

**The Road to 2020: Comprehensive Environmental Response,
Compensation and Liability Act of 1980 (CERCLA): Cleanup of the
East Tennessee Technology Park — 17425**

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ABSTRACT

Uranium enrichment activities at the 890-ha (2,200-acre) East Tennessee Technology Park (ETTP), formerly the Oak Ridge Gaseous Diffusion Plant, date back to the World War II Manhattan Project. The site produced nuclear fuel for weapons and reactors for four decades. Because of these operations, ETTP has a legacy of radiologically and chemically contaminated buildings, soil, sediment, and groundwater that required remedial action to reduce the risk to human health and the environment. Since the early 1990s, the DOE Oak Ridge Office of Environmental Management (OREM) has directed the environmental cleanup of this contaminated site through the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) process. Cleanup activities have included the demolition of contaminated facilities and structures, including five gaseous diffusion buildings; remediation of contaminated soils; disposal of associated waste; and treatment of contaminated groundwater.

In August 2016, DOE realized its *Vision 2016*, demolition of all five gaseous diffusion buildings at ETTP. This milestone marked the first time that an entire uranium enrichment complex has been demolished. The landmark cleanup included deactivation and demolition of 418,064 m² (4.5 million ft²) of radiologically and chemically contaminated facilities, and disposal of more than 55,000 truckloads of debris.

Fulfillment of *Vision 2016* was a major step toward completing ETTP cleanup by 2020. To attain 2020 cleanup, DOE and its cleanup contractor, URS | CH2M Oak Ridge LLC (UCOR), must complete demolition of the following areas:

- Poplar Creek Facilities
- K-731 Switch House
- Building K-1037
- Central Neutralization Facility
- K-1200 Complex
- Toxic Substances Control Act Incinerator facilities
- Balance of Site Facilities

In addition, DOE will complete all remedial actions in accordance with current Records of Decision (RODs); as well as cleanup activities involving surface water, sediment, and groundwater that will be addressed in a final sitewide ROD. All waste, including soils, debris, and rubble from demolition and remediation activities, will be dispositioned.

Final cleanup of ETTP further advances DOE's goal for reindustrialization of the site as a private sector industrial park. With risks reduced, hazards removed, and the environment restored, DOE can transfer usable ETTP building and land assets to the community for redevelopment and reuse. A history center, equipment building, viewing tower, and wayside exhibits will tell the story of the site, honoring its contributions to the nation's defense and energy needs. Approximately 1,214 ha (3,000 acres) of adjoining lands, now the Black Oak Ridge Conservation Easement (BORCE), will be used for conservation and recreational purposes, including greenways and trail systems.

INTRODUCTION

Oak Ridge first made history as the center of operations for the Manhattan Project, established in 1942 to aid the war effort. K-25, a gaseous diffusion facility on what is now the 890-ha (2,200-acre) ETTP, was built to produce weapons-grade enriched uranium, which would fuel one of two atomic bombs that would end World War II.

In 1955, the K-25 complex had grown to include gaseous diffusion buildings K-25, K-27, K-29, K-31, and K-33, which comprised a multi-building production chain. Because of these operations, ETTP has a legacy of radiological and chemically contaminated buildings, soil, sediment, and groundwater.

Following shutdown of gaseous diffusion equipment at Oak Ridge in 1985, DOE—in partnership with the Tennessee Department of Environment and Conservation (TDEC), The U.S. Environmental Protection Agency (EPA), the citizen-based Oak Ridge Site Specific Advisory Board, and other interested stakeholders began a major environmental cleanup effort at the site to reduce risk to human health and the environment. The cleanup has been guided by publicly supported RODs issued under CERCLA. A final sitewide ROD is under development and will identify the final cleanup and environmental monitoring activities that are required for the site.

In 2016, DOE completed demolition of the site's fifth and final gaseous diffusion facility, Bldg. K-27, as part of its *Vision 2016* (see Fig. 1). This marked the first time that an entire uranium enrichment complex had been demolished, eliminating environmental hazards and paving the way for future economic development.

With the fulfillment of *Vision 2016*, DOE OREM is continuing to complete cleanup of ETTP and assist in transitioning it to the private sector. The goal is to complete cleanup at ETTP by 2020—an initiative known as *Vision 2020*. To achieve *Vision 2020*, DOE will demolish remaining facilities and structures, remediate contaminated environmental media, and dispose of the resulting waste. The UCOR schedule for *Vision 2020* is shown in Fig. 2.



