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INL Environmental Monitoring Plan, DOE/ID-11088 Revision 5

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Changing the World's Energy Future

Rajkumar S Devasirvatham

Idaho National Laboratory

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Idaho National Laboratory
Idaho Falls, Idaho 83415

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Idaho National Laboratory Site Environmental Monitoring Plan

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EXECUTIVE SUMMARY

The Idaho National Laboratory (INL) Site consists of nine major facilities located in southeastern Idaho within a U.S. Department of Energy (DOE)-specified boundary and several laboratories and administrative buildings located in Idaho Falls, Idaho, approximately 48 km (30 mi) east of the INL Site boundary. This plan describes routine environmental compliance and surveillance monitoring of airborne and liquid effluents, and ecological and meteorological conditions on and in the vicinity of the INL Site.

Environmental monitoring discussed in this plan is conducted in accordance with DOE Order 458.1, *Radiation Protection of the Public and the Environment*[1]. The purpose of DOE Order 458.1 is to establish requirements to protect the public and the environment against undue risk from radiation associated with radiological activities conducted under the control of DOE pursuant to the Atomic Energy Act of 1954, as amended. The objectives of the order include 1) conducting DOE radiological activities so that exposure to members of the public is maintained within the dose limits established in the order, 2) controlling radiological clearance of DOE real and personal property, 3) ensuring that potential radiation exposures to members of the public are as low as reasonably achievable, 4) ensuring DOE sites have the capabilities, consistent with the types of radiological activities conducted, to monitor routine and non-routine radiological releases and to assess the radiation doses to members of the public, and 5) protecting the environment from the effects of radiation and radioactive material.

This plan includes the rationale for monitoring, the types of media monitored, where the monitoring is conducted, and information regarding access to analytical results. Environmental monitoring activities are conducted by a variety of organizations consisting of:

- Idaho National Laboratory
- Idaho Cleanup Project Core
- Environmental Surveillance, Education, and Research Program
- United States Geological Survey
- National Oceanic and Atmospheric Administration.

Monitoring of airborne and liquid effluents is performed to verify compliance with permitting requirements, state and federal regulations, and environmental-protection policies and commitments. Surveillance monitoring addressed in this document is driven by DOE order and is performed to characterize preoperational conditions, detect, characterize, and respond to releases from site operations and activities, assess impacts, estimate dispersal patterns in the environment, characterize the exposures and doses to individuals and the population, and evaluate the potential impacts to biota in the vicinity of the release.

Non-routine activities, such as special research studies and the characterization of individual sites for environmental restoration, are outside the scope of this plan. Environmental monitoring activities at Naval Reactors Facility conducted by Fluor Marine Propulsion, LLC, are not included in this plan.

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FIGURES

TABLES

ACRONYMS

ARLFRD	Air Resources Laboratory Field Research Division
ARP	Accelerated Retrieval Project
ASER	Annual Site Environmental Report
ASME	American Society of Mechanical Engineers
ATR	Advanced Test Reactor
BBS	Breeding Bird Survey
BEA	Battelle Energy Alliance, LLC
BLR	Big Lost River
CCA	Candidate Conservation Agreement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CITRC	Critical Infrastructure Test Range Complex
CRMO	Cultural Resources Management Office
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
EBR	Experimental Breeder Reactor
EDE	effective dose equivalent
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
ES&S	Environmental Support and Services
ESA	Endangered Species Act
ESER	Environmental Surveillance, Education and Research (Program)
ESRPA	Eastern Snake River Plain Aquifer
GPRS	global positioning radiometric scanner
HSL	Health Services Laboratory
HWMA	Hazardous Waste Management Area
ICDF	Idaho CERCLA Disposal Facility
ICP Core	Idaho Cleanup Project CORE
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IWD	Industrial Waste Ditch

INEEL	Idaho National Engineering and Environmental Laboratory
INEL	Idaho National Engineering Laboratory
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IRC	INL Research Center
LI	Laboratory Instruction
LTV	Long-term Vegetation
M&O	management and operating
MEI	maximally exposed individual
MFC	Materials and Fuels Complex
MSC	Monitoring and Surveillance Committee
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOAA	National Oceanic and Atmospheric Administration
NRF	Naval Reactors Facility
OSLD	optically stimulated luminescent dosimeter
PBF	Power Burst Facility
QA	quality assurance
R&D	research and development
RCRA	Resource Conservation and Recovery Act
REC	Research and Education Campus
RESL	Radiological and Environmental Sciences Laboratory
RHLLW	Remote-Handled Low-Level Waste
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RWMC	Radioactive Waste Management Complex
RWMC–AMWTP	Advanced Mixed Waste Treatment Plant
SDA	Subsurface Disposal Area
SMC	Specific Manufacturing Capability
TAN	Test Area North
TLD	thermoluminescent dosimeter
TSA	Transuranic Storage Area
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
WAG	Waste Area Group
WIPP	Waste Isolation Pilot Plant

WNS	White-nose syndrome

Idaho National Laboratory
Site Environmental Monitoring Plan

1. GENERAL INFORMATION

1.1 Purpose

This plan provides a high-level summary of environmental monitoring performed by various organizations within and around the Idaho National Laboratory (INL) Site as required by U.S. Department of Energy (DOE) Order 435.1, "Radioactive Waste Management,"[1] DOE Order 458.1, "Radiation Protection of the Public and the Environment,"[2] DOE-HDBK-1216-2015, "Environmental Radiological Effluent Monitoring and Environmental Surveillance,"[3] which updates and supersedes DOE/EH-0173t, "Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance,"[4] and in accordance with 40 Code of Federal Regulations (CFR) 61, "National Emission Standards for Hazardous Air Pollutants."[5] The purpose of these orders is to 1) implement sound stewardship practices that protect the air, water, land, and other natural and cultural resources that may be impacted by DOE operations and 2) to establish standards and requirements for the operations of DOE and DOE contractors with respect to protection of the environment and members of the public against undue risk from radiation. This plan describes the organizations responsible for conducting environmental monitoring across the INL Site, the rationale for monitoring, the types of media being monitored, where the monitoring is conducted, and where monitoring results can be obtained.

Detailed monitoring procedures, program plans, or other governing documents used by contractors or agencies to implement requirements are referenced in this plan. This plan covers all planned monitoring and environmental surveillance. Non-routine activities, such as special research studies and characterization of individual sites for environmental restoration, are outside the scope of this plan.

1.2 INL Site Description

The INL Site is approximately 230,500 hectares (890 mi^2) and is located on the Eastern Snake River Plain in southeastern Idaho (see Figure 1-1). It was established as a nuclear energy research and development (R&D) testing station in the late 1940s and was designated a National Environmental Research Park in 1975. All land within the Site is protected as an outdoor laboratory where the effects of energy development, industrial activities on the environment, and the complex ecological relationships of this cool-desert ecosystem can be studied. The INL Site is owned by DOE and administered through its Idaho Operations Office (DOE-ID). The DOE-ID oversees operations at the INL Site.

Subsurface geology consists of successive layers of basalt and sedimentary strata, overlain by wind- and water-deposited sediments. Most of the Site is in the closed Mud Lake-Lost River drainage basin, which has been informally named the Pioneer Basin. Surface waters within the Pioneer Basin include the Big Lost River (BLR), the Little Lost River, and Birch Creek drainages, which drain mountain watersheds located to the north and northwest of the Site. All three drainages may flow onto the Site during high flow years, but are otherwise ephemeral. In addition, local rainfall and snowmelt contribute to surface water, mainly during the spring. The portion of surface water that is not lost to evaporation infiltrates into the subsurface. Both aquifer and surface waters are used for irrigating crops and other applications outside the Site.

The primary groundwater source of the region is the Eastern Snake River Plain Aquifer (ESRPA) (see Figure 1-2). The ESRPA is approximately 320 km (199 mi) long, 30 to 100 km (20 to 60 mi) wide, and encompasses an area of about 2,500,000 hectares (9,650 mi^2). This sole-source aquifer is one of the most productive in the U.S, is a source of process and drinking water to more than 200,000 people, and supplies irrigation water to a large regional agricultural and aquaculture economy.

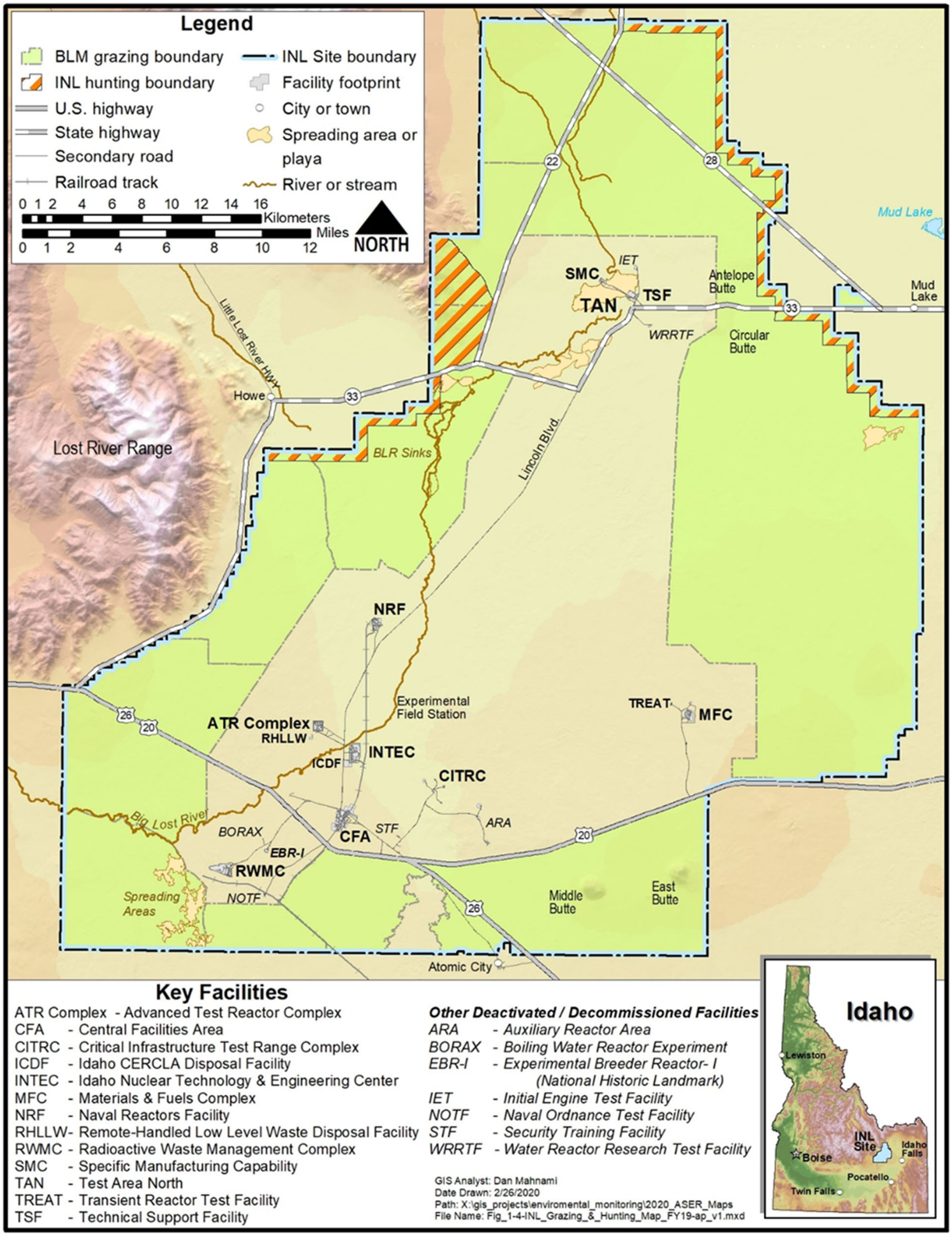

Figure 1-1. Idaho National Laboratory Site.

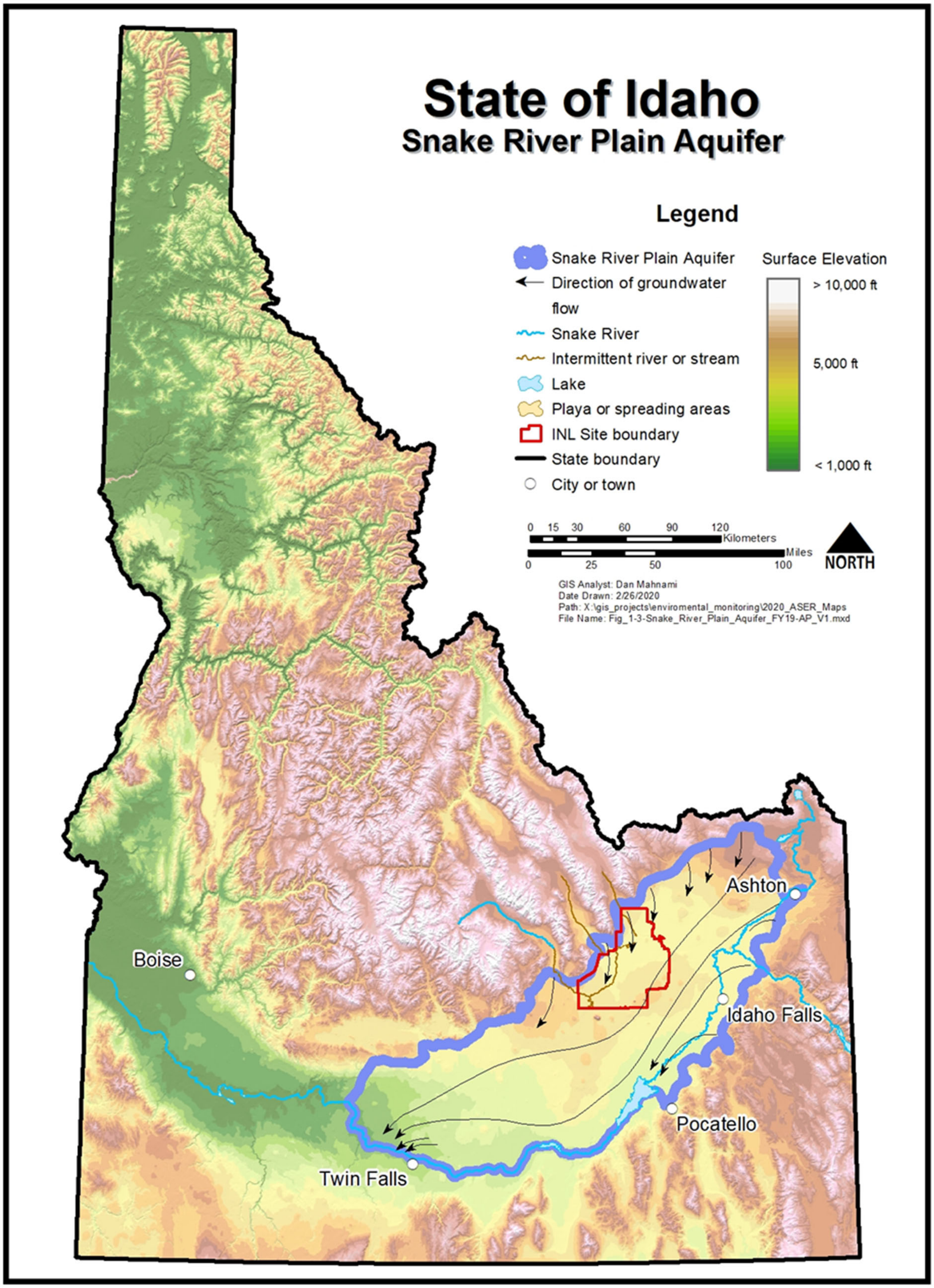

Figure 1-2. Idaho National Laboratory Site in relation to the Eastern Snake River Plain Aquifer.

The depth to the ESRPA varies from approximately 60 m (200 ft) in the northern part of the INL Site to more than 270 m (900 ft) in the southern part. The aquifer is recharged from infiltrating precipitation and irrigation seepage, runoff from the surrounding highlands, and groundwater underflows from the surrounding watersheds. Groundwater in the ESRPA flows generally to the southwest, although locally the direction of flow is influenced by recharge from rivers, surface water, spreading areas, and heterogeneities in the aquifer. Groundwater flow rates in the vicinity of the INL Site range from approximately 1.5 to 6 m (5 to 20 ft) per day.

Annual rainfall at the Site is light, and the region is classified as arid to semiarid.[6] The long-term average (from March 1950 through 2006) annual precipitation at the Site is 21.6 cm (8.5 in. at the Central Facilities Area [CFA] station). Monthly precipitation is usually highest in April, May, and June and lowest in July, August, and October. The average daily temperature is 18.3°C (64.9°F) in the summer, and the average daily temperature is 7.3°C (18.9°F) in the winter. The annual average daily temperature is 5.7°C (42.3°F). The Site is in the belt of prevailing westerly winds, which are channeled within the plain to produce a west-southeasterly or southwesterly wind at most locations on the Site.

1.3 Summary of INL Site Facilities

The INL Site consists of nine major facilities and several laboratories and administrative buildings located approximately 48 km (30 mi) east of the Site boundary in Idaho Falls, Idaho. Battelle Energy Alliance, LLC (BEA), is the management and operating (M&O) contractor for INL. In this document, BEA is referred to as the INL contractor. Fluor Idaho, LLC, is the Idaho Cleanup Project (ICP) Core contractor.

1.3.1 INL Facilities

The CFA houses many technical and support services for the INL contractor, including administrative offices, monitoring and calibration laboratories, fire protection, medical services, warehouses, vehicle and equipment pools, and bus operations.

The Advanced Test Reactor (ATR) complex is the world's most sophisticated nuclear reactor testing complex and has extensive facilities for studying the effects of radiation on materials, testing nuclear fuels, and producing medical and industrial isotopes.

The Research and Education Campus (REC) in Idaho Falls consists of office and classroom complexes and multiple laboratory facilities, including many one-of-a-kind advanced labs dedicated to the full spectrum of physical- and life-science research. The laboratories are "modular" with respect to their provision, for ease of utility tailoring and flexibility. There are other advanced R&D laboratories located in Idaho Falls, including engineering demonstration facilities, robotics laboratories, material research laboratories, and advanced information technology and computer simulation and modeling facilities.

The Materials and Fuels Complex (MFC) is the prime testing center in the U.S. for demonstration and proof-of-concept of nuclear energy technologies. R&D activities at this facility are focused on areas of national concern, including energy, nuclear safety, spent nuclear fuel treatment, nonproliferation, decommissioning and decontamination technologies, nuclear-material disposal, and homeland security. MFC operates the Remote-Handled Low-Level Waste (RHLLW) Disposal Facility, which is located southwest of the ATR Complex.

The Critical Infrastructure Test Range Complex (CITRC) is an isolated and secure microcosm of many of the critical-infrastructure systems important to the operation of our country, including power, transportation, cybersecurity, and communications. This INL facility was chosen to be a "Test Range" due to its remote location and dedication to various research, development, and testing activities.

The CITRC has specific test beds housed in 12 buildings that encompass approximately 6,652 m^2 (71,600 ft^2), including the following:

- Range Support Area, which consists of office structures, training facility, area power substation, and area water supply system
- National Contraband Detection and Testing Center
- Incident Response Training and Testing Center, Range Control Center facility, and an office building housing the range director's office with other test bed facilities
- Special Programs test facility.

The Specific Manufacturing Capability (SMC) facility, located at Test Area North (TAN), houses a unique project that began with a Memorandum of Understanding between DOE and the U.S. Army in February 1985. Operated by the INL contractor, the SMC Project manufactures armor for the army's M1A2 Abrams battle tank.

1.3.2 Idaho Cleanup Project Core Facilities

The Idaho Nuclear Technology and Engineering Center (INTEC) was established in the 1950s to recover usable uranium in spent nuclear fuel from government reactors and to store it. The current work scope at INTEC includes removing excess nuclear material, closing radioactive and hazardous waste tanks, constructing the Integrated Waste Treatment Unit to prepare the liquid radioactive waste for shipment offsite, transferring spent nuclear fuel from wet to dry storage, remediating the spent nuclear fuel basin, treating and disposing of waste, closing liquid-waste tanks, remediating contaminated environmental sites, and demolishing facilities.

The Idaho Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Disposal Facility (ICDF) is a landfill located just southeast of INTEC. It has been operating since 2003 to dispose of low-level waste and mixed low-level waste from the CERCLA environmental restoration activities within the INL Site.

Three primary areas comprise the Radioactive Waste Management Complex—the Subsurface Disposal Area (SDA), the Transuranic Storage Area (TSA), and the Administrative Area. The SDA is a 97-acre area that consists of approximately 35 acres of waste that was buried in disposal pits and trenches from the early 1950s until 1970, when disposal practices changed, and above-ground storage of waste was established in the TSA. The Administrative Area primarily houses office and maintenance support functions. Current ICP Core missions involve CERCLA remediation of the SDA buried waste through implementation of the Accelerated Retrieval Project (ARP) exhumation program, operation of the Organic Contamination in the Vadose Zone system, and various monitoring activities. In addition to the CERCLA program, ICP Core waste-management program scope involves treatment, characterization, storage, packaging, and transportation of stored transuranic and low-level waste streams that have been retrieved from above-ground pads in the TSA that are destined for offsite disposal at the Waste Isolation Pilot Plant (WIPP) and other appropriate offsite disposal facilities. Waste-management operations in the TSA are conducted primarily under Resource Conservation and Recovery Act (RCRA) authority, as are supporting activities in two repurposed CERCLA facilities located in the SDA (i.e., ARP V and ARP VII).

TAN, which is located at the north end of the Site, was built in the 1950s to house the nuclear-powered airplane project. Cleanup operations were completed for OU1-10 at TAN, including demolition of 44 facilities. The OU1-07B remedy is ongoing and consists of three parts for the TCE plume: In Situ Bioremediation (ISB) in the hot spot, pump and treat in the medial zone, and monitored natural attenuation (MNA) in the distal zone of the plume. In addition, monitoring associated with monitored natural attenuation of the radionuclide (Cs-137 and Sr-90) plumes is ongoing.

1.3.3 Naval Reactors Facility

The Naval Reactors Facility (NRF), operated by Fluor Marine Propulsion, LLC, is specifically excluded from detailed discussion in this monitoring plan. As established in Executive Order 12344,[7] the Naval Nuclear Propulsion Program is exempt from the requirements of DOE Orders 458.1, *Radiation Protection of the Public and the Environment*,[2] and 414D, *Quality Assurance*.[8] The director for the Naval Nuclear Propulsion Program establishes reporting requirements and methods implemented within the program, including those necessary to comply with appropriate environmental laws. NRF's program is documented in the *Naval Reactors Facility Environmental Monitoring Program*.[9]

1.3.4 Radiological and Environmental Sciences Laboratory

The Radiological and Environmental Sciences Laboratory (RESL) is a government-owned laboratory operated by DOE-ID, which is located in Idaho Falls within the REC. RESL, and its predecessor organizations, have been part of DOE-ID since 1949. RESL has conducted DOE's Mixed Analyte Performance Evaluation Program (MAPEP) since 1994, through a performance-based program that tests the ability of the laboratories to correctly analyze for radiological, stable organic, and inorganic constituents that are representative of those at DOE sites. It provides an unbiased technical component to DOE oversight of contractor operations at DOE facilities and sites. As a reference laboratory, it conducts cost-effective measurement quality-assurance programs that help assure that key DOE missions are completed in a safe and environmentally responsible manner. By assuring the quality and stability of key laboratory measurement systems throughout DOE, and by providing expert technical assistance to improve those systems and programs, it assures the reliability of data on which decisions are based. As a result, customers and stakeholders have greater confidence that those programs protect workers, the public, and the environment. RESL's core scientific capabilities are in analytical chemistry and radiation calibrations and measurements.

2. INL SITE ENVIRONMENTAL MONITORING OVERVIEW

Effluent monitoring of airborne emissions and liquid effluents is driven by DOE and Environmental Protection Agency (EPA) requirements, state and federal regulations, and facility operating permits. Effluent monitoring refers to the collection and analysis of samples or measurements of liquid and gaseous effluents for characterizing and quantifying contaminants, assessing radiation exposures of members of the public, controlling effluents at or near the point of discharge, and demonstrating compliance with applicable standards and permit requirements. Liquid and airborne effluents from facilities are monitored for radiological and non-radiological parameters.

Environmental surveillance is the collection and analysis of environmental samples (i.e., air, water, soil, biota, and agricultural products) or direct measurements of environmental media. These activities are performed to generate measurement-based estimates of the amounts or concentrations of contaminants in the environment. Measurements are performed by sampling and laboratory analysis or by measurement of direct radiation in the environment. Environmental surveillance activities are discussed in more detail in Section 4 and are conducted to:

- Comply with DOE Order 458.1[2]
- Determine potential effects of contaminants on the public and the environment
- Evaluate pathways through which contaminants move in the environment.

In addition to effluent monitoring and environmental surveillance, meteorological conditions are monitored in and around the INL Site. Meteorological monitoring provides information needed to support and interpret the results of other monitoring and surveillance activities, particularly for air dispersion modeling. Meteorological monitoring activities are discussed in Section 5.

Ecological-resource monitoring documents sensitive and threatened species on the INL Site, evaluates habitat needs, and monitors biota population trends and weed invasions in disturbed areas. These data better enable the evaluation of environmental impacts of operations and help determine restoration and mitigation needs. These activities are discussed in Section 4.9.

Cultural-resource monitoring enables the Site Cultural Resources Management Office (CRMO) staff to gather baseline data and assess the condition of known cultural resources that have the potential to be impacted by natural processes, unauthorized activities, or inadvertently by project activities. If impacts are noted during monitoring visits, appropriate notifications are made as outlined in DOE/ID-10997, "INL Cultural Resource Management Plan,"[10] and as legitimized through the Programmatic Agreement between the Idaho State Historic Preservation Office, the Advisory Council on Historic Preservation, and DOE-ID. By identifying impacts to cultural resources in this manner and implementing mitigation or treatment plans, federal stewardship responsibilities are fulfilled by completing actions to avert further deterioration. Certain properties that are of special significance to the Shoshone-Bannock Tribes and other groups are monitored at least once per year while others are chosen based on known threats (i.e., close to public roads, ongoing projects in the vicinity). Because of tribal sensitivities, all projects that will disturb the ground in and around the CITRC area are monitored. Details of the annual monitoring activities are reported to DOE-ID annually in the *INL Monitoring Report* and are summarized for the public in the *Idaho National Laboratory Cultural Resource Monitoring Report*. A description of the INL Site CRMO monitoring program is in Appendix L of DOE/ID-10997.[10]

A separate system of environmental monitoring and surveillance is activated during environmental events, which may be planned, as in startup of new equipment or process, or unplanned, such as operational events or wildfires. This environmental event monitoring is discussed in Section 6. Environmental reporting on compliance and regulatory sampling is discussed in Section 7.

The locations of monitoring stations within and surrounding the Site are shown in Figure 2-1. Appendix A includes tables for various media monitored at the INL Site and contains each sample point and geographic location along with the organization responsible for the monitoring.

2.1 History of Environmental Monitoring at the INL

Some of the earliest environmental monitoring on the INL Site was completed by the U.S. Weather Bureau, which created a Research Station in 1948 to support the National Reactor Testing Station, as the INL Site was then called. The Research Station still exists as the Air Resources Laboratory Field Research Division (ARLFRD) of the National Oceanic and Atmospheric Administration (NOAA). The Station's task was to develop a basic understanding of the regional meteorology and climatology, with a focus on protecting the health and safety of workers and nearby residents using meteorological measurements and transport and dispersion models.

In 1949, the Health and Safety Division of the Idaho Operations Office of the Atomic Energy Commission collected numerous samples to determine the pre-reactor radionuclide background in soil, plants, animals, etc., at the Site.[11] The United States Geological Survey (USGS) also began monitoring hydrologic conditions of the ESRPA in 1949 by sampling two wells on the INL Site.

In 1959, the first of several aerial radiological surveys of the Site was performed under the direction of the Idaho Operations Office to determine the extent of natural and man-made radioactivity. Subsequent aerial surveys performed in 1965, 1974, 1982, and 1990 focused mainly on characterizing facilities and associated regions of the Site.[12]

Between 1956 and 1963, ecological research was conducted on the INL Site by the Health Services Laboratory (HSL), which focused on movement of radioactive contaminants through the food chain. Rabbits were sampled as indicators of the extent of contamination around Site facilities. In 1970, HSL established a routine soil-sampling and monitoring program for radionuclides in the surface soils near INL Site facilities and the surrounding area.

In 1973, the RESL Program incorporated a biological component that included extensive studies of radionuclide-contaminated areas and transport by biota from these areas. In 1977, HSL merged with RESL and the RESL Program continued on-Site and off-Site monitoring through 1993.

