nonferrous, and light steel scrap metals for recycling; and reduction of sanitary waste by less than 1 metric ton (1.1 tons) by collecting and redistributing unneeded copier machine supplies within the Nevada Operations Office and the Nevada Environmental Protection Agency, and returning the remaining supplies to the vendor for credit (DOE 2000h).

4.4.12.7 Waste Management PEIS Records of Decision

The *Waste Management PEIS* Records of Decision affecting NTS are shown in **Table 4–51**. Decisions on the various waste types were announced in a series of Records of Decision that have been published as a result of analyses documented in the *Waste Management PEIS* (DOE 1997a). The hazardous waste Record of Decision was published on August 5, 1998 (63 FR 41810), and the low-level radioactive and mixed low-level radioactive waste Record of Decision was published on February 18, 2000 (65 FR 10061). The hazardous waste Record of Decision states that most DOE sites will continue using offsite facilities to treat and dispose of major portions of nonwastewater hazardous waste, except the Oak Ridge Reservation and the Savannah River Site, which will continue treating some of their own nonwastewater hazardous waste on site in existing facilities where this is economically feasible. The low-level radioactive waste and mixed low-level radioactive waste Record of Decision states that, for the management of low-level radioactive waste, minimal treatment will be performed at all sites, and disposal will continue on site to the extent practicable at INEEL, LANL, the Oak Ridge Reservation, and the Savannah River Site. In addition, Hanford and on site NTS will be available to all DOE sites for low-level radioactive waste disposal. Mixed low-level radioactive waste will be treated at Hanford, INEEL, the Oak Ridge Reservation, and the Savannah River Site, and will be disposed of at Hanford and NTS. More detailed information concerning DOE's decisions for the future configuration of waste management facilities at NTS is presented in the hazardous waste and low-level radioactive waste and mixed low-level radioactive waste Records of Decision.

Table 4–51 Waste Management PEIS Records of Decision Affecting NTS

Waste Type	*Preferred Action*
Low-level radioactive	DOE has decided to continue to treat and dispose of NTS low-level radioactive waste on site. In addition, NTS is available to all DOE sites for low-level radioactive waste disposal. [a]
Mixed low-level radioactive	DOE has decided to regionalize treatment of mixed low-level radioactive waste at the Hanford Site, INEEL, the Oak Ridge Reservation, and the Savannah River Site. NTS will continue to dispose of its own mixed low-level radioactive waste on site and will receive and dispose of mixed low-level radioactive waste generated and shipped by other sites, consistent with permit conditions and other applicable requirements. [a]
Hazardous	DOE has decided to continue to use commercial facilities for treatment of NTS nonwastewater hazardous waste. [b]

[a] From the Record of Decision for low-level radioactive and mixed low-level radioactive waste (65 FR 10061).
[b] From the Record of Decision for hazardous waste (63 FR 41810).
Source: 65 FR 10061, 63 FR 41810.

4.5 ANL-W

ANL-W is located within the boundaries of INEEL. Because of this, the general site description presented in this section is that of INEEL. INEEL is located on approximately 230,700 hectares (570,000 acres) in southeastern Idaho and is 55 kilometers (34 miles) west of Idaho Falls; 61 kilometers (38 miles) northwest of Blackfoot; and 35 kilometers (22 miles) east of Arco (see **Figure 4–32**). INEEL is owned by the Federal Government and administered, managed, and controlled by DOE. It is primarily within Butte County, but portions of the site are also in Bingham, Jefferson, Bonneville, and Clark Counties. The site is roughly equidistant from Salt Lake City, Utah, and Boise, Idaho (DOE 2000j).

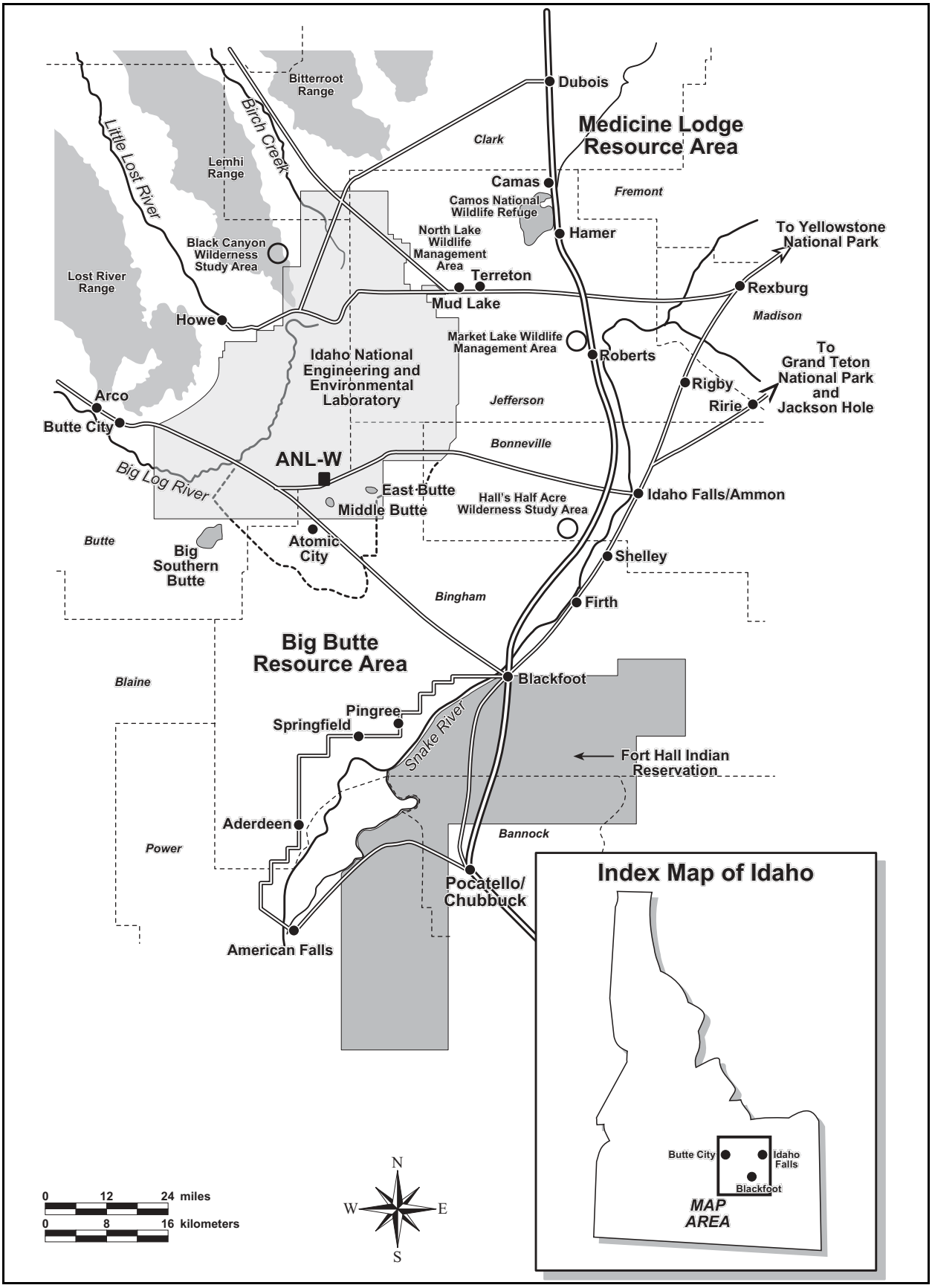


Figure 4–32 Idaho National Engineering and Environmental Laboratory Vicinity

There are 450 buildings and 2,000 support structures at INEEL, with more than 279,000 square meters (3,000,000 square feet) of floor space in varying conditions of utility. INEEL has approximately 25,100 square meters (270,000 square feet) of covered warehouse space and an additional 18,600 square meters (200,000 square feet) of fenced yard space. The total area of the various machine shops is 3,035 square meters (32,665 square feet) (DOE 2000j).

Fifty-two research and test reactors have been used at INEEL over the years to test reactor systems, fuel and target design, and overall safety. In addition to nuclear research reactors, other INEEL facilities are operated to support reactor operations. These facilities include high- and low-level radioactive waste processing and storage sites; hot cells; analytical laboratories; machine shops; and laundry, railroad, and administrative facilities. Other activities include management of one of DOE's largest storage sites for low-level radioactive waste and transuranic waste (DOE 2000j).

ANL-W is located in the southeastern portion of INEEL, about 61 kilometers (38 miles) west of the city of Idaho Falls. The site is designated as a testing center for advanced technologies associated with nuclear power systems. The area has 52 major buildings, including reactor buildings, laboratories, warehouses, technical and administrative support buildings, and craft shops that comprise 55,700 square meters (600,000 square feet) of floor space (DOE 1997c). Five nuclear test reactors have operated on the site, although the only one currently active is a small reactor used for radiography examination of experiments, waste containers, and spent nuclear fuel. Principal facilities located at ANL-W include the Fuel Manufacturing Facility, Transient Reactor Test Facility, Fuel Conditioning Facility, Hot Fuel Examination Facility, Zero Power Physics Reactor, and Experimental Breeder Reactor II. The following descriptions of the affected environment at INEEL and ANL-W are based all or in part on information provided in the *Idaho High-Level Waste and Facility Disposition EIS* (DOE 1999h), the *EIS for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel* (DOE 2000d), and the *NI PEIS* (DOE 2000j) which are incorporated by reference.

4.5.1 Land Resources

4.5.1.1 Land Use

The Federal Government, the State of Idaho, and various private parties own lands surrounding INEEL. Regional land uses include grazing, wildlife management, mineral and energy production, recreation, and crop production. Small communities and towns near the INEEL boundaries include Mud Lake and Terraton to the east; Arco, Butte City, and Howe to the west; and Atomic City to the south. Two National Natural Landmarks border INEEL: Big Southern Butte (2.4 kilometers [1.5 miles] south) and Hell's Half Acre (2.6 kilometers [1.6 miles] southeast). A portion of Hell's Half Acre National Natural Landmark is designated as a Wilderness Study Area. The Black Canyon Wilderness Study Area is adjacent to INEEL, and the Craters of the Moon Wilderness Area is located about 20 kilometers (12 miles) southwest of INEEL's western boundary. On November 9, 2000, President Clinton signed a Presidential Proclamation that added 267,500 hectares (661,000 acres) to the 21,850-hectare (54,000-acre) monument.

Land use categories at INEEL include facility operations, grazing, general open space, and infrastructure such as roads. Approximately 60 percent of the site is used for cattle and sheep grazing. Generalized land uses at INEEL and the surrounding vicinity are shown in **Figure 4–33**. Facility operations include industrial and support operations associated with energy research and waste management activities. Land is also used for recreation and environmental research associated with the designation of INEEL as a National Environmental Research Park. Much of INEEL is open space that has not been designated for specific use. Some of this space serves as a buffer zone between INEEL facilities and other land uses. Recently, 29,950 hectares (74,000 acres) of open space in the north-central portion of the site were designated as the

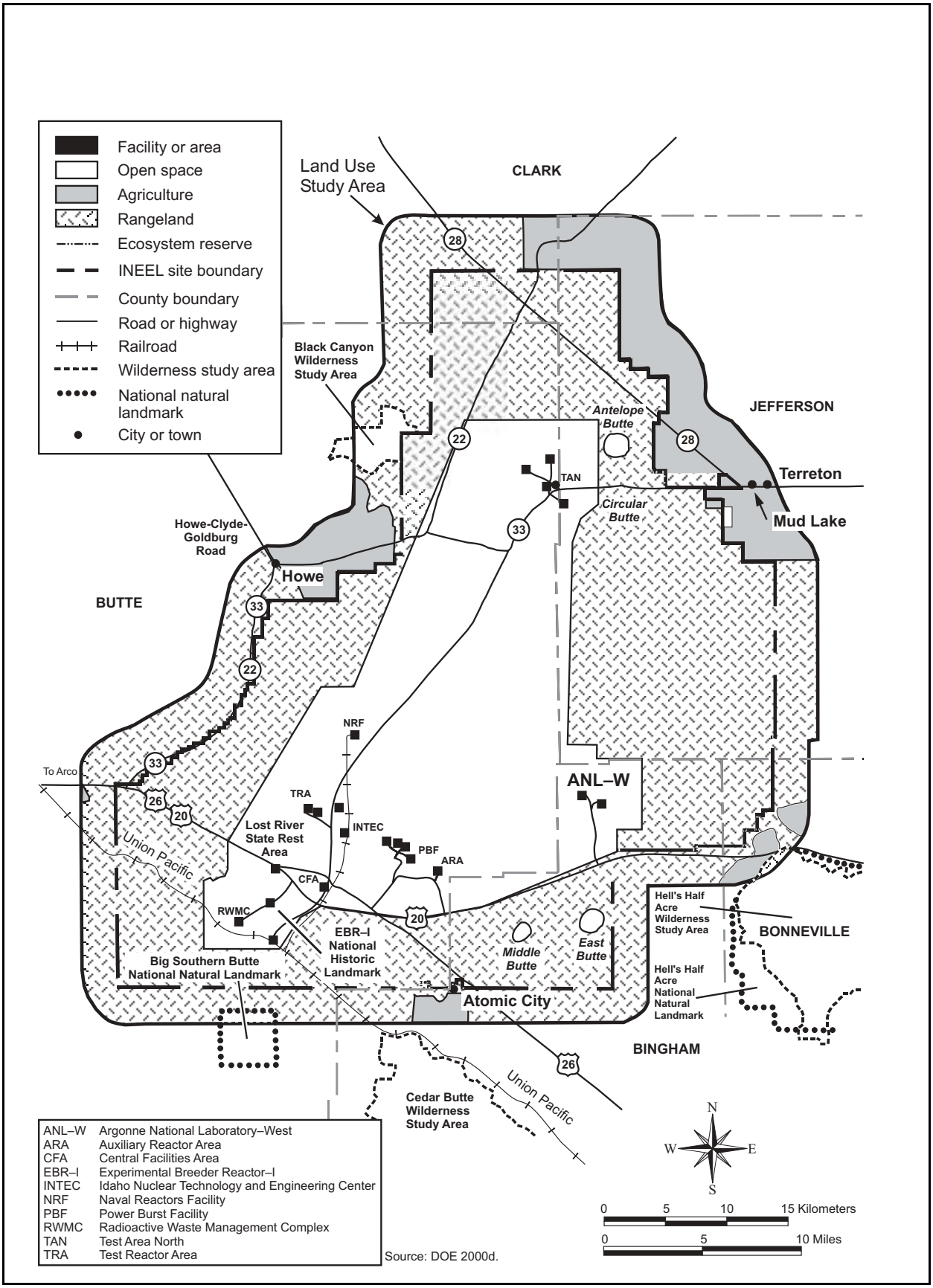


Figure 4–33 Land Use at INEEL and Vicinity

INEEL Sagebrush Steppe Ecosystem Reserve. This area represents one of the last sagebrush steppe ecosystems in the United States and provides a home for a number of rare and sensitive species of plants and animals. Approximately 2 percent of the total INEEL site area (4,600 hectares [11,400 acres]) is used for facilities and operations. Facilities are sited within a central core area of about 93,100 hectares (230,000 acres) (Figure 4–33). Public access to most facilities is restricted. DOE land use plans and policies applicable to INEEL are discussed in the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DOE 1995c).

