

The Oak Ridge Reservation

# Annual Site Environmental Report *Summary*



2009



U.S. DEPARTMENT OF  
**ENERGY**



## Message from the Department of Energy and the National Nuclear Security Administration

Each year the Department of Energy conducts environmental monitoring at each of the three sites on the Oak Ridge Reservation: the Oak Ridge National Laboratory, the East Tennessee Technology Park, and the Y-12 National Security Complex. The information we collect is presented in this summary report, the data volume, and the more comprehensive publication entitled the *Annual Site Environmental Report*.

Each of these reports is highly important because it allows DOE to clearly and concisely explain our environmental-monitoring programs to our stakeholders. The environmental monitoring also assists us in achieving our mission in science, national security, environmental management, and nuclear energy. The information presented in this summary shows that Oak Ridge is a safe community for its citizens, and part of the reason for that is the Department's unwavering focus on safety. The work at each of our facilities is highly detailed and technically complex, but our commitment is to perform all of our activities safely. No matter what we do, our first priority is to protect the well-being of our workers, the surrounding communities, and the environment.

Once again, we would like to offer our sincerest appreciation to the students at Karns High School who worked to put together this summary document. On behalf of the entire Department of Energy, we congratulate each of you for your effort, enthusiasm, and willingness to support DOE with this project. We hope that you enjoy reading the *2009 Annual Site Environmental Report Summary*.

Handwritten signatures of Gerald Boyd and Ted Sherry.

Gerald Boyd  
Manager,  
Oak Ridge Office

Ted Sherry  
Manager,  
Y-12 Site Office

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*“One of the best parts of the field trip we took to the ORR was seeing the Graphite Reactor and all the old equipment that is still there. I felt so honored to be standing in the same place where 60 plus years ago great workers were rushing around to get their part of the job done. Many had no idea what great leaps in science they were working toward. To be wrapped up in all that history and to be right there was breathtaking. It made me so proud to be born in Tennessee.” – Michelle Miller*

### About the Annual Site Environmental Report

The Oak Ridge Reservation Annual Site Environmental Report is prepared and published each year to inform the public of the environmental activities that take place on the reservation and in the surrounding areas. It is written to comply with DOE Order 231.1A, Environment, Safety, and Health Reporting. This document has been prepared to present the highlights of the *Oak Ridge Reservation Annual Site Environmental Report 2009* in an easy-to-read summary format.

***The Oak Ridge Reservation Annual Site Environmental Report 2009 and this summary are on the World Wide Web at [www.ornl.gov/asr](http://www.ornl.gov/asr).***





KARNS HIG  
 Chemistry II Hon

Michelle Miller Vanessa Carnes Hannah David Wells Juthinant Pomanae  
 Kirsten Fox Kitts Carl Puteh Nicholas Creekmore Kenn McMahan Harris Barwick  
 Lexi Ferguson William Hawks Will Stafford Zac Hylton Lily Tavassoli  
 Melissa Dixon Jenny Tran Kati Tran

**Pictured Contributors**

Bottom: Amanda Peretich (teacher), Joan Hughes, Nicholas Creekmore, Lexi Ferguson

On dam: Vanessa Carnes, Will Stafford

Back row: Harris Barwick, David Wells, Kenn McMahan, Juthinant Pomanae, William Hawks, Zac Hylton, Kati Tran, Jenny Tran, Michelle Miller, Kirsten Fox, Hannah Kitts, Lily Tavassoli, Melissa Dixon



# What we learned Survey

1. What kind of work do you think is done at the DOE facilities in Oak Ridge?

- |  |                   |  |
|--|-------------------|--|
| <ul style="list-style-type: none"> <li>- To discover new radioisotopes and collect nuclear material such as U238 &amp; plutonium - 6</li> <li>- Developing parts for the nuclear bomb or building bombs - 8</li> <li>- Nuclear power plants - 1</li> <li>- Coal power production - 1</li> <li>- Research and experiments - 2</li> <li>- Energy research - 2</li> <li>- Make fertilizer - 1</li> <li>- Secret things - 1</li> <li>- Don't know - 3</li> </ul> | BEFORE<br>/ AFTER | <ul style="list-style-type: none"> <li>- Produce energy - 1</li> <li>- Help find new energy sources and develop products and processes to make the US a more energy efficient country - 2</li> <li>- Cleanup - 7</li> <li>- Weapons production - 4</li> <li>- Research for medical, isotope development - 2</li> <li>- Supercomputing - 2</li> <li>- Secure uranium storage - 5</li> <li>- Medical research and isotope development - 2</li> <li>- Environmental protection - 1</li> </ul> |
|--|-------------------|--|

2. How many different DOE installations or plants do you think there are in Oak Ridge - can you name them?

- |   |  |  |                   |  |
|---|--|--|-------------------|--|
| <ul style="list-style-type: none"> <li>- 3</li> <li>- 4</li> <li>- 5</li> <li>- 7-10</li> <li>- 10</li> <li>- 12</li> </ul> | <ul style="list-style-type: none"> <li>- 15</li> <li>- 15-20</li> <li>- 1</li> <li>- 40</li> <li>- hundreds</li> <li>- don't know</li> </ul> | <ul style="list-style-type: none"> <li>- ORNL</li> <li>- X-10</li> <li>- Y-12</li> <li>- UF-Battelle</li> <li>- Bull Run</li> <li>- Oak Ridge Plant</li> <li>- Can't name any</li> </ul> | BEFORE<br>/ AFTER | <ul style="list-style-type: none"> <li>- K25</li> <li>- Y-12</li> <li>- 3 installations (Y-12, ORNL, ETRF) - 17</li> </ul> |
|---|--|--|-------------------|--|

3. What government department is responsible for the facilities and activities on the Oak Ridge Reservation?

- |  |  |                   |  |
|--|--|-------------------|--|
| <ul style="list-style-type: none"> <li>- TVA - 1</li> <li>- DOE - 3</li> <li>- FBI - 1</li> <li>- ORNL - 1</li> <li>- Y-12 - 1</li> <li>- Department of War - 2</li> </ul> | <ul style="list-style-type: none"> <li>- MMSA, DOE, JFed - 1</li> <li>- Something to do with energy or supplies - 1</li> <li>- Don't know - 8</li> </ul> | BEFORE<br>/ AFTER | <ul style="list-style-type: none"> <li>- DOE - 17</li> </ul> |
|--|--|-------------------|--|

4. What do you plan to major in when you go to college?

- |   |  |                   |   |
|---|--|-------------------|---|
| <ul style="list-style-type: none"> <li>- Pre-Medicine - 5</li> <li>- Architecture - 1</li> <li>- Horticulture - 1</li> <li>- Liberal arts - 1</li> <li>- Chemical engineering - 2</li> <li>- Civil engineering - 1</li> <li>- Aerospace engineering - 2</li> <li>- Veterinary science - 1</li> <li>- Chemistry - 1</li> </ul> | <ul style="list-style-type: none"> <li>- Pharmacy - 1</li> <li>- Forensics - 1</li> <li>- Undecided - 2</li> </ul> | BEFORE<br>/ AFTER | <ul style="list-style-type: none"> <li>- Management - 1</li> <li>- Computer science - 1</li> <li>- Pre-medicine - 6</li> <li>- Chemical engineering - 2</li> <li>- English or writing - 1</li> <li>- Engineering - 3</li> <li>- Forensics - 1</li> <li>- Undecided - 2</li> </ul> |
|---|--|-------------------|---|

5. Do you think the government facilities in Oak Ridge cause harm to the local environment? If so what do you think the worst pollutant might be?

- |  |                   |   |
|--|-------------------|---|
| <ul style="list-style-type: none"> <li>- Yes, worst pollutants are waste materials - 2</li> <li>- Yes, don't know what contaminants might be - 1</li> <li>- Yes, worst contaminant is nuclear waste - 1</li> <li>- Yes, radiation is the worst pollutant - 2</li> <li>- Yes, chemicals are worst pollutants - 1</li> <li>- Yes, coal is the worst pollutant - 1</li> <li>- No - 4</li> <li>- Some - 1</li> <li>- Don't know - 4</li> </ul> | BEFORE<br>/ AFTER | <ul style="list-style-type: none"> <li>- No - 14</li> <li>- Yes - 3 (radiation - 2, airborne monoxide - 1)</li> </ul> |
|--|-------------------|---|

6. What do you think the term "environmental remediation" means?

- |   |                   |  |
|---|-------------------|--|
| <ul style="list-style-type: none"> <li>- Protecting or helping the environment recover from an accident - 1</li> <li>- Changing the environment using other means like radiation - 1</li> <li>- Conservation and environmental protection - 1</li> <li>- Curing the damage to the environment - 6</li> <li>- Fixing up the place - 2</li> <li>- Helping the environment - 2</li> <li>- No clue - 6</li> </ul> | BEFORE<br>/ AFTER | <ul style="list-style-type: none"> <li>- Clean-up of the environment - 17</li> </ul> |
|---|-------------------|--|

7. How do you think you might benefit from the government facilities located in Oak Ridge? (More than one response per person may be submitted)

- |  |                   |   |
|--|-------------------|---|
| <ul style="list-style-type: none"> <li>- Power plants which provide power to our homes - 4</li> <li>- Jobs and research opportunities - 2</li> <li>- Education and internships - 1</li> <li>- No idea - 9</li> <li>- Provide alternate forms of energy - 1</li> <li>- Protection in war - 1</li> <li>- New inventions - 1</li> </ul> | BEFORE<br>/ AFTER | <ul style="list-style-type: none"> <li>- Mutations and super powers - 1</li> <li>- Medical research and advancements - 7</li> <li>- Technological advancement - 2</li> <li>- Cheaper and more efficient energy options and products - 5</li> <li>- Provide nuclear fuel - 1</li> <li>- Job opportunities - 3</li> </ul> |
|--|-------------------|---|

## Production Team

Fall 2010 Chemistry II Honors Students,  
Karns High School

Amanda Peretich, Instructor,  
Karns High School

Joan Hughes, Project Director,  
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Creative Media, Oak Ridge National Laboratory  
(ORNL)-design, illustration, layout, editing,  
and photography (unless otherwise specified)

ORNL Photography, front cover photo:  
Black-crowned night heron



# History of the Oak Ridge Reservation

The Oak Ridge Reservation (ORR) area was first occupied by Native Americans more than 10,000 years ago, and members of the Overhill Cherokee tribe still lived in the East Tennessee region when European settlers arrived in the late 1700s. The settlers lived on farms or in one of the four small communities called Elza, Robertsville, Scarboro, and Wheat. In the early 1940s, approximately 1000 families inhabited the area.

