

# Annual Site Environmental Report



2014

*Oak Ridge Reservation*

# Annual Site Environmental Report 2014

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# Acronyms and Abbreviations

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|                   |  |
|-------------------|--|
| AAS               | ambient air (monitoring) station   |
| ABC               | aluminum beverage can (recycling)  |
| AC                | alternating current  |
| ACHP              | Advisory Council on Historic Preservation  |
| ACO               | Analytical Chemistry Organization (Y-12 Complex)   |
| ACM               | asbestos-containing material   |
| AGL               | above ground level   |
| ALARA             | as low as reasonably achievable  |
| ANSI              | American National Standards Institute  |
| ANSI/HPS          | ANSI Health Physics Society (standard)   |
| AOEC              | Agent Operations Eastern Command (NNSA OST)  |
| ARAP              | Aquatic Resource Alteration Permit   |
| ARRA              | American Recovery and Reinvestment Act   |
| ASER              | <i>Oak Ridge Reservation Annual Site Environmental Report</i>                                  |
| AWQC              | ambient water quality criterion  |
|                   |  |
| B&W Y-12          | Babcock & Wilcox Technical Services Y-12, LLC  |
| BCG               | biota concentration guide  |
| BMAP              | Biological Monitoring and Abatement Program  |
| BRW               | bedrock well   |
|                   |  |
| C&D               | construction and demolition  |
| CAA               | Clean Air Act  |
| CAP-88            | Clean Air Assessment Package (software)  |
| CAS               | condition assessment survey  |
| CCA               | chromated copper arsenate (as in CCA Type C pressure-treated wood)                             |
| CEI               | Compliance Evaluation Inspection (NPDES)   |
| CERCLA            | Comprehensive Environmental Response, Compensation, and Liability Act                          |
| CFR               | <i>Code of Federal Regulations</i>   |
| CFTF              | Carbon Fiber Technology Facility   |
| CH                | contact-handled  |
| CNF               | Central Neutralization Facility  |
| CNS               | Consolidated Nuclear Security, LLC   |
| CO <sub>2</sub> e | CO <sub>2</sub> equivalent   |
| COC               | contaminant of concern   |
| CPU               | central processing unit (computer)   |
| CRK               | Clinch River kilometer   |
| CROET             | Community Reuse Organization of East Tennessee   |
| CRT               | cathode-ray tube (also display devices, especially computers, incorporating cathode-ray tubes) |

|         |  |
|---------|--|
| CVSR    | Continuously Variable Series Reactor   |
| CWA     | Clean Water Act  |
| CWTS    | Chromium Water Treatment System (ETTP)   |
| CX      | categorical exclusion  |
| CY      | calendar year  |
|         |  |
| D&D     | decontamination and decommissioning  |
| DAC     | derived air concentration  |
| DCA     | dichloroethane   |
| DCE     | dichloroethene/dichloroethylene  |
| DCG     | derived concentration guide  |
| DCS     | derived concentration standard   |
| DMR     | discharge monitoring report  |
| DNAPL   | dense nonaqueous phase liquid  |
| DOE     | US Department of Energy  |
| DOE ORO | DOE Oak Ridge Office   |
| DVD     | digital video disc   |
|         |  |
| e-RICE  | emergency RICE   |
| E85     | Ethanol-fuel blend consisting of up to 85% ethanol and 15% gasoline or other hydrocarbon |
| EC      | Environmental Compliance   |
| EC&P    | Environmental Compliance and Protection  |
| ECD     | Environmental Compliance Department (Y-12 Complex)                                       |
| ECM     | energy conservation measure  |
| ED      | effective dose   |
| EDTA    | ethylenediaminetetraacetic acid  |
| EFK     | East Fork Poplar Creek kilometer   |
| EFPC    | East Fork Poplar Creek   |
| EISA    | Energy Independence and Security Act   |
| EM      | environmental management   |
| EMDF    | Environmental Management Disposal Facility   |
| EMMIS   | Environmental Monitoring Management Information System (Y-12 Complex)                    |
| EMP     | environmental monitoring program   |
| EMS     | Environmental Management System  |
| EMWMF   | Environmental Management Waste Management Facility                                       |
| EO      | executive order  |
| EPA     | US Environmental Protection Agency   |
| EPCRA   | Emergency Planning and Community Right-to-Know Act                                       |
| EPEAT   | Electronic Product Environmental Assessment Tool   |
| EPT     | Ephemeroptera, Plecoptera, and Trichoptera (taxa)  |
| EPSD    | Environmental Protection Services Division (UT-Battelle)                                 |
| ES&H    | environment, safety, and health  |
| ESPC    | Energy Savings Performance Contract  |

