DOE/ID-11441 (2025)

U.S. Department of Energy
Idaho Operations Office

National Emission Standards for Hazardous Air Pollutants - Calendar Year 2024 INL Report for Radionuclides

June 2025

Idaho National Laboratory

DOE/ID-11441 (2025)

National Emission Standards for Hazardous Air Pollutants - Calendar Year 2024 INL Report for Radionuclides

June 2025

Prepared for the
U.S. Department of Energy
Idaho Operations Office

ABSTRACT

The U.S. Department of Energy (DOE) Idaho National Laboratory (INL) Site operates facilities with potential emissions of radioactive materials. This report has been prepared to comply with the *Code of Federal Regulations*, Title 40, Protection of the Environment, Part 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities" (Subpart H). Subpart H requires the measurement and reporting of radionuclides emitted from DOE facilities that result in an offsite dose from those emissions.

This report documents the calendar year 2024 radionuclide air emissions and resulting effective dose equivalent to the maximally exposed individual (MEI) member of the public from operations at the INL. The MEI is defined in Subpart H as any member of the public at any off-site location where there is a residence, school, business, or office.

For calendar year 2024 the effective dose equivalent to the maximally exposed individual member of the public was 1.50E-02 millirem (mrem) per year, which is 0.15 percent of the 10 mrem per year standard, for the INL Site. The effective dose equivalent to the maximally exposed individual for the Research and Education Campus was 4.83E-03 mrem per year or 0.048 percent of the standard.

CONTENTS

FIGURES

TABLES

ACRONYMS

AFF	Advanced Fuel Facility
AMWTP	Advanced Mixed Waste Treatment Project
ARP	Accelerated Retrieval Project
ATR	Advanced Test Reactor
BEA	Battelle Energy Alliance, LLC
CAP	Clean Air Act Assessment Package
CEM	Continuous Emission Monitoring
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
Ci	curies
CITRC	Critical Infrastructure Test Range Complex
CPP	Chemical Processing Plant
CY	calendar year
D&D	deactivation and decommissioning
DOE	Department of Energy
EDE	effective dose equivalent
EML	Electron Microscopy Laboratory
EPA	Environmental Protection Agency
FASB	Fuels and Applied Science Building
FAST	Fluorinel and Storage Facility
FCF	Fuel Conditioning Facility
FMF	Fuel Manufacturing Facility
HEPA	high-efficiency particulate air
HFEF	Hot Fuel Examination Facility
HPIL	Health Physics Instrument Laboratory
ICDF	Idaho CERCLA Disposal Facility
ICE	Inner Contamination Enclosure
IEC	Idaho Environmental Coalition, LLC
IMCL	Irradiated Materials Characterization Laboratory
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IRC	INL Research Center
LLMW	low-level mixed waste
L&O	Laboratory and Office Building
MEDE	melt-drain-evaporate
MEI	maximally exposed individual
MFC	Materials and Fuels Complex
mrem	millirem
MTR	Material Test Reactor
NESHAP	National Emission Standards for Hazardous Air Pollutants

NPTF	New Pump and Treat Facility
NRF	Naval Reactors Facility
NWCF	New Waste Calcining Facility
OCVZ	Organic Contamination in the Vadose Zone
OU	operable unit
PIC	Potential Impact Category
QC	quality control
REC	Research and Education Campus
RCE	Retrieval Contamination Enclosure
RCRA	Resource, Conservation, and Recovery Act
RESL	Radiological and Environmental Sciences Laboratory
RDD	radiological dispersion device
RRTR	Radiological Response Training Range
RSWF	Radioactive Scrap Waste Facility
RWMC	Radioactive Waste Management Complex
SCMS	Sodium Components Maintenance Shop
SDA	Subsurface Disposal Area
SMC	Specific Manufacturing Capability
STAR	Safety and Tritium Applied Research
TAN	Test Area North
TDS	Thermal Desorption Spectroscopy
TMI	Three Mile Island
TRA	Test Reactor Area
TSF	Technical Support Facility
WAG	Waste Area Group
WMF	Waste Management Facility

National Emission Standards for Hazardous Air Pollutants - Calendar Year 2024 INL Report for Radionuclides

1. INTRODUCTION

This report documents radionuclide air emissions for calendar year (CY) 2024 and the resulting effective dose equivalent (EDE) to the maximally exposed individual (MEI) member of the public from operations at the U.S. Department of Energy (DOE) Idaho National Laboratory (INL) Site.

Table 1 tabulates the reporting requirements found in 40 *Code of Federal Regulations* (CFR) Part 61.94. The corresponding section in the report of the response to those requirements are listed in the adjacent column.

Appendix A contains information specific to INL Research and Education Campus (REC) which includes the INL Research Center (IRC) and the Radiological and Environmental Sciences Laboratory (RESL) emissions located in Idaho Falls, Idaho. Radionuclide emissions from the REC are not included in the INL Site EDE calculation since the facilities are not contiguous. Compliance to the 10 millirem (mrem) per year dose standard is demonstrated by documenting REC radionuclide air emissions and the resulting EDE to its MEI from operations at the IRC and RESL.

Appendix B of this report contains information specific to the Naval Reactors Facility (NRF) located within the INL Site boundary. The EDE for NRF radionuclide emissions is included in the INL Site EDE to demonstrate overall compliance to the 10-mrem/year dose standard set by 40 CFR Part 61, Subpart H (Subpart H), "National Emission Standards for Emissions of Radionuclides other than Radon from Department of Energy Facilities."

For CY 2024, modeling was performed using Clean Air Act Assessment Package - 1988 PC (CAP88), Version 4.1.

2. Compliance and Reporting

This report documents the INL Site radionuclide air emissions and the resulting EDE to the MEI for CY 2024. It was prepared in accordance with the 40 CFR Part 61.94(a). As required, this report is submitted to both the EPA Headquarters and the appropriate regional office (EPA Region 10) no later than June 30, 2025.

Documentation for each of the requirements of 40 CFR Part 61.94(b) can be found in the corresponding section identified by Table 1 below.

Table 1 40 CFR Part 61.94(b) and Reference Location

40 CFR Part 61.94(b) In addition to the requirements of paragraph (a) of this section, an annual report shall include the following information:	
40 CFR Part 61.94(b)	Reference Location
(1) The name and location of the facility.	3 Site Identification and Sources
(2) A list of the radioactive material used at the facility	3.3 Radioactive Material
(3) A description of the handling and processing that the radioactive materials undergo at the facility.	3.1 INL Source Processes and Activities
(4) A list of the stack or vents or other points where radioactive materials are released to the atmosphere.	3.2 INL Source Release Points
(5) A description of the effluent controls that are used on each stack, vent, or other release point and an estimate of the efficiency of each control device.	3.2 INL Source Release Points
(6) Distances from the points of release to the nearest residence, school, business or office and the nearest farms producing vegetables, milk, and meat.	4 Receptors
(7) The values used for all other user-supplied input parameters from the computer models (e.g., meteorological data) and the source of these data.	6.1 Modeling Summary
(8) A brief description of all construction and modifications which were completed in the calendar year for which the report is prepared, but for which the requirement to apply for approval to construct or modify was waived under §61.96 and associated documentation developed by DOE to support the waiver. …	2.2 Approval to Construct or Modify Exemptions
(9) Each report shall be signed and dated by a corporate officer or public official in charge of the facility and contain the "certification".	See signed certification statement

2.1 Reporting Period Discussion

The INL is addressing various observations and areas of concern (AOC) from recent Environmental Protection Agency (EPA) partial compliance inspections. EPA completed inspections at the Advanced Test Reactor (ATR) in April of 2022, and one at the Materials and Fuels Complex (MFC) culminating in August of 2023.

In EPA's *Advanced Test Reactor Idaho Operations Office Partial Compliance Audit Report,* signed 5-3-2022, *EPA* identified two AOCs. One regarded the methods that INL uses to calculate estimated emissions from minor sources that incorporate reductions from HEPA filtration. As of the writing of this report, this matter has not been resolved. INL is reporting emissions consistent with historical practice as well as including the comparison of total emissions using EPA's preferred Appendix D methodology for reference. The other AOC regarded the verification for accuracy for flow rate measurement on the ATR stack. INL is currently working with EPA to get an approval for a method that diverges from those stated in Method 1 of 40 CFR Part 60, Appendix A.

In EPA's *Department of Energy Idaho National Lab Subpart H Partial Compliance Inspection Fuel Manufacturing Facility Hot Fuel Examination Facility August 2023* report, signed 9-19-2024, EPA identified one AOC and two observations. MFC is currently updating quality assurance project plans to incorporate technical basis for the monitoring at the Hot Fuels Examination Facility (HFEF), and the Fuels Manufacturing Facility (FMF) to be consistent with ANSI/HPS N13.1, clause 4. To address the AOC identified during the MFC inspection, INL is completing an air permitting applicability determination (APAD) to incorporate CAP88-PC modeling of unabated emissions for HFEF.

The Retrieval Contamination Enclosure (RCE) Stack, Inner Contamination Enclosure (ICE Stack), and Contamination Enclosure facility (WMF-636-002) ceased radiological waste processing operation in 2022 and is in the process of undergoing various stages of Resource Conservation and Recovery (RCRA) closure.

2.2 Approval to Construct or Modify Exemptions

INL evaluated several projects to determine their relevance for requiring an approval to construct or modify. None were identified as needing an approval in 2024, however several applications for approval were waved based on the potential for the project to emit above the threshold, as specified in 40 CFR, Part 61.96.

A revision to the air permitting applicability determination (APAD) for the Sample Preparation Laboratory (SPL) at the Material and Fuels Complex (MFC) was developed to account for potential radiological emissions from the X-ray Difractometer (XRD). Calculated potential emissions were estimated to be below 1% of the standard prescribed in 40 CFR 60.92 (i.e., 0.1 mrem/year). Therefore, emissions from SPL are exempted from requiring an approval to construct. This determination is documented in APD-INL-18-011 R1.

IEC performed four different permitting applicability determinations over the course of 2024. These included determinations for waste processing activities in WMF-635 containment enclosure (EDF-11595), the decommissioning and demolition of S1W Complex at the Naval Reactors Facility (EDF-11377), the treating and repackaging of wastes at CPP-659 (EDF-11585), and the treating and repackaging of wastes at CPP-666 (EDF-11586).

Please refer to Appendix B for any construction or modifications performed by NRF.

3. Site Identification and Sources

Site Name: Idaho National Laboratory Site.

The INL Site encompasses approximately 890 square miles on the upper Snake River Plain in southeastern Idaho (see Figure 1). The nearest INL boundaries to population centers are approximately 22 mi (35.3 km) west of Idaho Falls, 23 mi (37 km) northwest of Blackfoot, 44 mi (70.8 km) northwest of Pocatello, 7 mi (11.3 km) east of Arco, 1 mi (1.6 km) north of Atomic City, 3 mi (5 km) west of Mud Lake and 2 mi (3 km) south of Howe. Figure 1 below displays the INL site along with the major facilities and the off-site MEI location (Receptor 26).