In 1942, the area that was to become the ORR was selected for use in the Manhattan Project because the Clinch

River provided ample supplies of water, nearby Knoxville was a good source of labor, and the Tennessee Valley Authority (TVA) could supply the huge amounts of electricity needed. About 3000 residents received court orders to vacate within weeks the homes and farms that their families had occupied for generations. The site's wartime name was "Clinton Engineering Works."

The workers' city, named Oak Ridge, was established on the reservation's northern edge. The city grew to a population of 75,000 and was the fifth largest in Tennessee; however, it was not shown on any map. At the Y-12 Complex, south of the city, the electromagnetic separation method was used to separate uranium-235 from natural uranium. The K-25 plant, built on the reservation's western edge, used the gaseous diffusion method to enrich uranium by separating uranium-235 from uranium-238. This separation

method was based on the principle that molecules of a lighter isotope would pass through a porous barrier more readily than molecules of a heavier one. Near the reservation's southwest corner, about 16 km (10 miles) from Y-12, was a third facility, known as X-10 (or Clinton Laboratories), where the Graphite Reactor was built. The X-10 facility was a pilot plant for the larger plutonium production facilities built at Hanford, Washington. Two years after World War II ended, Oak Ridge was shifted to civilian control, under the authority of the US Atomic Energy Commission. In 1959, the city was incorporated, and the community adopted a city manager/city council form of government.

Since that time, the missions of these three major installations have continued to evolve, and operations have been adapted to meet the changing defense, energy, and research needs of the United States.

*"The leader of the Manhattan Project, General Groves, was a hard guy to work for, but many people admired him." – Kirsten Fox*

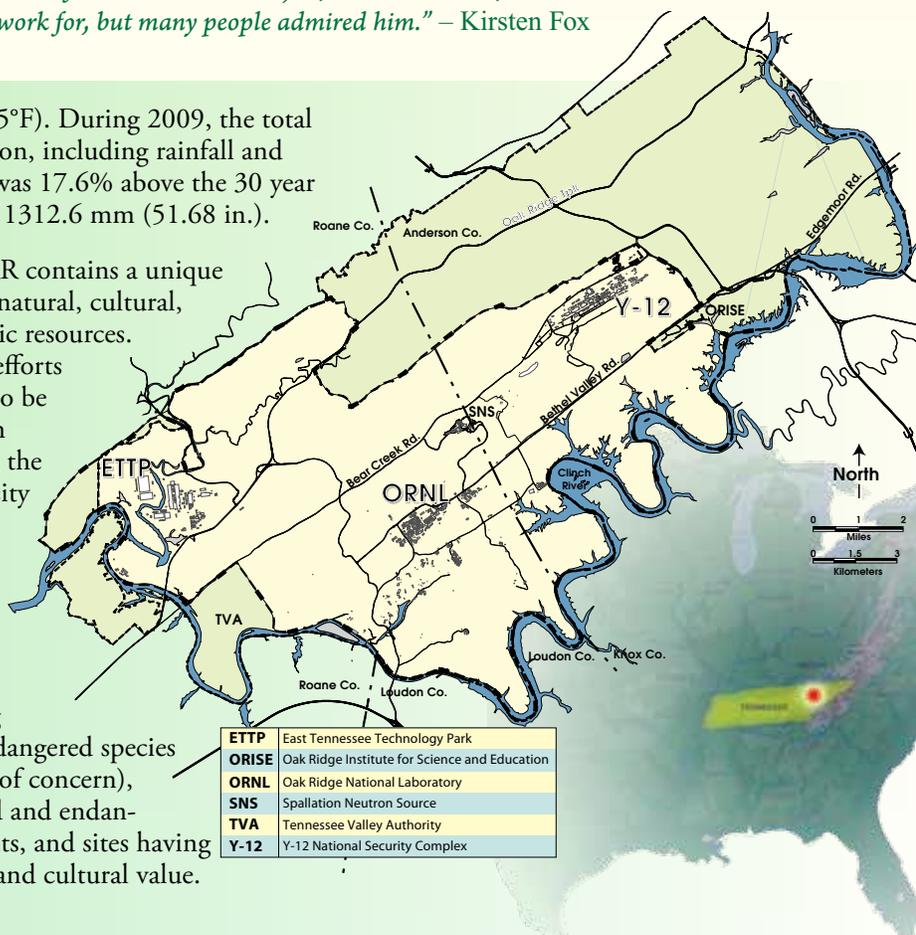
## About the Site

The ORR lies within the Great Valley of East Tennessee between the Cumberland Mountains and Great Smoky Mountains and is bordered on two sides by the Clinch River. Most of the reservation is within the corporate limits of the city of Oak Ridge and is in both Anderson and Roane counties. Except for the city of Oak Ridge, most of the land located within 5 miles of the ORR is semirural and is used primarily for residences, small farms, and cattle pasture. Fishing, hunting, boating, waterskiing, and swimming are popular recreational activities in the area.

The climate of the Oak Ridge area is characterized by significant temperature changes between summer and winter. The coldest month is usually January, and July tends to be the warmest month. During 2009, January temperatures were near normal at 2.9°C (37.2°F); July temperatures were below the 30 year mean for that month and averaged

23.9°C (75°F). During 2009, the total precipitation, including rainfall and snowfall, was 17.6% above the 30 year average of 1312.6 mm (51.68 in.).

The ORR contains a unique variety of natural, cultural, and historic resources. Ongoing efforts continue to be focused on preserving the rich diversity of these resources, which include wetlands, wildlife (including several endangered species or species of concern), threatened and endangered plants, and sites having historical and cultural value.



*"The ORR is approximately 33,699 acres and about 13,000 employees work at the Oak Ridge facilities." – David Wells*

# US Department of Energy Offices and Sites

## The DOE Oak Ridge Office

The Department of Energy (DOE) Oak Ridge Office (ORO) is rich in history, dating back to World War II, when the organization played a major role in the production of enriched uranium and development of processes for production and separation of plutonium for the Manhattan Project. Since then, the ORO has expanded far beyond those first missions and today is responsible for managing major DOE programs in science, environmental management, energy efficiency, nuclear fuel supply, reindustrialization, and national security and for providing support to science laboratories and facilities operated by DOE throughout the United States. ORO also provides support to national security activities managed by the National Nuclear Security Administration (NNSA). The fiscal year 2009 budget for all DOE's Oak Ridge programs was more than \$4 billion.

## The National Nuclear Security Administration Y-12 Site Office

The NNSA is a semiautonomous (partially self-governing) agency within DOE. The NNSA works in partnership with the US Department of Defense and other components of the national security enterprise to perform routine maintenance and repair of nuclear weapons components, dismantlement of retired nuclear weapons, and refurbishment of nuclear warheads. The NNSA also maintains the capability to design, manufacture, and certify new nuclear warheads.

The NNSA Y-12 Site Office (YSO) is responsible for operation of the Y-12 Complex and is also located there. YSO employees perform contract and program management oversight, contract and administrative management, and technical evaluation and assessment.

## Oak Ridge National Laboratory

Oak Ridge National Laboratory (ORNL) is DOE's largest science and energy laboratory. Managed since April 2000 by a partnership of the University of Tennessee and Battelle (UTB), ORNL was



established in 1943 as a part of the Manhattan Project to pioneer a method for producing and separating plutonium. During the 1950s and 1960s, ORNL became an international center for the study of nuclear energy and related research in the physical and life sciences. ORNL is now an international leader in a range of scientific areas that supports DOE's mission. With more than \$2 billion in new facilities completed since 2003, ORNL has one of the world's most modern campuses for the next generation of scientific discovery. The \$1.4 billion Spallation Neutron Source, located adjacent to the new Center for Nanophase Materials Sciences, combines with one of the nation's largest research reactors to continue the laboratory's reputation as a leader in the study of materials. ORNL's Center for Computational Sciences houses one of the world's most powerful open science supercomputers capable of 1600 trillion calculations per second. One project being conducted in conjunction with the new DOE-funded Bioenergy Science Center involves research to develop a new form of cellulosic ethanol that will not require land currently needed for the production of food.

In addition to the UTB activities, several other contractors manage and operate facilities at ORNL. Wastren Advantage, Inc. (WAI) manages and operates the Transuranic Waste Processing Center (TWPC), which is located on the western boundary of ORNL on about 5 ha (12.35 acres) of land adjacent to the Melton Valley Storage Tanks along State Route 95. In late 2009, WAI was awarded the contract to operate the TWPC, which had previously been operated by EnergX. The TWPC's mission is to receive transuranic wastes for processing, treatment, repackaging, and shipment to designated facilities for final disposal. Isotek Systems LLC

(Isotek) manages activities at ORNL's Building 3019 Complex for DOE and is responsible for activities associated with processing, down-blending, and packaging the inventory of uranium-235 stored there.

