DOE Oak Ridge Environmental Management Program

Balance of Reservation Closure Project

Background

The Department of Energy (DOE) Oak Ridge Reservation includes several contaminated areas that are a result of years of operation at the three on-site federal facilities: East Tennessee Technology Park (ETTP), Oak Ridge National Laboratory (ORNL) and the Y-12 National Security Complex.

The ETTP and Melton Valley are being cleaned up as separate projects. The remaining Environmental Management sites are categorized into one grouping known as the "Balance of Reservation Closure Project." This grouping includes the high priority CERCLA projects that will be completed by 2009, the reservation waste management responsibilities, and all other post-2008 cleanup responsibilities on the Reservation. It also includes two contaminated off-site locations: Atomic City Auto Parts in Oak Ridge and the David Witherspoon Sites in Knoxville.

Waste management responsibilities include transporting waste, meeting waste acceptance criteria, managing Oak Ridge Reservation landfills, operating and expanding the Environmental Management Waste Management Facility (EMWMF) near the Y-12 Complex, and disposing of low-level and mixed low-level waste on the Reservation.

One significant waste management milestone was the complete disposition of legacy low-level and mixed low-level waste on the Reservation by the end of Fiscal Year (FY) 2005. That milestone was completed on time, and much of the waste was disposed on-site in EMWMF.

Pre-2009 High-Priority Activities

DOE is cleaning up the Oak Ridge Reservation on an accelerated schedule. High-priority risk reduction activities will be addressed by FY 2009 to reduce/identify potential risks and decrease maintenance needs/costs. Numerous risk reduction source remedial actions planned at the Y-12 Complex and ORNL will commence after FY 2008.

The pre-2009 Balance of Reservation activities encompass remediation activities covered by signed Records of Decision (RODs): the Bethel Valley Interim ROD; the Upper East Fork Poplar Creek (UEFPC) Phase 1 ROD; the EMWMF ROD; and the Bear Creek Valley Interim ROD, under which remediation of the Boneyard/Burnyard waste disposal site has been completed. Other activities performed during this period have taken place in the off-Reservation actions.

Bethel Valley

Bethel Valley Interim ROD Groundwater Engineering Study

The Bethel Valley ROD, which was signed by the Federal Facility Agreement parties in 2002, presents the selected remedy for remediating various contaminated areas within the ORNL Bethel Valley area. The ROD specified that a groundwater engineering study be conducted to satisfy soil data needs for identifying remedial actions related to impacted groundwater, including deep groundwater extraction at the Core Hole 8 plume, in situ biodegradation at the East Bethel Valley volatile organic compound (VOC) plume, groundwater monitoring in West Bethel Valley, and soil excavation at known leak sites to minimize impacts to groundwater.

The Balance of Reservation Closure Project includes all areas on the Reservation not being remediated under the Melton Valley and ETTP cleanup projects.

Projected Site Cleanup Target Date: 2015

The project collected soil samples at 285 locations throughout ORNL and analyzed approximately 450 samples to identify locations containing contaminants from historical spills or leaks that may require future removal. Of the 38 areas investigated, two were found which may require removal.

A total of eight groundwater monitoring wells were installed at various depths to further delineate the extent of three separate plumes of radiologically contaminated groundwater in central and western ORNL. Seven wells were installed to further delineate the extent of a VOC plume located at the eastern part of ORNL and to provide data on the ability to perform in situ bioremediation.

Three separate creeks were sampled at 200-ft intervals where they pass through the main part of ORNL operations. The samples were analyzed for radionuclides and VOCs. This was performed at both high- and low-flow conditions to determine if there were any major sources of contaminant discharges to the creeks

and to assess whether discreet locations of groundwater entered the surface water.

The process waste drain system was monitored and sampled at 24 different locations to identify areas of the system no longer needed for facility operations or for the capture of contaminated groundwater. One sample was taken each quarter, and two high-flow samples were obtained and analyzed.

