
EXECUTIVE SUMMARY

From 1959 to 1970, the U.S. Department of Energy (DOE) annually published a report titled Evaluation of Radionuclide Conditions in the Vicinity of Hanford. In 1970, DOE expanded the report to include topics on air and water pollution, among other areas of public interest, and began annually publishing the report under the name Hanford Site Environmental Report. The report is published in accordance with DOE O 231.1B, *Environment, Safety and Health Reporting*, and DOE O 458.1, *Radiation Protection of the Public and the Environment*. The purpose of the *Hanford Annual Site Environmental Report for Calendar Year 2019* is to inform the public, regulators, employees, and other stakeholders of environmental and operating performance during the year.

Hanford Site operations are affected by and, in many cases, regulated by numerous federal and state agencies enforcing laws and regulations that address environmental compliance, remediation, planning, preservation, and waste management. For example, the DOE has sole authority to take action on matters under the *Atomic Energy Act of 1954* (AEA). In some cases, other federal agencies such as the Council on Environmental Quality, U.S. Environmental Protection Agency (EPA), and U. S. Fish and Wildlife Service have authority to regulate activities pursuant to the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA); *Endangered Species Act*; and *Migratory Bird Treaty Act*. The EPA has delegated authority to the Washington State Departments of Ecology (Ecology) and Washington State Department of Health (WDOH) to implement state laws and regulations in lieu of the *Resource Conservation and Recovery Act* (RCRA), the *Clean Air Act*, and the *Clean Water Act*. In these cases, state laws for licensing and permitting apply to activities and have resulted in the Hanford Site Radioactive Air Emissions License, RCRA Permit, Air Operating Permit, and State Waste Discharge Permits.

In general, the laws, regulations, and other requirements applicable to Hanford Site operations include, but may not be limited to, those that address environmental quality; air quality and noise; water resources; hazardous waste and materials management; radioactive waste and materials management; ecological resources; cultural and paleontological resources; worker safety and health; radiological safety and radiation protection; transportation; emergency planning, pollution prevention, and conservation; and environmental justice. It is DOE's policy to carry out its mission in a sustainable manner to maximize energy and water efficiency; minimize chemical toxicity and harmful environmental releases; promote renewable and other clean energy development; and conserve natural, cultural, and ecological resources while sustaining assigned mission activities.

All previous annual Hanford Site environmental reports are available online through Mission Support Alliance, LLC (MSA) at <http://msa.hanford.gov/page.cfm/enviroreports>. The following sections summarize this year's annual report.

ES.1 Section 1, Introduction

The DOE is responsible for the Hanford Site, one of the largest nuclear cleanup efforts in the world, managing the legacy of five decades of nuclear weapons production. Located in south-central Washington State within the semi-arid Pasco Basin of the Columbia Plateau, the Hanford Site encompasses approximately 581 mi² (1,505 km²) in Benton, Franklin, Adams, and Grant Counties (Figure ES-1). The Hanford Site was established in 1943 to produce plutonium for atomic weapons

during World War II and the Cold War. The site has restricted public access and provides a buffer area around facilities formerly used for nuclear materials production, waste storage, and waste disposal.

The primary mission of the Hanford Site shifted from production to cleanup with the signing of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement [TPA]) in 1989 (Ecology et al. 1989) by the Ecology, EPA, and DOE (collectively, TPA agencies). The Hanford Site's current mission focuses on environmental restoration, which includes remediation of contaminated areas, decontamination and decommissioning of Hanford Site facilities, waste management (i.e., waste storage, treatment, and disposal), and related scientific and environmental research and development of waste management technologies.

Cleanup of the Hanford Site is overseen by the U.S. Department of Energy, Richland Operations Office (DOE-RL) and Office of River Protection (DOE-ORP). The DOE-RL and the DOE-ORP manage the site through several contractors and their subcontractors. The DOE-RL serves as the Hanford Site property owner and oversees cleanup along the Columbia River and in Hanford's Central Plateau, including groundwater and waste site cleanup; management of solid waste, spent nuclear fuel, and sludge; facility cleanout, deactivation, and demolition; environmental restoration; plutonium management; and all site support services.

The DOE-ORP was established by Congress in 1998 as a field office to manage the retrieval, treatment, and disposal of approximately 54.1 million gal (204.8 million L) of radioactive tank waste currently stored in 177 underground tanks in the central part of the site. The tank waste is material left over from years of World War II and post-war production of nuclear weapons fuel. In support of this mission, DOE-ORP is responsible for the safe operation of the tank farms and associated 200 Area facilities and construction and operation of the Hanford Tank Waste Treatment Plant and Immobilization Plant located in the Central Plateau.

The DOE, U.S. Fish and Wildlife Service, and Washington State Department of Fish and Wildlife each manage portions of the Hanford Reach National Monument. In 2000, President Clinton created the Hanford Reach National Monument (65 FR 37253). Over 300 mi² (777 km²) of this riparian habitat and buffer lands surrounding active central Hanford Site lands were designated for management by the U.S. Fish and Wildlife Service.

The Manhattan Project National Historical Park, created in November 2015, is a partnership between DOE and the National Park Service. DOE continues to own, preserve, and provide public access to the five National Park facilities and areas at Hanford while the National Park Service is responsible for interpretation of the Manhattan Project story, as well as visitor services.

The DOE Office of Science's Pacific Northwest Site Office manages programs, goals, and objectives at the Hanford Site. DOE chartered the Pacific Northwest Site Office to oversee the operation of the Pacific Northwest National Laboratory (PNNL). PNNL has been operated by Battelle Memorial Institute for DOE since 1965. PNNL is one of ten DOE national laboratories in the Office of Science.

From 1989 through 2019, a total of 1,349 TPA milestones were completed and 343 target dates were met. During 2019, 25 specific cleanup milestones were scheduled for completion; of those, 2 milestones were deleted, 18 milestones were completed on time, 5 milestones were being disputed, and zero milestones were in negotiation. In addition, two target dates were met, zero target dates were deleted or disputed, and there were no target dates were in negotiation.

