
CHAPTER 4: AFFECTED ENVIRONMENT

The descriptions of the affected environment provide a basis for understanding the direct, indirect, and cumulative effects of the Y-12 proposed actions and alternatives. The scope of the discussion varies by resource to ensure that all relevant issues are included.

For land resources, geology and soils, biological resources, and cultural and paleontological resources, discussions of the Y-12 Site and ORR are included along with descriptions of the potential areas within the Y-12 Site that could be affected by the Y-12 SWEIS alternatives. This information provides a basis for understanding both direct effects and the overall resource base that could be affected by ancillary activities that may be defined in later stages of the Modernization Program (LMES 1999c).

Ambient conditions are described for air/noise and water resources. Discussions focus on air/noise conditions at the ORR and Y-12 Site boundary and the surface water bodies and groundwater aquifers that could be affected. This information serves as a basis for analyzing important air/noise and water quality parameters to obtain results that can be compared to regulatory standards.

Socioeconomic conditions are described for the counties and communities that could be affected by regional population changes associated with the Y-12 SWEIS proposed actions. The affected environment discussions include projections of regional growth and related socioeconomic indicators. The described region is large enough to account for growth related to direct project employment as well as secondary jobs that may be created by the proposed actions.

In addition to those natural and human environmental resources discussed above, the affected environment sections include a number of issues related to ongoing DOE activities at ORR and Y-12. These issues involve facility operations and site support infrastructure, intersite transportation of nuclear materials, waste management, and radiological and hazardous chemicals impacts during normal operation and from accidents. Where reasonably foreseeable changes to any of these factors can be predicted, they are discussed.

4.1 LAND USE

4.1.1 Land-Use Designations

Oak Ridge Reservation. The ORR consists of 13,943 ha (34,513 acres) and is located mostly within the corporate limits of the city of Oak Ridge, approximately 24 km (15 mi) west of the city of Knoxville. Approximately one-third of ORR is occupied by the facilities of Y-12, ORNL, and ETTP. All of this land is titled to the United States of America and under the jurisdictional control of DOE for administration and management. Figure 4.1.1–1 shows the location of ORR.

Ownership of ORR. Originally, the Federal Government acquired 23,664 ha (58,575 acres) of land between 1942 and 1947. However, 9,721 ha (24,062 acres) were transferred over the years with 25 percent (almost 2,408 ha [5,960 acres]) going to the city of Oak Ridge for developmental purposes. The transferred land included 109 ha (270 acres) for schools; 438 ha (1,083 acres) for utilities, drainage, and roads and streets; 596 ha (1,475 acres) for municipal properties; and 12 ha (29 acres) for public housing. Most of the remaining land tracts were conveyed to the State of Tennessee for health, forestry, agricultural research, and a biomedical graduate school (935 ha [2,315 acres]), private ownership (5,125 ha [12,686 acres]), and the Tennessee Valley Authority (TVA) (1,209 ha [2,992 acres]). Anderson County (11 ha [28 acres]), the town of Oliver Springs (4 ha [9 acres]), and Federal agencies (25 ha [63 acres]) also received land tracts (LMER 1999a, Hartman 1999). Land conveyed for private entities and homeowners totals 5,136 ha (12,692 acres). The reservation's boundaries, both past and present, are shown in Figure 4.1.1–2.

Source: DOE 1996e.

FIGURE 4.1.1-1.—Oak Ridge Reservation, Tennessee, and Region.

Source LMER1999a.

FIGURE 4.1.1-2.—Original U.S. Department of Energy Land Purchase and Current Reservation Boundaries.

As a result of a decision by the Secretary of Energy in 1979 allowing DOE to make financial assistance payments to the city of Oak Ridge for a 5-year period under the *Atomic Energy Community Act* of 1955, the city submitted a self-sufficiency plan which proposed that DOE sell land to the city for industrial/commercial development. This allowed direct transfer of excess land to the city at fair market price rather than turning it over to the General Services Administration for disposal. The self-sufficiency program ended; however, those parcels that were under review at the time were “grandfathered,” thus permitting DOE to still consider transfer of land to the city of Oak Ridge should it become excess to the needs of DOE (LMER 1999a).

Current Land Use at ORR. DOE classifies land use on the ORR according to five categories: Institutional/Research, Industrial, Mixed Industrial, Institutional/Environmental Laboratory, and Mixed Research/Future Initiatives (LMER 1999b). Development on the ORR accounts for about 35 percent of the total acreage leaving approximately 65 percent of the Reservation undeveloped (DOE 1999b).

