

Jan Jackson\*, Jeannette Widman\*\*

\*Babcock & Wilcox Technical Services, Y-12 National Security Complex

\*\*Strata-G

### **ABSTRACT**

American Recovery and Reinvestment Act (ARRA) funds were used at the Y-12 National Security Complex (Y-12) to remove legacy materials from large contaminated excess facilities in order to prepare the facilities for demolition, demolish five excess buildings, and clean up sources of environmental contamination. The legacy materials and buildings presented many challenges and the potential hazards included depleted uranium and other radiological contaminants, lead, polychlorinated biphenyls, Freon, mold, mildew, asbestos, beryllium and mercury. Y-12 project teams have integrated sustainable waste management practices into each of the seven ARRA projects. The ARRA clean up efforts have resulted in the reduction of potential environmental, health, and safety risks posed by the excess facilities and sources of environmental contamination. Y-12's ARRA project teams focused on completing the activities in a sustainable, timely and safe manner. The site utilized a systematic material disposition evaluation process to ensure that materials were not automatically dispositioned as waste. ARRA projects have recycled or reused over 1.3 million pounds of materials while preventing over 3 million vehicle miles traveled for waste disposal. Y-12 ARRA projects have worked over 2 million safe work hours without a lost time injury. The site has already begun to beneficially reuse land cleared by ARRA project activities to support sustainable transformation efforts.

### **INTRODUCTION**

The American Recovery and Reinvestment Act (ARRA) funded seven major cleanup projects at the Y-12 National Security Complex (Y-12) located in Oak Ridge, Tennessee. ARRA funds were used to remove legacy materials from large contaminated excess facilities in order to prepare the facilities for demolition, demolish five excess buildings, and clean up sources of environmental contamination. ARRA work at Y-12 has supported 2,058 full-time equivalent positions through September 2011. The ARRA funds at the site were a part of \$755 million received by the U.S. Department of Energy's (DOE) Oak Ridge Office Environmental Management Program for projects in Oak Ridge.

Y-12's ARRA project teams have focused on completing activities in a sustainable, timely, and safe manner. Required project activities such as characterization, dismantlement, waste handling, surveys and transportation were complicated by the contaminants of concern which included depleted uranium and other radiological contaminants, lead, polychlorinated biphenyls, Freon, mold, mildew, asbestos, beryllium and mercury. The complexity increased with a compressed time frame for completion of all projects. Accelerating projects of this magnitude required innovative thinking, cross-functional and cross-organizational collaboration.

### **METHOD**

#### **Pollution prevention**

The site utilized existing programs, practices, and staff expertise to plan and initiate work activities on the shovel-ready ARRA projects. Pollution prevention and safety are ingrained in the site culture. At Y-12, unneeded materials are not automatically assumed to be wastes requiring disposal.

The lessons learned by Y-12's successful Unneeded Materials and Chemicals (UMC) Project were applied to the ARRA efforts as teams focused on exploring and implementing waste minimization practices for legacy materials and facilities. Project teams coordinated area walk downs with subject matter experts to evaluate items to be dispositioned. The first step in the systematic disposition evaluation process was to determine if the items could be used at Y-12. Items that could not be used at the site were evaluated for use at other DOE facilities or government agencies. Items were then evaluated for potential sale, recycle, or as a last resort disposal as waste.

ARRA projects utilized the existing Y-12 Recycling Program to recycle materials including items such as scrap metal and universal wastes. Universal wastes were segregated and decontaminated as needed to facilitate recycling and prevent the generation of mixed low-level waste. Scrap metal was shipped for recycling within the DOE complex. Circuit boards were shipped for metals recovery. Items were transferred for reuse within the Y-12 Complex and to other off-site organizations.

### **Waste packaging and transportation**

The Y-12 ARRA projects generated a large volume of waste. More than 77,500 cubic meters of waste have been shipped for disposal from the ARRA projects. The project teams worked to ensure that the waste was shipped for disposal safely, securely and efficiently in order to minimize the potential environmental impacts of waste transportation and disposition.

The waste containers needed to be as full as possible without exceeding weight limits in order to achieve maximum packaging and transportation efficiency. The complete utilization of the volume of shipping containers presented many challenges including void spaces created by the shape of the waste materials or partially filled containers that approached the maximum weight limits. Combining waste from different projects was one solution that was implemented to ensure waste containers were as full as possible. Containers holding heavy, bulky items were filled with lighter weight materials from other projects.