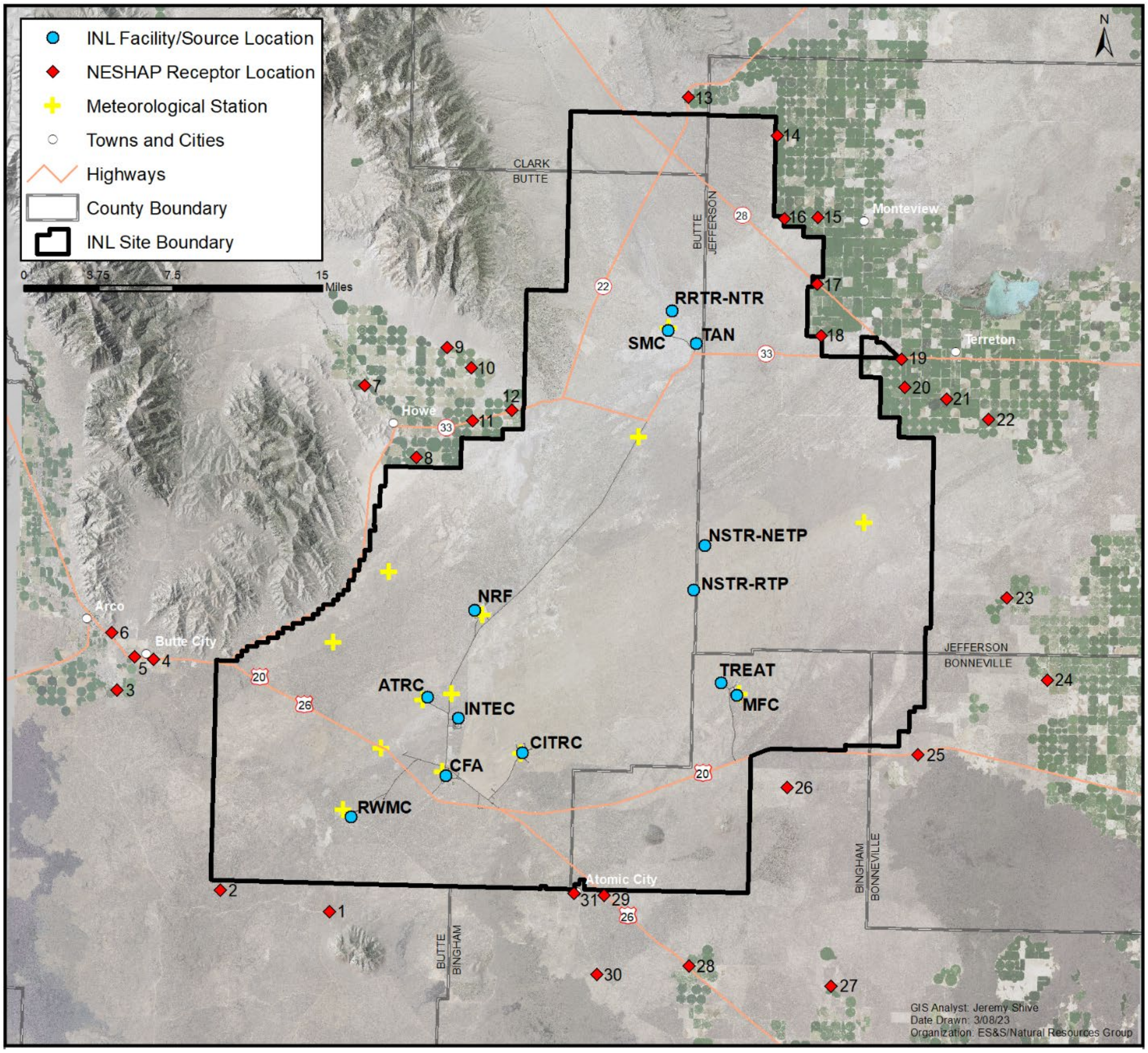

Figure 1 INL Site Facilities and Receptors

A list of each of INL's facilities identified in Figure 1 above are tabulated in Table 2 below along with identification of the associated sources.

Table 2. List of Emission Sources of Radionuclides from INL.

Facility	Source
Advanced Test Reactor (ATR) Complex:	Test Reactor Area (TRA)-670-074, ATR Chemistry Laboratory fume hoods exhaust
	TRA-670-086, laboratory fume hood exhaust
	TRA-670-098, laboratory fume hood exhaust (2 hoods)
	TRA-670, ATR canal
	TRA-678-001, Radiation Measurements Laboratory fume hoods vent
	TRA-710-001, Materials Test Reactor (MTR) stack
	TRA-715-001, Warm Waste Evaporation Pond
	TRA-770-001, ATR main stack
	TRA-1626, Test Train Assembly Facility
	TRA-1627-001, Radioanalytical Chemistry Laboratory
Central Facilities Area (CFA):	CFA-625, CFA Laboratory Complex
	CFA-1618, Health Physics Instrument Lab
	CFA-Tritium, Tritium emissions from pumped aquifer water
Critical Infrastructure Test Range Complex (CITRC):	Power Burst Facility (PBF)-612, CITRC Control System Research Facility
	PBF-613, CITRC Communication Research Facility
	PBF-623, CITRC Wireless Communication Support
	PBF-622, Explosives Detection Research Center Stack
Idaho Nuclear Technology and Engineering Center (INTEC):	Chemical Processing Plant (CPP)-603-001, Irradiated Fuels Storage Facility
	CPP-659-033, New Waste Calcining Facility (NWCF) Stack
	CPP-684-001, Remote Analytical Laboratory
	CPP-708-001, Main Stack
	CPP-749-001, Underground Fuel Storage/Vault Area
	CPP-1608-001, Manipulator Repair Cell
	CPP-1696, Integrated Waste Treatment Unit
	CPP-1774, Three Mile Island (TMI)-2 Independent Spent Storage Installation
	CPP-2707, Dry Cask Storage Pad
	ICDF-Landfill, Idaho Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Disposal Facility Landfill (ICDF) emissions from solid waste disposal
	ICDF-Ponds, ICDF pond emissions
	OU-3-14-EvapPond, Operable Unit 3-14 Evaporation Pond

Facility	Source
Materials and Fuels Complex (MFC):	CPP-653-001, Decontamination Testbed Facility MFC-704-008, Fuel Manufacturing Facility stack MFC-720-007, Transient Reactor Test Facility reactor cooling air exhaust MFC-752-004, Laboratory and Office Building (L&O) main stack MFC-752-005, L&O nondestructive assay stack MFC-764-001, Main Stack (Fuel Conditioning Facility [FCF] exhaust) MFC-768-105, Decontamination shower suspect waste tank vent MFC-768-108, Health Physics Area fume hood MFC-774-026, Electron Microscopy Laboratory (EML) exhaust MFC-774-027, EML exhaust MFC-774-028, EML exhaust MFC-774-029, EML exhaust MFC-777-002, Zero Power Physics Reactor MFC-784-001, Advanced Fuels Facility MFC-785-018, Hot Fuel Examination Facility stack MFC-787-001, Fuel Assembly and Storage Building MFC-792A-001, Space and Security Power Systems Facility MFC-794-002, Experimental Fuels Facility-West exhaust MFC-794-006, Experimental Fuels Facility-East exhaust MFC-1702-001, Radiochemistry Laboratory MFC-1729-001, Irradiated Materials Characterization Laboratory
Naval Reactors Facility[a]	NRF Point Sources
	NRF Diffuse Sources
	NRF Demolition
Radioactive Waste Management Complex (RWMC):	Waste Management Facility (WMF)-601-001, Health Physics Laboratory Hood WMF-615-001, Drum Vent Facility WMF-634-001, AMWTP Characterization Facility ARP-II Remaining Soil ARP-III Remaining Soil ARP-IV Remaining Soil ARP-V Remaining Soil WMF-1619-001, ARP-VII WMF-1621-001, ARP-VIII WMF-1622-001, ARP IX ARP IX Domo ARP IX Soils SDA Buried Beryllium Blocks
Test Area North (TAN) Specific Manufacturing Capability (SMC):	TAN-629-013, manufacturing process, Line 2A TAN-679-022, -023, -024 manufacturing process, north process TAN-679-025, -026, -027 manufacturing process, south process TAN-681-018, Process Reclamation Facility TAN-681-020, Process Reclamation Facility TAN-681-016, Process Reclamation Facility

Facility	Source
National and Homeland security	North Radiological Response Test Range (RRTR)
TAN Technical Support Facility (TSF):	Operable Unit (OU) 1-07B, New Pump and Treat Facility

[a] See Appendix B for NRF's Report

3.1 INL Source Processes and Activities

Work performed along with associated emissions can range significantly across the INL. The following subsection provides a general description of the work performed at each of the sources, along with the expected emissions. Refer to Appendix B for work and expected emissions associated with the Naval Reactor Facility.

3.1.1 Advanced Test Reactor Complex

The Advanced Test Reactor (ATR) Complex is operated by Battelle Energy Alliance, LLC (BEA) and is located in the south-central section of INL. The ATR Complex has facilities for studying the performance of reactor materials and equipment components under high neutron flux conditions. The primary facility at ATR Complex is the ATR. Other operations at ATR Complex include research and development, and analytical laboratory services.

Radiological air emissions from ATR Complex are primarily associated with operation of the ATR. These emissions include noble gases, isotopes of iodine and other mixed fission and activation products. Other radiological air emissions are associated with sample analysis, and research and development activities.

3.1.2 Central Facilities Area

The Central Facilities Area (CFA) is located in the south-central section of the INL Site. The CFA provides services that support the following INL Site facilities:

Maintenance shops

Vehicle maintenance facilities

Instrument calibration laboratories

Communications and security systems

Fire protection

Medical services

Warehouses

Laboratory Facilities

Other support services facilities

Minor emissions occur from CFA facilities where work with small quantities of radioactive materials is routinely conducted. This includes sample preparation and verification and radiochemical research and development. Other minor emissions result from groundwater usage via evapotranspiration from irrigation or evaporation from sewage lagoons and carbon-14 tracer release.

3.1.3 Critical Infrastructure Test Range Complex

The Critical Infrastructure Test Range Complex (CITRC) is located in the south-central section of the INL Site. The CITRC area supports the National and Homeland Security missions of the laboratory, including program and project testing (i.e., critical infrastructure resilience and nonproliferation testing and demonstration). Wireless test-bed operations, power line and grid testing, unmanned aerial vehicle testing, accelerator testing, explosives detection and training radiological counter-terrorism emergency-response take place at the CITRC area.

The radiological releases this reporting period took place as part of a training exercise for first responders to a release of radioactive material. Small amounts of a short-lived radionuclide were placed on various surfaces within the building as part of the training exercise. Building ventilation is not filtered.

The Plutonium, Uranium, Reduction, Extraction (PUREX) process is used for the extraction and recovery of uranium and plutonium from dissolved used nuclear fuel. A pilot plant is operated at PBF-622 that mimics several aspects of nuclear fuel reprocessing in the PUREX process using non-radioactive surrogates and some radioactive material.

3.1.4 Idaho Nuclear Technology and Engineering Center

The Idaho Nuclear Technology and Engineering Center (INTEC) is located in the southern portion of the INL Site and began operations in 1953 to recover and reprocess spent nuclear fuel. It was operated for the Department of Energy Idaho Operations Office by Idaho Environmental Coalition, LLC (IEC) for the CY 2024 reporting period.