## The Y-12 National Security Complex

The original Y-12 Complex was constructed as part of the Manhattan Project and began operations in November 1943. The first site mission was the separation of uranium-235 from natural uranium by the electromagnetic separation process. At its peak in 1945, more than 22,000 workers were employed at the site.



Today, as part of the NNSA nuclear security enterprise, Y-12 performs critical roles in strengthening national security and in reducing the global threat from weapons of mass destruction through work supporting the nation's nuclear weapons stockpile, nuclear nonproliferation, and naval reactors. Y-12 also provides unique and highly specialized manufacturing and software technologies to other federal agencies through the DOE Work for Others program. Babcock & Wilcox Technical Services, Y-12, L.L.C. (B&W Y-12), operates Y-12 for DOE.

## East Tennessee Technology Park

What is now known as the East Tennessee Technology Park (ETTP) was originally called the K-25 Plant. This site, the nation's first gaseous diffusion plant for enriching uranium, was





constructed as part of the Manhattan Project.

In postwar years, additional uranium enrichment facilities were built adjacent to K-25, forming a complex officially known as the Oak Ridge Gaseous Diffusion Plant. Uranium enrichment operations at the site ceased in 1987. Renamed “East Tennessee Technology Park” in 1996, the site began undergoing cleanup for ultimate conversion to a private-sector industrial park, called the Heritage Center. Restoration of the environment, facility decontamination and decommissioning, waste disposal, and reindustrialization are the major activities at ETTP, which is managed by Bechtel Jacobs Company LLC (BJC).

### **Environmental Management Waste Management Facility**

The Environmental Management Waste Management Facility (EMWMF), located in eastern Bear Creek Valley near the Y-12 Complex, is operated by BJC. The EMWMF was built for disposal of waste resulting from the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) cleanup actions on the ORR. The original design was for the construction, operation, and closure of a solid waste disposal facility with a projected capacity of 1.3 million m<sup>3</sup> (1.7 million yd<sup>3</sup>). The capacity was later increased to 1.7 million m<sup>3</sup> (2.2 million yd<sup>3</sup>) to maximize use of the footprint designated in a 1999 record of decision (ROD), a public document that explains which cleanup alternatives will be used for a site’s remediation. The facility consists of five disposal cells, one recently constructed and slated to receive waste in 2011.

The EMWMF is an engineered landfill that accepts low-level, mixed low-level, and hazardous wastes from DOE sites on the ORR that meet specific waste acceptance criteria developed in accordance with state and federal agreements. Waste types that qualify for disposal include soil, dried sludge and sediment,

solidified waste, stabilized waste, building debris, scrap equipment, and secondary waste such as personal protective equipment, all of which must meet state land disposal restrictions. In addition to disposing of solid waste, the EMWMF operates a leachate collection system. The leachate is treated at the ORNL Liquids and Gaseous Treatment Facility.

### **Oak Ridge National Environmental Research Park**

In 1980, DOE established the Oak Ridge National Environmental Research Park, which Congress designated a protected outdoor research reserve in 1990. Consisting of about 8000 ha (19,760 acres), the research park serves as an outdoor laboratory to evaluate the environmental consequences of energy use and development as well as strategies to mitigate those effects. It contains large blocks of forest and diverse communities of vegetation that offer unparalleled resources for ecosystem-level and large-scale research. Major national and international collaborative research initiatives use the research park to address issues such as multiple stress interactions, biodiversity, sustainable development, tropospheric air quality, global climate change, innovative power conductors, solar radiation monitoring, ecological recovery, and monitoring and remediation.

Field sites at the research park provide maintenance and support facilities that permit sophisticated environmental experiments with the latest innovations in instrumentation. These facilities include elaborate monitoring systems that let users precisely and accurately measure environmental factors over extended periods. Because access to the park is restricted by the federal government, the park’s experimental sites and associated equipment are undisturbed and protected.

Nationally recognized for its research value, the park hosts regional- and continental-scale projects. Various research park sites offer opportunities for aquatic and terrestrial ecosystem analyses of topics such as biogeochemical cycling of pollutants resulting from energy production, landscape alterations, ecosystem restoration, wetlands mitigation, and forest and wildlife management.

### **Oak Ridge Institute for Science and Education**

DOE’s Oak Ridge Institute for Science and Education (ORISE) is managed by Oak Ridge Associated Universities (ORAU). ORISE addresses national needs in assessing and analyzing environmental and health effects of radiation, beryllium, and other hazardous materials; developing and operating medical and national security radiation-emergency management and response capabilities; and managing education programs to help ensure a robust supply of scientists, engineers, and technicians to meet future science and technology needs. ORISE creates collaboration opportunities through partnerships with other DOE facilities, federal agencies, academia, and industry in a manner consistent with DOE objectives and the ORISE mission.

ORISE includes a 94-ha (232-acre) area on the southeastern border of the ORR. From the late 1940s to the mid-1980s, this site was part of an agricultural experiment station owned by the federal government and, until 1981, operated by the University of Tennessee. The site houses offices, laboratories, and storage support departments.

### **NNSA Office of Secure Transportation, Agent Operations Eastern Command**

Since 1947, DOE and its predecessor have transported weapons, weapons components, special nuclear materials, and other important national security assets. In the late 1960s, a worldwide increase in terrorism and violence prompted a review of procedures for safeguarding these materials, and a comprehensive new series of regulations and equipment was developed to enhance the safety and security of their transportation. Transportation equipment was modified and redesigned to better incor-



porate self-protection and deny unauthorized access to the materials. Furthermore, commercial transportation, which had been an option, was abandoned for an entirely federally operated system. The organization within DOE/NNSA responsible for

this mission is the Office of Secure Transportation.

The NNSA Office of Secure Transportation, Agent Operations Eastern Command (AOEC) Secure Transportation Center and Training Facility operates under a user permit agreement

with DOE ORO. The facility is located on approximately 485 ha (1198 acres). The AOEC implements its assigned mission of transportation operations, maintains associated fleet and escort vehicles, and continues extensive training activities for its federal agents.

## Compliance Summary

DOE operations on the ORR are required to conform with environmental standards established by numerous federal and state statutes and regulations, executive orders, DOE orders, contract-based standards, and compliance and settlement agreements. Principal among the regulating agencies are

the Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC). These agencies issue permits, review compliance reports, participate in joint monitoring programs, inspect facilities and operations, and oversee regulatory compliance.

When environmental concerns or problems are identified during routine operations or ongoing compliance self-assessments, the issues are typically discussed with the regulatory agencies.

status of these lessee operations is not discussed in this summary report.

### External Oversight and Assessments

Numerous appraisals, surveillances, and audits of ORR environmental activities were conducted during 2009 and are summarized in the table at left. This table does not include internal DOE contractor assessments.

The State of Tennessee also conducts a program of independent monitoring and oversight of DOE activities on the ORR through the Tennessee Oversight Agreement (TOA). The TOA is a voluntary agreement between DOE and the State of Tennessee and is designed to assure the citizens of Tennessee that their health, safety, and environment are being protected through existing programs and substantial new commitments by DOE. More information on the TOA and reporting of monitoring conducted under the TOA is available at [www.state.tn.us/environment/doeo/](http://www.state.tn.us/environment/doeo/).

### Laws and Regulations

The table on the following pages summarizes the principal environmental standards that apply to DOE activities on the ORR and associated 2009 compliance status.

Numerous ETTP facilities have been leased to private entities over the past several years through DOE's Reindustrialization Program; the compliance

### Reporting of Spills and Releases

During 2009, a release of hydraulic fluid and another release involving asbestos material were reported to regulators by B&W Y-12. Details on these releases are provided in the Y-12 Environmental Monitoring discussion on page 15.

### Notices of Violation and Penalties

There were no notices of violations (NOVs) or penalties issued to UTB, B&W Y-12, WAI, or Isotek during 2009. An NOV was issued by TDEC to BJC in November 2009 when 1,1-dichloroethene exceeded drinking water standards. The ETTP section on page 17 provides details on this NOV.



### Summary of Environmental Audits & Assessments Conducted at ORR in 2009

Date	Reviewer	Subject	Issues
<b>ORNL</b>			
May 11-14	TDEC	Annual RCRA Inspection	0
July 23	USDA/TNDA	USDA Compliance Inspection	0
Sept. 22	TDEC	CWA NPDES Inspection	0
Sept. 25	TDEC	RATA for Predictive Emissions	0
Nov. 3	TDEC	Annual RCRA inspection at Y-12 Complex	0
Dec. 17	TDEC	Annual CAA Inspection	0

<b>ETTP</b>			
Feb. 9-11	TDEC	Annual RCRA Compliance Inspection	0
Feb. 13	TDEC	NPDES Permitting — new permit discussions	0
April 16-17	TDEC	NPDES Permitting — new permit discussions	0
May 14	TDEC	NPDES Permitting — new permit discussions	0
Aug. 6	TDEC	NPDES Permitting — new permit discussions	0
Sept. 24	TDEC	NPDES Compliance Evaluation Inspection	0
Oct. 7	TDEC	TSCA Incinerator — RCRA	0
Oct. 8	EPA/TDEC	TSCA Incinerator — PCB Inspection	0
Monthly (Jan.-Dec.)	TDEC Div. of Solid Waste	Active Y-12 Landfill Inspection	0
Semiannual	TDEC Div. of Solid Waste	Inactive Y-12 Landfill Inspection	0

<b>Y-12 Complex</b>			
Jan. 14	City of Oak Ridge	Semi-Annual Industrial Pretreatment Compliance Inspection	1
Jan. 21-22	TDEC	TDEC Annual Clean Air Compliance Inspection	0
Aug. 4	TDEC	Underground Storage Tank Compliance Inspection	0
Sept. 14	City of Oak Ridge	Semi-Annual Industrial Pretreatment Compliance Inspection	0
Nov. 2-5	TDEC	TDEC Annual RCRA Inspection	0

The City of Oak Ridge requested an action plan to address inflow/infiltration into the sanitary sewer system.

