

Introduction

The BZDF was constructed for the safe disposal of a munitions stockpile containing 3-quinuclidinyl benzilate (BZ). The BZDF operated for approximately 18 months and ceased agent destruction operations in 1990. The BZDF (Fig. 1) was Resource Conservation and Recovery Act (RCRA) clean closed by the PBA as determined by the Arkansas Department Pollution Control and Ecology (ADPC&E). The BZDF destroyed BZ in the form of munitions, powdered agent in drums, and liquid agent in drums. These different forms of BZ were demilitarized by separate processes during operations. Munitions were processed by means of an autoclave that was used to inert the BZ fill and the explosives. These munitions were then sent to a Deactivation Furnace System (DFS) where the munitions were heated to 1,000 degrees Fahrenheit (°F) for a specified period of time. The residues from this operation were processed through the Heated Discharge Conveyor (HDC). BZ liquid drums were processed in Metal Parts Furnace (MPF) #1 and #2. The liquids were evaporated in the furnaces and the vapors were combusted in the primary fume burners above the furnaces to destroy the BZ. MPF #3 and #4 were used to destroy the materials and secondary wastes from the unpacking of munitions and contaminated materials from BZ processing. A Common Afterburner (AFB) and Pollution Control System (PCS) handled the combustion gases from all six BZDF incinerators. Drums containing BZ agent in the form of powder were processed through the Liquid Incinerator (LIN). The powder was mixed into slurry with acetic acid and pumped into the incinerator where the BZ was destroyed. The BZDF was monitored for BZ agent through randomized wipe samples to achieve the aforementioned 1990 RCRA clean closure status. As part of the closure process, items that were identified as being contaminated were subsequently decontaminated and re-sampled. Materials that could not be decontaminated were fed to the MPFs for incineration. These materials included piping, glove boxes, and dismantled liquid tanks. The BZDF remained inactive in a cold and dark state after RCRA closure.

Approach to Hazard Waste Remediation

Hazardous Materials/Waste within the BZDF. Hazardous materials known or suspected to be present in the BZDF included batteries, light bulbs and ballast, refractory, liquids, and mercury thermostats. All identified hazardous materials and all liquids were subsequently removed from the BZDF. Any tiles that tested positive for asbestos were removed. Any smoke alarms/detectors containing americium were removed. Electronic equipment such as computer monitors from the Control Room were removed. All material was containerized and labeled as required for proper storage, transport, and disposal (Fig. 2). All interior process and support equipment including the DFS, MPF material handling equipment in the MPF Room, LIN, generator, air compressors, liquid tanks, and air handling units, remained in place and were disassembled or removed as required to drain/remove hazardous materials including all lubricants, coolants, refrigerant, and such from gear boxes, compressors, equipment, motors, etc. The Common AFB, exterior to Building 57-110 (which housed the furnaces), was disassembled as necessary to remove all refractory and ash that had Toxic Characteristic Leachate Procedure (TCLP) metals above the regulatory thresholds. The PCS and associated ducting was also cleared of all material including ash, rust scaling and debris that exhibited TCLP metals concentrations above regulatory limits.



Figure 2. Hazardous waste segregation.



Figure 3. Hazardous waste disposal roll-off containers.

Waste Management. Waste management began with proper characterization of materials generated as part of the remediation process. Operational areas were sampled to determine the components of the potential waste streams. The samples were analyzed using Environmental Protection Agency (EPA) Method 1311 (TCLP) to determine whether the components of the waste met the RCRA requirements in accordance with (IAW) 40 Code of Federal Regulations (CFR) Section (§) 261.24. For operational purposes the sampling produced a refractory brick, slag, and/or ash waste consisting of, cadmium, chromium, and lead above the concentration thresholds identified in 40 CFR § 261.24. These were the expected waste constituents to be found in the processing components (incinerators) of the BZDF. These areas included the Common AFB, DFS, HDC, MPF, and the PCS. Each area was sampled individually to ensure that the waste streams did not contain other metals above the RCRA TCLP regulatory limits. The refractory brick, slag, and/or ash waste was removed by ECBC during remediation operations and placed into lined roll-off containers that were labeled in accordance with the management practices listed in the ECBC BZDF Waste Management Plan (Fig.3).

Approved for Public Release

Abstract

Under CRADA # 0716C with URS Corporation, ECBC was tasked with identifying, removing, and disposing of hazardous materials from a former BZ Agent/Munitions Disposal Facility (BZDF) located at Pine Bluff Arsenal (PBA), Pine Bluff Arkansas, prior to mass demolition of the facility. ECBC provided technical expertise, labor and equipment to support site mobilization/setup; sampling and analysis of all suspected hazardous materials; removal of all hazardous materials from the BZDF; dismantling of the interior and exterior of BZDF contaminated equipment as required to remove the hazardous material/waste; final sampling and analysis to render safe equipment/areas were clear of hazardous materials/waste to acceptable levels; packaging all materials/waste according to regulatory requirements; shipping of waste, debris, and recyclable materials to a disposal facility or recycler; and demobilizing the site upon completion. ECBC completed these tasks and all remediated BZDF areas/equipment were determined clear of hazardous materials/waste to acceptable levels by WDC and ECBC prior to demobilization. All materials/waste removed from the BZDF were characterized, segregated, packaged, transported and disposed of in accordance with approved procedures and regulatory requirements.



