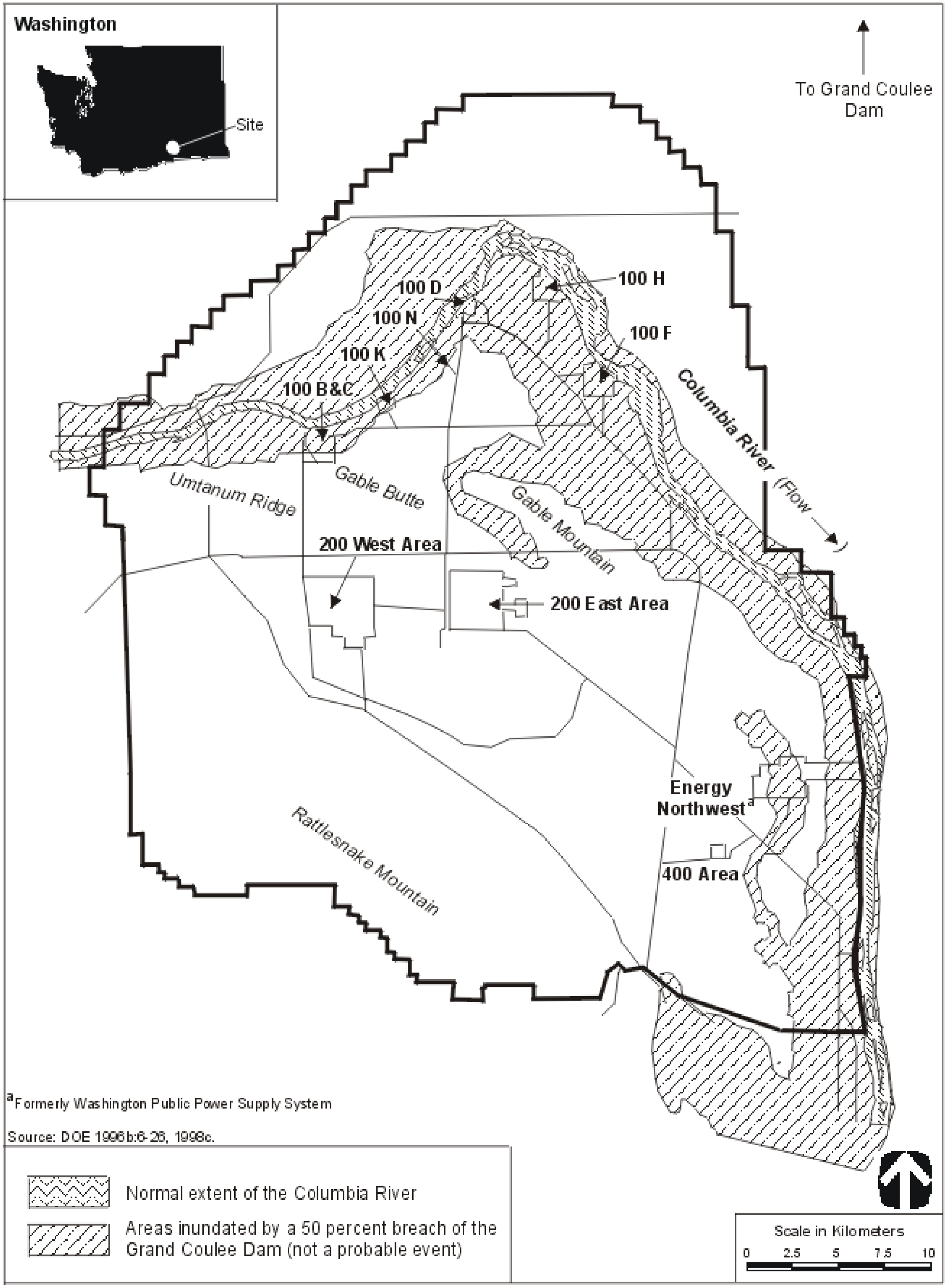

Figure 3–7. Flood Area of a 50 Percent Breach of the Grand Coulee Dam

The possibility of a landslide resulting in river blockage has also been evaluated for White Bluffs. Calculations were made for a landslide volume of 765,000 m^3 (1 million yd^3) with a concurrent flow of about 17,000 m^3/s (600,000 ft^3/s) in the river, which is the 200-year flood. This combination resulted in a flood wave crest elevation of 122 m (400 ft) above mean sea level, similar to that from the 50 percent breach of the Grand Coulee Dam (DOE 1996b:4-24).