INTEC radiological air emission sources result from various activities and operations. It has three continuously monitored point sources (two regulated, and one voluntary) and various other diffuse and non-diffuse sources. Voluntary continuous monitoring is performed for the New Waste Calcining Facility. Regulated continuous monitoring is conducted for the Fluorinel Dissolution Process and Fuel Storage (FAST) Facility as well as the Integrated Waste Treatment Unit which started waste operations in 2023.

Emissions exhausted through the Main Stack are associated with ventilation and process and vessel off-gas exhausts from liquid waste operations, including effluent primarily from periodic operation of the Process Equipment Waste Evaporator and Liquid Effluent Treatment and Disposal, as well as relief valve emissions from the Tank Farm Facility.

Additional radioactive emissions are associated with spent nuclear fuel storage, including interim storage of nuclear reactor fuel from Three Mile Island (managed by Spectra Tech, Inc.), remote-handled transuranic and mixed waste storage and treatment, radiological and hazardous waste storage facilities, contaminated equipment servicing and repair and the Remote Analytical Laboratory (CPP-684) which is in cold standby.

Soils that were disturbed at INTEC during CY 2024 as the result of maintenance and other project activities are not being reported for CY 2024 because they were determined to have activities at background or lower radioactivity levels.

The Idaho CERCLA Disposal Facility (ICDF) is located on the southwest corner of INTEC. Diffuse radiological emissions from this facility are estimated from waste disposal in the landfill and evaporation pond operations.

3.1.5 Materials and Fuels Complex

The Materials and Fuels Complex (MFC) is located in the southeastern corner of the INL Site. MFC, a research facility operated by BEA, is involved in advanced nuclear power research and development, spent fuel and waste treatment technologies, national security programs and projects to support space exploration.

Radiological air emissions are primarily associated with spent fuel treatment at the Fuel Conditioning Facility (FCF), waste characterization and fuel research and development at the Hot Fuel Examination Facility (HFEF), fuel research and development at the Fuel Manufacturing Facility (FMF) and post irradiation examination at the Irradiated Materials Characterization Laboratory (IMCL). These facilities are equipped with continuous monitoring or continuous sampling systems. On a regular basis, the effluent streams from FCF, HFEF, FMF, IMCL and other non-CEM radiological facilities are sampled and analyzed for particulate radionuclides. Gaseous and particulate radionuclides may also be released from other MFC facilities during laboratory research activities, sample analysis, waste handling and storage and maintenance operations. Both measured and estimated emissions from MFC sources are consolidated for National Emission Standards for Hazardous Air Pollutants (NESHAP) reporting on an annual basis.

3.1.6 Radioactive Waste Management Complex

The RWMC, located in the southwestern corner of INL, is a controlled-access area consisting of two primary project areas: The Advanced Mixed Waste Treatment Project (AMWTP) and the Subsurface Disposal Area (SDA) and associated Accelerated Retrieval Project (ARP). The primary mission of AMWTP is to sort, characterize, and treat transuranic and mixed low-level waste, and package the treated waste for shipment offsite for disposal. Various activities are being conducted in the SDA to complete environmental cleanup of the area under CERCLA and to conduct waste storage and treatment under the Resource, Conservation, and Recovery Act (RCRA). These include the closure of waste retrieval facilities at the ARP and the operation and subsequent closure of RCRA-permitted waste storage and treatment facility at WMF-1619. All projects at RWMC during 2024 were operated by IEC.

With approval from EPA, exhumation at the CERCLA ARP facilities in previous years as well as RCRA waste storage and treatment operations at ARP facilities use ambient air monitoring as an alternative to air dispersion calculations to verify compliance with the emissions standard during ARP operation. Therefore, record sampling is not performed, although continuous air monitors are used for real-time monitoring for detection of off-normal emissions.

The RCRA permitted Sludge Repackage Project (SRP) at WMF-1619 facility (ARP VII) processed and treated transuranic waste (originating at AMWTP) until May of 2024, and underwent RCRA closure, for which the Professional Engineering Certification was final on September 5, 2023. Waste treatment included segregating/sorting waste, adding absorbents, waste and container sizing, decontaminating debris items, and waste repackaging. High efficiency particulate air (HEPA) filtered radionuclide emissions from the ARP enclosures are calculated for use with emissions measurements from other INL sources to demonstrate INL site-wide compliance using the CAP-88 model.

The AMWTP had five potential sources of radionuclide emission in operation during CY 2024, of which two are continuously monitored point sources. Radiological air emissions from the AMWTP may result from the characterization and treatment of transuranic waste, alpha-contaminated low-level mixed waste and mixed low-level waste (MLLW).

3.1.7 Test Area North

Test Area North (TAN) is the northernmost developed area within INL. It was originally established to support the Aircraft Nuclear Propulsion Program, which operated from 1951 to 1961. Since 1961, TAN buildings have been adapted for use by various other programs, including current BEA operations at the Specific Manufacturing Capability (SMC) facility, the North Radiological Response Training Range (RRTR), and the New Pump and Treat Facility (NPTF).

3.1.7.1 Specific Manufacturing Capability

The TAN-SMC Project, managed by BEA, is a manufacturing operation that produces an armor package for the U.S. Department of the Army. The TAN-SMC Project was assigned to the INL Site in mid-1983. Operations at TAN-SMC include material development, fabrication and assembly work to produce armor packages. The operation uses standard metal-working equipment in fabrication and assembly. Other activities include developing tools and fixtures and preparing and testing metallurgical specimens. Radiological air emissions from TAN-SMC are associated with processing of depleted uranium. Potential emissions are uranium isotopes and associated radioactive progeny.

3.1.7.2 The North Radiological Response Training Range

The North Radiological Response Training Range (RRTR) began operation in July 2011 to support federal agencies responsible for the nuclear forensics mission.

3.1.7.3 New Pump and Treat Facility

The main purpose of the New Pump and Treat Facility (NPTF) located at TAN-TSF is to reduce concentrations of trichloroethylene and other volatile organic compounds in the medial zone portion of the OU 1-07B contamination groundwater plume at TAN to below drinking water standards (before reinjection into the aquifer). Low levels of Sr-90 and H-3 are also present in the treated water and are released to the atmosphere by the treatment process. The NPTF is operated by IEC.

3.2 INL Source Release Points

Table 3 through Table 11 list the facility stacks, vents, or other points where radioactive materials are released to the atmosphere. NRF emission points are listed in Appendix B.

Table 3. Stacks, vents, or other points of radioactive materials release to the atmosphere at ATR Complex.

Bldg	Vent	Source Description	Effluent Control Description	Efficiency
670	074	Laboratory 124 fume hoods exhaust	HEPA filter	99.97%
670	086	Laboratory 131 fume hoods exhaust	HEPA filter[b]	99.97%[b]
670	098	Laboratory 103 fume hoods exhaust (two hoods)	HEPA filter	99.97%
670	NA	ATR Canal	NA	NA
678	001	Radiation Measurements Laboratory fume hoods vent	HEPA Filter	99.97%
710	001	MTR Stack	Partial HEPA filtered[a]	99.97%
715	001	Warm Waste Evaporation Pond	NA	NA
770	001	ATR Main Stack	NA	NA
1626	001	Test Train Assembly Facility	NA	NA
1627	001	Radioanalytical Chemistry Laboratory fume hoods stack	HEPA Filter	99.97%

a. HEPA filters are on the effluent from the Safety and Tritium Applied Research Facility (TRA-666) prior to being emitted from the MTR stack.
b. Emission reduction credit was not taken for this HEPA filter during 2024 due to HEPA filter test results.

Table 4. Stacks, vents, or other points of radioactive materials release to the atmosphere at CFA.

Bldg	Vent	Source Description	Effluent Control Description[a]	Efficiency
625	010	Laboratory fume hoods	HEPA Filter bank	99.97%
1618		HPIL	NA	NA
NA	NA	CFA-Tritium, Pumped groundwater	NA	NA

a. Bank includes multiple HEPA filters.

Table 5. Stacks, vents, or other points of radioactive materials release to the atmosphere at CITRC.

Bldg	Vent	Source Description	Effluent Control Description	Efficiency
612	NA	PBR 612, CITRC Control System Research	NA	NA
613	NA	PBR 613, CITRC Communication Research Facility	NA	NA
622	NA	Explosives Detection Research Center Stack	NA	NA

Bldg	Vent	Source Description	Effluent Control Description	Efficiency
623	NA	CITRC Wireless Communication Support	NA	NA

Table 6. Stacks, vents, or other points of radioactive materials release to the atmosphere at INTEC.

Bldg	Vent	Source Description	Effluent Control Description	Efficiency
603	001	Irradiated Fuel Storage Facility	Two HEPA filters in series	99.97% each
659	033	NWCF Stack	Two HEPA filters in series	99.97%
684	001	Remote Analytical Laboratory	Two HEPA filters in series	99.97% each
708	001	INTEC Main Stack	Up to three HEPA filters in series	99.97% total
749	001	Underground Fuel Storage/Vault Area	HEPA filter	99.97%
1608	001	Manipulator Repair Cell	Two HEPA filters in series	99.97% each
1696	001	Integrated Waste Treatment Unit	Two HEPA filters in series	99.97% each
1774	NA	TMI-2 Independent Spent Fuel Storage Installation	HEPA filter	99.97%
CPP-2707	NA	Dry Cask Storage Pad	NA	NA
ICDF	NA	ICDF Landfill	NA	NA
ICDF	NA	ICDF Ponds	NA	NA
OU-3-14	NA	Evaporation Pond	NA	NA

Table 7. Stacks, vents, or other points of radioactive materials released to the atmosphere at MFC.

Bldg	Vent	Source Description	Effluent Control Description[a]	Efficiency
CPP-653	001	Decontamination Testbed Facility	Two HEPA filter banks in series	99.97% each
704	008	Fuel Manufacturing Facility Stack	Two HEPA filter banks in series	99.97% each
720	007	Transient Reactor Test Facility reactor cooling air exhaust	Two HEPA filter banks in series	99.97% each
752	004	L&O Building main stack	Two HEPA filter banks in series	99.97% each
752	005	L&O Building nondestructive assay building stack	HEPA filter banks	99.97% each
764	001	FCF Main Stack	Two HEPA filter banks in series	99.97% each
768	105	Decontamination shower suspect waste tank vent	HEPA filter bank	99.97%
768	108	Health Physics area fume hoods	HEPA filter bank	99.97%
774	026	EML exhaust	Two HEPA filter banks in series	99.97% each
774	027	EML exhaust	Two HEPA filter banks in series	99.97% each
774	028	EML exhaust	Two HEPA filter banks in series	99.97% each
774	029	EML exhaust	Two HEPA filter banks in series	99.97% each
777	002	Zero Power Physics Reactor exhaust	HEPA filter bank	99.97%
784	001	Advanced Fuels Facility	One HEPA filter	99.97%
785	018	Hot Fuel Examination Facility stack	Two HEPA filter banks in series	99.97% each
787	001	Fuel Assembly and Storage Building	HEPA filter bank	99.97%
792A	001	Space and Security Power System Facility	Two HEPA filter banks in series	99.97% each
794	002	Experimental Fuels Facility-West exhaust	HEPA filter bank	99.97%
794	006	Experimental Fuels Facility-East exhaust	HEPA filter bank	99.97%

Bldg	Vent	Source Description	Effluent Control Description[a]	Efficiency
1702	001	Radiochemistry Laboratory	HEPA filter bank	99.97%
1729	001	Irradiated Materials Characterization Laboratory	One to two HEPA filters in series	99.97%

a. Bank includes multiple HEPA filters.