Fig. 1. Demolition of Bldg. K-27 Completed *Vision 2016*.

REGULATORY STRATEGY

In 1992, DOE entered into a Federal Facility Agreement (FFA) with TDEC and EPA to implement remedial actions on the Oak Ridge Reservation (ORR) under the CERCLA process [1].

OREM is responsible for environmental restoration of this site through the deactivation and decommissioning (D&D) of site structures and remediation of contaminated environmental media including soils, surface water, sediments, and groundwater. To effectively manage and execute this responsibility, the site has been subdivided into the following areas:

- Zone 1—567 ha (1,400 acres) surrounding the industrial portion of the site
- Zone 2—324 ha (800 acres) in the main plant industrial areas

An Interim Record of Decision (IROD) was issued in 2002 for Zone 1 remediation activities, including removal of contaminated soil and burial ground sources, and disposal of contaminated surface debris piles to a depth of 3 m (10 ft) for the protection of industrial workers [2].

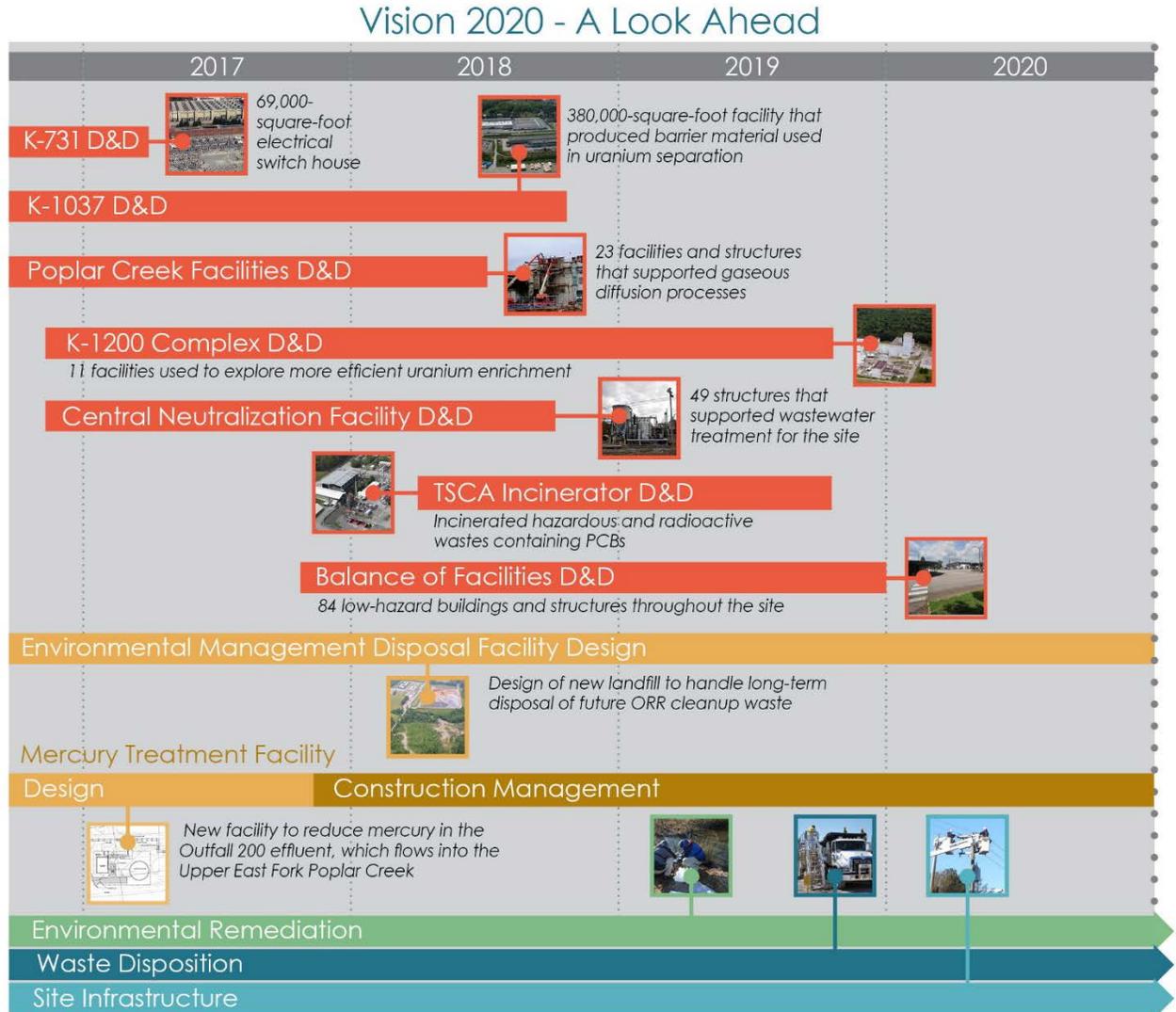


Fig. 2. UCOR Contract Schedule for *Vision 2020*.

In 2005, a ROD was issued for the remediation of Zone 2 to address soil and subsurface structures within the main plant area [3].

ACHIEVING VISION 2020

The Work

Deactivation and Demolition (D&D) of Remaining Facilities

Figure 3 illustrates the current status of D&D efforts. To achieve 2020 cleanup, D&D crews will demolish the site's remaining 450-plus facilities and structures, totaling approximately 185,800 m² (2 million ft²). Major facilities include:

1. **Poplar Creek Facilities.** The Poplar Creek Facilities project consists of approximately 50 structures that supported operations in the K-27 and K-29 Facilities. Additional support facilities within this scope include the K-1203 wastewater treatment operations, as well as structures used for a variety of processes including sandblasting and painting, oil storage, and water pump houses. Also included are the uranium hexafluoride (UF₆) and utility tielines in the Poplar Creek area, and between K-25/K-27, and from K-27 to K-631, K-633, and K-1232. **Major challenge:** Disposition of legacy chemicals.