The Hanford Reach has been classified Class A: excellent drinking water, a recreation area, and wildlife habitat (DOE 1996a:3-32; Dirkes and Hanf 1996:113). The river currently meets applicable drinking water and water quality standards. No federally designated Wild and Scenic Rivers exist on Hanford, although consideration is being given to so designating the Hanford Reach (Barghusen and Feit 1995:2.2-17–2.2-19).

DOE continues to assert a federally reserved water withdrawal right for the Columbia River. Currently, Hanford withdraws approximately 13.5 billion l/yr (3.6 billion gal/yr) from the Columbia River (DOE 1996a:3-34).

Hanford has six NPDES-permitted discharges and two NPDES permits for these discharges. One permit, WA-000374-3, includes five discharges in the 100 and 300 Areas. A request for a minor permit modification to delete two inactive outfalls from the 100 N-Area was submitted to EPA in August 1995. No effluent noncompliance issues were associated with any of these outfalls in 1995 (Dirkes and Hanf 1996:31, 32).

Permit #WA-002592-7 was issued for the 300 Area Treated Effluent Disposal Facility, which had 10 permit exceedances in 1996. This disposal facility was in normal operations and meeting design specifications at the time of these events. All indications suggest that the facility is unable to consistently meet the restrictions of the facility's NPDES permit despite the use of the best available technology (Dirkes and Hanf 1997:36). An application for a permit modification was submitted to the EPA in November 1997. A revised permit is expected to be issued in 1998 (Sandberg 1998b).

Hanford received a general storm-water permit in February 1994. The *Annual Site Compliance Evaluation and the Pollution Prevention Plan* was updated as required by the permit. No noncompliances were associated with this permit in 1995 (Dirkes and Hanf 1996:32).

All radiological contaminant concentrations measured in the Columbia River in 1995 were lower than the DOE-derived concentration guides and Washington State ambient surface water quality criteria (Dirkes and Hanf 1996:114). For nonradiological parameters, applicable standards for Class A–designated surface water were met; however, the minimum detectable concentration of silver exceeded the Washington State toxicity standard. During 1995, there was no evidence of deterioration in water quality attributable to Hanford operations along the Hanford Reach (Dirkes and Hanf 1996:119).

The Columbia River is also the primary discharge area for the unconfined aquifer underlying Hanford. The site conducts sampling of these discharges and refers to them as riverbank springs. Hanford-origin contaminants continued to be detected in riverbank spring water during 1995. The location and extent of the contaminated discharges were consistent with recent groundwater surveys. Tritium; strontium 90; technetium 99; uranium 234, 235, and 238; cadmium; chloroform; chromium; copper; nitrate; trichloroethylene (TCE); and zinc entered the river along the 100 Area shoreline. Tritium; technetium 99; iodine 129; uranium 234, 235, and 238; chromium; nitrate; and zinc entered the river along the portion extending from the old Hanford Townsite to below the 300 Area. All radiological contaminants in these discharges were below DOE-derived concentration guides. With the exception of TCE, the concentrations of all anion and volatile organic compounds measured in riverbank spring water collected from the Hanford shoreline were below Washington State ambient surface water quality criteria. The concentration of TCE exceeded the EPA standard for protection of human health for the consumption of water and organisms in the 100 K-Area riverbank spring (Dirkes and Hanf 1996:124–126, 132).

3.2.7.1.2 Proposed Facility Locations

The water source in the 200 Area is the Hanford export water system that withdraws Columbia River water at the 100 B-Area pumphouse (Mecca 1997a:5, 7). Most of the Hanford Site is supplied with water from this system. Water is withdrawn at a rate of about 36.2 million l/day (9.6 million gal/day). This system provides water to other areas of the site, but since the shutdown of the reactors its primary function is to provide water to the 200 Area (Mecca 1997a:145–147). More detailed information on this water system may be found in Section 3.2.11.