Land bordering ORR is predominantly rural, with agricultural and forest land dominating. The city of Oak Ridge has residential areas primarily along the northern and eastern boundaries. There are four residential areas along the northern boundary that have several houses within approximately 30 m (98 ft) of the ORR boundary. There are a few residences within Roane County that border the ORR to the west. The Clinch River, which confines the ORR to the south and southeast, forms a boundary between Knox County, Loudon County, and portions of Roane County.

Remote sensing data from 1994 showed 70 percent of the ORR in forest cover while 20 percent was transitional, consisting of old fields, agricultural areas, cutover forest lands, roadsides, and utility corridors (LMER 1999a). Less than 2 percent of ORR remains as open agricultural fields. Currently 234 ha (580 acres) of wetlands on the ORR provide water quality benefits, stormwater control, wildlife and rare species habitats, and landscape and biological diversity. About 1,414 ha (3,500 acres) are used as waste sites or are remediation areas (LMER 1999a).

Most of the ORR is designated a Tennessee Wildlife Management Area through a cooperative agreement between DOE and the Tennessee Wildlife Resources Agency (TWRA). The agreement provides protection of wildlife habitat and species as well as restoration of other wildlife habitat and species. Wildlife management is carried out under these agreements by TWRA in cooperation with ORNL’s Environmental Sciences Division.

In 1980, DOE established the Oak Ridge National Environmental Research Park (Research Park) which includes approximately 8,000 ha (20,000 acres) of ORR. The Research Park is an ORNL user facility which serves as an outdoor laboratory for the study of present and future impacts on the environment stemming from the various missions at ORR. Major environmental field research areas within the Research Park include (LMER 1999a):

- Walker Branch Watershed
- Free-Air CO₂ Enrichment Facility
- Global Change Field Research Facility
- Bear Creek Valley Hydrology Field Sites
- Melton Branch Watershed Field Sites
- National Oceanic and Atmospheric Administration Field Research Facility
- Natural and Accelerated Bioremediation Field Research Center

In 1986, seven State Natural Areas were registered on the ORR through an agreement between DOE and TDEC (LMER 1999a). Qualification for this designation requires meeting specific criteria which may include existence of rare plant species, animal species, or community types on the premises. Figure 4.1.1–3 shows the research and forested areas within the ORR.

Source: LMER 1999a.

FIGURE 4.1.1-3.—Research Areas and Forested Areas.

On June 23, 1999, Secretary of Energy Bill Richardson set aside 1,214 ha (3,000 acres) of ORR as a conservation and wildlife management area in an agreement between DOE and TWRA. The proclamation calls for the land to be cooperatively managed for preservation purposes under a use permit. This area, called the Three Bend Scenic and Wildlife Management Refuge Area, is located in the ORR buffer zone on Freels, Gallaher, and Solway bends on the north shore of Melton Hill Lake in Anderson County. TWRA, in consultation with DOE, will prepare a cooperative agreement to serve as a natural resources management plan to establish guidelines for managing this area in the hopes to preserve and enhance its natural attributes.

Two major firearms ranges, along with their surface danger zones or buffer areas, encompass approximately 1,010 ha (2,500 acres) on ORR. The range areas, which are located at the south side of Bear Creek Road about 8 km (5 mi) west of Y-12, extend from the DOE ORR boundary on the west to Highway 95 on the east and from Bear Creek Road on the north to the Clinch River on the south. The eastern portion of the site is operated by DOE's Transportation Safeguards Division Southeastern Courier Section and consists of four individual live-fire ranges and associated support facilities. The western portion of the range site, formerly operated by LMES, is now operated for DOE by Wackenhut Services International (effective January 10, 2000) as a Central Training Facility and consists of an indoor range, five outdoor ranges, a shooting tower, three live-fire facilities, and assorted tactical facilities.

Federal statutes require each state, tribal, or local government to protect its citizens from releases of hazardous materials (40 CFR 301, 302, 304, and 355). Emergency planning zones spanning 8 km (5 mi) are defined around ORNL, ETTP, and Y-12. Each zone is then subdivided into emergency planning sectors, with each defined by easily recognizable terrain features (LMER 1999a).