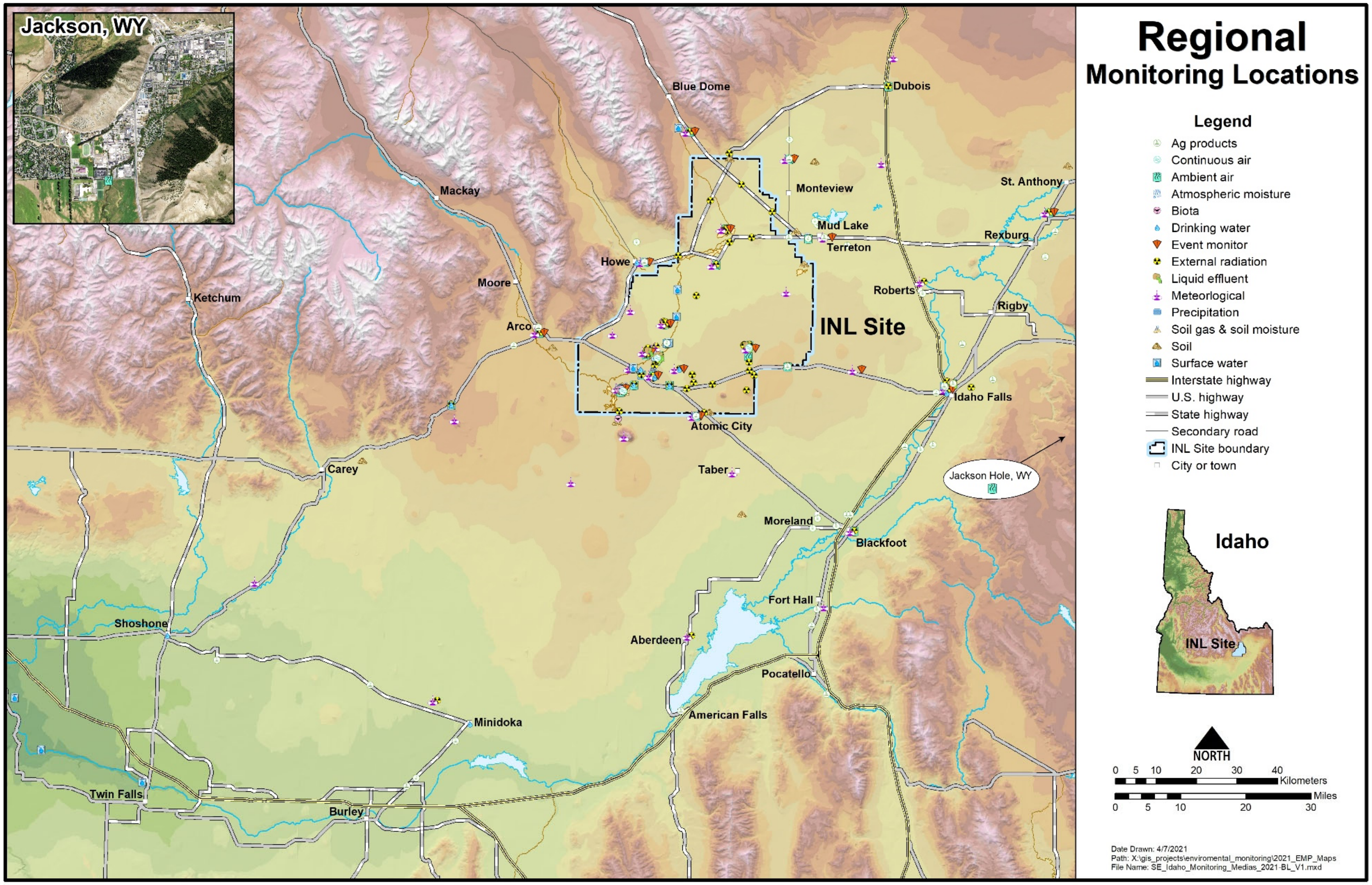

Figure 2-1. Regional monitoring locations.

In 1989, the INL Site was placed on the National Priorities List, found at http://www.epa.gov/superfund/sites/npl/. In 1991, DOE, EPA, and the state of Idaho signed the *Federal Facility Agreement and Consent Order*[12] under 42 USC §9601, *Comprehensive Environmental Response, Compensation, and Liability Act*[13] to ensure that environmental hazards associated with contaminant releases were identified and remediation was completed. Since 1991, comprehensive remedial investigations, feasibility studies, and Records of Decision (RODs) have been completed for most of the ten Waste Area Groups (WAGs) identified under CERCLA, and in some areas, remediation has been completed. As part of CERCLA regulatory commitments, long-term monitoring is ongoing.

Also, in 1989, the Idaho Legislature established a comprehensive state oversight program for the INL Site. In 1990, Idaho became the first state in the nation to negotiate an Environmental Oversight and Monitoring Agreement[14] with DOE to provide funding for independent environmental oversight and monitoring of a DOE facility. Over the years, the INL Oversight Program has developed an effective monitoring network to verify and supplement INL Site monitoring programs and to assure that DOE activities protect Idaho's environment. The INL Oversight Program also provides independent information concerning DOE impacts on the public and environment.

In 1994, DOE transferred the responsibility for on-Site environmental surveillance from RESL to the prime INL M&O contractor, and all off-Site environmental surveillance was transferred to a private contractor under the Environmental Surveillance, Education and Research (ESER) Program. Currently, the ESER Program continues to conduct off-Site surveillance. The on-Site program was split in 2005 with award of contracts to the INL contractor (BEA) and the ICP Core Contractor (Fluor Idaho), the facilities and activities of which are discussed in other parts of this plan.

Environmental monitoring performed by the various contractors in charge of facility operations initially involved limited sampling of liquid and airborne effluents from the facilities to develop waste-inventory information and to meet operational monitoring objectives. Over the years, these contractor-run monitoring programs have evolved to ensure compliance with applicable federal, state, and local regulations and protect human health and the environment.

2.2 Environmental Monitoring Organizations

Several organizations conduct environmental monitoring activities on or in the vicinity of the Site. Two organizations conduct monitoring at facilities they operate—BEA and ICP Core. Other organizations perform INL Site-related environmental monitoring but do not operate facilities—NOAA, Veolia, and the USGS. Currently, BEA has Site-wide environmental monitoring responsibilities and conducts environmental monitoring at the facilities under its control.

2.2.1 INL and ICP Core Contractors

The INL and ICP contractors conduct environmental monitoring activities at facilities under their respective areas of purview, as discussed in Section 1.3 of this plan. Both the INL and ICP contractors perform liquid- and airborne-effluent monitoring, along with environmental surveillance of ambient air, groundwater, drinking water, and external radiation. The INL contractor also monitors soils while the ICP Core contractor also monitors surface water. Compliance monitoring programs have been instituted to meet the monitoring requirements of federal, state, and local regulations, permits, and DOE orders. Requirements exist to sample drinking water, liquid effluents, injection-well basins for storm water runoff, and groundwater. Facilities with airborne emissions are responsible for monitoring airborne effluents in compliance with the standards set forth in Public Law 91-604, *Clean Air Act Amendments of 1990*[15] and Idaho Administrative Procedures Act (IDAPA) 58.01.01, *Rules for the Control of Air Pollution in Idaho*.[16] Those facilities with Reuse Permits are monitored as required by their associated permits in accordance with the Wastewater Rules (IDAPA 58.01.16),[17] the Recycled Water Rules (IDAPA 58.01.17),[18] and the Ground Water Quality Rule (IDAPA 58.01.11).[19]

Both INL and ICP Core contractors perform CERCLA monitoring of groundwater. A majority of CERCLA monitoring is performed by the ICP Core contractor because the INL contractor is only responsible for the CERCLA work at MFC. Sites with residual contamination will need to be monitored, controlled, operated, and maintained by institutional controls to protect human health and the environment.

Post-closure monitoring is conducted to evaluate the effectiveness of the final remedies and ensure that no additional contamination is occurring. However, even though CERCLA regulates most INL Site stewardship activities, INL expects some stewardship activities to be regulated under RCRA, including post-closure groundwater monitoring. The monitoring of facilities operated by both INL and ICP Core contractors will continue at the remediation areas for the period negotiated in the RODs 5-year review reports, in RCRA closure plans, or in other laws or agreements that govern the remedies.

Table 2-1. Summary of INL Site environmental monitoring organization activities.

	Organization				
	INL	ICP Core	ESER	USGS	NOAA
Effluent					
Airborne	X	X			
Liquid	X	X			
Surveillance					
Ambient Air	X[a]	X	X[a]		
Drinking Water	X	X	X		
Precipitation			X		
Groundwater	X	X		X	
Surface Water		X	X	X	
Soil	X	X	X		
Biota			X		
Agricultural Products & Game Animals			X		
External Radiation	X	X	X		
Ecological		X	X		
Meteorological					X

a. Includes collection of atmospheric moisture samples.

The staff of CRMO monitors cultural resources for both INL and ICP Core contractors. The CRMO provides cultural-resource management services to the ICP Core contractor through an agreement between the two contractors. The CRMO services facilitate a coordinated and seamless management of Site cultural resources for DOE-ID and inform and educate stakeholders about the INL Site's more than 13,000-year history of rich and varied human land use. The CRMO staff of professional archaeologists, historians, and anthropologists conducts monitoring to determine whether natural events or human activities are impacting Site cultural resources and to provide current information regarding the resources' preservation and protection. As required through an agreement between DOE-ID and the Shoshone-Bannock Tribes, the CRMO staff invite tribal participation during monitoring activities of properties that are of importance to them (Agreement-in-Principle 2007).[20] Cultural resource management is described in detail in DOE/ID-10997.[10]

2.2.2 ESER Program

The ESER Program, currently managed by Veolia, primarily conducts off-Site environmental surveillance for DOE-ID. The ESER Program's primary responsibility is to monitor the different pathways by which radiological pollutants from the INL Site could reach the public. Current services provided by the ESER Program include off-Site sample collection and analyses of air (including analysis of moisture in air for tritium), precipitation, surface-water, drinking-water, soil, milk, wheat, lettuce, potatoes, alfalfa, and animal-tissue samples; measurement of external ambient radiation; wildlife-habitat and vegetation surveys, and ecological research on and near the Site; research concerning at-risk species, pollutants in the environment, and revegetation; environmental education concerning ecological and radiological issues around the INL Site; and preparing the Annual Site Environmental Report (ASER) summarizing environmental monitoring activities across the INL Site.

The ESER Program also performs focused ecological research on the INL Site and manages environmental education programs for DOE-ID. Finally, ESER subject-matter experts work with INL Site contractors and DOE-ID to maintain regulatory compliance by identifying low- or no-cost means to avoid or minimize impacts to protected ecological resources from INL Site operations while avoiding mission impacts.

2.2.3 USGS

The USGS conducts water sampling and takes water-level measurements at INL. The data collected are publicly available through the National Water Information System (NWIS). The USGS and other organizations use these data to describe changes in hydrologic and geochemical conditions of the ESRPA and to evaluate effects of waste disposal and other activities at the INL Site through interpretive reports. USGS groundwater monitoring is detailed in DOE/ID-11034, "Idaho National Laboratory Groundwater Monitoring and Contingency Plan."[21]

The USGS monitors more than 130 wells within a regional network in the ESRPA, both on-Site and off-Site, to study contaminant migration and determine groundwater quality and quantity as they relate to Site operations. Well placement within the regional network and constituent selection supplement existing INL and ICP Core contractors' groundwater monitoring programs. The USGS also collects real-time streamflow information at five sites along the BLR and one site on Antelope Creek to provide estimates of snowmelt runoff and recharge to the aquifer and to provide data for flood-control studies.

2.2.4 NOAA

NOAA provides meteorological services and supporting research to the INL Site through the ARLFRD, which operates a large meteorological monitoring network to characterize the meteorology and climatology of the eastern Snake River Plain, which includes the INL Site.

Meteorological-monitoring data are required to characterize atmospheric transport and diffusion conditions in the vicinity of the Site and to represent other meteorological conditions (e.g., precipitation, temperature, and atmospheric moisture) that are important to environmental surveillance activities, such as air-quality and radiological monitoring.

2.2.5 Idaho Environmental Monitoring Program

The Idaho Environmental Monitoring Program is jointly supported by the INL Oversight Program, DOE-ID, NOAA, and the Shoshone-Bannock Tribes. Four weather stations were constructed in 1997 at publicly accessible locations in southeastern Idaho. These stations are located in Idaho Falls, Fort Hall, Terreton, and the BLR Rest Area on U.S. Highway 20/26.

2.3 Laboratory-Wide Monitoring Committees

2.3.1 Monitoring and Surveillance Committee and Groups

The INL Site has a Monitoring and Surveillance Committee (MSC) with participating organizations from DOE-ID, INL, ICP Core, NRF, ESER Program, INL Oversight Program, NOAA, USGS, and the Shoshone-Bannock Tribes. Chartered in 1997, the MSC provides a means for exchanging and sharing technical information, expertise and data. The MSC is to provide a collaborative atmosphere in which the participating organizations can communicate and discuss what they are doing in the areas of environmental monitoring and surveillance and make recommendations where appropriate.

2.3.2 INL Water Committee

The INL Water Committee was established in 1994 to coordinate drinking-water-related activities across the Site and to provide a forum for exchanging information related to drinking-water systems. In 2007, the committee was expanded to include wastewater, stormwater, and groundwater interests. In 2011, the Water Committee incorporated membership from the former Water Resource Committee to serve as a resource for the coordination and exchange of technical information on water-related activities.

The committee meets quarterly and includes participants from DOE-ID, USGS, INL, ICP Core, and NRF. Water and wastewater-related issues addressed during these meetings include regulatory issues, the Cross-Connection Program, construction activities, facility-specific activities, sampling, analytical results, and training.

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3. EFFLUENT MONITORING

Operations of Site facilities have the potential to release pollutants such as radioactive and non-radioactive contaminants into the environment. These pollutants can enter the atmosphere as airborne effluents and can enter surface and groundwater as liquid effluents or storm water runoff via injection wells. The following subsections summarize the effluent monitoring currently conducted by various organizations at the INL Site.

3.1 Airborne Effluent

Regulated facilities at the INL Site are required, under Public Law 91-604[15] and IDAPA 58.01.01,[16] to measure and estimate airborne effluents. These facilities include:

- CFA
- INTEC
- CITRC
- MFC
- RWMC
    - RWMC–Advanced Mixed Waste Treatment Plant (RWMC–AMWTP)
    - RWMC–ARP
- TAN
- ATR Complex
- SMC
- REC.

One Permit to Construct (PTC) with Facility Emission Cap (FEC) air-quality permit and several facility-specific PTCs have been issued by the Idaho Department of Environmental Quality (IDEQ). These permits include various permit requirements, such as emission limits, and operating, monitoring, recordkeeping, and reporting requirements applicable to specific air-emission sources at the various Site facilities. Many of the facility-specific PTCs have since been terminated at DOE's request by IDEQ, or permit conditions have been rolled into the PTC FEC permit.

Numerous stack emissions are monitored for radioactive pollutants, but specific aspects of stack emission monitoring, such as the radionuclides being measured, depend on the facility source term. Some monitoring is required by regulation, permit, or DOE order, and some monitoring is conducted as a best management practice or to fulfill requirements for periodic confirmatory measurements. Where monitoring is performed, emissions are normally sampled after abatement (filtration); emissions can also be estimated by other means, such as by engineering calculations or process knowledge.

Continuous monitoring is required for emission points that have a potential to emit radionuclides[a] in quantities that could result in an effective dose equivalent (EDE) to a member of the public in excess of 0.1 mrem per year, which is 1% of the of 10 mrem emission standard per year specified by the National Emission Standards for Hazardous Air Pollutants (NESHAP) 40 CFR 61, Subpart H.[5]

Monitoring for compliance and screening purposes is conducted in accordance with the guidance of 40 CFR 61, Appendix B, *Method 114*,[22] ANSI N13.1-1999, *Sampling and Monitoring Releases of*

a. The "potential to emit radionuclides" is evaluated by assuming normal facility operations; however, no credit is taken for reduction of emissions by abatement equipment.

Airborne Radioactive Substances from Stacks and Ducts of Nuclear Facilities,[23] and the air monitoring recommendations of DOE-HDBK-1216-2015.[3]

The contractor associated with each permitted facility at the Site is responsible for airborne effluent monitoring at its facility. Figure 3-1 shows the locations of those emission sources that currently require continuous monitoring by Subpart H of 40 CFR 61.[5] Sources shown in Figure 3-1 at RWMC include both RWMC–AMWTP and RWMC–ARP as listed in Section 3.1. The following information on airborne effluent emissions and sources associated with contractor-operated facilities is summarized in DOE/ID-11441, *National Emission Standards for Hazardous Air Pollutants INL Report for Radionuclides*.[24]

Other sources with the potential to emit low quantities of radioactive emissions also exist at other contractor-operated facilities. Emissions from sources that could cause annual doses to the maximally exposed individual greater than 10^{-5} mrem are periodically monitored and included in calculating the INL Site's annual EDE to members of the public.

3.1.1 INL Contractor

INL contractor-operated facilities are monitored for air emissions associated with R&D and operational activities as described in the following paragraphs. Release points at INL Site facilities that do not require continuous monitoring are sampled periodically to provide emissions data for INL Site reports and permit requirements as well as a best management practice.

- **CFA.** Minor releases occur from CFA facilities where work is routinely conducted with small quantities of radioactive materials. This includes operations at the CFA Laboratory Complex CFA-625. Only trace quantities of radioactive materials are used at the facility. Additional radioactive emissions are associated with decontamination activities, sample analyses, and site remediation.
- **ATR Complex.** Radiological air emissions from the 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 hot cell operations, sample analysis, site remediation, and R&D activities.
- **REC.** Radiological releases from the REC could arise from uncontrolled laboratory fume hoods within buildings at the INL Research Center (IRC) facility. Exhaust from most of the fume hoods is released directly to the outside atmosphere via the heat-recovery fan system in the IRC heating, ventilating, and air conditioning system. Other potential release points include IF-603, the System Analysis Facility, RESL, and the INL Engineering Demonstration Facility.
- **MFC.** MFC has three release points that require continuous emission monitoring as specified under 40 CFR 61, Subpart H:[5] the Experimental Breeder Reactor (EBR)-II/Fuel Conditioning Facility Main Stack (MFC-764); the Hot Fuel Examination Facility Stack (MFC-785); the Fuel Manufacturing Facility (MFC-704); and the Irradiated Materials Characterization Laboratory (IMCL) (MFC-1729).
- **SMC.** Operations at SMC include material development, fabrication, and assembly work to produce armor packages for the U.S. Department of the Army. Other activities include developing tools and fixtures and preparing and testing metallurgical specimens. Radiological air emissions from SMC are associated with the processing of depleted uranium. Potential emissions are uranium isotopes and associated radioactive progeny.
- **INTEC.** INTEC operations are the EPA Radiological Dispersion Device Decontamination Project located in CPP-653.
- **CITRC**. Releases include training exercises for first responders for release of radioactive material. Small amounts of a short-lived radionuclide are placed on various surfaces within a building as part of the training exercise.

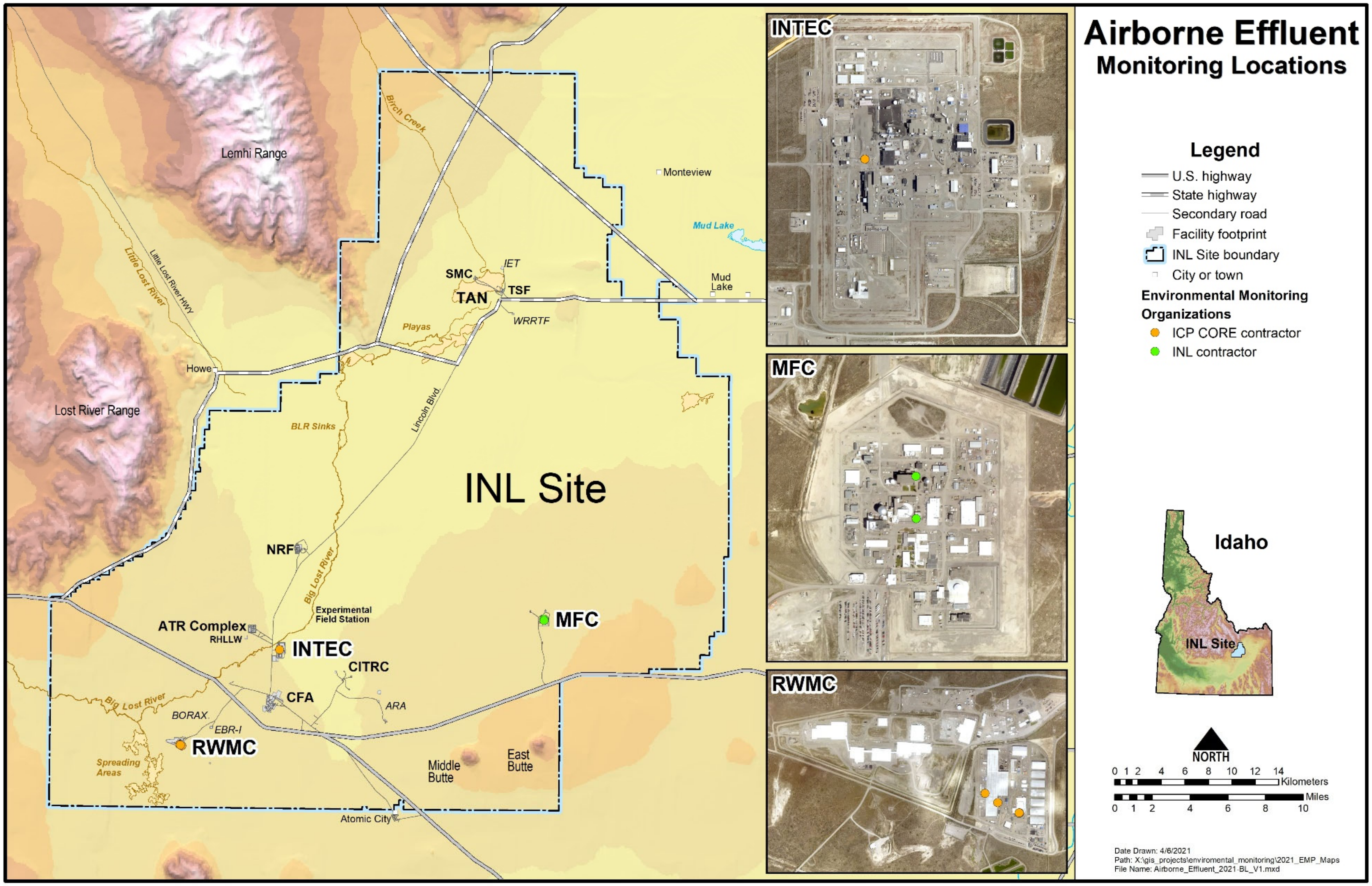

Figure 3-1. Airborne-effluent monitoring locations.

3.1.2 ICP Core Contractor

The ICP Core remediation, waste management, and operational activities are conducted in compliance with federal and state rules. The ICP-Core radiological emissions originate from operation of process equipment, spent-nuclear-fuel storage and handling, deactivation and demolition activities, as applicable, waste-management operations, and other mission activities. The ICP Core monitors radioactive emissions at INTEC and RWMC as described in the following paragraphs:

- **INTEC**. Emissions from INTEC are primarily associated with waste-management operations (treatment and repackaging activities), operation of process equipment, dry storage of spent nuclear fuel, ventilation of radioactively contaminated buildings, and maintenance and servicing of contaminated equipment. Radioactive emissions include both particulate and gaseous radionuclides. The only emission point source that is continuously monitored at INTEC per NESHAP monitoring requirements is the Fluorine Dissolution Process and Fuel Storage Stack (CPP-767-001). Once it becomes operational, the Integrated Waste Treatment Unit will continuously monitor radiological emissions from its stack (STK-SRE-140).

- **RWMC-ARP.** Radiological air emission point sources at the RWMC include the three OCVZ Vapor-Extraction Units D, E, and F in the SDA and the CERCLA ARP-excavation enclosures (ARP II-IV, VIII, and IX). The OCVZ units are currently shut down as part of a rebound study approved by the regulator agencies. Radiological emissions from the ARP facilities meet NESHAP monitoring standards using an EPA-approved ambient air monitoring program that meets the requirements specified by 40 CFR 61.93(g).[25] The ambient air monitoring program also monitors radionuclides emitted from WMF-1619 for the RCRA Sludge Repackage Project (formerly ARP VII). It was also used to monitor radionuclide emissions from WMF-1617 (ARP-V), which is undergoing RCRA closure. Three high-volume air samplers are located near the EBR-I facility, and a fourth sampler is operated at Howe, Idaho, to provide background samples for NESHAP and SDA monitoring. The execution of the ARP ambient air measurement project is documented in ICP PLN-720, "Environmental Surveillance Program Plan."[26] For emissions from the ARP, the EBR-I Facility is a conservative surrogate location for the INL Site's maximally exposed individual.

  Periodic measurements of carbon-14 (C-14) and tritium (H-3) gaseous emissions from the three vapor vacuum-extraction units were formerly performed twice a year; however, measurements of these radionuclides were discontinued in 2018, and emissions are now determined using historical averages. The emissions of gaseous H-3 and C-14 radionuclides to the atmosphere are also generated from the corrosion of activated beryllium blocks buried at the SDA. Curie emissions are estimated based on Site-specific corrosion data for buried beryllium, H-3 and C-14 inventories, and fractional release rates. Soil-gas measurements of C-14 and H-3 collected near known beryllium disposal locations were conducted through Fiscal Year 2018, but have since been discontinued. Millions of gallons of groundwater contaminated with H-3 (originating from upgradient sources) are extracted annually from the Snake River Plain Aquifer at the RWMC production well for use at the facility. In accordance with the provisions of PLN-730, "Idaho Cleanup Project Drinking Water Program Plan," radiological constituents, including H-3, are routinely sampled. Annual emissions are calculated based on the entire volume of groundwater pumped from the ESRPA, which is ultimately discharged to the four sewage lagoons, the annual H-3 analyses results, and a release fraction applicable for tritiated water.

- **RWMC–AMWTP**. Operational features associated with the AMWTP consist of processes to vent waste containers, nondestructive examination of container contents, and treatment, repackaging, storage, assembly, and loading of waste containers for transport and disposal.

  Operational activities at the RWMC-AMWTP, operated within the TSA, could potentially result in the release of radiological and other pollutants to the atmosphere. Currently, RWMC-AMWTP continuously monitors for radioactive particulates at three stack locations—two stacks on WMF-676 and one stack on WMF-636—in accordance with 40 CFR 61.93. Particulate sampling is conducted for the other WMF-636 stack to satisfy periodic confirmatory measurements requirements and remain less than 0.1 mrem per year. These emissions are calculated, documented, and included in the INL's annual NESHAP report.

- **TAN.** The New Pump and Treat Facility is part of OU 1-07B CERCLA remediation project which is operated to treat contaminated groundwater at TAN. Its treatment process targets various organic contaminants of concern. As the result of its extraction, it also releases Sr-90 and tritium to the atmosphere.

3.2 Liquid Effluent

Operations at the INL Site may result in the release of liquid-effluent discharges containing radioactive or non-radioactive pollutants. Effluent monitoring includes the collection and analysis of samples and other measurements to establish the type and concentrations of pollutants in liquid discharges from facilities. Monitoring also provides data to evaluate the effectiveness of liquid effluent treatment and control systems, identifies potential contaminant source areas and environmental problems, and provides a mechanism for detecting, characterizing, and reporting unplanned releases.

Direct discharge of wastewater to the land surface is regulated under IDAPA 58.01.17[18] and IDAPA 58.01.16.[17] Three facilities operated by the INL and ICP Core contractors have Reuse Permits issued by IDEQ; all three require monitoring of liquid effluents for facility-specific parameters.

Additional liquid effluent monitoring is performed in support of DOE environmental protection objectives. Radiological liquid effluents are monitored in accordance with DOE Order 458.1[2] and the recommendations of DOE-HDBK-1216-2015.[3] A risk-based approach, identified in PLN-8540, "Idaho National Laboratory Liquid Effluent Monitoring Plan,"[27] is used by the INL contractor to determine which nonpermitted effluent streams or additional nonpermitted parameters require monitoring. The ICP Core contractor has a similar approach documented in PLN-932, "Management Plan and Implementation of Best Available Technology per DOE Order 5400.5 for Disposal of Wastewater."[28] The risk-based approach considers the likelihood that an effluent measurement equals or exceeds a regulatory limit or environmental release level. It will also determine the severity of the exceeded levels, were such an event to occur.

Figure 3-2 shows liquid-effluent monitoring locations currently sampled across the Site. Some facilities have in-line alarm monitors located upstream from the routine effluent-monitoring locations. These monitors are used to detect radiation or pH levels that fall outside predetermined levels.

3.2.1 INL Contractor

The INL contractor conducts sampling on the wastewater treatment systems at MFC and the ATR Complex and monitors for non-radioactive and radioactive parameters in liquid-waste effluents as required by the applicable Reuse Permit and DOE environmental-protection objectives. Specific liquid-effluent monitoring locations, frequencies, and analyses are documented in PLN-8540[27] and associated procedures.

Reuse permits are in effect for the ATR Complex Cold Waste Pond, and the MFC Industrial Waste Pond (IWP). In April 2020 the MFC Industrial Waste Ditch (IWD) was connected to a new lift station and pipeline that transports IWD effluent into the existing IWP pipeline. A minor modification was issued by IDEQ to remove the IWD from the current MFC Reuse Permit. Discharge of wastewater to the land surface is regulated by wastewater rules found in IDAPA 58.01.16[17] and 58.01.17.[18] The ATR Complex and MFC Reuse Permits do not specify maximum effluent concentrations for any specific constituents. These facilities also have specific radiological and other parameters monitored for surveillance purposes in order to comply with DOE Order 458.1.[2] Furthermore, the permits generally require that data from groundwater monitoring wells at the INL Site comply with the Idaho groundwater-quality primary- and secondary-constituent standards found in IDAPA 58.01.11.[19] The permits specify maximum annual discharge volumes. All permitted and nonpermitted facilities are monitored in accordance with state of Idaho requirements.

The INL Site facilities located in Idaho Falls are required to comply with the applicable regulations in Chapter 1, Section 8 of the *Municipal Code of the City of Idaho Falls*.[29] Industrial-wastewater acceptance forms are obtained for facilities that dispose liquid effluent through the city of Idaho Falls sewer system. Industrial-wastewater acceptance forms include general requirements that apply to all REC facilities and specific monitoring requirements for the IRC, owing to the nature of activities conducted therein. The city of Idaho Falls currently monitors effluents at the IRC for compliance with the city's wastewater-acceptance criteria.