The 200 East Area sits on a plateau about 11 km (6.8 mi) south of the Columbia River (Mecca 1997a:120; Barghusen and Feit 1995:2.2-8). In this area, only the East Powerhouse Ditch and the 216-B-3C Pond are active. The pond was originally excavated in the mid-1950s for disposal of process cooling water and other liquid waste occasionally containing low levels of radionuclides. West Lake, north of the 200 East Area, is predominantly recharged from groundwater. The lake has not received direct effluent discharges from site facilities; it owes its existence to the intersection of the elevated water table with the land surface in the topographically low area south of Gable Mountain and north of the 200 East Area (Neitzel 1996:4.61).

Analyses of maximum flooding scenarios have indicated that the 200 East Area would not be flooded, even in the worst-case scenario of a failure of the Grand Coulee Dam (Neitzel 1996:4.55–4.61; ERDA 1976:1–11). Similar results have been produced by landslide analyses—specifically, analysis of a landslide-induced blockage of the Columbia River at White Bluffs. Such a blockage would cause flooding, but it would not impact the 200 East Area facilities (Neitzel 1996:4-58).

The 400 Area receives its water from three wells that have a total capacity of about 397 million l/yr (105 million gal/yr) (Mecca 1997a:780). Two other wells would provide emergency service if these wells failed, and another, dire emergency service if all other wells failed. Chlorination is the only treatment provided to these wells (Dirkes and Hanf 1996:140).

No specific flooding analyses have been completed for the 400 Area, but analyses have been completed for the site as a whole. According to the sitewide data, the elevation of the ground surface in the 400 Area is about 30 m (100 ft) above that of the maximum calculated flood from a 50 percent breach in the Grand Coulee Dam (Mecca 1997a:4). Also, the 400 Area is above the elevation of the maximum historical flood of 1894 (Neitzel 1996:4.56).

3.2.7.2 Groundwater

Aquifers are classified by Federal and State authorities according to use and quality. The Federal classifications include Class I, II, and III groundwater. Class I groundwater is either the sole source of drinking water or is ecologically vital. Class IIA and IIB are current or potential sources of drinking water (or other beneficial use), respectively. Class III is not considered a potential source of drinking water and is of limited beneficial use.

3.2.7.2.1 General Site Description

Groundwater under Hanford occurs in confined and unconfined aquifers. The unconfined aquifer lies within the glacioalluvial sands and gravels of the Hanford Formation and the fluvial and lacustrine sediments of the Ringold Formation. Groundwater generally flows eastward across the site; because of local water disposal practices, however, the water table has risen as much as 27 m (89 ft) in the 200 West Area. This has caused groundwater mounding with radial and northward flow components in the 200 Area. Depth to groundwater across the site ranges from 24 to 80 m (79 to 262 ft) (DOE 1996a:3-34).

The unconfined aquifer is recharged mainly from rainfall and runoff from the higher elevation on the western border and from artificial recharge from irrigation and wastewater disposal practices at Hanford. In the vicinity of Hanford, groundwater is discharged along the Columbia River, and some lesser amounts along the Yakima River (DOE 1996a:3-34).

The confined aquifers at Hanford consist of sedimentary interbeds and interflow zones that occur between basalt flows in the Columbia River Basalt Group. Aquifer thickness varies from several centimeters to at least 52 m (171 ft). Recharge of the confined aquifer occurs where the basalt formations are near ground level, and thus surface water is allowed to infiltrate them. Groundwater from the confined aquifers discharges to the Columbia River (DOE 1996a:3-34).

Water use in the Pasco Basin, which includes Hanford, is primarily via surface water diversion; groundwater accounts for less than 10 percent of water use. While most of the water used by Hanford is surface water withdrawn from the Columbia River, some groundwater is used. One of the principal users of groundwater was FFTF, which used about 697,000 l/day (184,000 gal/day) when it operated. The other facilities that use groundwater are the Yakima Barricade and the Patrol Training Academy (Dirkes and Hanf 1996:139–144; Barghusen and Feit 1995:2.2-21–2.2-24). DOE currently asserts an unlimited federally reserved groundwater withdrawal right with respect to the existing Hanford operations and withdraws about 195 million l/yr (52 million gal/yr) (DOE 1996a:3-37).