All county plans and policies encourage development adjacent to previously developed areas to minimize the need for infrastructure improvements and to avoid urban sprawl. Because INEEL is remote from most developed areas, its lands and adjacent areas are not likely to experience residential and commercial development, and no new development is planned near the site. Recreational and agricultural uses, however, are expected to increase in the surrounding area in response to greater demand for recreational areas and the conversion of rangeland to cropland.

The Fort Bridger Treaty of July 3, 1868, secured the Fort Hall Reservation as the permanent homeland of the Shoshone-Bannock Peoples. According to the treaty, tribal members reserved rights to hunting, fishing, and gathering on surrounding unoccupied lands of the United States. While INEEL is considered occupied land, it was recognized that certain areas on the INEEL site have significant cultural and religious significance to the tribes. A 1994 Memorandum of Agreement with the Shoshone-Bannock Tribes provides tribal members access to the Middle Butte to perform sacred or religious ceremonies or other educational or cultural activities.

The total land area at ANL-W is 328 hectares (810 acres); however, site facilities are principally situated within about 20 hectares (50 acres), or 6 percent of the site. ANL-W is located 7 kilometers (4.3 miles) northwest of the nearest site boundary. Land within the fenced portion of the site has been heavily disturbed, with buildings, parking lots, and roadways occupying most areas and is no natural habitat present. The Fuel Manufacturing Facility is located within the main fenced portion of the site, while the Transient Reactor Test Facility is located about 1.2 kilometers (0.75 miles) to the northeast (Figure 3–13). Land within the site will continue to be used for nuclear and nonnuclear scientific and engineering experiments for DOE, private industry, and academia (DOE 1997c).

4.5.1.2 Visual Resources

The Bitterroot, Lemhi, and Lost River mountain ranges border INEEL on the north and west. Volcanic buttes near the southern boundary of INEEL can be seen from most locations on the site. INEEL generally consists of open desert land predominantly covered by big sagebrush and grasslands. Pasture and farmland border much of the site. Ten facility areas are on the INEEL site. Although INEEL has a comprehensive facility and land use plan (DOE 1997c), no specific visual resource standards have been established. INEEL facilities have the appearance of low-density commercial/industrial complexes widely dispersed throughout the site. Structure heights generally range from 3 to 30 meters (10 to 100 feet); a few stacks and towers reach 76 meters (250 feet). Although many INEEL facilities are visible from highways, most facilities are more than 0.8 kilometers (0.5 miles) from public roads. The operational areas are well defined at night by the security lights.

Lands adjacent to INEEL are under Bureau of Land Management jurisdiction and have a Visual Resource Contrast Class II rating. Lands within the INEEL site have a Visual Resource Contrast rating of Class II and III. Management activities within these classes may be seen, but should not dominate the review. The Black Canyon Wilderness Study Area adjacent to INEEL is under consideration by Bureau of Land Management

for Wilderness Area designation, approval of which would result in an upgrade of its Visual Resource Contrast rating from Class II to Class I. The Hell's Half Acre Wilderness Study Area is 2.6 kilometers (1.6 miles) southeast of INEEL's eastern boundary. This area, famous for its lava flow and hiking trails, is managed by the Bureau of Land Management. The Craters of the Moon Wilderness Area is about 20 kilometers (12 miles) southwest of INEEL's western boundary.

Developed areas within ANL-W are consistent with a Class IV Visual Resource Contrast rating in which management activities dominate the view and are the focus of viewer attention. The tallest structure at ANL-W is the Fuel Conditioning Facility stack, which is 61 meters (200 feet) in height. The site is visible from Highway 20. Facilities that stand out from the highway include the Transient Reactor Test Facility, Hot Fuel Examination Facility, the Experimental Breeder Reactor-II containment shell, and the Zero Power Physics Reactor. Natural features of visual interest within a 40-kilometer (25-mile) radius of ANL-W include the East Butte at 9 kilometers (5.6 miles), Middle Butte at 11 kilometers (6.8 miles), Hell's Half Acre National Natural Landmark and Hell's Half Acre Wilderness Study Area at 15 kilometers (9.3 miles), Big Lost River at 19 kilometers (11.8 miles), and Big Southern Butte National Natural Landmark at 30 kilometers (18.6 miles).

4.5.2 Site Infrastructure

Site infrastructure characteristics are identified in **Table 4–52**.

4.5.2.1 Ground Transportation

The road network at INEEL provides for onsite transportation; railroads are used for deliveries of large volumes of coal and oversized structural components. Commercial shipments are transported by truck; some bulk materials are transported by train; and waste is transported by truck and train. About 140 kilometers (87 miles) of paved surface have been developed out of the 445 kilometers (277 miles) of roads on the site, including 29 kilometers (18 miles) of service roads that are closed to the public (Table 4–52). Most of the roads are adequate for the current level of normal transportation activity and could handle increased traffic volume.

Table 4–52 INEEL Sitewide Infrastructure Characteristics

Resource	*Site Usage*	*Site Capacity*
Transportation		
Roads (kilometers)	445 [a]	Not applicable
Railroads (kilometers)	48	Not applicable
Electricity		
Energy consumption (megawatt-hours per year)	221,772	394,200
Peak load (megawatts)	39	124
Fuel		
Natural gas (cubic meters per year)	0	Not applicable
Liquid fuels (liters per year)	5,820,000	16,000,000 [b]
Coal (metric tons per year)	11,340	11,340 [b]
Water (liters per year)	4,829,000,000 [c]	43,000,000,000 [d]

[a] Includes paved and unpaved roads.
[b] Low supplies can be replenished by truck or rail and, therefore, are essentially not limited.
[c] 1998 usage (DOE 2000j).
[d] Water right allocation.

Source: DOE 2000d.

The Union Pacific Railroad's Blackfoot-to-Arco Branch crosses the southern portion of INEEL and provides rail service to the site. This branch connects with a DOE spur line at Scoville Siding, then links with

developed areas within INEEL. There are 48 kilometers (30 miles) of railroad track at INEEL. Rail shipments to and from INEEL usually are limited to bulk commodities, spent nuclear fuel, and radioactive waste. Local and linking regional transportation systems including roadways are detailed in Section 4.5.9.4.

4.5.2.2 Electricity

Commercial electric power is supplied to INEEL through two feeders from the Antelope substation to the Federally owned Scoville substation, which supplies electric power directly to the site's electric power distribution system. Electric power supplied by Idaho Power Company is generated by hydroelectric generators along the Snake River in southern Idaho and by the Bridger and Valmy coal-fired thermal electric generation plants in southwestern Wyoming and northern Nevada.

Site electrical availability is about 394,200 megawatt-hours per year. In 1997, INEEL used 221,772 megawatt-hours of electricity. The 1997 peak load usage was about 39 megawatts; the peak load capacity for INEEL is 124 megawatts (Table 4–52). Current electrical usage at ANL-W is 28,700 megawatt-hours per year.

4.5.2.3 Fuel

Fuel consumed at INEEL includes several types of liquid petroleum fuel, coal, and propane gas. All fuel is transported to the site for use and storage. Fuel storage is provided for each facility, and the inventories are restocked as necessary. The current site usage of fuel oil is about 5.8 million liters (1.5 million gallons) per year. The current site usage of coal is about 11,340 metric tons (12,500 tons) per year (Table 4–52). If additional coal or fuel oil were needed during the year, it could be shipped to the site.

4.5.2.4 Water

The Snake River Plain aquifer is the source of all water used at INEEL (see Section 4.5.6.2). The water is provided by a system of about 30 wells, together with pumps and storage tanks. That system is administered by DOE, which holds the Federal Reserved Water Right of 43 billion liters (11.4 billion gallons) per year for the site. INEEL site-wide groundwater production in 1998 was about 4.83 billion liters (1.28 billion gallons) (see Table 4–52). In 1998, ANL-W withdrew some 187.6 million liters (49.6 million gallons) from its two production wells (EBR II #1 and EBR II #2).

4.5.3 Air Quality

The climate at INEEL and the surrounding region is characterized as that of a semiarid steppe. The average annual temperature at INEEL is 5.6 °C (42 °F); average monthly temperatures range from a minimum of -8.8 °C (16.1°F) in January to a maximum of 20 °C (68 °F) in July. The average annual precipitation is 22 centimeters (8.7 inches). Prevailing winds at INEEL are southwest or northeast. The annual average wind speed is 3.4 meters per second (7.5 miles per hour).

4.5.3.1 Nonradiological Releases

INEEL is within the Eastern Idaho Intrastate Air Quality Control Region (#61). None of the areas within INEEL and its surrounding counties are designated as nonattainment areas with respect to the NAAQS for criteria air pollutants (40 CFR 81.313). The nearest nonattainment area for particulate matter is in Pocatello, about 80 kilometers (50 miles) to the south. Applicable NAAQS and Idaho State ambient air quality standards are presented in **Table 4–53**.

Table 4–53 Modeled Ambient Air Concentrations from INEEL Sources (µg/m^3)

Pollutant	*Averaging Period*	*Most Stringent Standard* [a]	*INEEL Concentration without ANL-W* [b]	*ANL-W Concentration* [c]
Carbon monoxide	8 hours	10,000 [d]	76	13
	1 hour	40,000 [d]	350	57
Lead	Quarterly	1.5	0.0024	(f)
Nitrogen dioxide	Annual	100 [d]	3.2	1.1
Ozone	1 hour	235 [e]	(f)	(f)
PM_{10}	Annual	50 [d]	1.2	0.018
	24 hours	150 [d]	19	0.28
Sulfur dioxide	Annual	80 [d]	0.61	0.88
	24 hours	365 [d]	16	11
	3 hours	1,300 [d]	67	62

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50), other than those for ozone, particulate matter, and lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic PM_{10} mean standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard.

[b] Maximum concentrations occur at receptors along public roads.

[c] ANL-W concentrations based on 1997 actual emissions and 1996 meteorology data modeled using ISCST3.

[d] Federal and state standard.

[e] Federal 8-hour standard is currently under litigation.

[f] Not directly emitted or monitored by the site.

Note: NAAQS also include standards for lead. No sources of lead emissions have been identified for any alternative evaluated. Emissions of hazardous air pollutants not listed here have been identified at INEEL, but are not associated with any of the alternatives evaluated. EPA revised the ambient air quality standards for particulate matter and ozone in 1997 (62 FR 38856, 62 FR 38652); however, these standards are currently under litigation, but could become enforceable during the life of this project.
Sources: 40 CFR 50, DOE 1999h, DOE 2000d, ID DEQ 2000.

The primary sources of air pollutants at INEEL include combustion of coal for steam and combustion of fuel oil for heating. Other emission sources include waste burning, coal piles, industrial processes, stationary diesel engines, vehicles, and fugitive dust from waste burial and construction activities. Emissions for 1997 are presented in **Table 4–54**.

Table 4–54 Air Pollutant Emissions at INEEL in 1997 [a]

Pollutant	*Sources Other Than ANL-W*	*ANL-W*
Carbon monoxide	1.1 [b]	1.6
Nitrogen dioxide	4.4	6.6
PM_{10}	0.44	0.31
Sulfur dioxide	15	2.2
Volatile organic compounds	0.055	0.13
Lead	0.66	None

[a] Values in metric tons per year.

[b] Emissions associated with fuel combustion.

Source: DOE 1999h, INEEL 1998.

Routine offsite monitoring for nonradiological air pollutants is generally only performed for particulates. Monitoring for PM_{10} is performed by the Environmental Science and Research Foundation at the site boundary and at communities beyond the boundary. In 1998, 55 samples were collected at Rexburg (about 60 kilometers [19.3 miles] east of the site) by the Foundation. The mean PM_{10} concentration at Rexburg for 1998 was 27 micrograms per cubic meter. Forty-eight samples were collected at the Mountain View Middle School in Blackfoot, with a mean concentration of 23 micrograms per cubic meter. Forty-four samples were collected at Atomic City in 1998, with a mean concentration of 21 micrograms per cubic meter.

Some monitoring data have also been collected by the National Park Service at the Craters of the Moon Wilderness Area. The monitoring program has shown no exceedances of the 1-hour ozone standard, low levels of sulfur dioxide (except for one exceedance of the 24-hour standard in 1985), and total suspended particulates within applicable standards. Note that the total suspended particulate standards have been replaced with PM_{10} standards.

The existing ambient air concentrations attributable to sources at INEEL are presented in Table 4–53. These concentrations are based on dispersion modeling at the INEEL site boundary centered at the Idaho Nuclear Technology and Engineering Center facility, and were performed for the *Idaho High-Level Waste and Facilities Disposition Environmental Impact Statement* using 1997 actual emissions and excluding ANL-W and meteorological data from 1991-1992; dispersion modeling at the INEEL site boundary centered on ANL-W using 1997 actual emissions for ANL-W; and meteorological data from 1996. The estimated concentrations are conservative and bound the actual INEEL contribution to ambient levels, as some of the modeled sources are currently in standby. Concentrations shown in Table 4–53 represent a small percentage of the ambient air quality standards. Concentrations of any hazardous and toxic compounds would be well below regulatory levels.

Because INEEL sources are limited and background concentrations of criteria pollutants are well below ambient standards, INEEL emissions should not result in air pollutant concentrations that violate the ambient air quality standards.

The nearest Prevention of Significant Deterioration Class I area to INEEL is Craters of the Moon Wilderness Area, Idaho, 53 kilometers (33 miles) west-southwest from the center of the site. A Class I area is one in which very little increase in pollution is allowed due to the pristine nature of the area. There are no other Class I areas within 100 kilometers (62 miles) of INEEL. INEEL and its vicinity are classified as a Class II area in which more moderate increases in pollution are allowed.

EPA has established Prevention of Significant Deterioration increments for certain pollutants such as: sulfur dioxide, nitrogen dioxide, and particulate matter. The increments specify a maximum allowable increase above a certain baseline concentration for a given averaging period, and apply only to sources constructed or modified after a specified baseline date. These sources are known as increment-consuming sources. The baseline date is the date of submittal of the first application for a Prevention of Significant Deterioration permit in a given area.

Prevention of Significant Deterioration permits have been obtained for the coal-fired steam-generating facility next to the Idaho Nuclear Technology and Engineering Center and the Fuel Processing Facility, which is not expected to be operated. In addition to these facilities, INEEL has other increment consuming sources on site. Current amounts of Prevention of Significant Deterioration increment consumption in Class I and Class II areas by INEEL's increment-consuming sources based on dispersion modeling analyses are specified in **Tables 4–55** and **4–56**, respectively.

Table 4–55 Prevention of Significant Deterioration Increment Consumption at Craters of the Moon Wilderness (Class I) Area by Existing (1996) and Projected Sources Subject to Prevention of Significant Deterioration Regulation (µg/m^3)

Pollutant	*Averaging Period*	*Allowable Prevention of Significant Deterioration Increment* [a]	*Amount of Prevention of Significant Deterioration Increment Consumed*
Nitrogen dioxide	Annual	2.5	0.40
Respirable particulates [b]	Annual 24 hours	4 8	0.025 0.57
Sulfur dioxide	Annual 24 hours 3 hours	2 5 25	0.12 1.9 8.1

[a] All increments specified are State of Idaho standards (ID DEQ 2000).