The Groundwater Engineering Study Report has recently been completed and is now available at the DOE Information Center. The remainder of the remediation activities defined with this ROD will be addressed post-2008. A future final ROD is also planned to reach closure on the site once all the remedial activities have been completed.

Core Hole 8 Plume

An area of groundwater contamination, called the Core Hole 8 plume, and its source were the focus of early actions taken by DOE at ORNL. The plume is located in the central portion of the ORNL main plant area. The plume emanates from contaminated soil surrounding Tank W-1A in the North Tank Farm and migrates westward to First Creek. The principal plume contaminants are strontium-90 and uranium isotopes. Since late 1994, DOE has been implementing various coordinated actions to minimize the release of contaminants, including:

- intercepting, collecting, and treating approximately six million gallons per year of contaminated groundwater migrating toward First Creek; and
- removing a significant portion of the source (i.e., 90% of the contaminated soil surrounding Tank W-1A).

The first action implemented by DOE was to install a groundwater interceptor on the western part of ORNL to reduce contaminant discharge to First Creek. The next action was the construction of a groundwater interceptor trench near the existing Core Hole 8 plume interceptor system. A third action was implementation of hydraulic controls on the plume by pumping groundwater from an existing monitoring well.

The most recent action partially addressed the contaminant source that contributed to the plume by removing a significant portion of the soil surrounding Tank W-1A.

Approximately 900 cubic yards of the soil were also removed. However, during excavation of soil adjacent to the tank, analytical results from grab samples of soil indicated that approximately 100 cubic yards of soil around the tank contained very high concentrations of transuranic (TRU) radionuclides. Since there is no disposal facility that could accept soil at these levels, these soils and the tank were left in place. The tank and the TRU-contaminated soil discovered during this removal action are currently being addressed under a new work plan and different contract. Additional characterization soil data is being obtained in preparation for the removal action continuation.

Facilities Contamination Stabilization and Ventilation Risk Reduction Project

Thirteen surveillance and maintenance facilities at ORNL (including nuclear, radiological, and industrial category facilities) are served by the cell ventilation or process off-gas systems that are tied to the 3039 Stack System.

This aging stack system and filter housings associated with each facility provide a risk to continued operations, which the project is proceeding to eliminate. Filter maintenance activities three years ago resulted in the release of measurable radioactive strontium across the ORNL complex.

Systematic stabilization of the radioactive contaminants in the facility hot cells, fume hoods, and glove boxes utilizing a commercial fixative application will allow these facilities to be removed from the ventilation systems.

Contaminant stabilization and ventilation isolation has been completed in three of the 13 facilities, with the remaining facilities scheduled for completion during the next two years.

Two of the nuclear category facilities require the removal of significant quantities of radioactive material prior to contaminant stabilization. When the inventory removal and contaminant stabilization is complete, these two facilities are expected to be downgraded from a nuclear to radiological category.

Hot Storage Garden

Beginning in the mid-1950s, the Hot Storage Garden supported research at ORNL by storing radioactive material, including spent fuel rods, in the below-grade wells and partially above-grade water-filled canal. All the fuel was transferred for storage to a solid waste storage area in the mid-1980s. The facility was then placed in the surveillance and maintenance (S&M) program.

In 2003, some additional funding was made available to perform decontamination and decommissioning (D&D) on a facility currently in the S&M program. The Hot Storage Garden was selected because it was small facility that could be D&D'ed with the available funding and existing documentation indicated that the source material had been removed with no indication of residual contamination.

The project started in the summer of 2004 and removed all the surface structures and removed and cut five of the 14 well sleeves. High concentrations of removable alpha-emitting contamination were found near the bottom of one of the well sleeves. The sleeve had been cut in half using a reciprocating saw. It is thought that the vibration caused by the reciprocating saw caused the contaminants near the bottom to become airborne. As a result, four workers received an unexpected dose.