Groundwater quality beneath portions of the Hanford Site from the 200 Areas north and east to the Columbia River has been affected by past liquid waste disposal practices and as a result of spills and leaks from single-shell radioactive waste storage tanks (Dirkes and Hanf 1997:95). The unconfined aquifer contains radiological and nonradiological contaminants at levels exceeding water quality criteria and standards. Contamination in the confined aquifer is typically limited to areas of exchange with the unconfined aquifer. Tritium and nitrate plumes have moved steadily eastward across the site and seeped into the Columbia River. No aquifers have been designated sole-source aquifers (Barghusen and Feit 1995:2.2-22).

3.2.7.2.2 Proposed Facility Locations

Two major groundwater mounds have been formed in the 200 Area, both in response to wastewater discharges. The first was created by disposal at U Pond in the 200 West Area. This mound has been slowly dissipating since the pond was decommissioned in 1984. The second major mound was created by discharges to B Pond east of the 200 East Area. The water table near B Pond increased to a maximum of about 9 m (30 ft) above preoperational conditions in 1990, and has dropped slightly over the last few years because of the reduced volume of discharges. These mounds have altered the unconfined flow patterns that generally recharge from the west and flow to the east. Water levels in the unconfined aquifer continually change as a result of variations in the volume and location of wastewater discharges. Consequently, the movement of groundwater and its associated constituents has also changed with time (Dirkes and Hanf 1996:185).

The radiological contaminants in two 200 East Area groundwater plumes include cesium 137, cobalt 60, plutonium, strontium 90, technetium 99, and tritium. They are the result of historical reprocessing operations at B Plant. Two pump-and-treat test systems used in treatability testing of these plumes were discontinued in May 1995 after about 5 million l (1.3 million gal) of water were treated. Decisions concerning further actions have been deferred until the data are evaluated. A RCRA Field Investigation/Corrective Measures Study addressing contaminants associated with PUREX Plant discharges is being prepared (Dirkes and Hanf 1996:197–219).

In the 400 Area, groundwater flows to the east. The flow direction at the Nonradioactive Dangerous Waste Landfill and the Solid Waste Landfill, which are nearby, is east-southeast. Because of their rather high permeabilities, Hanford Formation sediments dominate groundwater flows in these areas. Transmissivity of the unconfined aquifer system in the landfill areas is particularly high, because the system is within the main flow channel of the catastrophic floods that deposited the Hanford Formation gravels. In the 400 Area, the Hanford Formation consists mainly of the sand-dominated facies, and the water table is near the point of contact between the Hanford and Ringold Formations. Transmissivity of the aquifer in the 400 Area is an order of magnitude lower than that in the landfill areas (Hartman and Dresel:1997:3.11, 3.12). Water for the 400 Area is supplied by three wells in the unconfined aquifer. Each well has a pumping capacity of 83.3 l/min (22 gal/min). The water is distributed throughout the 400 Area for potable, process, and fire protection use (Dirkes and Hanf 1997:193; Rohl 1994:2-7).

Nitrate is the only significant contaminant attributable to 400 Area operations. Elevated levels have been attributed to the sanitary sewage lagoon, a source of groundwater contamination that should be eliminated by a recently constructed sewage treatment system. Other contamination found in well samples is believed not to emanate from the 400 Area (Hartman and Dresel 1997:6.90).

3.2.8 Ecological Resources

Ecological resources are defined as terrestrial (predominantly land) and aquatic (predominantly water) ecosystems characterized by the presence of native and naturalized plants and animals. For the purposes of this SPD EIS, those ecosystems are differentiated in terms of habitat support of threatened, endangered, and other special-status species—that is, "nonsensitive" versus "sensitive" habitat.

3.2.8.1 Nonsensitive Habitat

Nonsensitive habitat comprises those terrestrial and aquatic areas of the site that typically support the region's major plant and animal species.

3.2.8.1.1 General Site Description

Hanford is made up of large, undisturbed expanses of shrub-steppe habitat that supports nearly 600 plant species and numerous animal species suited to the region's semiarid environment (DOE 1996d:3-89, 3-90). Present site development consists of clusters of large buildings at widely spaced locations, occupying about 6 percent of the total available area. The remaining site area can be divided into 10 major plant communities (see Figure 3–8). The dominant plants are cheatgrass, big sagebrush, rabbitbrush, and Sandberg's bluegrass, with cheatgrass providing at least half of the total plant coverage. Shrub-steppe is considered a priority habitat by the State of Washington because of its significant value to sensitive wildlife. Trees that were originally planted on farmland to provide windbreaks and shade serve as nesting platforms for several species of birds, including hawks, owls, ravens, magpies, and great blue herons, and as night roosts for wintering bald eagles (DOE 1996a:3-42; DOE 1996b:4-51).

