ABSTRACT

Battelle Columbus Laboratories (BCL), located in Columbus, Ohio, must complete decontamination and decommissioning (D&D) activities for nuclear research buildings and grounds by 2006, as directed by Congress. Most of the resulting waste (approximately 27 cubic meters [m³]) is remote-handled (RH) transuranic (TRU) waste destined for disposal at the Waste Isolation Pilot Plant (WIPP). The BCL, under a contract to the U.S. Department of Energy (DOE) Ohio Field Office, has initiated a plan to ship the TRU waste to the DOE Hanford Nuclear Facility (Hanford) for interim storage pending the authorization of WIPP for the permanent disposal of RH-TRU waste. The first of the BCL RH-TRU waste shipments was successfully completed on December 18, 2002. This BCL shipment of one fully loaded 10-160B Cask was the first shipment of RH-TRU waste in several years. Its successful completion required a complex effort entailing coordination between different contractors and federal agencies to establish necessary supporting agreements.

This paper discusses the agreements and funding mechanisms used in support of the BCL shipments of TRU waste to Hanford for interim storage. In addition, this paper presents a summary of the efforts completed to demonstrate the effectiveness of the 10-160B Cask system. Lessons learned during this process are discussed and may be applicable to other TRU waste site shipment plans.

BACKGROUND

The BCL Decommissioning Project is an initiative of Battelle Memorial Institute (BMI) and the DOE-Columbus Environmental Management Project (CEMP) to decontaminate and decommission buildings and associated grounds at BMI’s Columbus King Avenue facility and West Jefferson North campus. These buildings became radioactively contaminated as a result of atomic energy research performed by BMI for clients including the DOE and its predecessor agencies. The BCL is generating defense contact-handled (CH-) and RH-TRU wastes that are destined for disposal at WIPP. As directed by Congress in the Defense Facilities Closure Projects account, BCL has a site closure deadline of 2006. Corresponding BCL milestones requiring TRU waste removal from the site by August 2003 precipitated efforts by BCL to investigate available alternatives for waste transportation and off-site storage. During this effort, the use of the 10-160B Cask and the storage option presented by Hanford emerged as favorable options.
The BCL milestones necessitated the establishment of a site-specific program to direct the packaging of RH-TRU waste prior to the finalization of WIPP RH-TRU waste characterization requirements. As such, the BCL RH-TRU waste characterization program has been conservatively designed to collect waste data, including complete audio and videotape records of all waste packaging, such that upon completion of waste packaging, comprehensive data records exist from which to demonstrate compliance with final WIPP RH-TRU waste characterization requirements. As of January 2003, the BCL program has been implemented for the packaging of approximately 140 55-gallon drums (approximately 27 m$^3$) total CH- and RH-TRU waste inventory. Complete data records have been generated under the BCL RH-TRU waste characterization program, and the conservative program design produces waste data that are sufficient to meet Hanford waste acceptance criteria and will be adequate to meet any additional requirements that may be established with the finalization of the WIPP RH-TRU waste characterization program.

A memorandum of agreement (MOA) for the “Interim Storage of Defense Transuranic Waste” was approved by the DOE Richland Operations Office, DOE Ohio Field Office, DOE National TRU Waste Program, and DOE-CEMP. This MOA assigns responsibilities and sets forth guidelines to establish Hanford as the site for temporary storage of defense TRU waste generated at the BCL West Jefferson Site. Hanford has the infrastructure necessary to safely manage the TRU waste, and the BCL West Jefferson site TRU waste streams are similar to those of Hanford. Much of the BCL TRU waste is the result of research performed for Hanford activities or contains TRU material that originated at Hanford. The TRU waste covered in this MOA will meet Hanford waste acceptance criteria and will be eligible for disposal at WIPP. To the maximum extent possible, the BCL TRU waste will be characterized for WIPP disposal prior to transport to Hanford, requiring no additional handling by Hanford beyond storage and final shipment to WIPP.