Abbreviations	
CAA	Clean Air Act
CWA	Clean Water Act
EPA	Environmental Protection Agency
NPDES	National Pollutant Discharge Elimination System
PCB	polychlorinated biphenyl
RATA	relative accuracy test audit
RCRA	Resource Conservation and Recovery Act
TDEC	Tennessee Department of Environment and Conservation
TNDA	Tennessee Department of Agriculture
TSCA	Toxic Substances Control Act
USDA	United States Department of Agriculture



# Applicable Laws/Regulations & 2009 Status

## Regulatory program description

## 2009 Status

**The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** provides the regulatory framework for remediation of releases of hazardous substances and of inactive hazardous waste disposal sites.

The ORR has been on the US Environmental Protection Agency National Priorities List (NPL) since 1989. The ORR Federal Facility Agreement was initiated in 1992 among EPA, the Tennessee Department of Environment and Conservation, and DOE. The Federal Facility Agreement establishes the framework and schedule for developing, implementing, and monitoring remedial actions on the ORR.

There were no Notices of Violation issued for CERCLA-related ORR actions during CY 2009.

Under the authority of CERCLA, pursuant to the Statutory Review requirements, a review must be conducted of remedial actions "that result in any hazardous substances, pollutant, or contaminant remaining at the site...to assure that human health and the environment are being protected by the remedial action being implemented" [CERCLA §121 (c)]. Five-year reviews are required for sites, which, upon attainment of the cleanup levels, still have hazardous substances remaining above levels that allow for unlimited use and unrestricted exposures. A five-year review was conducted of ORR actions in 2006 and the next five-year review will occur in 2011.

### **The National Environmental Policy Act (NEPA)**

requires consideration of how federal actions may impact the environment and an examination of alternatives to the actions. NEPA also requires that decisions include public input and involvement through scoping and review of NEPA documents.

During 2009, DOE activities on the ORR were in full compliance with NEPA activities.

**The National Historic Preservation Act (NHPA)** provides protection for the nation's historical resources by establishing a comprehensive national historic preservation policy.

The ORR has several facilities eligible for inclusion in the *National Register of Historic Places*. Proposed activities are reviewed to determine potential adverse effects on these properties, and methods to avoid or minimize harm are identified. During 2009, activities on the ORR were in compliance with NHPA requirements.

**The Clean Air Act (CAA)** and Tennessee environmental conservation laws regulate the release of air pollutants through permits and air quality limits. Emissions of airborne radionuclides are regulated by EPA via the National Emission Standards for Hazardous Air Pollutants (NESHAPs) authorizations. Greenhouse gas emissions inventory tracking and reporting are regulated by EPA.

In 2009, all ORR activities were conducted in accordance with CAA requirements.

**The Clean Water Act (CWA)** seeks to improve surface water quality by establishing standards and a system of permits. Wastewater discharges are regulated by National Pollutant Discharge Elimination System (NPDES) permits issued by TDEC.

Discharges to surface water at each of the three sites are governed by NPDES permits. A compliance rate of greater than 99% was achieved by the three major ORR sites in 2009.

**The Safe Drinking Water Act (SDWA)** establishes minimum drinking water standards and monitoring requirements.

The city of Oak Ridge supplies potable water to the facilities on the ORR.

**Emergency Planning and Community Right-to-Know Act**, also referred to as the Superfund Amendment Reauthorization Act (SARA Title III), requires reporting emergency planning information, hazardous chemical inventories, and environmental releases of certain toxic chemicals to federal, state, and local authorities.

DOE facilities on the ORR were in full compliance with emergency planning and reporting requirements. There were no releases of hazardous substances exceeding reportable quantities in 2009.

**The Resource Conservation and Recovery Act (RCRA)** governs the generation, storage, handling, and disposal of hazardous wastes. RCRA also regulates underground storage tanks containing petroleum and hazardous substances, universal waste, and recyclable used oil.

The Y-12 Complex, ORNL, and ETPP are defined as large-quantity generators of hazardous waste because each generates >1000 kg of hazardous waste per month. Each site is also regulated as a handler of universal waste. During 2009 each site, including the TWPC, operated in accordance with the RCRA permits that govern waste treatment, storage, and disposal units. In August 2009, TDEC and DOE entered into a RCRA Compliance Agreement concerning previously corrected issues at Y-12 and ETPP that were the result of inspections in 2005 and 2006, respectively.

## Regulatory program description

## 2009 Status

### The Toxic Substances Control

**Act (TSCA)** regulates the manufacture, use, and distribution of all chemicals.

The ORR facilities manage TSCA-regulated materials, including polychlorinated biphenyls (PCBs). The ORR PCB Federal Facilities Compliance Agreement between EPA and DOE continues to provide a mechanism to address legacy PCB-use issues across the ORR. The agreement specifically addresses the unauthorized use of PCBs, storage and disposal of PCB wastes, PCB spill cleanup and/or decontamination, PCBs mixed with radioactive materials, PCB research and development, and records and reporting requirements for the ORR. EPA is updated annually on the status of DOE actions with regard to management and disposition of PCBs covered under the ORR PCB Federal Facilities Compliance Agreement. There were no TSCA-related issues reported to regulators in 2009.

### ORR Floodplains Management Programs

are established to avoid, to the extent possible, adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.

ORR Floodplains Management Programs incorporate management and protection goals into planning, regulatory, and decision-making processes through each site's NEPA program. Goals include flood-loss reduction, minimization of the impact of floods, and the restoration and preservation of ORR floodplains.

**ORR Protection of Wetlands Programs** are implemented to minimize the destruction, loss, or degradation of ORR wetlands and to preserve and enhance their beneficial values.

Protection of approximately 243 ha (600 acres) of ORR wetlands was implemented through each site's NEPA program, and surveys for the presence of wetlands were conducted on a project or program as-needed basis.

**The Endangered Species Act** prohibits activities that would jeopardize the continued existence of an endangered or threatened species or cause adverse modification to a critical habitat.

The ORR is host to several plant and animal species that are categorized as endangered, threatened, or of special concern and that were protected in accordance with this act.

**DOE Order 231.1A, Environment, Safety, and Health Reporting**, ensures timely collection, reporting, analysis, and dissemination of information on environment, safety, and health issues.

The ORR Annual Site Environmental Report will summarize ORR environmental activities during 2009 and characterize environmental performance.

**DOE Order 435.1, Change 1, Radioactive Waste Management**, is implemented to ensure that all DOE radioactive waste is managed in a manner that protects workers, public health and safety, and the environment.

UT-Battelle, B&W Y-12, BJC, WAI, Isotek, and Oak Ridge Associated Universities/Oak Ridge Institute for Science and Education all generate radioactive waste and have implemented waste certification programs that are protective of workers, the public, and the environment to ensure compliance with this DOE order.

**DOE Order 450.1A, Environmental Protection Program**, has the objective of implementing sound stewardship practices that protect the air, water, land, and other natural and cultural resources affected by DOE operations. DOE facilities meet this objective by implementing environmental management systems.

UT-Battelle, B&W Y-12, BJC, WAI, and other DOE contractors on the ORR have implemented environmental management systems that are incorporated with the contractors' integrated safety management systems to promote sound stewardship practices and to ensure compliance with this DOE order.

**DOE Order 5400.5, Radiation Protection**, was established to protect members of the public and the environment against undue risk from radiation. This order establishes standards and requirements for operations of DOE and DOE contractors.

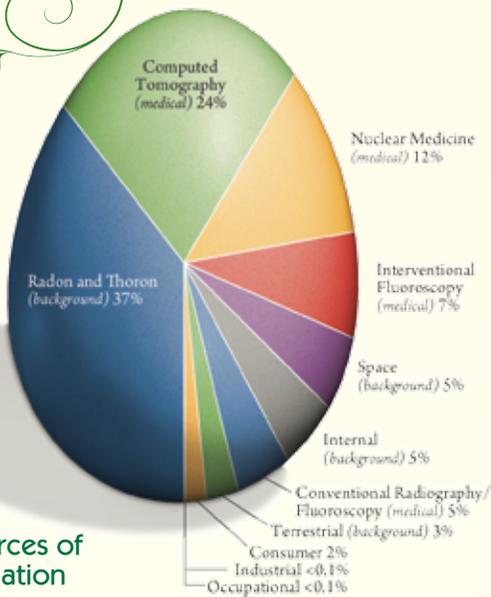
A dose assessment, performed to ensure that the total dose to members of the public from all DOE ORR pathways did not exceed the 100 mrem annual limit established by this order, estimated the maximum 2009 dose to a hypothetically exposed member of the public from all ORR sources could have been about 5 mrem. The derived concentration guides provided in DOE Order 5400.5 are employed on the ORR to ensure that effluents and emissions result in doses that meet the dose limits and as-low-as-reasonably-achievable policy.