Animal species at Hanford include over 1,000 species of insects, 12 species of amphibians and reptiles, 214 species of birds, 44 species of fish, and 39 species of mammals (Dirkes and Hanf 1997:275). Grasshoppers and darkling beetles are among the more conspicuous groups, and along with other species, are important in the food web of the local birds and mammals. The most abundant reptile is the side-blotched lizard, although short-horned and sagebrush lizards, gopher snakes, yellow-bellied racers, and Pacific rattlesnakes are also seen frequently. The horned lark and western meadowlark are the most abundant nesting birds, but the site also supports populations of chukar partridge, gray partridge, and sage grouse (DOE 1996d:3-90). The Hanford Reach, including several sparsely vegetated islands, provides nesting habitat for the Canadian goose, ring-billed gull, Forster's tern, and great blue heron. Numerous raptors, such as the northern harrier, ferruginous hawk, Swainson's hawk, red-tailed hawk, prairie falcon, American kestrel, and owls, use the site as a refuge, especially during nesting (DOE 1996a:3-42; DOE 1996b:4-56; DOE 1996e:3-90). Mammals on the site are generally small

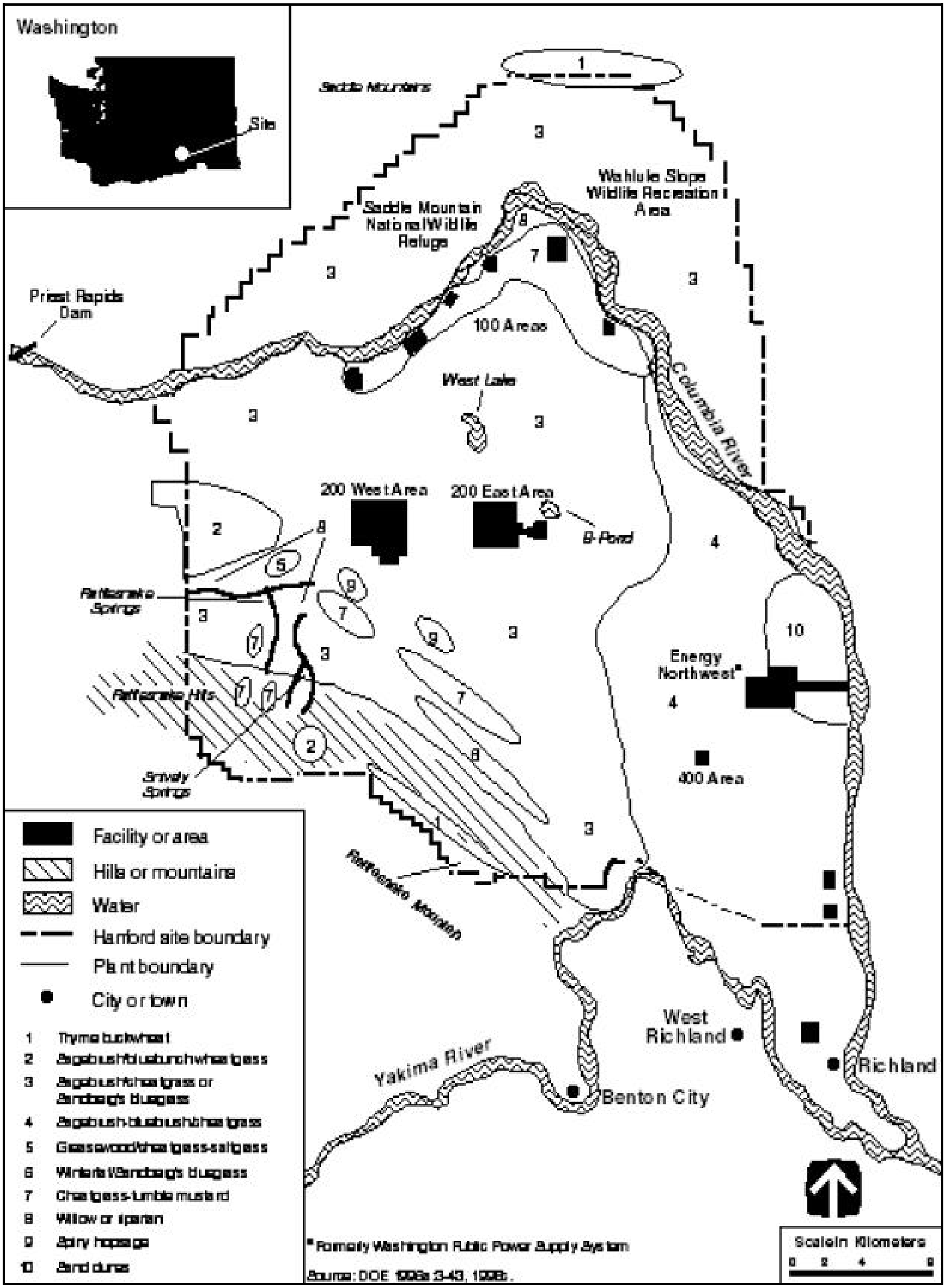

Figure 3–8. Major Plant Communities at Hanford

and nocturnal, the Great Basin pocket mouse being the most abundant. Other small mammals include the deer mouse, Townsend ground squirrel,pocket gopher, harvest mouse, Norway rat, sagebrush vole, grasshopper mouse, montane vole, vagrant shrew, Leasts chipmunk, and Merriam's shrew. Larger mammals include the mule deer and elk. Small numbers of bobcats and badgers also inhabit the site. The largest predator, which ranges all across the site, is the coyote. Bat species include the pallid bat, which frequents deserted buildings and is thought to be the most abundant. Other species include the hoary bat, silver-haired bat, California brown bat, little brown bat, Yuma brown bat, and Pacific western big-eared bat (DOE 1996b:4-55; DOE 1996d:3-90).

There are two types of natural aquatic habitats on the Hanford Site. The dominant one, the Columbia River, flows along the northern and eastern edges; the other is the small spring-streams and seeps in the Rattlesnake Hills. Several artificial water bodies, primarily ponds and ditches, have been formed as a result of wastewater disposal practices associated with the operation of reactors and separation facilities. Although they are temporary and will vanish with cessation of activities, all except West Lake form established aquatic ecosystems when present. West Lake is created by a rise in the water table in the 200 Areas, and because it is not fed by surface flow, it is alkaline and has limited plant and animal species (DOE 1996b:4-63).

