Getting Remediation Done at ORNL

At Oak Ridge National Laboratory, four environmental remediation projects are making significant progress in reducing risk to site workers, the public, and the environment, while also enabling redevelopment opportunities in an area of the national laboratory that is being cleared of decaying, excess facilities.

By Malinda Conger, Amy Harkey, Ken Schneider, and Dirk Van Hoesen

Jump-started with more than $200 million in American Recovery and Reinvestment Act (ARRA) funding received in 2009, the U.S. Department of Energy's Oak Ridge National Laboratory (ORNL) has experienced a boom in environmental management projects, including legacy material removal, facility decontamination and decommissioning (D&D), and environmental remediation. In the area of environmental remediation, four projects are making significant progress in reducing risk to site workers, the public, and the environment, while also enabling redevelopment opportunities in an area of the national laboratory that is being cleared of decaying, excess facilities from the Manhattan Project and Cold War eras. Two of the projects target cleanup of a radiologically contaminated groundwater plume, another removes building slabs and contaminated soils from an area of the ORNL Central Campus slated for redevelopment, and a fourth project hydrologically isolates decades-old buried waste.

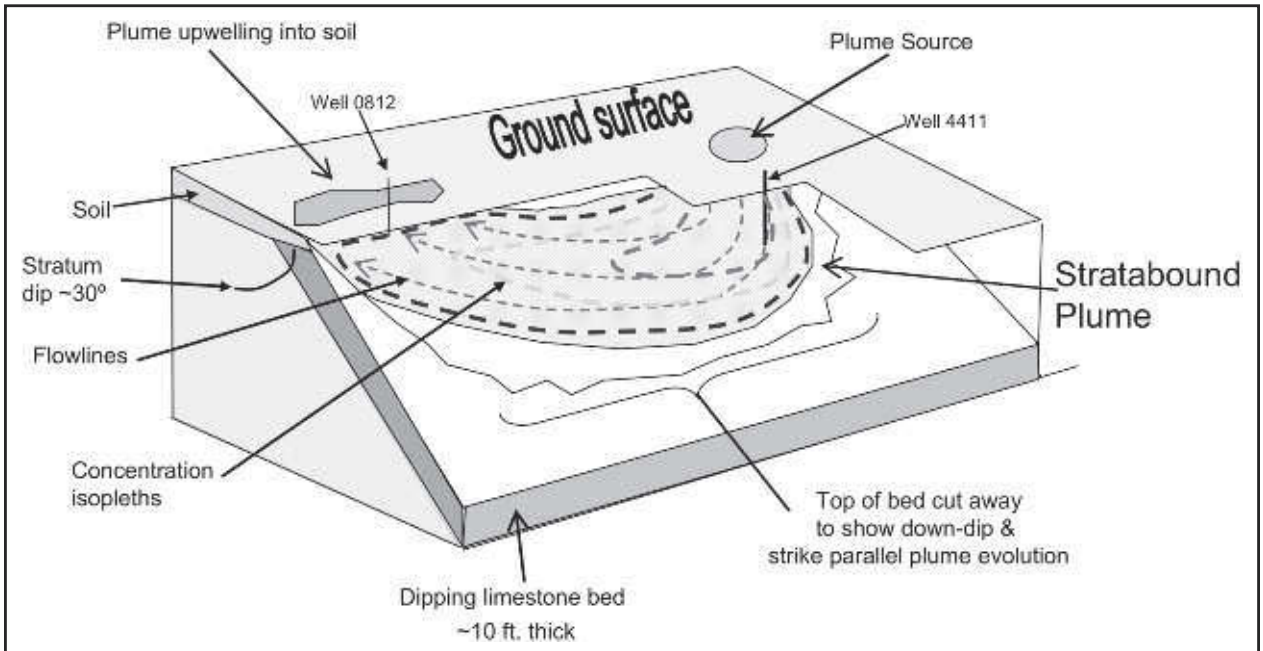
Tank W-1A Removal Action

The Tank W-1A Removal Action, managed by URS/CH2M Hill Oak Ridge (UCOR), is remediating approximately 350 cubic yards of radiologically contaminated soil and removing a 4000-gallon stainless steel tank that collected wastes from the Radiochemical Processing Pilot Plant and other high-radiation analytical facilities at ORNL from 1951 to 1986. Soil surrounding the tank is contaminated with a variety of radionuclides, including americium, cesium, strontium, and plutonium. The contamination resulted from leaks in the waste transfer lines feeding Tank W-1A. The soils are a continuing source of groundwater contamination that poses risks to both the groundwater and the industrial worker. Approximately 650 cubic yards of soil was removed from the Tank W-1A site in 2002 before high dose rates caused the work to be suspended.