## Radiation and Chemical Exposures

Activities on the ORR have the potential to release small quantities of radionuclides and hazardous chemicals to the environment, potentially exposing members of the public to low concentrations of radionuclides or chemicals. Data from monitoring materials released from the reservation and environmental monitoring and surveillance on and around the reservation show that doses from released radionuclides and chemicals comply with the law.

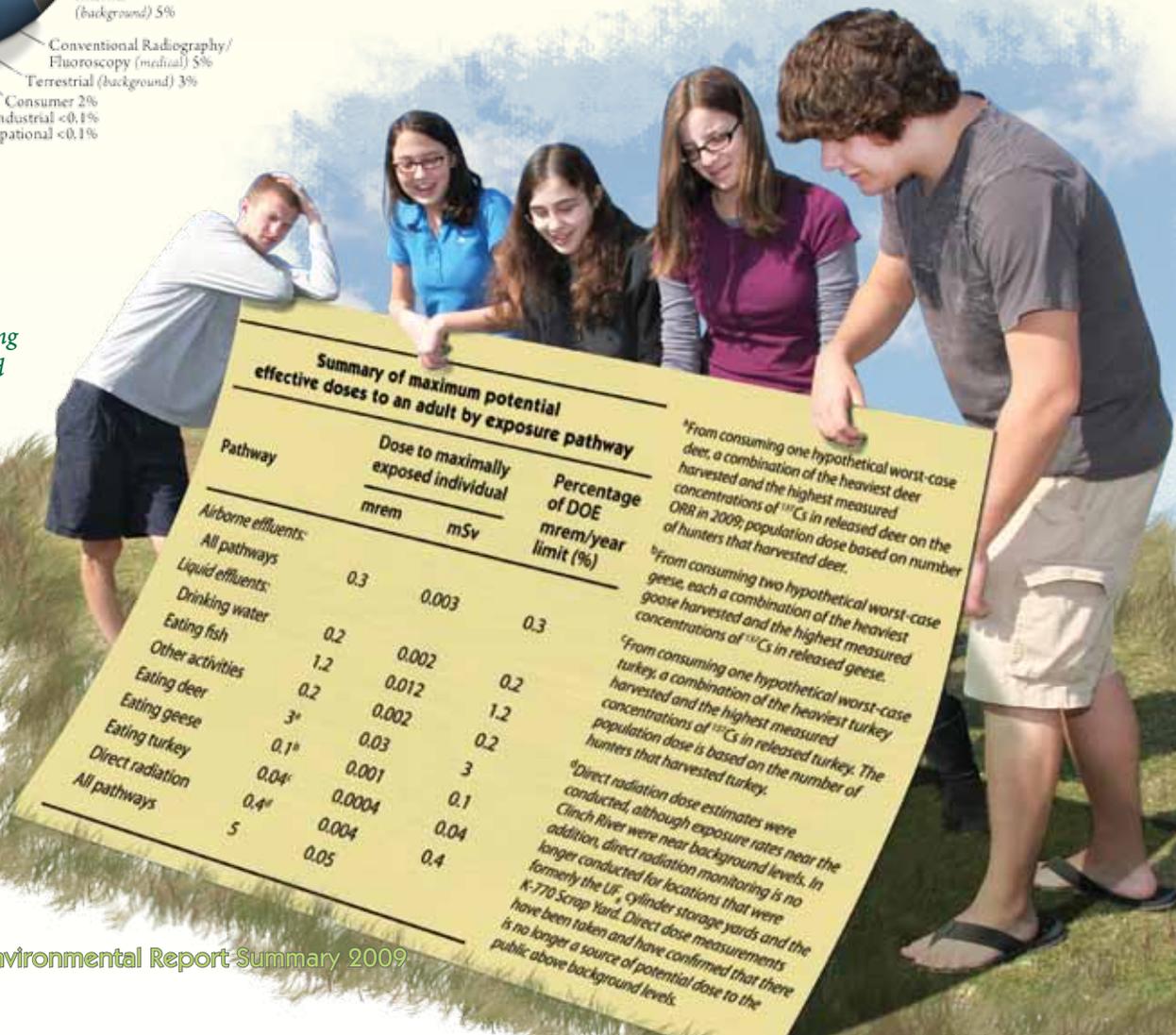
A hypothetical maximally exposed individual could have received a total effective dose (ED) of about 0.3 mrem from radionuclides emitted to the atmosphere from all ORR sources in 2009, well below the National Emission Standards for Hazardous Air Pollutants standard of 10 mrem for public protection.



### Sources of Radiation Exposure

National Council on Radiation Protection and Measurements, 2009

Environmental samples are collected in areas surrounding the ORR. They are analyzed for chemical constituents most likely to be released from the ORR.” – Lexi Ferguson



Pathway	Dose to maximally exposed individual		Percentage of DOE mrem/year limit (%)
	mrem	mSv	
Airborne effluents:			
All pathways	0.3	0.003	0.3
Liquid effluents:			
Drinking water			
Eating fish	0.2	0.002	0.2
Other activities	1.2	0.012	1.2
Eating deer	0.2	0.002	0.2
Eating geese	3 <sup>a</sup>	0.03	3
Eating turkey	0.1 <sup>b</sup>	0.001	0.1
Direct radiation	0.4 <sup>c</sup>	0.004	0.4
All pathways	5	0.05	5

<sup>a</sup>From consuming one hypothetical worst-case deer, a combination of the heaviest deer harvested and the highest measured concentrations of <sup>137</sup>Cs in released deer on the ORR in 2009; population dose based on number of hunters that harvested deer.

<sup>b</sup>From consuming two hypothetical worst-case geese, each a combination of the heaviest goose harvested and the highest measured concentrations of <sup>137</sup>Cs in released geese.

<sup>c</sup>From consuming one hypothetical worst-case turkey, a combination of the heaviest turkey harvested and the highest measured concentrations of <sup>137</sup>Cs in released turkey. The population dose is based on the number of hunters that harvested turkey.

<sup>d</sup>Direct radiation dose estimates were conducted, although exposure rates near the Clinch River were near background levels. In addition, direct radiation monitoring is no longer conducted for locations that were formerly the U<sup>2</sup> cylinder storage yards and the K-770 Scrap Yard. Direct dose measurements have been taken and have confirmed that there is no longer a source of potential dose to the public above background levels.



# Environmental Monitoring

Environmental monitoring is performed across the ORR to confirm that no member of the public is exposed to hazardous substances or radionuclides above regulatory levels from DOE activities. There are two primary types of environmental monitoring and sampling. Effluent monitoring involves collecting and analyzing liquid or gaseous samples at the point of emission. This could be a pipe discharging water from a facility or a stack emitting gaseous discharges from an operation or activity. Surveillance monitoring involves collecting and analyzing samples of air, water, soil, vegetation, wildlife, biota, and other media from the reservation and nearby areas. Each major facility conducts site-specific monitoring programs and participates in a reservation-wide surveillance monitoring program that measures radiological and nonradiological parameters directly in environmental media adjacent to the facilities.

The following text describes sampling programs and results from 2009 environmental activities on the ORR.

**Meteorological** – Eight meteorological towers provide data on ORR atmospheric conditions. These data are used in modeling to predict effects from facility operations and as input for emergency response atmospheric models. The meteorological data are also used to support various research and engineering projects.

**Ambient Air** – Ambient air is the surrounding air, and specifically for this discussion, refers to the air surrounding the ORR. In addition to the exhaust-stack monitoring performed at each of the three major DOE installations in Oak Ridge, ambient air is monitored to measure radiological parameters at eight locations that could be affected by DOE activities and at a reference location not within the potential impact area of ORR activities. These ambient air monitoring data are used to assess how DOE operations affect local air quality. The sampling systems consist of a high-volume air sampler used to collect particulates on a glass-fiber filter and a column of silica gel used to collect water vapor containing tritium. The samples undergo laboratory analyses for determination of radionuclide concentrations, and the results are compared to DOE reference levels known as derived concentration guides (DCGs). In 2009, all radionuclide concentrations were less than 1% of the applicable DCGs, indicating that DOE activities did not significantly affect local air quality.

**External Gamma Radiation** – External gamma radiation monitoring determines whether radioactive emissions from the ORR are increasing external radiation levels; results are compared from year to year. Exposure rates are recorded weekly at six of the ORR ambient air stations. The average ORR exposure rate for 2009 was within the range of normal background levels in Tennessee, indicating that ORR activities do not increase external gamma levels in the area above normal background levels.

*“Through all this research I’ve done about the ORR for this project, I don’t think there are any real major environmental concerns. DOE upholds rigorous standards to protect the environment.”* – William Hawks

*“The Manhattan project started when Einstein wrote a letter to the president warning him that the Germans were building a new kind of weapon.”* - Will Stafford

**Surface Water** – Surface water is a possible route for contaminants to move from the ORR into areas accessible to the public. In 2009, surface water samples were collected from three locations on the Clinch River in addition to the samples collected to meet the requirements of the National Pollutant Discharge Elimination System (NPDES) permits and other site-specific monitoring programs at the three major operating facilities. The samples were analyzed for metals, radioactivity, water quality parameters, and in some cases, volatile organic compounds and polychlorinated biphenyls (PCBs). In 2009, there were no radionuclides detected in the Clinch River samples above 4% of the DOE DCG or the 4-mrem EPA limit. The DOE guideline is sometimes used for radionuclide comparisons because it is roughly equivalent to the dose limits that EPA uses to establish radionuclide drinking water standards. These results indicate that Oak Ridge activities are not adversely affecting the water quality of the Clinch River.