The Columbia River supports a large and diverse community of plankton, benthic invertebrates, fish, and other aquatic organisms. The Hanford Reach supports transient phytoplankton and zooplankton populations and 44 anadromous and resident species of fish (DOE 1996d:3-90). Of these species, the chinook salmon, sockeye salmon, coho salmon, and steelhead trout use the river as a migration route to upstream spawning areas. Principal resident fish species sought by anglers include whitefish, sturgeon, smallmouth bass, catfish, walleye, and perch. There are also large populations of rough fish present, including carp, shiners, suckers, and squawfish. Small spring-streams, such as Rattlesnake and Snively Springs, support diverse biotic communities and are extremely productive, consisting of dense blooms of watercress and aquatic insects (DOE 1996b:4-63, 4-64). Temporary wastewater ponds and ditches develop riparian communities and are attractive to migrating birds in autumn and spring (DOE 1996e:3-90).

3.2.8.1.2 Proposed Facility Locations

Biological surveys in the 200 East Area and immediately surrounding areas show that approximately 40 percent of the area is big sagebrush and grey rabbitbrush, both native species characteristic of shrub-steppe communities. Roughly 20 percent is Russian thistle, the remainder being either disturbed vegetation or bare gravel (DOE 1996c:4-32). Because of past disturbances and human occupancy in the 200 Areas, wildlife associated with shrub-steppe habitat is somewhat limited (DOE 1996c:S-7). Several animal species may be found in this area. Bird species include the burrowing owl, ferruginous hawk, great blue heron, loggerhead shrike, long-billed curlew, northern harrier, sage sparrow, Swainson's hawk, western meadowlark, vesper sparrow, and horned lark. Potential mammal species include the black-tailed jackrabbit, coyote, Great Basin pocket mouse, house mouse, deer mouse, mule deer, Nuttall's cottontail, raccoon, and badger. Reptiles likely to be seen include the gopher snake, northern Pacific rattlesnake, western yellow-bellied racer, and side-blotched lizard (Mecca 1997b:Poston memo to Teal).

