PLANNING AND IMPLEMENTATION OF THE RETRIEVAL OF BURIED TRANSURANIC WASTE AT OAK RIDGE NATIONAL LABORATORY*

D. W. Turner, D. H. Bolling
Bechtel Jacobs Company LLC
P. O. Box 4699, Oak Ridge, Tennessee 37830-6402

D. M. Hall
Washington Group International
105 Mitchell Road, Oak Ridge, Tennessee 37830

ABSTRACT

As part of the U.S. Department of Energy's (DOE's) Accelerated Closure at Oak Ridge National Laboratory (ORNL), Bechtel Jacobs Company LLC (BJC) is remediating Solid Waste Storage Area (SWSA) 5 North. Remote-handled (RH) alpha-contaminated transuranic (TRU) waste was placed into 22 unlined trenches in SWSA 5 North between 1971 and 1981. The majority of the TRU waste was packaged in 204 concrete casks having one of several configurations. However, a number of the 22 trenches contain waste packaged in wooden boxes, metal boxes, and metal drums. At least two trenches are documented to contain loose materials placed into the trench with no indication of original packaging. One trench contains mixed Resource Conservation and Recovery Act (RCRA) waste. The various containers and loose waste will be retrieved from the trenches, overpacked, and staged, pending treatment and final disposition.

Initially, available information on the 22 trenches was integrated into requirements from the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Record of Decision (ROD) and a consent agreement between DOE and the Tennessee Department of Environment and Conservation (TDEC) to develop the basis for a scope of work. A part of the scope, BJC's remediation subcontractor was responsible for preparation of work control and safety basis documentation appropriate for conducting this work in a DOE Nuclear Facility.

The TRU Waste Retrieval Project is being implemented in a phased manner, allowing low-risk preliminary work to be completed in parallel with the preparation and implementation of controls that will govern the higher risk retrieval and overpacking activities. This phased approach was used in developing work plans for specific tasks, with initial mobilization and site preparation activities being implemented while the documentation for subsequent tasks was being developed and approved. This approach contributes to the accelerated closure schedule, while allowing the project team to gain experience working together in a controlled environment and also incorporate information and lessons learned during early stages into subsequent project activities. The primary focus of this paper is on the planning and implementation of methods and controls that allow effective and efficient project execution while minimizing risks to the workers, public, and the environment.

Waste retrieval will be performed inside a retrieval enclosure using commercial construction equipment adapted for the unique needs of the project. The retrieved waste will be packaged into steel overpacks and staged on site in preparation for processing and final disposal.

INTRODUCTION

In negotiating the proposed Record of Decision (ROD) for the Melton Valley (MV) watershed at the Oak Ridge National Laboratory (ORNL), it was agreed to cap and close in place most of the solid waste burial grounds at ORNL. However, the State of Tennessee insisted that wastes stored in unlined trenches in Solid Waste Storage Area (SWSA) 5 North used in the 1970s for "retrievable storage" of transuranic (TRU) waste must be retrieved. The MV ROD was developed but could not be signed until the issue on the TRU trenches in SWSA 5 North could be resolved. Eventually, a Consent Agreement between the U.S. Department of Energy (DOE) and the State of Tennessee was signed documenting that the TRU waste casks stored in the 22 unlined trenches in SWSA 5 North would be retrieved for processing and disposal off site. The Melton Valley TRU Waste Retrieval Project (MVTWRP) was developed to carry out the requirements of the Consent Agreement.

The scope of the project is to retrieve the inventory of waste packages in the 22 trenches, and to overpack the wastes to await processing in the Transuranic Waste Processing Facility (TWPF) constructed and operated by Foster Wheeler under contract to DOE. The expected inventory of the 22 trenches includes up to 204 concrete casks, 18 boxes of various sizes and shapes, 12 drums of varying construction, and about 500 ft^3 of loose waste. Figure 1 shows concrete casks placed in Trench 3 in 1973. This project is being performed as part of the DOE accelerated closure of Melton Valley, which must be complete by September 2006. The accelerated goal of the MVTWRP is to complete the scope by March 2006. This project is viewed as one of the highest risk and longest duration subprojects in the Melton Valley Completion Project.

Fig. 1. Photo from 1973 showing casks placed in Trench 3.

As the waste is retrieved, it is overpacked and staged on site for treatment in the TWPF that is operated by Foster Wheeler at the ORNL site under contract to DOE. The steel overpacks for the concrete casks were designed by Foster Wheeler to interface with their operating cell at the TWPF. The cask overpacks are provided to the project at the trenches site as part of the

government-furnished equipment for this project. Overpacks for the boxes, drums, and loose waste will be supplied by the remediation subcontractor.