|                  |  |
|------------------|--|
| ESS              | Environmental Surveillance System (ORNL)   |
| ETTP             | East Tennessee Technology Park   |
| FAST             | Federal Automotive Statistical Tool  |
| FCK              | First Creek kilometer  |
| FFA              | Federal Facility Agreement (for the Oak Ridge Reservation)   |
| FFK              | Fifth Creek kilometer  |
| FWS              | US Fish and Wildlife Service   |
| FY               | fiscal year  |
| GET              | General Employee Training  |
| GHG              | greenhouse gas   |
| GI               | green infrastructure   |
| GM               | Geiger–Müller tube for detection of ionizing radiation   |
| GWPP             | Groundwater Protection Program (Y-12)  |
| HAP              | hazardous air pollutant  |
| HEPA             | high-efficiency particulate air  |
| HEU              | highly enriched uranium  |
| HFIR             | High Flux Isotope Reactor  |
| HiPAS            | High-Performance Architectural Surface-Selective   |
| HPIC             | high-pressure ion chamber  |
| HPSB             | high-performance sustainable building  |
| HQ               | hazard quotient  |
| HVAC             | heating, ventilating, and air-conditioning   |
| IC <sub>25</sub> | inhibition concentration (the concentration of effluent that causes a 25% reduction in survival, reproduction, and/or growth of monitored species) |
| ID               | identification (number)  |
| IDMS             | Integrated Document Management System (UT-Battelle)  |
| ISMS             | Integrated Safety Management System  |
| ISO              | International Organization for Standardization   |
| Isotek           | Isotek Systems LLC   |
| LCD              | liquid crystal display   |
| LID              | low impact development   |
| LIMS             | Laboratory Information Management System (Y-12 Complex)  |
| LLW              | low-level waste  |
| M&E              | material and equipment   |
| M&TE             | measurement and test equipment   |
| MACT             | Maximum Achievable Control Technology  |
| MARSAME          | <i>Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual</i>  |