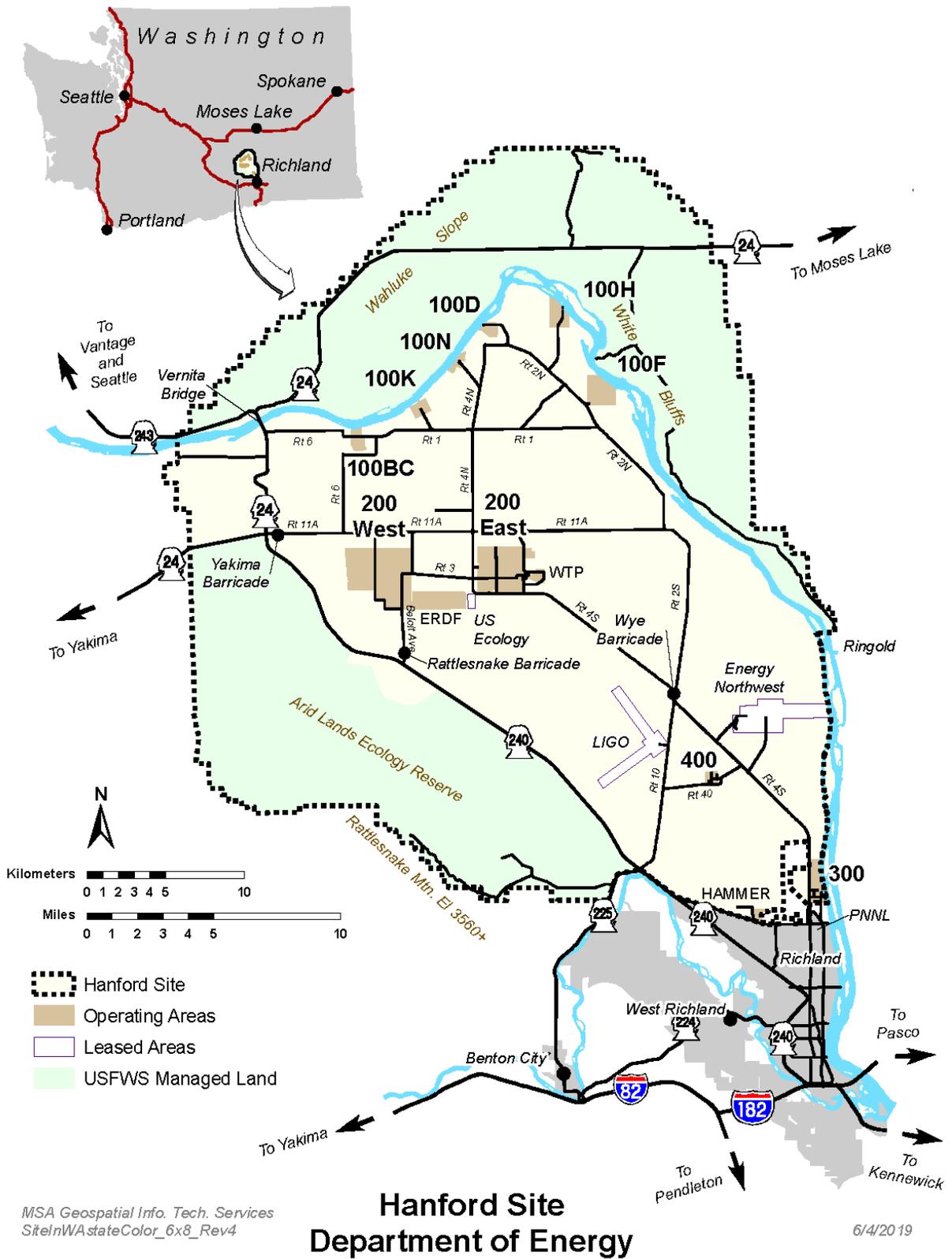


Figure ES-1. Location of the Hanford Site.

ES.2 Section 2, Compliance Summary

To ensure the protection of human health and the environment through safe operations, DOE implements compliance programs designed to fulfill requirements of applicable federal, state, and local laws and regulations, as well as DOE orders, directives, policies, and guidelines. In addition, the Hanford Site operates under permits required under specific environmental protection regulations. Several federal, state, and local regulatory agencies are responsible for monitoring and enforcing compliance with applicable environmental regulations at the Hanford Site, including the EPA, Ecology, WDOH, City of Richland, and the Benton Clean Air Agency. The EPA and Ecology are the two main agencies who oversee Hanford Site cleanup as part of the TPA. In addition, the Defense Nuclear Facilities Safety Board provides oversight of DOE work. Congress created the Defense Nuclear Facilities Safety Board as an independent agency within the Executive Branch to identify the nature and consequences of potential threats to public health and safety at DOE's defense nuclear facilities, to elevate such issues to the highest levels of authority, and to inform the public.

Hazardous Material and Waste Management

During fiscal year (FY) 2019, 90 regulatory agency inspections and visits were conducted at DOE facilities on the Hanford Site. There were five RCRA Permit General Inspections of the 100, 200, 300, and 400 Areas, as well as the banks of the Columbia River by boat. The General-Inspections were conducted by Hanford Site contractors with DOE oversight. Agency inspections at Hanford are occasionally conducted jointly between multiple agencies.

The Ecology inspections focused on treatment, storage, and disposal (TSD) unit compliance with the *Hanford Facility Dangerous Waste Permit* (Ecology 1994) and WAC 173-303, "Dangerous Waste Regulations." Generator activities, waste accumulation, and universal waste management areas were also inspected. During 2019, permit modifications were processed to change requirements for TSD units pursuant to WAC 173-303-830, "Permit Changes."

For waste sites where hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure, CERCLA requires a review every 5 years to evaluate the implementation and performance of a remedy to determine if the remedy is or will be protective of human health and the environment. During calendar year (CY) 2017, DOE/RL-2016-01, *Hanford Site Fourth CERCLA Five-Year Review Report*, addressing 2011 through 2015, was completed and received concurrence from EPA (2017). The next Hanford Site CERCLA 5-year review must be completed by May 2022.

DOE/RL-2019-10, *2018 Hanford Site Tier Two Emergency and Hazardous Chemical Inventory*, was submitted to Ecology's Community Right-To-Know Unit, local emergency planning committees for Benton, Franklin, and Grant counties, and the City of Richland and Hanford Site Fire Department before the annual March 1 deadline. The Hanford Site had 50 hazardous chemicals that exceeded the reporting thresholds.

National Environmental Policy Act of 1969

The *National Environmental Policy Act of 1969* (NEPA) requires federal agencies to assess the environmental consequences of proposed actions prior to making decisions that may have environmental effects. The Council on Environmental Quality regulations that implement NEPA (40 CFR 1500-1508) and DOE's NEPA implementing procedures (10 CFR 1021) ensure compliance with the letter

and spirit of NEPA. Proposed actions are evaluated to determine whether an Environmental Impact Statement (EIS) or Environmental Assessment is required, or the proposed action is categorically excluded (CX) from preparation of an EIS or Environmental Assessment.

During CY 2019, there were no EISs completed or underway. The EA for rebuild of the Benton-Othello switching station 115-kV transmission line on the Hanford Site was completed and a Finding of No Significant Impact was issued; therefore, an EIS is not required. A total of 49 CXs were approved by the DOE NEPA Compliance Officer. These included 36 annual CXs for recurring maintenance activities and 13 activity-specific CXs for non-routine construction projects.

Radiation Protection Statutes, Regulations, and Directives

Potential sources of radionuclide release from the Hanford Site include airborne emissions, groundwater seeping into the Columbia River, and fugitive emissions from soils and facilities. The annual dose to a maximally exposed member of the public continued to be well below the DOE public dose limit of 100 mrem/yr, at 0.16 mrem during 2019. The dose to biota of the Columbia River and other offsite locations was also well below the DOE standards. Section 4.0, *Radiological Protection and Doses*, explains the determination of public and biota dose in detail.

Air Quality Statutes and Regulations

In 2019, the WDOH inspections focused on compliance of point and non-point emission units with the *Hanford Site Radioactive Air Emissions License #FF-01* (FF-01). Ecology inspections included discharge points (e.g., package boilers, emergency engines/generators, and tank farm ventilation systems) regulated under the Hanford Site Air Operating Permit. During FY 2019, regulatory agencies conducted 44 *Clean Air Act* inspections on the Hanford Site.

Water Quality Permits, Statutes, and Regulations

The Ecology state waste discharge permits, all held by DOE, were in effect during 2019: ST0004500, ST0004502, ST0004511, and ST0045514. Ecology's wastewater discharge permits page is located at <https://fortress.wa.gov/ecy/nwp/permitting/WWD/index.html>. WDOH issues annual permits to DOE to operate Hanford Site onsite sewage systems, which include some holding-tank sewage systems. Most onsite sewage systems (septic systems) operate under permits issued by the WDOH.

Two Ecology general permits for sand and gravel were in effect (and issued to Bechtel National Inc.) during 2019: WAG-50-5180 and WAG-50-5181.

Natural and Cultural Resources

There were 100 ecological compliance reviews requested during FY 2019 from 17 functional departments on the Hanford Site. Of the 17 functional departments, those with a significant number of requests include Soil and Groundwater (16), Reliability Services (12), Remediation (10), Water and Sewer Utilities (10), and Electrical Utilities (6).