Procurement

It was recognized early in the procurement planning process that the project to retrieve the TRU waste packages from the 22 trenches would be a very challenging project. There was very little existing information available for the project to incorporate into the planning for the unique aspects of retrieving buried concrete casks and miscellaneous other packages of TRU and mixed Resource Conservation and Recovery Act (RCRA)/TRU waste from unlined burial trenches. Preparation for the project involved assembling available historical information and developing a procurement strategy for the project. Since there were difficulties with prior TRU waste retrieval projects at other DOE sites, significant care was taken in planning and preparation for this project.
Initially, a review of the available historical disposal logs was used in concert with civil site surveys and subsurface geophysical investigations to determine the expected burial location for each waste container. The available disposal logs recorded the approximate location of the container relative to the end of the disposal trench and the approximate disposal depth for most, but not all, of the waste containers. The available historical information was collected and organized into an Engineering Report that could be provided to potential bidders. Although not all uncertainties could be eliminated in researching the historical records, it was important to document as much information as possible and to eliminate as many myths as possible. The retired foreman responsible for placing the waste in the trenches was brought in as a part-time consultant to help research historical records and check the data to develop a most-likely set of records for the trenches. Although it took a lot of time and effort, and some unknowns could not be eliminated, it was important to establish the best possible set of information as the basis for the procurement and eventual project implementation.

As part of the procurement strategy, it was decided to competitively bid the project per the Management and Integration contract in place at that time between the DOE Oak Ridge Environmental Management organization and Bechtel Jacobs Company LLC (BJC). It was also determined that, because of the crucial nature of the project, the procurement would be an evaluated procurement, based on the combination of technical approach (60%) and pricing (40%). When the notice of the upcoming procurement was first issued, a large number of companies expressed interest. After pre-qualifying to be able to compete for this procurement, the number was reduced to about a dozen. Approximately a half-dozen proposals were actually received. When the evaluations were completed, the Washington Group International (WGI) was selected and awarded the subcontract to complete this project under BJC management. The project scope for WGI is to complete the remedial design, develop and obtain approval of safety basis documentation, complete the readiness review process, and provide the equipment and labor to excavate and retrieve the waste from the 22 trenches in SWSA 5 North at ORNL.

Regulatory Environment, Safety Basis and Readiness Process

Environmental restoration activities at ORNL, including the TWRP, are conducted under a Federal Facility Agreement between DOE, U.S. Environmental Protection Agency (EPA), and

the State of Tennessee that ensures response actions are conducted in accordance with applicable federal and state regulations. Integration of the unique, and sometimes diverse, regulatory requirements was crucial since remediation of contaminated soil is being conducted under Comprehensive Environmental Response, Compensation, and Recovery Act (CERCLA), retrieval of the stored TRU waste is being conducted under a consent agreement, and the mixed RCRA waste will be staged in an existing facility necessitating modification to an existing RCRA permit. The regulatory constraints include both RCRA and CERCLA, along with specific requirements contained in the project-specific Consent Agreement. The actual retrieval of the waste packages is being done under the Consent Agreement between the State of Tennessee and DOE. Closure of the SWSA 5 North site will be done under CERCLA, as any residual soil contamination must meet the cleanup criteria in the MV ROD. It is expected that after removal of the waste packages in the 22 trenches, the area will meet the closure requirements in the MV ROD without further remedial actions, such as capping, being required. However, one of the trenches, Trench 27, is listed as a RCRA storage unit, requiring a RCRA closure plan to be filed with the State of Tennessee along with the other regulatory submittals. Trench 27 will require additional soil sampling to verify RCRA closure under the closure plan, and subsequent closure under CERCLA as part of the overall SWSA 5 North remediation. The State of Tennessee has approved the RCRA Closure Plan, which requires sampling for residual RCRA contamination after the waste packages in Trench 27 have been removed. Additionally, an existing RCRA storage permit is being modified to allow storage of overpacked waste packages in an existing nearby facility covered by the RCRA permit.

The project safety basis documentation was developed, reviewed, and approved over a nine-month period, with the approval of the Safety Evaluation Report being issued by DOE on April 2, 2004. The project will be performed as a Nuclear Category 3 activity, as no single waste package approaches the Nuclear Category 2 threshold. The total of all the packages in the trenches exceeds the Nuclear Category 2 threshold, but the six highest inventory packages will be transferred out of the project footprint individually as soon as they are retrieved and overpacked. All the remaining waste packages combined do not exceed the Nuclear Category 2 threshold. The only safety basis design feature in the project is the overpack, and most safety basis controls are either administrative controls or interface controls from nearby facilities.

Upon approval of the project safety basis by DOE, BJC conducted an Implementation Verification Review (IVR) of the safety basis. After completion of the IVR and an internal management assessment, intrusive activities on the site preparation phase of the project were allowed to proceed. Prior to the safety basis being implemented, the 22 trench area was part of an Inactive Waste Site (IWS), which prohibits any intrusive work. Once the project safety basis was implemented and the IWS status of the SWSA 5 North 22 trench area was removed, intrusive site preparation activities could proceed. This included the construction of the retrieval enclosure by WGI and their subcontractors, soil sampling, and excavation of overburden soil. When the retrieval equipment and procedures were in place and the retrieval enclosure was completed, BJC and DOE conducted readiness assessments of the waste retrieval operations. Once DOE approved the completion of the pre-start findings and issued their report on the readiness assessment, waste retrieval operations were approved to begin. In addition to the schedule savings from this phased implementation strategy, the remediation subcontractor was able to

gain valuable experience at the site during site preparation that was incorporated into the simultaneous planning for the higher risk retrieval operations.