A team member on the Alpha 5 ARRA legacy material removal project developed an innovative method to increase the project waste handling and packaging efficiency. Custom made plywood boxes were constructed to meet disposal facility requirements for size requirements and compactability as applicable. The boxes are called "Doug Boxes" after the team member who developed the idea. The boxes were built using 0.75 inch plywood reinforced with a 0.75 inch steel band. The boxes were lined with 6-Mil plastic and taken to the radiological work areas. Waste was loaded into the boxes inside the radiological work areas according to disposal path. When the loading was complete the boxes went through a quality inspection as well as verification by a waste package certifier to confirm the box content matched the disposal facility waste acceptance criteria. The box was then sealed and marked to indicate its disposal path and readiness for loading. The filled Doug boxes were then moved via forklift into a non-radiological area and placed directly into an open super sack for transport to the disposal facility or placement into a sea land or B-25 container. This efficient method reduced the number of times the waste was handled as well as the safety concerns related to handling contaminated wastes.

Doug Boxes utilized for compactable waste were built to collapse when rolled over by compaction equipment at the disposal facility. Doug Boxes were also built to stack and fit inside of sea land containers. This allowed the project teams to make the most efficient use of the sea land containers and eliminate void spaces. The number of sea lands required for the Alpha 5

project waste was reduced by 20 through the use of the custom Doug Boxes. This also reduced the number of required truckload shipments to the disposal facilities for the project sea land containers as well as the volume of space consumed at disposal facilities by Y-12 ARRA wastes.

Project teams have also worked to ensure that materials are transported for disposition as efficiently as possible. Combining project shipments, utilizing enhanced waste characterization methods, and sorting and segregating legacy waste containers reduced the number of truckloads shipped for disposal to facilities such as the Nevada National Security Site.

### **Safety**

With new people and new teams working in hazardous environments, safety and security were of the utmost concern. Project teams faced challenging work environments with a wide variety of physical, chemical, and radiological hazards. Project teams utilized the existing site Integrated Safety Management System. Management clearly defined the safety expectations for project activities.

ARRA safety teams were formed to increase employee involvement. Employees understood their responsibility to suspend work when conditions changed or potential safety concerns were identified. First aid reporting was encouraged for even the most minor incidents as these incidents served as leading indicators of situations that needed to be addressed to avoid more serious events.

## **RESULTS**

### **Reduce**

The Y-12 ARRA projects have reduced the potential environmental, health, and safety risks posed by the excess facilities and legacy sources of environmental contamination. The five excess buildings demolished reduced the site footprint by over 150,000 square feet and cleared the areas for future beneficial use. Over 23,000 cubic meters of potentially radioactively contaminated scrap metal and debris were removed from the Old Salvage Yard, a 7 acre yard, as a part of the ARRA efforts.

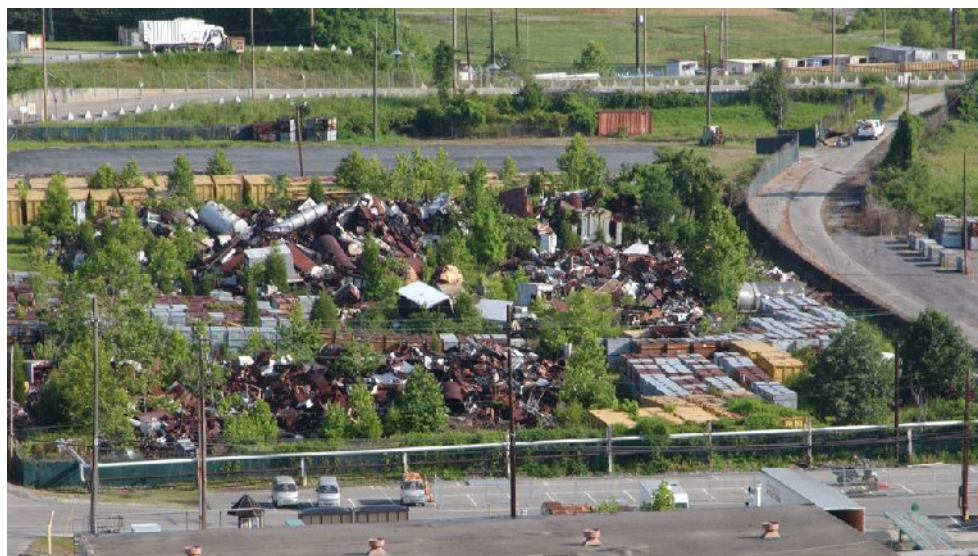


Fig. 1 East side of Old Salvage Yard prior to ARRA cleanup activities.



Fig. 2 East side of Old Salvage Yard after ARRA cleanup activities.

The sustainable waste management and transportation practices implemented by the project teams prevented over 3 million vehicle miles traveled for waste disposal, thus reducing the amount of greenhouse gas emissions generated from ARRA waste shipments. These efforts also reduced the amount of space utilized at disposal sites such as the Nevada National Security Site for the ARRA wastes.