Sustainability

The Hanford Site maintains a pollution prevention and waste minimization program that contributes to the achievement of sustainability goals. The Hanford Site continued diversion of non-hazardous solid waste. In 2019, a total of 1,125 metric tons of non-hazardous (i.e., plastic, aluminum, cardboard, paper, wood, and metal), universal waste (i.e., batteries and lamps), and other regulated (i.e., antifreeze and used oils) wastes were recycled through Hanford Site programs administered through the Mission Support Contract. Along with material recycling and diversion, the Hanford Site strives to reduce

greenhouse gas emissions. There was a 39% reduction in Scope 3 greenhouse gas emissions for the Hanford Site in FY 2019 from the FY 2008 baseline; emissions in FY 2019 were 25,234.2 metric tons of carbon dioxide equivalent, whereas emissions in FY 2008 were 41,427 metric tons of carbon dioxide equivalent. Greenhouse gas emissions from employee commuting, business travel, offsite wastewater treatment, and contracted solid waste disposal are primarily dependent on work locations and the number of workers employed at the Hanford Site.

Occurrence Reporting and Processing of Operations Information

Per DOE O 232.2A, *Occurrence Reporting and Processing of Operations Information*, and associated Supplemented Contractor Requirements Documents, environmental releases of radioactive and regulated materials from the Hanford Site are reported to DOE and other federal and state agencies as required. The Reporting Criteria provides a set of requirements that must be used to identify reportable occurrences. Three occurrence report levels exist: High (H), Low (L), and Informational (I) to reflect the impact associated with a given occurrence in terms of health, safety, and security to personnel, the public, the environment, and the operational mission. In 2019, there were 29 documented occurrences of legacy contamination.

Environmental Permits

During 2019, permit modifications were processed to change requirements for TSD units pursuant to WAC 173-303-830, "Permit Changes."

Environmental Enforcement Actions

During 2019 there were 10 regulatory agency compliance actions filed against the DOE and its contractors for alleged violations of regulatory requirements or other enforceable agreements. Ten compliance actions were issued by Ecology. Nine compliance actions resulted from regulatory agency inspections of DOE facilities on the Hanford Site (Section 2.1.2.2). The inspection reports also contained 24 concerns.

During CY 2019, there were 18 non-compliances reported to regulatory agencies for wastewater permit deviations. Two of the events involved Large Onsite Sewage System permits and 16 involved State Waste Discharge Permits. In all cases, action was taken to repair and correct the non-compliant conditions; regulatory notifications were made in accordance with permit requirements.

ES.3 Section 3, Environmental Management System

Environmental management performance measure objectives for 2019 included fleet management, alternative fuel use, potable and non-potable water use, electricity use, facility fuel use, facility energy use, Electronic Product Environmental Assessment Tool, and sanitary waste reduction. The targets for renewable electric energy, sanitary waste reduction, and alternative fuel vehicle acquisitions were not met in 2019. The target objectives for potable and non-potable water, facility fuel, facility energy, and Electronic Product Environmental Assessment Tool acquisitions were met in FY 2019.

ES.4 Section 4, Radiological Protection and Doses

Hanford Site radiation protection program staff conduct ongoing monitoring of external radiation sources, perform environmental radiological surveys, and evaluate potential radiological doses to the public. Results of 2019 monitoring efforts are provided below.

External Radiation Monitoring

External radiation fields were monitored in 2019 at 122 locations on and off the Hanford Site. Quarterly monitoring results were used individually or averaged to determine dose rates in a given area for a specific sampling period. The average dose rate levels measured in the operational areas during 2019 were comparable to the previous years' levels.

Radiological Clearance of Hanford Site Property

No property with anthropogenic (man-made) residual radioactivity above authorized limits was released from the Hanford Site in 2019.

Personal Property. An estimated 37,000 items of personal property were surveyed for residual radioactivity during 2019. All met the limits of DOE O 458.1, allowing them to be cleared from the Hanford Site for unrestricted use by members of the public. Personal property consists mainly of materials and equipment; formal surveys are conducted on items such as power poles, transformers, miscellaneous electrical equipment, air conditioning units, industrial vehicles, excavation equipment, man lifts, and scaffolding. Verification surveys are also performed on common items such as electronics, pallets, batteries, office items, respiratory protection equipment, compressed gas cylinders, vehicles, tools, and physical security items. Some types of debris may be cleared to go to sanitary waste disposal sites. Scrap metal that has been confirmed to not have been in radiological areas can be verified as free of residual radioactivity and cleared from the Hanford Site.

Real Property. No real property (i.e., land and buildings) was cleared during 2019.

Granular Activated Carbon for Offsite Shipment and Regeneration. Four containers, approximately 80,000 lb (36,300 kg) of granular-activated carbon, were shipped offsite in 2019 for regeneration.

Potential Radiological Doses to the Public and Biota

Scientists evaluated potential radiological dose to the public and biota resulting from modeled exposure to 2019 Hanford Site liquid effluents and airborne emissions to determine compliance with pertinent regulations and limits. The sources of radionuclide releases considered in the dose assessment included gaseous emissions from stacks and ventilation exhausts and contaminated groundwater seeping into the Columbia River. Potential doses were also evaluated based on measured concentrations of radionuclides in samples of Hanford Site drinking water, regional crops from near-by land, and fish from the Columbia River. Potential radiological doses from 2019 Hanford Site operations were evaluated in detail to determine compliance with pertinent regulations and limits. The following radiological doses were assessed:

- Dose to a hypothetical maximally exposed individual (MEI) at an offsite location
- Collective dose to the population residing within 50 mi (80 km) of Hanford Site operation areas
- Dose from recreational activities (e.g., hunting and fishing)
- Dose to a worker consuming drinking water on the Hanford Site
- Dose to a visitor to the Manhattan Project National Historical Park
- Dose from non-DOE industrial sources on and near the Hanford Site

- Absorbed dose received by biota exposed to radionuclide releases to the Columbia River and to radionuclides in onsite surface water bodies.

Additionally, air-pathway doses from stack and fugitive emissions to offsite and non-DOE Hanford Site employees calculated using regulation-specified EPA methods for comparison to the *Clean Air Act* standards in 40 CFR 61, Subpart H, “National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities,” were summarized.

The MEI is a hypothetical person whose location and assumed exposures are modeled in such a protective manner that it is highly unlikely any actual offsite individual would have received a higher Hanford-related dose. The dose to the MEI calculated in 2019 from Hanford Site operations was 0.16 mrem (1.6 μ Sv), which is 0.16% of the 100 mrem (1,000 μ Sv) annual public dose limit specified in DOE O 458.1. Many different exposure pathways are included in the dose calculations but inhalation and external exposure to radon isotopes and their radioactive progeny from 300 Area air emissions was the single largest contributor. Collective dose was estimated for the entire population living within a 50-mi (80-km) radius of the air emissions sources and also individuals obtaining drinking water from the Columbia River downstream of the Hanford Site. A collective dose of 1.4 person-rem (0.014 person-Sv) was calculated as the sum of doses to all individual members of the exposed population.

In addition to the offsite MEI and collective dose calculations, several supplemental dose calculations were performed addressing onsite exposures. An onsite annual dose of up to 0.074 mrem (0.74 μ Sv) was calculated for ingestion of Hanford Site drinking water based on samples from the 400 Area, where water is supplied by groundwater wells. Onsite annual doses were also calculated for workers and visitors to the Manhattan Project National Historical Park, including B Reactor, Hanford Townsite and White Bluffs Bank tour locations. Up to 0.036 mrem (0.36 μ Sv) could be received at B Reactor. Like the offsite MEI dose, these calculated doses were far below the public dose limit. Due to a lack of site-related radionuclides detected at levels greater than analytical minimum detectable activities in muscle tissue samples of game animals and fillet samples of fish, there was no basis for a quantitative dose screening of the outdoor recreationalist based on the 2019 wildlife data collected from the Hanford Site.