Under an agreement with DOE and the State of Tennessee, the city of Oak Ridge transports municipal biosolids to approved sites on ORR and applies the material as a soil conditioner and fertilizer. The city of Oak Ridge has been applying biosolids at selected sites on ORR since 1983. Municipal biosolids are not considered RCRA waste but are regulated by EPA under 40 CFR 503 of the *Clean Water Act* regarding disposal, including risk-based, metal-loading criteria for the receiving soil. Since the application process is occurring on federally-owned land, DOE provides oversight of the process. However, daily operations, including permitting, disposal, sampling, and monitoring at each site, are the responsibility of the city of Oak Ridge. The application program currently utilizes a total of 65 ha (160 acres); approximately 20 ha (50 acres) have been closed due to self-imposed solids loading limits rather than exceeding metal or radionuclide limits (Bechtel Jacobs 1999). Table 4.1.1-1 shows all previously identified and approved sites on ORR along with the status of each.

Although ORR is not open to the public, opportunities for public use of numerous facilities and land areas do exist. The following are examples of land/facilities open to public use (LMER 1999a):

- New Bethel Church Interpretive Center (historical site)
- Walks and tours including Community Day, which allows public access to ORNL facilities and land areas such as Freels Bend/Solway Bend (bird-watching, wildflower walks, etc.)
- Ecological and Physical Sciences Study Center
- ORNL Graphite Reactor (National Historic Landmark)
- Clark Center Park (or Clark Center Recreation Area)
- George Jones Memorial Church
- ETTP Visitors Overlook and Y-12 Visitors Center
- North Boundary Road Greenway
- Gallaher Bend Greenway

DOE has also granted a license for TWRA to sponsor and manage hunting on the ORR. Figure 4.1.1-4 shows the locations of some of the public, educational, and recreational opportunities on ORR.

TABLE 4.1.1-1.—Biosolids Application Sites^a

Site Name	Site No.	Total Acres On-site	Tons Allowed per Year	Total Tons ^b Life of Site	Total Tons to Date	Remaining Capacity in Tons	Years Remaining On-site
McCoy	1	20	Closed	Closed	Closed	Closed	Closed
Pine Plantation	2	20	Closed	Closed	Closed	Closed	Closed
High Pasture	2	25	94	1,250	483	767	8.2
Rogers	2	30	142	1,500	765	735	5.2
Scarboro	3	45	167	2,250	960	1,290	7.7
Upper Hayfield #1	3	25	93	1,250	540	710	7.6
Upper Hayfield #2	3	20	69	1,000	505	495	7.7
Future Site	4	N/A	N/A	N/A	N/A	N/A	N/A
Future Site	5	N/A	N/A	N/A	N/A	N/A	N/A
Future Site	6	N/A	N/A	N/A	N/A	N/A	N/A
Future Site	7	N/A	N/A	N/A	N/A	N/A	N/A
Site #8	8	12	Closed	Closed	Closed	Closed	Closed
Watson Road	9	60	134	3,000	929	2,071	15.4
Future Site	10	N/A	N/A	N/A	N/A	N/A	N/A
Cottonwoods	11	17	Closed	Closed	Closed	Closed	Closed
Future Site	12	N/A	N/A	N/A	N/A	N/A	N/A
Future Site	13	N/A	N/A	N/A	N/A	N/A	N/A
Future Site	14A	N/A	N/A	N/A	N/A	N/A	N/A
Future Site	14B	N/A	N/A	N/A	N/A	N/A	N/A

Active Site Total Tonnage to Date: **4,182**

^a Information is based on COR Sludge Application Site Monitoring Report in Appendix I.

^b Calculations are based on a maximum of 50 tons (dry wt) applied x the number of acres on the site.

Source: Bechtel Jacobs 1999.

FIGURE 4.1.1-4.—Public, Educational, and Recreational Opportunities.

Source: LMER 1999a.

4.1.2 Future Land Use and Leasing Agreements

Future land use of ORR will continue to incorporate the principles associated with ecosystem management. For the most part, these land uses will expand and build on current uses, not replace them. New future land uses include research facilities, environmental research and partnership areas, waste management facilities, future initiatives, transportation improvements, education and recreation, and land transfers and lease areas (LMER 1999a).