3.2.2 ICP Core Contractor

A Reuse Permit is in effect for the INTEC New Percolation Ponds. Discharge of wastewater to the land surface is regulated by IDAPA 58.01.16[17] and IDAPA 58.01.17.[18] The INTEC Reuse Permit requires liquid-effluent monitoring, but does not specify any release limits. The facility also has specific radiological and other field parameters monitored for surveillance purposes in order to comply with DOE Order 458.1.[2] Furthermore, the permit generally requires that data from groundwater monitoring wells at the New Percolation Ponds comply with the IDAPA 58.01.11[19] groundwater-quality primary- and secondary-constituent standards. The permit also specifies daily and annual discharge volumes. Liquid-effluent monitoring is performed in accordance with PLN-729, "Idaho Cleanup Project Core Liquid Effluent Monitoring Program Plan."[30]

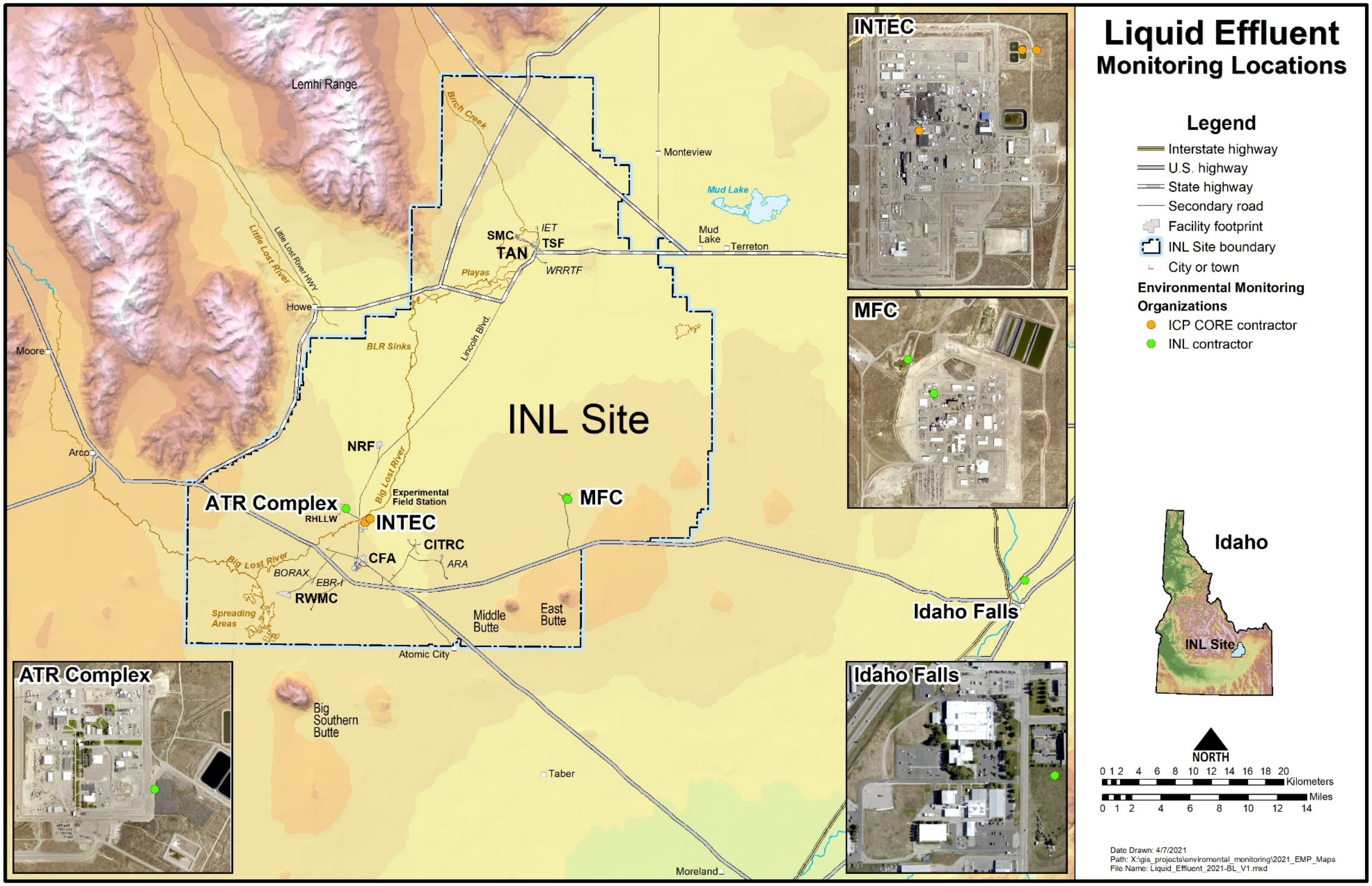

Figure 3-2. Liquid-effluent monitoring locations.

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4. ENVIRONMENTAL SURVEILLANCE

Environmental surveillance at the INL Site includes the collection and analysis of samples or direct measurements of air, water, soil, biota, and agricultural products. Environmental surveillance is conducted by several organizations to support laboratory-wide compliance with DOE Order 458.1,[2] environmental laws and regulations, and DOE agreements, and follows the guidance in DOE-HDBK-1216-2015[3] for establishing environmental surveillance programs.

Separate on-Site environmental surveillance is required for waste-management facility operations to meet DOE Order 435.1, *Radioactive Waste Management*[1] requirements. The SDA at RWMC-ARP and the ICDF are low-level waste disposal facilities, and are required to be monitored for DOE Order 435.1[1] compliance. Waste-management surveillance monitoring is designed to be more facility- or source-specific than other site-wide surveillance.

4.1 Ambient Air

Air is the most likely transport pathway through which INL Site contaminants could reach off-Site populations according to DOE/ID-12119, *Idaho National Engineering Laboratory Historical Dose Evaluation*.[31] Using a network of low-volume air samplers, several organizations monitor ambient air to compare concentrations at on-Site release locations with off-Site control locations.[32] The network of regional ambient-air monitoring locations is shown in Figure 4-1, and the on-Site ambient-air monitoring locations are shown in Figure 4-2. Ambient-air particulate matter and airborne radionuclides are also sampled during wildfires or other emergency events using a separate network of high-volume air samplers. (Refer to Section 6.1 for a discussion of air monitoring performed for operational emergencies.) The ambient-air monitoring network was evaluated and optimized using a defensible methodology and modeling tool that objectively assessed the air-monitoring network design against established performance objectives. The evaluation began with the development of a frequency of detection methodology, which is the fraction of events that result in a detection at any given sampler. The methodology is further described in INL/EXT-14-33194, *Development and Demonstration of a Methodology to Quantitatively Assess the INL Site Ambient Air Monitoring Network*.[32] The application of the frequency-of-detection method to optimize the regional network is described in INL/EXT-15-36544, *Application of Frequency of Detection Methods in Design and Optimization of the INL Site Ambient Air Monitoring Network*. [33] Additional work was completed in 2019 to apply the methodology to potential release points in Idaho Falls and to optimize the in-town ambient-air network. The in-town evaluation is described in INL/EXT-19-53491, *Assessment of INL Ambient Air Radiological Monitoring for Idaho Falls Facilities*. [34]

The various organizations conducting air monitoring are discussed below.

4.1.1 INL Contractor

The INL contactor measures airborne radionuclides and monitors for potential trends in radioactivity in the environment per PLN-8510, “Planning and Management of Environmental Support and Services Monitoring Activities,”[33] PLN-8550, “Environmental Support and Services Monitoring Services Surveillance Plan,”[34] and supporting Laboratory Instructions (LIs). Ambient-air monitoring activities support INL Site compliance with DOE Order 458.1[2] and the Idaho Air Quality Operating Permit. Atmospheric particulates released from INL Site facilities, natural radioactivity, and global fallout from historical nuclear detonations or nuclear accidents are collected on- and off-Site using low-volume samplers and 2 in. filters. Potential gaseous-iodine releases are monitored using activated charcoal cartridges. Atmospheric moisture is collected using digital flow meters and molecular sieves per LI-351, “Sampling Atmospheric Tritium,”[35] to monitor for tritium in water vapor (see Figure 4-3).

4.1.2 ICP Core Contractor

The ICP Core contractor measures airborne radionuclides and monitors for potential trends in radioactivity in the environment per ICP Core PLN-720."[26] The ICP Core ambient-air monitoring activities support the waste-management facility requirements of DOE Order 435.1.[1] A series of samplers that monitor for radioactive particulates is used around the RWMC SDA and at the ICDF. Airborne materials from the SDA and ICDF are predominantly fugitive dusts potentially contaminated with small amounts of sorbed radionuclides. The samplers are located along the periphery of the SDA in predominant wind paths from disposal activities and at a control location north of Howe, Idaho.

4.1.3 ESER Program

The ESER Program conducts ambient-air monitoring both on-Site and off-Site using a variety of monitors to determine if there is a gradient in radionuclide concentrations between the INL Site and off-Site locations. These monitors include:

- A network of low-volume air samplers on and around the INL Site to collect particulate matter on filters and gaseous radioiodine on cartridges. Placement of these samplers is based on DOE regulatory guidance to monitor population centers within 50 miles, atmospheric-transport and dispersion patterns modeled by NOAA ARLFRD, and on public interest. The network design (including air monitors operated by INL) was recently demonstrated through use of CALPUFF, an integrated Lagrangian puff contaminant-dispersion model, capable of a release detection frequency that conservatively meets program objectives. Filters are analyzed weekly for gross alpha- and beta-emitting activity and composited quarterly for analysis for gamma-emitting and specific alpha- and beta-emitting radionuclides.
- A high-volume air sampler in Idaho Falls is operated as part of the EPA's RadNet Program, which monitors environmental radioactivity across the U.S. to provide high-quality data for assessing public exposure and environmental impacts resulting from nuclear emergencies and baseline data during routine operations. The sampler collects real-time data on gross beta and gamma activity, which EPA monitors from their RadNet headquarters. Filters are also collected biweekly from the Idaho Falls sampler by the ESER Program and are shipped to an EPA laboratory, where they are analyzed for gross radioactive activity and concentrations of specific radionuclides. Results can be found at https://www.epa.gov/radnet/radnet-air-data-idaho-falls-id.
- Four atmospheric moisture monitors located in Atomic City, Experimental Field Station, Idaho Falls, and Howe, which collect water-vapor samples for tritium analysis (see Figure 4-3).

The ESER Program also collects precipitation samples to measure tritium in air at the same stations that the atmospheric moisture samplers are located (see Figure 4-4). The Idaho Falls station is operated as part of the EPA's RadNet Program and results can be queried at https://iaspub.epa.gov/enviro/erams_query_v2.simple_query. Ambient-air monitoring locations, frequencies, methodologies, and analytes are specified in the ESER Program procedures.[36]

4.2 Drinking Water

Groundwater supplies the drinking-water systems at the INL Site, and drinking water is monitored according to regulations to ensure that the drinking water at the facilities is safe for consumption in accordance with IDAPA 58.01.08, "Idaho Rules for Public Drinking Water Systems,"[37] and Public Law 104-182, *Safe Drinking Water Act Amendments of 1996*.[38] All on-Site contractors participate in the INL Drinking Water Program as a means of sharing information, but each contractor administers its own drinking-water monitoring program. Because of known contaminants, certain parameters are monitored more frequently than required.

Monitoring is based on the classification and size of the water systems (i.e., transient or non-transient non-community). Off-Site drinking-water systems are also monitored by the ESER Program due to the potential for contaminant migration beyond the Site boundary and are collected from taps. Samples collected off-Site are included as drinking-water samples, but are not used for compliance with drinking-water regulations. Instead, they are used to assess groundwater quality. Section 4.3 discusses the groundwater-monitoring samples taken directly from wellheads. Transient non-community water systems on the Site are located at CITRC, EBR-I, Gun Range, and the main gate. Non-transient non-community water systems have more-stringent compliance requirements than transient non-community water systems. The non-transient non-community water systems at the Site are located at INTEC, RWMC, CFA, ATR Complex, Test Area North Contained Test Facility, and MFC.

Cross-connection programs are in place to protect water systems from potential contamination. These programs are responsible for the installation, maintenance, and testing of approved backflow-prevention assemblies and inspection of buildings to prevent the potential of contamination hazards and the elimination of cross-connections. The INL Contractor and ICP Core Contractor have a cross connection program.

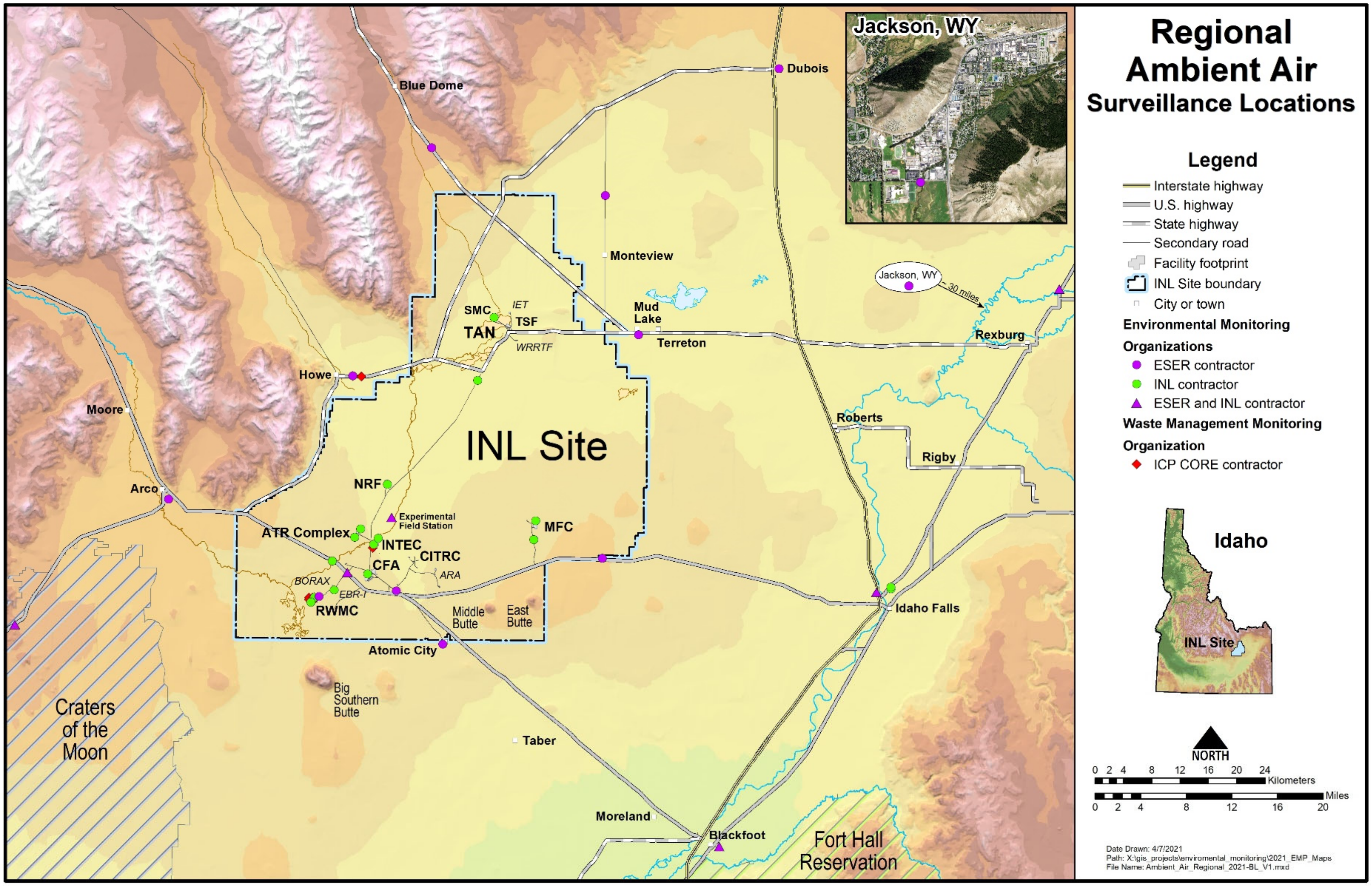

Figure 4-1. Regional ambient-air monitoring locations.

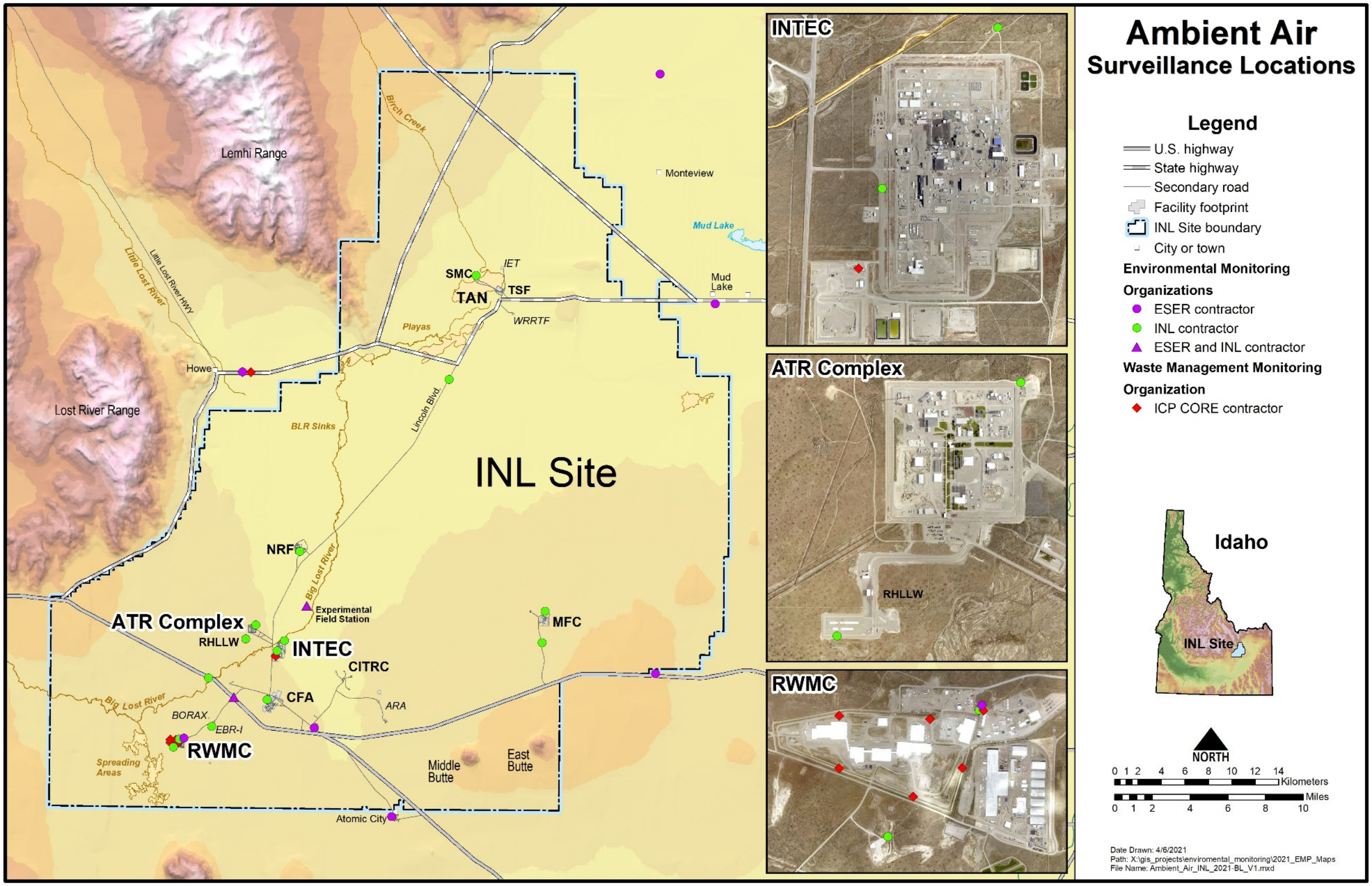

Figure 4-2. Detailed on-Site ambient-air monitoring locations.

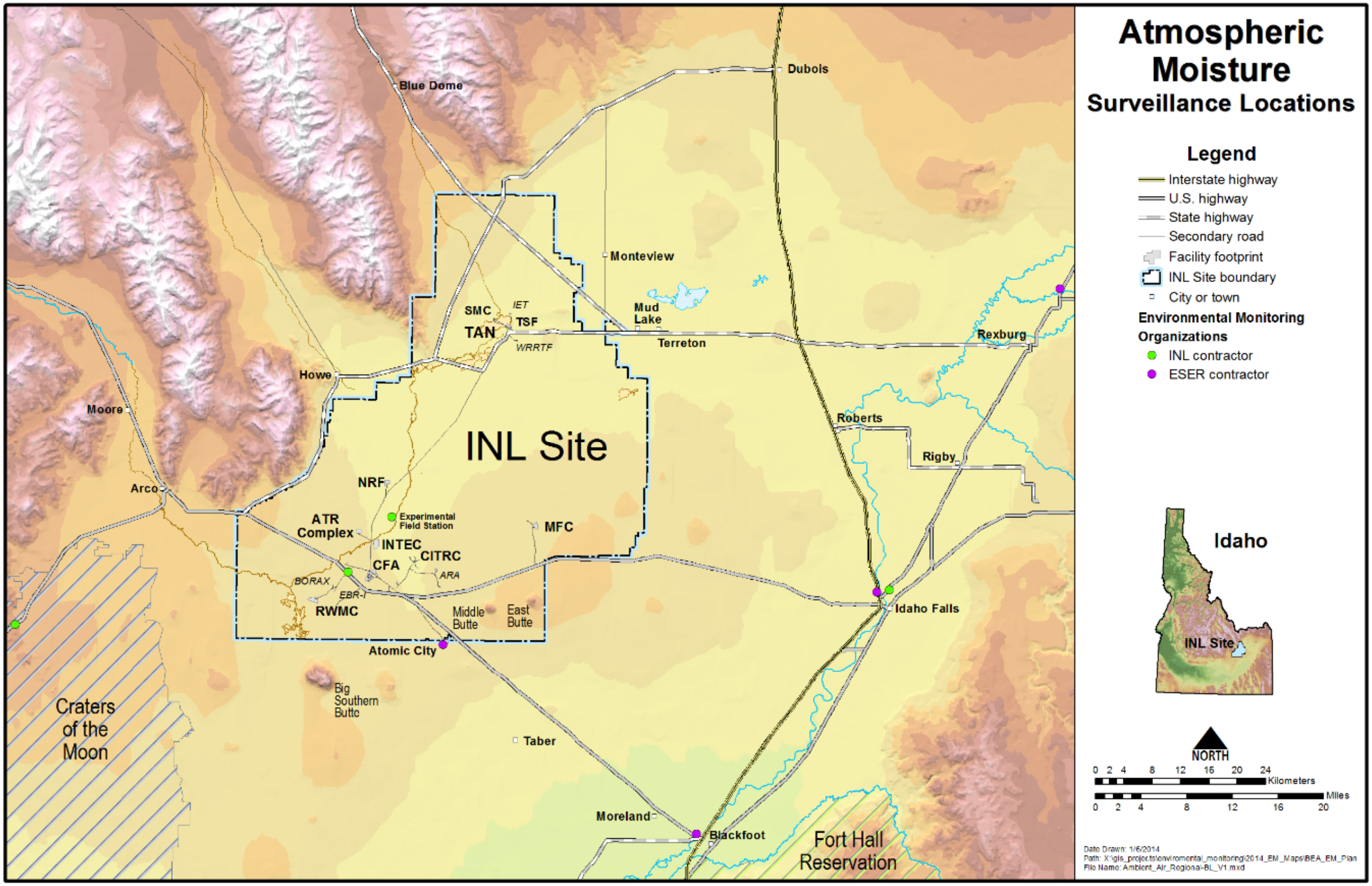

Figure 4-3. Atmospheric-moisture monitoring locations.

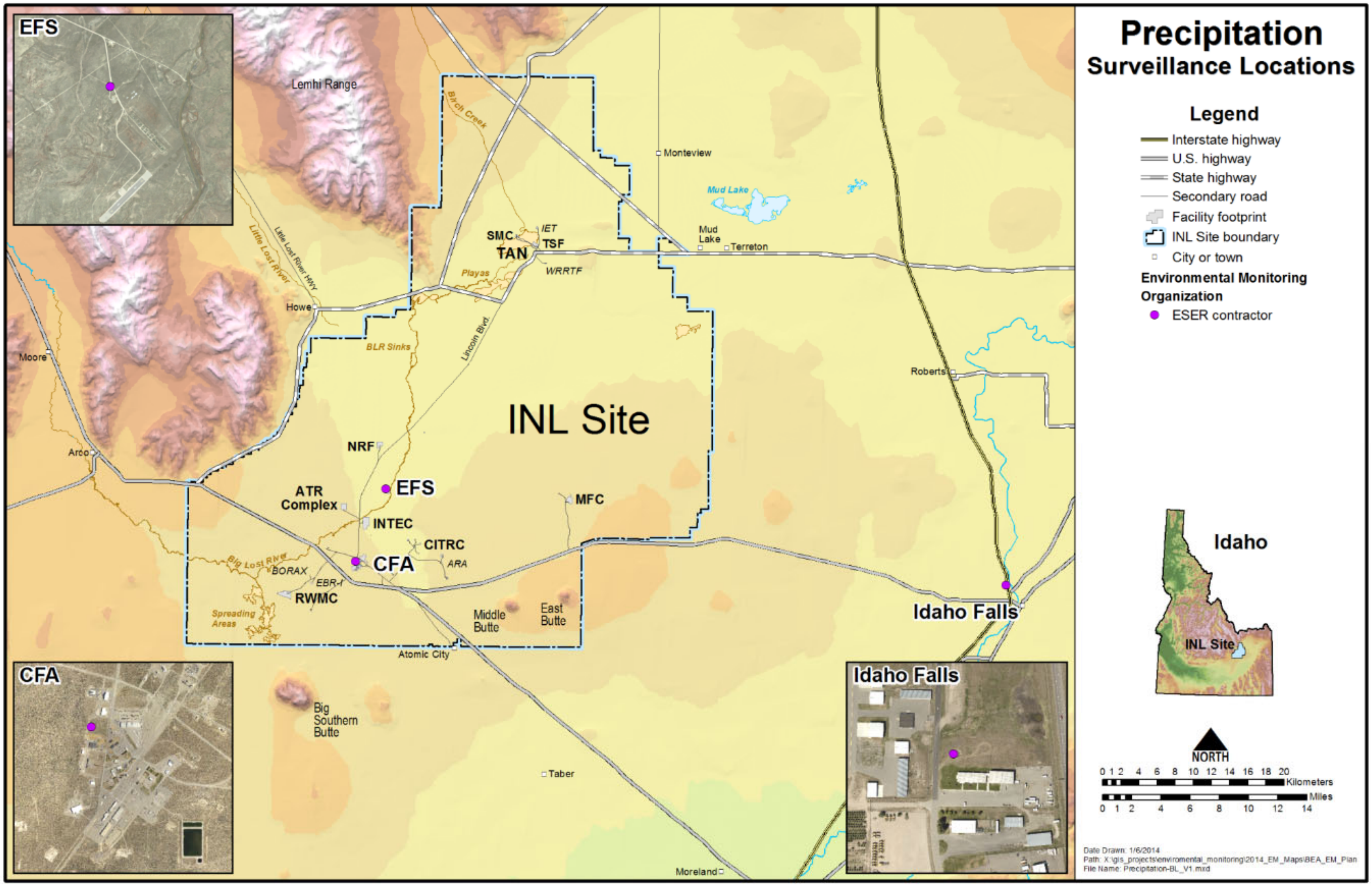

Figure 4-4. Precipitation monitoring locations.

Figure 4-5 shows regional drinking water monitoring locations. On-Site drinking water samples are collected from the point of entry to each distribution system or manifold, directly from the wellheads, and from buildings associated with each drinking-water distribution system. Figure 4-6 shows the detailed locations of those manifolds and wellheads that are currently monitored across the INL Site. Individual sampling points from each drinking water distribution system are not shown on Figure 4-6 because these sample points include most buildings connected to the distribution system.

4.2.1 INL Contractor

The INL contractor performs all drinking-water monitoring and is responsible for all Site drinking-water systems except for INTEC and RWMC, which are ICP Core-contractor facilities. Currently, the INL contractor monitors 13 wells and eight distribution systems across the Site for both radiological and non-radiological parameters. Sampling locations, parameters, and frequencies are documented in the PLN-8530, "Idaho National Laboratory Drinking Water Program Plan,"[39] and associated procedures.

The INL contractor conducts annual testing of backflow prevention assemblies and inspects INL buildings and facilities onsite and in town.

4.2.2 ICP Core Contractor

The ICP Core contractor monitors drinking-water systems at INTEC and RWMC. The ICP Core contractor is responsible for regulatory compliance at these facilities. Sampling locations, parameters, and frequencies are documented in PLN-730[40] and associated procedures. A licensed backflow-assembly tester performs cross-connection inspections and testing of all backflow-prevention assemblies for the ICP Core drinking water systems and facilities. Facility inspections are performed annually, and backflow prevention assemblies are tested upon installation, after repair or relocation, and at a minimum, annually.

4.2.3 ESER Contractor

The ESER contractor collects drinking water at Atomic City, Craters of the Moon, Howe, Idaho Falls, Minidoka, Mud Lake, Shoshone, and the public rest stop on Highway 20/26. The last location is the only public drinking-water site located close to the mapped tritium plume from the INL Site. Howe is monitored because it is close to the INL Site boundary and the BLR Sinks.

The water at Atomic City, Minidoka, Mud Lake, and Shoshone is co-sampled with the IDEQ INL Oversight Program. A subsample of the Idaho Falls sample is sent to EPA for analysis as part of the EPA RadNet program. These samples are all distant from the INL Site groundwater plume, but are of interest to the public.

The Craters of the Moon and Idaho Falls locations are outside the influence of the groundwater plume and are used for background comparison with the other sites.

All samples are analyzed for gross alpha and beta activity and tritium.