To place this information into perspective, Hanford-related doses were compared with those received by the U.S. population from other routinely encountered sources of radiation. The 2009 National Council on Radiation Protection and Measurements report *Ionizing Radiation Exposure of the Population of the United States* (NCRP 2009) estimated that the overall annual exposure to ionizing radiation for the average American is 620 mrem (6,200 μ Sv), approximately half of which is related to natural sources and the other half attributable primarily to medical procedures.

ES.5 Section 5, Environmental Restoration and Waste Management

This section includes a waste summary for environmental restoration and waste management activities, including Hanford Site River Corridor closure, cleanup and remediation, facility decommissioning, waste management operations, underground waste storage tank status, construction of the Waste Treatment and Immobilization Plant and its associated facilities, and research activities related to waste cleanup. The following describes important 2019 cleanup and remediation activities at the Hanford Site.

River Corridor Closure

Hanford's River Corridor, which borders the Columbia River, includes the 100 Area, 300 Area and 400 Area. The majority of waste sites in the River Corridor have been remediated, and the majority of lands within the River Corridor have now been transitioned to MSA's Long-Term Stewardship (LTS) Program. Exceptions include the 105-K East and West Reactors, and the 105-K West Spent Fuel Storage Basins under CH2M Plateau Remediation Contractor (CHPRC) management, portions of the 300 Area (including the 325 Building, 331 Building under PNNL management and the 324 Building under CHPRC Management), and portions of the 400 Area (including the Fast-Flux Test Facility under CHPRC management).

The 100-K Area completed transfer of sludge from 105-KW Basin engineered containers into 20 sludge transfer and storage containers, which were transported to T-Plant for storage. The 105-KW Basin floor sample analysis was conducted to help assess the transuranic/dose ratio in support of eventual K-West Basin demolition by quantifying the plutonium, americium, and strontium-90 content in K-Basin floor core samples. A treatability test to flush the residual contamination in the vadose zone to the groundwater was conducted at 100-K West. Removal of asbestos from the 165-KW Building was completed in preparation for demolition. Removal began of the 166-KE fuel oil bunker; the bunker supplied fuel oil to the boilers located in 165-KE Power Control Building. Removal of the fuel oil bunker will continue into 2020. Demolition of 1724, 1724-KA, and 167-K Buildings was completed. Waste sites 100-K-50:2 and 100-K-94 are interim closed and backfilled. Excavation and load out of contaminated material for the 100-K-99 waste site was completed. Verification samples have been collected and are waiting on results.

Central Plateau

The Central Plateau includes a rectangular area of about 20 mi² (52 km²) in the center of the Central Plateau that is designated in the DOE/EIS-0222-F, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, and the 64 FR 61615, "Record of Decision for the Hanford Comprehensive Land-Use Plan Environmental Impact Statement," as the Industrial-Exclusive Area. The Industrial-Exclusive Area contains the 200-East and 200-West Areas, used in the past primarily for Hanford Site nuclear fuel processing and currently used for waste management and disposal activities. The Central Plateau also encompasses the CERCLA 200 Area National Priorities List site. The Central Plateau has a large physical inventory of chemical processing and support facilities, tank systems, liquid and solid waste disposal and storage facilities, utility systems, administrative facilities, and groundwater monitoring wells (Figure ES-2).

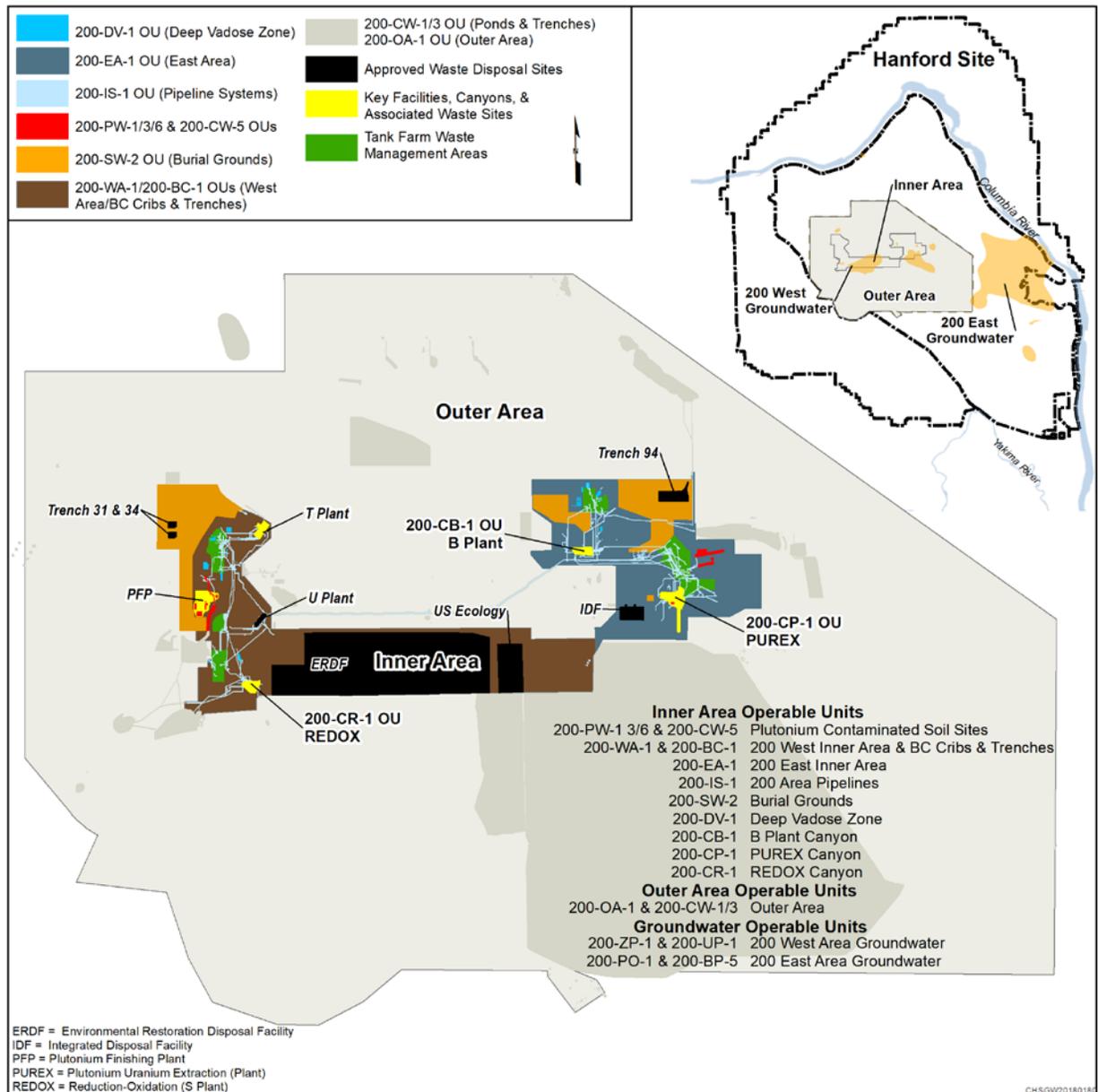


Figure ES-2. Overview of the Central Plateau.