To support interim storage at Hanford, the DOE revised the Record of Decision (ROD) for the Waste Management Programmatic Environmental Impact Statement (1). In addition to approximately 27 m$^3$ of TRU waste from BCL, the DOE decided to ship approximately 9 m$^3$ from the Energy Technology Engineering Center (ETEC) in California to Hanford for interim storage. The revised ROD will allow the DOE to meet the closure schedules established for the BCL and ETEC sites.

**WASTE SHIPMENTS TO HANFORD NUCLEAR FACILITY**

On December 18, 2002, at 02:10 Eastern Standard Time (EST), the BCL shipped one 10-160B Cask (ten 55-gallon drums) of RH-TRU waste to Hanford (Fig. 1). The BCL had prepared to ship a convoy of three loaded 10-160B Casks on December 18, 2002. However, as directed by the DOE Headquarters through DOE-CEMP, BCL transported two empty 10-160B Casks to Santa Susanna, California, for use by ETEC. Also on December 18, 2002, the ETEC site loaded both casks and shipped their entire RH-TRU and CH-TRU waste inventory to Hanford. These were the first intersite RH-TRU waste shipments to be completed in the nation in more than 13 years.
The successful completion of these shipments represents the culmination of an aggressive effort by BCL to ship their TRU waste inventory offsite. This effort began in January 2001 when BCL approached the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico, with the concept of shipping RH-TRU waste in the 10-160B Cask. The effort continued with the performance of numerous technical demonstrations at BCL, WIPP, and Hanford. In addition, BCL successfully completed a 10-160B Cask shipment of ten 55-gallon drums of RH low-level radioactive waste to Hanford burial grounds in July 2002.

**10-160B CASK**

The 10-160B Cask, which is certified by the U.S. Nuclear Regulatory Commission as a Type B shipping cask, was originally intended for use by the utility market as a low-level waste transportation cask in response to changing transportation regulations for greater than Type A quantities. The 10-160B Cask is a cylindrical carbon steel and lead shielded, single-containment-shipping cask designed for the transport of a single 160 cubic foot container (liner) or ten 55-gallon drums.

Two 5-drum pallets specifically designed for BCL can be stacked in the cask. Each pallet has five pick points that can be attached to lifting slings for low-level waste shipments or to a solid remote lifting mechanism for RH-TRU waste shipments. The 55-gallon drums associated with RH-TRU waste shipments are fitted with drum slings before being packaged with waste. These drum slings allow a crane to lift the drums remotely and load them onto into the pallets for insertion in the cask.

The 10-160B Cask is currently licensed to transport RH-TRU wastes from the BCL and ETEC sites. The 10-160B is also licensed to transport CH-TRU for BCL, ETEC, the University of Missouri, and Lawrence Livermore National Laboratory (2). The maximum quantity of material per package is limited to 3,000 times a Type A quantity. The decay heat of the payload is
limited to 100 watts. The contents may include fissile material contaminants provided the mass limits of Title 10, Code of Federal Regulations, Section 71.53 are not exceeded. Because the 10-160B Cask is of a single-containment design, the total plutonium content must not exceed 0.74 terabecquerel (20 curies).

10-160B Cask Operational Demonstrations

The 10-160B Cask was leased by BCL in August and September 2000 to demonstrate its potential as an RH-TRU waste transportation cask. The BCL, in cooperation with WIPP, conducted a mock demonstration of an RH-TRU waste shipment to WIPP in September 2000. Waste-handling activities at the BCL site were simulated using available equipment and approved procedures to load the 10-160B Cask and prepare it for transport to WIPP. The cask was then transported by truck along a DOE-approved shipping route to WIPP, where WIPP personnel simulated unloading the cask. Battelle repeated these demonstrations in February 2002 using newly designed and fabricated cask loading equipment identified during the initial demonstrations at BCL and WIPP.

A mock demonstration also was conducted at the WIPP site on September 26 and 27, 2000, in Carlsbad, New Mexico. The objectives included using existing equipment and facilities at the WIPP RH Bay to unload the 10-160B Cask from the transportation trailer and demonstrating the Hot Cell in the RH Bay as the preferred alternative for cask unloading. The demonstration successfully met its objectives, including showing that the RH Bay Hot Cell is a viable option for unloading and canisterizing 55-gallon drums transported in the cask. The WIPP repeated these technical demonstrations in August 2002.