2. **Building K-731.** The approximately 6,410-m² (69,000-ft²) electrical switch house supplied power to the K-27 and K-29 Buildings. (96 percent complete through December 2016)
3. **Building K-1037.** The K-1037 Building produced barrier material that was used to separate U-235 and U-238 in the uranium enrichment gaseous diffusion process. **Major challenge:** Security declassification.
4. **Central Neutralization Facility (CNF).** The CNF was an industrial wastewater treatment facility. This project encompasses approximately 45 structures, including buildings, containment and storage tank facilities, and support trailers. **Major challenge:** Environmental controls for demolition activities.
5. **K-1200 Centrifuge Complex.** These 11 facilities were used to explore a more efficient uranium enrichment alternative to the gaseous diffusion process. **Major challenges:** Availability of Q-cleared personnel and high-reach demolition.
6. **Toxic Substances Control Act (TSCA) Incinerator.** The TSCA Incinerator, which operated from 1991 to 2010 and treated more than 15.8 million kg (35 million lb) of waste, was a key treatment location for radioactive polychlorinated biphenyl (PCB) and hazardous wastes. The D&D project will consist of approximately 50 structures, includes K-1425, Waste Oil Storage; K-1430, TSCA Maintenance Shops; K-1435-A, Office/Lab/Control Building; K-1435-B, Drum Storage and Drum Handling; K-1435-C, Tank Farm and Drum Storage; and other facilities for waste storage areas, office trailers. **Major challenge:** PCB- and radiological-contaminated piping.
7. **Balance of Site Facilities.** The Balance of Site Facilities project scope includes removal and/or demolition of approximately 270 remaining site structures. This project will consist of nine major facilities (including K-1414, K-1317, K-2500-H, K-2500-G, K-1095, K-1098-F, K-892, K-

1423, and K-1034-A), site portals, site support towers, and miscellaneous other above-grade facilities including, but not limited to, storage facilities, pump and valve housings, and job trailers. **Major challenge:** Efficient demolition at multiple facilities spanning the site footprint.