Workers erected a confinement structure over the work area, and UCOR instituted exposure controls for soil excavation, packaging, and transport to the Nevada National

Waste container placement in enclosure.

Tank W-1A footprint.



- Plume originates at leak site in soil at Tank W-1A.
- Soluble contaminants seep downward into bedrock and westward toward First Creek.
- Plume is largely confined beneath clay soils in the upwelling area.
- Contamination is encountered in soils near bedrock surface and in bedrock groundwater.

Core Hole 8 groundwater plume.

Security Site (NNSS) for disposal. Soon the tank shell, concrete pad, and tank supports will be removed, size-reduced, packaged, and transported to NNSS. The project, scheduled for completion this winter, is proceeding with readiness reviews.

Core Hole 8 Plume Extraction Wells

Another consequence of leaks in and around Tank W-1A is the Core Hole 8 groundwater plume. Plume discharges were discovered in nearby First Creek in the early 1990s, and geologic connections to Tank W-1A were determined shortly thereafter during a remedial investigation/feasibility study. In 1995 a plume extraction system was connected to the process waste treatment system as part of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Removal Action. Over time the system suffered frequent breakdowns and malfunctions as well as in-leakage from the storm drain system. Subsequently, the initial system for capturing the plume was deemed insufficient to meet CERCLA goals of reducing radiological contamination discharged to the creek.

In December 2010 the installation of two additional groundwater extraction wells was completed to improve water level suppression and to remove contaminant mass from the plume. Personnel installed pumps, controls, transfer lines, and electrical components to connect the new wells to the existing extraction system. The existing extraction system was refurbished to improve its performance and to accommodate additional flow from the new wells. Testing verified the integrity and flow capacity of the existing transfer line for the added collection. Finally, approximately 250 feet of transfer line were relocated to accommodate ORNL redevelopment plans for the area. The project was scheduled for completion this September.

Removal of Soils and Slabs in 2000 Area

UT-Battelle LLC is managing a project to remove soils and slabs in a northwestern portion of the ORNL Central Campus known as the 2000 Area. The ARRA funded the project through the Soils and Sediments Program of the DOE's Office of Environmental Management (EM). This project, building on work at ORNL that demolished 14 excess facilities (also funded through ARRA Environmental Management funds as part of a 34-facility demolition project) with a footprint of 90 000 ft^2, will complete the cleanup of this portion of the campus, approximately 20 acres. Cleanup of the 2000 Area will reduce radiological exposure risk to site workers as well as facilitate redevelopment for new science and technology missions at ORNL.

Concrete sample from 2000 Area slab.

Abandoned slab to be removed.

The DOE–EM Soils and Sediments Program funded characterization to support remedial action decision making and waste disposal. By March 2012, the crumbling concrete slabs that remain from the D&D of excess facilities, along with associated contaminated soil and abandoned process waste pipelines, will be removed. These wastes, except for the soil, will be segregated, size-reduced, packaged, and disposed of at the Oak Ridge Environmental Management Waste Management Facility and the Oak Ridge Reservation Industrial Landfill. The soil, contaminated primarily with cesium and polychlorinated biphenyls, will be packaged and transported to NNSS for disposal. The project will be complete when the impacted areas are either restored to grass or graveled for temporary parking.

Bethel Valley Burial Grounds Remediation Project

Lata-Sharp Remediation Services (LSRS) is the construction contractor for the Bethel Valley Burial Grounds Remediation Project (BVBGRP), a project that began in October 2009 and is complete. The BVBGRP upgraded existing soil covers and installed Resource Conservation and Recovery Act (RCRA)–type multilayer caps to hydrologically isolate long-abandoned radiological burial sites at ORNL. This ARRA-funded project will protect humans, surface water bodies, groundwater, and ecological resources from further radiological contamination.

The BVBGRP addresses nine sites: Solid Waste Storage Area (SWSA) 1, the Former Waste Pile Area (FWPA), and the Non-Radioactive Wastewater Treatment Plant (NRWTP) Debris Pile, all located on ORNL's Central Campus; and SWSA 3, the Closed Scrap Metal Area (CSMA), the Contractor's Landfill, and three contaminated soil areas, all located on the west end of ORNL.