Hanford Site cleanup operations result in the generation of solid wastes that must be evaluated for proper management. Solid wastes are reviewed as required by WAC 173-303-070(3), "Designation of Dangerous Waste," and are considered dangerous (i.e., hazardous) when the criteria for this classification are met. The radionuclides in solid waste are exempt from evaluation under WAC 173-303-070(3) but are subject to evaluation and categorization as transuranic, high-level waste, or low-level waste (LLW) under the AEA. Wastes that contain constituents regulated under both WAC 173-303 and the AEA are classified as mixed wastes.

Radioactive and/or mixed wastes are managed in several ways. High-level waste is stored in large underground single-shell and double-shell tanks. LLW typically is stored in tanks or containers. The method used to store LLW depends on the source, composition, and waste concentration. Transuranic waste is stored in vaults, in storage buildings, on aboveground storage pads, and retrievably buried cribs

and vaults. DOE/RL-2018-12, *Hanford Site Annual Dangerous Waste Report*, lists the dangerous and mixed wastes that are generated, treated, and disposed of onsite or shipped offsite. Dangerous and mixed wastes are treated, stored, and prepared for disposal at several Hanford Site facilities. Dangerous waste generated at the site is shipped offsite for treatment and/or disposal. Some types of dangerous waste, such as used lead–acid batteries and aerosol products (e.g., spray paint), are shipped offsite for recycling.

As of December 31, 2019, quantities for both mixed and radioactive wastes generated onsite or received from offsite sources and disposed at the Hanford Site as tracked by the Solid Waste Information and Tracking System database are shown in Tables ES-1 and ES-2. Quantities of dangerous waste shipped offsite as tracked by the database are shown in Table ES-3. All data is current as of December 31, 2019.

Table ES-1. Solid Waste^a Quantities Generated on the Hanford Site.

Waste Category		2014	2015	2016	2017	2018	2019
Mixed	Tons	140	657	609	452	523	571
	Metric tons	127	596	552	410	474	518
Radioactive	Tons	572	1550	665	828	2680	658
	Metric tons	519	1408	603	751	2434	597

^a Solid waste includes containerized liquid waste.

Table ES-2. Solid Waste^a Quantities Received on the Hanford Site from Offsite Sources.

Waste Category ^b		2014	2015	2016	2017	2018	2019
Mixed	Tons	38.4	97.9	105	83.3	118	120
	Metric tons	35	88.9	95.3	76	107	109
Radioactive	Tons	57	91.4	113	133	130	187
	Metric tons	52	82.9	102	121	118	170

^a Solid waste includes containerized liquid waste. Solid waste quantities do not include U.S. Navy reactor compartments.

^b Total includes Hanford Site-generated waste treated by an offsite contractor and returned as newly generated waste. Includes both low-level radioactive and transuranic waste.

Table ES-3. Dangerous Waste^a Quantities Shipped Off the Hanford Site.

Waste Category		2014	2015	2016	2017	2018	2019
Containerized (DW Only)	Tons	103	76.8	69.4	68.5	84.5	67.9
	Metric tons	93.4 ^b	69.7 ^b	63.0 ^b	62	76.6	61.6
Containerized (MW Only)	Tons	33.7	65.7	69.7	90.4	56.9	36.6
	Metric tons	30.6 ^c	59.6 ^c	63.2 ^c	82	51.6	33.2
Bulk Solids (DW Only)	Tons	22.1	—	—	0	0	0
	Metric tons	20.1	—	—	0	0	0
Bulk Solids (Non-Rad/Non-DW)	Tons	—	—	—	0	0	0
	Metric tons	—	—	—	0	0	0
Bulk Liquids (DW Only)	Tons	22	—	1	0	0	0
	Metric tons	20	—	1.36	0	0	0
Bulk Liquids (Non-Rad/Non-DW)	Tons	—	—	—	0	0	0
	Metric tons	—	—	—	0	0	0
Totals	Tons	181	142	140	158.9	141.4	104.5
	Metric tons	164	129	127	144	128.2	94.8

^a Does not include *Toxic Substances Control Act* waste
^b Dangerous waste only
^c Mixed waste (radioactive and dangerous)
— = no data met the criteria
DW = dangerous waste
MW = mixed waste

Groundwater Remediation

Candidate remediation technologies were evaluated in support of the 200-UP-1 Operable Unit record of decision-required iodine-129 remedy evaluation. While other contaminants in the 200-UP-1 Operable Unit could be addressed with an existing remedial technology, the iodine-129 contamination required additional evaluation to identify an appropriate remedy. The results are being used to support proceeding with a technical impracticability waiver application for the iodine-129 plume in the 200-UP-1 Operable Unit. A technical basis for a Technical Impracticability waiver for iodine-129 was provided by PNNL. Relevant parameters and information were compiled to support the TI waiver process, including integrating geochemical process descriptions relevant at the field-scale to identify potential risks for leaving iodine-129 in place.

Online decision-support tools (SOCRATES) were created to meet DOE needs for groundwater assessments, real-time remedy support, and pump-and-treat exit strategies. The tools provide rapid online access to data and data analytics relevant to contaminant transport and remedy decisions, enabling identification of transition points from active to passive remediation. An additional tool within SOCRATES enables access to real-time geophysical imaging of in situ subsurface amendment delivery, providing critical feedback to field operators to optimize remedy performance. The new tools also enable users to visualize remotely-sensed data and identify elevation changes relevant to waste site management and early response to potential structural collapses. This is accomplished through an automated data acquisition process that provides data at regular frequencies and analytical tools that provide decision support. In addition, remotely sensed data provides seasonal estimates of groundwater

base flow to the Columbia River, which can improve predictive simulations that are used to make decisions on waste site remedies, site closure, and long-term protectiveness of human health and the environment. Use of remote sensing data is cost-effective and eliminates the need for manual flux measurements at the groundwater-surface water interface.

Long-Term Stewardship

The Hanford Site's LTS Program has responsibilities within the 220 mi² (570 km²) of the Hanford Site's River Corridor, which is bounded by 46 mi (74 km) of Columbia River shoreline. The LTS Program is responsible for managing the post-cleanup obligations for more than 1,700 Waste Information Data System waste sites and six Manhattan Project Era production reactors that have been placed in interim safe storage (i.e., cocooned reactors). In 2019, the LTS Program completed annual inspections of 38 accepted and active Waste Information Data System sites, as required, to confirm their current status; assessed 221 waste sites with institutional controls as defined in CERCLA decision documents; updated the DOE/RL-2001-41, *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions and RCRA Corrective Actions*; performed external inspections on the six cocooned reactors; decommissioned 11 underground-injection-control wells; and continued to manage the LTS library, which now contains over 25,000 documents associated with LTS-managed lands.

ES.6 Section 6, Air Monitoring

Hanford Site contractors monitor airborne emissions from site facilities to determine compliance with federal and state regulatory requirements and to assess the effectiveness of emission control equipment. Outdoor air is also monitored on the Hanford Site and offsite in nearby and distant communities.

Air Emissions

Small quantities of radionuclides and industrial air pollutants are emitted to the environment from the Hanford Site due to facility operations. Most facility radioactive air emission sources are sampled or monitored if they have the potential to emit radionuclides. The dose impact from 2019 emissions were well below DOE O 458.1 and federal and state limits. Non-radioactive air pollutant emissions are estimated via sampling or chemical and material use. Pollutant emissions from all sources in 2019 were similar to emissions in 2018.

Onsite Air Monitoring

A network of continuously operating samplers at 78 locations across the Hanford Site was used during 2019 to monitor radioactive airborne materials in air near site facilities and operations. Generally, radionuclide levels measured in the 2018 air composite samples were similar to those measured in previous years.