Figure 1. BZ Agent/Munitions Disposal Facility located at Pine Bluff Arsenal in Arkansas.

Site Sampling

Prior to the sampling and remediation processes, key areas were identified as being the principle areas of concern for the presence of hazardous materials/waste. These locations were the main areas involved in the demilitarization of the BZ materials. These locations were the DFS, LIN, Common AFB, all four MPFs, HDC, and the PCS. These areas were specifically identified for RCRA TCLP, PCBs, lead and asbestos sampling. Sampling was an ongoing process during the removal of hazardous materials and waste at the BZDF. The initial phase involved the collection of samples from the areas of concern for an initial characterization for the BZDF. During characterization, representative grab samples were collected from each area to determine if the area would require remediation or further sampling to determine whether or not the components of the area would be disposed of as hazardous waste.

TCLP Sampling. In areas where the initial samples were below the TCLP regulatory threshold limits for toxic metals, no further sampling was conducted. Areas that were above the limit(s) and could be remediated were re-sampled after cleanup activities to confirm that the location was below the TCLP regulatory levels for toxic metals. If the clean-up samples were above the TCLP regulatory thresholds, then remediation activities continued until acceptable levels were achieved. Areas that were above the TCLP regulatory limits that could not be remediated were re-sampled using a composite sampling technique.

PCB Sampling. PCB sampling was conducted as suspect materials were identified.

Asbestos Sampling. Approximately 137 asbestos samples were obtained from suspected materials at the BZDF. The sampling area covered 28,000 square feet to include suspected materials on equipment inside and outside the BZ Building (Building 57-110). Of the total number of samples obtained, seven samples were identified as asbestos containing material (ACM). This material was classified as Class I non-friable pursuant to 40 CFR § 61.141.

Lead Paint Sampling. Lead paint chip samples were obtained from the interior (walls, flooring, and other painted surfaces) of the BZ Building (Building 57-110) and analyzed using EPA Method 6010C for total metals. The areas sampled included the LIN, Common AFB, DFS, HDC, laundry areas, Munitions Inerting Area (MIN), Munitions Unpack Area (MUA), decontamination areas, Control Room, and mask fit/personal protective equipment (PPE) issue areas.

Hazardous Materials and Waste Removal Process

An overall SOP for hazardous materials and waste removal operations titled Removal of Hazardous Waste Materials Required for Building Demolition (SOP # CNG-138PB), was developed for the remediation efforts. Task specific JSAs were also developed for specific removal operations. Prior to the start of hazardous materials and waste removal operations all assigned personnel read and signed off on the SOP. JSAs were also discussed before a specific operation was started and personnel performed a safety walkthrough of the operation prior to actually conducting it.



Figure 4. Hazardous waste remediation of pollution control system ducting.



Figure 5. Contaminated refractory removal.

Universal Waste. The approximate quantities of universal waste removed from the BZDF were 71 batteries, 275 fluorescent light tubes, 6 mercury switches, 140 pounds of refrigerant, 363 light bulbs, and 3 bins of used electronic boards.

Asbestos. Approximate quantities of asbestos removed from the BZDF were 13 drums of loose floor tile with mastic containing Class I non-friable ACM.

Hazardous Waste. Approximate quantities of hazardous waste removed from the BZDF were 212 light ballasts, 121 capacitors, 290 gal of spent/used petroleum products, 330 gal of coolant, 4 gal of expired bleach, 2,650 gal of oil/water, six 55 gallon drums of ash containing heavy metals, and 60 cubic yards of refractory contaminated with heavy metals.



Figure 6. Metal parts furnace remediation photos describing pre-remediation (left); post-remediation (right).

Discussion

The scope of this project as identified within the CRADA #0716C, Task Order 001 was to identify and remove all hazardous materials/wastes (including but not limited to potential ACMs, fluorescent light tubes/ballasts, batteries, liquids, lubricants, refrigerants, antifreezes, fuels, refractory brick, mercury switches, americium in smoke alarms, and hydraulic oils) as well as disassemble contaminated equipment (if necessary) prior to the mass demolition of the BZDF. ECBC was successful in identifying, removing and disposing of all known hazardous materials/wastes from the BZDF as described in the subject CRADA. All tasks were completed in a safe manner. All suspected materials/waste was disposed of in compliance with all local, state and federal requirements. ECBC completed their tasks in an acceptable time frame and within WDC's overall project schedule for the mass destruction of the BZDF.