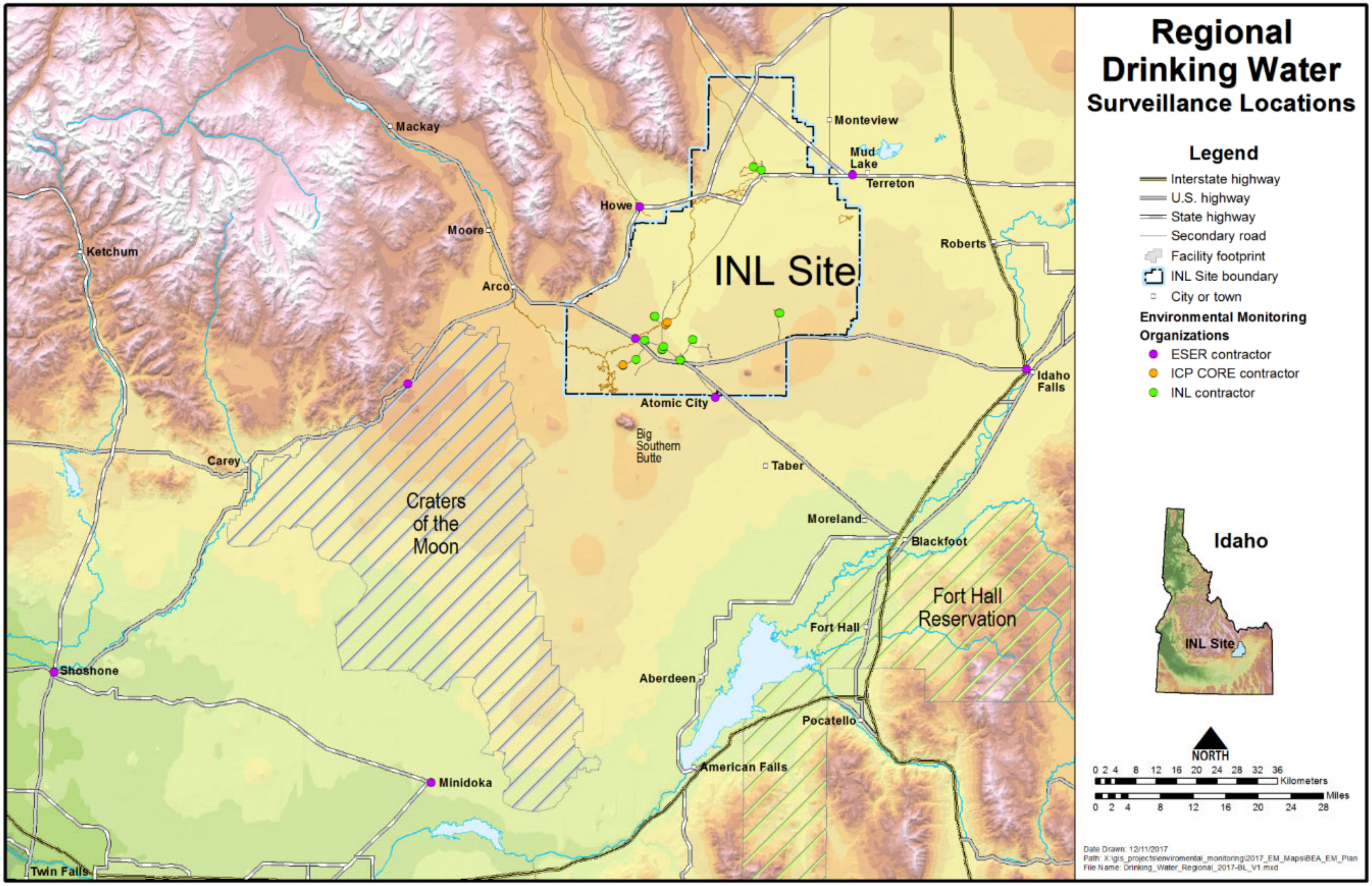

Figure 4-5. Regional drinking-water monitoring locations.

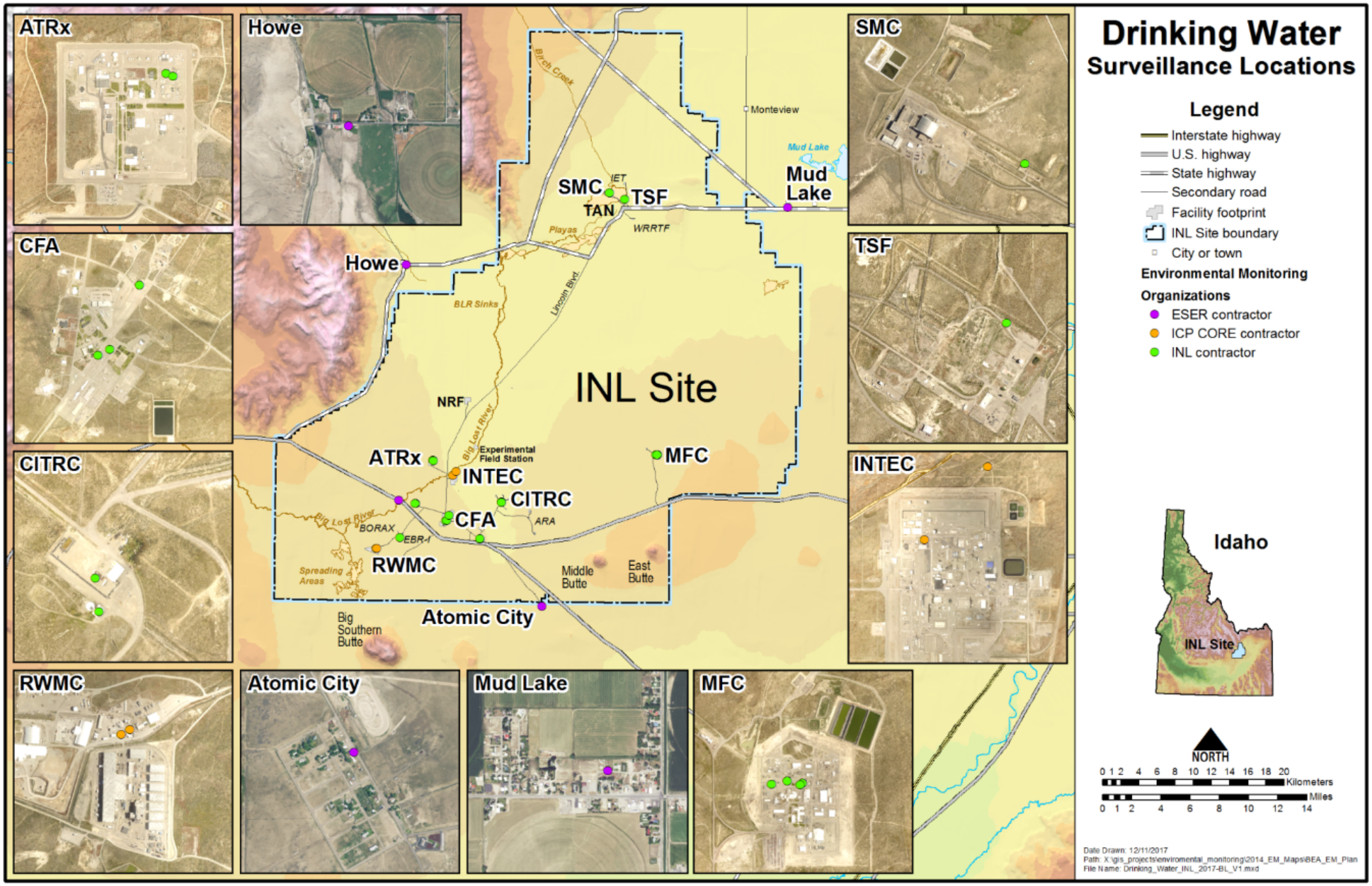

Figure 4-6. Detailed on-Site drinking-water monitoring locations.

4.3 Groundwater

Historic waste-disposal practices have produced localized areas of contamination in the ESRPA beneath the INL Site. The ESRPA is the source of regional drinking water and supplies irrigation water to a large, regional agricultural and aquaculture economy. On-Site groundwater samples are taken from wells near each facility, in areas of known contamination, and regionally across the Site (including upgradient of Site operations). Contaminants resulting from past INL Site operations have been detected in the ESRPA beyond the Site's southern boundary at concentrations far below regulatory limits. Off-Site groundwater samples are taken downgradient of the INL Site near the INL Site boundary and near the terminus of the ESRPA.

Groundwater is currently monitored at the INL Site by multiple organizations to:

- Satisfy specific CERCLA-related remedial action objectives and/or regulatory requirements contained in RODs, RCRA regulations, Reuse Permits, and DOE orders
- Determine the nature and extent of groundwater contamination during CERCLA remedial-investigation and feasibility-study activities
- Evaluate general groundwater conditions and contaminant fate and transport on a regional and subregional scale (as performed by the USGS and WAG 10).

The groundwater-monitoring programs established by the contractors responsible for managing and operating INL Site facilities, at a minimum, address regulatory-compliance and remediation goals at each of the facilities for which they have management responsibility. DOE/ID-11034[41] provides an overview of the routine groundwater monitoring conducted on-Site and specifies how the recommended elements of a groundwater-monitoring program under DOE Order 458.1[2] are met. All approved CERCLA documents and associated groundwater-monitoring activities can be found in the Administrative Record/Information Repository at ar.inel.gov.

4.3.1 INL Contractor

The INL contractor is responsible for groundwater monitoring at MFC per the CERCLA ROD and the Reuse Permit for the IWP, and at the ATR Complex in compliance with the Reuse Permit for the Cold Waste Pond. The INL contractor is also responsible for groundwater monitoring at the RHLLW Disposal Facility.

4.3.2 ICP Core Contractor

Except for MFC and NRF, the ICP Core contractor is responsible for groundwater monitoring conducted at all other CERCLA-site monitoring locations, Reuse Permit compliance at INTEC, and RCRA post-closure monitoring at INTEC's Waste Calcining Facility and CPP-601/627/640 Landfill. The ICP Core contractor currently performs data interpretations to determine the cumulative impact of CERCLA sites at the INL Site.

4.3.3 USGS

USGS monitors ESRPA wells within its defined regional network (both on-Site and at boundary locations) to study contaminant migration and determine groundwater quality and quantity as they relate to Site operations. The Site boundaries are monitored to detect groundwater contaminants entering and leaving the INL Site. Wells within the Site boundary are monitored to evaluate contaminant movement in the ESRPA between facilities.

Each monitoring well in the USGS regional network is monitored for the contaminants of concern specific to its locale and known or suspected contaminant sources. In general, on-Site ESRPA wells outside of facility fences are sampled by the USGS annually, depending on location. Samples are routinely collected and analyzed for radionuclides, volatile organic compounds, trace elements, and anions. Sampling locations, methodologies, and parameters are specified in DOE/ID-22230, "Field Methods and Quality-Assurance Plan for Water-Quality Activities and Water-Level Measurements, U.S. Geological Survey, Idaho National Laboratory, Idaho."[42]

4.4 Surface Water

The BLR system includes the Little Lost River, BLR, Birch Creek, and associated tributary channels, playas, and sinks. No streams or rivers flow from within the Site to locations outside the boundaries, and during most years, the channels of the BLR system on the INL Site are dry. However, surface-water samples are taken when water is present both on and around the Site to monitor the surface-water pathway. Currently, no discharges of storm water or liquid effluent from INL Site facilities require monitoring under 33 USC §1251, *Federal Clean Water Act*.[43] Figure 4-7 shows all the current on-Site and off-Site surface water monitoring locations.

4.4.1 ICP Core Contractor

Surface and near-surface soils at RWMC-ARP have become contaminated from waste handling and biotic intrusion during past flooding of open pits. Surface water runoff is sampled at the SDA because of the potential for surface water runoff to become contaminated. Sampling locations, parameters, and frequencies are documented in the ICP Core PLN-720[26] and associated procedures. These samples are collected to comply with the following objectives:

- Meet the requirements for waste-management facility monitoring per DOE Order 435.1.[1]
- Determine concentrations of radionuclides in surface water leaving the facility.
- Report comparisons of measured concentrations against derived concentration guides for the public. Derived concentration technical standards are calculated from DOE dose equivalent tables and based on DOE radiation protection standards given in DOE Order 458.1.[2]
- Detect and report significant trends in measured concentrations of radionuclides in surface waters leaving the SDA with the potential of leaving the facility.

4.4.2 ESER Contractor

Surface water is sampled on the BLR through the INL Site, as it has the potential to carry contaminated soil to the BLR Sinks. Samples are analyzed for gross alpha and beta activity and tritium. In addition, gamma spectroscopy is performed on these samples, as cesium-137 is a major soil contaminant at the INL Site.

Samples are collected opportunistically at five locations along the BLR, from the Highway 20/26 to the BLR Sinks when water is available. Water is also collected at Birch Creek as a control.

Surface water is also collected semiannually at locations downgradient (in terms of groundwater flow) of the BLR Sinks at Buhl, Hagerman, and Twin Falls. These locations are co-sampled with the IDEQ INL Oversight Program and are analyzed for gross alpha and beta activity and tritium.

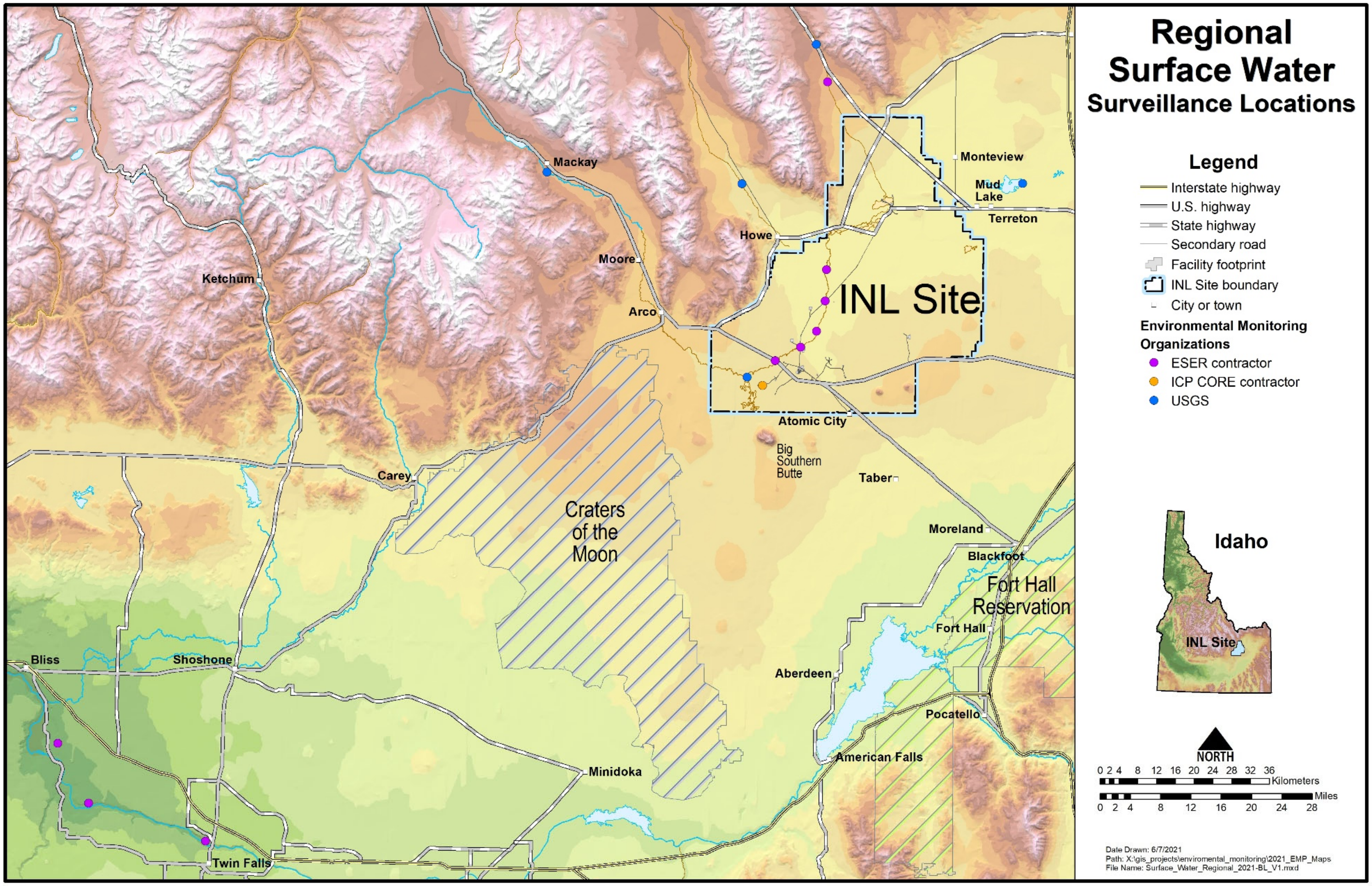

Figure 4-7. Regional surface-water monitoring locations.

4.4.3 USGS

When flow occurs in the BLR or other selected streams, surface-water samples are collected annually and submitted for radionuclide and chemical analyses to determine the effect that surface-water flow has on the chemistry of groundwater beneath the Site.

The USGS takes surface-water samples from Birch Creek, the Little Lost River, and Mud Lake, and from two locations on the BLR. The BLR on-Site sampling location is at the INL Diversion Dam near RWMC. The off-Site sampling location is located below Mackay Dam near Mackay. Details on surface-water sampling performed by the USGS are specified in DOE-ID-22230.[42]

4.5 Soil

Some INL Site soils have been contaminated by radioactive and non-radioactive effluents from INL Site operations and from nuclear weapons-testing fallout. Soil sampling is conducted at the Site to:

- Determine present concentrations of non-radioactive contaminants and radioactivity (natural and anthropogenic) in soil
- Identify and quantify changes in contaminant concentrations in the soil caused by INL Site operations
- Comply with regulatory requirements
- Provide data used to calculate fugitive air emissions.

Figure 4-8 shows regional soil-monitoring locations, and Figure 4-9 shows detailed on-Site soil-monitoring locations.

4.5.1 INL Contractor

The INL contractor conducts soil sampling in compliance with DOE Order 458.1[2] requirements for monitoring to determine the impacts of operations on the environment and public health.

Soil-monitoring activities are conducted primarily to determine whether long-term deposition of airborne materials released from INL Site facilities have resulted in a buildup of radionuclides in the environment. To evaluate the need for soil monitoring at INL, evaluations of the deposition of airborne particulates released from each INL facility were modeled using CALPUFF, a non-steady-state Lagrangian puff-dispersion model,[32] and estimated particulate deposition rates.[43] The modeling results show that only RWMC has the potential for soil-contaminant accumulations to be detectable in a time period less than the range of decades. Dispersion and deposition modeling of source terms at other facilities (e.g., INTEC and MFC) shows the potential for surface accumulations to be detectable only after hundreds to thousands of years.[43]

Soils are analyzed every five years around RWMC, the Experimental Field Station and the Rest Area on US Highway 20/26. Geostatistical and trend analyses are performed on the radiological data to evaluate the soil radionuclide concentrations over time at the INL Site.

4.5.2 ICP Core Contractor

The ICP Core contractor performs additional monitoring to comply with EXT-95-00496, *Record of Decision Declaration for Central Facilities Area Landfills I, II, and III (Operable Unit 4-12), and No Action Site, (Operable Unit 4-03)*,[45] and to support ongoing work for a WAG 7 Remedial Investigation/Feasibility Study (RI/FS) of RWMC areas. At CFA, soil gas is monitored through a series of soil-gas sampling ports at varying depths adjacent to the landfills in accordance with DOE/ID-11374, *Long-Term Monitoring and Field Sampling Plan for the Central Facilities Area Landfills I, II, III, under Operable Unit 4-12*.[46]

At RWMC-ARP, soil moisture and soil gas are monitored to support the WAG 7 CERCLA activities. The data collected for WAG 7 are also used to satisfy the requirements of DOE Order 435.1.[1] Soil-moisture monitoring in the vadose zone is performed using tensiometers. Soil gas is sampled in the waste zone using vapor probes placed directly in the waste at selected locations. Soil gas is sampled in the vadose zone using an extensive system of soil-gas sampling ports inside and outside of the SDA boundary. Figure 4-10 shows the soil-gas and soil-moisture monitoring locations.

4.5.3 ESER Contractor

Soil samples are used to establish background levels of radionuclides (both natural and those resulting from fallout from nuclear weapons testing) and to detect any long-term buildup of radionuclides from the INL Site in off-Site soils. Soil is taken from 12 off-Site locations during even-numbered years for Sr-90, transuranic, and gamma-emitting radionuclide analyses. Co-sampling is conducted with the IDEQ INL Oversight Program at St. Anthony, Mud Lake, Monteview, Butte City, and Carey. Details on the soil sampling performed by the ESER Program are specified in the ESER Program soil sampling procedure.[36]

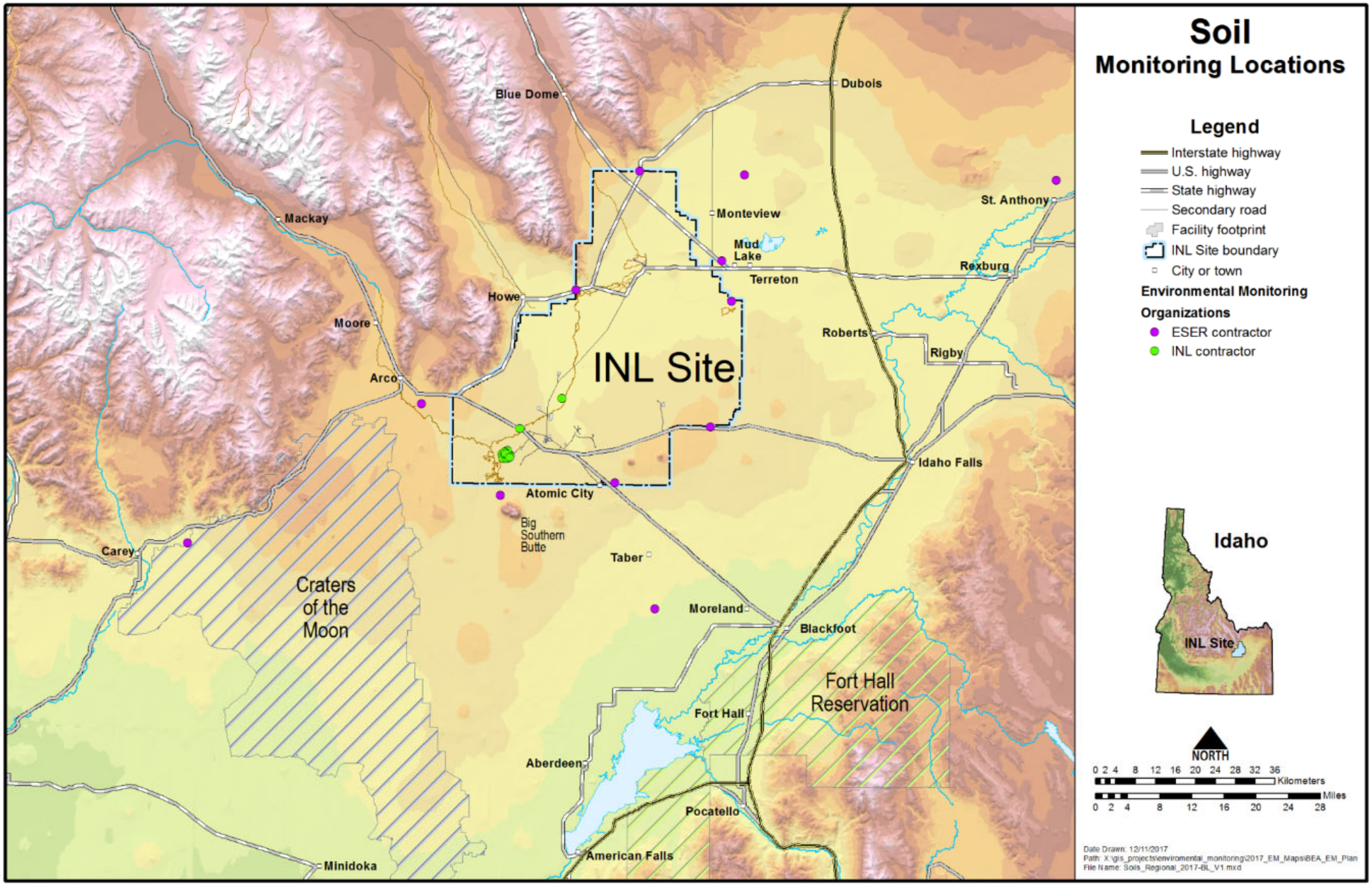

Figure 4-8. Regional soil-monitoring locations.

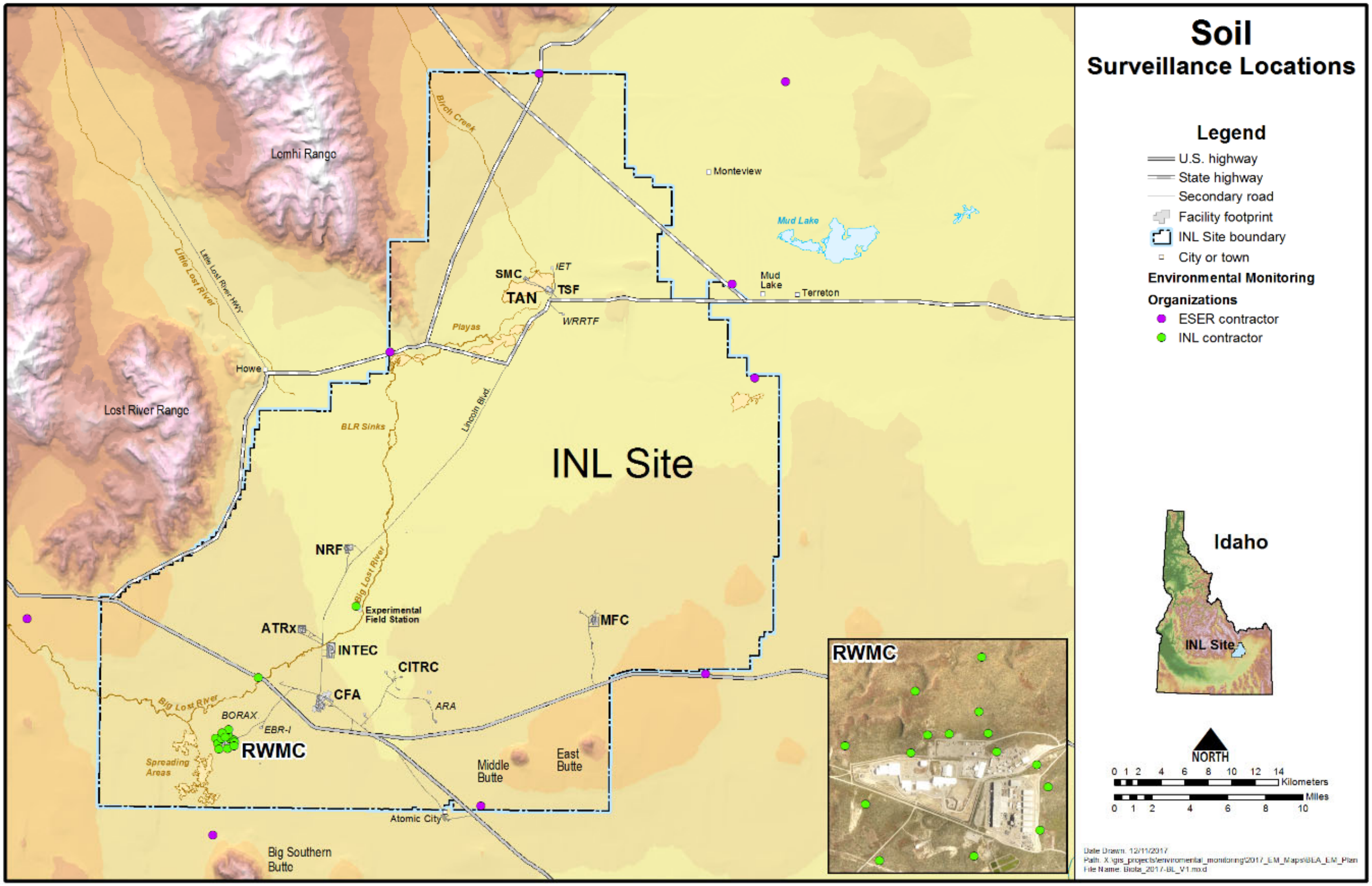

Figure 4-9. Detailed on-Site soil-surveillance locations.

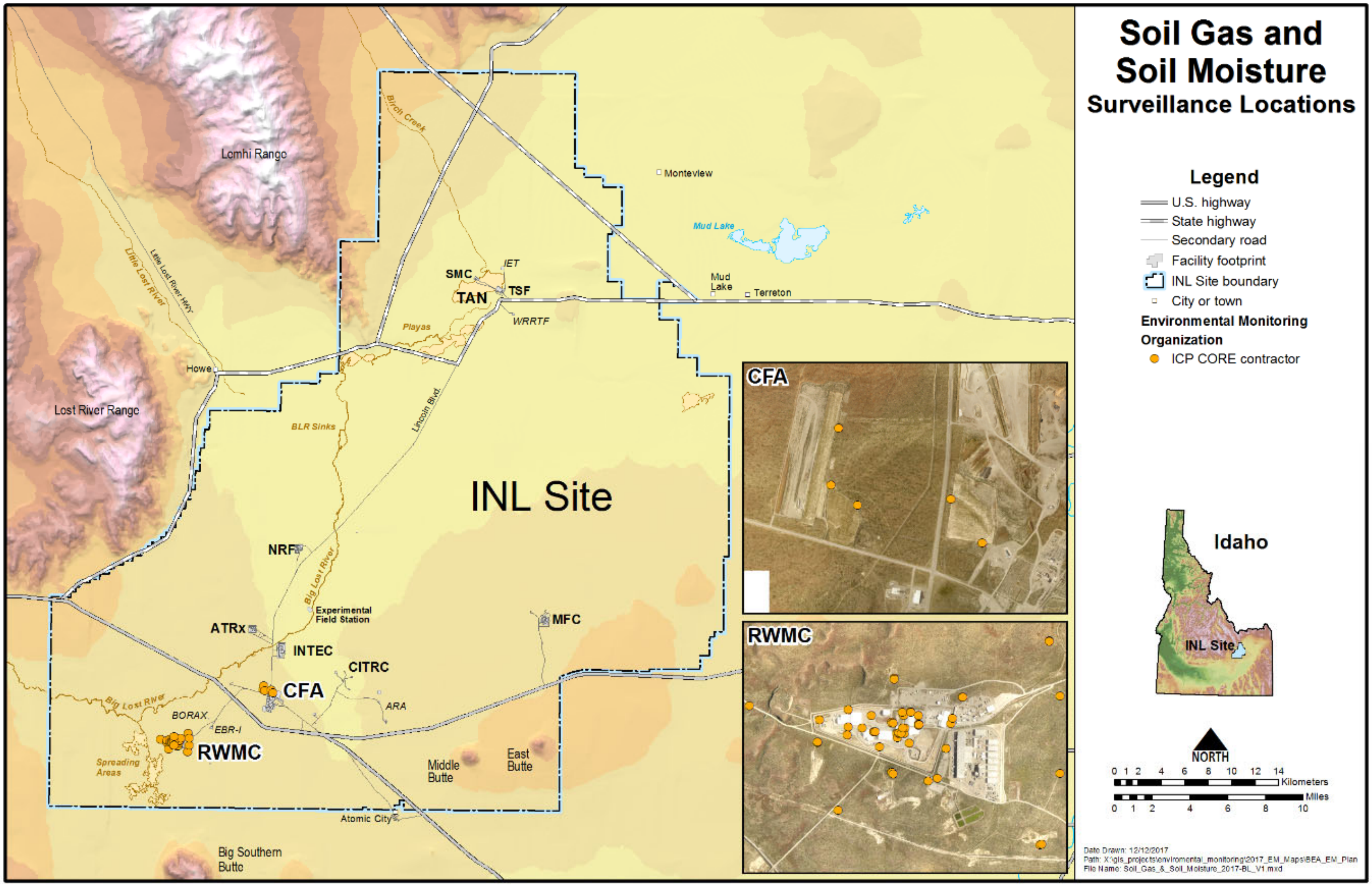

Figure 4-10. Soil-gas and soil-moisture monitoring locations.

