

Executive Summary

Overview

The Oak Ridge Reservation (ORR), managed by the US Department of Energy (DOE), is located in Roane and Anderson counties in east Tennessee about 40 km (25 mi) from Knoxville. The ORR is one of DOE's most unusual and complex sites. It encompasses three major facilities and thousands of employees who perform every mission in the DOE portfolio—energy research, environmental restoration, national security, nuclear fuel supply, reindustrialization, science education, basic and applied research in areas important to US security, and technology transfer. The ORR was established in 1942 as part of the Manhattan Project for the purposes of enriching uranium and pioneering methods for producing and separating plutonium. Today scientists at the Oak Ridge National Laboratory (ORNL), DOE's largest multipurpose national laboratory, conduct leading-edge research in advanced materials, alternative fuels, climate change, and supercomputing. The Y-12 National Security Complex (Y-12 or Y-12 Complex) is vital to maintaining the safety, security, and effectiveness of the US nuclear weapons stockpile and reducing the global threat posed by nuclear proliferation and terrorism. The East Tennessee Technology Park (ETTP), a former uranium enrichment complex, is being transitioned to a clean, revitalized industrial park.

DOE's signature integrated safety management system (ISMS) integrates safety in all aspects of work at its facilities. Safety, as defined in ISMS, encompasses protection of the public, the worker, and the environment and includes all safety, health, and environmental disciplines (i.e., radiation protection, fire protection, nuclear safety, environmental protection, waste management, and environmental management).

The ORR is managed by three DOE Program Secretarial Offices and their management and operating contractors and support contractors. This 2016 *Oak Ridge Reservation Annual Site Environmental Report* (ASER) contains detailed and complex information provided to the DOE ORR integrating contractor by contractors including UT-Battelle, LLC; Consolidated Nuclear Security, LLC; URS | CH2M Oak Ridge LLC; North Wind Solutions (NWSol) ; Oak Ridge Associated Universities; and Isotek Systems LLC. Five key chapters were prepared as follows: Chapter 3 by URS | CH2M Oak Ridge LLC (UCOR), the lead environmental management contractor for ETTP; Chapter 4 by Consolidated Nuclear Security, LLC, which manages and operates the Y-12 National Security Complex; and Chapter 5 by UT-Battelle, LLC, which manages the Oak Ridge National Laboratory; Chapter 6 ORR Environmental Monitoring Program; and Chapter 7 Dose. In addition, the aforementioned contractors are responsible for independently carrying out the various DOE missions at the three major ORR facilities. These contractors manage and implement environmental protection programs through environmental management systems that adhere to International Organization for Standardization standard 14001:2004, *Environmental Management Systems*, and are integrated with ISMS to provide unified strategies for managing resources. Detailed information on contractors' environmental management systems is provided in Chapters 3, 4, and 5.

DOE operations on the ORR have the potential to release a variety of constituents into the environment via atmospheric, surface water, and groundwater pathways. Some of these constituents, such as particles from diesel engines, are common at many types of facilities while others, such as radionuclides, are unique to specialized research and production activities like those conducted on the ORR. Any releases are highly regulated and carefully monitored. DOE is committed to enhancing environmental stewardship and managing the impacts its operations may have on the community and the environment, and it encourages the public to participate in matters to the ORR's environmental impact on the

community by soliciting citizens' input on matters of significant public interest and through various communications. DOE also provides public access to information on all of its Oak Ridge environmental, safety, and health activities.

The ASER is prepared for DOE according to the requirements of DOE O 231.1B, *Environment, Safety, and Health Reporting*. The ASER includes data on the environmental performance of each of the major DOE ORR contractors and describes significant accomplishments in pollution prevention and sustainability programs that serve to reduce all types of waste and pollutant releases to the environment. An environmental report for the ORR that provides consolidated data on overall reservation performance and status has been published annually since the mid-1970s. The ASER continues to be a key component of the DOE effort to keep the public informed about environmental conditions across DOE and National Nuclear Security Administration sites. The report is prepared for readability, and frequent references to other sections, chapters, and reports are made throughout to avoid redundancy.

2016 Impacts

DOE ORR operations in 2016 continued to result in minimal impact to the public and the environment. Permitted discharges to air and water were well below regulatory standards, and potential radiation doses to the public from activities on the reservation were significantly less than the 100 mrem standard established for DOE sites in DOE O 458.1, *Radiation Protection of the Public and the Environment*.

The maximum radiation dose a hypothetical off-site individual could have received from DOE activities on the ORR in 2016 was estimated to be 0.2 mrem from air pathways, 1.3 mrem from water pathways (drinking water, fish consumption, swimming, recreation, and other uses), and 1 mrem from consumption of wildlife harvested on the ORR. This is about 3% of the DOE 100 mrem standard for all pathways and is significantly less than the 300 mrem annual average dose to people in the United States from natural or background radiation. The 2016 maximum hypothetical dose is consistent with those calculated for the previous 6 years (2010–2015).