[b] Data on particulate size are not available for most sources. For purposes of comparison to the respirable particulate increments, it is conservatively assumed that all particulates emitted are of respirable size (i.e., 10 microns or less in diameter).

Note: Estimated increment consumption includes existing INEEL sources subject to Prevention of Significant Deterioration regulation and including Idaho Nuclear Technology and Engineering Center CPP-606 boilers.
Source: DOE 1999h.

Table 4–56 Prevention of Significant Deterioration Increment Consumption at Class II Areas by Existing (1996) and Projected Sources Subject to Prevention of Significant Deterioration Regulation at INEEL (µg/m^3)

Pollutant	*Averaging Period*	*Allowable Prevention of Significant Deterioration Increment* [a]	*Amount of Prevention of Significant Deterioration Increment Consumed*
Nitrogen dioxide	Annual	25	8.8
Respirable particulates [b]	Annual 24 hours	17 30	0.53 10
Sulfur dioxide	Annual 24 hours 3 hours	20 91 512	3.6 27 120

[a] All increments specified are State of Idaho standards (ID DEQ 2000).

[b] Data on particulate size are not available for most sources. For purposes of comparison to the respirable particulate increments, it is conservatively assumed that all particulates emitted are of respirable size (i.e., 10 microns or less in diameter).

Note: Estimated increment consumption includes existing INEEL sources, subject to Prevention of Significant Deterioration regulations and include Idaho Nuclear Technology and Engineering Center CPP-606 boilers.
Source: DOE 1999h.

4.5.3.2 Radiological Releases

Primary releases of radiological air pollutants at INEEL and localized releases at ANL-W are presented in **Table 4–57**. During 1998, an estimated 5,995 curies of radioactivity were released to the atmosphere from all INEEL sources. Ninety-nine percent of the total airborne radioactive effluent was released from two INEEL facilities, the ANL-W and the Test Reactor Area. ANL-W released 4,719 curies and the Test Reactor Area released 1,201 curies. Isotopes of noble gases comprised more than 99 percent of each of their releases.

Year-to-year fluctuations in airborne radioactive effluent releases depend on which processes are active at INEEL facilities. The total for 1998 is higher than the annual totals for 1993 to 1997, primarily because of the 4,687 curies of krypton-85 released from ANL-W. Krypton-85, a noble gas, was released from ANL-W as part of a spent fuel treatment project, (the Electrometallurgical Treatment Research and Demonstration Project) in the Fuel Conditioning Facility. Although the 1998 releases were higher than in previous years, they were still considerably less than the annual totals in the 1980s.

Table 4–57 Radiological Airborne Releases to the Environment at INEEL in 1998

Emission Type	***Radionuclide*** [a]	***ANL-W (curies)***	***Other Facilities at INEEL*** [b] ***(curies)***	***Total (curies)***
Noble gases	Argon-41	2.3	1,172	1,175
	Krypton-85	4,687	0.30	4,687
	Krypton-85m	—	1.5	1.5
	Xenon-133	—	7.8	7.8
	Xenon-135	—	18.5	18.5
Airborne particulates	Sodium-24	—	0.013	0.013
	Chromium-51	—	0.0037	0.0037
	Rubidium-88	—	1.1	1.1
	Strontium-90 [c]	—	3.1×10^{-4}	3.1×10^{-4}
	Technetium-99m	—	0.0014	0.0014
	Antimony-125	—	1.3×10^{-4}	1.3×10^{-4}
	Cesium-137	—	0.0013	0.0013
	Cesium-138	—	0.050	0.050
	Uranium-234	—	0.0050	0.0050
	Plutonium-238	—	5.0×10^{-6}	5.0×10^{-6}
	Plutonium-239	—	5.3×10^{-7}	5.3×10^{-7}
Tritium, carbon-14, and iodine isotopes	Tritium (Hydrogen-3)	30	74	104
	Carbon-14	—	0.80	0.80
	Iodine-129	—	0.018	0.018
	Iodine-131	—	6.7×10^{-4}	6.7×10^{-4}
	Iodine-133	—	0.0015	0.0015
	Iodine-135	—	8.2×10^{-4}	8.2×10^{-4}
Others		4.8×10^{-5}	0.0026	0.0027
Total releases		4,719	1,276	5,995

[a] The table includes all radionuclides with total releases greater than 10^{-7} curies, except for plutonium-239. Values are not corrected for decay after release.

[b] Facilities include Idaho Nuclear Technology and Engineering Center, the Test Reactor Area, and the Naval Reactor Facility.

[c] Parent-daughter equilibrium assumed.

Note: Dashed lines indicate virtually no releases.

Source: DOE 2000e.

4.5.4 Noise

Major noise emission sources within INEEL include various industrial facilities, equipment, and machines (e.g., cooling systems, transformers, engines, pumps, boilers, steam vents, paging systems, construction and materials-handling equipment, and vehicles). Most INEEL industrial facilities are far enough from the site boundary that noise levels at the boundary from these sources are not measurable or are barely distinguishable from background levels.

Existing INEEL-related noises of public significance result from the transportation of people and materials to and from the site and in-town facilities via buses, trucks, private vehicles, and freight trains. Noise measurements along U.S. Route 20, about 15 meters (50 feet) from the roadway, indicate that traffic sound levels range from 64 to 86 dBA, and that the primary source is buses (71 to 80 dBA). While few people reside within 15 meters (50 feet) of the roadway, the results indicate that INEEL traffic noise might be objectionable to members of the public residing near principal highways or busy bus routes. Noise levels along these routes may have decreased somewhat due to reductions in employment and bus service at INEEL in the last few years. The acoustic environment along the INEEL site boundary in rural areas and at nearby areas away from traffic noise is typical of a rural location; the average day-night sound level is in the range

of 35 to 50 dBA. Except for the prohibition of nuisance noise, neither the State of Idaho nor local governments have established any regulations that specify acceptable community noise levels applicable to INEEL. The EPA guidelines for environmental noise protection recommend an average day-night sound level limit of 55 dBA to protect the public from the effects of broadband environmental noise in typically quiet outdoor and residential areas (EPA 1974). Land use compatibility guidelines adopted by the Federal Aviation Administration and the Federal Interagency Committee on Urban Noise indicate that annual day-night average sound levels less than 65 dBA are compatible with residential land uses (14 CFR Part 150). These guidelines further indicate that levels up to 75 dBA are compatible with residential uses if suitable noise reduction features are incorporated into structures. It is expected that, for most residences near INEEL, day-night average sound levels are compatible with residential land use, although noise levels may be higher than 65 dBA for some residences along major roadways.

No distinguishing noise characteristics at ANL-W have been identified. ANL-W is 7 kilometers (4.3 miles) from the nearest site boundary, so the contribution from the area to noise levels at the site boundary is unmeasurable.

4.5.5 Geology and Soils

INEEL is on the northwestern edge of the eastern Snake River Plain, which is bounded on the north and south by north-to-northwest-trending mountains and valleys of the Basin and Range Physiographic Province. The upper 1 to 2 kilometers (0.6 to 1.2 miles) of the crust beneath INEEL is composed of a sequence of Quaternary age (recent to 2 million years old) basalt lava flows and poorly consolidated sedimentary interbeds collectively called the Snake River Group. The sediments are composed of fine-grained silts that were deposited by wind; silts, sands, and gravels deposited by streams; and clays, silts, and sands deposited in lakes. Rhyolitic (granite-like) volcanic rocks of unknown thickness lie beneath the basalt sediment sequence. The rhyolitic volcanic rocks were erupted between 4.3 and 6.5 million years ago during the upper Tertiary Period. Lava tubes, which could have similar adverse effects as karst, occur in the INEEL area. Additional details about INEEL site geology are presented in the *NI PEIS*.

Within INEEL, economically viable sand, gravel, pumice, silt, clay, and aggregate resources exist. Several quarries supply these materials to various onsite construction and maintenance projects. Geothermal resources are potentially available in parts of the Eastern Snake River Plain, but neither of two boreholes drilled near the Idaho Nuclear Technology and Engineering Center encountered rocks with significant geothermal potential.

The Arco Segment of the Lost River Fault is thought to terminate about 7 kilometers (4.3 miles) from the INEEL boundary. The Howe Segment of the Lemhi Fault terminates near the northwest boundary of the site (**Figure 4–34**). Both segments are considered capable. A capable fault is one that has had movement at or near the ground surface at least once within the past 35,000 years, or recurrent movement within the past 500,000 years (10 CFR Part 100, Appendix A).

The seismic characteristics of the Eastern Snake River Plain and the adjacent Basin and Range Province are different; the Snake River Plain has historically experienced a few small earthquakes. Monitoring by the INEEL seismic network has detected relatively few microearthquakes (magnitude less than 1.5) occurring on or near the site. Thus, INEEL has a relatively low seismicity indicative of the Eastern Snake River Plain. Since 1973, 22 earthquakes have been recorded within 100 kilometers (62 miles) of south-central INEEL ranging in magnitude from 2.8 to a magnitude 3.9. These represent minor earthquakes with none centered closer than 77 kilometers (48 miles) from the site (USGS 2001i).

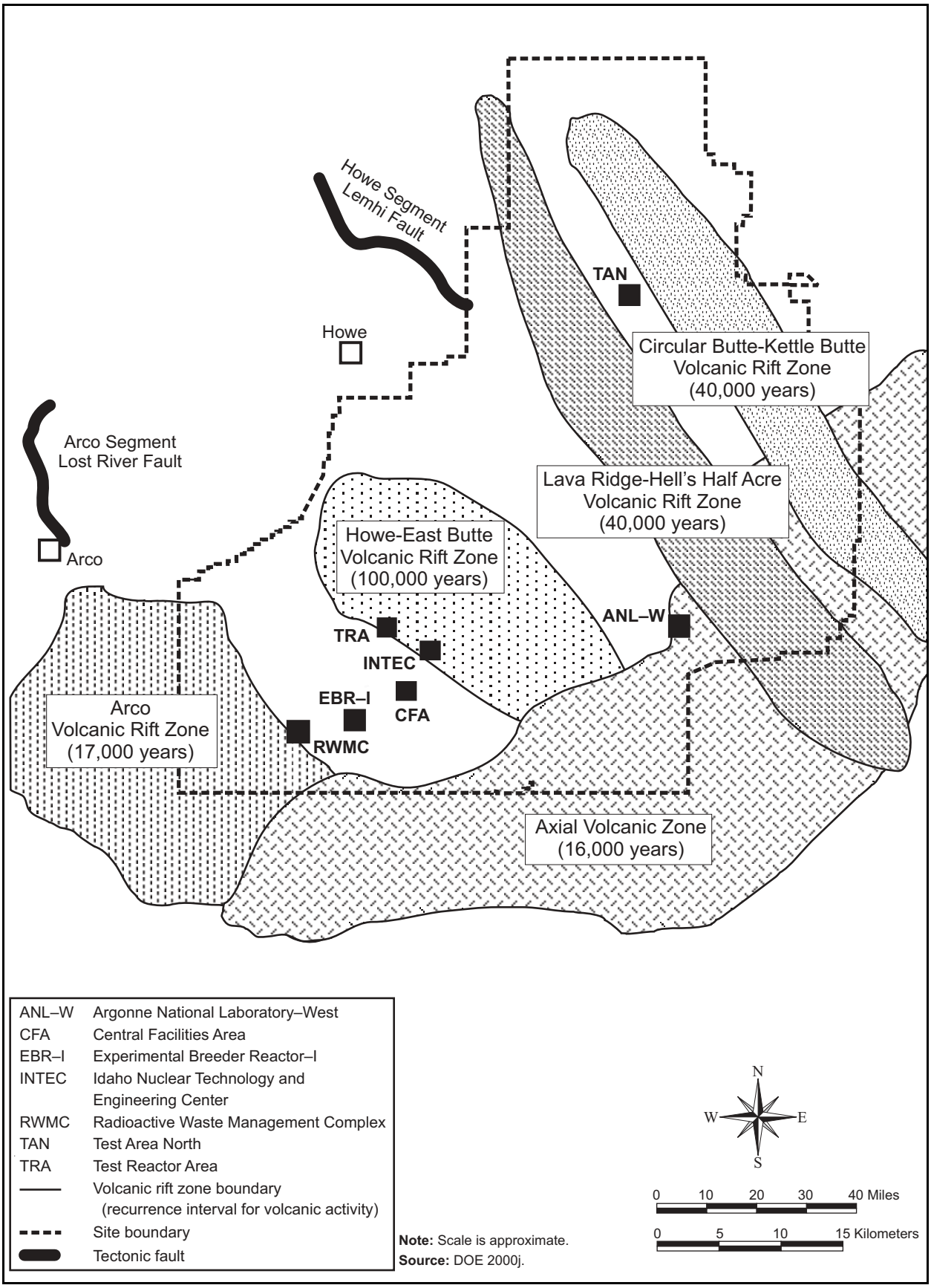


Figure 4–34 Major Geologic Features of INEEL

The largest historic earthquake near INEEL took place in October 1983 about 90 kilometers (56 miles) to the northwest of the western site boundary, near Borah Peak in the Lost River Range. It occurred on the middle portion of the Lost River Fault. The earthquake had a surface-wave magnitude of 7.3 (moment magnitude of 6.9), producing peak horizontal accelerations of 0.022g to 0.078g at INEEL (USGS 2001h, USGS 2001i). The reported Modified Mercalli Intensity ranged from V to IX at the event's epicenter (USGS 2001i). The Test Reactor Area (Advanced Test Reactor) experienced a Modified Mercalli Intensity of VI during this event with no damage to the Advanced Test Reactor found upon inspection. For reference, a comparison of Modified Mercalli Intensity (the observed effects of earthquakes) with measures of earthquake magnitude and ground acceleration is provided in Section F.5.2 (see Appendix F).

As discussed in more detail in Section 4.2.5, the U.S. Geological Survey has developed new earthquake hazard maps that are based on spectral response acceleration. These maps have been adapted for use in the new International Building Code (ICC 2000) and depict a maximum considered earthquake ground motion of 0.2- and 1.0-second spectral response acceleration, respectively, based on a 2 percent probability of exceedance in 50 years (i.e., 1 in 2,500). The south-central portion of INEEL encompassing ANL-W is calculated to lie within the 0.35g to 0.36g mapping contours for a 0.2 second spectral response acceleration and the 0.12g to 0.13g contours for a 1.0-second spectral response acceleration. For comparison, the calculated peak ground acceleration, for the given probability of exceedance is approximately 0.14g (USGS 2001e).

Basaltic volcanic activity occurred from about 2,100 to 4 million years ago in the INEEL site area. Although no eruptions have occurred on the Eastern Snake River Plain during recorded history, lava flows of the Hell's Half Acre lava field erupted near the southern INEEL boundary as recently as 5,400 years ago. The most recent eruptions within the site area occurred about 2,100 years ago 30 kilometers (19 miles) southwest of the site at the Craters of the Moon Wilderness Area. Five volcanic zones have been identified in the vicinity of INEEL. The estimated recurrence interval for volcanism in these zones ranges from 16,000 to 100,000 years. These zones are depicted in Figure 4–34.