4.6 Biota

Plants represent the major linkage in transfer of soil-borne contaminants to primary consumers and higher trophic levels. The leaves, florets, and shoots of plants can accumulate constituent concentrations caused by wind-blown contamination and uptake from the soil. Belowground plant components can also accumulate certain contaminants, although most birds and mammals are expected to consume primarily aboveground components. Plants are sampled to determine potential migration of facility contaminants and to ensure waste-confinement integrity.

Wildlife have access to some areas on the Site containing radioactive contamination. Because wildlife have the potential to move off-Site and be harvested by the public for consumption, wildlife are sampled to document levels of radioactivity in the edible tissues. Small mammal species are sampled to determine long-term ecological impacts of contamination and assess waste-confinement integrity.

4.6.1 ICP Core Contractor

The ICP Core contractor previously performed biota sampling activities. Routine biota monitoring was discontinued in 2018 with DOE concurrence. It was concluded that sufficient data had been collected indicating no potential for public exposure through biota at RWMC. Data had demonstrated no impacts of biota transporting radionuclides from buried waste or contaminated soil, and there were no longer increasing trends. Sample areas and sample media have diminished due to the changed footprint of the SDA. Planned waste-management activities and maintenance in the SDA (e.g., overburden depth, weed control) will remain unchanged in the foreseeable future, so it is reasonable to assume the biota uptake will be consistent with past results between now and planned cap installation (approximately 2028). The ICP Core Environmental Surveillance Program recommended discontinuing biota sampling under PLN-720.

4.6.2 ESER Contractor

Because large game animals (pronghorn, mule deer, and elk) are wide ranging and are a popular food source for many area residents, the ESER Program collects samples of game animals that are killed on roadways on or near the Site. The collection of large-game-animal samples is described in the ESER Program large-game-animal sampling procedures.[36] Thyroid and samples of muscle and liver tissue are collected from each animal and analyzed for radioactivity. Figure 4-11 shows locations where ESER big-game samples have been collected in the past. These locations vary from year to year depending on the number and locations of motor-vehicle accidents involving big game.

The ESER Program also collects waterfowl on an annual basis from liquid-waste disposal ponds on the Site and from off-Site control areas. Ponds sampled always include the ATR Complex sewage lagoon and an off-Site location. Past results indicate waterfowl may use the Hypalon-lined pond at ATR Complex, but no sampling is conducted there. Edible tissues, viscera, and remaining tissues (feathers, skin and bones) from waterfowl are each analyzed for gamma-emitting radionuclides.

Ecological studies, such as population surveys (on birds and mammals) and community structure surveys (on soil, fauna, and plants) are performed by the ESER Program at varying times during the year as described in Section 4.9 (see Figure 4-12).

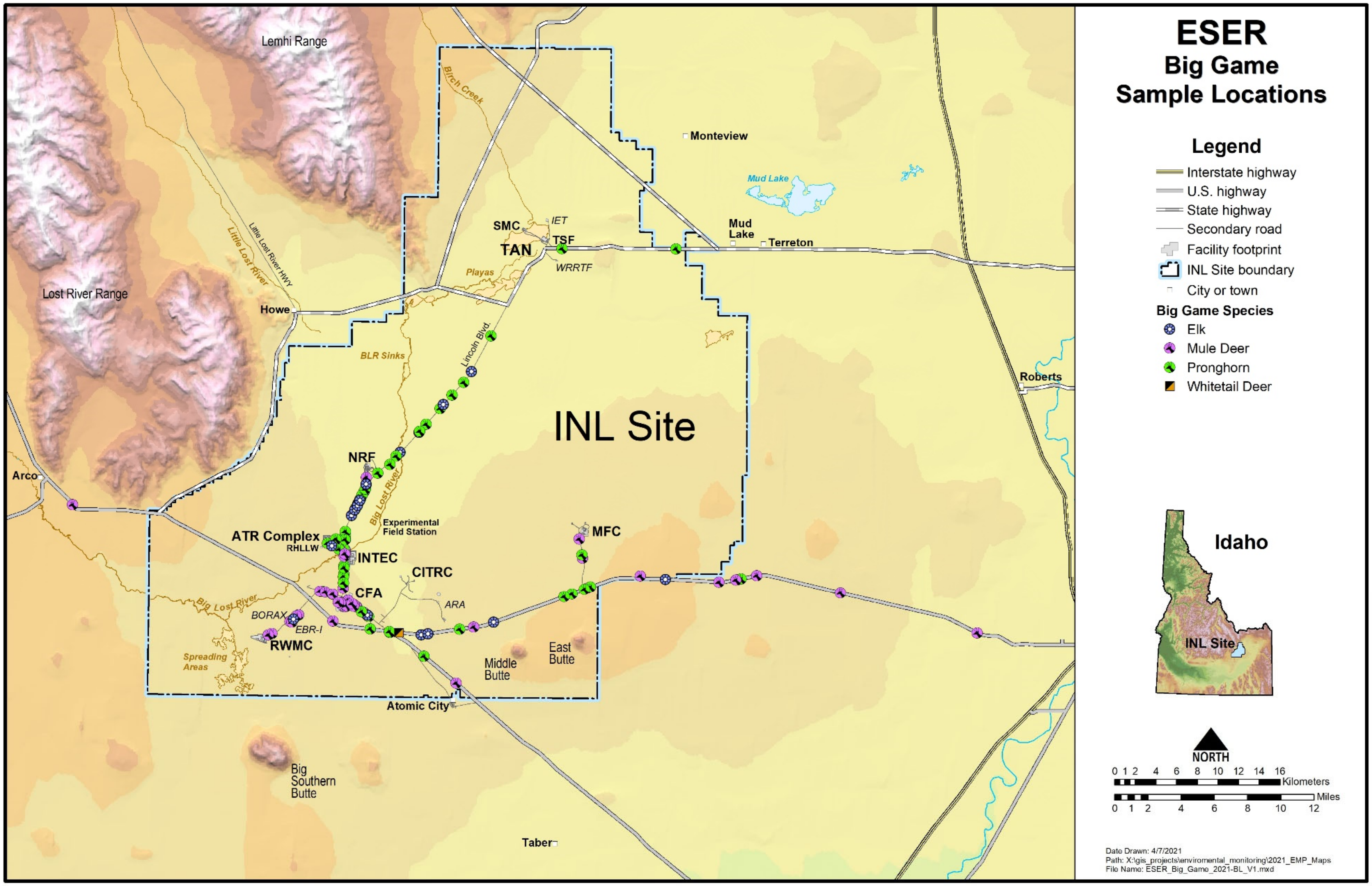

Figure 4-11. ESER big-game sample locations.

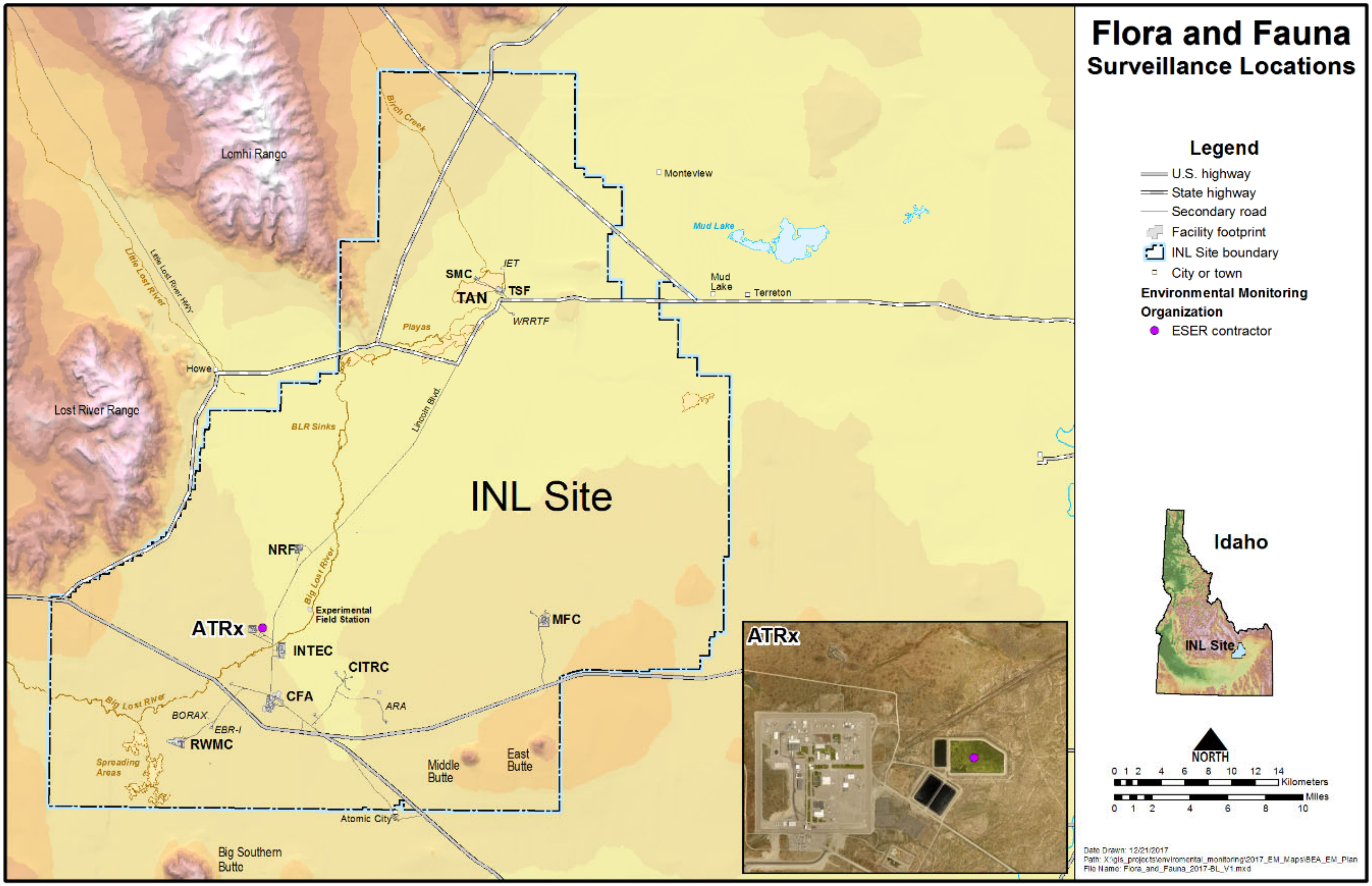

Figure 4-12. Flora and fauna monitoring locations.

4.7 Agricultural Products

The INL Site is located in a large agricultural area that produces products that are economically important to the state. These food products are monitored because they are a direct route of human exposure through ingestion. Milk, meat, and produce may become contaminated via atmospheric deposition, irrigation using contaminated water, and livestock ingesting contaminated water or feed. **Error! Reference source not found.** shows the locations where agricultural products are monitored. The ESER Program performs most of the agricultural monitoring in the vicinity of the INL Site. The agricultural products monitored are chosen because they are commonly consumed and are readily available for radionuclide analysis. The ESER Program procedures for milk, lettuce, wheat, potatoes, and alfalfa sampling provide details for the collection and processing of agricultural products.[36]

4.7.1 Milk

Milk is monitored at off-Site locations because it is a potential pathway to the public for radioactive materials from the INL Site activities, particularly radioiodine and Sr-90. Some samples are taken from single-family dairies; others are taken from commercial dairies. A dairy in Idaho Falls (crosswind location) and one in Terreton (downwind location) are sampled weekly; the rest are sampled monthly.

4.7.2 Lettuce

Lettuce from portable lettuce growers and local gardeners is collected at selected locations annually to measure the uptake of radionuclides from soil and deposition from air and because they are a part of the typical diet. Lettuce is a broad-leaf crop which is known to be a good interceptor of radionuclides in airborne particulates. Samples are analyzed for gamma-emitting radionuclides and Sr-90.

4.7.3 Potatoes

Although potatoes were not generally considered to be as good an indicator of radionuclide uptake as leafy vegetables, routine potato sampling was resumed in 1994 due to public interest in Idaho's most famous product. Potato samples are obtained annually from warehouses in the vicinity of the Site during harvest. Potatoes are also obtained from friends and relatives living out of state from areas as distant as Maine and Alaska to serve as control samples.

4.7.4 Wheat

Wheat is sampled because it potentially represents a major part of the typical diet. Wheat samples are collected and processed from several areas in southeastern Idaho. These samples are collected annually during harvest time at local grain elevators.

4.7.5 Alfalfa

Because milk cows could eat hay potentially contaminated by releases from the INL Site, alfalfa is collected downwind of the INL Site from Mud Lake/Terreton, Howe, and Idaho Falls. It is analyzed for gamma-emitting radionuclides.

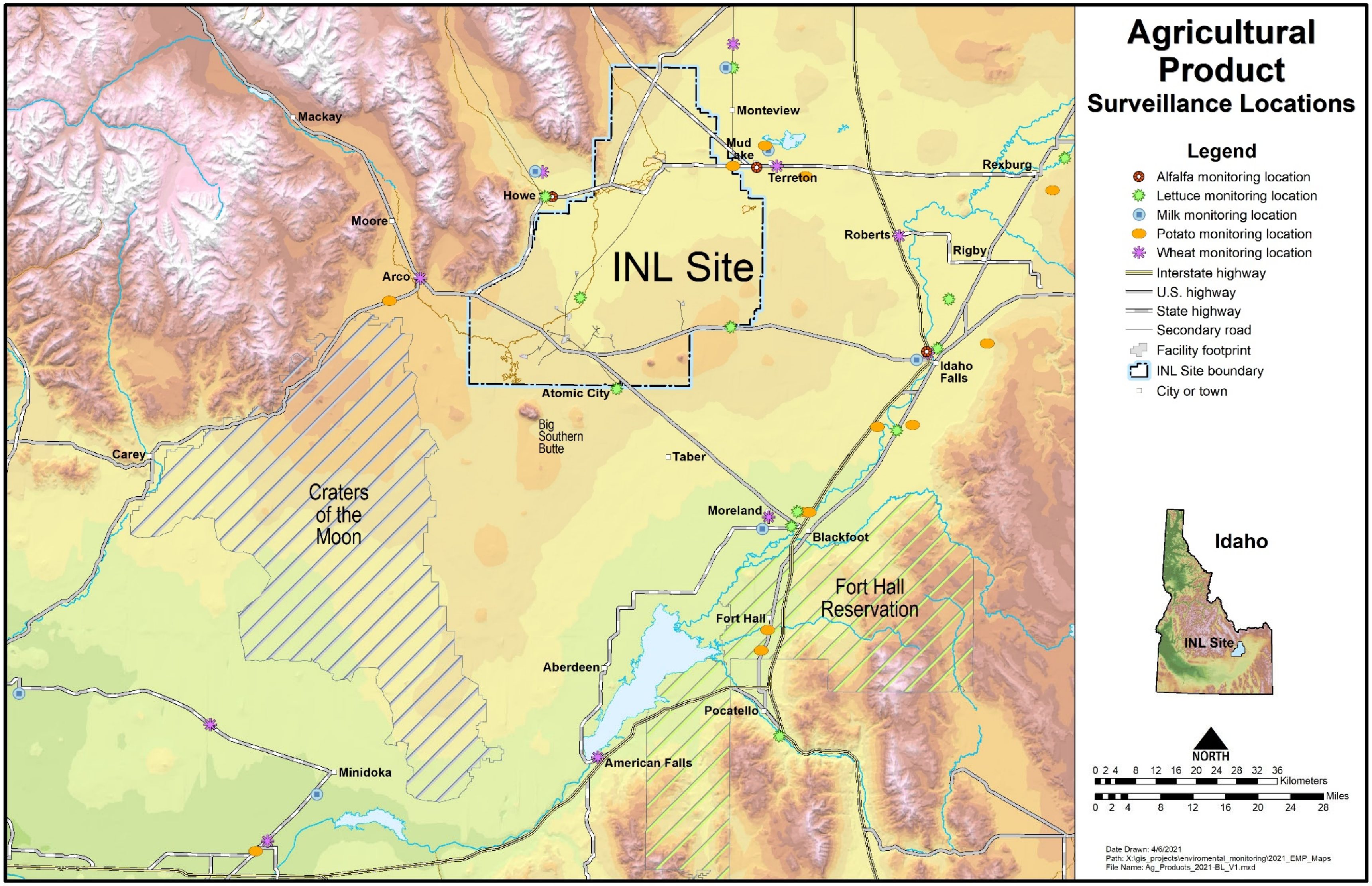

Figure 4-13. Agricultural-products monitoring locations.

4.8 External Radiation

External (or penetrating) radiation is measured using radiation dosimeters, pressurized ion chambers, and gamma-radiation detectors at facilities, roadways, and surrounding communities. Sources of external radiation include natural radioactivity, cosmic radiation, fallout from nuclear-weapons testing, radioactivity from fossil-fuel burning, and radioactive effluents from INL Site operations. The contribution of INL Site operations to background radiation exposure is determined by comparing exposures measured at the Site boundary locations to those at distant locations. Figure 4-14 shows the regional external-radiation monitoring locations, and Figure 4-15 shows detailed on-Site monitoring locations.

Radiation monitoring is performed at the INL Site to:

- Characterize penetrating-radiation levels at specific points of interest at waste-management facilities and at the perimeter of Site facilities
- Detect and report significant trends in measured levels of penetrating radiation.

To meet these objectives, INL Site contractors measure gamma-radiation exposure rates and cumulative exposures and perform gamma-radiation surveys both on- and off-Site.

Environmental dosimeters are used to measure cumulative exposures to ambient penetrating radiation for monitoring locations. The dosimeters measure changes in ambient exposures possibly attributed to handling, processing, transporting, or disposing of radioactive waste. The dosimeters are located along major highways, in surrounding communities, and around the perimeter fences of each major facility. The dosimeters are placed 0.9 m (3 ft) above ground and are collected and analyzed in May and November of each year to determine background exposures resulting from natural terrestrial sources, cosmic radiation, and fallout from testing nuclear weapons.

In addition to environmental dosimeters, a global-positioning radiometric-scanner (GPRS) system is used to conduct gamma-radiation surveys. These surveys measure gross gamma radiation and are used to identify general areas of radioactivity. Gamma-radiation surveys are used to screen soils that have become contaminated with gamma-emitting nuclides and to detect penetrating-radiation exposures outside the fenced areas from a variety of possible sources inside the facility.

The primary purpose of the ESER external-radiation monitoring program is to assess the actual external-radiation dose to an individual living at the INL Site boundary and to members of the public living beyond the INL Site boundary, within 50 miles of any Site facility.

The GPRS is mounted on a four-wheel drive vehicle. Annual gamma-radiation surveys are conducted around the perimeter of selected facilities on an annual schedule to document penetrating-radiation fields. Two plastic scintillation detectors identify contaminated areas, and both the global positioning system and radiometric data are recorded. Because these surveys involve facility perimeters, these monitoring locations are not displayed on either of the external radiation figures.

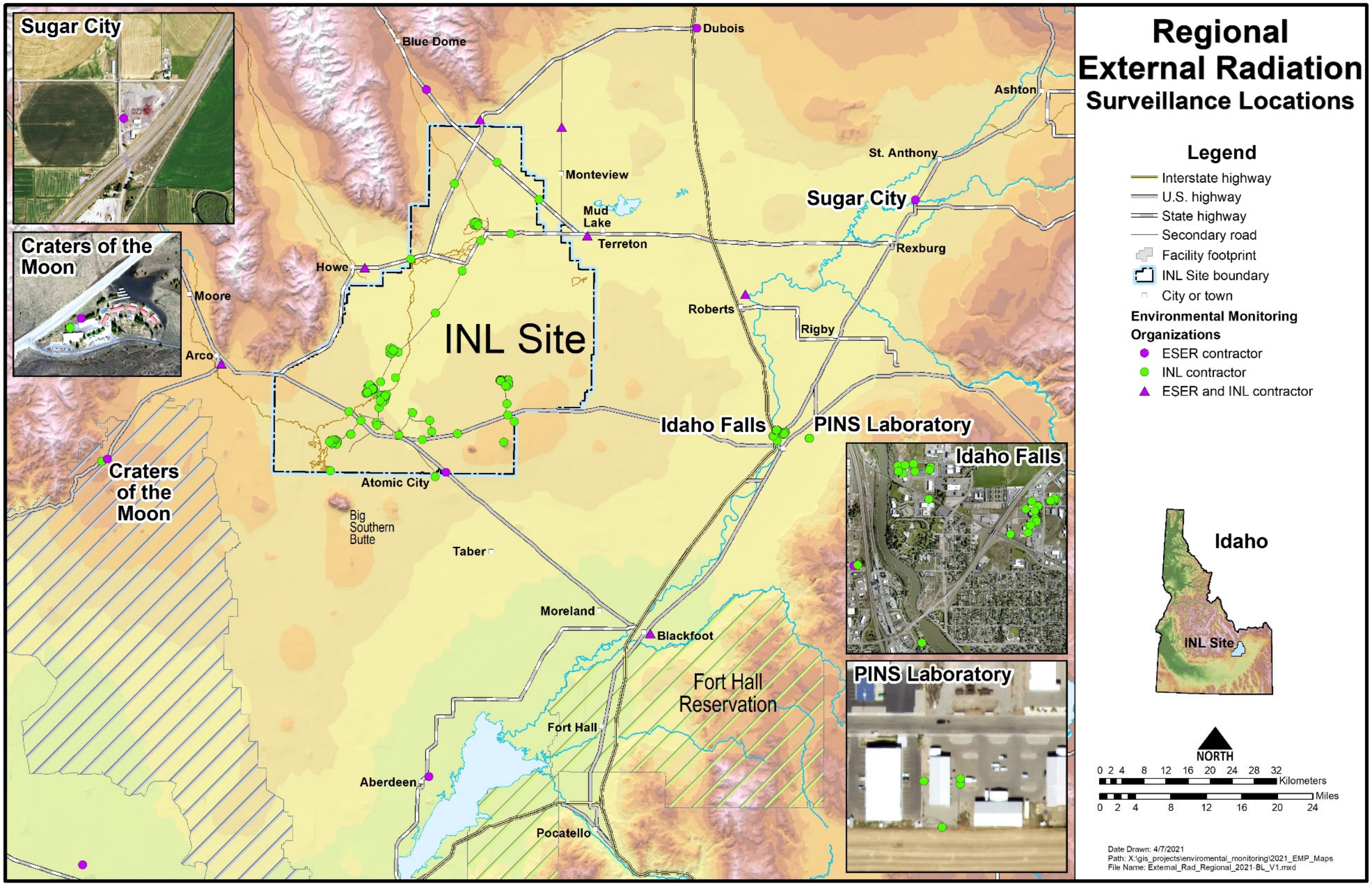

Figure 4-14. Regional external-radiation monitoring locations.

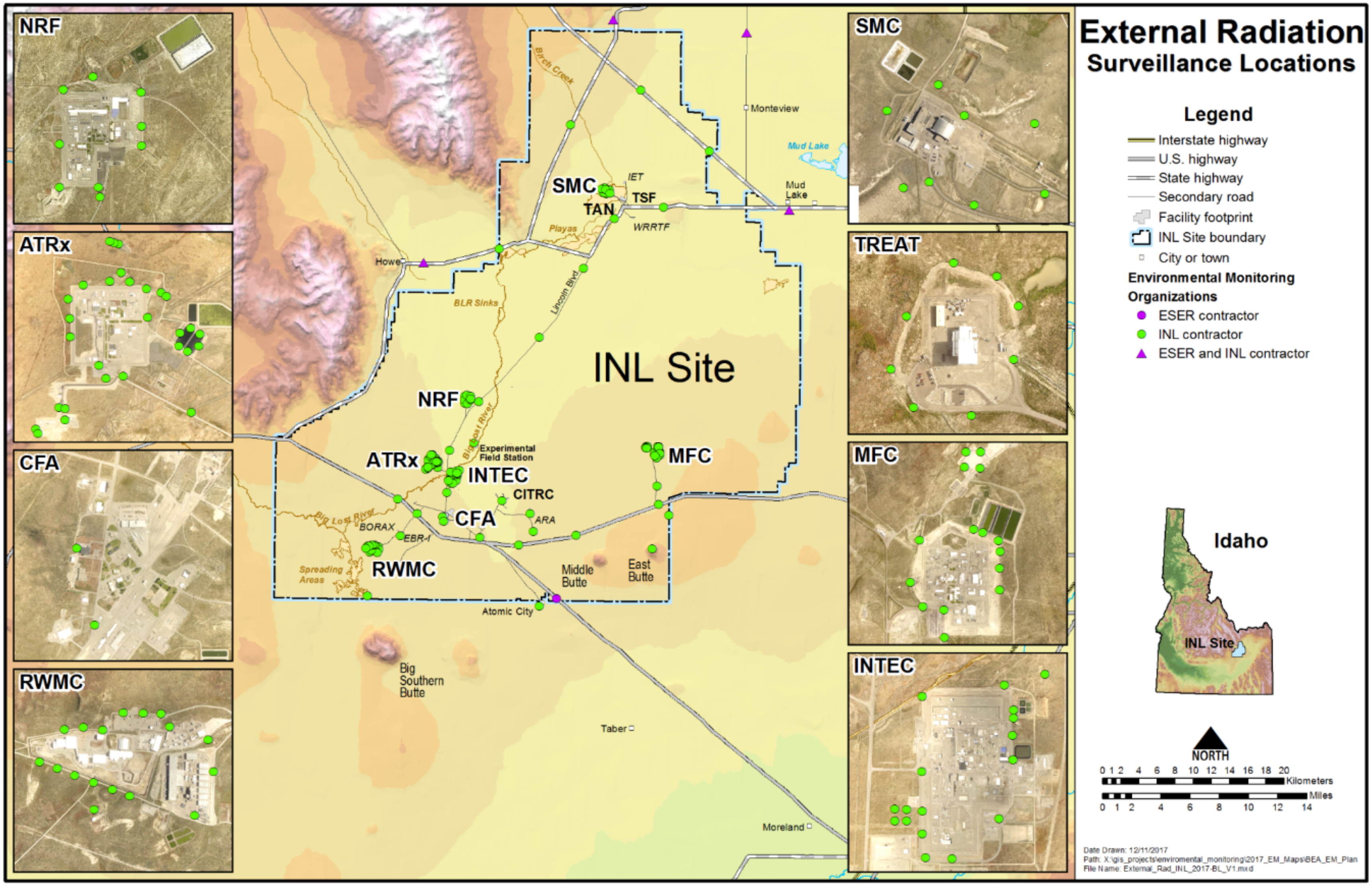

Figure 4-15. Detailed on-Site external-radiation monitoring locations.

4.8.1 INL Contractor

External-radiation monitoring is performed by the INL contractor as described in the PLN-8510[33] and associated procedures. Environmental dosimeters are maintained at locations on the Site along major highways, around the perimeter fences of each major facility, and at off-Site locations.

A GPRS is used for Sitewide radiological monitoring and emergency response. The GPRS units used are primarily for collecting long-term stewardship data and yearly monitoring of gross radiation levels at Site perimeters and roadways. These data are used to identify and analyze year-to-year trends.

4.8.2 ICP Core Contractor

External-radiation monitoring is performed by the ICP Core contractor as described in ICP Core PLN-720[26] and associated procedures. Annual surveys are conducted per DOE Order 435.1,[1] compliance requirements for detecting gross gamma radiation at the RWMC-ARP and around the ICDF. The survey is conducted using a vehicle mounted GPRS. The system uses a Trimble global-positioning system and two plastic scintillation detectors connected to a personal computer onboard the vehicle. The GPRS information data are differentially corrected and transmitted via satellites, and geographic coordinates (latitude and longitude) are recorded at least every two seconds. The vehicle is driven less than or equal to 5 miles per hour, with the detector height at 36 in. above the ground.

4.8.3 ESER Contractor

The ESER Program monitors external radiation at seven Site boundary and ten off-Site locations (see Figure 4-15) using environmental dosimeters. Two kinds of dosimeter systems are currently used—optically stimulated luminescent dosimeters (OSLDs) and thermoluminescent dosimeters (TLDs). OSLD technology is relatively new and involves absorption of ionizing radiation energy by trapping electrons which are excited to a higher energy band. The trapped electrons in the OSLD are released by exposure to a green light from a laser. TLDs have historically been used and involve crystals with impurities which when exposed to ionizing radiation are excited to higher states and remain there at normal ambient temperature. When TLDs are heated, electrons are released in the form of photon energy, which is measured with photomultiplier tubes. The crystal then returns to the lower state of energy. The primary advantage of OSLD technology compared with TLD technology is that the nondestructive reading of the OSLD allows for multiple readings of the dosimeter.

An OSLD and TLD is placed at each location 1 meter above the ground surface. The dosimeters are changed semiannually, normally in early May and again in early November. Conversion to OSLDs began in November 2010 when they were placed side-by-side with existing TLDs. Both kinds of dosimeters continue to be used in order to provide a comparative data basis. The Idaho State University Environmental Assessment Laboratory analyzes the TLDs. The four chips are read separately, and a mean response is determined for each set. This value is converted to the exposure in milliroentgen based on a detailed calibration procedure. The OSLDs are also analyzed by the Idaho State University Environmental Assessment Laboratory. Results read by the instrument are in units of mrem, ambient dose.

Dosimeter data are interpreted by comparing exposures measured at the boundary locations to those at distant locations.