|                 |  |
|-----------------|--|
| MARSSIM         | <i>Multi-Agency Radiation Survey and Site Investigation Manual</i>                     |
| MCK             | McCoy Branch kilometer   |
| MCL             | maximum contaminant level  |
| MDA             | minimum detectable activity  |
| MDF             | Manufacturing Demonstration Facility   |
| MEI             | maximally exposed individual   |
| MEK             | Melton Branch kilometer  |
| MIK             | Mitchell Branch kilometer  |
| MOA             | memorandum of agreement  |
| MSRE            | Molten Salt Reactor Experiment   |
| MT              | meteorological tower (when directly followed by a numeral as in “MT2”)                 |
| MTF             | Mercury Treatment Facility   |
|                 |  |
| NAAQS           | National Ambient Air Quality Standards   |
| NEPA            | National Environmental Policy Act  |
| NESHAPs         | National Emission Standards for Hazardous Air Pollutants                               |
| NHPA            | National Historic Preservation Act   |
| NIST            | National Institute of Standards and Technology   |
| NNSA            | National Nuclear Security Administration   |
| NNSS            | Nevada National Security Site  |
| NOV             | notice of violation  |
| NO <sub>x</sub> | oxides of nitrogen   |
| NPDES           | National Pollutant Discharge Elimination System  |
| NPL             | National Priorities List (EPA)   |
| NPO             | NNSA Production Office   |
| NRHP            | National Register of Historic Places   |
| NSF-ISR         | NSF International Strategic Registrations, Ltd.  |
| NSPS            | New Source Performance Standard  |
| NTRC            | National Transportation Research Center  |
|                 |  |
| ODS             | ozone-depleting substance  |
| OMP             | operational monitoring plan  |
| ORAU            | Oak Ridge Associated Universities  |
| OREIS           | Oak Ridge Environmental Information System (ORNL)                                      |
| ORGDP           | Oak Ridge Gaseous Diffusion Plant  |
| ORISE           | Oak Ridge Institute for Science and Education  |
| ORNL            | Oak Ridge National Laboratory  |
| ORO             | Oak Ridge Office (DOE)   |
| ORPS            | Occurrence Reporting and Processing System (Y-12 Complex)                              |
| ORR             | Oak Ridge Reservation  |
| ORR-PCB-FFCA    | Oak Ridge Reservation Polychlorinated Biphenyl Federal Facilities Compliance Agreement |
| ORSSAB          | Oak Ridge Site Specific Advisory Board   |
| ORSTP           | Oak Ridge Science and Technology Park  |



|                   |   |
|-------------------|---|
| OS                | Office of Science (DOE)   |
| OST               | Office of Secure Transportation (NNSA)  |
| P2                | designation for an on-site ORNL wetland   |
| PAM               | perimeter air monitoring (station)  |
| PCB               | polychlorinated biphenyl  |
| PCE               | tetrachloroethene   |
| PEMS              | Predictive Emissions Monitoring System  |
| PM                | particulate matter  |
| PM <sub>10</sub>  | particulate matter with an aerodynamic diameter less than or equal to 10 μm       |
| PM <sub>2.5</sub> | fine particulate matter with an aerodynamic diameter less than or equal to 2.5 μm |
| POTW              | publicly owned treatment works  |
| PWTC              | Process Waste Treatment Complex   |
| QA                | quality assurance   |
| QC                | quality control   |
| RA                | remedial action   |
| R&D               | research and development  |
| Rad-NESHAPs       | National Emission Standards for Hazardous Air Pollutants for Radionuclides        |
| RATA              | relative accuracy test audit  |
| RCRA              | Resource Conservation and Recovery Act  |
| RCW               | recirculating cooling water   |
| RESRAD            | residual radioactivity  |
| RFITS             | Radio Frequency Identification Transportation System                              |
| RH                | remote-handled  |
| RI                | remedial investigation  |
| RI/FS             | remedial investigation/feasibility study  |
| RICE              | reciprocating internal combustion engine  |
| RMP               | risk management plan  |
| ROD               | record of decision  |
| RQ                | reportable quantity (CERCLA)  |
| RRSTP             | Rarity Ridge Sewage Treatment Plant   |
| RSI               | Restoration Services, Inc.  |
| RSO               | radiation safety officer  |
| S&M               | surveillance and maintenance  |
| SAA               | satellite accumulation area   |
| SAP               | sampling and analysis plan  |
| SARA              | Superfund Amendments and Reauthorization Act                                      |
| SBMS              | Standards-Based Management System (UT-Battelle)                                   |
| SCP               | standards and calibration program   |
| SD                | storm water outfall/storm drain   |