Four basic soilscapes exist at INEEL: river-transported sediments deposited on alluvial plains, fine-grained sediments deposited into lake or playa basins, colluvial sediments originating from bordering mountains, and wind-blown sediments over lava flows. The alluvial deposits follow the courses of the modern Big Lost River and Birch Creek. The playa soils are found in the north-central part of the site. The colluvial sediments are located along the western edge of INEEL. Wind-blown sediments (silt and sand) covering lava plains occupy the rest of the landscape of the site. The thickness of surficial sediments ranges from less than 0.3 meters (1 foot) at basalt outcrops east of the Idaho Nuclear Technology and Engineering Center to 95 meters (312 feet) near the Big Lost River sinks. No prime farmland lies within INEEL boundaries.

The nearest capable fault to ANL-W is the Howe Segment of the Lemhi Fault, which is located 31 kilometers (19 miles) northwest of the site. ANL-W is located within the Axial Volcanic Zone, which has an estimated recurrence interval for volcanism of 16,000 years. The site is situated within a topographically closed basin. Low ridges of basalt found east of the area rise as high as 30 meters (100 feet) above the level of the plain. Sediments cover most of the underlying basalt on the plain, except where pressure ridges form basalt outcrops. Soils in the ANL-W area have been found to resemble the Pancheri-Polatis-Tenno series, which generally consist of light brown-gray well-drained silty loams to brown extremely stony loams. Soils are highly disturbed within developed areas of the site.

4.5.6 Water Resources

4.5.6.1 Surface Water

INEEL is in the Mud Lake-Lost River Basin (also known as the Pioneer Basin). This closed drainage basin includes three main streams—the Big and Little Lost Rivers and Birch Creek (**Figure 4–35**). These three streams are essentially intermittent and drain the mountain areas to the north and west of INEEL, although most flow is diverted for irrigation in the summer months before it reaches the site boundaries. Flow that reaches INEEL infiltrates the ground surface along the length of the stream beds in the spreading areas at the southern end of INEEL and, if the stream flow is sufficient, in the ponding areas (playas or sinks) in the northern portion of INEEL. During dry years, there is little or no surface water flow on the INEEL site. Because the Mud Lake-Lost River Basin is a closed drainage basin, water does not flow off INEEL, but instead infiltrates the ground surface to recharge the aquifer or is consumed by evapotranspiration. The Big Lost River flows southeast from Mackay Dam, past Arco and onto the Snake River Plain. On the INEEL site near the southwestern boundary, a diversion dam prevents flooding of downstream areas during periods of heavy runoff by diverting water to a series of natural depressions or spreading areas. During periods of high flow or low irrigation demand, the Big Lost River continues northeastward past the diversion dam, passes within about 60 meters (200 feet) of the Idaho Nuclear Technology and Engineering Center, and ends in a series of playas 24 to 32 kilometers (15 to 20 miles) northeast of the Idaho Nuclear Technology and Engineering Center and the Test Reactor Area, where the water infiltrates the ground surface.

Flow from Birch Creek and the Little Lost River infrequently reaches INEEL. The water in Birch Creek and Little Lost River is diverted in summer months for irrigation prior to reaching INEEL. During periods of unusually high precipitation or rapid snow melt, water from Birch Creek and Little Lost River may enter INEEL from the northwest and infiltrate the ground, recharging the underlying aquifer. Other than the three intermittent streams, the only other surface water bodies on the site include natural wetland-like ponds and manmade percolation and evaporation ponds.

Big Lost River, Little Lost River, and Birch Creek in the vicinity of INEEL have been classified by the State of Idaho for cold water communities, salmonid spawning, and primary contact recreation, with the Big Lost River sinks and channel and lowermost Birch Creek also classified for domestic water supply and as special resource waters (Idaho Administrative Code 58.01.02). In general, the water qualities of Big Lost River, Little Lost River, and Birch Creek are similar, with the chemical qualities reflecting the carbonate mineral compositions of the mountain ranges drained by them along with the quality of irrigation water return flows. Surface waters, however, are not used for drinking water on the site, nor is effluent discharged directly to them, so there are no surface water rights issues at INEEL. Although there are no routine wastewater discharges to surface waters, an NPDES permit application has been filed with EPA Region 10 for minor discharges from the Idaho Nuclear Technology and Engineering Center production wells to the Big Lost River. However, these discharges are subject to Idaho water quality standards and criteria. INEEL facilities are also covered by EPA's NPDES Storm Water Multi-Sector General Permit issued in 1998 (63 FR 52430). Storm-water is managed via the INEEL Storm Water Pollution Prevention Plan (first implemented in 1993). Annual storm-water evaluations are conducted as part of the plan, and storm-water is monitored in accordance with the permit and with DOE Orders. In 1998, INEEL also submitted a Notice of Intent to EPA for renewal of the site's General Permit for Storm Water Discharges from Construction Sites. As for industrial activities, a pollution prevention plan covering construction activities is maintained. Applications have been made to the State of Idaho for Wastewater Land Application Permits for all existing wastewater treatment facilities on the site (e.g., percolation ponds and sewage treatment irrigation systems); four permits have been issued (DOE 2000e).

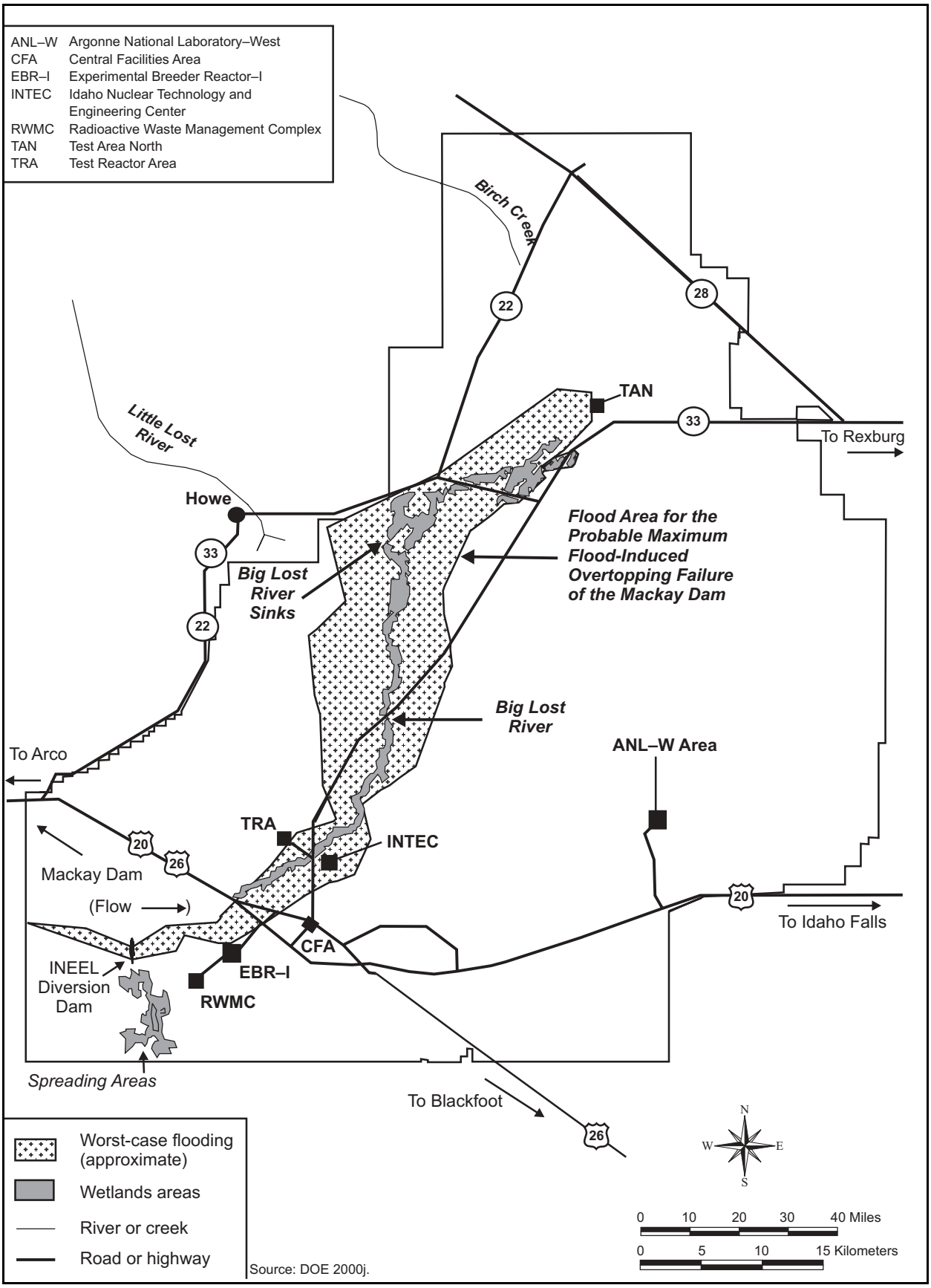


Figure 4–35 Surface Water Features at INEEL

None of the rivers or streams on or near the INEEL site have been classified as a Wild and Scenic River. The INEEL diversion dam constructed in 1958 and enlarged in 1984 secured INEEL from the 300-year flood of the Big Lost River by directing flow through a diversion channel into four spreading areas.

There are no named streams within the ANL-W area and no permanent, natural, surface water features near the area. Neither the 100-year flood nor flooding scenarios that involve the failure of Mackay Dam on the Big Lost River indicate that flood waters would reach ANL-W (Figure 4–35).

4.5.6.2 Groundwater

The Snake River Plain aquifer lies below the INEEL site and covers about 2,486,000 hectares (6,143,000 acres) in southeastern Idaho and is classified by EPA as a Class I sole source aquifer. This aquifer serves as the primary drinking water source in the Snake River Basin and is believed to contain 1.2 quadrillion to 2.5 quadrillion liters (317 trillion to 660 trillion gallons) of water. The aquifer consists of 610 to 3,048 meters (2,000 to 10,000 feet) of interbedded sediments, lava flows, and rhyolite. Recharge of the groundwater comes from Henry's Fork of the Snake River, Big Lost River, Little Lost River, and Birch Creek. Rainfall and snowmelt also contribute to the aquifer's recharge. Groundwater generally flows laterally at a rate of 1.5 to 6.1 meters (5 to 20 feet) per day. Groundwater flow is toward the south-southwest. It emerges in springs along the Snake River from Milner to Bliss, Idaho. Depth to the groundwater table ranges from about 60 meters (200 feet) below ground in the northeast corner of the site to about 300 meters (1,000 feet) in the southeast corner. Perched water tables also occur below the site. These perched water tables tend to slow the migration of pollutants that might otherwise reach the Snake River Plain aquifer. Perched water tables have been detected beneath the Idaho Nuclear Technology and Engineering Center and the Test Reactor Area and are mainly attributed to disposal ponds.

INEEL has a large network of monitoring wells that are maintained and monitored by the U.S. Geological Survey. This network includes 125 observation wells in the Snake River Plain aquifer and 45 drilled to monitor perched aquifers. An additional 120 auger holes have been drilled for monitoring shallow perched groundwater. INEEL's management and operations contractor also routinely monitors drinking water quality via 17 production wells and 10 distribution systems.

Historical waste disposal practices have produced localized plumes of radiochemical and chemical constituents in the Snake River Plain Aquifer at INEEL. Of principal concern over the years have been the movements of the tritium and strontium-90 plumes.

The main sources of tritium contamination of groundwater have been the injection of wastewater through the Idaho Nuclear Technology and Engineering Center disposal well and the discharge of wastewater to the infiltration/percolation ponds at the Idaho Nuclear Technology and Engineering Center and Test Reactor Area. Since 1984, wastewater has been discharged only to the infiltration ponds, and principally to lined evaporation ponds at the Test Reactor Area since 1993. The extent of the tritium contamination plume has remained about the same since 1991; however, concentrations in well water within the plume have decreased significantly. This is attributed to radioactive decay and a decrease in tritium disposal rates.

The extent of the strontium-90 contaminant plume, which also originates from the Idaho Nuclear Technology and Engineering Center, and the concentrations of strontium-90 have remained essentially constant since 1991. This is attributed to a lack of groundwater recharge from the Big Lost River that would otherwise dilute concentrations, and to the disposal of other chemicals in the Idaho Nuclear Technology and Engineering Center infiltration ponds which may have decreased strontium-90 adsorption to soil and rock causing more to remain in the liquid phase. Other known contaminants include cesium-137, iodine-129, strontium-90, and nonradioactive compounds such as trichloroethylene. Components of nonradioactive

waste entered the aquifer as a result of past waste disposal practices. Elimination of groundwater injection exemplifies a change in disposal practices that has reduced the amount of these constituents in the groundwater. Detailed information on groundwater monitoring including analytical results are presented in the annual site environmental report.

From 1982 to 1985, INEEL used about 7.9 billion liters (2.1 billion gallons) per year from the Snake River Plain aquifer, the only source of water at INEEL. This represents less than 0.3 percent of the groundwater withdrawn from that aquifer. Since 1950, DOE has held a Federal Reserved Water Right for the INEEL site that permits a pumping capacity of approximately 2.3 cubic meters (80 cubic feet) per second, with a maximum water consumption of 43 billion liters (11.4 billion gallons) per year. Total groundwater withdrawal at INEEL historically averages between 15 and 20 percent of that permitted amount. In 1998, INEEL's production well system withdrew a total of about 4.83 billion liters (1.276 billion gallons) of water. Most of the groundwater withdrawn for use by INEEL facilities is returned to the subsurface via percolation ponds.

All water used at ANL-W is groundwater from the Snake River Plain aquifer. The depth of the groundwater at ANL-W is approximately 195 meters (640 feet), and the flow is generally to the south-southwest. ANL-W uses approximately 188 million liters (49.6 million gallons) per year of water.

No significant levels of radioactivity have been found in the production wells at ANL-W. Constituents measured in the groundwater monitoring wells in 1997 were all below regulatory levels.