4.8.4 NOAA

The NOAA ARLFRD is primarily responsible for meteorological monitoring at the Site (see Section 5). In the past, ARLFRD maintained its own external-radiation sensors at towers in the meteorological monitoring network, but these have been deactivated. All external-radiation sensors on the NOAA towers are owned and maintained by other organizations, as described in other parts of this section. ARLFRD collects these data together with the meteorological data so that the information can be simultaneously displayed using ARLFRD's meteorological display tool that is described in a following section. The ARLFRD's primary role with these sensors is to collect and display the data in near-real time.

4.9 Ecological Monitoring

The ESER Program conducts an array of ecological activities on the Site to provide ecological and natural-resources support to DOE-ID for land-management issues and to supply ecological information and expertise to support activities that affect natural resources. These activities include wildlife and vegetation surveys, revegetation, weed management, assessing potential impacts to ecological resources, and facilitating ecological research on the Idaho National Environmental Research Park.

Specific ecological monitoring work at the Site involves collecting data related to the abundance and distribution of certain species or groups of species. Results provide information on ecological conditions and trends at the Site that are used to:

- Provide assessments of the condition and trend of INL Site ecological resources
- Assess compliance with federal and state regulations and agreements
- Provide assessments of the likely impacts to ecological resources from human-caused or natural disturbances
- Propose mitigation for minimizing adverse impacts to ecological resources from Site activities
- Support long-term stewardship goal of conserving ecological resources
- Provide baseline data to support ecological research opportunities at the Idaho National Environmental Research Park.

Ecological monitoring data are provided in various technical reports and presented on the ESER web site at http://www.idahoeser.com. The data are reported to DOE-ID and various state and federal natural resource and agricultural agencies with whom the ESER Program collaborates.

4.9.1 Native Vegetation and Invasive Plants

Long-term Vegetation (LTV) transect plots were established in 1950 to monitor the potential effects of activities at the INL Site on ecological resources. Although they were established for that specific purpose, the LTV transect plots now provide one of the most significant data sets for understanding vegetation dynamics in sagebrush steppe. These plots are among the most intensive and scientifically rigorous efforts by any agency to document long-term changes in sagebrush steppe. This monitoring provides information on plant community-level changes at a landscape level. Initially, 100 permanent plots were established on two intersecting transects (see Figure 4-16). These plots are surveyed at 5-year intervals. Data collected at each plot include cover by line-intercept and point-interception frame and density and frequency.

Beginning in 2013, additional vegetation data were collected to characterize habitat quality for sage-grouse. A total of 225 plots are monitored—75 annually, and each of the remaining 150 on a 5-year rotation to provide information on abundance and distribution of native and non-native plants.

In 2011, the ESER Program completed a comprehensive vegetation map of the INL Site using a standardized approach that is commonly accepted across several federal land-management agencies. This mapping methodology utilizes the National Vegetation Classification System and involves three steps. The first step is collection of plot-level vegetation abundance and structure data and classifying those data into vegetation, or map classes, using multivariate statistical techniques. The second step includes acquisition of aerial imagery and delineating vegetation-class polygons using photo interpretation of the imagery. The final step of the process involves collecting independent field data to verify the accuracy of the final map. This is an important step for informing map users about the strengths and potential limitation of the map. The INL Site vegetation map has become one of the most important ecological data sets for the INL Site, and it is used extensively to support National Environmental Policy Act compliance, habitat assessment, and post-fire restoration planning. The vegetation map is intermittently updated to provide current sagebrush habitat estimates and comprehensive updates, which include reclassification of vegetation that occur every 5–10 years.

To improve sagebrush habitat in burned areas, sagebrush seedlings are planted in high-priority restoration areas every year. These seedlings are monitored for survivorship at 1- and 5-year post-planting intervals. Survivorship monitoring provides valuable information about the potential trajectory of habitat recovery in a planted area and survivorship estimates can be used to improve the success of future plantings.

Finally, vegetation monitoring often occurs for a few years after a fire in areas that have burned. Monitoring efforts in those areas are specifically tailored to the natural-resource concerns and recovery goals for the location. Cheatgrass abundance and sagebrush reestablishment are two of the vegetation metrics most often monitored after a wildland fire on the INL Site.

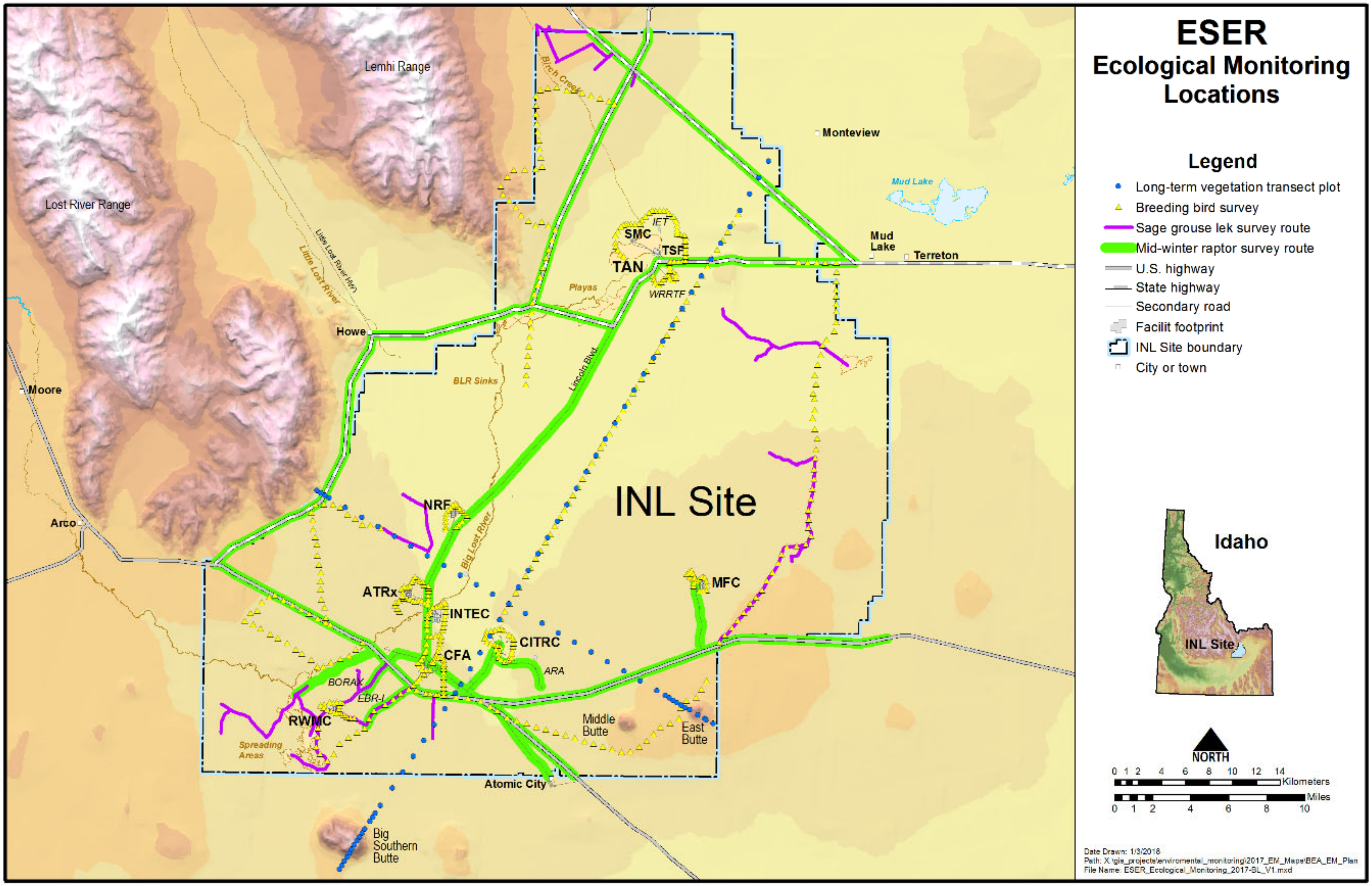

Figure 4-16. Select ESER Program ecological-monitoring locations.

4.9.2 Mammals

Surface lava features on the INL Site present a diversity of rocky habitats, including an abundance of lava-tube caves, used year-round by resident and transient bat species. The regional importance of the INL Site for bats has long been recognized, and as a result, researchers have investigated bat populations at the INL Site since the 1970s. Some of the largest known hibernation sites for several bat species are found on the INL Site. Recently, white-nose syndrome (WNS) has been identified as a major threat to many bats that hibernate in caves. WNS is a disease caused by a cold-adapted fungus (*Pseudogymnoascus destructans*). Since its discovery in 2006, WNS has rapidly spread to bat populations in most large hibernation sites in the eastern half of the U.S. and Canada.

The U.S. Fish and Wildlife Service (USFWS) estimates that WNS has killed between 5.5 and 6.7 million bats of seven species. This disease has been labeled by some as the greatest wildlife crisis of the past century, and many species of bats could be at risk of significant declines or extinction due to this disease. In 2016, WNS was detected in a bat in Seattle, Washington (1,300 miles away from the nearest known infection). Although not yet detected in Idaho, several species of bats on the INL Site could be affected by WNS. One of these species, little brown myotis (*Myotis lucifugus*) is undergoing a status review for emergency listing under the Endangered Species Act (ESA). Two additional species that occur on the INL Site, the western small-footed myotis (*Myotis ciliolabrum*) and western long-eared myotis (*Myotis evotis*) are the western counterparts of the eastern small-footed myotis (*M. leibii*) and northern long-eared myotis (*M. septentrionalis*).

In 2015, the northern long-eared myotis was listed as threatened under the ESA, and the ESER Program developed a bat monitoring program on the INL Site in collaboration with the USFWS and Idaho Department of Fish and Game (IDFG). Bat monitoring supports analysis of baseline conditions of spatial and temporal distribution and diversity of bat species at the INL Site, as well as allowing DOE to track future trends. Initial work led to the development of an INL Site bat-protection plan, which is intended to support planning and reduce mission impacts (if a bat species is listed under the ESA) by directing a program of bat conservation based on acoustic monitoring at long-term monitoring stations, biennial hibernaculum surveys, and surveillance for the appearance of WNS in INL Site bat populations.

The INL Site provides summer range, winter range, calving or fawning areas, and migration corridors for a variety of big-game species. DOE-ID has collected decades of baseline data on big-game populations and movements on the INL Site and has collaborated with its regional agency partners on larger-scale efforts. Historically, large mammal surveys through 2011 were conducted in January and July each year to estimate abundance and distribution of elk, deer, and pronghorn antelope. The surveys were done from the air on a representative sample of transects. Data were collected in a manner that is comparable with those collected by neighboring agencies (i.e., IDFG, Bureau of Land Management, and U.S. Forest Service). From 2010 through 2012, the scope of the big-game surveys was changed from conducting flights across the INL Site to placing global-positioning system collars on elk. This study provided defensible and reliable data for National Environmental Policy Act documents and enable a more-complete and reliable assessment of impacts from infrastructure development, roadway accidents, and wildfires. This study provided information on migratory corridors, agricultural-area use, and contaminant-area use and evaluation of potential radionuclide contamination of human receptors off the INL Site. Currently, regional big-game surveys are conducted by neighboring agencies with DOE-ID (though ESER) providing collaborative support to our agency partners as needed.

4.9.3 Birds

In October 2014, DOE-ID and the USFWS entered into a Candidate Conservation Agreement (CCA) for greater sage-grouse (*Centrocercus urophasianus*). The CCA provides a framework for monitoring greater sage-grouse and their habitat on the INL Site and tracking potential effects of INL Site operations on greater sage-grouse populations and habitat. The CCA is implemented through a series of delineated tasks and annual reporting to USFWS. Greater sage-grouse populations on the INL Site are monitored annually by surveying their use of leks on six routes. All sagebrush habitat within 3.1 miles of a lek is considered a potential nesting and early brood-rearing habitat on the INL Site.

Greater sage-grouse lek routes (see Figure 4-16) are monitored weekly for a minimum of 4 weeks, beginning in March. The surveys are conducted by visiting those leks at dawn and counting the number of individual birds. The methods used provide comparable data to those collected by neighboring agencies and the data collected are shared with them. As directed by the CCA, additional lek surveys are conducted in the spring to identify all active leks on the INL Site.

Beginning in 2012, raven nests have been inventoried and monitored for nest success. Ravens have been reported to be important predators on greater sage-grouse eggs and chicks. Ravens often use infrastructure as nesting sites. These include buildings, power poles, chimneys, stacks and other vertical structures. Monitoring raven-nest occupancy along established routes can be used to develop nest deterrents and evaluate their effectiveness. Raven nest routes are monitored from April 1 to May 31. Annual raven nest surveys are directed by the CCA.

Raptors are surveyed annually on the Site through mid-winter raptor counts in collaboration with the USGS. Raptor populations tend to fluctuate with slight changes in the environment, such as prey availability and weather conditions. Therefore, they are often used as environmental indicators to determine effects of human development on the environment and the general health of the ecosystem. INL Site raptor surveys are conducted in conjunction with the nationwide USGS Mid-Winter Bald Eagle Survey. The ESER Program surveys two official USGS Mid-Winter Bald Eagle Survey routes (see Figure 4-16). In addition to surveying for bald eagles, ESER Program surveys include all eagles, hawks, falcons, shrikes, owls, ravens, crows, and magpies.

The Breeding Bird Survey (BBS) is a large-scale survey of North American birds. It is a roadside route survey of avifauna designed to monitor abundance and distribution of birds primarily covering the continental U.S. and southern Canada. It is administered by the USGS. These surveys yield useful information about population dynamics, effects of weather and fire on avian abundance, effects of INL Site operations on avifauna, and the breeding status of several bird species of concern, including sagebrush obligate species and other species exhibiting declines throughout their range. Thirteen BBS routes are surveyed on the Site (see Figure 4-16). Five remote routes are standard 40 km (25 mi) BBS routes, data from which are reported to the USGS annually. These routes traverse the remote areas of the INL Site and include major habitat types throughout the Site. Eight facility routes are in and around major Site facility complexes. Each remote route consists of 50 stop locations at approximately 0.5 mi (0.8 km) intervals. Facility routes consist of 18–60 stop locations at approximately 0.2 mi (0.32 km) intervals. The data collected are comparable to those collected by other neighboring agencies.

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5. METEOROLOGICAL MONITORING

The meteorological monitoring program supports laboratory-wide environmental monitoring activities as well as emergency response. Short- and long-term weather conditions have a substantial effect on the INL Site environment, particularly with respect to the movement of contaminants in air and the groundwater system. Meteorological monitoring is performed to record weather conditions such as wind speed and direction, temperature, and precipitation so that this information may be used with predictive models to estimate the concentration of contaminants after they have been released to the environment. Meteorological monitoring results are also used to plan environmental measurement programs or for modeling required for compliance with air-quality regulations. For example, the Site contractors perform modeling to show compliance with ambient-air-quality regulations and to comply with requirements to estimate off-Site dose (see Section 9 for a discussion of dose-assessment modeling). Figure 5-1 shows the meteorological monitoring locations.

Results of past work related to the tower network are summarized in DOE-ID-12118[6] and DOE-ID-12119.[31]

5.1 NOAA

Meteorological services and supporting research are provided to the INL Site by the NOAA ARLFRD. The ARLFRD provides real-time meteorological data, climatological data, weather predictions, and dispersion calculations for routine operations and emergency response.

The ARLFRD operates a meteorological-monitoring network that covers an area of approximately 3,885,000 hectares (15,000 mi^2) to characterize the meteorology and climatology of the INL Site. The network consists of 35 meteorological towers both on and around the Site. Most of the towers are 15 m (50 ft) tall and take wind speeds and direction measurements at 15 m (50 ft), temperatures at 2 m and 15 m (6 and 50 ft), and relative humidity at 2 m (6 ft) above ground level. Three taller towers range from 46 m to 76 m (150 ft to 250 ft) high and are instrumented at multiple levels. Many towers have additional sensors for precipitation, solar radiation, and barometric pressure. All the tower measurements are averaged over 5-minute periods and transmitted to ARLFRD in near real-time via radio-frequency communication.

In addition to the meteorological towers, ARLFRD operates a 915-MHz radar wind profiler with a radio acoustic sounding system at a site just north of INTEC. These systems provide wind speed and direction profiles up to about 4 km (2.5 mi) above ground level and temperature profiles up to about 1 km (0.6 mi) above ground level, thereby providing crucial information about winds and temperatures aloft. More recently, ARLFRD added a mini sonic detection and ranging (Sodar) system capable of providing high-resolution wind and turbulence measurements up to 200 m (650 ft) above the ground.

The ARLFRD has also developed a program called INLViz to display data in near real-time from the tower network and the vertical profilers. INLViz has been installed at many office locations both within and outside the INL Site. At this time, INLViz is being phased out in favor of web-based displays of the network data. A real-time display of the meteorological data is publicly available on the Internet at http://www.noaa.inel.gov. In addition, ARLFRD now maintains an INL Site Weather Center at http://niwc.noaa.inel.gov that provides a range of meteorological information relevant to the INL Site.

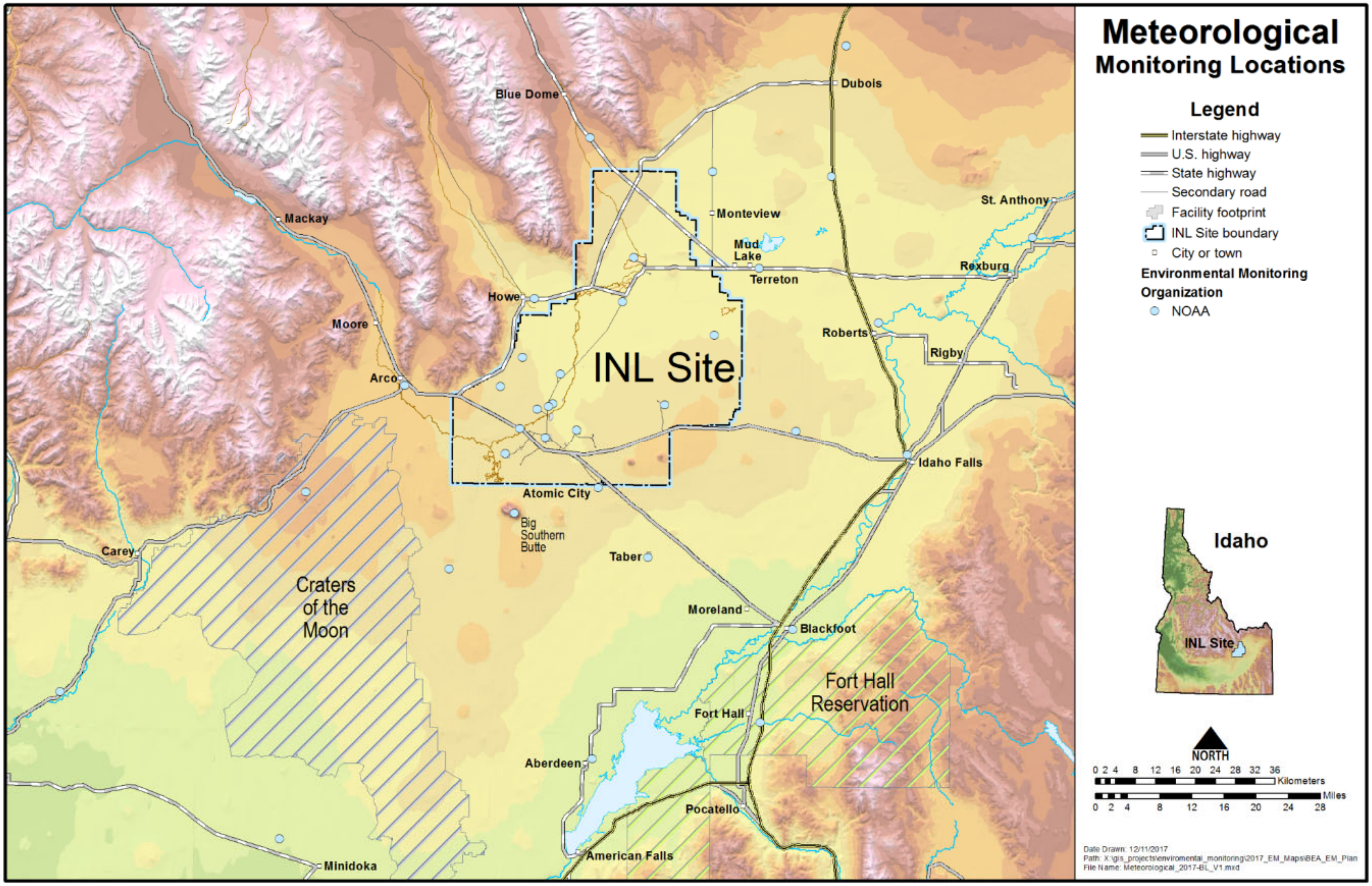

Figure 5-1. Meteorological monitoring locations.

6. ENVIRONMENTAL EVENT MONITORING

Environmental-event monitoring is an essential part of safe operations because of the potential impacts a release of radioactive or regulated materials from Site facilities, either from unplanned accidental operational events or natural events, could have on the environment and the public. Environmental events at the Site can be widespread (e.g., a wildland fire spread by high winds) or facility-specific (e.g., a chemical spill limited to a small area immediately around the spill). Data from event-specific monitoring are used to evaluate the potential impact of an event to personnel, the environment, and the public.

Responses to environmental events vary depending on the severity of the event and are conducted by the responsible contractor. The INL contractor responds to all events. Figure 6-1 shows the locations of samplers specifically intended for use during an environmental event. Locations of portable or routine samplers are not shown.

6.1 Response to an Emergency or Unplanned Release

The INL Site has an extensive program to identify chemical and radioactive hazards, evaluate associated risks, prevent accidental releases, and respond appropriately in the event of a release. This comprehensive INL Site Emergency Preparedness Program is addressed in PLN-114, “INL Emergency Plan/RCRA Contingency Plan.”[50] The plan is used by the Emergency Response Organization and other trained personnel in the event of an emergency and provides the overall process for responding to and mitigating consequences of emergencies that might arise at the Site. Emergency plans for the INL Site consolidate all emergency-planning requirements for federal, state, and local agencies. Mutual aid agreements are in place between the INL and state and local agencies to respond to emergencies. One such agreement allows local fire departments to respond to fires on the Site and allows the INL fire department to respond to fires off-Site.

In the event of an emergency or unplanned release, anthropogenic or natural radioactivity can be released into the air. These releases could result from direct atmospheric release from a facility, or by redistribution by fire or winds of anthropogenic or natural radioactivity contained in soil and vegetation. During such events, the INL contractor collects field data. Data collected include readings of penetrating radiation levels, airborne and surface-contamination levels, and radiation surveys outside of facility fences. Three types of air samples can be taken during environmental events that are declared operational emergencies or which involve soil-contamination areas:

- Immediate short-term “grab” samples
- Stationary 24-hour samples at strategic locations specific to the event
- Routine environmental samples taken at standard locations (continuous monitoring).

Field data results are reported to the Emergency Response Organization.

The plan also includes spill-prevention and response requirements for each facility. Spills and releases are reported to the Spill Notification Teams. The Spill Notification Teams determine if the spill or release is reportable and assists operations in making appropriate release notifications.

6.1.1 ICP Core

The ICP Core Spill Notification Team is responsible for release notifications in accordance with federal and state regulations, DOE orders, executive orders, and company requirements. The ICP Core Spill Notification Team provides 24/7-coverage. The team documents all spills at ICP Core facilities, determines whether releases are reportable, documents required information, determines thresholds, and makes release notifications within prescribed timeframes.

RWMC-AMWTP has installed ANSI N13.1-1999[23] compliant monitors with alarms on two stacks at the RWMC-AMWTP. If the stack monitors initiate an alarm, RWMC-AMWTP will respond using a graded approach to minimize the release by switching filter banks and/or shutting down the processes

6.1.2 INL

High-volume air samplers owned and maintained by Environmental Support and Services (ES&S) are located at sixteen of the ARLFRD towers operated by NOAA, as shown in Figure 6-1. These samplers are intended for use in the event of a radiological accident at the Site and are not used for routine environmental monitoring. Samplers can be turned on and off remotely upon request from personnel by an operator stationed at ARLFRD or in the Emergency Operations Center (EOC).

Short-term grab samples can be taken in the field by the ES&S Monitoring Services organization to provide gross radiation levels for early indication of event conditions. The grab samples are taken using portable high-volume air monitors to assess exposure potentials, verify the effectiveness of on-Site protective actions, and determine the need for off-Site protective actions. The high-volume air monitor locations are selected by the EOC based on wind direction and conditions specific to the event. High-volume air monitors are capable of drawing large quantities of air through a particulate filter over a short period of time (approximately 15 minutes). Monitors are used to detect gross alpha and beta emitting radionuclides. Screening results of short-term samples are generally available within 1–2 hours after samples are collected.

The INL contractor maintains, at fixed locations, a monitoring network of low-volume air samplers that take continuous air samples. Results from these routine environmental samples are used to supplement other event-specific measurements to determine and document the nature and quantity of any radioactive material detected in ambient air on and around the INL Site.

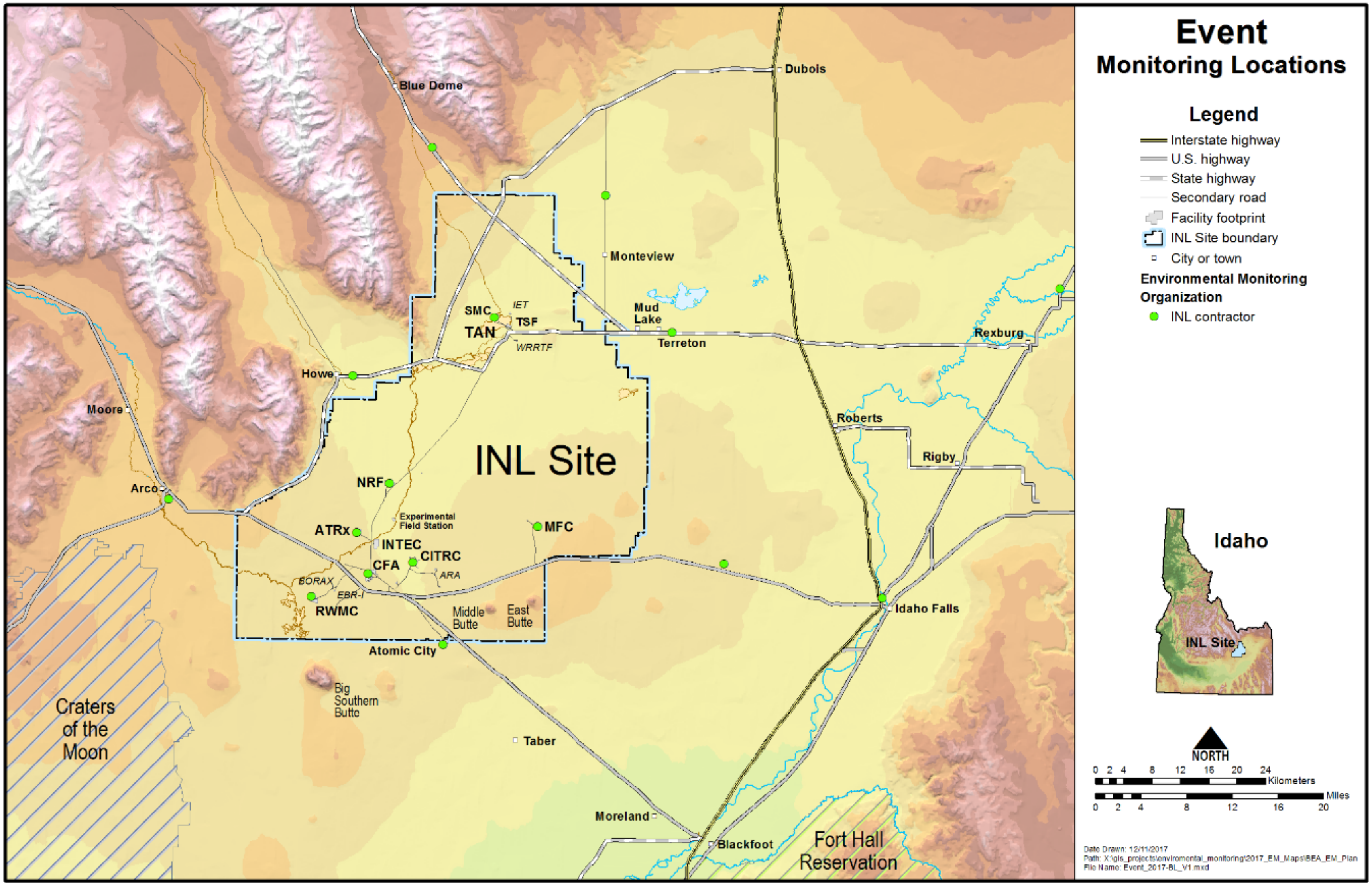

Figure 6-1. Event-monitoring locations.

6.2 Response to an Exceedance

Each INL contractor maintains its own plans or procedures to ensure that appropriate, timely notifications to appropriate authorities occur and that corrective actions are taken in the event that monitoring results exceed a regulatory limit or, in some cases, a preset trigger level. Specific actions—to be taken when validated monitoring results are above certain trigger levels—are identified in the applicable permits and regulations (e.g., RCRA, Reuse Permits, Safe Drinking Water Act[38]). These actions include reporting any exceedances to the appropriate federal, state, or local agencies, along with initiating appropriate corrective actions in a timely manner. The types of corrective actions could vary depending on the specific regulation and could include follow-up analysis or confirmation sampling, removing a potable water well from service, or remedial action.

For reportable occurrences, specific actions to be taken are identified in the DOE Order 231.1B, *Environment, Safety and Health Reporting*,[47] which establishes reporting requirements and categorizes releases of radionuclide and hazardous substances or regulated pollutants. Taking the following general steps when responding to an environmental data exceedance will ensure that coordinated actions are taken and INL Site stakeholders are notified in a timely manner:

1. Discover, confirm, and make initial notification.
2. Categorize environmental data exceedance.
3. Determine and initiate appropriate response.
4. Complete necessary reporting and notification.