|        |  |
|--------|--|
| SDWA   | Safe Drinking Water Act  |
| SHPO   | State Historic Preservation Office (Tennessee)                       |
| SIC    | Standard Industrial Classification (code)                            |
| SNAP   | Significant New Alternatives Program (EPA)                           |
| SNM    | special nuclear material   |
| SNS    | Spallation Neutron Source  |
| SODAR  | SOnic Detection And Ranging  |
| SOF    | sum of fractions   |
| SPCC   | spill prevention, control, and countermeasures (plan)                |
| SPMD   | semipermeable membrane device  |
| SSP    | site sustainability plan   |
| SSPP   | Strategic Sustainability Performance Plan (DOE)                      |
| STP    | sewage treatment plant   |
| SVOC   | semivolatile organic compound  |
| SWEIS  | site-wide environmental impact statement                             |
| SWHISS | Surface Water Hydrological Information Support System (Y-12 Complex) |
| SWPP   | Storm Water Pollution Prevention                                     |
| SWPPP  | Storm Water Pollution Prevention Plan                                |
| SWSA   | solid waste storage area   |
|        |  |
| TCA    | trichloroethane  |
| TCE    | trichloroethene/trichloroethylene                                    |
| TDEC   | Tennessee Department of Environment and Conservation                 |
| TDS    | total dissolved solids   |
| TEMA   | Tennessee Emergency Management Agency                                |
| TGSP   | Tennessee Green Star Partnership                                     |
| TMDL   | Total Maximum Daily Load   |
| TMSP   | Tennessee Stormwater Multi-Sector General Permit                     |
| TOA    | Tennessee Oversight Agreement  |
| TRI    | toxic (chemical) release inventory                                   |
| TRO    | total residual oxidant   |
| TRU    | transuranic  |
| TSCA   | Toxic Substances Control Act   |
| TSS    | total suspended solids   |
| TTO    | total toxic organic  |
| TVA    | Tennessee Valley Authority   |
| TWA    | time-weighted average  |
| TWPC   | Transuranic Waste Processing Center                                  |
| TWRA   | Tennessee Wildlife Resources Agency                                  |
|        |  |
| UCOR   | URS   CH2M Oak Ridge LLC   |
| UMC    | Unneeded Materials and Chemicals                                     |
| UMS    | Utilities Management System (Y-12 Complex)                           |
| UNW    | unconsolidated well  |

|                   |  |
|-------------------|--|
| UPF               | Uranium Processing Facility (Y-12 Complex)   |
| USACE             | US Army Corps of Engineers   |
| USDA              | US Department of Agriculture   |
| USGS              | US Geological Survey   |
| UST               | underground storage tank   |
| UT-Battelle       | UT-Battelle, LLC (Partnership between University of Tennessee and Battelle Memorial Institute formed to manage ORNL for DOE) |
|                   |  |
| VOC               | volatile organic compound  |
|                   |  |
| WAI               | Wastren Advantage, Inc.  |
| WCK               | WOC kilometer  |
| WEMA              | west end mercury-use area (Y-12)   |
| WET               | whole effluent toxicity  |
| WETF              | West End Treatment Facility  |
| WIPP              | Waste Isolation Pilot Plant  |
| WOC               | White Oak Creek  |
| WOD               | White Oak Dam  |
| WQC               | water quality criterion  |
| WQPP              | water quality protection plan  |
| WRRP              | Water Resources Restoration Program  |
| WSR               | waste services representatives   |
|                   |  |
| Y-12/Y-12 Complex | Y-12 National Security Complex   |
|                   |  |
| ZPR               | Zero Power Reactor   |