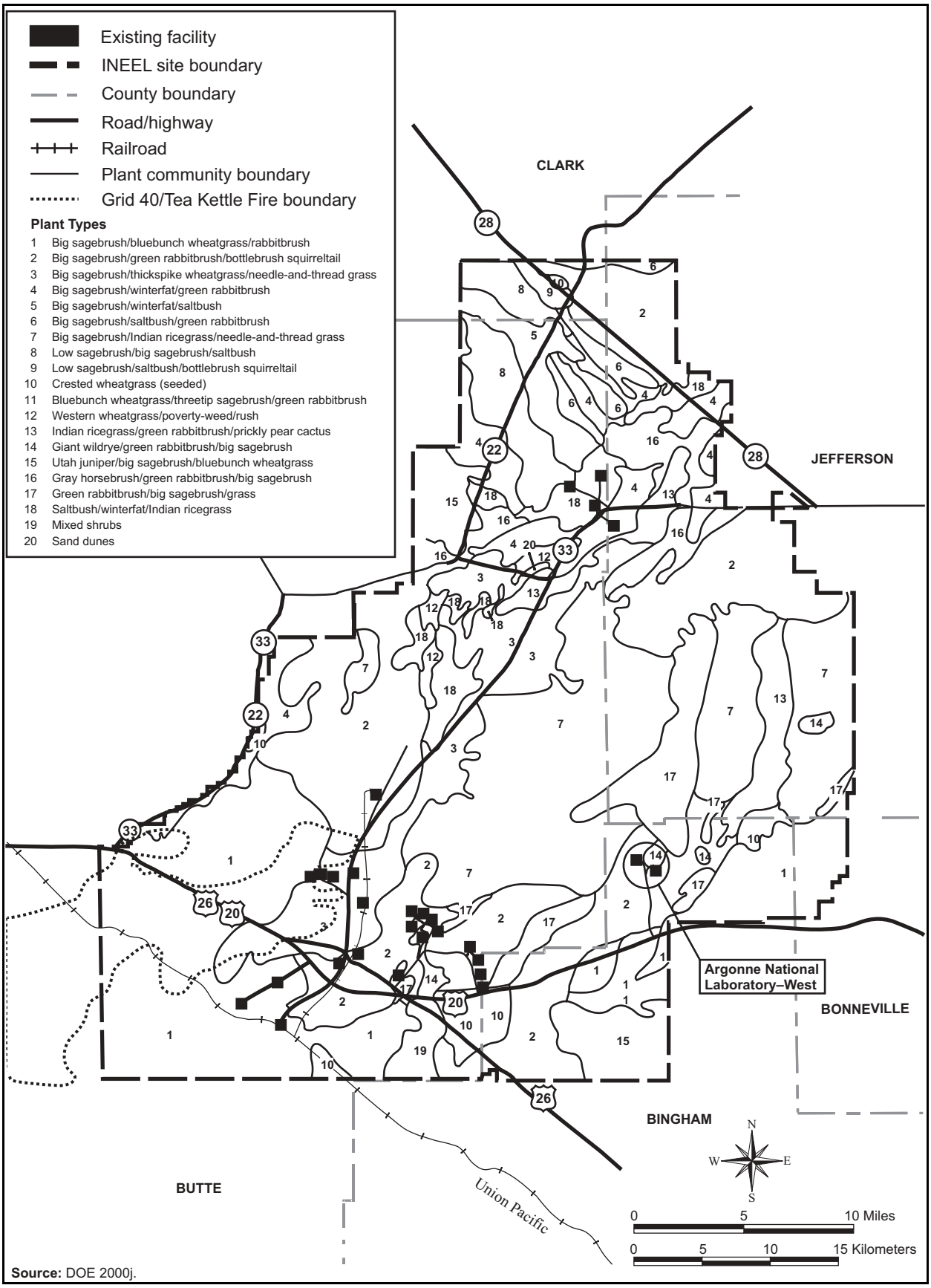
4.5.7 Ecological Resources

4.5.7.1 Terrestrial Resources

INEEL lies in a cool desert ecosystem dominated by shrub-steppe communities. Most land within the site is relatively undisturbed and provides important habitat for species native to the region. Facilities and operating areas occupy 2 percent of INEEL; approximately 60 percent of the area around the periphery of the site is grazed by sheep and cattle. Although sagebrush communities occupy about 80 percent of INEEL, a total of 20 plant communities has been identified (**Figure 4–36**). In total, 398 plant taxa have been documented at INEEL.

The interspersion of low and big sagebrush communities in the northern portion of INEEL and juniper communities in the northwestern and southeastern portions of the site are considered sensitive habitats. The former provide critical winter and spring range for sage grouse and pronghorn, while the latter are important to nesting raptors and songbirds. Riparian vegetation, primarily cottonwood and willow along the Big Lost River and Birch Creek provides nesting habitat for hawks, owls, and songbirds. Recently, approximately 29,950 hectares (74,000 acres) of open space in the north-central portion of the site have been designated as the INEEL Sagebrush Steppe Ecosystem Reserve. The area represents some of the last sagebrush steppe habitat in the United States and provides habitat for numerous rare and sensitive plants and animals.

INEEL supports numerous animal species, including two amphibian, 11 reptile, 225 bird, and 44 mammal species. Common animals on the INEEL site include the short-horned lizard, gopher snake, sage sparrow, Townsend's ground squirrel, and black-tailed jackrabbit. Important game animals include the sage grouse, mule deer, elk, and pronghorn. During some winters, 4,500 to 6,000 pronghorn, or about 30 percent of Idaho's total pronghorn population, may be found on the INEEL site. Pronghorn wintering areas are located in the northeastern portion of the site, in the area of the Big Lost River sinks, in the west-central portion of the site along the Big Lost River, and in the south-central portion of the site. Hunting elk and pronghorn is permitted only within 0.8 kilometers (0.5 miles) of the site boundary on INEEL lands adjacent to agricultural



Source: DOE 2000j.

Figure 4–36 Vegetation Association at INEEL

lands. Numerous raptors, such as the golden eagle and prairie falcon, and carnivores, such as the coyote and mountain lion, are also found on INEEL. A variety of migratory birds have been found at INEEL. Migratory birds are protected under the Migratory Bird Treaty Act.

Large wildfires in 1994, 1995, 1996, and 1999 played an important role in the ecology of INEEL. The most recent large fire, the Grid 40/Tea Kettle Fire, burned 19,830 hectares (49,000 acres) across the southwestern portion of the site between July 27 and 28, 2000 (INEEL 2000). The immediate effect of the fire on ecological resources at INEEL, aside from plants and animals that perished as a direct result of the fire, was the displacement of animals from their habitat. A longer-term concern is that non-native, invasive plant species may have a greater competitive advantage at the expense of native grasses and shrubs, especially where the ground was disturbed by fire fighting activities. Of particular concern is the loss of sagebrush, the dominant shrub of the shrub-steppe community. This plant is slow to regenerate since it must do so from seed, whereas many other plants regenerate from underground root systems. The slow recovery of sagebrush is likely to have a detrimental impact on the sage grouse (a bird that has been declining over much of its range) which is dependent on this plant, particularly for critical winter habitat.

ANL-W is located within one of several sagebrush communities found on the INEEL site (Figure 4–35). While sagebrush is present on undeveloped portions of the site, developed areas are nearly devoid of vegetation. Wildlife use of developed portions of the site is negligible; however, surrounding areas do provide natural habitat for a variety of wildlife. While elk and mule deer are the most important large mammals present in the area, many of the common species discussed above also would be expected. The ANL-W wastewater pond acts as an important source of water for wildlife found in the vicinity of the site.

4.5.7.2 Wetlands

National Wetland Inventory maps prepared by the USFWS have been completed for most of INEEL. These maps indicate that the primary wetland areas are associated with the Big Lost River, the Big Lost River spreading areas, and the Big Lost River sinks, although smaller (less than about 0.4 hectares [1 acre]) isolated wetlands also occur. Wetlands associated with the Big Lost River are classified as riverine/intermittent, indicating a defined stream channel with flowing water during only part of the year. The only areas of jurisdictional wetland are the Big Lost River sinks. Wetland areas on INEEL are shown in Figure 4–35.

Wetland vegetation exists along the Big Lost River, which is located 18 kilometers (11 miles) west of ANL-W; however, this vegetation is in poor condition because of recent years of only intermittent flows. The Big Lost River spreading areas and Big Lost River sinks are seasonal wetlands and are located 34 kilometers (21 miles) west-southwest and 23 kilometers (14 miles) northwest of ANL-W, respectively. These areas can provide more than 809 hectares (2,000 acres) of wetland habitat during wet years. Within ANL-W itself, small areas of intermittent marsh occur along cooling tower blowdown ditches.

4.5.7.3 Aquatic Resources

Aquatic habitat on the INEEL site is limited to the Big Lost River, Little Lost River, Birch Creek, and a number of liquid waste disposal ponds. All three streams are intermittent and drain into four sinks in the north-central part of the site. Six species of fish have been observed within water bodies located on site. Species observed in the Big Lost River include: brook trout, rainbow trout, mountain whitefish, speckled dace, shorthead sculpin, and kokanee salmon. The Little Lost River and Birch Creek, northwest and northeast of the Test Reactor Area, respectively, enter the INEEL site only during periods of high flow. Surveys of fish in these surface water bodies have not been conducted. The liquid waste disposal ponds on the INEEL site, while considered aquatic habitat, do not support fish.

There is no natural aquatic habitat on or in the vicinity of the ANL-W site. The nearest such habitat is the Big Lost River, which is located 18 kilometers (11 miles) west of the site. ANL-W waste disposal ponds do not contain any fish populations, but do provide habitat for a variety of aquatic invertebrates.

4.5.7.4 Threatened and Endangered Species

There are three agencies that have authority to designate threatened, endangered, and sensitive species in Idaho. The agencies are the USFWS, the Idaho Department of Fish and Game, and the U.S. Forest Service. The U.S. Forest Service lists species for special management consideration on lands under their jurisdiction and protects these species under the authority of the Endangered Species Act of 1973.

Fifteen Federal- and state-listed threatened, endangered, and other special status species occur, or possibly occur, on the INEEL site (**Table 4–58**). The bald eagle is listed by the USFWS as threatened (but is proposed for delisting) and by the State of Idaho as endangered. The bald eagle has rarely been seen in the western and northern portions of the INEEL site. The gray wolf (listed endangered, experimental population) has been sighted several times on the INEEL site since 1993. On July 27 and 28, 2000, the Grid 40/Tea Kettle Fire burned across 19,830 hectares (49,000 acres) of the southwestern portion of the INEEL site. DOE is currently assessing the impacts of that fire on threatened and endangered species and species of concern. No critical habitat for threatened or endangered species, as defined in the Endangered Species Act, exists on the INEEL site.

The ANL-W area was surveyed in 1996 for threatened, endangered, and special status species. The only listed species observed were the peregrine falcon and the loggerhead shrike. While no peregrine falcon nests were found near ANL-W, one peregrine falcon was observed perched on a power line 1.5 kilometers (0.9 miles) from the site. Since then, the peregrine falcon has been delisted. The loggerhead shrike, which is listed by Idaho as a species of concern, has been seen on numerous occasions in the vicinity of the site. The gray wolf (state endangered) and the pigmy rabbit and Townsend's big-eared bat (state species of concern) were not identified in the vicinity of ANL-W during the surveys. In addition, no Federally or state-listed plants were found in the vicinity of the site.

4.5.8 Cultural and Paleontological Resources

Cultural resources are human imprints on the landscape and are defined and protected by a series of Federal laws, regulations, and guidelines. INEEL has a well-documented record of cultural and paleontological resources. Past studies, which covered 4 percent of the site, identified 1,506 cultural resource sites and isolated finds, including 688 prehistoric sites, 38 historic sites, 753 prehistoric isolates, and 27 historic isolates. As of January 1998, approximately 7 percent of INEEL had been surveyed, raising the number of potential archeological sites to 1,839. Most surveys have been conducted near significant facility areas in conjunction with major modification, demolition, or abandonment of site facilities.

Cultural sites are often occupied continuously or intermittently over substantial timespans. For this reason, a single location may contain evidence of use during both historic and prehistoric periods. In the discussions that follow, the numbers of prehistoric and historic resources are presented. However, the sum of these resources may be greater than the total number of sites reported due to such dual-use histories at sites. Therefore, where the total number of sites reported is less than the sum of prehistoric and historic sites, certain locations were used during both periods. DOE is currently evaluating the impacts to cultural resources from fire suppression activities during the Grid 40/Tea Kettle fire that burned across 19,830 hectares (49,000 acres) of the southwestern portion of the INEEL site on July 27 and 28, 2000.

Table 4–58 Listed Threatened and Endangered Species, Species of Concern, and Other Unique Species that Occur or May Occur at INEEL

Species	*Federal Classification*	*State Classification*	*Occurrence on INEEL*
Mammals			
Gray wolf	Endangered/Experimental Population	Endangered	Several sightings since 1993
Long-eared myotis	Special Concern	Unlisted	Limited onsite distribution
Small-footed myotis	Special Concern	Unlisted	Limited onsite distribution
Townsend's big-eared bat	Special Concern	Special Concern	Year-round resident
Pygmy rabbit	Special Concern	Special Concern	Limited onsite distribution
Merriam's shrew	Special Concern	Unlisted	Limited onsite distribution
Birds			
American peregrine falcon	Special Concern	Endangered	Winter visitor
Bald eagle	Threatened	Endangered	Winter visitor most years
Boreal owl	Special Concern	Special Concern	Recorded, but not confirmed
Ferruginous hawk	Special Concern	Protected	Widespread summer resident
Flammulated owl	Special Concern	Special Concern	Recorded, but not confirmed
Loggerhead shrike	Special Concern	Special Concern	Numerous sitings in the vicinity of ANL-W
Long-billed curlew	Special Concern	Protected	Limited summer distribution
Greater sage grouse	Special Concern	Unlisted	Year-round resident
Plants			
Lemhi milkvetch	Unlisted	Idaho Native Plant Society-State Priority 3	Limited distribution
Painted milkvetch	Special Concern	Unlisted	Limited distribution
Speal-tooth dodder	Unlisted	Idaho Native Plant Society-State Priority 1	Found near, but not on the INEEL site
Spreading gilia	Unlisted	Idaho Native Plant Society-State Priority 2	Common in western foothills
Ute's ladies tresses	Threatened	Idaho Native Plant Society-Global Priority 2	Found near, but not on the INEEL site
Winged-seed evening primrose	Unlisted	Idaho Native Plant Society-Sensitive	Rare and limited
Reptiles			
Northern sagebrush lizard	Special Concern	Unlisted	Limited distribution

Sources: DOE 1999h, USFWS 2001.

4.5.8.1 Prehistoric Resources

Prehistoric resources identified at INEEL are generally reflective of Native American hunting and gathering activities. A total of 688 prehistoric sites and 753 prehistoric isolates have been located. Most of the prehistoric sites are lithic scatters or locations (DOE 1996f). Resources appear to be concentrated along the Big Lost River and Birch Creek, atop buttes, and within craters or caves. They include residential bases, campsites, caves, hunting blinds, rock alignments, and limited-activity locations such as lithic and ceramic scatters, hearths, and concentrations of fire-affected rock. Most sites have not been formally evaluated for nomination to the National Register of Historic Places, but are considered to be potentially eligible. Given the rather high density of prehistoric sites at INEEL, additional sites are likely to be identified as surveys continue.

The most recent cultural resource survey conducted near ANL-W took place in 1996 and covered an area to the south of the site that had been burned over by a wildfire and was proposed for revegetation. A total of

12 isolated finds and 2 archaeological sites were located. Isolated finds include items such as pieces of Shoshone brownware pottery and projectile points. The archaeological sites include projectile points, scrappers, and volcanic glass flakes. Areas within the fenced portion of the ANL-W site are highly disturbed and are not likely to yield significant archaeological material.