Environmental Monitoring

Extensive environmental monitoring is conducted across the ORR each year. Site-specific environmental protection programs are carried out at ORNL, the Y-12 Complex, and ETPP. The ORR-wide environmental surveillance programs, which include locations and media both on and off the reservation, are conducted to enhance and supplement data from site-specific efforts. In 2016 thousands of samples and measurements of air, water, direct radiation, vegetation, fish, and wildlife collected from across the reservation were analyzed for both radioactive and nonradioactive contaminants. Sample media, locations, frequencies, and parameters were selected based on environmental regulations, permits and standards, public and environmental exposure pathways, public concerns, and measurement capabilities. Chapters 2 through 7 of this report provide detailed summaries of the environmental protection and surveillance programs on the ORR. These extensive sampling and monitoring efforts demonstrate DOE's commitment to ensuring safety; protecting human health; complying with regulations, standards, DOE orders, and "as low as reasonably achievable" principles; reducing the risks associated with past, present, and future operations; and improving cost-effectiveness.

Compliance with Environmental Regulations

Federal, state, and local government agencies, including the US Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC), monitor the ORR for compliance with applicable environmental regulations and permits. These agencies issue permits, review

compliance reports, participate in joint monitoring programs, inspect facilities and operations, and/or oversee compliance with regulations. Continued compliance with environmental regulations and DOE orders assures on-site processes do not adversely impact the public or the environment.

During 2016 there were only a few instances of noncompliance with regulations, permits, and DOE orders. These were promptly addressed to ensure minimal adverse environmental or public health effects resulted. Noncompliances and notifications made to regulatory agencies during the year are summarized below, and detailed information is provided in Chapters 2 through 5 of this report.

- On December 8, 2016, UCOR D&D personnel were downsizing an exterior tank on the north side of Bldg. K-131, the former function and original location of which are unknown. Heavy machinery was used to cut the tank into smaller pieces for disposal. During this operation, an unknown white solid material was released onto the paved area where the tank was located. This release occurred immediately before a rainfall event, and D&D personnel were not able to clean up the material before the rain began. Despite efforts to prevent the material from entering a nearby storm drain inlet, some of it entered an inlet connected to Outfall 382, which discharges to Poplar Creek. Because this material could have posed safety and health hazards, sampling of it was delayed until additional information could be gathered on the potential source of the released material and the tank.
- On December 1, 2016, a significant fire-water line break occurred near the M&EC Process/Storage Area at Bldg. K-1052. Chlorinated fire water, discharged as part of this event, flowed into a radiologically contaminated portion of Bldg. K-1052, as well as a radiologically contaminated portion of Bldg. K-1010 (M&EC Process Area). The K-1010 Process Area had been recently contaminated during the processing of a waste stream containing a significant amount of strontium-90 (90Sr) and was being cleaned. Even though elevated levels of gross beta radiation and 90Sr were detected after the initial spill, the levels of these contaminants had dissipated by the time the follow-up sampling was performed. Therefore, it is believed that no threat to the environment occurred as a result of this spill. No impact to aquatic biota in the K-1007-P1 pond was observed.
- Personnel from EPA Region 4 and the TDEC Knoxville Field Office conducted a RCRA hazardous waste compliance inspection of the Y-12 Complex August 15–17, 2016. The inspections covered 48 waste storage areas and record reviews. The report identified two findings involving a single container of used lamps (light bulbs). The lamps were not dated and labeled as required. These issues were immediately corrected.
- TDEC performed a UST compliance inspection at ORNL in November 2016, and two findings were cited by TDEC as a result of the inspection. Both findings were resolved within 60 days, as required by TDEC.

Pollution Prevention and Site Sustainability

Numerous pollution prevention and sustainability programs across the ORR embody efforts to achieve enduring sustainability in facilities, operations, and organizational culture. These programs promote energy and water conservation, building efficiency, sustainable landscaping, green transportation, sustainable acquisition, and waste minimization, which in turn reduce life-cycle costs of programs and projects and reduce risks to the environment. In 2016, ORR contractors were recognized for excellence in pollution prevention and sustainability programs with multiple awards, which are described in Chapters 3, 4, and 5.

Cleanup Operations in 2016

The ORR has played key roles in US defense and energy research. However, past waste disposal practices, operational and industrial practices, changing standards, and unintentional releases have left land and facilities contaminated. Contaminants include radioactive elements, mercury, asbestos, polychlorinated biphenyls, and industrial wastes. The DOE Environmental Management (EM) program is responsible for cleaning up these sites, and numerous cleanup projects are under way at the reservation's three main facilities.