7. REPORTS

General reporting requirements for effluent- and environmental-monitoring activities at the INL Site are outlined in DOE Order 231.1B[47] and DOE Order 458.1.[2] These orders specify the reporting responsibilities, timing, and distribution of several routine environmental reports. The requirements for preparing and distributing accident-related or unusual-occurrence reports are included in DOE Order 231.1B.[47]

The following are the principal objectives of DOE's reporting system, as stated in DOE-HDBK-1216-2015:[4]

- Alert DOE management to occurrences for the purpose of investigating and evaluating causes and identify appropriate measures to prevent recurrences
- Obtain early, complete, and factual information on occurrences as a basis for reports to the Secretary of Energy, Congress, other federal agencies, and the public, as appropriate
- Identify trends in areas of concern for DOE and contractor operations
- Provide a basis for improving codes, guides, and standards used in the DOE and contractor operations
- Monitor, evaluate, and report on-Site discharges, liquid and airborne effluents, and environmental conditions in the vicinity of DOE sites to assess the levels of radioactive pollutants and their impact on the public and the environment
- Comply with regulations and DOE orders.

Compliance-monitoring data driven by specific permits or regulatory requirements are reported to federal, state, and local agencies in formats and frequencies specified by the respective regulatory document. Table 7-1 lists effluent and environmental monitoring reports at the INL Site.

Table 7-1. Effluent monitoring and environmental monitoring reports at the INL Site.

Report Title	Frequency	Summary Description
Annual Site Environmental Report	Annual	Summarizes DOE, USGS, and contractor data from environmental monitoring activities and data from monitoring programs. Includes a yearly environmental compliance summary for the INL Site.
INL Offsite Environmental Surveillance Program Reports	Quarterly	Reports results of offsite monitoring under the ESER Program including air, agricultural, external radiation, soil, water, and wildlife sampling.
INL Oversight Program Environmental Surveillance Program Reports	Quarterly	Presents quarterly environmental data results and associated quality assurance data.
	Annual	Summarizes trends in environmental data and compares data collected by the INL Oversight Program, contractors, and the USGS for selected sample locations.
Injection Well Monitoring Reports	As Required	Provides the analytical results from monitoring of storm water runoff discharged to injection wells.
Semi-Annual Report for the HWMA/RCRA Post Closure Permit for the Waste Calcining Facility at INTEC	Semiannual	Summarizes the analytical results from HWMA/RCRA groundwater monitoring conducted for the Waste Calcining Facility Post Closure Permit.
USGS Scientific Investigations Reports	Every Three Years	Summarizes USGS data, describes hydrologic conditions and distribution of selected constituents in groundwater and surface water in and around the INL Site.
Reuse Site Performance Reports for the INL Site	Annual	Reports required information for each permitted Reuse facility to include (a) all permit monitoring data (b) status of any permit special compliance conditions, (c) interpretive discussions of monitoring data with respect to environmental impacts by the facility.
Monthly and Semiannual Liquid Effluent Reports to the City of Idaho Falls	Monthly and Semiannually	Monthly pH logs and semiannual monitoring reports from the IRC effluent to the city of Idaho Falls sewer system.
Storm Water Discharge Monitoring Report	As Required	Reports storm characteristic information and all analytical results from National Pollutant Discharge Elimination System permit monitoring.
CERCLA 5-Year Review Reports	Every Five Years	Reports overall effectiveness of remedial actions covered by a CERCLA ROD.
CERCLA Post-Record of Decision Monitoring Reports	As Specified in ROD	Summarizes data collected in support of remedial actions and long-term monitoring.

7.1 ICP Core and INL Reporting Requirements

The INL and ICP Core contractors are responsible for reporting requirements for their respective facilities regarding:

- Source-specific and Sitewide air permits required for compliance with Public Law 91-604, *Clean Air Act Amendments of 1990*[15] and with IDAPA 58.01.01, *Rules for the Control of Air Pollution in Idaho*[16]
- Permits required for compliance with IDAPA 58.01.17, *Recycled Water Rules*[18]
- Permits required for compliance with IDAPA 37.03.03, *Rules for the Construction and Use of Injection Wells in the State of Idaho*[37]
- Laboratory-wide permits and records required under the RCRA: Public Law 94-469, *Toxic Substances Control Act*;[48] 42 USC 11001, *Emergency Planning and Community Right-to-Know Act*;[49] and 7 USC 136, *Federal Insecticide, Fungicide, and Rodenticide Act*[50]
- 42 USC 9601, *Comprehensive Environmental Response, Compensation, and Liability Act*[13]
- Public Law 104-182, *Safe Drinking Water Act Amendments of 1996*[38]

The INL contractor is also responsible for reporting requirements associated with the following:

- City Order Chapter 1, Section 8, *Permits required for compliance with City of Idaho Falls Sewer Ordinance and Municipal Stormwater Discharge Permit*.[29]

7.2 ESER Program Reporting

The ESER Program prepares the ASER each calendar year with input from the various organizations performing environmental monitoring on and around the INL Site. The ASER is available electronically, summarizes data from effluent-monitoring programs and environmental-monitoring activities, and includes a yearly environmental compliance summary for the INL Site. The ASER is prepared as required by DOE Order 231.1B.[47]

The ESER Program prepares quarterly reports summarizing off-Site monitoring results and distributes these electronically. Topical reports summarizing trends in data for a particular medium or dealing with other environmental-monitoring subjects are produced periodically.

The ESER Program also maintains an environmental public-communications and education program. Articles covering environmental monitoring and other ESER Program activities are published in the ESER Program newsletter and in press releases. The ESER Program has established a web site at http://www.idahoeser.com containing information on the various aspects of the program, all ESER Program data, and recently published reports.

7.3 USGS Reporting

All data collected by the USGS INL Project Office are publicly available after review. Most data are published in periodic data reports and used in interpretive reports. The ASER contains an appendix that lists the abstracts of USGS publications for the calendar year. The USGS National Water Information System website is open to the public. This system permits public electronic access and retrieval of USGS water data, including groundwater and water-quality data. The web site address is https://waterdata.usgs.gov/id/nwis/.

7.4 NOAA Reporting

The NOAA-ARLFRD, *Quality Program Plan, NOAA Air Resources Laboratory Field Research Division*,[51] addresses the requirements of DOE Order 414D, *Quality Assurance*,[8] and is consistent with ANSI/ANS-3.11-2015*,* "Determining Meteorological Information at Nuclear Facilities."[52] Implementing procedures include regular, independent system and performance audits, written procedures and checklists, follow-up actions, and continuous automated and visual data checks to ensure representation and accuracy. The plan and implementing procedures provide the framework to ensure that the INL Meteorological Monitoring Network meets the elements of the DOE-HDBK-1216-2015[3] and DOE Order 458.1.[2]

Network meteorological data are transmitted every five minutes from each station in NOAA's meteorological network via radio to the central ARLFRD facility in Idaho Falls. The data receive nearly continuous monitoring and quality-control screening. Data are recorded on electronic media and stored in a dedicated, computerized archive, with backup media maintained as recommended by the DOE-HDBK-1216-2015.[3]

The ARLFRD's data specific to the INL Site are available in near real time, electronically, at http://niwc.noaa.inel.gov/. Results of past work are summarized in DOE/ID-12118[6] and DOE/ID-12119.[31]

8. QUALITY ASSURANCE

An effective quality assurance (QA) program is essential to the collection of quality data. This section presents QA procedures and practices used as part of the effluent- and environmental-monitoring programs. This section does not provide a QA plan for monitoring at the INL Site; rather, it defines QA requirements applicable to environmental programs. Each monitoring organization incorporates the required components into its QA documentation for environmental monitoring.

The primary policy, requirements, and responsibilities for establishing and maintaining plans and actions that ensure QA in DOE activities are provided in DOE Order 414D,[8] *Quality Assurance*;10 CFR 830, Subpart A, *Quality Assurance Requirements*;[53] and American Society of Mechanical Engineers (ASME) NQA-1-2004, *Quality Assurance Requirement for Nuclear Facility Applications*.[54] The ASME NQA-1-2004 is the preferred standard for activities at nuclear facilities. Additional QA program requirements found in 40 CFR 61, Appendix B,[22] must be met for all radiological air emission sources continuously monitored for compliance with 40 CFR 61, Subpart H.[5]

The EPA policy on QA plans is based on the national consensus standard ANSI/ASQC E4-1994, *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs*.[55] The EPA approach to data quality centers on the data quality objective process. Data quality objectives are project dependent and are determined based on the data users' needs and the purpose for which data are generated. Quality elements applicable to environmental monitoring and decision-making are specifically addressed in EPA/240/B-01/003, *EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5)*.[56] These elements are included in the following general categories:

- Project management
- Data generation and acquisition
- Assessment and oversight
- Data validation and usability.

8.1 QA Requirements

The QA procedures are designed to ensure sample integrity, precision, and accuracy in the analytical results and to ensure that the environmental data is representative and complete. The following subsections describe how each monitoring organization implements the above QA requirements.

8.1.1 INL Contractor

The INL contractor integrates applicable requirements from Manual 13A*, Quality and Requirements Management Program Documents*,[57] into the implementing monitoring program plans and procedures for non-CERCLA monitoring activities. The program's plans address the QA elements, as stated in EPA/240/B-01/003,[56] to ensure that the required standards of data quality are met.

In addition, the INL contractor uses a documented approach for collecting, assessing, and reporting environmental data. Environmental surveillance and compliance monitoring are conducted in accordance with PLN-8510,[33] PLN-8515, "Data Management Plan for the INL Environmental Support and Services Monitoring Services Program,"[58] and PLN-8550[34] in order to assure that analytical work for environmental and effluent monitoring supports data-quality objectives.

8.1.2 ICP Core Contractor

All CERCLA monitoring activities at the INL Site are conducted in accordance with DOE/ID-10587, *Quality Assurance Project Plan (QAPP) for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10 and Removal Actions*.[59] The Quality Assurance Project Plan was written in accordance with EPA/540/G-89/004, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Office of Emergency and Remedial Response*.[60] In addition, the ICP Core contractor uses:

- PLN-720[26]
- PLN-729[30]
- PLN-730[40]
- PLN-1305, "Groundwater Monitoring Program Plan"[61]
- PLN-1373, "Groundwater Monitoring Plan for the Waste Calcining Facility and for the CPP-601/627/640 Facility."[62]

RWMC-AMWTP maintains a QA program in accordance with 40 CFR 61, Appendix B,[22] as required of all radiological air-emission sources that are continuously monitored for compliance with 40 CFR 61, Subpart H,[5] and ANSI N13.1-1999, Section 7.1.[23] The QA requirements are documented in PLN-5231, "Quality Assurance Project Plan for the WMF 676 NESHAPs Stack Monitoring System,"[63] and PLN-5778, "Quality Assurance Project Plan for the RCE and ICE NESHAPs Stack Monitoring System."[64]

8.1.3 ESER Program

The ESER Program maintains a QA program consistent with the requirements of 10 CFR 830[53] and DOE Order 414D[8] that is implemented through the ESER *Quality Assurance Implementation Plan (QIP)*.[65] Additional QA requirements for monitoring activities are provided in the ESER *Offsite Environmental Surveillance Program Quality Assurance Project Plan*.[66] Analytical laboratories used by the ESER Program maintain their own QA programs consistent with DOE requirements.

8.1.4 NOAA

A QA plan[60] addresses the requirements of DOE Order 414D,[8] and is consistent with ASME. Implementing procedures include regular independent system and performance audits, written procedures and checklists, follow-up actions, and continuous automated and visual data checks to ensure representativeness and accuracy. The plan and implementing procedures provide the framework to ensure that the INL Meteorological Monitoring Network meets the elements of DOE-HDBK-1216-2015[3] and DOE Order 458.1.[2]

All the meteorological sensors in the ARLFRD tower network are inspected, serviced, and calibrated semiannually as recommended by American Nuclear Society (ANS) guidelines found in ANSI/ANS-3.11-2015.[52] Unscheduled service is also promptly performed whenever a sensor malfunctions.

8.2 Sample and Analysis Management Activities

Sample and analysis management activities are performed separately by the various monitoring organizations. Functions performed by each of these monitoring organizations include:

- Developing a sample and analysis plan or equivalent
- Coordinating sampling
- Obtaining analytical-laboratory services
- Processing analytical-laboratory data packages
- Managing sample and analytical data
- Validating analytical data (where applicable)
- Coordinating sample disposition.

Subcontract laboratories used by the INL and ICP Core contractors are audited by the DOE Consolidated Audit Program. This program uses trained and certified personnel to perform in-depth audits of subcontract laboratories to review:

- Personnel training and qualification
- Detailed analytical procedures
- Calibration of instrumentation
- Participation in an inter-comparison program
- Use of blind controls
- Analysis of calibration standards.

Audit results are maintained by the DOE Consolidated Audit Program. Laboratories are required to provide corrective action plans for audit findings.

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9. RADIOLOGICAL DOSE EVALUATION

Potential radiological doses to the public from INL Site operations are evaluated to determine compliance with pertinent regulations and limits. Two different computer models are used to estimate doses. The EDE for a maximally exposed individual (MEI) member of the public from INL Site airborne releases of radionuclides is calculated annually using the methods prescribed by Subpart H of 40 CFR 61[5] and documented in an annual NESHAP report for radionuclides.[24] The annual dose to the public for the MEI and the collective 80 km (50 mi) population and the biota dose are estimated annually and documented in DOE/ID-12082, *Idaho National Laboratory Site Environmental Report*.[67]

9.1 Maximum Individual Dose—Airborne Emissions Pathway

The EDE to an individual member of the public is calculated from airborne-emission sources across the INL Site to demonstrate compliance with Subpart H of 40 CFR 61[5] and DOE Order 458.1.[2] 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 per year. The purpose of DOE Order 458.1[2] is to implement sound stewardship practices that protect the air, water, land, and other natural and cultural resources impacted by DOE operations, and by which DOE cost-effectively meets or exceeds compliance with applicable environmental, public-health, and resource-protection laws, regulations, and DOE requirements. DOE Order 458.1[2] states that it is also a DOE objective that potential exposures to members of the public be as far below the limits as is reasonably achievable.

Because individual radiological impacts to the public surrounding the INL Site remain too small to be measured by available monitoring techniques, the dose to the public from INL Site operations is calculated using the reported amounts of radionuclides released from INL Site facilities using EPA-approved air-dispersion models. Compliance to Subpart H of 40 CFR 61[5] is demonstrated primarily using the CAP-88 computer model.

9.1.1 Dose Evaluation Using CAP-88 Computer Model

Use of the CAP-88 computer model is required by the EPA to demonstrate compliance with the *Clean Air Act Amendments of 1990*.[15] Using the CAP-88 model and information on the reported amounts of radionuclides released from INL Site facilities, the EDE to the MEI is estimated. CAP-88 uses dose and risk tables developed by the EPA. It does not include shielding by housing materials, but does include a factor to allow for shielding by surface-soil contours from radioactivity on the ground surface. The ARLFRD performs annual meteorological and dispersion assessments as part of environmental compliance at the Site. Yearly wind statistics are generated for many of the towers in the meteorological network; these are used to run the CAP-88 atmospheric-dispersion model required for NESHAP[5] compliance. CAP-88 makes its calculations based on the joint frequency of wind conditions from a single wind station located near a facility (or emission source) in a straight line from that source and ignores recirculation.

9.1.2 Dose Evaluation Using HYSPLIT Dispersion Model

The ARLFRD uses a dispersion model called HYSPLITT to estimate radiological pollutant emissions from the INL Site. This model is the primary dispersion model used by NOAA for a variety of applications. The model is run over an entire year, using observations from the meteorological network, and the resulting total integrated concentrations are used to evaluate the dose to members of the public to show compliance with DOE Order 458.1[2] (NOAA-TM-ERL-ARL-224, PB-2001-014789).[68]

This method offers a more-realistic dose estimate for the Site than that from the CAP-88 computer model. The dispersion algorithms within the model are based on current atmospheric research on plume dispersion and use hourly averaged observations from the ARLFRD tower network. HYSPLIT is used only for calculating population dose. Unlike CAP-88, HYSPLIT can account for spatial and temporal wind variations associated with the complex topography near the Site.

The ARLFRD has also developed a web-based program called HYRad to simulate possible hazardous releases from the INL Site. It is also based on the NOAA HYSPLIT model, but the user interface is designed to allow rapid estimates of plume doses based on known chemical inventories at the Site. Plumes are displayed on a background map that can be panned and zoomed. HYRad can be run either with observations from the meteorological network or output from weather forecast models. It is a major part of ARLFRD's support to the INL Site Emergency Operations Center.

9.2 80-Kilometer (50-Mile) Population Dose

An estimate of the collective EDE, or population dose, from inhalation, submersion, ingestion, and deposition resulting from airborne releases of radionuclides from the INL Site is determined from the HYSPLIT evaluations and information on the population within 80 km (50 mi) of an INL Site facility. Results of the HYSPLIT population-dose evaluations are used to show compliance with DOE Order 458.1.[1] The population dose is calculated from the average dispersion coefficient for the county census division, the population in each census division within that county, and the normalized dose received at the location of the MEI from the HYSPLIT evaluation. This gives an approximation of the dose received by the entire population in a given county division. Total population dose is the sum of the population dose for the various county divisions. The calculation overestimates dose because radioactive decay and deposition of the isotopes is not calculated during transport over distances greater than that to the MEI. Population estimates are reviewed and updated annually, as necessary.

9.3 Biotic Dose

Maximum radionuclide concentrations in waterfowl and game animals collected from the INL Site are used to estimate a potential dose from ingestion. Estimates of the potential dose an individual may receive from occasionally ingesting meat from game animals consider that waterfowl may reside briefly at the various waste disposal ponds on the Site and those game birds and other game animals may reside on or migrate across the Site. The potential dose estimate is based on the highest concentrations of radionuclides in waterfowl or game animals sampled from the Site.

A graded approach is used to evaluate the potential dose to aquatic and terrestrial biota from contaminated soil and water according to DOE-STD-1153-2002, “A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota.”[69] The graded approach evaluates the impacts of a given set of radionuclides on aquatic and terrestrial ecosystems by comparing available concentration data in soils and water with biota concentration guides. Details and justifications for applying the graded approach at the INL Site can be found in NW-ID-2003-062, *Biota Dose Assessment Guidance for the INEEL*.[70]

10. REFERENCES

1. DOE Order 435.1, "Radioactive Waste Management," U.S. Department of Energy, current version.
2. DOE Order 458.1, "Radiation Protection of the Public and the Environment," U.S. Department of Energy, current version.
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Appendix A
Monitoring Locations

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Appendix A
Monitoring Locations

The tables in this appendix contain individual sampling locations for media discussed in this environmental monitoring plan and that are included in the maps and figures in the plan. The following definitions apply to the headings found in the following tables:

- **EMP_REF_ID;** A unique integer assigned to each sample point. This ID number is specific to each sample location identified on the maps in the Environmental Monitoring Plan.
- **LOC_NAME;** The common name assigned to a sample (e.g., 400.3, SDA 2.3).
- **LOCATION DESCRIPTION;** A description of geographical location assigned to the GRL_ID (i.e., 32; MFC – Inside facility fence.

Table A-1. Airborne Effluent Monitoring Locations.

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
32	EBR-II/FCF Main Stack (ANL-764)	INL	MFC – Inside facility fence.
33	HFEF Stack (ANL-785)	INL	MFC – Inside facility fence.
34	Glovebox Extract (WMF-676-003)	ICP Core	RWMC – TSA/AMWTP area.
35	Zone 3 Extract (WMF-676-002)	ICP Core	RWMC – TSA/AMWTP area.
38	Advanced Retrieval Project	ICP Core	RWMC/SDA – Inside facility fence.
701	FAST STACK	ICP Core	INTEC – FAST Stack (CPP-767)

Table A-2. Soil Gas and Soil Moisture Surveillance Locations.

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
542	CFA-GAS-V-004	ICP Core	CFA Landfill
543	CFA-GAS-V-005	ICP Core	CFA Landfill
544	CFA-GAS-V-006	ICP Core	CFA Landfill
545	CFA-GAS-V-007	ICP Core	CFA Landfill
546	CFA-GAS-V-008	ICP Core	CFA Landfill
549	9302	ICP Core	RWMC facility area
550	D-02	ICP Core	RWMC facility area
551	89-02D	ICP Core	RWMC facility area
552	9301	ICP Core	RWMC facility area
553	WWW1	ICP Core	RWMC facility area
554	USGS-118	ICP Core	RWMC facility area
555	78-4	ICP Core	RWMC facility area
556	77-1	ICP Core	RWMC facility area
557	M10S	ICP Core	RWMC facility area
558	M1SA	ICP Core	RWMC facility area
559	88-01D	ICP Core	RWMC facility area
560	M3S	ICP Core	RWMC facility area
561	M6S	ICP Core	RWMC facility area
562	M7S	ICP Core	RWMC facility area
568	VVE-7	ICP Core	RWMC facility area
569	SOUTH-MON-A-010	ICP Core	RWMC facility area
570	SOUTH-MON-A-009	ICP Core	RWMC facility area
571	VVE-6	ICP Core	RWMC facility area
572	SOUTH-1898	ICP Core	RWMC facility area
573	VVE-4	ICP Core	RWMC facility area
574	SOUTH-1835	ICP Core	RWMC facility area
575	VVE-10	ICP Core	RWMC facility area
576	RWMC-GAS-V-081	ICP Core	RWMC facility area
577	RWMC-VVE-V-204	ICP Core	RWMC facility area
578	RWMC-VVE-V-205	ICP Core	RWMC facility area
579	RWMC-1816	ICP Core	RWMC facility area
580	RWMC-GAS-V-074	ICP Core	RWMC facility area
581	RWMC-1819	ICP Core	RWMC facility area
582	RWMC-GAS-V-075	ICP Core	RWMC facility area
583	RWMC-VVE-V-071	ICP Core	RWMC facility area
584	RWMC-GAS-V-076	ICP Core	RWMC facility area
585	RWMC-GAS-V-077	ICP Core	RWMC facility area
586	RWMC-GAS-V-078	ICP Core	RWMC facility area
587	RWMC-VVE-V-067	ICP Core	RWMC facility area
588	RWMC-GAS-V-079	ICP Core	RWMC facility area

Table A-2. (continued).

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
589	RWMC-1810	ICP Core	RWMC facility area
590	RWMC-GAS-V-080	ICP Core	RWMC facility area
591	RWMC-MON-A-162	ICP Core	RWMC facility area
592	VVE-1	ICP Core	RWMC facility area
593	RWMC-VVE-V-163	ICP Core	RWMC facility area
594	VVE-3	ICP Core	RWMC facility area
595	RWMC-1809	ICP Core	RWMC facility area
596	RWMC-1812	ICP Core	RWMC facility area
597	RWMC-1815	ICP Core	RWMC facility area
598	RWMC-1818	ICP Core	RWMC facility area
599	RWMC-1821	ICP Core	RWMC facility area
600	RWMC-GAS-V-072	ICP Core	RWMC facility area
601	RWMC-1822	ICP Core	RWMC facility area
602	RWMC-VVE-V-068	ICP Core	RWMC facility area
603	RWMC-GAS-V-073	ICP Core	RWMC facility area
604	RWMC-1813	ICP Core	RWMC facility area
605	RWMC-VVE-V-069	ICP Core	RWMC facility area
606	RWMC-1817	ICP Core	RWMC facility area
607	RWMC-1820	ICP Core	RWMC facility area
608	RWMC-1808	ICP Core	RWMC facility area
609	RWMC-1814	ICP Core	RWMC facility area

Table A-3. Airborne Effluent Monitoring Locations.

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
260	Idaho Falls	ESER	Idaho Falls: north of Sawtelle Street Facility (SSF) on east side of Foote Dr.
261	Atomic City	ESER	Atomic City at NOAA tower
667	Tritium Air Monitor—IF	INL	Idaho Falls: located at the INL Research Center (IRC) facility, southeast corner of Building IF-627
677	Tritium Air Monitor—EFS	INL	Experimental Field Station: west of facility fence
678	Tritium Air Monitor—Craters	INL	Craters of the Moon
679	Tritium Air Monitor—VAN B	INL	Van Buren Blvd just north of U.S. Highway 20/26
1327	Howe	ESER	Howe
1339	EFS	ESER	Experimental Field Station: west of facility fence

Table A-4. Liquid Effluent Monitoring Locations.

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
214	MFC IWP	INL	MFC: IWP
216	CPP-797	ICP Core	INTEC: Building CPP-797 inside facility fence
217	IRC	INL	Idaho Falls IRC Facility: point located in the center of the N. Boulevard at main IRC entrance
218	CPP-769	ICP Core	INTEC: sewage treatment lagoon, Building CPP-769
219	CPP-773	ICP Core	INTEC: sewage treatment lagoon, Building CPP-773
220	TRA Cold Waste Pond	INL	ATR Complex: Building TRA-764
224	MFC Industrial Waste Ditch/Pipeline	INL	MFC: west of Building MFC-793C inside the facility fence

Table A-5. Ambient Air Surveillance Locations.

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
39	Idaho Falls	ESER	Idaho Falls: North of SSF on east side of Foote Dr.
40	DuBois	ESER	DuBois
42	Mud Lake	ESER	Mud Lake: South of State HWY 33 on North 1100 East
44	FAA Tower	ESER	FAA Tower: U.S. HWY 20 west of mile marker 282
45	Main Gate	ESER	Main Guard Gate
46	Van Buren	ESER	Van Buren Blvd just north of U.S. Highway 20/26
47	Craters of the Moon	ESER	Craters of the Moon
48	Mountain View Middle School	ESER	Blackfoot: Mountain View Middle School
50	Monteview	ESER	Monteview: Near intersection of E 2700 North & North 800 East
51	Blue Dome	ESER	Blue Dome
52	EFS	ESER	Experimental Field Station: West of facility fence
53	Arco	ESER	Arco: NOAA tower 0.5 miles south of U.S. HWY 20/26 near mile marker 249
54	Atomic City	ESER	Atomic City at NOAA tower
57	2-inch air—SMC	INL	TAN/SMC: North of SMC facility fence at NOAA tower
58	2-inch air—Gate 4	INL	Sand Dunes NOAA tower: South of Lincoln Blvd. guard gate #4
63	2-inch air—RTC	INL	ATR Complex: NE corner of facility fence
65	2-inch air—INTEC	INL	INTEC: North of facility fence
66	2-inch air—CPP	INL	INTEC: Along the west side of the facility fence south of Cleveland Blvd.
68	2-inch air—Rest Area	INL	BLR Rest Area on U.S. Highway 20/26
69	2-inch air—CFA	INL	CFA: North of Building CF-690
634	2-inch air—IF	INL	Idaho Falls: North of SSF on east side of Foote Dr.
639	2-inch air—CRATERS	INL	Craters of the Moon
641	2-inch air—BLKFT	INL	Blackfoot: Mountain View Middle School
643	2-inch air—VAN B	INL	Van Buren Blvd just north of U.S. Highway 20/26
644	2-inch air—EFS	INL	Experimental Field Station: West of facility fence

Table A-5. (continued).

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
645	2-inch air—EBR 1	INL	EBR-I: Inside facility fence south of Building EBR-602
646	2-inch air—RWMC	INL	RWMC: Northeast of Pit 9 just outside of facility fence
655	2-inch air—NRF	INL	NRF: NW of new communication tower south of the main parking lot
658	Howe	ESER	Howe
661	Sugar City	ESER	Sugar City
666	2-inch air—IRC	INL	Idaho Falls: Located at the INL Research Center (IRC) facility, east of Building IF-605
698	2-inch air—SUGAR	INL	Sugar City
1268	2-inch air—RWMCS	INL	RWMC: Near the power pole on the NE side of Cold Test Pit South
1269	2-inch air—MFCN	INL	South side of RSWF facility fence (MFC-771)
1296	2-inch air—MFCS	INL	Location near the north east corner of MFC-735, the guard checkpoint on Taylor Blvd.
1297	2-inch air—Loc B (RWMC)	INL	RWMC: Northeast of Pit 9 just outside of facility fence
1298	2-inch air—Loc A (CPP)	INL	INTEC: Along the west side of the facility fence south of Cleveland Blvd.
1319	2-inch air—RHLLW	INL	RHLLW Disposal Facility
1336	Jackson Hole	ESER	Jackson Hole
1352	2-inch air—IRCN	INL	Idaho Falls: Located at the INL Research Center (IRC) facility, north of Building IF-603

Table A-6. Drinking Water Monitoring Locations.

EMP_REF_ID	LOC NAME	MEDIA	MON_ORG_ID	LOCATION
86	Idaho Falls	Drinking Water	ESER	Idaho Falls
88	Howe City Park	Drinking Water	ESER	Howe: West of town center
89	Mud Lake Well #2 (Control)	Drinking Water	ESER	Mud Lake Well #2 (Control) North of State HWY 33
90	Rest Area	Drinking Water	ESER	BLR Rest Area on U.S. Highway 20/26
91	Atomic City	Drinking Water	ESER	Atomic City: North central end of town south of Taber Rd.
92	Minidoka	Drinking Water	ESER	Minidoka
93	Shoshone	Drinking Water	ESER	Shoshone
94	Craters of the Moon	Drinking Water	ESER	Craters of the Moon
101	MFC-754 Well Manifold (a.k.a. MFC 754 Manifold)	Drinking Water	INL	MFC: Inside facility fence west of Building MFC-707
103	TRA-608 RTC Manifold	Drinking Water	INL	ATR Complex: Inside facility fence near northeast corner
106	CPP-1767 Sump	Drinking Water	ICP Core	North of INTEC
107	CPP-614	Drinking Water	ICP Core	INTEC: Inside of facility fence
108	Gun Range B21-608	Drinking Water	INL	CFA Rifle Range Building B21-608
109	CFA-1603 Manifold	Drinking Water	INL	CFA: Facility center
110	CFA-2 (a.k.a. CFA-642 [WELL #2])	Drinking Water	INL	CFA: Facility center
111	CFA-1 (a.k.a. CFA-651 [WELL #1])	Drinking Water	INL	CFA: Facility center
112	Main Gate B27-603	Drinking Water	INL	Main Guard Gate
114	SPERT-1 (a.k.a. PBF-602 [WELL #1])	Drinking Water	INL	CITRC: At PBF Support Area
115	PBF-638 CITRC Manifold	Drinking Water	INL	CITRC: At PBF Support Area
116	EBR-I (a.k.a. EBR-601 [711 Well])	Drinking Water	INL	EBR-I: At main building
117	WMF-603 Entry Point	Drinking Water	ICP Core	RWMC: In Operations Area
118	WMF-604 Entry Point	Drinking Water	ICP Core	RWMC: In Operations Area
119	TRA-2317/696 Wellfield	Drinking Water	INL	ATR Complex: Inside facility fence near northeast corner
1264	MFC-1740 Pump House/Manifold	Drinking Water	INL	MFC: Inside facility fence at MFC-1740

Table A-6. (continued).