Table 8. Stacks, vents, or other points of radioactive materials release to the atmosphere at RWMC.

Bldg	Vent	Source Description	Effluent Control Description	Efficiency
601	001	Health Physics Laboratory Hood	HEPA filter	99.97%
615	001	Drum Vent Facility	HEPA filter	99.97%
634	001	AMWTP Characterization Facility	Two HEPA filters in series	99.97% each
676	002	Zone 3 Stack (AMWTP)	Three HEPA filters in series	99.97% each
1612	NA	ARP-II Soils	NA	NA
1614	NA	ARP-III Soils	NA	NA
1615	NA	ARP-IV Soils	NA	NA
1617	NA	ARP-V Soils	NA	NA
1619	001	ARP-VII Debris Repackage Project	HEPA filter or two HEPA filters in series	99.97%
1621	001	ARP-VIII	HEPA filter	99.97%
1622	001	ARP-IX	HEPA filter	99.97%
1622	NA	ARP-IX Demo	NA	NA
1622	NA	ARP-IX Soils	NA	NA
SDA	1	Buried Beryllium Blocks	NA	NA

a. Assumed sources of potential fugitive emissions, post demolition include: WMF-1612 (ARP-II), WMF-1614 (ARP-III), WMF-1615 (ARP-IV), WMF-1617 (ARP-V), and WMF-1622 (ARP-IX)

Table 9. Stacks, vents, or other points of radioactive materials release to the atmosphere at TAN-SMC.

Bldg	Vent	Source Description	Effluent Control Description[a]	Efficiency
629	013	Line 2, manufacturing process	Two HEPA filter banks	99.97%
679	022	North manufacturing process (EF-206) and includes releases from the quality control (QC) laboratory	HEPA filter bank	99.97%
679	023	North manufacturing process (EF-205) includes releases from the QC laboratory	HEPA filter bank	99.97%
679	024	North manufacturing process (EF-204) and includes releases from the QC laboratory	HEPA filter bank	99.97%
679	025	South process (RAD Stack #8) manufacturing process (EF-203)	HEPA filter bank	99.97%
679	026	South process (RAD Stack #7) manufacturing process (EF-202)	HEPA filter bank	99.97%
679	027	South process (RAD Stack #6) manufacturing process (EF-201)	HEPA filter bank	99.97%
681	018	Process Reclamation Facility	HEPA filter bank	99.97%
681	020	Process Reclamation Facility	HEPA filter bank	99.97%
681	016	Process Reclamation Facility	NA	NA

a. Bank includes multiple HEPA filters.

Table 10. Stacks, vents, or other points of radioactive materials release to the atmosphere at TAN-TSF.

Bldg.	Vent	Source Description	Effluent Control Description	Efficiency
1611	NA	OU 1-07B Treatment Process	NA	NA

Table 11. Stack, vents, or other points of radioactive materials release to the atmosphere at RRTR.

Bldg.	Vent	Source Description	Effluent Control Description	Efficiency
RRTR	NA	North Radiological Response Test Range (RRTR-North)	NA	NA

3.3 Radioactive Material

The individual radionuclides found in materials used at the INL Site during CY 2024 are listed in Table 12. These materials included, but were not limited to, samples, products, process solids, liquids and wastes that have potential emissions.

Table 12. Radionuclides potentially emitted to the atmosphere from INL sources.

Ac-225	Br-82	Cs-138	Hf-179m	Kr-89	Pa-234	Rb-88	Si-32	Te-127m	Xe-135
Ac-227	Br-83	Cs-139	Hf-180m	La-140	Pa-234m	Rb-89	Sm-147	Te-129	Xe-135m
Ag-108m	Br-84	Cs-140	Hf-181	La-141	Pb-205	Rb-90	Sm-151	Te-129m	Xe-137
Ag-109m	C-14	Cu-64	Hf-182	La-142	Pb-210	Re-184	Sm-153	Te-131	Xe-138
Ag-110	Ca-45	Cu-66	Hg-203	Mn-52	Pb-214	Re-184m	Sm-156	Te-131m	Y-88
Ag-110m	Cd-109	Cu-67	Ho-166	Mn-53	Pd-107	Re-186	Sn-113	Te-132	Y-89m
Ag-111	Cd-113m	Dy-165	Ho-167	Mn-54	Pd-109	Re-186m	Sn-117m	Te-133	Y-90
Ag-111m	Cd-115	Dy-166	I-125	Mn-56	Pd-111	Re-187	Sn-119m	Te-133m	Y-90m
Ag-112	Cd-115m	Er-167m	I-126	Mo-101	Pd-112	Re-188	Sn-121	Te-134	Y-91
Ag-113	Cd-117	Er-169	I-128	Mo-93	Pm-147	Rh-103m	Sn-121m	Th-228	Y-91m
Am-241	Cd-117m	Er-171	I-129	Mo-99	Pm-148	Rh-104	Sn-123	Th-229	Y-92
Am-242	Cd-118	Er-172	I-130	Na-22	Pm-148m	Rh-105	Sn-123m	Th-230	Y-93
Am-243	Ce-139	Eu-152	I-131	Na-24	Pm-149	Rh-106	Sn-125	Th-231	Zn-65
Ar-39	Ce-141	Eu-152m	I-132	Nb-92m	Pm-150	Rh-106m	Sn-126	Th-232	Zn-69
Ar-41	Ce-143	Eu-154	I-132m	Nb-93m	Pm-151	Rn-219	Sn-127	Th-234	Zn-69m
As-76	Ce-144	Eu-155	I-133	Nb-94	Po-210	Rn-220	Sn-128	Tl-204	Zn-71m
As-77	Cf-252	Eu-156	I-134	Nb-95	Pr-142	Ru-103	Sr-80	Tl-206	Zn-72
As-78	Cl-36	Eu-157	I-135	Nb-95m	Pr-143	Ru-105	Sr-85	Tm-171	Zr-93
Au-194	Cl-38	Eu-158	In-115	Nb-96	Pr-144	Ru-106	Sr-87m	Tm-172	Zr-95
Au-195	Cm-242	Fe-55	In-115m	Nb-97	Pr-144m	Sb-122	Sr-89	U-232	Zr-97
Au-196	Cm-243	Fe-59	In-117	Nd-147	Pr-145	Sb-124	Sr-90	U-233	
Au-196m	Cm-244	Fe-60	In-117m	Nd-149	Pr-146	Sb-125	Sr-91	U-234	
Au-198	Cm-248	Ga-68	In-118	Ni-57	Pt-195m	Sb-126	Sr-92	U-235	
Ba-133	Co-57	Ga-72	Ir-188	Ni-59	Pu-236	Sb-126m	Ta-179	U-236	
Ba-135m	Co-58	Ga-73	Ir-189	Ni-63	Pu-238	Sb-127	Ta-182	U-237	
Ba-137m	Co-60	Gd-152	Ir-190	Ni-65	Pu-239	Sb-128	Ta-183	U-238	
Ba-139	Co-60m	Gd-159	Ir-192	Ni-66	Pu-240	Sb-128m	Ta-184	V-49	
Ba-140	Cr-51	Ge-68	Ir-193m	Np-237	Pu-241	Sb-129	Tb-160	W-181	
Be-10	Cs-132	Ge-71	K-40	Np-239	Pu-242	Sb-130	Tb-161	W-185	
Bi-207	Cs-134	Ge-75	Kr-81	Os-185	Pu-244	Sc-46	Tc-101	W-187	
Bi-210	Cs-134m	Ge-77	Kr-83m	Os-191	Ra-226	Sc-48	Tc-99	W-188	
Bi-210m	Cs-135	Ge-78	Kr-85	P-32	Ra-228	Se-77m	Tc-99m	Xe-129m	
Bi-214	Cs-135m	H-3	Kr-85m	P-33	Rb-84	Se-79	Te-123m	Xe-131m	
Br-80	Cs-136	Hf-175	Kr-87	Pa-231	Rb-86	Se-81	Te-125m	Xe-133	
Br-80m	Cs-137	Hf-178m	Kr-88	Pa-233	Rb-87	Se-81m	Te-127	Xe-133m	

4. Receptors

Receptors are identified as any "offsite point where there is a residence, school, business or office." The Environmental Protection Agency (EPA) has further defined receptors as also onsite places of occupancy to members of the public, in a memo addressing DOE's previous privatization/industrialization program. Frank Marcinowski addressed the Regional Radionuclide NESHAP Coordinators on Marth 26, 2001. In that memo EPA clarified that facilities located on DOE property, that allow nonrestricted access, to non-secure, private facilities that are generally accessible by the general public, should be considered ambient air, and considered as receptors.

INL is located in the middle of rural farming communities with restricted access to its facilities. There are five state highways which pass through portions of the INL site, however access to INL facilities is only granted to DOE badged employees and approved guests who must pass through controlled access points. INL maintains one visitor center with access to the general public, Experimental Breeder Reactor 1 (EBR I), which is a historical site maintained by INL. EBR I is not considered a receptor for Subpart H purposes because it is managed by INL badged employees. State highway 26 does have an unmanned rest area within INL boundary which is also not considered a receptor because it is not occupied for any consistent period of time. The general public does not have access to any office or building located on the INL site. Potential receptors for the INL consist primarily of farms and rural residences located offsite.

INL re-evaluated receptors and locations prior to the 2022 reporting year. This effort both evaluated the possibilities of new receptors previously unaccounted for, as well as minimizing the total quantity. All receptors within a specified offset from the INL boundary were identified. Of those identified, one from each of the 16 radial sectors from the site, if available, for each source were selected based on their proximity and orientation. The closest receptor in each sector relative to each source was selected. Of those receptors, many overlapped from one source to the next, and many of the other potential receptors were located within the same relative sector but further from the source. Those receptors were removed as they would not have the potential to receive the highest EDE from any of the sources. This effort reduced the total number of receptors from 62 to 31 surrounding the INL Site. This effort also changed the numbering of the receptors. Most notably, the receptor previously receiving the highest EDE, receptor 54, is now receptor 26. All these receptors identified by a red diamond can be seen in Figure 1 above.

Table 13 tabulates distances from the points of release to the nearest residence, school, business or office and the nearest farms producing vegetables, milk and meat.

Table 13. Distances from INL facility points of release to the nearest off-Site receptor location, farm, dairy, feedlot and to Receptor 26 (INL MEI).

Facility	Distance and Direction to Nearest Residence, School, Business	Distance and Direction to Nearest Vegetable Farm	Distance and Direction to Nearest Dairy	Distance and Direction to Nearest Feedlot	Distance and Direction to MEI (Receptor 26)
MFC	8.5 km[a] SSE	22.3 km S	36.6 km NW	39 km ESE	8.5 km SSE
CFA	12.5 km SE	12.5 km SE	34.7 km N	60 km E	27.6 km E
CITRC	10.8 km SSE	10.7 km S	33.4 km N	53 km E	21.6 km E
INTEC	15.3 km SSE	25.1 km W	30 km N	60 km E	27.2 km ESE
NRF	13.7 km NNW	13.3 km NNW	21.4 km N	61 km E	29.1 km ESE
RWMC/AMWTP	8.0 km SSW	20.6 km NW	38.5 km ESE	69 km E	35.4 km E
TAN-TSF	10.3 km E	10.2 km E	18.2 km E	30 km E	36.7 km SSE

Facility	Distance and Direction to Nearest Residence, School, Business	Distance and Direction to Nearest Vegetable Farm	Distance and Direction to Nearest Dairy	Distance and Direction to Nearest Feedlot	Distance and Direction to MEI (Receptor 26)
TAN-SMC	12.3 km E	12.4 km E	20.4 km E	30 km E	38.3 km SSE
ATR Complex	19.1 km SSW	22.4 km W	41 km SE	65 km E	30.0 km ESE

a. km = kilometers.