# Units of Measure and Conversion Factors\*

## Units of measure and their abbreviations

|                            |         |                              |      |
|----------------------------|---------|------------------------------|------|
| acre                       | acre    | millicurie                   | mCi  |
| becquerel                  | Bq      | milligram                    | mg   |
| British thermal unit       | Btu     | milliliter                   | mL   |
| centimeter                 | cm      | millimeter                   | mm   |
| curie                      | Ci      | million                      | M    |
| day                        | day     | millirad                     | mrad |
| degrees Celsius            | °C      | millirem                     | mrem |
| degrees Fahrenheit         | °F      | milliroentgen                | mR   |
| disintegrations per minute | dpm     | millisievert                 | mSv  |
| foot                       | ft      | minute                       | min  |
| gallon                     | gal     | nanogram                     | ng   |
| gallons per minute         | gal/min | nephelometric turbidity unit | NTU  |
| gram                       | g       | parts per billion            | ppb  |
| gray                       | Gy      | parts per million            | ppm  |
| gross square feet          | gsf     | parts per trillion           | ppt  |
| hectare                    | ha      | picocurie                    | pCi  |
| hour                       | h       | pound                        | lb   |
| inch                       | in.     | pound mass                   | lbm  |
| joule                      | J       | pounds per square inch       | psi  |
| kilocurie                  | kCi     | pounds per square inch gage  | psig |
| kilogram                   | kg      | quart                        | qt   |
| kilometer                  | km      | rad                          | rad  |
| kilowatt                   | kW      | roentgen                     | R    |
| liter                      | L       | rem                          | rem  |
| megajoule                  | MJ      | roentgen equivalent man      | rem  |
| megawatt                   | MW      | second                       | s    |
| megawatt-hour              | MWh     | sievert                      | Sv   |
| meter                      | m       | standard unit (pH)           | SU   |
| microcurie                 | μCi     | ton, short (2,000 lb)        | ton  |
| microgram                  | μg      | yard                         | yd   |
| micrometer                 | μm      | year                         | year |

## Quantitative prefixes

|       |                  |       |                   |
|-------|------------------|-------|-------------------|
| exa   | $\times 10^{18}$ | atto  | $\times 10^{-18}$ |
| peta  | $\times 10^{15}$ | femto | $\times 10^{-15}$ |
| tera  | $\times 10^{12}$ | pico  | $\times 10^{-12}$ |
| giga  | $\times 10^9$    | nano  | $\times 10^{-9}$  |
| mega  | $\times 10^6$    | micro | $\times 10^{-6}$  |
| kilo  | $\times 10^3$    | milli | $\times 10^{-3}$  |
| hecto | $\times 10^2$    | centi | $\times 10^{-2}$  |
| deka  | $\times 10^1$    | deci  | $\times 10^{-1}$  |

\*Due to differing permit reporting requirements and instrument capabilities, various units of measurement are used in this report. The provided list of units of measure and conversion factors is intended to help readers make approximate conversions to other units as needed for specific calculations and comparisons.