The 400 Area is characterized as postfire shrub-steppe habitat dominated by cheatgrass and small shrubs, including gray and green rabbitbrush. Generally, the same animal species listed above as potentially located in the 200 Area may be found in the 400 Area, with the following exceptions: great blue heron, raccoon, and badger. Species that may be infrequently seen due to limited habitat as a result of fire include loggerhead shrike and sage sparrow (Mecca 1997b:Poston memo to Teal). No surface water flows within 1.6 km (1 mi) of the proposed facility locations in the 200 East and 400 Areas (Mecca 1997b).

3.2.8.2 Sensitive Habitat

Sensitive habitat comprises those terrestrial and aquatic (including designated wetlands) areas of the site that support threatened and endangered, State-protected, and other special-status plant and animal species.[3]

3.2.8.2.1 General Site Description

The primary jurisdictional wetlands on the Hanford Site are found along the Hanford Reach and include the riparian and riverine habitats associated with the river shoreline (DOE 1996b:4-64). The riparian zone varies with seasonal water-level fluctuations and daily variations related to power generation at Priest Rapids Dam, but is known to support extensive stands of willows, grasses, various macrophytes, and other plants. Other large areas of wetlands can be found within the Saddle Mountain National Wildlife Refuge and the Wahluke Slope Wildlife Recreation Area. Wetland habitat in these areas consists of large ponds resulting from irrigation runoff. The ponds support extensive stands of cattails and other emergent aquatic vegetation that are frequently used as nesting sites by waterfowl (DOE 1996a:3-42).

Sixty-five threatened, endangered, and other special-status species listed by the Federal Government or the State of Washington may be found in the vicinity of Hanford, as shown in Table 3.2.6–1 of the *Storage and Disposition PEIS* (DOE 1996a:3-45).

3.2.8.2.2 Proposed Facility Locations

Riparian habitats are associated with the B Pond Complex near the 200 East Area and a small cooling and wastewater pond in the 400 Area (DOE 1996b:4-64). Wetland plants occurring along the shoreline of B Pond include herbaceous and woody species such as showy milkweed, western goldenrod, three square bulrush, horsetail rush, common cattail, and mulberry. Wildlife species observed include a variety of mammals and waterfowl (DOE 1996c:4-33). Similar representative plants and animals may be found in the 400 Area, with the exception of bulrushes, cattails, horsetails, and mulberry (Mecca 1997a:Poston memo to Teal).

No animals or plants on the Federal list of threatened and endangered species are known to occur on or around the 400 Area and 200 East Area. As indicated in Table 3–11, the State of Washington has classified eight bird, one mammal, four plant, and two reptile species as threatened, endangered, or species of concern. Loggerhead shrike and sage sparrow nest in undisturbed sagebrush habitat. Other bird species of concern that may occur in shrub-steppe habitat are the burrowing owl, ferruginous hawk, golden eagle, long-billed curlew, sage thrasher and Swainson’s hawk. The only mammal species is the State-listed endangered pygmy rabbit which have only rarely been observed at Hanford. Pipers daisy has been found at B Pond near the 200 East Area and crouching milkvetch, stalked-pod milkvetch, and squill onion are also found in the vicinity. The reptile species of concern are the desert night snake and striped whipsnake (Dirkes and Hanf 1997:F.1–F.3; DOE 1996a:3-44; DOE 1996c:4-34).