5. INL Emissions

Emissions from the INL are determined via three primary methods consisting of: continuously monitored Potential Impact Category (PIC) 1 or PIC 2 sources, measured PIC 3 or PIC 4 sources, and estimated PIC 3 or PIC 4 sources. These sources are estimated or measured based on a graded approach to emission estimates.

The majority of emissions are derived from the measured PIC 3 or PIC 4 sources and consist of a variety of sampling and or measuring methods, such as periodic destructive/ non-destructive filter analysis, engineering analysis based on operating energies and activation coefficients, continuous sampling, etc. Table 13 below tabulates the highest emitted radionuclides for each monitoring or estimating category as well as the total emissions and percent emissions from that category for CY 2024.

The second largest contribution of emissions, but the largest contribution to EDE is from the estimating of PIC 3 or PIC 4 sources. The primary form of estimating emissions in this category is calculating emissions from inventories or materials used over the reporting period. Inventories are assumed emitted to the atmosphere based on resuspension factors derived from their physical states and any downstream abatement reductions.

The method contributing the least emissions, but also the most accurate are the continuously monitored or sampled PIC 1 or PIC 2 sources. Emissions from those sources are tabulated in Table 14 below.

Table 14. Emissions by Measurement or Estimation Method.

Method	Emissions (Ci/yr)	
	Total	%
PIC 1 & 2	3.14E-05	0.00000%
Measured PIC 3 & 4	1,289.62	81.21%
Estimated PIC 3 & 4	289.46	18.79%
Total	1,588.08	

Table 15 reports the annual radionuclide emissions for the INL Site sources that require continuous monitoring for compliance during CY 2024.

Table 15. Radionuclide emissions, in curies (Ci), from the INL Site continuously monitored point sources during CY 2024.

Radionuclide	MFC[a]-1729-001	MFC-785-018	MFC-764-001	MFC-704-008	CPP[a]-767-001	WMF-676-002	WMF-676-003
Am-241	---	---	---	---	---	1.05E-09	ND
Pu-238e	---	---	---	---	---	8.01E-09	ND
Pu-239	2.63E-08	9.94E-08	5.37E-08	2.33E-08	---	4.56E-09	ND
Pu-240	---	---	---	---	---	ND	ND
Sr-90	2.71E-07	2.68E-07	7.79E-07	2.79E-08	0.00E+00	ND	ND

6. INL Effective Dose Equivalents

INL calculates the effective dose equivalent (EDE) at each receptor from each source, for every radionuclide released. The EDE at each receptor from every source is then summed to determine the maximum dose received at any receptor. This receptor is referred to as the maximally exposed individual (MEI). INL uses the Clean Air Act Assessment Package 1988-Personal Computer (CAP88-PC) model to generate unit dose factors (UDF) for each source to each receptor for each radionuclide. Thes UDF's, in units of mrem per curie, are the potential EDE at the receptor if a unit curie was released from the source for that radionuclide.

$$EDE_{i,j,k} = AE_{i,j,k} \times UDF_{i,j,k}$$

Where:

$EDE = Effective\ Dose\ Equivalent\ \left(\frac{mrem}{year}\right)$

$AE = Abated\ Emissions\ \left(\frac{Ci}{year}\right)$

$UDF = Unit\ Dose\ Factor\ \left(\frac{mrem}{Ci}\right)$

$i = Source$

$j = Receptor$

$k = Radionuclide$

And the EDE from every source and radionuclide at receptor j is determined by the following:

$$EDE_j = \sum_{i,k} EDE_{i,j,k}$$

6.1 Modeling Summary

CAP88-PC is an EPA maintained and approved computer model, consisting of computer programs, databases, and associated utility programs. Combined with facility input data, the model outputs the UDF's required for calculating the EDE's.

Meteorological data are supplied by the Idaho Falls Office of National Oceanic and Atmospheric Administration (NOAA). NOAA collects data from the INL station locations identified in Figure 1, with the station nearest to each facility generally used for each facility. For modeling purposes, ground level releases are assumed for all facilities with the exception of the stack parameters listed below in Table 16.

Table 16. Stack parameters used in CAP88-PC simulations.

FacilityID	Stack SourceID	Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)
INTEC-MS[b]	CPP-708-001	76.2	1.83	9.99[a]
RTC-ATR	TRA-770-001	76.2	1.524	9.13[a]
MTR Stack	TRA-710-001	76.2	1.524	3.28
MFC-MS[b]	MFC-764-001	61	1.524	15.0[a]
MFC-TREAT	MFC-720-007	42.7	0.61	6.78

a. Exit velocity a change from previous year.
b. MS = main stack

Given INL's location, within a rural farming community, the "local" food source option in CAP88-PC is chosen to simulate a rural subsistence-farming scenario. Otherwise, the default parameters for this exposure scenario were utilized. Additional meteorological parameters are displayed below in Table 17.

Table 17. Other meteorological parameters used in the CAP88-PC modeling.

Variable	INL Site Value	In-Town Value	Units
Lid height	800[a]	800[a]	meters
Mean temperature	5.78[b]	8.72[d]	Celsius
Annual Precipitation	21.3[b]	27.8[d]	cm/yr
Absolute humidity	4.31[c]	5.18[d]	g/m^3

a. Memo from J. Sagendorf, NOAA, to M. Abbott, INL, February 11, 1991.
b. Annual average value at CFA based on data from 1950 to 2015 (Clawson et al. 2018).
c. Calculated from annual average mean temperature at CFA (1950–2015), pressure and relative humidity at CFA (1994–2015) (Clawson et al. 2018).
d. 2024 average value from NOAA Mesonet tower located in Idaho Falls.

6.2 MEI

CY 2024 EDE's resulted in an MEI located at receptor 26, a farm and cattle operation located approximately 2.3 km south of the INL border, and northeast of the East Butte (see Figure 1). The dose to the MEI, 0.015 mRem/year, is consistent with recent years. 0.015 mRem/year is 0.15% of the 10 mRem/year Subpart H Standard. MFC is the nearest source to receptor 26, and as a result, had the highest dose contribution. The majority of emissions were generated from the ATR Main Stack, with its nearest receptor, Receptor 1, receiving a lessor EDE than Receptor 26. Table 18 below tabulates the dose contributions from each source to receptor 26.

Table 18. INL facility dose (mrem) contributions and total INL Site dose (mrem) to the MEI located at Receptor 26 for CY 2024 radionuclide air emissions.

Facility	Point source dose (mrem/yr)	Fugitive source dose (mrem/yr)	Total dose (mrem/yr)	Notes
CFA Total	**1.10E-05**	**1.23E-06**	**1.22E-05**	Total from 3 CFA sources
CITRC Total	**2.04E-06**	**4.48E-12**	**2.04E-06**	Total from 4 CITRC sources
INTEC	9.05E-07	2.28E-06	3.18E-06	11 INTEC sources including ICDF.
INTEC-MS	2.12E-07		2.12E-07	INTEC Main Stack (CPP-708)
INTEC Total	**1.12E-06**	**2.28E-06**	**3.39E-06**	Total from all INTEC sources
MFC	1.33E-02		1.33E-02	19 MFC sources
MFC-MS	7.27E-08		7.27E-08	MFC Main Stack (MFC-764)
MFC-TREAT	5.25E-04		5.25E-04	TREAT Exhaust Stack
MFC Total	**1.39E-02**		**1.39E-02**	Total from all MFC sources
NRF Total	**7.69E-05**	**2.98E-08**	**7.69E-05**	Total from all NRF sources
ATR Complex	8.95E-06	5.17E-04	5.26E-04	8 ATR Complex sources
ATR Complex-ATR	1.56E-04		1.56E-04	ATR Stack (TRA-770)
ATR Complex-MTR	6.68E-07		6.68E-07	MTR Stack (TRA-710)
ATR Complex Total	**1.65E-04**	**5.17E-04**	**6.83E-04**	**Total from ATR Complex sources**
RRTR Total		**1.65E-11**	**1.65E-11**	Total from all RRTR sources
RWMC Total	**5.03E-09**	**2.95E-04**	**2.95E-04**	14 RWMC sources including ARPs. Glovebox Stack emissions were non-detect in 2024.
TAN-SMC Total	**3.78E-10**		**3.78E-10**	Total from SMC emissions
TAN-TSF Total	**1.10E-06**		**1.10E-06**	OU 1-07B emissions
INL Site Total	**1.41E-02**	**8.16E-04**	**1.49E-02**	Total MEI dose from all INL Site sources

Table 19 below tabulates the emissions and resulting EDE to both receptors previously reported as the MEI. Included are those estimated emissions utilizing EPA's preferred Appendix D methodology. It should be noted that the estimated emissions effected by the difference in methods are those that are estimated due to their low potential to emit, and those emissions that would have otherwise been reduced due to filtration through HEPA filters. Noble gases or other material heated to the gaseous state would not result in differing emissions based on the difference in these methods.

Table 19. CY 2024 Emissions and Resulting Dose from Existing Method Compared to Appendix D Methodology.

Receptor	Historical Method (DOE-HDBK)		Appendix D Method	
	Emissions (Ci/yr)	EDE (mRem/yr)	Emissions (Ci/yr)	EDE (mRem/yr)
1	1,588.08	0.00921	1,588.09	0.00923
26	1,588.08	0.0149	1,588.09	0.0149

Appendix A

INL Research and Education Campus

INL Research and Education Campus

This report documents radionuclide air emissions for calendar year (CY) 2024 and the resulting effective dose equivalent (EDE) to the maximally exposed individual (MEI) member of the public from operations at Idaho National Laboratories (INL) at the INL Research Center (IRC) and the Department of Energy - Idaho Operations Office (DOE-ID) Radiological and Environmental Sciences Laboratory (RESL) on the INL Research and Education Campus (REC).

The heading of each section in this report corresponds to the citation found in 40 *Code of Federal Regulations* (CFR) Part 61.94. The applicable reporting requirement is cited under the heading in italicized text followed by the compliance report for REC.

40 CFR 61.94(a)

"Compliance with this standard shall be determined by calculating the highest effective dose equivalent to any member of the public at any offsite point where there is a residence, school, business or office. The owners or operators of each facility shall submit an annual report to both Environmental Protection Agency (EPA) headquarters and the appropriate regional office by June 30, which includes the results of the monitoring as recorded in DOE's Effluent Information System and the dose calculations required by §61.93(a) for the previous calendar year."

No radionuclide emissions for the IRC or RESL required continuous monitoring for compliance during CY 2024. Table 1A lists the sources used to calculate the EDE to the MEI.

Table 1A. Sources used to calculate the EDE to the MEI.