Future research facilities include:

- *Spallation Neutron Source (SNS)*. Location requires approximately 45 ha (110 acres) which will encompass a new linear accelerator facility, user facilities, central utility building, support laboratories and shops, and a central office building as well as a 132,500-L (35,000-gal) fire water reservoir, electric service switchyard, and stormwater retention pond required to service the facility. As a result of the *Final Environmental Impact Statement for the Construction and Operation of the Spallation Neutron Source*, a ROD was issued for construction and operation where ORR, more specifically Chestnut Ridge, was selected as the site. Funding has been approved and construction is underway.
- *Joint Institute for Neutron Sciences*. Joint venture with the University of Tennessee, the State of Tennessee (the institute providing funding for the facility), and DOE for a user facility which **would** serve both the High Flux Isotope Reactor and the proposed SNS. The site **would** be integrated into the SNS campus. Funding has been approved and construction is underway.
- *Laboratory for Comparative and Functional Genomics*. Facility to house 50,000 mice in support of ORNL's mouse genetics mutagenesis. The laboratory **would** be adjacent to Life Sciences Division Building 1062 at the west end of ORR.
- *Oak Ridge Institute for Sciences and Education*. Future development and expansion for the Institute at Scarboro Operations Site, currently covering approximately 100 ha (247 acres).
- *ORNL Expansion*. Bethel Valley areas east and west of the central ORNL site are identified for future R&D use to include support and service facilities and **would** cover a total of 283 ha (700 acres).
- *Engineering Technology Complex*. Planned for the main Bethel Valley campus; more specifically, a **privately-funded building, a state-funded building, and a DOE-funded parking lot and other Infrastructure** between the 4000 and 6000 areas. **The Complex Facilities would be leased. Construction is planned in the 2001-2002 time frame.**
- *Fusion Materials Irradiation Facility*. Proposed to house a linear accelerator, a supply system for lithium targets, and an experimental complex for irradiation and handling test specimen assemblies. It **would** be used to address the technological problems associated with the development of fusion reactor materials. This project is still in the early planning stages without funding as of yet. However, plans to relocate the Fusion Energy Division to the 7600 area in the next 3-4 years **would** open up construction of a GPP funded office building in the 7600 area and modifications/additions to other facilities for preparation of relocation.

Source: LMER 1999a.

FIGURE 4.1.2-1.—*New Future Use at Oak Ridge Reservation.*

- *Melton Valley R&D Facilities (Ramsey Drive Site)*. Approximately 16 ha (39 acres) adjoining the proposed Fusion Materials Irradiation Facility have been identified for future use. Specific facility designations are not yet determined (LMER 1999a).

New field research areas, in addition to that previously mentioned within the Research Park, include Bull Bluff watersheds, watershed manipulation experiments; Copper Ridge Research Area, forest nutrient dynamics; Freels Bend Research Area, agricultural research; Raccoon Creek Research Area, global change research; White Wing Research Area, biodiversity, global change, and fundamental ecological process research; Pine Ridge Experimental Catchments, expansion to Walker Branch watershed research; and Unexploded Ordnance Research and Demonstration Area, testing and validation methodology of locating unexploded ordnance (LMER 1999a).

Proposed waste management facilities, including the Environmental Management Waste Management Facility at East Bear Creek and the Transuranic Waste Packaging Facility at ORNL, are in various stages of planning or design/construction (LMER 1999a).

The following proposed transportation improvements have been proposed, or are under construction by the Tennessee Department of Transportation (DOT): I-75/I-40 connector, Highway 58 widening, and Bethel Valley Road/Illinois Avenue interchange (LMER 1999a). Figure 4.1.2–1 shows some of the proposed land uses for the ORR.

Also, the following are areas that have been identified by DOE that have recently been, or will soon be, leased or re-leased (LMER 1999b):

Public Areas:

- 3.5 ha (8.5 acre) parcel of Federal land near Wisconsin Avenue in Oak Ridge to the city of Oak Ridge for a park

Industrial Development:

- Parcel ED-1, located near the former K-25 Plant, was leased in April of 1998 to the Community Reuse Organization of East Tennessee, a private-sector organization established by DOE to lease underutilized facilities on ORR, for industrial development. The parcel is now known as the Horizon Center.
- Parcel ED-2, 6 ha (15 acres) leased to the Community Reuse Organization of East Tennessee in September of 1997
- 40 ha (100 acres) of Parcel 8, lease pending
- Tower Shielding Facility (10.5 ha [26 acres] leased in 1998 to BioNeutrics, Inc.)
- Boeing Property. Oak Ridge Properties has purchased approximately 492 ha (1,216 acres) from the Boeing Company at the former K-25 Plant and has proposed a mixed-use development plan which would include approximately 1,500 residential units including houses, apartments/condominiums, about 187 ha (450 acres) of industrial zoned property, and a shopping area (*Oak Ridge* 12/10/99, 12/17/99, and 01/04/00). The Boeing Property was rezoned from industrial to mixed-use in February 2000. The Oak Ridge Land Company has completed the acquisition of a 74-ha (182-acre) floodplain strip abutting the Boeing Property for use as a buffer zone and green space. DOE previously controlled the floodplain strip and prepared an EA on the transfer of the property prior to the sale of the parcel to the abutting landowner.