## Unit conversions

| Unit                 | Conversion                | Equivalent          | Unit                | Conversion               | Equivalent          |
|----------------------|---------------------------|---------------------|---------------------|--------------------------|---------------------|
| <b>Length</b>        |                           |                     |                     |                          |                     |
| in.                  | × 2.54                    | cm                  | cm                  | × 0.394                  | in.                 |
| ft                   | × 0.305                   | m                   | m                   | × 3.28                   | ft                  |
| mile                 | × 1.61                    | km                  | km                  | × 0.621                  | mile                |
| <b>Area</b>          |                           |                     |                     |                          |                     |
| acre                 | × 0.405                   | ha                  | ha                  | × 2.47                   | acre                |
| ft <sup>2</sup>      | × 0.093                   | m <sup>2</sup>      | m <sup>2</sup>      | × 10.764                 | ft <sup>2</sup>     |
| mile <sup>2</sup>    | × 2.59                    | km <sup>2</sup>     | km <sup>2</sup>     | × 0.386                  | mile <sup>2</sup>   |
| <b>Volume</b>        |                           |                     |                     |                          |                     |
| ft <sup>3</sup>      | × 0.028                   | m <sup>3</sup>      | m <sup>3</sup>      | × 35.31                  | ft <sup>3</sup>     |
| qt (US liquid)       | × 0.946                   | L                   | L                   | × 1.057                  | qt (US liquid)      |
| gal                  | × 3.7854118               | L                   | L                   | × 0.264172051            | gal                 |
| <b>Concentration</b> |                           |                     |                     |                          |                     |
| ppb                  |                           |                     |                     |                          | ppb                 |
| ppm                  | × 1                       | mg/L                | mg/L                | × 1                      | ppm                 |
| <b>Weight</b>        |                           |                     |                     |                          |                     |
| lb                   | × 0.4536                  | kg                  | kg                  | × 2.205                  | lb                  |
| lbm                  | × 0.45356                 | kg                  | kg                  | × 2.2046226              | lbm                 |
| ton, short           | × 907.1847                | kg                  | kg                  | × 0.00110231131          | ton, short          |
| <b>Temperature</b>   |                           |                     |                     |                          |                     |
| °C                   | °F = (9/5) °C + 32        | °F                  | °F                  | °C = (5/9) (F—32)        | °C                  |
| <b>Activity</b>      |                           |                     |                     |                          |                     |
| Bq                   | × 2.7 × 10 <sup>-11</sup> | Ci                  | Ci                  | × 3.7 × 10 <sup>10</sup> | Bq                  |
| Bq                   | × 27                      | pCi                 | pCi                 | × 0.037                  | Bq                  |
| mSv                  | × 100                     | mrem                | mrem                | × 0.01                   | mSv                 |
| Sv                   | × 100                     | rem                 | rem                 | × 0.01                   | Sv                  |
| nCi                  | × 1,000                   | pCi                 | pCi                 | × 0.001                  | nCi                 |
| mCi/km <sup>2</sup>  | × 1                       | nCi/m <sup>2</sup>  | nCi/m <sup>2</sup>  | × 1                      | mCi/km <sup>2</sup> |
| dpm/L                | × 0.45 × 10 <sup>9</sup>  | μCi/cm <sup>3</sup> | μCi/cm <sup>3</sup> | × 2.22 × 10 <sup>9</sup> | dpm/L               |
| pCi/L                | × 10 <sup>-9</sup>        | μCi/mL              | μCi/mL              | × 10 <sup>9</sup>        | pCi/L               |
| pCi/m <sup>3</sup>   | × 10 <sup>-12</sup>       | μCi/cm <sup>3</sup> | μCi/cm <sup>3</sup> | × 10 <sup>12</sup>       | pCi/m <sup>3</sup>  |

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# Executive Summary

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## Overview

The US Department of Energy's (DOE's) Oak Ridge Reservation (ORR) is located in Roane and Anderson counties in East Tennessee, about 40 km (25 miles) from Knoxville. ORR is one of DOE's most unique and complex sites. It encompasses three major facilities and thousands of employees that 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. ORR was established in the early 1940s 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 world-leading 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 has established an integrated safety management system (ISMS) to integrate safety into 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). Several contractors, including UT-Battelle, LLC; Babcock & Wilcox Technical Services Y-12, LLC (B&W Y-12); Consolidated Nuclear Security, LLC (CNS); URS | CH2M Oak Ridge LLC; Wastren Advantage, Inc.; Oak Ridge Associated Universities; and Isotek Systems LLC, are responsible for carrying out the various DOE missions at the three major ORR facilities. (Note: For most of the reporting year, B&W Y-12 was the managing contractor for the Y-12 Complex, with CNS assuming that role under a new contract July 1, 2014.) These contractors manage and implement environmental protection programs through environmental management systems (EMSs) 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. An EMS is a continuous cycle of planning, implementing, evaluating, and improving processes and actions undertaken to achieve environmental missions and goals. Routine, external (independent) audits of contractor-implemented EMSs on the reservation are typically conducted annually and, if applicable, a triennial recertification is also performed. Detailed information on contractor EMSs is provided in Chapters 3, 4, and 5.

DOE operations on ORR have the potential to release a variety of constituents into the environment via atmospheric, surface water, and groundwater pathways. Some of the 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 on 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 environment and encourages the public to participate in matters related to 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 its Oak Ridge environmental, safety, and health activities.