Facility	Source
IRC:	IF-603, IRC Laboratory (IRC-L) Building IF-611, National Security Laboratory (NSL)
RESL:	IF-683, Radiological and Environmental Sciences Laboratories

Subpart H requires DOE facilities to calculate the resulting dose to the offsite MEI. The location of IRC/RESL MEI for CY 2024 is an office building 0.1 km south of the RESL Laboratory Building (IF-683). The EDE to the MEI was 4.83E-03 mrem/yr, which is 0.048% of the 10-mrem/yr federal standard and was calculated using all sources that emitted radionuclides to the environment from IRC/RESL. Table 2A provides a summary of IRC/RESL Site MEI dose by facility and source type.

Table 2A, Dose (mrem) contributions and total IRC/RESL dose (mrem) to the MEI located 0.1 km south of the IRC/RESL for CY 2024 radionuclide air emissions.

Source ID	Non Fugitive Dose (mrem/yr)	Percent of Total MEI Dose	Notes
RESL IF-683	3.82E-03	79.1%	DOE RESL Sources
IRC IF-603 & IF-611	1.01E-03	20.1%	IRC Laboratories
REC Total	**4.83E-03**	**100%**	**REC Total**

40 CFR 61.94(b)

"In addition to paragraph (a), the annual report will include the following information:"

40 CFR 61.94(b)(1)

"The name and location of the facility."

IRC and RESL facilities are located contiguously on a partially developed 14.3-ha (35.5-acre) plot of the REC on the north side of the City of Idaho Falls. Though programs and operations at the IRC/RESL are affiliated with INL, the IRC/RESL is located within the city limits of Idaho Falls and is not contiguous with the INL Site, the nearest boundary of which is approximately 22 mi west of Idaho Falls.

BEA facilities include three, one-story laboratory buildings containing 66 laboratories in IRC-L (Building IF-603) and NSL (IF-611). RESL (IF-683) consists of 8 radiochemistry laboratories, stable chemistry laboratories, offices and conference areas.

40 CFR 61.94(b)(2)

"A list of the radioactive materials used at the facility."

The individual radionuclides found in materials used at the IRC and RESL during CY 2024 are listed in Table 3A. These materials included, but were not limited to, samples, products, process solids, liquids and wastes that have potential emissions. Table 3A does not contain radionuclides with an activity <1E-25.

Table 3A. Radionuclides in use and potentially emitted to the atmosphere from REC facilities in CY 2024

Ac-227	Co-57	I-129	Pd-103	Sc-48	Te-131m
Ag-108m	Co-58	I-131	Pm-145	Se-75	Th-228
Ag-110m	Co-60	In-114m	Pm-147	Se-79	Th-229
Am-241	Co-60m	Ir-192m	Pm-148	Sm-145	Th-230
Am-243	Cr-51	Ir-194	Pm-148m	Sm-151	Th-232
Ar-39	Cs-131	Kr-81	Pm-149	Sm-153	Tl-204
As-76	Cs-134	Kr-85	Pm-151	Sn-113	Tm-170
As-77	Cs-135	La-140	Po-210	Sn-117m	Tm-171
Au-199	Cs-136	Lu-177m	Pr-143	Sn-119m	U-232
Ba-131	Cs-137	Mn-54	Pt-191	Sn-121	U-233
Ba-133	Cu-67	Mo-93	Pt-193	Sn-121m	U-234
Ba-133m	Er-169	Mo-99	Pt-195m	Sn-123	U-235
Ba-135m	Er-172	Na-22	Pu-236	Sn-125	U-238
Be-10	Eu-152	Nb-92	Pu-238	Sr-85	W-181
Bi-210	Eu-152m	Nb-94	Pu-239	Sr-89	Xe-129m
Br-82	Eu-154	Nb-95	Pu-244	Sr-90	Xe-131m
C-14	Eu-155	Nb-95m	Ra-226	Ta-182	Xe-133
Ca-45	Eu-156	Nd-147	Rb-86	Ta-183	Xe-133m
Ca-47	Fe-55	Ni-59	Re-186	Tb-157	Xe-135
Cd-109	Fe-59	Ni-63	Rh-105	Tb-160	Y-88
Cd-115	Gd-148	Ni-66	Ru-103	Tb-161	Y-90
Cd-115m	Gd-153	Np-237	Ru-106	Tc-97m	Y-91
Ce-137m	Ge-71	Os-185	Ru-97	Tc-99	Yb-175
Ce-139	H-3	Os-191	S-35	Tc-99m	Zn-65
Ce-141	Hf-175	Os-193	Sb-122	Te-121	Zr-89
Ce-143	Hf-179m	Os-194	Sb-124	Te-121m	Zr-95
Ce-144	Hf-181	P-32	Sb-125	Te-123m	
Cf-252	Hg-197	P-33	Sb-126	Te-125m	
Cl-36	Hg-203	Pa-231	Sc-46	Te-127m	
Cm-244	I-125	Pb-210	Sc-47	Te-129m	

40 CFR 61.94(b)(3)

"A description of the handling and processing that the radioactive materials undergo at the facility."

The IRC is principally an experimental research facility dedicated to a wide range of research areas including microbiology, geochemistry, materials characterization, welding, ceramics, thermal fluids behavior, materials testing, nondestructive evaluation of materials using standard industrial x-ray processes, x-ray diffraction and x-ray fluorescence, analytical and environmental chemistry and biotechnology. Non-research activities include analytical chemistry and preparation of reference radioactive and nonradioactive standards for performance evaluation programs.

Radiological emissions from the IRC could arise from uncontrolled laboratory fume hoods within the facility. Exhaust from most of the fume hoods is released directly to the outside atmosphere via the heat recovery fan system of the IRC heating, ventilating, and air conditioning system. The heat recovery fan system exhausts to the outside via vents on the north side of the mechanical penthouse on top of the IRC laboratory building. The height of these vents is 7.6 m (25 ft). The exhausts from other fume hoods (not exhausted to the heat recovery fan) are released to the atmosphere via a 2.1-m (7.0-ft) stack above the roof or two 8.5-m (28-ft) stacks above the roof.

Emissions can occur from other areas as well. Not all radiological emissions will occur from work in a fume hood. Some work is done on work benches or in bay areas.

The Radiological and Environmental Sciences Laboratory (RESL) is a federally owned and operated laboratory by the Department of Energy (DOE). The laboratory's focus is primarily in analytical chemistry, radiation protection and as a reference laboratory for numerous performance evaluation programs. RESL emissions are from low-level radiological performance testing sample preparation and verification.

Radiological emissions from the DOE-ID RESL (Bldg IF-683) could be emitted from uncontrolled laboratory fume hoods. The fume hoods are identified by vent numbers and the emissions exhaust directly to the outside atmosphere via individual stacks on the south side of the building roof. These stacks all have a height of 9.6m (31.6ft). Radiological emissions from RESL could also be emitted from the centralized building exhaust system (F-1 and F-2) located in all the south labs plus the following rooms: Alpha and Gamma spectrometry, Beta Counting, Radiological Standards Vault and the Sample and Radiological Storage. The stack height for the centralized exhaust system is 7.4m (24.3ft) and is located on the east side, center, of the building roof. All heights are from ground level.

40 CFR 61.94(b)(4)

"A list of the stacks or vents or other points where radioactive materials are released to the atmosphere."

Tables 4A and 5A list the facility stacks, vents, or other points where radioactive materials were released to the atmosphere during CY 2024.

Table 4A. Stacks, vents, or points of radioactive materials release to the atmosphere at IRC.[1]

Building	Vent	Source Description	Effluent Control Description	Efficiency
IF-603	HRF-4	Laboratories A13, A15, A20 and B4-B6	NA	NA
IF-603	HRF-5	Laboratory B12	NA	NA
IF-603	HRF-6	Laboratories C6 and C10	NA	NA
IF-611	HV[1]-EF-4	Laboratory 104	NA	NA
IF-611	HV-EF-6	Laboratory 105	NA	NA
IF-611	Blower EF-5	Laboratory 105	NA	NA
IF-638		IRC Physic Laboratory	NA	NA

1. Key- EF: exhaust fan, AHU: air handler unit, HRF: heat recovery fan, HV: heating ventilation.

Table 5A. Stacks, vents, or points of radioactive materials release to the atmosphere at RESL.

Building	Vent	Source Description	Effluent Control Description	Efficiency
IF-683	F-9	Laboratory 129 fume hood exhaust	NA	NA
IF-683	F-10	Laboratory 129 fume hood exhaust	NA	NA
IF-683	F-11	Laboratory 130 fume hood exhaust	NA	NA
IF-683	F-12	Laboratory 130 fume hood exhaust	NA	NA
IF-683	F-13	Laboratory 131 fume hood exhaust	NA	NA
IF-683	F-14	Laboratory 131 fume hood exhaust	NA	NA
IF-683	F-15	Laboratory 132 fume hood exhaust	NA	NA
IF-683	F-16	Laboratory 132 fume hood exhaust	NA	NA
IF-683	F-17	Laboratory 133 fume hood exhaust	NA	NA
IF-683	F-18	Laboratory 133 fume hood exhaust	NA	NA
IF-683	F-19	Laboratory 134 fume hood exhaust	NA	NA
IF-683	F-20	Laboratory 134 fume hood exhaust	NA	NA
IF-683	F-21	Laboratory 135 fume hood exhaust	NA	NA
IF-683	F-22	Laboratory 135 fume hood exhaust	NA	NA
IF-683	F-23	Laboratory 136 fume hood exhaust	NA	NA
IF-683	F-24	Laboratory 136 fume hood exhaust	NA	NA
IF-683	F-1, F2	Building exhaust	NA	NA

40 CFR 61.94(b)(5)

"A description of the effluent controls that are used on each stack, vent, or other release point and an estimate of the efficiency of each control device."

No effluent control equipment is associated with any release points of radioactive material at IRC facilities.

40 CFR 61.94(b)(6)

"Distances from the points of release to the nearest residence, school, business or office and the nearest farms producing vegetables, milk and meat."

The nearest residence is approximately 0.4 km (0.25 mi.) to the west. The nearest school is approximately 0.4 km (0.25 mi.) to the south. The nearest business or office is approximately 0.1 km (0.0620 mi.) east, north and south of the IRC/RESL. The nearest farm producing vegetables, milk and meat is 0.35 km (0.22 mi.) to the north of the IRC/RESL.

40 CFR 61.94(b)(7)

"The values used for all other user supplied input parameters for the computer models (e.g., meteorological data) and the source of these data."

The meteorological input file used to calculate the MEI was IDAL18.WND from the NOAA station at Fanning Field in Idaho Falls, ID. The measurement height is 15 meters.

The CAP88-PC Version 4.1 modeling was performed for facilities in Idaho Falls using emission rates for radionuclides listed in Table 3A. For IRC facility and RESL, releases were calculated from a single ground-level point source for receptors in each of the 16, 22.5-degree sectors.

40 CFR 61.94(b)(8)

"A brief description of all construction and modifications that were completed in the calendar year for which the report is prepared, but for which the requirement to apply for approval to construct or modify was waived under § 61.96 and associated documentation developed by DOE to support the waiver."

None.