4.5.8.2 Historic Resources

Thirty-eight historic sites and 27 historic isolates have been identified at the INEEL site. These resources are representative of European-American activities, including fur trapping and trading, immigration, transportation, mining, agriculture, and homesteading, as well as more recent military and scientific/engineering research and development activities. Examples of historic resources include Goodale's Cutoff (a spur of the Oregon Trail), remnants of homesteads and ranches, irrigation canals, and a variety of structures from the World War II era. The Experimental Breeder Reactor I, the first reactor to achieve a self-sustaining chain reaction using plutonium instead of uranium as the principal fuel component, is listed on the National Register of Historic Places and is designated as a National Historic Landmark. Many other INEEL structures built between 1949 and 1974 are considered eligible for the National Register because of their exceptional scientific and engineering significance, and their major role in the development of nuclear science and engineering since World War II. Additional historic sites are likely to exist in unsurveyed portions of INEEL.

A number of recent items, including farm implements, a belt buckle, broken glass, and a large scattering of cans, have been found in the vicinity of ANL-W. EBR-II has been designated as an American Nuclear Society Historical Landmark.

4.5.8.3 Native American Resources

Native American resources at INEEL are associated with the two groups of nomadic hunters and gatherers that used the region at the time of European-American contact: the Shoshone and Bannock. Both of these groups used the area that now encompasses INEEL as they harvested plant and animal resources and obsidian from Big Southern Butte and Howe Point. Because the INEEL site is considered part of the Shoshone-Bannock Tribes' ancestral homeland, it contains many localities that are important for traditional, cultural, educational, and religious reasons. This includes not only prehistoric archaeological sites that are important in the context of a religious or cultural heritage, but also features of the natural landscape and air, plant, water, and animal resources that have special significance.

Although prehistoric Native American resources have been found in the vicinity of ANL-W (see Section 4.5.8.1), the 1994 Memorandum of Agreement with the Shoshone-Bannock Tribes does not affect the site.

4.5.8.4 Paleontological Resources

The region encompassing INEEL has abundant and varied paleontological resources, including plant, vertebrate, and invertebrate remains in soils, lake and river sediments, and organic materials found in caves and archaeological sites. Vertebrate fossils recovered from the Big Lost River floodplain consist of isolated bones and teeth from large mammals of the Pleistocene or Ice Age. These fossils were discovered during excavations and well drilling operations. Fossils have been recorded in the vicinity of the Naval Reactors Facility. Occasional skeletal elements of fossil mammoth, horse, and camel have been retrieved from the Big Lost River diversion dam and Radioactive Waste Management Complex on the southwestern side of the INEEL site, and from river and alluvial fan gravels and Lake Terreton sediments near Test Area North. In

total, 24 paleontological localities have been identified on the INEEL site. Paleontological resources were not found in the immediate vicinity of ANL-W during a recent archaeological survey.

4.5.9 Socioeconomics

Statistics for population, housing, community services, and local transportation are presented for the region of influence, a four-county area in Idaho (**Figure 4–37**) in which 94.4 percent of all INEEL employees reside (**Table 4–59**). In 1997, INEEL employed 8,291 persons.

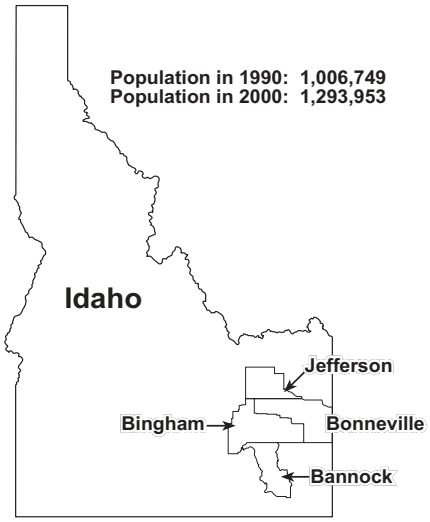


Figure 4–37 Counties in the ANL-W Region of Influence

4.5.9.1 Regional Economic Characteristics

Between 1994 and 1999, the civilian labor force in the region of influence increased 6.8 percent, to the 1999 level of 119,149. In 1999, the annual unemployment average in the four-county area was 4.5 percent, which was slightly less than the annual unemployment average for Idaho (5.2 percent) (DOL 2000).

In 1997, service activities represented the largest sector of employment in the region of influence (24.9 percent). This was followed by retail trade (21.1 percent), and government (20.2 percent). The totals for these employment sectors in Idaho were 24.1 percent, 19.5 percent, and 18.3 percent, respectively (ID DOL 1999).

Table 4–59 Distribution of Employees by Place of Residence in the INEEL Region of Influence in 1997

County	*Number of Employees*	*Total Site Employment (percent)*
Bonneville	5,553	67.0
Bingham	1,077	13.0
Bannock	615	7.4
Jefferson	583	7.0
Region of influence total	7,828	94.4

Source: DOE 2000j.

4.5.9.2 Demographic Characteristics

The 2000 demographic profile of the region of influence population is included in **Table 4–60**. The 2000 population in the four-county area was 218,977 people. The predominant population in the region of influence is white; 7.6 percent of the population have a Hispanic or Latino ethnic background.

Income information for the INEEL region of influence is included in **Table 4–61**. In 1997, the median household incomes in each of the four counties in the region of influence were higher than the Idaho state average $33,612. However, with the exception of Bonneville County, these counties had a larger percent of persons living below the poverty line as compared to the state average.

Table 4–60 Demographic Profile of the Population in the INEEL Region of Influence

	Bannock County	*Bingham County*	*Bonneville County*	*Jefferson County*	*Region of Influence*
Population					
2000 Population	75,565	41,735	82,522	19,155	218,977
1990 Population	66,026	37,583	72,207	16,543	192,359
Percent change from 1990 to 2000	14.4	11.0	14.3	15.8	13.8
Race (2000) (percent of total population)					
White	91.3	82.4	92.8	90.9	90.1
Black or African American	0.6	0.2	0.5	0.3	0.4
American Indian and Alaska Native	2.9	6.7	0.6	0.5	2.6
Asian	1.0	0.6	0.8	0.2	0.8
Native Hawaiian and other Pacific Islander	0.2	0.0	0.1	0.1	0.1
Some other race	2.1	8.0	3.7	6.8	4.2
Two or more races	2.0	2.1	1.5	1.3	1.8
Percent minority	10.5	21.4	9.8	11.5	12.4
Ethnicity (2000)					
Hispanic or Latino	3,540	5,550	5,703	1,907	16,700
Percent of total population	4.7	13.3	6.9	10.0	7.6

Source: DOC 2001.

Table 4–61 Income Information for the INEEL Region of Influence

	Bannock	*Bingham*	*Bonneville*	*Jefferson*	*Idaho*	*USA*
Median household income 1997 ($)	35,382	34,488	39,962	34,390	33,612	37,005
Percent of persons below poverty line (1997)	13.9	14.7	12.2	13.1	13.0	13.3

Source: DOC 2000.

4.5.9.3 Housing and Community Services

Table 4–62 lists the total number of occupied housing units and vacancy rates in the region of influence. In 1990, the region of influence contained 69,760 housing units, of which 64,085 were occupied. The median value of owner-occupied units ranged from $63,700 in Bonneville County to $50,700 in Bingham County. The vacancy rate was lowest in Bonneville County (6.8 percent) and highest in Bingham County (9.1 percent) (DOC 1998).

Community services include public education and health care (i.e., hospitals, hospital beds, and doctors). In 1998, student enrollment in the four-county area totaled 49,361 with a student-to-teacher ratio of 19:1 (Department of Education 2000). In 1998, four hospitals served the region of influence with a hospital bed-to-population ratio of 3 hospital beds per 1,000 persons. The average physician-to-population ratio in the four-county area was 1.5 physicians per 1,000 persons (Gaquin and DeBrandt 2000).

4.5.9.4 Local Transportation

U.S. Highways 20 and 26 are the main access routes to the southern portion of the INEEL site and State Routes 22 and 33 provide access to the northern INEEL facilities (Figure 4–32).

DOE buses provide transportation between INEEL facilities and Idaho Falls for DOE and contractor personnel. The major railroad in the area is the Union Pacific Railroad. The railroad's Blackfoot-to-Arco Branch provides rail service to the southern portion of the INEEL site. A DOE-owned spur connects the Union Pacific Railroad to INEEL by a junction at Scoville Siding. There are no navigable waterways within

the area capable of accommodating waterborne transportation of material shipments to INEEL. Fanning Field in Idaho Falls and Pocatello Municipal Airport in Pocatello provide jet air passenger and cargo service for both national and local carriers. Numerous smaller private airports are located throughout the region of influence.

Table 4–62 Housing and Community Services in the INEEL Region of Influence

	Bannock County	*Bingham County*	*Bonneville County*	*Jefferson County*	*Region of Influence*
Housing (1990) [a]					
Total units	25,694	12,664	26,049	5,353	69,760
Occupied housing units	23,412	11,513	24,289	4,871	64,085
Vacant units	2,282	1,151	1,760	482	5,675
Vacancy rate (percent)	8.9	9.1	6.8	9.0	8.1
Median value ($)	53,300	50,700	63,700	54,300	Not available
Public Education [b]					
Total enrollment	14,504	10,719	18,623	5,515	49,361
Student-to-teacher ratio	19.2:1	18.5:1	19.2:1	19.1:1	19.0:1
Community Health Care (1998) [c]					
Hospitals	2	1	1	0	4
Hospital beds per 1,000 persons	3.3	2.9	3.4	0	3.0
Physicians per 1,000 persons	2.0	0.5	1.90	0.2	1.5

[a] DOC 1998.
[b] Department of Education 2000.
[c] Gaquin and DeBrandt 2000.

4.5.10 Environmental Justice

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. As discussed in Appendix E, minority persons are those who identify themselves as Hispanic or Latino, Asian, Black or African American, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or multiracial. Persons whose income is below the Federal poverty threshold are designated as low-income.

ANL-W is located at latitude 43° 35' 41.7" north, longitude 112° 39' 18.7" west. **Figure 4–38** shows the region of potential radiological impacts and the location of the Fort Hall Indian Reservation. As shown in the figure, the region includes Idaho Falls and portions of the Fort Hall Indian Reservation and Pocatello.

Fourteen counties in Idaho are included or partially included in the potentially affected area: Bannock, Bingham, Blaine, Bonneville, Butte, Clark, Caribou, Custer, Fremont, Jefferson, Lemhi, Madison, Minidoka, and Power (see **Figure 4–39**). **Table 4–63** provides the racial and Hispanic composition for these counties using data obtained from the decennial census conducted in 2000. In the year 2000, approximately 13 percent of the county residents identified themselves as members of a minority group. Hispanics and American Indians or Alaska Natives comprised more than 80 percent of the minority population.

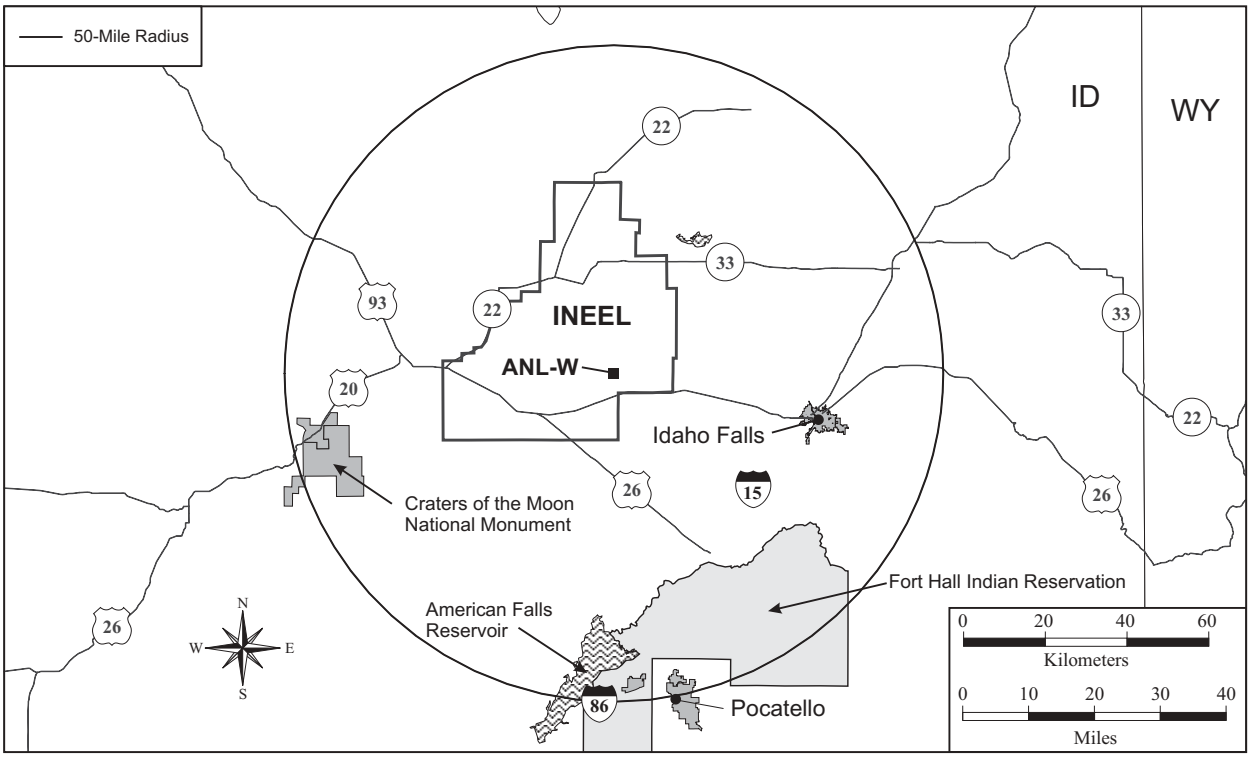


Figure 4–38 Location of the ANL-W and the Fort Hall Indian Reservation

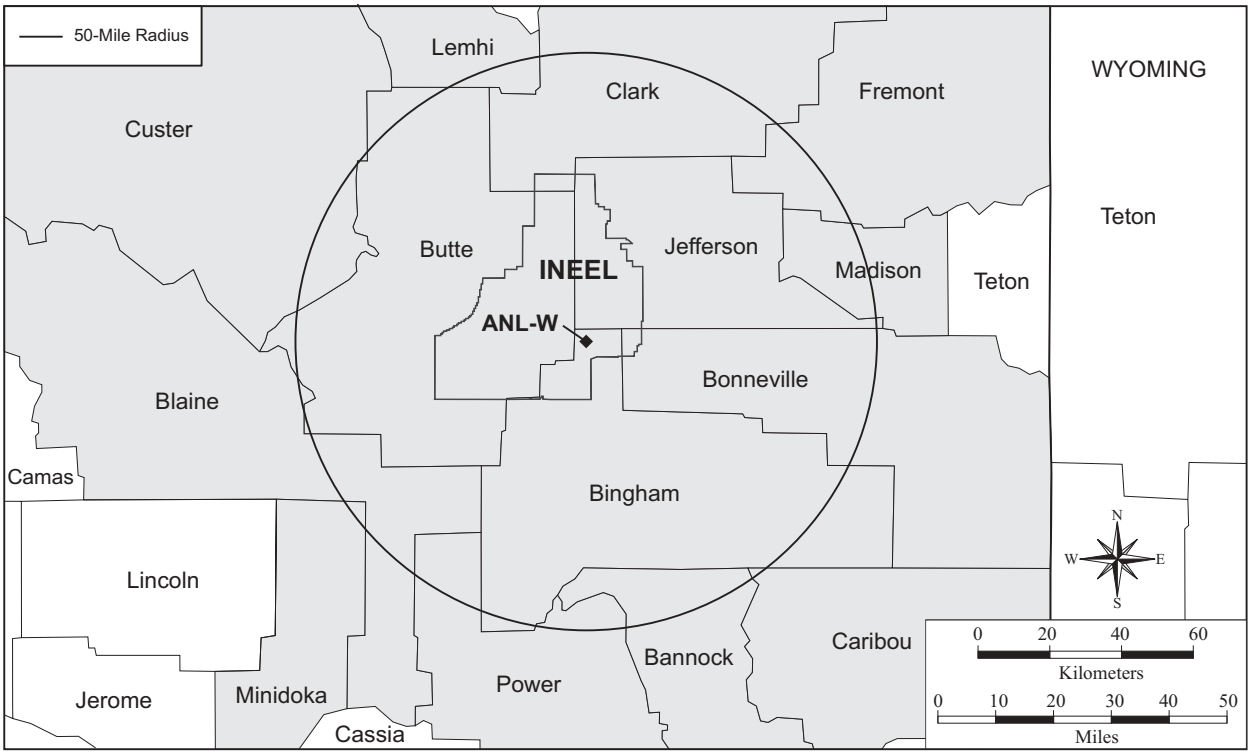


Figure 4–39 Potentially Affected Counties near ANL-W

Table 4–63 Populations in Potentially Affected Counties Surrounding ANL-W in 2000