The project was immediately stopped and the area secured. Additional characterization was performed to and a fixative applied to the interior and exterior of the well sleeves. The sleeves

were then containerized and safely disposed in the EMWMF. As a result of the unexpected residual contamination, the D&D of the remaining nine wells were deferred until a final cleanup effort begins in 2009.

Upper East Fork Poplar Creek

Phased Records of Decision

In 1953, the Y-12 National Security Complex began efforts to separate isotopes of lithium to develop hydrogen bombs based on fusion.

Millions of pounds of mercury were needed to separate the lithium. Three similar processes housed in several buildings were used to perform this task. Flowing at relatively high rates and pressures through numerous pumps, pipes, valves, and seals, the mercury often dripped or spilled. Pump maintenance also allowed mercury to escape, especially during early operating years. An estimated 240,000 pounds of mercury were released from Y-12 directly to UEFPC from 1950 to 1982. An estimated total of 2 million pounds of mercury was lost to the environment or not otherwise accounted for, although limited inventory control makes estimating difficult.

The Remediation of UEFPC is being conducted in phases. Phase 1 addresses interim actions for remediation of mercury-contaminated soil, sediment, and groundwater discharges that contribute contamination to surface water. The Phase 1 ROD was signed in May 2002. The initial Phase 1 action is the design and construction of the Building 9201-2 Water Treatment System, which will collect and treat the largest remaining point source of mercury in UEFPC. Post-2009 actions remaining from this ROD include hydraulic isolation of the West End Mercury Area and the removal of contaminated sediments from the UEFPC creek bed and Lake Reality.

The UEFPC Phase II ROD is to be signed prior to FY 2009. It addresses the remediation of the balance of contaminated soil, scrap, and buried materials within the Y-12 Complex. The remediation activities within this ROD will be initiated post-2008 after the work in Melton Valley and ETTP are completed. Decisions regarding final land use and final goals for surface water, groundwater, and soils cleanup will be addressed in future decisions.

Building 9201-2 Water Treatment System

A new water treatment system that continuously treats 300 gallons of water a minute has been constructed at the Y-12 Complex.

The Building 9201-2 Water Treatment System, so named because it is being built near Building 9201-2, will mitigate mercury being released into UEFPC. Past operations at the Y-12 Complex have resulted in mercury contamination of a natural spring called "Big Spring," located on the eastern portion of the site. Water from the spring flows through Outfall 51, a culvert that empties into UEFPC. The system will also treat contaminated groundwater collected in sumps in Building 9201-2.

The treatment system consists of three facilities, including a 15-ft-deep, in-ground wet well to collect the contaminated water; a 70,000-gallon collection tank, where the water is pumped and stored prior to treatment; and the treatment process system, where the water is decontaminated. The process system uses a series of granular activated carbon columns to reduce the mercury concentration. Construction began in March 2004 and was completed in March 2005. Operations of the facility began during the summer after treatment systems were tested.

Waste Management

The Waste Management project operates key disposal and treatment facilities necessary to support cleanup of the entire Reservation as well as the disposition of newly generated waste from active missions at the Y-12 Complex and ORNL.

Legacy Waste Disposition

In FY 2005, DOE and its environmental cleanup contractor, Bechtel Jacobs Company LLC, accomplished a major milestone in cleaning up the Oak Ridge Reservation with the safe disposition of more than 1.2 million cubic feet of legacy waste.

Legacy waste is defined as "waste belonging to the EM program prior to September 30, 2000, when waste inventories were baselined." It is categorized as either low-level waste (LLW), which contains low-level radioactivity, or mixed low-level (MLLW), which contains both radioactive and hazardous waste components.

Oak Ridge's legacy waste inventory stemmed from Cold War operations that took place at three sites – the Y-12 Complex, ORNL, and ETTP. Historically, Oak Ridge has had the largest inventory of LLW and MLLW in the DOE complex.