At Hanford, in Washington State, a technical demonstration was conducted on June 18-20, 2002. The objectives included staging 10-160B Cask and using existing equipment near the low-level waste trench to remove the upper impact limiter, primary closure lid, and two 5-drum pallets. In addition, the demonstration was used to qualify operations personnel on applicable procedures in anticipation of future waste shipments to Hanford. The demonstration successfully met its objectives.

Finally, ten 55-gallon drums of Type B RH low-level waste were shipped Hanford following all WIPP shipping protocols. The shipment was completed on July 22, 2002, and the successful off-loading of the waste was completed August 1, 2002.

DOE INTEROFFICE WORK ORDERS (IWO)

DOE Oak Ridge Operations – Storage Vaults

The DOE Ohio Field Office established an IWO to DOE Oak Ridge Operations (ORO) to allocate funding for ORO to transport 15 concrete storage vaults from Oak Ridge, Tennessee, to Hanford. The vaults were shipped to Hanford by truck in June 2002 and will be used for the interim storage of BCL and ETEC TRU waste. Initially, $252,000 was transferred to ORO to ship the vaults. The BCL had previously purchase three similar type concrete vaults for their use at the West Jefferson site at $30,000 (U.S.) each, including delivery. The average cost for delivery of the ORO vaults is approximately $16,600 (U.S.).
DOE Richland Operations Office – Storage Fees

The DOE Ohio Field Office established an IWO to DOE Richland Operations Office to allocate funding for the shipment of BCL TRU waste for interim storage. The IWO includes funding allocation for an engineering study performed to determine the effect of radiation on the cask loading components and the actions, if any, to be taken to ensure that there will not be any degradation of the steel shipping pallets, drums, or lifting attachments. In addition, this IWO funded the 10-160B Cask demonstration and training of Hanford operations personnel, the preparation of the 15 concrete vaults, and the receipt and disposal of ten 55-gallon drums of RH low-level waste. Some of the associated costs are:

- $15,000 (U.S.) to support the cask demonstration
- $14,000 for a Radiation Effects Study for interim storage of TRU waste in concrete vaults
- $30,000 to unload and setup vaults for storage
- $1,500 per drum of TRU waste for handling/storage fees.

Carlsbad Field Office – Transportation

The DOE Ohio Field Office established an IWO with the DOE Carlsbad Field Office to allocate funding for the shipment of BCL TRU waste for interim storage. The IWO includes funding allocation for preparing the 10-160B Transportation Plan, employing trucks and drivers, obtaining special permits and transport vehicle permits, notifying states, and monitoring the shipments through the Central Monitoring Room at WIPP. Some of the rates for this IWO include:

- $5.75 (U.S.) per mile for all miles, loaded and empty for line-haul charges
- $70.00 per hour for all hours, drivers
- $1.60 per mile for bob-tail charges
- $2,470.00 for over-weight permits from Ohio to Washington (Hanford) and return
- $2,500.00 for State of Illinois fees.

CONCLUSION

The initiation of the RH-TRU waste shipping campaign by the 10-160B Cask shipment of BCL RH-TRU waste to Hanford is a considerable success for the DOE RH-TRU waste complex. The BCL’s effective persistence in developing the 10-160B Cask RH-TRU waste transportation option and identifying an interim RH-TRU waste storage site has resulted in a plan for meeting site milestones for waste removal. The removal of the TRU waste inventory will allow for decontamination and decommissioning activities to progress in compliance with the schedule for the BCL site closure in 2006. The successful completion of the first BCL RH-TRU waste shipment off-site on December 18, 2002, was a result of the decisive development and coordination of multiple agreements between contractors and state and federal agencies. The BCL RH-TRU waste shipment followed all WIPP protocols for shipping TRU waste established by the WIPP Transportation Plan and corridor state agreements. The BCL plans to complete additional 10-160B Cask shipments, which will be subject to the same protocol and agreements, for the transport of the remaining BCL TRU waste inventory to Hanford.
REFERENCES