The *Oak Ridge Reservation Annual Site Environmental Report* (ASER) is prepared for DOE according to the requirements of DOE O 231.1 B, *Environment, Safety and Health Reporting*. 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 ORR that provides consolidated data on overall reservation performance and status has been published annually since the mid-1970s. ASER is a key component of the DOE effort to keep the public informed about environmental conditions across DOE/National Nuclear Security Administration sites. The report is prepared for readability, and frequent reference to other sections, chapters, and reports is made throughout the report to avoid redundancy.

## 2014 Impacts

DOE ORR operations in 2014 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 that a hypothetical off-site individual could have received from DOE activities on ORR in 2014 was estimated to be 0.6 mrem from air pathways 1.1 mrem from water pathways (drinking water, fish consumption, swimming, recreation, and other uses), and 1.1 mrem from consumption of wildlife harvested on 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 2014 maximum hypothetical dose is consistent with those calculated for the previous 5 years (2009–2013), which have ranged from 3 to 5 mrem.

## Environmental Monitoring

Extensive environmental monitoring is conducted across ORR each year. Site-specific environmental protection programs are carried out at ORNL, the Y-12 Complex, and ETTP, and ORR-wide environmental surveillance programs, which include locations and media on and off the reservation, are conducted to enhance and supplement data from site-specific efforts. In 2014, 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 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 ORR. These extensive sampling and monitoring efforts demonstrate DOE's commitment to 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 and the State of Tennessee, monitor ORR and enforce compliance with applicable environmental regulations. These agencies issue permits, review compliance reports, participate in joint monitoring programs, inspect facilities and operations, and/or oversee compliance with regulations. Compliance with environmental regulations and DOE orders related to environmental protection provides assurance that on-site processes do not impact the public or the environment adversely.

During 2014, there were only a few instances of noncompliance with regulations, permits, and DOE orders, which were promptly addressed to ensure that no 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 2–5 of this report.

- During 2014 a Tennessee Department of Environment and Conservation (TDEC) inspection at Y-12 identified three alleged violations related to the use of an incorrect checklist, missing labels, and improper labeling. The issues were administrative in nature, with no identified potential for environmental insult, and were immediately corrected.
- Three reportable occurrences related to Y-12 water programs occurred during 2014: (1) an oil sheen was observed on upper East Fork Poplar Creek within the Y-12 Complex, (2) an upset condition led to material from a stack being dispersed onto a building roof and the area adjacent to the building, and (3) minnow-sized dead fish were observed in East Fork Poplar Creek.
- A TDEC inspection at ORNL identified three alleged violations related to (1) an open satellite waste container, (2) an open 90-day accumulation area container, and (3) the location of the 90-day accumulation area in the vicinity of heavy equipment operation. The alleged violations were immediately corrected, and there was no environmental insult associated with these issues.
- A notice of violation was issued to UT-Battelle by TDEC for failure to notify TDEC of the demolition of two small structures (about 300 ft<sup>2</sup> each). Although the facilities did not contain asbestos, the regulations require that TDEC be notified before any building demolition.

Chapter 2 provides a detailed summary of ORR environmental compliance during 2014, and Chapters 3, 4, and 5 discuss each facility's compliance status for the year.

## Pollution Prevention and Site Sustainability

Numerous pollution prevention and sustainability programs across 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. During 2014, 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 2014

ORR has played key roles in US defense and energy research. However, past waste disposal practices and unintentional releases have left land and facilities contaminated. These contaminants include radioactive elements, mercury, asbestos, PCBs, 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.

In 2014, the most notable EM accomplishment on ORR was completion of the K-25 Building Demolition Project at ETTP. This project, DOE's largest ever demolition project, was completed 6 months ahead of schedule, which enabled work on the K-31 Demolition Project to begin earlier than expected. EM also continued planning activities for capital asset projects that will further advance ORR cleanup objectives. These include construction of a mercury treatment facility at Y-12, construction of a new disposal facility that will accept debris from future cleanup at Y-12 and ORNL, and construction of a sludge treatment facility at the Transuranic Waste Processing Center.