Storage of these materials occupied more than 27,000 containers and consisted of a variety of materials, including radioactive scrap metal, contaminated soil, construction debris, organic liquids, waste water, and sludge residues. DOE's contract with Bechtel Jacobs Company required the safe management, treatment, and disposal of all legacy LLW and legacy MLLW stored on the Oak Ridge Reservation by September 30, 2005, and this milestone was completed

A monolith, part of the legacy waste inventory, is being prepared for off-site shipment

on time. The legacy waste included about 1.2 million cubic feet of LLW and 36,000 cubic feet of MLLW located across the Reservation. This volume equates to a football field covered more than 30 feet high.

Legacy waste removal and disposal is the first major milestone of DOE's Accelerated Cleanup Program.

CERCLA Waste Facility (EMWMF)

Wastes generated in the cleanup of the Oak Ridge Reservation are disposed of in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The CERCLA Waste Facility was constructed to receive these wastes. It is an above-grade waste disposal facility located in East Bear Creek Valley just west of the Y-12 Complex.

The facility is authorized to receive low-level radioactive waste (LLRW) as well as wastes regulated under the Resource Conservation and Recovery Act and Toxic Substances Control Act from CERCLA-regulated cleanup work. Potential wastes include soil, sludge, sediments, solidified waste forms, stabilized waste, vegetation, building debris, personal protection equipment, and scrap equipment.

In addition to the two current disposal cells, the EMWMF consists of a leachate collection and transfer facility, support facilities, access roads, stormwater retention basins, and monitoring and security systems.

Construction of the 800,000 cubic yard build-out was completed in April 2005 and the certification report approved by the regulators in July 2005. The build-out brought the operating capacity to 1,200,000 cubic yards across the four completed cells. The final expansion of EMWMF to bring the facility to its ROD approved capacity of 1,700,000 cubic yards has started with the commencement of the design of Cell 5. Construction was started in 2005 and will take about a year to complete. This expansion will fully develop the EMWMF site to provide waste disposal capacity to dispose of more than 95 percent of the waste that will be generated and managed during the Environmental Management cleanup program. The remainder of the waste generated will be disposed of at off-site DOE or permitted commercial facilities.

Off-Site Projects

Witherspoon 901 Site

From the early 1950s until 1984, the U.S. Department of Energy (DOE) and its predecessors sold scrap radioactive and hazardous materials from its Oak Ridge operations to local dealers in Oak Ridge and Knoxville, Tenn. One of those scrap dealers was David Witherspoon, Inc., which owned and operated facilities in south Knoxville.

Demolition activities at Witherspoon site

DOE is overseeing cleanup of the site in accordance with a Memorandum of Understanding with the State of Tennessee. Bechtel Jacobs Company is implementing field activities.

Cleanup began March 10, 2004, on the Witherspoon site at 901 Maryville Pike. Phase I of the project – the removal of structures and debris piles – was completed March 22, 2005.

Phase II of the 901 Witherspoon project—removal of contaminated soils—began in July 2005. On July 25, the first of an anticipated 4,500 truck loads (60,000 cubic yards) of excavated material was shipped to Oak Ridge for disposal at the CERCLA Waste Facility. Phase II is expected to be completed by July 2006.

Atomic City Auto Parts

Remediation of the Atomic City Auto Parts (ACAP) Site, located in northeast Oak Ridge, was completed in 2004. This 5-acre site was originally used as a coal distribution center by the Manhattan Project, and was sold in 1954. From 1954 to 1975, the site was used as a private salvage business and received contaminated metals from the Y-12 Complex. After 1975, the business was an automobile salvage/repair and scrapyard facility.

In 1994, the ACAP Site was declared a Tennessee Department of Environment and Conservation Superfund Site. Approximately 35,000 cubic yards of contaminated soil and debris were removed and shipped to EMWMF by the ACAP remediation activities. Field work at the site was completed in October 2004.