Appendix B

Naval Reactors Facility National Emission Standards for Hazardous Air Pollutants - Radionuclides Annual Report for 2024

Naval Reactors Facility

National Emission Standards for Hazardous Air Pollutants

Report on Radionuclide Air Emissions

For Calendar Year 2024

Prepared for the U.S. Department of Energy by

Fluor Marine Propulsion, LLC

Calendar Year 2024

Naval Reactors Facility

National Emission Standards for Hazardous Air Pollutants

Report on Radionuclide Air Emissions

As required under 40 CFR Part 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities"

Site Name: Idaho National Laboratory (INL)

Area: Naval Reactors Facility (NRF)

Area Information for NRF

Operator: Fluor Marine Propulsion, LLC
P. O. Box 2068
Idaho Falls, Idaho 83403-2068

Contact: D. A. Honabach, Director, Naval Reactors Facility
Phone: (208) 533-5526

Owner: Naval Reactors Laboratory Field Office
Idaho Branch Office
P. O. Box 2469
Idaho Falls, Idaho 83403-2469

Contact: R. G. Pratt, Manager, Naval Reactors Idaho Branch Office
Phone: (208) 533-5317

I. FACILITY INFORMATION

Site Description

The Naval Reactors Facility (NRF) is located in the west-central part of Idaho National Laboratory (INL), as shown in Figure 1. The nearest population center is Howe, which is located approximately 16.3 kilometers (10.1 miles) north-northwest of NRF.

The climate of INL is characterized as semi-arid. INL is located on the Snake River Plain with an elevation of approximately 1500 meters (5000 feet). Air masses entering the Snake River Plain from the west lose most of their moisture as precipitation prior to reaching INL; therefore, annual precipitation at INL is light. Winds are channeled over the Snake River Plain by bordering mountain ranges so that winds from the southwest and northeast predominate over INL. The meteorological data for the area is used in the dose modeling, as described in Section III.

Established in 1949, NRF is operated for the U. S. Naval Nuclear Propulsion Program (NNPP) by Fluor Marine Propulsion, LLC. The operations area of NRF within the security fence consists of buildings, streets, and equipment covering about 89 acres. The principal facilities at NRF are three former naval reactor prototypes (S1W, A1W, and S5G) and the Expended Core Facility (ECF). The S1W, A1W, and S5G prototypes were shut down in 1989, 1994, and 1995, respectively.

In 2019, NNPP and the Department of Energy Office of Environmental Management (DOE-EM) signed an agreement that included deactivation and decommissioning (D&D) of the three prototypes. Over the next several years, the D&D work will be performed by the DOE-EM Idaho Cleanup Project contractor. As each prototype enters into D&D, operational, radiological, and environmental responsibilities are transferred to DOE-EM and emissions reporting will be the responsibility of DOE-EM. The S1W, A1W, and S5G prototypes, along with other surrounding support areas, were formally transferred over to DOE-EM on January 27, 2022, November 2, 2023, and October 31, 2024, respectively. Because NRF maintains control of parts of the S5G prototype building and continues to repackage radioactive waste in the building, emissions from S5G for all of 2024 are included in this NESHAP Report.

Developmental nuclear fuel material samples, naval spent fuel, and irradiated reactor plant components/materials are examined at ECF. The knowledge gained from these examinations is used to improve current designs and to monitor the performance of existing reactors. The naval spent fuel examined at ECF is critical to the design of longer-lived reactor cores, which results in the generation of less spent fuel requiring disposition. NRF also prepares and packages spent naval fuel for dry storage and eventual transport to a permanent repository.

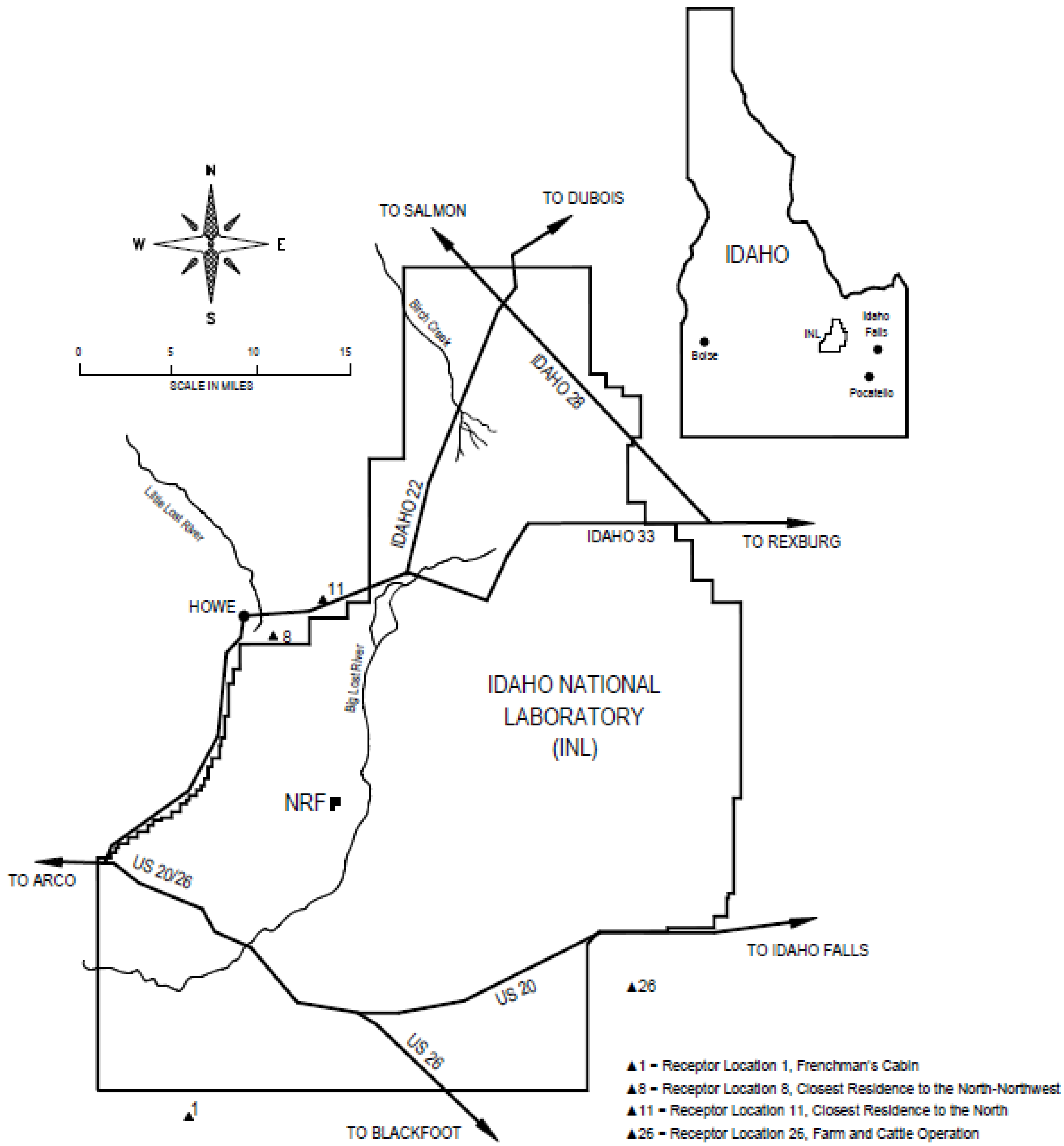

Figure 1. Relation of NRF to INL and the Surrounding Area

Source Descriptions

NRF receives spent fuel and radioactive components from the NNPP, shipped in Department of Energy (DOE)/Nuclear Regulatory Commission approved shipping containers in accordance with Department of Transportation requirements. The shipments are processed and examined at ECF.

Radioactive materials at NRF include enriched uranium fuel with associated fission products, activation products, and activated corrosion and wear products. Various radiation sources are used for calibrating and checking equipment, and for verifying shielding. Soil with low levels of radioactivity from past releases is also present at NRF.

Radioactive materials are handled and processed in several areas at NRF, including shielded hot cells, chemical and metallurgical laboratories, water pools, and radioactive material storage areas. Physical, chemical, and metallurgical testing of small quantities of highly radioactive material specimens is performed in the ECF shielded hot cells. Radiological work conducted within the ECF high bay water pools consists of unloading spent naval fuel and radioactive specimens from shipping containers, fuel examinations, removal of non-fuel structural pieces, and storage of fuel. In another part of ECF called the Spent Fuel Packaging Facility, the spent naval fuel is removed from the water pools and packaged for long-term dry storage. Segregation and repackaging of radioactive waste are performed at the S5G prototype building. Decontamination of inactive radiological systems is conducted throughout NRF controlled areas. Radiological work is performed in appropriate containment. Storage and movement of radioactive materials are under strict control. Special laboratory facilities are available for the chemical analysis of low-level radioactive samples.

Radionuclide emissions to the atmosphere can come from the following sources at NRF:

(1) ECF, where spent fuel from naval reactor cores and contaminated materials such as anticontamination clothing, tools, and equipment are handled. Spent fuel is handled, stored, and prepared for disposal in the water pools. Radioactive specimens are handled in the shielded hot cells. Spent fuel is unloaded from shipping containers and is packaged for long-term storage at a permanent repository.

(2) The S5G Prototype, where activities such as routine inspection of the reactor compartment has a small potential to emit radionuclides even though the reactor has been shut down and defueled. The last reactor compartment entry occurred in 2022. At the S5G prototype building, contaminated materials such as anticontamination clothing, tools, equipment, and contaminated waste are handled. The S5G prototype, along with portions of the S5G building, were formally transferred over to DOE-EM for D&D on October 31, 2024. D&D was started shortly after the formal transfer.

(3) Fugitive soil emissions from areas surrounding NRF that potentially contain low levels of radioactivity.

(4) Remediation and demolition activities at various buildings and structures with historical radioactive contamination.

II. AIR EMISSIONS DATA

NRF has a number of stacks and vents with the potential to emit low quantities of radionuclides. These emissions are quantified by monitoring and/or by calculations based on production. Continuous monitoring is required by 40 Code of Federal Regulations (CFR) section (§) 61.93(b), for emission points that have a potential to emit radionuclides in quantities that could result in an Effective Dose Equivalent (EDE) to a member of the public in excess of 1 percent of the 10 millirem (1×10^{-4} sievert) per year standard, which equates to 0.1 millirem (1×10^{-6} sievert) per year. None of the emission points at NRF qualify for the continuous monitoring requirement; all emission points are below the 0.1 millirem (1×10^{-6} sievert) per year criterion. For emission points where the potential to emit is below this criterion, periodic confirmatory measurements are required to verify the low emissions.

Table II-1 identifies point sources of potential radionuclide air emissions at NRF. Table II-2 identifies potential non-point sources (also called diffuse, or fugitive sources) of radionuclide air emissions. The only non-point source at NRF is windblown soil from areas on NRF property outside of the operations area that contain low levels of radioactivity from past releases to the environment. Table II-3 lists the amount of each radionuclide emitted from point sources and Table II-4 lists the amount from non-point sources. The tables include measured values for those radionuclides that are routinely monitored and calculated values for those radionuclides that are not monitored.