Project Approach to Retrieval

Prior to beginning excavation activities, soil sampling and probing has been performed to quantify preliminary soil contamination levels and confirm container locations while the radioactive contamination and dose levels sampling personnel are exposed to are low due to the presence of the soil overburden. As soil overburden is removed, the waste packages will be retrieved one at a time. As each item is retrieved, its identity will be verified, it will be overpacked, and then it will be moved to one of the nearby staging facilities. The six highest inventory packages will be moved individually off the project footprint to other existing Nuclear Category 2 storage facilities at ORNL. A package of documentation will be prepared for each of the waste packages retrieved and overpacked. These data packages will be used to track the location of the inventory as it is removed from the trenches and staged in the facilities until it can be processed for off-site disposal.

Soil excavation and waste retrieval will be performed inside a retrieval enclosure using commercial construction equipment adapted for the unique needs of the project. The retrieval enclosure is a movable weather enclosure composed of five separate sections that covers several trenches at once. As the retrieval operation progresses up the hillside into subsequent trenches, the retrieval enclosure will be disassembled and moved to cover the next set of trenches to be excavated. The retrieval enclosure consists of both an outer skin and an inner skin, which can be partially or completely replaced if contaminated. The retrieval enclosure also includes a ventilation system that ensures worker safety through maintaining clean airflow through the enclosure while removing diesel exhaust from the retrieval equipment. The retrieval enclosure also includes a misting system, which can be utilized as necessary in the event of airborne contamination or dusty conditions. The WGI approach to retrieval includes the availability of an additional secondary enclosure, similar to an asbestos enclosure, which can be implemented inside the retrieval enclosure in the event localized areas with high levels of contamination are encountered. Project planning also incorporates remote-operated equipment that could be utilized if high radiation situations are encountered during the retrieval operations.

Drums, boxes, and loose waste will be packaged into appropriate remediation subcontractor-supplied steel overpacks, typically drums or boxes. DOE is supplying the steel overpacks for the concrete casks to the project as government-furnished equipment. These overpacks were designed by Foster Wheeler, who holds the DOE contract to process the retrieved waste through the TWPF at ORNL. The cask overpack is designed to interface with the TWPF hot cell, where the waste in the concrete casks will be processed for off-site shipment and final disposal. The subcontractor-supplied overpacks will satisfy size and weight requirements for the TWPF. The TWPF will certify the TRU waste for disposal at the Waste Isolation Pilot Plant (WIPP), while waste that meets the criteria for low-level waste is being certified for disposal at the Nevada Test Site (NTS).

A trackhoe and a track loader, shown in Figure 2, are the primary pieces of equipment operating inside the retrieval enclosure. The trackhoe is typically used to uncover the casks and load the

excavated soil into dump trucks or rolloff containers, and can be used in conjunction with the track loader to stabilize the waste packages during retrieval. The track loader incorporates a cask shield into the modified logging fork attachment used to lift and transport the concrete casks. The cask shield serves to cradle the concrete casks during handling, and also reduces the dose to the equipment operator. The concrete casks are lifted straight up as part of the overpacking process, which is accomplished by the large crane sitting outside the enclosure. The wheel loader is used to move overpacked waste packages outside the retrieval enclosure to the on-site staging facilities as shown in Figure 3. Excavated soil will be segregated and, where within acceptable contamination limits, stockpiled on site for use as backfill following waste retrieval. Soil that is contaminated above the limits for use as backfill will be characterized, containerized, and disposed at the appropriate disposal facility. Contaminated soil is expected to meet the waste acceptance criteria for disposal at the Oak Ridge Environmental Management Waste Management Facility disposal cell.

Fig. 2. Retrieval equipment inside excavation enclosure.

Fig. 3. Relocation of completed cask overpack.

Existing storage facilities adjacent to the 22 trenches in SWSA 5 North have been made available to the subcontractor for use during project execution. These facilities, typically Rubb type structures, can be used for staging overpacks and other equipment. Upon completion of waste retrieval activities, the remediation subcontractor is responsible for removing and dispositioning the structures as part of site demobilization activities.

CONCLUSION

Following extensive planning and preparation, the retrieval of transuranic waste packages from unlined burial trenches has begun at ORNL. A competitive procurement process was used to select a well-qualified, experienced subcontractor to perform the retrieval operations in a turn-key approach. The waste retrieval will satisfy the consent agreement, and the project will maintain compliance with applicable CERCLA and RCRA requirements. Successful completion of a thorough safety basis implementation review and readiness assessment process has prepared the project team to begin waste retrieval operations. The design of the retrieval enclosure and the conservative selection of equipment have provided a solid basis for the retrieval operations to proceed safely. Completion of the retrieval of the waste from the 22 trenches in SWSA 5 North is a key piece of the accelerated closure implemented under the Melton Valley Completion Project at ORNL.

FOOTNOTE