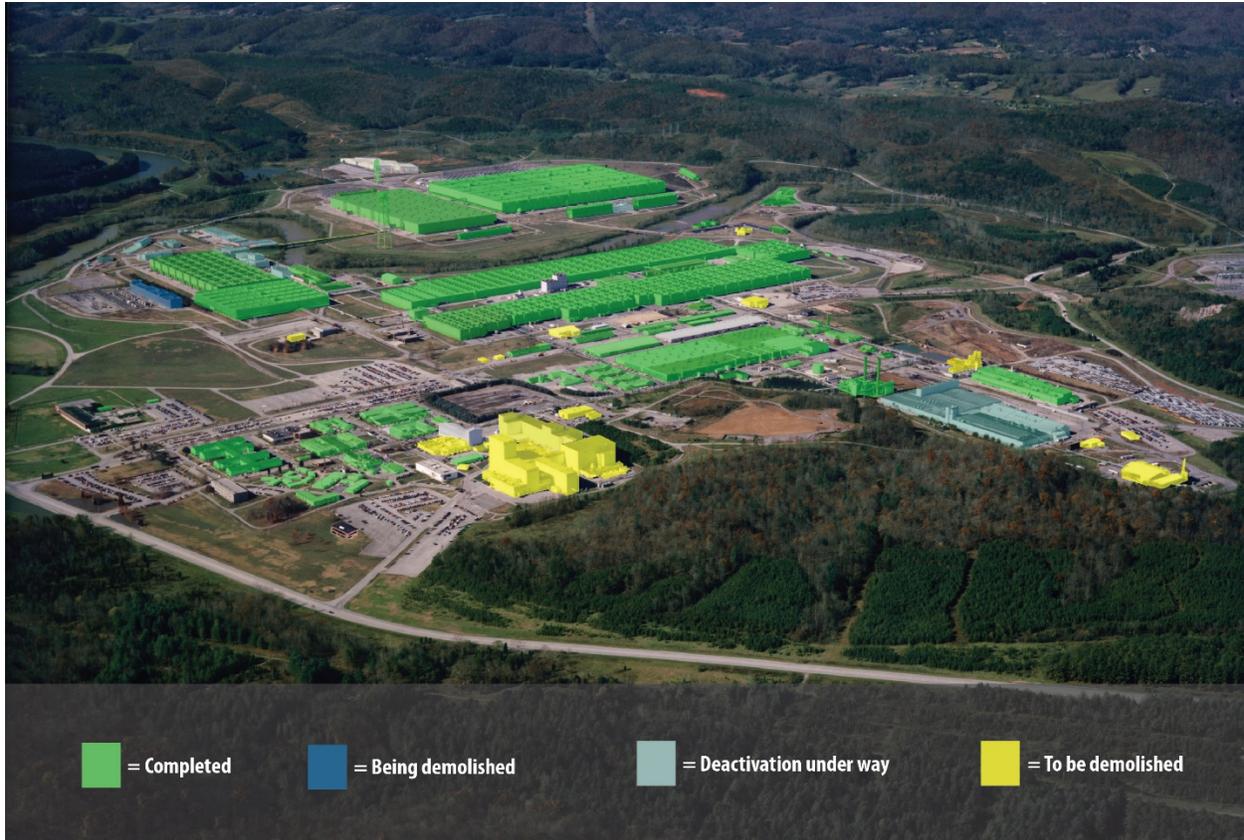


Fig. 3. D&D of remaining facilities at ETTP is underway.

Environmental Remediation

To achieve *Vision 2020*, crews will clean up the Zone 1 and 2 areas, which will address contaminated soil, buried waste, and subsurface structures (including building slabs). Cleanup of contaminated soils, down to 3 m (10 ft), and groundwater contamination sources ensures the area is suitable for reuse and no longer poses health or environmental risks. UCOR will use the existing D&D workforce to execute the environmental scope—retaining valuable skills and saving dollars. The environmental remediation work scope includes:

- **Buffer Zone.** Commonly known as Zone 1, this 567-ha (1,400-acre) area surrounds the main process facilities. Work includes capping the 770 burial ground and performing targeted soil excavations.
- **Building Zone.** Referred to as Zone 2, this heavily industrialized, approximately 324-ha (800-acre) footprint contained the five gaseous diffusion plants, main plant, laboratory, and disposal areas, as well as maintenance shops and other ancillary structures. Work includes:

- **Mitchell Branch.** Mitchell Branch stream cleanup, soil characterization and excavation, groundwater remediation, and land use controls.
- **K-25 Footprint.** Work includes evaluation of the slab and underlying soil currently under way to support cleanup goals and historic preservation efforts.
- **K-27/29/Poplar Creek Footprint.** Work includes evaluation of slabs and underlying soil currently underway to support cleanup goals and historic preservation efforts.
- **Main Plant.** Work includes evaluation of the slabs and underlying soil in the central plant areas formerly housing the K-1006 laboratory, the Centrifuge Facilities, and administrative office space.
- **Sitewide ROD.** Work includes groundwater cleanup and obtaining final regulatory approval.^a

Relocation of Site Personnel and Materials

To complete building demolition and remedial actions, site personnel, materials, supplies, equipment and support functions must be relocated off the site. This move will be completed in a series of strategically phased moves, timed to accommodate the DOE demolition and closure schedule.