Population Group	*Population*	*Percentage of Total*
Minority	41,547	12.7
Hispanic	28,950	8.8
Black/African American	990	0.3
American Indian/Alaska Native	5,702	1.7
Asian	2,125	0.6
Native Hawaiian/Pacific Islander	277	0.1
Two or more races	3,503	1.1
Some other race	225	0.1
White	286,567	87.3
Total	328,339	100.0

Figure 4–40 compares the growth in the minority populations in the potentially affected counties between 1990 and 2000. As discussed in Section E.5.1 of Appendix E, data concerning race and Hispanic origin from the 2000 Census cannot be directly compared with that for the 1990 Census because the racial categories used in the two enumerations were different. Bearing this change in mind, the minority population in potentially affected counties increased from approximately 9 percent to 13 percent in the decade from 1990 to 2000. More than 80 percent of the increase in the resident minority population was due to the increases in Hispanic or Latino and American Indian or Alaska Native populations. In the same decade, the percentage minority population of Idaho increased from approximately 8 percent to 12 percent.

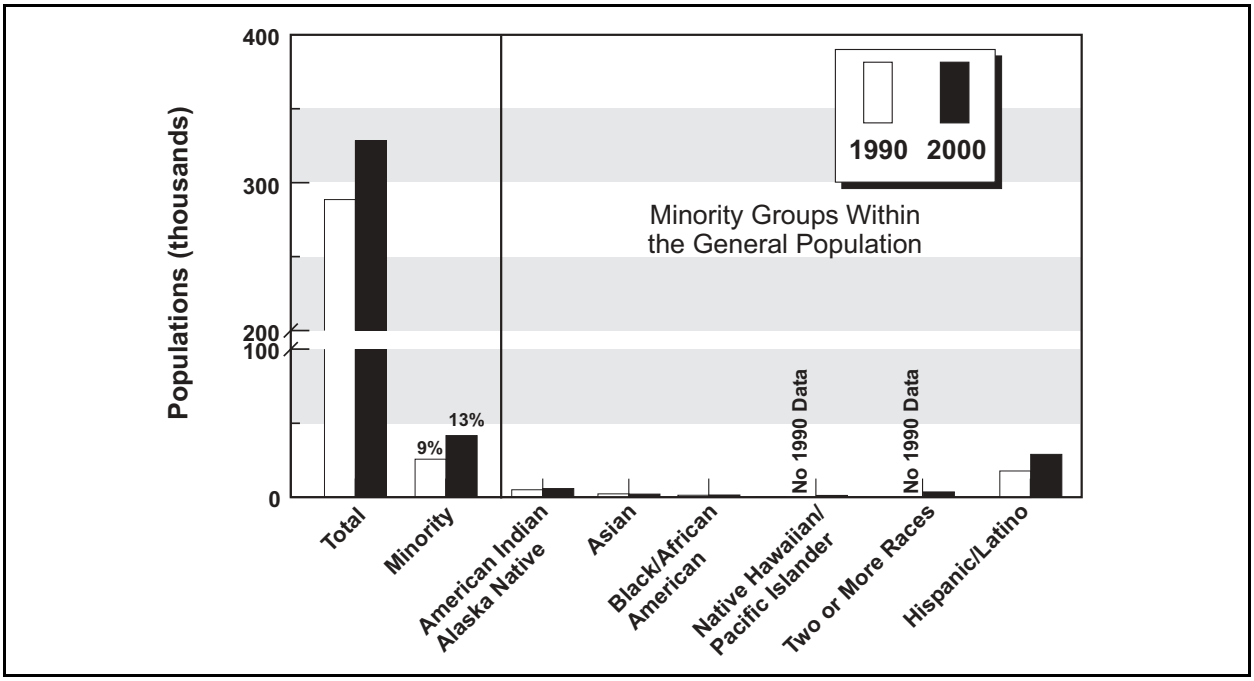


Figure 4–40 Comparison of Populations in Potentially Affected Counties Surrounding ANL-W in 1990 and 2000

The percentage of low-income population residing in potentially affected counties surrounding ANL-W in 1990 was approximately 13 percent. In 1990, nearly 13 percent of the total population of the continental United States reported incomes less than the poverty threshold. In terms of percentages, minority populations in potentially impacted counties are relatively small in comparison with the national percentage, while the low-income resident population in 1990 is commensurate with the corresponding national percentage.

Complete census data with block group resolution for minority and low-income populations obtained from the decennial census of 2000 are scheduled for publication in 2002.

4.5.11 Existing Human Health Risk

Public and occupational health and safety issues include the determination of potentially adverse effects on human health that result from acute and chronic exposures to ionizing radiation and hazardous chemicals.

4.5.11.1 Radiation Exposure and Risk

Major sources and levels of background radiation exposure to individuals in the vicinity of INEEL are shown in **Table 4–64**. Annual background radiation doses to individuals are expected to remain constant over time. The total dose to the population, in terms of person-rem, changes as the population size changes. Background radiation doses are unrelated to INEEL operations.

Table 4–64 Sources of Radiation Exposure to Individuals in the INEEL Vicinity Unrelated to INEEL Operations

Source	*Effective Dose Equivalent (millirem per year)*
Natural Background Radiation	
External (terrestrial and cosmic) [a]	119
Internal terrestrial and global cosmogenic [b]	40
Radon in homes (inhaled)	200 [b, c]
Other Background Radiation [b]	
Diagnostic x-rays and nuclear medicine	53
Weapons test fallout	less than 1
Air travel	1
Consumer and industrial products	10
Total	424

[a] DOE 2000e.
[b] NCRP 1987.
[c] An average for the United States.

Releases of radionuclides to the environment from INEEL operations provide another source of radiation exposure to individuals in the vicinity of INEEL. Types and quantities of radionuclides released from INEEL operations in 1998 are listed in the *Idaho National Engineering and Environmental Laboratory Site Environmental Report for Calendar Year 1998* (DOE 2000e). The releases are summarized in Section 4.5.3.2 of this EIS. The doses to the public resulting from these releases are presented in **Table 4–65.** These doses fall within the radiological limits given in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and are much lower than those of background radiation.

Using a risk estimator of one latent cancer death per 2,000 person-rem to the public (see Appendix B), the fatal cancer risk to the maximally exposed member of the public due to radiological releases from INEEL operations in 1998 is estimated to be 4.0×10^{-9}. That is, the estimated probability of this person dying of cancer at some point in the future from radiation exposure associated with one year of INEEL operations is 4 in 1 billion (it takes several to many years from the time of radiation exposure for a cancer to manifest itself).

Table 4–65 Radiation Doses to the Public From Normal INEEL Operations in 1998 (total effective dose equivalent)

Members of the Public	Atmospheric Releases		Liquid Releases		Total	
	Standard [a]	Actual	Standard [a]	Actual	Standard [a]	Actual
Maximally exposed offsite individual (millirem)	10	0.008	4	0	100	0.008
Population within 80 kilometers (50 miles) (person-rem) [b]	None	0.075	None	0	100	0.075
Average individual within 80 kilometers (50 miles) (millirem) [c]	None	0.00062	None	0	None	0.00062

[a] The standards for individuals are given in DOE Order 5400.5. As discussed in that Order, the 10-millirem per year limit from airborne emissions is required by the Clean Air Act (40 CFR 61), and the 4-millirem per year limit is required by the Safe Drinking Water Act (40 CFR 141). The total dose of 100 millirem per year is the limit from all pathways combined. The 100-person-rem value for the population is given in proposed 10 CFR 834, *Radiation Protection of the Public and Environment; Proposed Rule*, as published in 58 FR 16268. If the potential total dose exceeds the 100 person-rem value, the contractor operating the facility would be required to notify DOE.

[b] Based on an estimated population of 121,500 in 1998.

[c] Obtained by dividing the population dose by the number of people living within 80 kilometers (50 miles) of the site.

Source: DOE 2000e.

According to the same risk estimator, 3.8×10^{-5} excess fatal cancers are projected in the population living within 80 kilometers (50 miles) of INEEL from normal operations in 1998. To place this number in perspective, it may be compared with the number of fatal cancers expected in the same population from all causes. The mortality rate associated with cancer for the entire U.S. population is 0.2 percent per year. Based on this mortality rate, the number of fatal cancers expected during 1998 from all causes in the population living within 80 kilometers (50 miles) of INEEL was 243. This expected number of fatal cancers is much higher than the 3.8×10^{-5} fatal cancers estimated from INEEL operations in 1998.

INEEL workers receive the same dose as the general public from background radiation, but they also receive an additional dose from working in facilities with nuclear materials. The average dose to the individual worker and the cumulative dose to all workers at INEEL from operations in 1998 are presented in **Table 4–66**. These doses fall within the radiological regulatory limits of 10 CFR 835. According to a risk estimator of one latent fatal cancer per 2,500 person-rem among workers (see Appendix B), the number of projected fatal cancers among INEEL workers from normal operations in 1998 is 0.026. The risk estimator for workers is lower than the estimator for the public because of the absence from the work force of the more radiosensitive infant and child age groups.

Table 4–66 Radiation Doses to Workers From Normal INEEL Operations in 1998 (total effective dose equivalent)

Occupational Personnel	Onsite Releases and Direct Radiation	
	Standard [a]	Actual
Average radiation worker (millirem)	None [b]	87 [c]
Total workers [d] (person-rem)	None	65 [c]

[a] The radiological limit for an individual worker is 5,000 millirem per year (10 CFR 835). However, DOE's goal is to maintain radiological exposure as low as is reasonably achievable. Therefore, DOE has recommended an administrative control level of 500 millirem per year (DOE 1999c); the site must make reasonable attempts to maintain individual worker doses below this level.

[b] No standard is specified for an average radiation worker; however, the maximum dose that this worker may receive is limited to that given in footnote a.

[c] Does not include doses received at the Naval Reactors Facility. The impacts associated with this facility fall under the jurisdiction of the Navy as part of the Nuclear Propulsion Program.

[d] There were 743 workers with measurable doses in 1998.

Source: DOE 1998b.

External radiation doses have been measured on the ANL-W site that may contain radiological sources for comparison with offsite natural background radiation levels. Measurements taken in 1998 showed an average onsite dose at ANL-W of 140 millirem compared to an offsite dose of 128 millirem (DOE 1998b).

External concentrations of plutonium, gross alpha, and beta radiation in air have been measured at ANL-W. The concentrations in air of plutonium-239/240 in 1996 were 3.4×10^{-18} curies per cubic meter. This value is essentially the same as that measured at an offsite control location. Concentrations in air of gross alpha and beta radiation at ANL-W in 1998 were 7.1×10^{-16} curies per cubic meter and 2.2×10^{-14} curies per cubic meter, respectively. These alpha and beta radiation concentrations are about the same as those measured at offsite control locations.

4.5.11.2 Chemical Environment

The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., soil through direct contact or via the food pathway).

Adverse health impacts to the public are minimized through administrative and design controls to decrease hazardous chemical releases to the environment and to achieve compliance with permit requirements. The effectiveness of these controls is verified through the use of monitoring information and inspection of mitigation measures. Health impacts to the public may occur during normal operations at INEEL via inhalation of air containing hazardous chemicals released to the atmosphere by INEEL operations. Risks to public health from ingestion of contaminated drinking water or direct exposure are also potential pathways.

Baseline air emission concentrations for air pollutants and their applicable standards are presented in Section 4.5.3.1. These concentrations are estimates of the highest existing offsite concentrations and represent the highest concentrations to which members of the public could be exposed. These concentrations are compared with applicable guidelines and regulations.

Chemical exposure pathways to INEEL workers during normal operation may include inhaling the workplace atmosphere, drinking INEEL potable water, and possible other contacts with hazardous materials associated with work assignments. Workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. INEEL workers are also protected by adherence to Occupational Safety and Health Administration and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals utilized in the operation processes, ensures that these standards are not exceeded. Additionally, DOE requirements ensure that conditions in the workplace are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm. Therefore, worker health conditions at INEEL are substantially better than required by standards.

4.5.11.3 Health Effects Studies

Epidemiological studies were conducted on communities surrounding INEEL to determine whether there are excess cancers in the general population. Two of these are described in more detail in Appendix M.4.4 of the *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement*. No excess cancer mortality was reported, and although excess cancer incidence was observed, no association with INEEL was established. A study by the State of Idaho completed in June 1996 found excess brain cancer incidence in the six counties surrounding INEEL, but a follow-up survey concluded that there was nothing that clearly linked all these cases to one another or any one thing (DOE 1996f).

Researchers from the Boston University School of Public Health, in cooperation with the National Institute of Occupational Safety and Health, are investigating the effects of work force restructuring (downsizing) in the nuclear weapons industry. The health of displaced workers will be studied. Under a National Institute of Occupational Safety and Health cooperative agreement, the epidemiological evaluation of childhood leukemia and paternal exposure to ionizing radiation included the INEEL site. This study found no evidence of a link between brain cancer or leukemia and paternal employment at INEEL (DOE and HHS 2000). Another study begun in October 1997, *Medical Surveillance for Former Workers at INEEL*, is being carried out by a group of investigators consisting of the Oil, Chemical, and Atomic Workers International Union; Mount Sinai School of Medicine; the University of Massachusetts at Lowell; and Alice Hamilton College. A mortality study of the work force at INEEL was conducted by the National Institute of Occupational Safety and Health. DOE has implemented an epidemiological surveillance program to monitor the health of current INEEL workers. A discussion of this program is given in Appendix M.4.4 of the *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* (DOE 1996f).

4.5.11.4 Accident History

Since the early 1950s, there have been eight criticality accidents at INEEL (LANL 2000h). Some accidents resulted from intentional experiments, but the power excursion was significantly larger than expected. The accidents occurred during processing, control rod maintenance, critical experiment setups, and intentional destructive power excursions. These accidents resulted in various levels of radiation exposure to the involved workers and in no damage, small damage, or total loss of the equipment. The exposure to the public from these accidents was minimal.