**Food Crops** – Another possible route for contaminants from the ORR to reach the public is through the consumption of food crops grown off-site in areas that could potentially be affected by DOE activities. In 2009, samples of tomatoes, lettuce, and turnips were collected from gardens or fields near the reservation and were analyzed for gross alpha, gross beta, gamma emitters, and uranium isotopes. The results were at background levels and were consistent with historical values, indicating that DOE activities in Oak Ridge do not significantly affect the radionuclide concentrations in locally grown produce.

**Fish** – Fish from three locations on the Clinch River are collected annually to ensure that members of the public are not exposed to harmful levels of contaminants from Oak Ridge activities by consuming fish from the river. Sunfish and catfish are collected at each location, filleted, frozen, and sent to a laboratory for analyses for selected metals, pesticides, PCBs, tritium, gross alpha, gross beta, gamma-emitting radionuclides, and total radioactive strontium. Consumption of fish from the Melton Hill and Watts Bar reservoirs as well as from areas unaffected by ORR activities is limited by a TDEC advisory issued for PCBs. PCBs are found in water bodies all over the United States, and the local advisories are for the entire Melton Hill Reservoir and the Clinch River arm of Watts Bar Reservoir, not just areas that could potentially be affected by the Oak Ridge DOE facilities. This advisory applies to atypical consumers such as pregnant or nursing women, children, and subsistence fishermen. Consistent with this advisory, PCBs were detected in both species at all locations in 2009.

**White-Tailed Deer** – Three weekend deer hunts were held on the Oak Ridge Wildlife Management Area, which is part of the ORR, during October, November, and December 2009. These annual deer hunts were managed by the Tennessee Wildlife Resources Agency and DOE. Shotgun/muzzleloader and archery hunts yielded a total harvest of 354 deer, which were screened for radioactivity prior to release to the hunters. Officials retained two of the harvested deer, which exceeded administrative release limits. These limits are very conservative in keeping with



**Raccoons**  
Photo by iStockphoto



**Egret**



**Groundhogs**  
Photo by Jeffrey Riggs

*“‘Reindustrialization’ refers to refurbishing and/or reusing some of the older buildings at ETPP for modern, commercial uses.” – Zac Hylton*





**Beaver**

Photo by iStockphoto



**Baby Vultures**

*"On the ORR, DOE is required to follow numerous regulations and laws to protect the environment. The EPA and the TDEC are the two major entities overseeing activities at the ORR to ensure the environment is protected." – Lily Tavassoli*

DOE's as-low-as-reasonably-achievable exposure philosophy. This retention level is consistent with levels from hunts in previous years.

**Canada Geese** – Open hunts for Canada geese are held each year in counties adjacent to the ORR. To determine the potential impact of consuming geese that could have accessed areas affected by DOE facilities in Oak Ridge, 63 geese were captured on the ORR during June 2009. Whole-body gamma scans were conducted to determine concentrations of gamma-emitting radionuclides accumulated by these waterfowl. No geese exceeded administrative release limits established for radiological contamination.

**Turkey** – Two wild turkey hunts were held on the reservation in April 2009. Hunting was open for both shotguns and archery. Thirty-six turkeys were harvested; none exceeded administrative release limits established for radiological contamination. In addition to the ORR-wide environmental monitoring described in this section, site-specific monitoring is conducted at the three major Oak Ridge DOE installations.

Calculated radiation doses to maximally exposed off-site individuals from airborne releases, 2009

Plant	Effective dose, mrem (mSv)	
	At plant max	At Oak Ridge Reservation max
Oak Ridge National Laboratory	0.3 (0.003) <sup>a</sup>	0.3 (0.003)
East Tennessee Technology Park	0.06 (0.0006) <sup>b</sup>	0.007 (0.00007)
Y-12 National Security Complex	0.1 (0.001) <sup>c</sup>	0.01 (0.0001)
Entire Oak Ridge Reservation	<sup>d</sup>	0.3 (0.003) <sup>e</sup>



<sup>a</sup>The maximally exposed individual was located 5070 m SW of X-3039 and 5240 m WSW of X-7911.

<sup>b</sup>The maximally exposed individual was located 1000 m W of K-1435.

<sup>c</sup>The maximally exposed individual is located 2270 m NE of the Y-12 National Security Complex release point.

<sup>d</sup>Not applicable.

<sup>e</sup>The maximally exposed individual for the entire ORR is the ORNL maximally exposed individual.

*"Oak Ridge was probably chosen as a site for the Manhattan Project since it was a remotely populated area, had abundant power from TVA, and the valleys and ridges would isolate the area in case of an accident during development." – Juthinant Pomanece*

*"Before I worked on this project I thought TVA ran the facilities in Oak Ridge – DOE actually runs them." – Harris Barwick*

# Site-Specific Environmental Monitoring

## Y-12 National Security Complex

At the Y-12 National Security Complex, an Environmental Management System (EMS) modeled on International Organization for Standardization (ISO) standard 14001:2004 is used as a tool to manage, control, and minimize or eliminate potential environmental impacts associated with site activities. An EMS is designed to help improve environmental performance, provide for compliance with the law, improve efficiency and effectiveness, and promote stewardship. Protection of the environment includes monitoring of water, air, soil, and biota, and measuring progress in achieving environmental performance goals.

TDEC regulates surface streams and wastewater discharges under a sitewide NPDES permit. This permit covers approximately 65 Outfalls and storm water monitoring locations. In 2009, more than 6000 data points were generated from field and analytical samples, and the Y-12 NPDES compliance rate was greater than 99.9%. Only one NPDES permit excursion was reported when the cadmium monthly average at Outfall 200 measured 0.00162 mg/L, which exceeded the permit limit of 0.001 mg/L. There were no observed effects on the receiving stream.

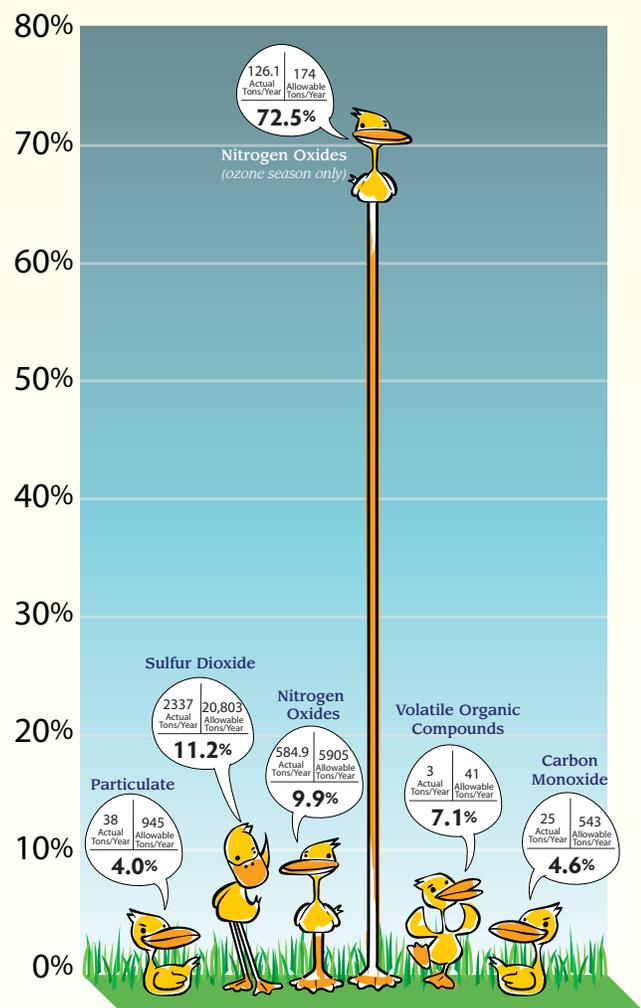
Air emissions from 36 emission sources and more than 100 air emission points at the Y-12 Complex are regulated by a Title V permit. More than 3000 data points are collected and reported under this permit every 6 months, and there are 5 continuous monitors for criteria pollutants as well as numerous continuous samplers for radiological emissions. Monitoring activities revealed no noncompliances. An estimated 0.0081 Ci (0.7 kg) of uranium was released into the atmosphere from Y-12 activities in 2009. The resulting total ED of 0.1 mrem is significantly less than the DOE limit of 10 mrem. The Y-12 Steam Plant burns coal and natural gas and is a primary source of criteria pollutants at Y-12. All monitored results were in compliance with the Title V permit in 2009.

More than 3000 samples from groundwater wells and springs were collected in 2009, and results from more than 61,000 analyses were reported. Results are consistent with historical monitoring efforts that have shown four primary contaminants to have affected groundwater quality at the Y-12 Complex: nitrate, volatile organic compounds, metals, and radionuclides. Of these, volatile organic compounds are the most widespread. In general, groundwater contamination trends are stable or decreasing.