EMP_REF_ID	LOC NAME	MEDIA	MON_ORG_ID	LOCATION
1342	ANL 1 (a.k.a. MFC 754 WELL #1)	Drinking Water	INL	MFC: Inside facility fence at Well ANL 1
1343	RIFLE RANGE (a.k.a. Gun Range B21-607)	Drinking Water	INL	CFA Rifle Range Building B21-607
1344	BADGING FACILITY (a.k.a. Main Gate B27-603)	Drinking Water	INL	Main Guard Gate
1345	TAN-1612 Manifold	Drinking Water	INL	TAN/SMC: Inside facility fence east of SMC

Table A-7. Surface Water Surveillance Locations.

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
617	BLR Control (Birch Creek)	ESER	State HWY 22 mile marker 41
618	BLR at EFS	ESER	Experimental Field Station: Northeast of facility fence
619	BLR at NRF	ESER	Lincoln Blvd. bridge northeast of NRF
620	BLR at INTEC	ESER	BLR at INTEC: Just west of Lincoln Blvd. bridge
621	BLR AT Rest Area	ESER	BLR Rest Area on U.S. Highway 20/26
622	Alpheus Springs	ESER	Alpheus Springs
623	Bill Jones Fish Farm	ESER	Bill Jones Fish Farm
624	Clear Spring	ESER	Clear Spring
625	BLR near Mackay	USGS	Mackay
626	Little Lost River	USGS	Howe
627	Mud Lake	USGS	Terreton: north east of State HWY mile marker 51
629	Birch Creek	USGS	Blue Dome: East of State Highway 28 near mile marker 45
630	SDA Lift Station	ICP Core	RWMC: Inside of the SDA on the south end of ARP V
632	BLR @ INEL Diversion	USGS	BLR Diversion near USGS gauging station
657	BLR Sinks	ESER	BLR Sinks

Table A-8. Soil Surveillance Locations.

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
455	RWMC 2-4	INL	RWMC: North of facility fence
463	RWMC 5-12	INL	RWMC: North of facility fence
464	RWMC 5-4	INL	RWMC: North of facility fence
465	RWMC 5-7	INL	RWMC: North of facility fence
467	RWMC 6-3	INL	RWMC: South of facility fence
525	Atomic City	ESER	Near Atomic City on T-Road 4 approximately 0.7 miles east of U.S. 26
526	Butte City	ESER	Butte City: 1.3 miles south of mile post 252
527	Frenchman's Cabin	ESER	Frenchman's Cabin
528	FAA Tower	ESER	FAA Tower: U.S. HWY 20 west of mile marker 282
529	Howe	ESER	Howe: 0.6 miles east of mile marker 22 on State HWY 33 east of Howe
530	Reno Ranch	ESER	Reno Ranch: approximately 0.3 miles north of mile marker 40 on State HWY 22
531	Monteview	ESER	Monteview
532	Mudlake #1	ESER	Mud Lake: approximately 0.3 miles north of mile marker 16 on State HWY 28
533	Mudlake #2	ESER	Mud Lake: approximately 4.2 miles south of mile marker 44 on State HWY 33
534	Carey	ESER	Carey
535	St. Anthony	ESER	St. Anthony
537	Blackfoot	ESER	Blackfoot
795	RWMC 3-2	INL	RWMC: East of facility fence
796	RWMC 2-3	INL	RWMC: North of facility fence
798	RWMC 7-1	INL	RWMC: South of facility fence
799	RWMC 5-5	INL	RWMC: North of facility fence
1092	RWMC 2-1	INL	RWMC: East of TSA facility fence
1096	RWMC 3-7	INL	RWMC: North of facility fence
1098	RWMC 3-1	INL	RWMC: East of TSA facility fence
1100	RWMC 2-5	INL	RWMC: North of facility fence
1105	RWMC 5-15	INL	RWMC: South of facility fence
1202	RWMC 5-8	INL	RWMC: North of facility fence
1292	REST 1-1	INL	BLR Rest Area on U.S. Highway 20/26
1293	EFS 1-1	INL	Experimental Field Station: West of facility fence

Table A-9. Agricultural Products Surveillance Locations.

EMP_REF_ID	LOC NAME	MEDIA	MON_ORG_ID	LOCATION
1	Idaho Falls (Reed's Dairy)	Milk	ESER	Idaho Falls: Reed's Dairy
4	Monteview	Lettuce	ESER	Monteview: Near intersection of E 2700 North & North 800 East
7	Terreton	Wheat	ESER	Terreton: State HWY 33 east of mile marker 47
8	FAA Tower	Lettuce	ESER	FAA Tower: U.S. HWY 20 west of mile marker 282
9	EFS	Lettuce	ESER	Experimental Field Station: West of facility fence
12	Arco	Wheat	ESER	Arco: West of U.S. HWY 20/26 near mile marker 249
14	Atomic City	Lettuce	ESER	Atomic City at NOAA tower
15	American Falls	Wheat	ESER	American Falls
16	Dietrich	Milk	ESER	Dietrich (Astle Dairy)
21	Minidoka	Milk	ESER	Minidoka
22	Monteview	Wheat	ESER	Monteview
24	Moreland	Wheat	ESER	Moreland
25	Rupert	Wheat	ESER	Rupert
26	Rupert (a.k.a. Arrowhead Potato)	Potato	ESER	Rupert (Arrowhead Potato)
699	Howe	Milk	ESER	Callister Dairy north of Howe
700	Blackfoot	Milk	ESER	Groneman Dairy in Blackfoot
708	Sugar City	Lettuce	ESER	Sugar City: Located north of 2983 E 2000 N
709	Roberts	Wheat	ESER	Roberts (Osgood Grain): Located at 616-626 N Bassett Rd.
710	Howe	Wheat	ESER	Callister Dairy north of Howe
1320	Mud Lake	Alfalfa	ESER	Mud Lake: South of State HWY 33 on North 1100 East
1321	Arco (Telford's Lost River)	Potato	ESER	Arco (Telford's Lost River)
1322	Rexburg (Pole line Rd)	Potato	ESER	Rexburg (Pole line Rd)
1323	Idaho Falls (Scoresby's)	Potato	ESER	Idaho Falls (Scoresby's)
1324	Terreton	Potato	ESER	Terreton
1325	Pocatello (Swore Farms)	Potato	ESER	Pocatello (Swore Farms)

Table A-9. (continued).

EMP_REF_ID	LOC NAME	MEDIA	MON_ORG_ID	LOCATION
1328	Blackfoot (Shoemaker Farms)	Lettuce	ESER	Blackfoot (Shoemaker Farms)
1329	Idaho Falls (Veolia)	Lettuce	ESER	Idaho Falls (Veolia)
1330	Shelley (Edwards, K)	Lettuce	ESER	Shelley (Edwards, K)
1331	Howe	Lettuce	ESER	Howe
1332	Terreton (Korn Dairy)	Milk	ESER	Terreton (Korn Dairy)
1333	Idaho Falls	Wheat	ESER	Idaho Falls
1334	Blackfoot (Shoemaker Farms)	Potato	ESER	Blackfoot (Shoemaker Farms)
1338	Shelley (Wattenberger Farms)	Potato	ESER	Shelley (Wattenberger Farms)
1358	Blackfoot (Grove City Gardens)	Potato	ESER	Blackfoot (Grove City Gardens)
1359	Blackfoot (Wheeler Farms)	Lettuce	ESER	Blackfoot (Wheeler Farms)
1360	Fort Hall	Potato	ESER	Fort Hall
1361	Howe	Alfalfa	ESER	Howe
1362	Idaho Falls	Alfalfa	ESER	Idaho Falls
1363	Idaho Falls (Littlefield Produce)	Lettuce	ESER	Idaho Falls (Littlefield Produce)
1364	Kimama	Wheat	ESER	Kimama
1365	Mud Lake	Potato	ESER	Mud Lake
1366	Pocatello (Bowman Farm)	Lettuce	ESER	Pocatello (Bowman Farm)
1367	Shelley	Potato	ESER	Shelley
1368	Terreton	Potato	ESER	Terreton
1384	Monteview (Paradise Grove)	Milk	ESER	Monteview (Paradise Grove)

Table A-10. External Radiation Surveillance Locations.

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
136	Reno Ranch	ESER	Reno Ranch: State HWY 22 near mile marker 41
137	Blue Dome	ESER	Blue Dome
138	Craters of Moon	ESER	Craters of the Moon
139	Atomic City	ESER	US HWY 26: South of mile marker 278
141	Aberdeen	ESER	Aberdeen
142	Minidoka	ESER	Minidoka
144	Idaho Falls	ESER	Idaho Falls: North of SSF on east side of Foote Dr.
145	Monteview	ESER	Monteview: Near intersection of E 2700 North & North 800 East
146	DuBois	ESER	DuBois
147	Howe	ESER	Howe
148	Mud Lake	ESER	Mud Lake: South of State HWY 33 on North 1100 East
149	Arco	ESER	Arco: NOAA tower 0.5 miles south of U.S. HWY 20/26 near mile marker 249
150	Mountain View Middle School	ESER	Blackfoot: Mountain View Middle School
152	Hwy28 N2300 O-2	INL	State Highway 28: approximately 0.3 miles north of mile marker 27
153	Hwy22 T28 O-1	INL	State Highway 22: approximately 0.2 miles north of mile marker 33
154	Idaho Falls O-10	INL	Idaho Falls: North of SSF on east side of Foote Dr.
155	IF-627 O-30	INL	Idaho Falls: Located at the INL Research Center (IRC) facility near Building IF-627
156	IF-675E O-31	INL	Idaho Falls: PINS Laboratory located east of Hitt Rd. on E 14th N
157	IF-675D O-33	INL	Idaho Falls: PINS Laboratory located east of Hitt Rd. on E 14th N
158	IF-675S O-34	INL	Idaho Falls: PINS Laboratory located east of Hitt Rd. on E 14th N
159	IF-675W O-35	INL	Idaho Falls: PINS Laboratory located east of Hitt Rd. on E 14th N
160	Atomic City O-2	INL	Atomic City at NOAA tower
161	TAN LOFT O-7	INL	TAN: East of SMC facility fence
162	TAN LOFT O-6	INL	TAN: South of SMC facility fence
163	Hwy33 T17 O-3	INL	State HWY 33: near mile marker 36
164	LincolnBlvd O-25	INL	TAN: South of TSF facility on State Highway 33 (Lincoln Blvd.)
165	NRF O-20	INL	NRF: South of facility
166	NRF O-19	INL	NRF: South of facility

Table A-10. (continued).

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
167	NRF O-16	INL	NRF: North of facility
171	LincolnBlvd O-9	INL	Lincoln Blvd. mile marker 9: east side of road
172	LincolnBlvd O-5	INL	Lincoln Blvd. mile marker 5: east side of road
173	TRA O-13	INL	ATR COMPLEX: West of facility
174	TRA O-11	INL	ATR COMPLEX: West of facility
175	TRA O-10	INL	ATR COMPLEX: North of facility fence
176	TRA O-8	INL	ATR COMPLEX: North of facility
177	TRA O-6	INL	ATR COMPLEX: Northeast of facility
180	ICPP O-19	INL	INTEC: West of facility fence
182	ICPP O-21	INL	INTEC: Southwest of facility fence
184	ICPP O-25	INL	INTEC: Southeast of facility fence
185	ICPP O-26	INL	INTEC: East of facility
186	ICPP O-15	INL	INTEC: Northeast of facility fence
187	ICPP O-9	INL	INTEC: Northeast of facility fence
188	ICPP O-17	INL	INTEC: Northwest of facility fence
189	LincolnBlvd O-3	INL	Lincoln Blvd. south of ICDF: East side of road
190	CFA O-1	INL	CFA: West of Building CFA-690
191	LincolnBlvd O-1	INL	CFA: East of Lincoln Blvd. near Main St. intersection
192	PBF SPERT O-1	INL	CITRC: North of Jefferson Rd. and Building PBF-632 located at the former PBF Control Area
193	ARA I&II O-1	INL	ARA: ARA I & II facility location
194	Hwy20 Mile O-276	INL	US HWY 20 and the intersection of Taylor Blvd. on the east side of the road.
196	ANL O-12	INL	MFC: West of perimeter fence near guard gate
197	ANL O-7	INL	MFC: West of perimeter fence
198	ANL O-18	INL	MFC: West of perimeter fence
200	ANL O-15	INL	MFC: Northeast of perimeter fence
202	EBR1 O-1	INL	EBR-I: Parking lot
203	RWMC O-46	INL	RWMC: North of Operation Area facility fence
204	RWMC O-9A	INL	RWMC: North of SDA facility fence near north gate
205	RWMC O-13A	INL	RWMC: North of SDA facility fence
207	RWMC O-21A	INL	RWMC: South of SDA facility fence
208	RWMC O-25A	INL	RWMC: South of SDA facility fence
209	RWMC O-29A	INL	RWMC: South of SDA facility fence
210	RWMC O-43	INL	RWMC: South of TSA facility fence
211	RWMC O-41	INL	RWMC: East of TSA facility fence
212	RWMC O-39	INL	RWMC: East of facility fence near main gate
633	Arco O-1	INL	Arco: NOAA tower 0.5 miles south of U.S. HWY 20/26 near mile marker 249
637	Howe O-3	INL	Howe

Table A-10. (continued).

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
640	Craters of Moon O-7	INL	Craters of the Moon
642	Blackfoot O-9	INL	Blackfoot: Mountain View Middle School
649	Reno Ranch O-6	INL	Reno Ranch: State HWY 22 near mile marker 41
651	Monteview O-4	INL	Monteview: Near intersection of E 2700 North & North 800 East
652	Mud Lake O-5	INL	Mud Lake: South of State HWY 33 on North 1100 East
662	Sugar City	ESER	Sugar City
668	IF-603W O-4	INL	Idaho Falls: Located at the INL Research Center (IRC) facility, west of Building IF-603
669	IF-603N O-1	INL	Idaho Falls: Located at the INL Research Center (IRC) facility, north of Building IF-603
670	IF-603E O-2	INL	Idaho Falls: Located at the INL Research Center (IRC) facility, east of Building IF-603
671	IF-603S O-3	INL	Idaho Falls: Located at the INL Research Center (IRC) facility, south of Building IF-603
672	IF-638N O-1	INL	Idaho Falls: Located at the INL Research Center (IRC) facility, north of Building IF-638
673	IF-638W O-4	INL	Idaho Falls: Located at the INL Research Center (IRC) facility, west of Building IF-638
674	IF-638S O-3	INL	Idaho Falls: Located at the INL Research Center (IRC) facility, south of Building IF-638
675	IF-638E O-2	INL	Idaho Falls: Located at the INL Research Center (IRC) facility, east of Building IF-638
680	VanB O-1	INL	Van Buren Blvd just north of U.S. Highway 20/26
681	Main Gate O-1	INL	Main Guard Gate
682	EFS O-1	INL	Experimental Field Station: West of facility fence
703	IF-IDA O-38	INL	Idaho Falls south of John's Hole Bridge
704	IF-616N O-36	INL	North of building IF-616 at Willow Creek Building (WCB)
705	IF-665W O-37	INL	West of building IF-665 at Research and Education Campus
706	IF-IRC O-39	INL	On the southern perimeter fence at INL Research Center (IRC)
712	ANL O-14	INL	MFC: East of perimeter fence near NOAA tower
713	ANL O-20	INL	MFC: East of perimeter fence north west NOAA tower
714	ANL O-21	INL	MFC: East of perimeter fence north west NOAA tower
715	ANL O-22	INL	MFC: Northeast of perimeter fence by sewage treatment lagoons
716	ANL O-16	INL	MFC: Northeast of perimeter fence by sewage treatment lagoons

Table A-10. (continued).

717	ANL O-26	INL	South side of RSWF facility fence (MFC-771)
718	ANL O-25	INL	West side of RSWF facility fence (MFC-771)
719	ANL O-24	INL	North side of RSWF facility fence (MFC-771)
720	ANL O-23	INL	East side of RSWF facility fence (MFC-771)
721	TREAT O-1	INL	East side of TREAT facility
722	TREAT O-2	INL	East side of TREAT facility
723	TREAT O-3	INL	North side of TREAT facility
724	TREAT O-4	INL	North side of TREAT facility
725	TREAT O-5	INL	West side of TREAT facility
726	TREAT O-6	INL	West side of TREAT facility
727	TREAT O-7	INL	South side of TREAT facility
728	TREAT O-8	INL	South side of TREAT facility
729	ANL O-19	INL	MFC: Southeast corner of MFC main parking lot.
730	ANL O-8	INL	MFC: North of the bridge on Buchanan Blvd
731	Haul E O-1	INL	East Haul Road entrance west of Taylor Blvd.
732	ICPP TreeFarm O-1	INL	INTEC: West of facility fence
733	ICPP TreeFarm O-2	INL	INTEC: West of facility fence
734	ICPP TreeFarm O-3	INL	INTEC: West of facility fence
735	ICPP TreeFarm O-4	INL	INTEC: West of facility fence
736	ICPP O-20	INL	INTEC: West of facility fence
737	ICPP O-30	INL	INTEC: West of facility fence
738	ICPP O-22	INL	INTEC: South of facility fence
739	ICPP O-14	INL	INTEC: East of facility fence
740	ICPP O-27	INL	INTEC: East of facility fence
741	ICPP O-28	INL	INTEC: East of facility fence
742	TRA O-23	INL	ATR COMPLEX: North side of Monroe Blvd. near intersection
743	TRA O-15	INL	ATR COMPLEX: South of facility
744	TRA O-1	INL	ATR COMPLEX: South of facility
745	TRA O-14	INL	ATR COMPLEX: Parking lot along facility fence
746	TRA O-12	INL	ATR COMPLEX: West of facility
747	TRA O-9	INL	ATR COMPLEX: North of facility
748	TRA O-7	INL	ATR COMPLEX: North of facility
749	TRA O-16	INL	ATR COMPLEX: East of facility
750	TRA O-25	INL	ATR COMPLEX: East of facility
751	TRA O-24	INL	ATR COMPLEX: East of facility
752	TRA O-26	INL	ATR COMPLEX: North of facility
753	TRA O-27	INL	ATR COMPLEX: North of facility
754	TRA O-28	INL	ATR COMPLEX: North of facility
755	TRA O-20	INL	ATR COMPLEX: North of TRA-715 evaporative ponds
756	TRA O-19	INL	ATR COMPLEX: North of TRA-715 evaporative ponds

Table A-10. (continued).

757	TRA O-18	INL	ATR COMPLEX: East of TRA-715 evaporative ponds

Table A-10. (continued).

758	TRA O-17	INL	ATR COMPLEX: South of TRA-715 evaporative ponds
759	TRA O-22	INL	ATR COMPLEX: South of TRA-715 evaporative ponds
760	TRA O-21	INL	ATR COMPLEX: West of TRA-715 evaporative ponds
762	NRF O-18	INL	NRF: West of facility
763	NRF O-11	INL	NRF: West of facility and west of Washington Blvd.
764	RRL24 O-1	INL	Howe: 0.4 miles west of mile marker 23 on State HWY 33 east of Howe and is 140-ft south of the road
765	RRL17 O-1	INL	State HWY 28: 100-ft north of mile marker 21 and approximately 100-ft west of the road
766	Hwy20 Mile O-266	INL	U.S. HWY 20 mile marker 266
767	Hwy20 Mile O-270	INL	U.S. HWY 20 mile marker 270
768	IF-670E O-32	INL	Idaho Falls: North side of Building IF-670 on the wall
769	IF-670N O-31	INL	Idaho Falls: North side of Building IF-670 on the wall and east of chain-link fence
770	IF-670W O-35	INL	Idaho Falls: West side of Building IF-670 on the wall near the door
771	RRL6 O-1	INL	East side of T-4 road approximately 1 mile south of US HWY 20 mile marker 277
772	RRL5 O-1	INL	East peak of East Butte
773	RWMC O-3A	INL	RWMC: North of facility fence
774	RWMC O-5A	INL	RWMC: North of facility fence
775	RWMC O-7A	INL	RWMC: North of facility fence
776	RWMC O-11A	INL	RWMC: North of facility fence
777	RWMC O-19A	INL	RWMC: South of facility fence
778	RWMC O-23A	INL	RWMC: South of facility fence
779	RWMC O-47	INL	RWMC: South of facility fence at the Cold Test Pit south burial ground.
780	RRL3 O-1	INL	T-1 Road: North of Frenchman's Cabin 1.8 miles
781	RWMC O-27A	INL	RWMC: South of facility fence
782	REST O-1	INL	BLR Rest Area on U.S. Highway 20/26
783	Haul W O-2	INL	370-ft east of west Haul Road entrance gate north of ARA III
784	LincolnBlvd O-15	INL	Lincoln Blvd.: Just north of mile maker 15 on the east side of the road
785	GATE 4 O-1	INL	Sand Dunes NOAA tower: South of Lincoln Blvd. guard gate #4
786	TAN LOFT O-12	INL	TAN/SMC: South of SMC facility on the north side of Nile Ave and the railroad tracks
787	TAN LOFT O-11	INL	TAN/SMC: South of SMC facility on the west side of Nile Ave
788	TAN LOFT O-10	INL	TAN/SMC: West of the SMC facility fence

Table A-10. (continued).

789	TAN LOFT O-9	INL	TAN/SMC: North of SMC facility fence at NOAA tower
790	TAN LOFT O-8	INL	TAN/SMC: Northeast corner of the SMC facility fence
791	TAN LOFT O-13	INL	TAN/SMC: East of the SMC facility 600-ft north side of Nile Ave near a large dirt berm.
792	IF-670S O-33	INL	Idaho Falls: Inside of Building IF-670
793	IF-670D O-34	INL	Idaho Falls: Inside of Building IF-670
1262	RobNOAA	INL	Roberts: at NOAA tower
1270	RHLLW O-1	INL	RHLLW Disposal Facility
1271	RHLLW O-4	INL	RHLLW Disposal Facility
1272	RHLLW O-3	INL	RHLLW Disposal Facility
1273	RHLLW O-2	INL	RHLLW Disposal Facility
1274	RHLLW O-5	INL	RHLLW Disposal Facility
1275	RHLLW O-6	INL	RHLLW Disposal Facility
1290	IF-689 O-7	INL	IRC: South west side of IF-698
1291	IF-689 O-8	INL	IRC: South east side of IF-698
1302	NRF O-21	INL	NRF: North of facility
1303	NRF O-22	INL	NRF: East of facility
1304	NRF O-23	INL	NRF: East of facility
1305	NRF O-24	INL	NRF: North east of facility
1335	Roberts (NOAA)	ESER	Roberts: at NOAA tower
1350	EBR1 O-2	INL	EBR-I view area
1351	EBR1 O-3	INL	EBR-I view area
1348	IF-688B O-1	INL	Idaho Falls: Energy Innovation Laboratory
1349	IF-688B O-2	INL	Idaho Falls: Energy Innovation Laboratory
1353	IF-665 O-1	INL	Idaho Falls: Northeast of building
1354	IF-665 O-2	INL	Idaho Falls: Northeast roadway intersection
1355	IF-665 O-3	INL	Idaho Falls: East of building
1356	IF-665 O-4	INL	Idaho Falls: South of building
1357	IF-665 O-5	INL	Idaho Falls: Southwest of building

Table A-11. Flora and Fauna Surveillance Locations.

EMP_REF_ID	LOC NAME	MEDIA	MON_ORG_ID	LOCATION
82	Sewage Lagoons	Flora and Fauna	ESER	ATR Complex-Main Sewage Lagoon TRA 736

Table A-12. Long-Term Vegetation Locations.

PLOT	MEDIA	PLOT	MEDIA
1	Long-term vegetation plot	45	Long-term vegetation plot
2	Long-term vegetation plot	46	Long-term vegetation plot
3	Long-term vegetation plot	47	Long-term vegetation plot
4	Long-term vegetation plot	48	Long-term vegetation plot
5	Long-term vegetation plot	49	Long-term vegetation plot
6	Long-term vegetation plot	50	Long-term vegetation plot
7	Long-term vegetation plot	51	Long-term vegetation plot
8	Long-term vegetation plot	52	Long-term vegetation plot
9	Long-term vegetation plot	53	Long-term vegetation plot
10	Long-term vegetation plot	54	Long-term vegetation plot
11	Long-term vegetation plot	55	Long-term vegetation plot
13	Long-term vegetation plot	56	Long-term vegetation plot
14	Long-term vegetation plot	57	Long-term vegetation plot
15	Long-term vegetation plot	66	Long-term vegetation plot
17	Long-term vegetation plot	67	Long-term vegetation plot
18	Long-term vegetation plot	68	Long-term vegetation plot
19	Long-term vegetation plot	69	Long-term vegetation plot
20	Long-term vegetation plot	70	Long-term vegetation plot
21	Long-term vegetation plot	71	Long-term vegetation plot
22	Long-term vegetation plot	72	Long-term vegetation plot
23	Long-term vegetation plot	73	Long-term vegetation plot
24	Long-term vegetation plot	74	Long-term vegetation plot
25	Long-term vegetation plot	75	Long-term vegetation plot
26	Long-term vegetation plot	76	Long-term vegetation plot
27	Long-term vegetation plot	77	Long-term vegetation plot
28	Long-term vegetation plot	78	Long-term vegetation plot
29	Long-term vegetation plot	79	Long-term vegetation plot
30	Long-term vegetation plot	80	Long-term vegetation plot
31	Long-term vegetation plot	81	Long-term vegetation plot
32	Long-term vegetation plot	82	Long-term vegetation plot
33	Long-term vegetation plot	83	Long-term vegetation plot
34	Long-term vegetation plot	84	Long-term vegetation plot
35	Long-term vegetation plot	85	Long-term vegetation plot
36	Long-term vegetation plot	86	Long-term vegetation plot
37	Long-term vegetation plot	87	Long-term vegetation plot
38	Long-term vegetation plot	88	Long-term vegetation plot
39	Long-term vegetation plot	89	Long-term vegetation plot
40	Long-term vegetation plot	90	Long-term vegetation plot
41	Long-term vegetation plot	91	Long-term vegetation plot
42	Long-term vegetation plot	92	Long-term vegetation plot
43	Long-term vegetation plot	93	Long-term vegetation plot
44	Long-term vegetation plot	94	Long-term vegetation plot

Table A-12. (continued).

PLOT	MEDIA
95	Long-term vegetation plot
96	Long-term vegetation plot
97	Long-term vegetation plot
98	Long-term vegetation plot
99	Long-term vegetation plot

Table A-13. Precipitation Surveillance Locations.

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
262	EFS	ESER	Experimental Field Station: West of facility fence
676	Idaho Falls	ESER	Idaho Falls: North of SSF on east side of Foote Dr.
1326	Atomic City	ESER	Atomic City at NOAA tower
1337	Howe	ESER	Howe

Table A-14. Meteorological Monitoring Locations.

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
225	690	NOAA	CFA north of Building CFA-690
226	ABE	NOAA	Aberdeen
227	ARC	NOAA	Arco: NOAA tower 0.5 miles south of U.S. HWY 20/26 near mile marker 249
228	BAS	NOAA	Base of Howe Peak NOAA tower northwest of NRF
229	BIG	NOAA	Southwest of Big Southern Butte approximately 10 miles (Coxs Well)
230	BLK	NOAA	Blackfoot: Mountain View Middle School
231	BLU	NOAA	Blue Dome
232	CRA	NOAA	Craters of the Moon
233	DEA	NOAA	Dead Man Canyon NOAA tower on T-Road 11
234	DUB	NOAA	Dubois
235	EBR	NOAA	MFC: West side of MFC facility fence
236	FOR	NOAA	Fort Hall
237	GRI	NOAA	INTEC/Grid3 NOAA tower
238	HAM	NOAA	Hamer
239	HOW	NOAA	Howe
240	IDA	NOAA	Idaho Falls: South of John's Hole Bridge
241	KET	NOAA	Kettle Butte
242	LOF	NOAA	TAN/SMC: North of SMC facility fence at NOAA tower
243	LOS	NOAA	BLR Rest Area on U.S. Highway 20/26
244	MIN	NOAA	Minidoka
245	MON	NOAA	Monteview: Near intersection of E 2700 North & North 800 East
246	NRF	NOAA	NRF: East of NRF
247	PBF	NOAA	CITRC: At PBF Support Area
248	PRO	NOAA	0.5 miles northeast of INTEC/Grid 3 NOAA tower
249	RIC	NOAA	Richfield
250	ROB	NOAA	Roberts: NOAA tower
251	ROV	NOAA	Rover NOAA tower on T-Road 4
252	RWM	NOAA	RWMC: North of RWMC
254	SAN	NOAA	Sand Dunes NOAA tower: South of Lincoln Blvd. guard gate #4
255	SUG	NOAA	Sugar City
256	SUM	NOAA	Big Southern Butte Summit
257	TAB	NOAA	Taber
258	TER	NOAA	Terreton: State HWY 33 east of mile marker 47
259	TRA	NOAA	ATR Complex: West of facility fence
654	ATO	NOAA	Atomic City: NOAA tower

Table A-15. Event Monitoring Locations.

EMP_REF_ID	LOC NAME	MON_ORG_ID	LOCATION
120	690	INL	CFA: North of Building CFA-690
121	EBR	INL	MFC: West side of MFC facility fence
122	LOF	INL	TAN/SMC: North of SMC facility fence at NOAA tower
123	NRF	INL	NRF: East of NRF
124	PBF	INL	CITRC: PBF Support Area
125	RWM	INL	RWMC: North of RWMC
126	TRA	INL	ATR Complex: West of facility fence
127	ARC	INL	Arco: NOAA tower 0.5 miles south of U.S. HWY 20/26 near mile marker 249
128	ATO	INL	Atomic City at NOAA tower
129	BLU	INL	Blue Dome
130	HOW	INL	Howe
131	KET	INL	Kettle Butte
132	MON	INL	Monteview: Near intersection of E 2700 North & North 800 East
133	TER	INL	Terreton: State HWY 33 east of mile marker 47
134	IDA	INL	Idaho Falls: South of John's Hole Bridge
1266	Sugar	INL	Sugar City