DOE conducted a study, the *Idaho National Engineering Laboratory Historical Dose Evaluation*, to estimate the potential offsite radiation doses for the entire operating history of INEEL (DOE 1996f). Releases resulted from a variety of tests and experiments as well as a few accidents at INEEL. The study concluded that these releases contributed to the total radiation dose during test programs of the 1950s and early 1960s. The frequencies and sizes of releases have declined since that time. During more than the last decade of operations at INEEL facilities, there have been no serious unplanned or accidental releases of radioactivity or other hazardous substances.

4.5.11.5 Emergency Preparedness

Each DOE site has established an emergency management program that would be activated in the event of an accident. This program was developed and is maintained to ensure adequate response to most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program includes emergency planning, training, preparedness, and response.

Government agencies whose plans are interrelated with the INEEL Emergency Plan for Action include the State of Idaho; Bingham, Bonneville, Butte, Clark, and Jefferson counties; the Bureau of Indian Affairs; and the Fort Hall Indian Reservation. INEEL contractors are responsible for responding to emergencies at their facilities. Specifically, the emergency action director is responsible for recognition, classification, notification, and protective action recommendations. At INEEL, emergency preparedness resources include fire protection from onsite and offsite locations and radiological and hazardous chemical material response. Emergency response facilities include an emergency control center at each facility, at the INEEL warning communication center, and at the INEEL site emergency operations center. Seven INEEL medical facilities are available to provide routine and emergency service. In addition, DOE has specified actions to be taken at all DOE sites to implement lessons learned from the emergency response to an accidental explosion at Hanford in May 1997.

4.5.12 Waste Management

Waste management includes minimization, characterization, treatment, storage, transportation, and disposal of waste generated from ongoing DOE activities. The waste is managed using appropriate treatment, storage, and disposal technologies, and in compliance with all applicable Federal and state statutes and DOE Orders.

4.5.12.1 Waste Inventories and Activities

INEEL manages the following types of waste: high-level radioactive, transuranic, mixed transuranic, low-level radioactive, mixed low-level radioactive, hazardous, and nonhazardous. Because there are no high-level, transuranic, or mixed transuranic wastes associated with TA-18 operations, these waste types are not discussed in this EIS. Waste generation rates and the inventory of stored waste from activities at INEEL are provided in **Table 4–67**. INEEL waste management capabilities are summarized in **Table 4–68**.

Table 4–67 Waste Generation Rates and Inventories at INEEL

Waste Type	*Generation Rate (cubic meters per year)*	*Inventory (cubic meters)*
Low-level radioactive	6,400	6,000
Mixed low-level radioactive [a]	230	1,700
Hazardous	835 [b]	Not applicable [c]
Nonhazardous		
Liquid	2,000,000 [a]	Not applicable [c]
Solid	62,000	Not applicable [c]

[a] Projected annual average generation amounts for 1997–2006.
[b] Includes 760 cubic meters that is recyclable.
[c] Generally, hazardous and nonhazardous wastes are not held in long-term storage.
Source: DOE 2000j.

Table 4–68 Waste Management Facilities at INEEL

Facility Name/Description	*Capacity*	*Status*	*Applicable Waste Type*			
			Low-Level Radioactive Waste	*Mixed Low-Level Radioactive Waste*	*Hazardous*	*Non-hazardous*
Treatment Facility (cubic meters per year except as otherwise specified)						
INTEC HEPA Filter Leach (cubic meters per day)	0.21	Online		X		
INTEC Debris Treatment and Containment (cubic meters per day)	88	Waiting on Part B Permit		X		
Advanced Mixed Waste Treatment Project	6,500	Planned for 2003		X		
ANL-W Remote Treatment Facility	42	Planned for 2009	X	X		
INTEC Liquid Effluent Treatment and Disposal Facility	11,365	Online		X		
INTEC High-Level Radioactive Waste Evaporator	6,138	Online		X		
INTEC Process Equipment Waste Evaporator	13,000	Online	X	X		
ANL-W Sodium Processing Facility	698	Online		X		
Test Area North Cask Dismantlement	11	Online		X		
Test Reactor Area Evaporation Pond (cubic meters per day)	820	Online	X			

Facility Name/Description	Capacity	Status	Applicable Waste Type			
			Low-Level Radioactive Waste	Mixed Low-Level Radioactive Waste	Hazardous	Non-hazardous
WROC-Debris Sizing (kilograms per hour)	1,149	Planned for 2000	X	X		
WROC-Macroencapsulation (kilograms per hour)	2,257	Planned for 2001		X		
WROC - Stabilization (cubic meters per day)	7.6	Online		X		
WERF	49,610	Shutdown [a]	X	X	X	
INTEC Sewage Treatment Plant	3,200,000	Online				X
Storage Facility (cubic meters)						
ANL-W Radioactive Sodium Storage	75	Online		X		
ANL-W Sodium Components Maintenance Shop	200	Online		X		
ANL-W Radioactive Scrap and Waste Storage	193	Online	X	X		
ANL-W EBR II Sodium Boiler Drain Tank	64	Online		X		
INTEC FDPF HEPA Storage	25	Online		X		
INTEC NWCF HEPA Storage	56	Online		X		
INTEC CPP-1619 Storage	45	Online		X	X	
INTEC CPP-1617 Staging	8,523	Online		X	X	
RWMC Transuranic Storage Area-RE	64,900	Online	X	X		
RWMC Waste Storage [b]	112,400	Online	X	X		
WROC PBF Mixed Low-level Radioactive Waste Storage	129	Online		X	X	
Portable Storage at SPERT IV	237	Online		X	X	
PBF WERF Waste Storage Building	685	Online		X	X	
Test Area North 647 Waste Storage	104	Online		X		
Test Area North 628 SMC Container Storage	125	Online		X		
Disposal Facility (cubic meters per year)						
RWMC Disposal Facility	37,700	Online	X			
CFA Landfill Complex	48,000	Online				X
Percolation Ponds	2,000,000	Online				X
FPF Sanitary Sewer	166,000	Online				X
TRA Warm Waste Evaporation Ponds	31,830	Online	X			
TRA Sanitary Waste Ponds	51,720	Online				X
TRA Cold Waste Pond	795,800	Online				X

CFA = Central Facilities Area, CPP = Chemical Processing Plant, EBR = Experimental Breeder Reactor, FDPF = Fluorinel Dissolution Process Facility; FPF = Fuel Processing Facility, HEPA = high-efficiency particulate air, INTEC = Idaho Nuclear Technology and Engineering Center, PBF = Power Burst Facility; RWMC = Radioactive Waste Management Complex, SMC = Specific Manufacturing Complex, SPERT = Special Power Excursion Reactor Test, TRA = Test Reactor Area, WERF = Waste Experimental Reduction Facility, WROC = Waste Reduction Operations Complex.

[a] WERF was denied its RCRA permit and ceased operating in September 2000.

[b] For these facilities, the low-level radioactive and mixed low-level radioactive wastes are considered alpha-contaminated low-level radioactive waste and alpha-contaminated mixed low-level radioactive waste (waste containing between 10 and 100 nanocuries of alpha activity per gram).

Source: DOE 2000j.

EPA placed INEEL on the National Priorities List on December 21, 1989. In accordance with CERCLA, DOE entered into a consent order with EPA and the State of Idaho to coordinate cleanup activities at INEEL under one comprehensive strategy. This agreement integrates DOE's CERCLA response obligations with RCRA corrective action obligations. Aggressive plans are in place to achieve early remediation of sites that represent the greatest risk to workers and the public. The goal is to complete remediation of contaminated sites at INEEL to support delisting from the National Priorities List by 2019. More information on regulatory requirements for waste disposal is provided in Chapter 6.

4.5.12.2 Low-Level Radioactive Waste

Liquid low-level radioactive waste is solidified before disposal. Low-level radioactive waste disposal occurs in pits and concrete-lined soil vaults in the subsurface disposal area of the Radioactive Waste Management Complex. Approximately 60 percent of the low-level radioactive waste generated at INEEL is treated for volume reduction prior to disposal at the Radioactive Waste Management Complex. Additionally, some low-level radioactive waste is shipped off site to be incinerated, and the residual ash is returned to INEEL for disposal. The Radioactive Waste Management Complex is expected to be filled to capacity by the year 2030, although some proposals would close the low-level radioactive waste disposal facility by 2006.

4.5.12.3 Mixed Low-Level Radioactive Waste

Mixed low-level radioactive waste is divided into two categories for management purposes: alpha mixed low-level radioactive waste and beta-gamma mixed low-level radioactive waste. Most of the alpha mixed low-level radioactive waste stored at INEEL is waste that has been reclassified from mixed transuranic waste and is managed as part of the transuranic waste program. Therefore, this section deals only with beta-gamma mixed low-level radioactive waste.

Mixed low-level radioactive waste, including polychlorinated biphenyl–contaminated low-level radioactive waste, is stored at several onsite areas awaiting the development of treatment methods. Mixed low-level radioactive waste is stored at the Mixed Waste Storage Facility (or Waste Experimental Reduction Facility Waste Storage Building) and in portable storage units at the Power Burst Facility area. In addition, smaller quantities of mixed low-level radioactive waste are stored in various facilities at INEEL, including the Hazardous Chemical/Radioactive Waste Facility at the Idaho Nuclear Technology and Engineering Center, and the Radioactive Sodium Storage Facility and Radioactive Scrap and Waste Storage Facility at ANL-West. Although mixed wastes are stored in many locations at INEEL, the bulk of that volume is solid waste stored at the Radioactive Waste Management Complex.

As part of the INEEL Site Treatment Plan and Consent Order required by the Federal Facility Compliance Act, preferred treatment options have been identified to eliminate the hazardous waste component for many types of mixed low-level radioactive waste. Mixed low-level radioactive waste is or will be processed to RCRA land disposal restrictions treatment standards through several treatment facilities. Those treatment facilities and their operational status are: (1) Waste Experimental Reduction Facility Incinerator (shutdown), (2) Waste Experimental Reduction Facility Stabilization (operational), (3) Test Area North cask dismantlement (operational), (4) Sodium Process Facility (standby), (5) High-Efficiency Particulate Air Filter Leach (operational), (6) Waste Reductions Operations Complex Macroencapsulation (March 2001), (7) Debris Treatment (operational), and (8) Advanced Mixed Waste Treatment Project (March 2003). Commercial treatment facilities are also being considered, as appropriate. Currently, limited amounts of mixed low-level radioactive waste are disposed of at Envirocare of Utah.

4.5.12.4 Hazardous Waste

Approximately 1 percent of the total waste generated at INEEL (not including liquid nonhazardous waste) is hazardous waste. Most of the hazardous waste generated annually at INEEL is transported off site for treatment and disposal. Offsite shipments are surveyed to determine that the wastes have no radioactive content and, therefore, are not mixed waste. Highly reactive or unstable materials such as waste explosives are addressed on a case-by-case basis and are either stored, burned, or detonated, as appropriate.

4.5.12.5 Nonhazardous Waste

Approximately 90 percent of the solid waste generated at INEEL is classified as industrial waste and is disposed of on site in a landfill complex in the Central Facilities Area or off site at the Bonneville County landfill. The onsite landfill complex contains separate areas for petroleum-contaminated media, industrial waste, and asbestos waste. The onsite landfill is 4.8 hectares (12 acres), and is being expanded by 91 hectares (225 acres) to provide capacity for at least 30 years.

Sewage is disposed of in surface impoundments in accordance with terms of the October 7, 1992, Consent Order. Wastewater in the impoundments is allowed to evaporate, and the resulting sludge is placed in the landfill. Solids are separated and reclaimed where possible.

4.5.12.6 Waste Minimization

The DOE Idaho Operations Office has an active waste minimization and pollution prevention program to reduce the total amount of waste generated and disposed of at INEEL. This is accomplished by eliminating waste through source reduction or material substitution; by recycling potential waste materials that cannot be minimized or eliminated; and by treating all waste that is generated to reduce its volume, toxicity, or mobility prior to storage or disposal. The Idaho Operations Office published its first Waste Minimization Plan in 1990, which defined specific goals, methodologies, responsibilities, and achievements of programs and organizations. Achievements and progress are updated at least annually. Implementation of pollution prevention projects reduced the total amount of waste generated at INEEL in 1999 by approximately 8,501 cubic meters (11,120 cubic yards). Examples of pollution prevention projects completed in 1999 at INEEL include: reduction of sanitary waste by approximately 6,467 metric tons (7,127 tons) by reusing or recycling concrete, steel, wood materials, etc., from deactivated and decommissioned buildings and equipment; and reduction of sanitary waste by 148 metric tons (163 tons) by reducing the total volume of office paper used at INEEL by 50 percent due to the use of electronic documents, electronic drawings, and e-mail (DOE 2000h).

4.5.12.7 Waste Management PEIS Records of Decision

The *Waste Management PEIS* Records of Decision affecting INEEL are shown in **Table 4–69**. Decisions on the various waste types were announced in a series of Records of Decision that have been published on the *Waste Management PEIS* (DOE 1997a). The hazardous waste Record of Decision was published on August 5, 1998 (63 FR 41810), and the low-level radioactive and mixed low-level radioactive waste Record of Decision was published on February 18, 2000 (65 FR 10061). The hazardous waste Record of Decision states that most DOE sites will continue to use offsite facilities for the treatment and disposal of major portions of their nonwastewater hazardous waste, and the Oak Ridge Reservation and the Savannah River Site will continue to treat some of their own nonwastewater hazardous waste on site in existing facilities, where this is economically feasible. The low-level radioactive waste and mixed low-level radioactive waste Record of Decision states that, for the management of low-level radioactive waste, minimal treatment will be performed at all sites and disposal will continue to the extent practicable on site at INEEL, LANL, the

Oak Ridge Reservation, and the Savannah River Site. In addition, Hanford and NTS will be available to all DOE sites for low-level radioactive waste disposal. Mixed low-level radioactive waste will be treated at Hanford, INEEL, the Oak Ridge Reservation, and the Savannah River Site, and disposed of at Hanford and NTS. More detailed information concerning DOE's decisions for the future configuration of waste management facilities at INEEL is presented in the hazardous waste and low-level radioactive waste and mixed low-level radioactive waste Records of Decision.

Table 4–69 Waste Management PEIS Records of Decision Affecting INEEL

Waste Type	*Preferred Action*
Low-level radioactive	DOE has decided to treat INEEL's low-level radioactive waste on site. [a]
Mixed low-level radioactive	DOE has decided to regionalize treatment of mixed low-level radioactive waste at INEEL. This includes the onsite treatment of INEEL's wastes and could include treatment of some mixed low-level radioactive waste generated at other sites. [a]
Hazardous	DOE has decided to continue to use commercial facilities for treatment of INEEL nonwastewater hazardous waste. DOE will also continue to use onsite facilities for wastewater hazardous waste. [b]

[a] From the Record of Decision for low-level radioactive and mixed low-level radioactive waste (65 FR 10061).
[b] From the Record of Decision for hazardous waste (63 FR 41810).
Source: 63 FR 41810; 65 FR 10061.