- DOE is considering leasing Parcel ED-3, an 187 ha (450 acre) piece of land located south of the former K-25 Site, to be developed for mixed use purposes. A buffer zone of approximately 615 ha (1,520 acres) would surround the site. The land would be transferred to the Community Reuse Organization of East Tennessee and leased to private companies.

Mobile Service Antenna Sites:

- Commercial service antennas proposed for three appropriate sites at ORR (attachment to existing structures when possible). BellSouth has erected a tower in the ETTP area while SprintCom has requested use of the Chestnut Ridge site (LMER 1999a).

Y-12. The Y-12 Area of Responsibility on the ORR covers a total of 2,197 ha (5,428 acres). The main area of Y-12 is largely developed and encompasses 328 ha (811 acres), with 255 ha (630 acres) fenced, (4 km [3 mi] long and 2 km [1 mi] wide), with approximately 580 buildings that house about 1 million m² (7.6 million ft²) of laboratory, machining, dismantlement, and R&D areas (LMER 1999b). For the purposes of this SWEIS, the boundary of analysis includes a total of approximately 1,472 ha (3,638 acres). As a result of the site's defense support, manufacturing, and storage facilities, the land in the Y-12 area is classified in DOE's industrial category.

The Research Park surrounds the Y-12 SWEIS area. Areas outside the main plant site but within its area of responsibility are used primarily for a buffer area as well as for environmental restoration and waste management activities. There are limited forested areas within the Y-12 boundary. There are no wetlands located within the Y-12 fenced boundaries. Land outside the SWEIS area includes buffer for the Walker Branch watershed long-term research area and other environmental research sites.

There are a number of active waste management facilities within the Y-12 SWEIS area of analysis. **Some of the major facilities** include the following:

- Disposal Area Remedial Action (liquid storage) facility. Collection of contaminated groundwater as a result of cleanup efforts in Bear Creek Valley
- Above-Ground Low-Level Waste Storage Facility
- Industrial Landfill V. Nonhazardous, nonradioactive industrial solid waste
- Construction/Demolition Landfill VI. Construction and demolition debris
- Construction/Demolition Landfill VII. Additional storage of construction and demolition debris (SPAS 1988)

These **facilities and more** are discussed in detail in **Section 4.11 and Appendix A.5, Waste Management Activities.**

The environmental restoration Y-12 Project includes two areas that are located within the Y-12 SWEIS physical study area of analysis: the Bear Creek and UEFPC watersheds. The boundaries of the Bear Creek watershed extend west from a topographic high near the west end of the plant to the point where Bear Creek exits the valley near Highway 95. Release points within the Y-12 SWEIS area of analysis include the (former) S-3 Pond Site, Sanitary Landfill I, Boneyard/Burnyard, the Oil Landfarm, the Bear Creek Burial Grounds, and the Rust Spoil Area. These units were used in the past as the primary area for disposal of various types of hazardous and nonhazardous wastes generated at Y-12. The UEFPC watershed is bounded by the base of Pine Ridge to the north and by Chestnut Ridge to the south and extends westward, abutting the Bear Creek watershed, and eastward to the DOE property line (LMER 1999a). These watersheds are shown in Figure 4.1.2-2.

Some sludge land farming activity is conducted to the south of the Y-12 National Security Complex. Figures 4.1.2-3 and 4.1.2-4 present the locations of the sludge land farming sites and environmental restoration activities, respectively.

The ORR End Use Working Group has recommended the following land use for Y-12: “the western area of the Y-12 Plant is expected to remain controlled industrial property. As opportunity arises, national security activities should be concentrated in the western area to allow for the broadest possible use of the rest of the plant (PEC 1998).”

FIGURE 4.1.2-2.—Watershed Areas on Oak Ridge Reservation.

Source: LMER 1999a.

FIGURE 4.1.2-3.—Sludge Land Application Sites.

Source: Tetra Tech, Inc./SPAS 1998.

Source: Tetra Tech Inc./SPAS 1998.

FIGURE 4.1.2-4.—Active Waste Management Facilities and Environmental Restoration Projects.