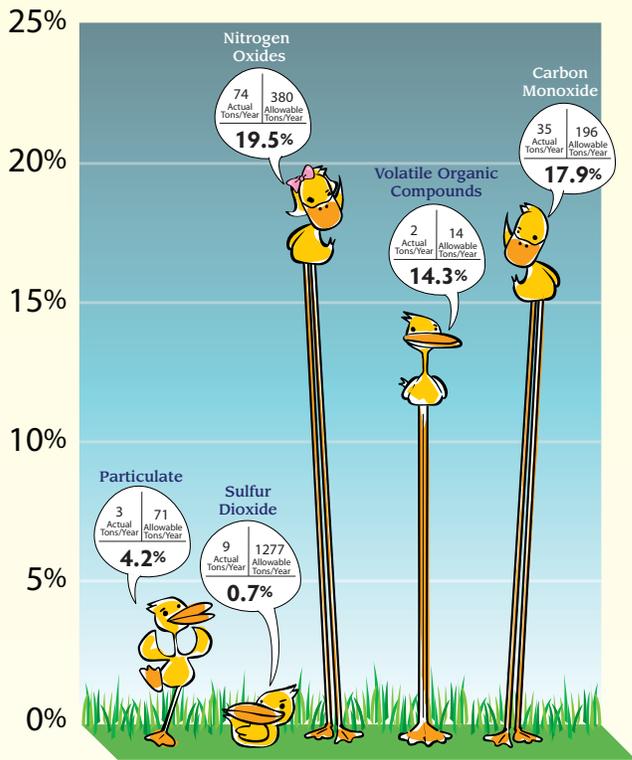
Five environmental audits/inspections by outside regulatory agencies (TDEC and the City of Oak Ridge) were conducted at the Y-12 National Security Complex during 2009. There were no regulatory noncompliances identified as a result of these audits; however, the City of Oak Ridge requested an action plan to address inflow/infiltration into the sanitary sewer system.

There was one release of a hazardous substance (asbestos) to the ground exceeding a reportable quantity; however, there was no environmental impact. There was also one release of hydraulic fluid that resulted in an observed oil sheen on Upper East Fork Poplar Creek, but there were no observed effects to fish or aquatic conditions as a result.

As a means to measure progress in continual environmental performance improvement, B&W Y-12 establishes environmental objectives and targets (or goals) and tracks performance during the year. In fiscal year 2009, Y-12 achieved 15 of 16 goals (94%) that resulted in overall environmental improvements. Significant among these goals were the achievement of several project milestones: replacing the existing coal-fired boiler steam plant by fiscal year 2011; replacing older electronics with new energy-efficient equipment and deploying virtual servers as a means to transition away from high-energy-use data centers; and initiating planning and data collection to develop a greenhouse gas inventory management plan.



Actual vs. Allowable Air Emissions from Y-12 Steam Plant, 2009



Actual vs. Allowable Air Emissions from ORNL Steam Plant, 2009

*“Working on the Annual Site Environmental Report Summary was incredible – we’ve learned so much! And the trip to Oak Ridge was also amazing. Getting to see things like the X-10 Reactor and the Spallation Neutron Source was so cool.”*  
– Hannah Kitts



Eastern Screech Owl

## Oak Ridge National Laboratory

UTB, WAI, BJC, and Isotek have all implemented EMSs modeled after ISO 14001:2004 to provide a framework for conducting activities at ORNL to facilitate measuring, managing, and controlling environmental impacts.

WAI’s EMS for TWPC activities was registered to the ISO 14001:2004 Standard by NSF International Strategic Registrations, Ltd. in May 2008. In May 2009, NSF conducted a surveillance audit for the WAI EMS. Several significant practices were noted; no nonconformities or issues were identified. WAI has a well-established recycling program at the TWPC and continues to expand the types and volumes of materials included in the program. Recycling streams at the TWPC range from office materials to operations-oriented materials. In addition, WAI successfully procured approximately \$131,000 in environmentally preferable materials in 2009 in keeping with the company’s policy to reduce packaging and to purchase products made with recycled or biobased materials.

DOE conducted an external validation audit of Isotek’s EMS in June 2009 and concluded the EMS was consistent with the requirements of DOE Order 450.1 A, Environmental Protection Program.

UTB’s EMS was initially registered to the ISO 14001 Standard by a third party registrar in 2004 and was reregistered in June 2007 by NSF. Surveillance audits were conducted in 2009, and no nonconformities were identified.

The Sustainable Campus Initiative, an ORNL-wide effort to build on the laboratory’s strengths as a premier science and technology organization to achieve sustainability, made significant strides in 2009. Modernization and revitalization of facilities and demolition of old, expensive-to-maintain facilities continued across ORNL during 2009. Energy-intensity-reduction efforts were ahead of pace for meeting the reduction goal of 30% by 2015 established by Executive Order 13423, “Strengthening Federal Environmental, Energy, and Transportation Management.” Green building and landscaping as well as energy management concepts were incorporated into all ORNL construction activities, and 2009 green transportation programs resulted in a significant reduction in vehicle emissions. This reduction was achieved in part through the use of 50,503 gallons of E85 to fuel the ORNL fleet, which now includes 17 electric vehicles and 41 hybrid cars.

During 2009, UTB implemented 33 new pollution prevention initiatives at ORNL. Together, these initiatives eliminated approximately 562,000,000 lb of waste and led to an associated cost avoidance of more than \$8 million. Major 2009 pollution prevention successes at ORNL included source reduction projects such as the elimination of photo-processing chemicals, water conservation efforts, and recycling. Over the last several years, UT Battelle’s Pollution Prevention Program has been repeatedly recognized for exemplary environmental sustainability and stewardship practices and excellence in pollution prevention. During 2009, the program received two DOE EStar awards, a DOE Office of Science Best in Class Award, a TDEC Tennessee Pollution Prevention Partnership Performer Member Flag, and a Tennessee Chamber of Commerce and Industry award for outstanding achievement in water quality.

Comprehensive environmental monitoring and sampling programs were conducted by ORNL’s various contractors in 2009 to demonstrate regulatory compliance and to provide a means of verifying that environmental releases from ORNL activities are as low as reasonably achievable.

During 2009, UTB, WAI, and Isotek operations were conducted in compliance with contractual and regulatory environmental requirements

except for two interrelated exceedances of NPDES permit discharge limits. These exceedances occurred at an in-stream monitoring point on Fifth Creek within the ORNL main campus, where, on February 16, 2009, a total residual oxidant measurement of 0.12 mg/L exceeded the daily maximum permit limit of 0.019 mg/L. The measurement resulted in a calculated exceedance of a monthly average limit at that same monitoring point. The cause of the exceedances was determined to be a malfunctioning dechlorination system. The unit was repaired, and there have been no exceedances since. No harm to aquatic species was seen as a result of this incident.

Several surface-water monitoring points and 49 groundwater wells at ORNL were also sampled by UTB during 2009, and all data were consistent with historical monitoring results, which continue to demonstrate that ongoing UTB operations are not significantly affecting the local environment.

Airborne discharges from ORNL, both radioactive and nonradioactive, are subject to regulation by EPA and the TDEC Division of Air Pollution Control. Radioactive airborne discharges at ORNL consist primarily of ventilation air from radioactively contaminated or potentially contaminated areas, vents from tanks and processes, and ventilation for hot-cell operations and reactor facilities. The calculated dose to the maximally exposed off-site individual from all radiological airborne release points at ORNL during 2009 was 0.3 mrem, well below the NESHAPs standard of 10 mrem. UTB holds a Title V permit for 10 emission sources, all of which operated in full compliance with permit conditions during 2009.

ORNL did not receive any NOV's or penalties from regulators during 2009, and there were no releases of hazardous materials exceeding reportable quantities at ORNL during 2009.

### East Tennessee Technology Park

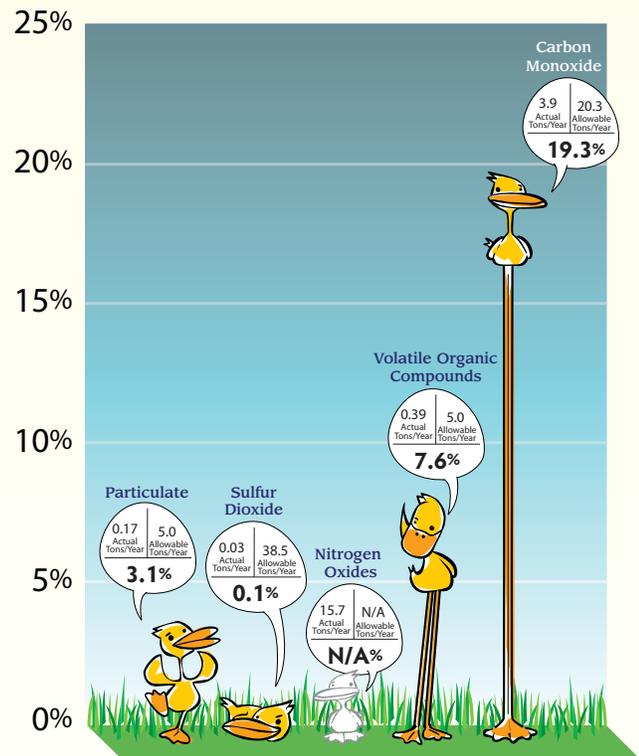
ETTP's original mission was to enrich uranium for use in weapons, and later, as fuel for reactors. In the 1980s, demand for enriched uranium dropped, the enrichment operations were closed, and the focus of ETTP operations transitioned to the management of waste that remained from the enrichment operations and site cleanup. Cleanup includes removing old waste areas (such as burial grounds), cleaning up spill residue, cleaning up buildings and facilities, repurposing old facilities when possible, and demolishing obsolete, unusable facilities.