Site Infrastructure Transfer

To enable DOE to complete its mission of closing the former K-25 Site and providing the area to private industry, site utilities must be code-compliant and transferrable. Much of the site's utility systems are decades old—built to now-obsolete standards. Accordingly, prior to transfer of site utilities, such as the electrical system to the City of Oak Ridge, these systems must be upgraded for safety and health reasons.

Waste Disposition

Cleanup includes the disposition of wastes, including soils, debris, and rubble from demolition and remediation activities. UCOR manages onsite disposal facility operations at the Environmental Management Waste Management Facility (EMWMF) and the ORR Landfill at the Y-12 National Security Complex (Y-12). To complete the cleanup of ETTP, 594,653.7 m³ (21 million ft³) of waste are projected to need characterization, packaging, and transportation either to the EMWMF or offsite for disposal.

^aCleanup activities related to the sitewide Record of Decision will extend beyond 2020.

ENABLING INVESTMENT-WORTHY RESULTS

Safe Performance

Safety remains the foundation for cleanup success at ETTP. Building on the robust safety culture that enabled 2015 DOE Voluntary Protection Program (VPP) Star site designation, given to only the safest sites in the DOE complex, UCOR will continue safe accomplishment of work through worker involvement and management commitment applied to every task.

Through 2016, the UCOR team reached 8.0 million consecutive hours worked without a lost workday. Additionally, its total recordable case rate was 0.34 per 100 workers. Through programs such as “Mission Possible: ZERO,” workers’ safety observations increased by 200 percent (Fig. 4).

Partnerships

UCOR will continue initiatives to strengthen working relationships with key partners, including DOE, local labor organizations, small businesses, regulators, and the community at-large. These strong partnerships will help ensure the continued high level of support necessary to successfully complete one of the largest, most challenging cleanup operations in the DOE complex.

Delivery Excellence

To achieve *Vision 2020*, UCOR will continue to be a good steward of the taxpayer funds it receives, continuously delivering projects ahead of schedule and under budget. Through December 2016, UCOR has delivered \$1.638 billion worth of work for \$1.484 billion. That translates to \$1.10 of work for every \$1.00 spent (Fig. 5).

CONCLUSION—THE END STATE

In 2020, the ETTP skyline will look markedly different (see Fig. 6). The gaseous diffusion plants, centrifuge complex, and hundreds of other facilities and structures will have been demolished. The wastes will be removed and soils remediated.

With risks reduced, hazards removed, and the environment restored, DOE will have



Fig. 4. UCOR’s safety culture is the foundation for cleanup success.



Fig. 5. UCOR project performance.

transferred ownership of many site buildings and land assets to the community for redevelopment and reuse. Portions of the land will become part of BORCE, used for conservation and recreational purposes. A history center, equipment building, viewing tower, and wayside exhibits will tell the story of the K-25 Site, honoring its defense, energy, and cleanup contributions over the past 70 years.



Fig. 6. Conceptual rendering of ETTP end use.

REFERENCES

1. DOE/OR-1014. *Federal Facility Agreement for the Oak Ridge Reservation*, 1992, Environmental Protection Agency-Region 4, U.S. Department of Energy, and Tennessee Department of Environment and Conservation, Washington, D.C.
2. DOE/OR/01-1997&D2. *Record of Decision for Interim Remedial Actions for Selected Contaminated Areas Within Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee*, 2002, Bechtel Jacobs Company LLC, Oak Ridge, TN.
3. DOE/OR/01-2161&D2. *Record of Decision for Soil, Buried Waste, and Subsurface Structure Actions in Zone 2, East Tennessee Technology Park, Oak Ridge, Tennessee*, 2005, Bechtel Jacobs Company LLC, Oak Ridge, TN.