Offsite Air Monitoring

Airborne radionuclide samples were collected in 2019 by 19 continuously operating samplers in the vicinity of the Hanford Site. Generally, the 2019 air sample results showed very low radiological concentrations (Appendix C, Table C-3).

Regulatory Notifications

One station showed a sample with a radionuclide concentration above the respective reporting threshold value (i.e., 10%) of 40 CFR 61, Appendix E, Table 2 concentration values. The EPA

concentration values (40 CFR 61, Appendix E, Table 2) are concentrations that would result in an annual dose of 10 mrem (100 μ Sv)/yr from airborne radiological material if a person stayed in that location for a majority of the year. The values in 40 CFR 61, Appendix E, Table 2 are used as reporting thresholds to the WDOH, pursuant to the FF-01 license.

Sample results from the first half of 2019 at a station near the 200 Area Liquid Effluent Retention Facility in the 200-East Area showed an elevated cesium-137 concentration. As this facility is not a source of cesium-137 and this was a lone occurrence, no additional actions were taken. Future sampling results in this vicinity will be closely monitored.

ES.7 Section 7, Water Monitoring

In 2019, water samples were collected and analyzed from different sources including Hanford Site drinking water systems, Columbia River surface water, sediment, and seep water; onsite pond water and sediment; offsite irrigation water; and liquid effluent.

Hanford Site Drinking Water Monitoring

Eight DOE-owned, contractor-operated public water systems supply drinking water to DOE facilities on the Hanford Site. MSA operates five of the public water systems. CHPRC operates two systems, and PNNL operates one system. The City of Richland supplies water to the 300 Area, Richland North Area, and Hazardous Materials Management and Emergency Response facility.

Routine radiological, chemical, physical, and microbiological monitoring of Hanford Site drinking water is performed regularly as mandated by EPA's Community Water System requirements. All of the DOE-owned Hanford Site systems were in compliance with drinking water standards for radiological, chemical, and microbiological contaminant levels for 2019. Contaminant concentrations measured during the year were similar to those observed in recent years.

Columbia River Water Monitoring

Radionuclide concentrations measured in cumulative river water samples collected upstream and downstream of the Hanford Site in 2019 were similar to concentrations measured in recent years. Concentrations of radionuclides in samples collected at the City of Richland intake facility were slightly higher than those measured in samples collected upstream at Priest Rapids Dam. Radiological contaminant concentrations were well below the DOE-derived concentration standards.

Radionuclide concentrations measured in cross-river, transect samples were, with one exception, similar to levels measured upstream at Priest Rapids Dam. The tritium concentration measured at the Hanford Townsite transect was higher than at Priest Rapids Dam or at any other transect. Strontium-90 concentrations in Hanford Reach transect samples were comparable to upstream reference concentrations. Strontium-90 concentrations measured in transect samples collected upstream and downstream of the Hanford Site during 2019 were below analytical detection limits. Uranium concentrations in all transect samples were below the EPA drinking water standard of 30 μ g/L (approximately 20 pCi/L [0.74 Bq/L]).

Transect samples were also analyzed for inorganic and organic constituents. Copper, uranium, and zinc were detected in most samples at levels below the Washington State Ambient Surface Water Quality criteria for the protection of aquatic life. Organic contaminants trichloroethane and dichloroethane, attributable to past Hanford Site operations, were well below their respective EPA Drinking Water Standard.

Columbia River Sediment Monitoring.

Samples of Columbia River sediment were collected from locations upstream and downstream of the Hanford Site as well as at locations along the Hanford Reach. All samples were analyzed for radionuclides, anions, hexavalent chromium, metals, mercury, and total organic carbon. Analytical results for 2019 were comparable to previous years with cesium-137 and uranium isotopes consistently detected at most sediment collection locations.

Columbia River Seep Water

Samples of Columbia River shoreline seep water were collected along the Hanford Reach and analyzed for radiological, inorganic, and organic contaminants. Tritium concentrations were noticeably elevated in samples collected near the Hanford Townsite and at the 300 Area. These results are consistent with concentrations and plume maps reported by the Groundwater Monitoring program.

Pond Water and Sediment

West Lake is the only naturally occurring pond on the Hanford Site. Remotely located, it is most frequented by the indigenous wildlife. Water and sediment samples were analyzed for radiological contaminants; the 2019 concentrations were similar to previous years with the exception of technetium-99 as those increased when compared to 2018 West Lake water results. However, overall concentrations of technetium-99 were well below DOE derived guidelines for riparian receptors.

Offsite Irrigation Water

To assess the potential for Hanford Site-associated contaminants to affect food products irrigated with Columbia River downstream of the site, water samples were collected three times during the irrigation season from irrigation systems on each side of the Columbia River. Radionuclide concentrations measured in 2019 were at similar levels shown in Columbia River transect water samples collected upstream of the Hanford Site.

Liquid Effluent Monitoring

Liquid effluent discharges to the environment are governed by federal and state regulations, discharge permits, and DOE Orders. In CY 2019 there were no liquid effluent discharges to the Columbia River and two permitted liquid effluent point sources discharged to the ground. Samples collected, analyzed, and reported monitor pollutants of concern. Permit required discharge monitoring reports with sample data are submitted to Ecology. Discharges to the ground in CY 2019 were similar to previous years.

ES.8 Section 8, Groundwater Monitoring

During Hanford Site operations, chemical and radioactive waste was released into the environment and contaminated soil and groundwater beneath portions of the site, mostly in the 200-East and 200-West Areas in the central part of the site, and the 300 and 100 Areas along the Columbia River. Groundwater monitoring data and information about monitoring wells are available through the DOE Environmental Dashboard Application at <https://ehs.hanford.gov/eda>. A detailed discussion of

groundwater monitoring results is available in DOE/RL-2019-66, *Hanford Site Groundwater Monitoring Report for 2019*, and the interactive online report at <https://www.hanford.gov/page.cfm/SoilGroundwaterAnnualReports>.

ES.9 Section 9, Soil Monitoring

Surface soil samples are collected on the Hanford Site to evaluate long-term accumulation trends and provide baseline data used to quantify contaminant level changes due to fugitive or accidental releases of Hanford Site radiological materials. Soil samples for this effort have been collected annually for several decades. These samples are typically collected in the late-spring from locations on or adjacent to waste disposal sites, as well as from locations downwind, near, or within the boundaries of operating facilities and remedial action sites. Soil samples from offsite locations are collected every 3 to 5 years and were collected in 2019. Offsite soil sampling is used for long-term trend analysis and is not used in dose model calculations. The sampling frequency of every 3 to 5 years is consistent with the guidance provided in DOE-HDBK-1216-2015, *Environmental Radiological Effluent Monitoring and Environmental Surveillance*.

Analytical results for soil samples collected in CY 2019 at locations in the 200-East, 200-West, 300, 400, and 600 Areas were consistent with analytical results from previous years. While there are no specific DOE limits for radionuclide concentrations in soil, the CY 2019 onsite soil sample results were compared to other benchmarks including Hanford Site background concentrations (DOE/RL-96-12), radionuclide concentrations resulting from natural sources and worldwide fallout as observed in offsite soil samples, dose-based limits for soil developed for a 1 mrem/yr dose threshold to an offsite member of the public (DOE/RL-91-50), and soil radiological preliminary remediation goals for the 200 Area outdoor worker exposure scenario (ECF-HANFORD-16-0133). Generally, radionuclide concentrations in soil samples collected from the 200, 300, 400, and 600 Areas were near or below the Hanford Site background concentrations and well below the dose-based reporting limits for an offsite member of the public and the preliminary remediation goals for the outdoor worker exposure scenario.