SWSA 1 Area in the ORNL Central Campus.

SWSA 3 Area in West Bethel Valley.

The burial sites operated between 1943 and 1951 for routine, shallow disposal of solid, low-level radioactive waste. Early burial practices involved placing wastes in unlined trenches and auger holes and covering them with soil or a combination of concrete caps and soil. ORNL terminated disposal at the sites after instances of groundwater intrusion into the burial trenches, evidence of substantial releases of radioactive contamination to the underlying groundwater, and fluxes of elevated strontium-90 in nearby surface waters after major precipitation events. The Bethel Valley Interim Record of Decision (May 2002) requires the following actions:

- Installation of a RCRA-type multilayer cap and an isolation cap at SWSA 1.
- Installation of a RCRA-type multilayer cap, an isolation cap, and an upgradient surface water/shallow groundwater diversion system at SWSA 3 and CSMA.
- Removal of contaminated soil near the SWSA 3 cap, with soil disposal either under the SWSA 3 multilayer cap or offsite.
- Plugging and abandonment of some existing substandard or unneeded wells to preclude pathways for contaminant migration.
- Installation, upgrade, or maintenance of existing soil covers at FWPA, the NRWTP Debris Pile, and the Contractor's Landfill.

The project began by determining the thickness of existing soil covers and the lateral extent of buried waste at FWPA and NRWTP while concurrently clearing and chipping nearly 8 acres of trees and other vegetation around the Contractor's Landfill and SWSA 3. As clearing progressed at the Contractor's Landfill, LSRS began investigating the soil cover and waste boundary in that area. Soil sampling in areas thought to be contaminated confirmed the need for removal and determined the extent of excavation needed. Excavation commenced, and the contaminated soils were placed under the SWSA 3 cap. By the summer of 2010, efforts were concentrated on installing the RCRA and isolation caps over SWSA 1 and completing the soil covers at FWPA, the NRWTP Debris Pile, and the Contractor's Landfill. This work was completed in November 2010, and project personnel then fo-

Placement of gas vent layer.

cused solely on the SWSA 3 and CSMA areas.

Completion of first-phase efforts corresponded with the arrival of the rainy season in the Oak Ridge area. About 2 feet of rain fell between October 2010 and March 2011, presenting significant challenges for hauling soils, excavating trenches, and maintaining sediment and erosion control. Despite the weather, the project team slogged ahead, working many weekends to hold the schedule. LSRS completed tie-in of the up-gradient trenches in March 2011, after encountering and removing waste debris outside the anticipated boundary and stretches of bedrock in the southeastern leg. Unforeseen challenges were plentiful, but adjustments in the design and sheer perseverance kept the project moving forward to accomplish the intended result.

Contaminated debris encountered during trench excavation.

Spring of 2011 saw installation of the cap, with placement of a working surface, a gas vent layer, a contour fill that established the cap grade, a geomembrane liner, and frost protection. Final activities included constructing access roads, placing topsoil, and hydroseeding the cap. When the project was completed, UCOR assumed re-

SWSA 3 before the Bethel Valley Burial Grounds Remediation Project.

SWSA 3 in January 2011.

SWSA 3 in April 2011.

SWSA 3 in June 2011.

sponsibility for maintaining the caps and monitoring remediation effectiveness.

The LSRS team achieved an impressive safety record on the BVBGRP. The accomplishment of nearly two years of construction work without a lost time injury is a credit to the safety culture established and maintained by the LSRS team. LSRS Project Manager Mike Kennicott sums up the project best, "The project offered many challenges to installing up-gradient trenches, geotechnical liners, and soil covers during a very wet winter, and with some unanticipated field conditions. LSRS worked very closely with the design contractor and DOE to develop and implement practical, innovative solutions for working through the issues, allowing the project to be completed in a timely and technically sound manner. Our workforce persevered through many long days and weekends, needed to make up for lost time due to weather, and completed the work with no lost time accidents."

The LSRS team on SWSA 3.

Backfilling conveyance ditches on SWSA 3.

Setting the Stage

With the successful completion of these four remedial action projects, ORNL will have markedly decreased risk to site personnel, the public, and the environment, thus setting the stage for future redevelopment. ■

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