Table II-1. Radiological Air Emission Point Sources at NRF During 2024

AREA-BLDG-VENT	SOURCE DESCRIPTION	EFFLUENT CONTROL	EFFICIENCY	MONI-TORED (1)
NRF-618-099	ECF Stack Number 1	HEPA Filter Carbon Filter	99.95%[2] 90-99.9%[3]	Yes+
NRF-618-103	ECF Stack Number 2	HEPA Filter	99.95%[2]	Yes+
NRF-618-237	ECF Stack Number 3	HEPA Filter	99.95%[2]	Yes+
NRF-618-HBRV	ECF High Bay Roof Vents (16 individual emission points)	None	NA	Yes
NRF-633A-HBRV	S5G High Bay Roof Vents (7 individual emission points)	None	NA	Yes

Table II-1 Notes:

1. "Yes" indicates that the source was monitored, and the measured emissions are included in this report. "Yes+" indicates that the source was monitored, and both measured and calculated emissions are included in this report. Because some gaseous radionuclides could not be measured, the amounts of these radionuclides were calculated based on process production rate.
2. High Efficiency Particulate Air (HEPA) filters are tested by the manufacturer prior to delivery to NRF and by NRF during the life of the filter. The manufacturer tests the efficiency for 0.3-micron monodispersed dioctylphthalate (DOP) particles to a minimum of 99.97 percent. NRF tests the efficiency for 0.7-micron polydispersed DOP particles to a minimum of 99.95 percent.
3. The carbon filters have an efficiency of 99.9 percent for the removal of radioactive iodine when new. Their efficiency lessens with use, as the carbon adsorbent depletes. The carbon filters are replaced every 3 years.

Table II-2. Radiological Air Emission Non-Point Sources at NRF During 2024

AREA-BLDG-VENT	SOURCE DESCRIPTION	EFFLUENT CONTROL	EFFICIENCY	MONI-TORED
NA	Fugitive Soil	None	NA	No

Table II-3. Point Source Releases from NRF During 2024

Radionuclide	Release (curies)	Release (becquerels)[1]
Gross alpha activity (modeled as plutonium-239)	2.0E-06	7.5E+04
Gross beta activity (modeled as strontium-90)	4.4E-05	1.6E+06
Carbon-14	5.8E-01	2.1E+10
Cobalt-60	1.7E-07	6.0E+03
Hydrogen-3 (Tritium)	3.9E-02	1.4E+09
Iodine-129	9.6E-06	3.5E+05
Iodine-131	5.5E-06	2.0E+05
Krypton-85	2.8E-01	1.0E+10
Total	9.0E-01	3.3E+10

Table II-3 Note:

1. One curie equals 3.7E+10 becquerels.

Table II-4. Non-Point Source Releases from NRF During 2024

Radionuclide	Release (curies)	Release (becquerels)[1]
Cesium-137	2.3E-06	8.6E+04
Cobalt-60	1.3E-07	4.8E+03
Total	2.5E-06	9.1E+04

Table II-4 Notes:

1. One curie equals 3.7E+10 becquerels.

The nearest residence, school, business, or office to NRF is a residence 13.3 kilometers (8.3 miles) to the north-northwest. The nearest cultivated land is 11.6 kilometers (7.2 miles) to the north. This area is typically planted in wheat, barley, or alfalfa. The nearest farm producing milk is 20.9 kilometers (13.0 miles) to the north-northwest. The nearest feedlot producing meat is 15.6 kilometers (9.7 miles) to the north-northwest. However, cattle are grazed on private and public land throughout the area. Cattle are allowed to graze as close as 3.4 kilometers (2.1 miles) to the north of NRF. These distances are from the northern-most emission point at NRF. The distances are greater from other NRF emission points. These distance values may differ from those stated in the overall INL report since that report may use a different origination point at NRF for calculating distances.

III. DOSE ASSESSMENT

Description Of Dose Model And Summary Of Input Parameters

The CAP88 computer code (CAP88-PC Version 4.1.1) was used to calculate the EDE from NRF releases. CAP88 is approved for use by the Environmental Protection Agency (EPA) for demonstrating compliance with 40 CFR Part 61, Subpart H. The output from CAP88 is the EDE, which includes the 50-year committed EDE from internal exposure through the ingestion and inhalation pathways, and the external EDE from ground deposition and air immersion.

Site-specific 2024 wind data was used, supplied by the National Oceanic and Atmospheric Administration (NOAA). The emissions from all NRF sources were totaled and modeled as a single emission point; individual emission points were not modeled separately. The emissions were modeled as ground level releases with no plume rise. Other user-supplied input parameters are as follows:

Wind Data File: NRFL24.STR provided by NOAA
Annual Average Temperature: 8.2 degrees Celsius average in 2024 per NOAA
Annual Rainfall: 21.2 centimeters in 2024 per NOAA
Humidity: 4 grams/cubic meter long-term INL average calculated from NOAA data
Lid Height: 800 meter standard value for INL, provided by NOAA
Agricultural Class: Rural

For determining the EDE, the gross alpha radioactivity was conservatively modeled as plutonium-239 and the gross beta radioactivity was conservatively modeled as strontium-90. The dose from radioactive daughter progeny is included in the dose determined by the CAP88 program.

Table III-1 summarizes the EDE results for point sources, non-point sources, and both combined.

Table III-1. Effective Dose Equivalents from Sources at NRF During 2024

Release Type	EDE[1] (millirem)	EDE[1] (Sv)[2]
Point Sources	2.0E-04	2.0E-9
Non-Point Sources	1.4E-07	1.4E-12
Total	2.0E-04	2.0E-9

Table III-1 Notes:
1. The EDE shown is for the NRF Maximally Exposed Individual (MEI) (Figure 1, Location 11).
2. One millirem equals 1.0E-05 sievert (Sv).

Compliance Assessment

40 CFR Part 61, Subpart H requires that emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive an EDE of 10 millirem (1×10^{-4} sievert) per year. "Member of the public" is any offsite point where there is a residence, school, business, or office. The CAP88 program determined the dose from NRF emissions at various locations around the INL where there is a residence, school, business, or office. The highest dose occurred at a residence 15.4 kilometers (9.6 miles) to the north of NRF (Figure 1, Location 11). This location is not the closest residence to NRF. The closest residence, school, business, or office is a residence 13.3 kilometers (8.3 miles) to the north-northwest (Figure 1, Location 8). However, the direction of winds throughout the year caused Location 11 to be more affected by NRF emissions than Location 8. The location numbers come from a list of residences around the INL boundary created by INL for dose modeling. None of the receptor locations changed from those reported in 2023.

The EDE from NRF emissions is provided for information only. For compliance purposes, the EDE from all INL emissions combined must comply with the 40 CFR § 61.92 standard of 10 millirem per year. NRF emissions are combined with emissions from other INL facilities to determine the overall EDE for the INL. This report is included as an appendix to the INL NESHAP Report. The location of the maximally exposed individual differs between NRF and INL facilities due to proximity to public locations.

IV. ADDITIONAL INFORMATION

40 CFR Part 61, Subpart H requires this report to include a brief description of all construction and modifications that were completed in the calendar year for which the report is prepared, but for which the requirement to apply for approval to construct or modify was waived.

During 2024, application for approval to construct was not required for the following projects:

- Radiological emissions from the Expended Core Facility hot cells were updated for all planned activities through 2030. Using conservative methods, the potential EDE to the MEI was estimated to be 4.73x10-3 millirem per year, which is less than 0.1 millirem per year, so an application for approval to construct was not required per 40 CFR § 61.96(b).

- The Cask Shipping and Receiving Facility began upgrades to support temporarily staging additional carrier spent fuel in dry canisters awaiting examination. Using conservative methods, the potential EDE to the MEI was estimated to be 3.47x10-3 millirem per year, which is less than 0.1 millirem per year, so an application for approval to construct was not required per 40 CFR § 61.96(b).

- Work started to remove the ECF Fire Wall that hinders crane operations and removal of the Fire Curtain that is no longer operational. Using conservative methods, the potential EDE to the MEI was estimated to be 4.60x10-9 millirem per year, which is less than 0.1 millirem per year, so an application for approval to construct was not required per 40 CFR § 61.96(b).

A dose assessment of the diffuse (non-point) emissions from NRF is presented in Section III. As shown in Table III-1, the EDE from diffuse sources does not significantly add to the overall EDE from NRF emissions. The only diffuse source of air emissions from NRF is soil with low levels of radioactivity from historical releases that is exposed to the wind. The amount of this diffuse emission is determined based on the measured activity in the soil and a conservative calculation of the amount of soil that leaves the NRF site as windblown dust.

V. SUPPLEMENTAL INFORMATION

A March 25, 1993, memorandum from the DOE Office of Environmental Guidance requested that the following supplemental information be included in the annual report. This information is not required by the reporting requirements of 40 CFR § 61.94.

REQUEST: Provide an estimate of the collective effective dose equivalent (person-rem per year) for 2024 releases.
An estimate of the collective effective dose equivalent for the population within 50 miles (80 kilometers) of NRF for 2024 is 1.2×10^{-2} person-rem per year (1.2×10^{-4} person-sievert per year).

REQUEST: Provide information on the status of compliance with Subparts Q and T of 40 CFR Part 61 if pertinent.
Subpart Q of 40 CFR Part 61, "National Emission Standards for Radon Emissions from Department of Energy Facilities," is applicable to the design and operation of storage and disposal facilities for radium-containing material that emit radon-222 into the air. Subpart Q is not applicable to NRF. Subpart T of 40 CFR Part 61, "National Emission Standards for Radon Emissions from the Disposal of Uranium Mill Tailings," is not applicable to NRF.

REQUEST: Provide information on radon-220 emissions from sources containing uranium-232 and thorium-232 where emissions potentially can exceed 0.1 millirem (1×10^{-6} sievert) per year to the public or 10 percent of the non-radon dose to the public.
NRF does not have any sources of uranium-232 or thorium-232 emissions that potentially can exceed 0.1 millirem (1×10^{-6} sievert) per year to the public or 10 percent of the non-radon dose to the public.

REQUEST: Provide information on non-disposal and non-storage sources of radon-222 emissions where emissions potentially can exceed 0.1 millirem (1×10^{-6} sievert) per year to the public or 10 percent of the non-radon dose to the public.
NRF does not have any non-disposal or non-storage sources of radon-222 emissions that potentially can exceed 0.1 millirem (1×10^{-6} sievert) per year to the public or 10 percent of the non-radon dose to the public.

REQUEST: For the purpose of assessing facility compliance with the National Emission Standards for Hazardous Air Pollutants effluent monitoring requirements of Subpart H under Section 61.93(b), give the number of emission points subject to the continuous monitoring requirements, the number of these emission points that do not comply with the Section 61.93(b) requirements, and if possible, the cost for upgrades. Describe site periodic confirmatory measurement plans. Indicate the status of the quality assurance program described by Appendix B, Method 114.
NRF does not have any emission points that require continuous monitoring under Section 61.93(b), and therefore does not have any emission points that do not comply, and no upgrades are necessary. Periodic confirmatory measurements were made using a combination of sampling and calculation. Particulate radionuclides were sampled on a continuous basis. Iodine-131 was sampled on a continuous basis from two stacks. Other gaseous radionuclide emissions were calculated based on process knowledge and production rate. The Appendix B Method 114 quality assurance program is not required since no NRF emission points require continuous monitoring. However, a quality assurance program is followed which incorporates many of the same features, such as equipment calibration, the use of blanks and known standards, and the annual review and validation of data by peer reviewers.