Radionuclide concentrations in soil samples collected in CY 2019 at offsite locations were compared to results from 2001, 2004, 2008, and 2015. In 2019, the observed average concentrations in soil samples for all isotopes were generally similar to their respective averages from 2001, 2004, 2008, and 2015. The Hanford sitewide average soil concentrations in 2019 were higher than at site perimeter and distant locations for the radionuclides measured (Appendix C, Table C-6). This was consistent with historical data and reflected the higher sitewide soil concentrations associated with years of nuclear materials production.

ES.10 Section 10, Biota Monitoring

DOE conducted agricultural monitoring at several locations that vary annually near the Hanford Site to assess potential contaminant concentrations in food and farm products resulting from site activities. Plant and animal species on the site were also monitored to assess abundance, condition, and population distributions. Data collection and analysis were integrated with environmental monitoring of biotic and abiotic media, and analytical results were used to characterize potential risks or impacts.

Agricultural Monitoring

Food and farm products (i.e., alfalfa, apricots, corn, leafy vegetables, melons, milk, potatoes, tomatoes, and wine must) were collected in 2019 at locations near the Hanford Site. Radionuclide concentrations in most food and farm product samples in 2019 were below the analytical laboratory detection levels; however, some potential Hanford Site-produced contaminants (e.g., tritium) were found at low levels in some samples. Data for potassium-40 and beryllium-7 were included to show the natural radioactive elements that exist in food products relative to concentrations of potential Hanford Site-produced contaminants.

Fish and Wildlife Monitoring

The fish and wildlife species sampled and analyzed for Hanford Site operations-produced contaminants during the CY 2019 included mountain whitefish (*Prosopium williamsoni*), walleye (*Prosopium williamsoni*), and Canada goose (*Branta canadensis*). Monitoring fish and wildlife for uptake and exposure to Hanford Site operations-produced contaminants ensures that consumption of fish and wildlife obtained from Hanford Site environs does not pose a threat to human health and provides long-term contamination trends. These species were selected and analyzed because they provide a potential pathway for offsite human consumption. Most fish and wildlife samples were collected on and around the Hanford Site and analyzed for human-pathway exposure every 2 to 3 years. Reference samples are obtained at locations determined not to be affected by Hanford Site effluents and emissions at least every 5 years.

Vegetation Monitoring

Native vegetation samples are collected annually on the Hanford Site to evaluate long-term accumulation trends and provide baseline data used to quantify contaminant level changes due to fugitive or accidental releases of Hanford Site radiological materials. Vegetation samples for this effort have been collected for several decades from locations on or adjacent to waste disposal sites, as well as from locations downwind, near, or within the boundaries of operating facilities and remedial action sites. Analytical results for vegetation samples collected in CY 2019 at locations in the 200-East, 200-West, 100-N, 300, 400, and 600 Areas were consistent with those seen in previous years.

Vegetation samples from offsite locations are collected every 3 to 5 years and were most recently collected in the summer of 2019. Offsite vegetation sampling is used for long-term trend analysis and is not used in dose model calculations. The sampling frequency of every 3 to 5 years is consistent with the guidance provided in DOE-HDBK-1216-2015, *Environmental Radiological Effluent Monitoring and Environmental Surveillance*.

Radiological Contamination. Investigations of radioactive contamination in vegetation were conducted in and near operational areas to monitor the presence or movement of radioactive materials around areas of known or suspected contamination or to verify radiological conditions at specific project sites. A review of radiological contamination incidents reported in CY 2019 identified 29 instances of radiologically contaminated vegetation. All 29 were Russian thistle (*Salsola tragus*) plants or fragments.

Vegetation Control. Approximately 4,868 ac (1,898 ha) were treated with herbicides in 2019 on radiological waste sites, around operations areas, and along roadways to keep areas free of deep-rooted vegetation (e.g., Russian thistle, also known as tumbleweed). Follow-up treatments were included in the total treated acres; several areas received more than one herbicide application.

Waste Site Remediation and Revegetation

In 2019, 125 ac (51 ha) across the Hanford Site were revegetated in an effort to restore native plant communities on revegetation and restoration sites including cleaned-up waste sites and revegetated mitigation sites.

ES.11 Section 11, Resource Protection

DOE is responsible for managing and protecting biological and cultural resources on the Hanford Site. Ecological and cultural resource monitoring are conducted to collect and track data needed to ensure compliance with applicable laws, regulations, and policies (including management plans) governing DOE activities.

Ecological Protection

Ecological monitoring data provide baseline information about the plants, animals, and habitats under DOE stewardship at the Hanford Site that is required to make cleanup decisions. During 2019, DOE continued to monitor and evaluate species that are protected by federal or state laws and regulations or are of special interest to the public and stakeholders. Fall Chinook salmon redds, steelhead redds, and bald eagle nesting and night roosting activity were assessed because these species have the potential to be impacted by Hanford Site operations. Additional monitoring efforts included vernal pools, ferruginous hawk nest monitoring, roadside bird surveys, burrowing owls, bats, pollinators, and riparian vegetation and rare plant species. Additionally, in 2019 DOE conducted a Conservation Habitat Assessment and Mitigation Prioritization study (HNF-64135) using ecological data to identify the high priority conservation and mitigation areas on the Hanford Site (HNF-64135).

Endangered and Threatened Species

Two endangered and threatened fish species, spring-run Chinook salmon and steelhead, are known to occur regularly on the Hanford Site. One additional threatened fish species (bull trout) is occasionally present in the Hanford Reach, which this species uses primarily as a migration corridor. Umtanum desert buckwheat and White Bluffs bladderpod, federally listed as threatened plant species, also occur on the Hanford Site. No other plants or animals known to occur on the Hanford Site are currently federally listed as threatened or endangered, though the Washington ground squirrel is a candidate for federal listing. In addition, 16 plant species and 4 bird species have been listed as either endangered or threatened by Washington State. Numerous additional species of animals and plants are listed as candidate or sensitive species by Washington State. There are 31 state-level sensitive and candidate species of animals and 12 sensitive plant species occurring or potentially occurring on the Hanford Site.

Cultural and Historic Resource Protection

DOE is responsible for managing and protecting the Hanford Site's cultural and historic resources in accordance with applicable federal cultural resources laws and regulations and DOE management plans. In 2019, Hanford Site archaeologists completed 71 *National Historic Preservation Act of 1966* (NHPA) Section 106 cultural resources reviews. Twenty-six undertakings had the potential to affect cultural resources. Twenty projects affected historic buildings and were determined exempt by Hanford Site archaeologists after meeting the DOE-approved historic buildings programmatic agreement (DOE/RL-96-77) exemption criteria following an initial review. Eighteen projects had been reviewed for effects to cultural resources under previous NHPA Section 106 reviews. Six projects were reviewed and completed by Hanford Site archaeologists under an emergency declaration. A total of 915.1 ac

(370.3 ha) of new ground was surveyed for cultural resources from NHPA Section 106 project-specific surveys.

Collection Management and Curation

The Hanford History Project provides professional curatorial and archival services for the management, conservation, and public access of the Hanford Collection, which consists of artifacts and multimedia relating to the Manhattan Project and Cold War Era. In addition to public outreach and education, Washington State University, Tri Cities (WSU-TC) provides a repository for the collection that meets the requirements of 36 CFR 79, “Curation of Federally-Owned and Administered Archaeological Collections,” including protecting these resources from theft, fire, breakage, or deterioration. During 2019, 20 items were reviewed, cleared for public release, and /or transferred to the Hanford History Project repository for integration with the Hanford Collection. Nineteen artifacts and one linear foot of archival material were evaluated for inclusion in the Hanford Collection. These materials were determined to meet the collections criteria and delivered to the Hanford History Project repository at WSU-TC for curation, leaving 20 (2.7%) of 744 tagged artifacts scheduled for collection between 2020 and 2048. Having transitioned the bulk of the Hanford Collection to the WSU-TC facility in 2016, tasks during 2020 consisted mainly of artifact cataloging and archival processing.