Regulators from EPA and TDEC have been working with DOE to determine the appropriate measures for managing wastes and controlling discharges. Permits are granted to specify methods of operation and to limit the amount of pollutants that can be safely discharged. For pollutants not covered under permits, DOE has developed guidelines to ensure the safety of the public and the environment. Regulators routinely inspect ETTP to ensure that the permit conditions continue to be met. In addition, DOE and its contractors monitor operations and conditions in the environment to further ensure permit compliance and that DOE operations will have the least possible impact on health, safety, and the environment. To this end, thousands of air, water, groundwater, and biological samples were collected and analyzed for pollutants. All monitoring of airborne radiological and nonradiological pollutants revealed that air samples were 100% compliant and that even the maximum exposure posed to workers and the public from ETTP operations was far below permissible limits. Results of water samples revealed compliance greater than 99%, with only one permit exceedance—a single water sample with a pH of 9.1 exceeded the permit pH limit of 9.0 (there was no



Muscovy Duck

*“Chemical concentrations are measured differently depending on what is being analyzed. Liquid concentrations are often expressed in terms of milligrams per liter or micrograms per liter. Concentrations of chemicals in solids are often expressed in units of milligrams per gram or micrograms per gram.” – Jenny Tran*



Actual vs. Allowable Air Emissions from Permitted ETTP Sources, 2009

### White-tailed Deer



### Red-tailed Hawk

Photo by iStockphoto



measurable environmental impact). BJC's only NOV, issued by TDEC, was related to a groundwater monitoring well at an ORR landfill.

ETTP conducted biological monitoring using water fleas (*Ceriodaphnia dubia*), caged clams (*Corbicula fluminea*), fish, and benthic invertebrates (insects, worms, and other species). This monitoring indicated that although past operations have impacted the environment, changes in ETTP operations, including better waste management and remedial actions, have improved conditions in recent years.

ETTP continues to receive high marks for EMS performance and 2009 Pollution Prevention performance measures. The ETTP Information Technology department's electronic stewardship and life cycle management program won a DOE Environmental Management (EM) Best in Class Award and a DOE EStar Award in 2009.

Great strides continue to be made in remediating the ETTP, and several facilities are being cleaned up or demolished. One major project involved the remediation of a PCB-contaminated pond. The PCBs, which had accumulated years ago in the pond sediment, were sequestered through the use of cutting-edge techniques, while the pond and its associated wetlands were preserved and even biologically enhanced.

Waste management activities in 2009 at the BJC-operated EMWMF included the construction of a new fifth cell, which will be open to receive wastes in 2011. The new cell will bring the total capacity of the EMWMF to slightly below 1.7 million m<sup>3</sup>. Planning is underway for a sixth cell, which will provide a safe location for the disposal of demolition debris from remediation efforts.

Whenever possible, new uses are found for old facilities. The reindustrialization program in 2009 included the transfer of the Phase 1 Electrical Distribution System and the Phase 1 Plant Roadway System to the City of Oak Ridge. A 14-acre parcel and several buildings, including one that was renovated to become the ETTP Welcome Center, were transferred to the Community Reuse Organization of East Tennessee, which will market these facilities to private industry or identify other uses for them.

## Environmental Management

Environmental Management (EM) is DOE's largest program in Oak Ridge, with cleanup programs underway to correct the legacies remaining from years of energy research and weapons production. Because of past practices, portions of land and facilities on the 13,658 ha (33,750 acre) ORR are contaminated with radioactive elements, mercury, asbestos, PCBs, and industrial wastes. The ORR is on the EPA's National Priorities List and is being cleaned up under a Federal Facility Agreement with the EPA and the State of Tennessee.

In 2009, the program focused on cleanup efforts at ETTP. The most visible project was the ongoing demolition of the massive K-25 Building. Significant progress has been made in cleaning up large gaseous diffusion



*"The graphite reactor was so amazing to learn about. I loved learning about what it did, how it helped America, and the history that it carried."* –  
Melissa Dixon

buildings, various facilities, and contaminated ponds and soils at this site. Cleanup efforts also continued at the other sites on the ORR. The current focus of the EM Program is completing the high-priority projects of demolishing the K-25 Building and preparing for cleanup activities at ORNL and Y-12.

Besides allowing more cleanup work to be performed on the ORR, funding from the American Recovery and Reinvestment Act (ARRA) has stimulated job creation and retention in the area. ORO received \$1.36 billion under ARRA, with a large portion of that amount—\$755 million—going to EM projects.

## Community Involvement

### Public Comments Solicited

Public input and comments were solicited on a variety of proposed actions, documents, and plans in 2009, including the following:

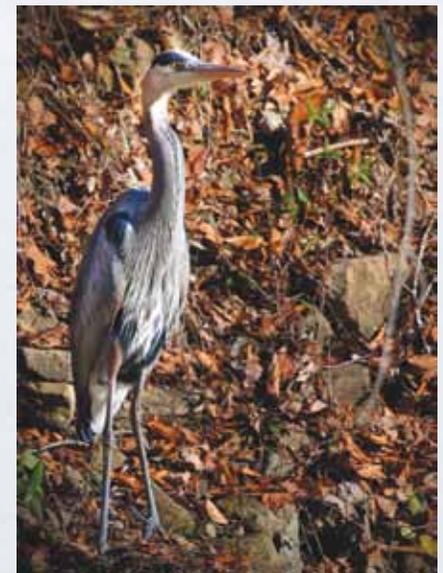
- aquatic resource alteration permit application and wetland notice of involvement for an ORNL vehicle-parking structure project
- draft Global Nuclear Energy Partnership Programmatic Environmental Impact Statement, which provides an analysis of the potential environmental consequences of the reasonable alternatives to support expansion of domestic and international nuclear energy production
- proposed approval of the radioactive, remote-handled transuranic waste characterization program implemented by the Central Characterization Project in Oak Ridge
- revision of DOE's Freedom of Information Act regulations, which streamlines DOE's procedures for determining the release of information and updates the requirement for document reproduction
- proposal for major modifications to the Federal Facility Agreement that would add new Integrated Facility Disposition Program work scope and extend the EM cleanup completion time frame
- parcel ED-8 covenant deferral request, which addresses the transfer of approximately 37 ha (91 acres) in the southern portion of ETTP to Heritage Center, LLC
- Tennessee Air Pollution Control Regulations permit request for Building 3019 at ORNL
- national resource damage assessment evaluation of contaminant-related losses in Watts Bar Reservoir and gains from the Black Oak Ridge conservation easement
- K-792 Switchyard covenant deferral request, which addresses the transfer of the switchyard to Heritage Center, LLC

### Coyote

Photo by Jeffrey Riggs



### Heron



*"I really enjoyed the stories the Y-12 historian told us about the ORR. I thought it was really cool how one person could remember so much history about the whole place." – Nicholas Creekmore.*

*"A lot of the cleanup on the ORR is focused on 'legacy waste' – which is waste left behind from previous activities on the DOE dating back to the original Manhattan Project." – Kenn McMahan*



Pickerel Frog



Eastern Box Turtle  
Photo by Scott Reasor



Wild Turkey

*“The funniest part of the field trip we took to visit the ORR facilities was when an elderly couple enjoyed the presentation at Y-12 so much they got on the bus with us to see what else we were learning.” – Kati Tran*

- request for proposal to sell approximately 13,900,000 kg (15,300 tons) of radiologically contaminated nickel scrap recovered from enrichment operations in Oak Ridge and in Paducah, Kentucky
- environmental impact statement for the long-term management and storage of elemental mercury, which will evaluate alternatives for a storage facility

To keep the public informed about comment periods and other matters related to cleanup activities on the ORR, DOE publishes a monthly newsletter, Public Involvement News (see [www.oakridge.doe.gov/external/](http://www.oakridge.doe.gov/external/)). DOE also keeps the public informed by publishing notices in local newspapers and conducting public meetings.

### DOE Information Center

The DOE Information Center, located at 475 Oak Ridge Turnpike, Oak Ridge, Tennessee, is a one-stop information facility that maintains a collection of more than 40,000 documents describing environmental activities in Oak Ridge. The center is open weekdays from 8 a.m. to 5 p.m. The DOE ORO website ([www.oakridge.doe.gov](http://www.oakridge.doe.gov)) includes a Public Activities tab, which describes DOE program activities for the general public. The Online Catalog tab, under the Information Center tab of Public Activities, can be used to search for DOE documents by author, title, date, and other fields. The recently added New Documents tab provides links to recently published documents.

### Telephone Contacts

- DOE Information Center: (865) 241-4780; toll free 1-800-382-6938 (option 6)
- DOE Public Affairs Office: (865) 576-0885
- DOE-ORO Public Information Line: 1-800-382-6938
- Oak Ridge Site Specific Advisory Board: (865) 241-4583, (865) 241-4584, 1-800-382-6938
- TDEC, DOE Oversight Division: (865) 481-0995
- EPA Region IV: 1-800-241-1754
- Agency for Toxic Substances and Disease Registry: 1-800-232-4636

### Internet Sites

- DOE main website: [www.energy.gov](http://www.energy.gov)
- DOE-ORO home page: [www.oakridge.doe.gov](http://www.oakridge.doe.gov)
- DOE-ORO Environmental Management Program: [www.oakridge.doe.gov/external](http://www.oakridge.doe.gov/external) (click on “Programs” then select “Environmental Management”)
- Oak Ridge Site Specific Advisory Board: [www.oakridge.doe.gov/em/ssab](http://www.oakridge.doe.gov/em/ssab)
- Agency for Toxic Substances and Disease Registry: [www.atsdr.cdc.gov](http://www.atsdr.cdc.gov)
- US Environmental Protection Agency: [www.epa.gov/region4/](http://www.epa.gov/region4/)
- Tennessee Department of Environment and Conservation: [www.state.tn.us/environment/](http://www.state.tn.us/environment/)
- Tennessee Department of Environment and Conservation, DOE Oversight Division: <http://www.state.tn.us/environment/doeo/>
- DOE Information Center: [www.oakridge.doe.gov/info\\_cntr](http://www.oakridge.doe.gov/info_cntr)
- American Recovery and Reinvestment Act: [www.recovery.gov](http://www.recovery.gov) and [www.energy.gov/recovery](http://www.energy.gov/recovery)



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