### **Reuse**

Y-12 has shown that one project's trash can be transformed into another organization's treasure. The site was able to transfer excess materials from the ARRA projects to other organizations for reuse. For example, titanium sponge, a porous metal that converts to a usable metal, was transferred to the U.S. Army for use in the development of lightweight body armor. A radiation package monitor was transferred to the Oak Ridge National Laboratory for reuse. Equipment was also sold to a commercial vendor for reuse.

ARRA projects reused pallets generated from other on-site activities that would have been recycled. Shipping containers were reused whenever it was feasible. Reusing the pallets and shipping containers reduced the amount of new materials purchased to support the ARRA activities.

The reuse of materials identified from ARRA activities has been a benefit to Y-12, other organizations within the federal enterprise, and commercial organizations. The reuse activities have increased the longevity of landfill capacity and conserved natural resources.

### **Recycle**

Y-12's ARRA project teams successfully leveraged the resources of the site recycling program. Over 1 million pounds of materials were recycled by ARRA projects. For example, over 71,000 pounds of cadmium plated metal and over 79,000 pounds of lead that would have been disposed of as low level mixed waste were sent for recycling within the DOE complex. Over 6,000 pounds of universal waste batteries, lamps, and mercury containing devices were segregated and recycled.

### **Preserve**

Y-12 was originally constructed during World War II as a part of the Manhattan Project. Project personnel have taken steps to preserve historical items discovered during the removal of legacy material. While cleaning out one of the buildings, 4 pallets of 1940's era terra cotta blocks were discovered. Terra cotta blocks were used in the construction of many of the historic buildings at the site. The project team worked with Environmental Compliance personnel to preserve the blocks for future use on Y-12's historic facilities. The preservation of the terra cotta blocks is in accordance with the National Historic Preservation Act and the Secretary of the Interior standards on rehabilitating historic facilities. The preservation of the blocks will save future projects time and money by replacing with "in-kind" material which is consistent with Secretary of Interior standards.

Historic items from the cold war era were discovered during the removal of legacy materials from a building. These items have been preserved and will be displayed in the history exhibit at Y-12's New Hope Center. Historical items on display at the New Hope Center play a key role in educating visitors and employees about the site's past. Y-12's preservation efforts illustrate the site's commitment to honor the past even as the site transforms for the future.

### **Transform**

Y-12 has already begun to innovatively reuse areas cleared by ARRA activities as a part of the site transformation activities. The site's dynamics have changed over time as the footprint continues to shrink. The employee population has been shifted and consolidated thus creating a demand for parking in different areas of the site. The East End Parking Lot project created 11 separate parking lots on more than 12 acres in order to address the need for additional parking spaces for site employees.

The site employed sustainable design practices to reduce the environmental impact of the new parking lots. The parking lots were constructed on abandoned slabs of demolished buildings rather than using undeveloped land. One of the slabs was cleared during an ARRA building demolition project. The slabs were utilized as base for asphalt paving for the parking lots. Each slab presented a different set of challenges. The project team innovatively designed each parking lot to ensure the slabs were utilized safely, while maximizing the space, and leaving the soil undisturbed. By utilizing the slabs, Y-12 avoided disturbing approximately twelve acres of land for the 11 parking lots.

The proper management and integration of pollution prevention techniques reduced the potential environmental impacts of excavation and minimized the increase of impervious surfaces at the site. The design of the parking lot on the existing slab cleared by ARRA prevented the excavation and disposal of approximately 900 cubic yards of soil. It also avoided the purchase and installation of approximately 600 cubic yards of aggregate base.



Fig. 3 Building 9735 prior to demolition by ARRA project team.



Fig. 4 Parking constructed on the slab of demolished Building 9735.

### **Work Safely**

The continuous focus on completing all ARRA project activities safely resulted in over 2 million man hours worked without a lost time incident. This achievement clearly illustrates the level of commitment by all project team members to complete these complex projects safely. Y-12 received a Certificate of Merit from the National Safety Council in recognition of completing one year without a lost time accident.

### **DISCUSSION**

The Y-12 ARRA project activities have demonstrated that large complex projects can be completed sustainably and safely while maintaining an aggressive schedule. Through careful planning and execution, ARRA projects at the site have sustainably reduced the potential environmental, health, and safety risks posed to site employees and the community by the excess facilities and sources of environmental contamination.

Y-12's systematic material disposition process ensured that materials were not automatically assumed to be wastes and facilitated the evaluation of all unneeded materials for reuse or recycling. The site's pervasive pollution prevention culture is reflected in the recycling or reuse of over 1.3 million pounds of materials by the ARRA project teams. While the disposal of a large volume of ARRA wastes could not be avoided, the projects were able to reduce the local and national impacts of waste transportation and disposal through careful planning and efficient execution.

The site has conserved natural resources through the preservation and beneficial reuse of materials and land cleared by ARRA activities. Y-12 has taken steps to preserve its history as the site undergoes a sustainable and safe transformation for the future.

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