ES.12 Section 12, Quality Assurance

Quality assurance (QA) and quality control (QC) programs for the Hanford Site and offsite environmental surveillance programs are documented through project-specific QA plans that describe applicable QA elements. Multiple types of field and laboratory QC samples are employed to ensure the validity of the sampling procedures and the resulting sample data. Samples collected by the Environmental Surveillance program were sent to two laboratories: General Engineering Laboratories, LLC [GEL] and Eurofins TestAmerica St Louis Laboratory (TASL). Additionally, GEL laboratories subcontracted the analysis of low-level tritium in liquids (e.g., water, milk, wine) to ARS Aleut Analytical, LLC (ARS). All three of these laboratories maintain various certifications that allow them to meet plan specifications. Additionally, to demonstrate analytical proficiency all three laboratories participate in independent QA and QC programs including the Mixed Analyte Performance Evaluation Program and DOE Consolidated Audit Program.

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Abbreviations and Acronyms

μS	microsiemens
μSv	microsievert
AEA	<i>Atomic Energy Act of 1954</i>
AEI	Air Emissions Inventory
AERR	Air Emissions Reporting Rule
ALARA	as low as reasonably achievable
ALI	Arid Lands Initiative
AOP	Air Operating Permit
ASCX	activity-specific categorical exclusion
BLM	Boundary Length Modifier
BNI	Bechtel National, Inc.
BOF	Balance of Facilities
BPA	Bonneville Power Administration
BRMP	Hanford Site Biological Resources Management Plan
C&D	construction and demolition
CAA	<i>Clean Air Act</i>
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
CGS	Columbia Generating Station
CHAMP	Conservation Habitat Assessment and Mitigation Prioritization
CHPRC	CH2M Plateau Remediation Company
CITS	Chemical Inventory Tracking System
CLUP	Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement
Council	Hanford Natural Resource Trustee Council
CSB	Canister Storage Building
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CWC	Central Waste Complex
CY	calendar year
CX	categorical exclusion
DFLAW	Direct Feed Low-Activity Waste
DMM	dimethyl mercury

DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DOECAP	DOE Consolidated Audit Program
DOE-HQ	U.S. Department of Energy, Headquarters
DOE-ORP	U.S. Department of Energy, Office of River Protection
DOE-RL	U.S. Department of Energy, Richland Operations Office
DST	double-shell tank
EA	environmental assessment
Ecology	Washington State Department of Ecology
EIS	environmental impact statement
EMF	Effluent Management Facility
EMS	Environmental Management System
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act of 1986
EPEAT	Electronic Product Environmental Assessment Tool
ERDF	Environmental Restoration Disposal Facility
ERT	Electrical Resistivity Tomography
ES	Environmental Surveillance
ESA	<i>Endangered Species Act of 1973</i>
ETF	Effluent Treatment Facility
EVOC	Emergency Vehicle Operations Course
FFTF	Fast Flux Test Facility
FMEF	Fuels and Materials Examination Facility
FS	feasibility study
FY	fiscal year
GAC	granular-activated carbon
GIS	Geographic Information System
HAB	Hanford Advisory Board
HAMMER	Hazardous Materials Management and Emergency Response
HAP	hazardous air pollutant
HDPE	high-density polyethylene
HFFACO	Hanford Federal Facility Agreement and Consent Order
HHP	Hanford History Project

HLW	high-level waste
HPMC-OMS	HPMC Occupational Medical Services
HRM	Hanford River Mile
HSTGWG	Hanford State and Tribal Government Working Group
HTO	tritiated water vapor
IC	institutional control
ICRP	International Convention on Radiological Protection
IDF	Integrated Disposal Facility
ISMS	Integrated Safety Management System
KEA	key ecological attribute
LAW	low-activity waste
LERF	Liquid Effluent Retention Facility
LIGO	Laser Interferometer Gravitational-wave Observatory
LLBG	low-level burial grounds
LLRW	low-level radioactive waste
LLW	low-level waste
LTS	Long-Term Stewardship
MAPEP	Mixed Analyte Performance Evaluation Program
MASF	Maintenance and Storage Facility
MBTA	<i>Migratory Bird Treaty Act of 1918</i>
MCO	Multi-Canister Overpacks
MEI	maximally exposed individual
MLLW	mixed low-level waste
MOA	Memorandum of Agreement
MSA	Mission Support Alliance
MSDS	Material Safety Data Sheet
NCO	NEPA Compliance Officer
NEPA	<i>National Environmental Policy Act of 1969</i>
NFFS	Nuclear Fuel Fragment Specimens
NFPA	National Fire Protection Association
NHPA	<i>National Historic Preservation Act of 1966</i>
NLOP	North Load-Out Pit
NOC	notice of construction

NRC	U.S. Nuclear Regulatory Commission
NRDA	Natural Resource Damage Assessment
NRDWL	Nonradioactive Dangerous Waste Landfill and Solid Waste Landfill
P&T	pump-and-treat
PCB	polychlorinated biphenyl
PEP	Project Execution Plan
PFP	Plutonium Finishing Plant
PHOENIX	PNNL-Hanford Online Environmental Information Exchange
PNNL	Pacific Northwest National Laboratory
PRG	preliminary remediation goal
PUREX	Plutonium Uranium Extraction Facility
QA	quality assurance
QC	quality control
RAVIS	robotic air-slot volumetric inspection system
RBDA	risk-based disposal approvals
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
REDOX	Reduction-oxidation
RESRAD	RESidual RADioactivity
RI	remedial investigation
ROD	Record of Decision
RPD	Relative Percent Difference
RPH	Richland Pumphouse
S&M	surveillance and maintenance
SALDS	State-Approved Land Disposal Site
SARA	Superfund Amendments and Reauthorization Act
SDS	Safety Data Sheet
SDWA	<i>Safe Drinking Water Act of 1974</i>
SPF	Species Penalty Factor
SSE	safe storage enclosure
SST	single-shell tank
STOMP-WAE	Subsurface Transport Over Multiple Phases – Water-Air-Energy
STSC	sludge transfer and storage containers
SVE	soil vapor extraction

SWL	Solid Waste Landfill
TAP	toxic air pollutant
TBI	Test Bed Initiative
TCE	trichloroethene
TEDF	Treated Effluent Disposal Facility
TLD	thermoluminescent dosimeter
TPA	Tri-Party Agreement
Tri-Cities	cities of Kennewick, Pasco, and Richland
TRU	transuranic
TSCA	<i>Toxic Substances Control Act</i>
TSD	treatment, storage, and disposal
UIC	underground injection control
USFWS	U.S. Fish and Wildlife Service
VNSFS	Veolia Nuclear Solutions – Federal Services
VPU	vertical pipe unit
WAI	Wastren Advantage, Inc.
WDFW	Washington Department of Fish and Wildlife
WDOH	Washington State Department of Health
WESF	Waste Encapsulation and Storage Facility
WHCWG	Wildlife Habitat Connectivity Working Group
WIDS	Waste Information Data System
WIPP	Waste Isolation Pilot Plant
WIR	Waste Incidental to Reprocessing
WMA	waste management area
WNS	White Nose Syndrome
WRAP	Waste Receiving and Processing
WRPS	Washington River Protection Solutions, LLC
WSU-TC	Washington State University, Tri-Cities
WTP	Hanford Tank Waste Treatment and Immobilization Plant
Yakama Nation	Confederated Tribes and Bands of the Yakama Nation

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