3.2.9 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. Hanford has a well-documented record of cultural and paleontological resources. The *Hanford Cultural Resources Management Plan*, approved by the State Historic Preservation Officer (Battelle 1989), establishes guidance for the identification, evaluation, recordation, curation, and management of

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[3] The Federal Government defines threatened and endangered species in the Endangered Species Act, and wetlands in 33 CFR 328.3.

these resources. There are 645 cultural resource sites and isolated finds recorded. Forty-eight archaeological sites and one building are included on the National Register of Historic Places. Nominations have been prepared

Table 3–11. Threatened and Endangered Species, Species of Concern, and Sensitive Species Occurring or Potentially Occurring in the Vicinity of 200 East Area and 400 Area

Common Name	Scientific Name	Federal Status	State Status
Birds			
Burrowing owl	*Athene cunicularia*	Species of Concern	Candidate Species
Ferruginous hawk	*Buteo regalis*	Species of Concern	Threatened
Golden eagle	*Aquila chrysaetos*	Not listed	Candidate Species
Loggerhead shrike	*Lanius ladovicianus*	Species of Concern	Candidate Species
Long-billed curlew	*Numenius americanus*	Not listed	Candidate Species
Sage sparrow	*Amphispiza belli*	Not listed	Candidate Species
Sage thrasher	*Oreoscoptes montanus*	Not listed	Candidate Species
Swainson's hawk	*Buteo swainsoni*	Not listed	Candidate Species
Mammals			
Pygmy rabbit	*Brachylagus idahoenis*	Species of Concern	Endangered
Plants			
Crouching milkvetch	*Astragalus succumbens*	Not listed	Monitor Group 3[a]
Piper's daisy	*Erigeron piperianus*	Not listed	Sensitive
Squill onion	*Allium scillioides*	Not listed	Monitor Group 3[a]
Stalked-pod milkvetch	*Astragalus sclerocarpus*	Not listed	Monitor Group 3[a]
Reptiles			
Desert night snake	*Hypsiglena torquata*	Not listed	Monitor Group
Striped whipsnake	*Masticophis taeniatus*	Not listed	Candidate Species

[a] Taxa that are more abundant or less threatened than previously assumed.

Source: Dirkes and Hanf 1997:F.1–F.3; DOE 1996c:4-34; McConnaughey 1998; Roy 1998.

for several archaeological districts and sites considered to be eligible for listing on the National Register. While many significant cultural resources have been identified, only about 6 percent of Hanford has been surveyed, and few of the known sites have been evaluated for their eligibility for listing on the National Register. Cultural resource reviews are conducted whenever projects are proposed in previously unsurveyed areas. In recent years, reviews have exceeded 500 per year (DOE 1996b:4-68, 4-69).

Cultural sites are often occupied continuously or intermittently over substantial time spans. For this reason, a single location (sites) 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; the sum of these resources may be greater than the total number of sites reported due to this dual-use history 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.

3.2.9.1 Prehistoric Resources

Prehistoric resources are physical properties that remain from human activities that predate written records.

3.2.9.1.1 General Site Description

Currently, 283 prehistoric sites have been identified, 17 of which contain historic components. Of 48 sites included on the National Register, 2 are individual sites (Hanford Island Site and Paris Site), and the remainder are located in seven archaeological districts. In addition, four other archaeological districts have been nominated or are planned to be nominated for the National Register. A number of sites have been identified along the Middle Columbia River and in inland areas away from the river, but near other water sources. Some evidence of human occupation has been found in the arid lowlands. Sites include remains of numerous pithouse villages, various types of open campsites, graves along the riverbanks, spirit quest monuments (rock cairns), hunting camps, game drive complexes, quarries in mountains and rocky bluffs, hunting and kill sites in lowland stabilized dunes, and small temporary camps near perennial sources of water away from the river (DOE 1996b:4-69, 4-70).

More than 10,000 years of prehistoric human activity in the largely arid environment of the Middle Columbia River region have left extensive archaeological deposits. Archaeological surveys have been conducted at Hanford since 1926; however, little excavation has been conducted at any of the sites. Surveys have included studies of Gable Mountain, Gable Butte, Snively Canyon, Rattlesnake Mountain, Rattlesnake Springs, and a portion of the Basalt Waste Isolation Project Reference Repository location. Most of the surveys have focused on islands and on a 400-m (1,312-ft) wide area on either side of the river. From 1991 through 1995, the 100 Areas were surveyed, and new sites were identified. Excavations have been conducted at several sites on the riverbanks and islands and at two unnamed sites. Test excavations have been conducted at the Wahluke, Vernita Bridge, and Tsulim sites and at other sites in Benton County (DOE 1996a:3-48).

3.2.9.1.2 Proposed Facility Locations

An archaeological survey has been conducted for all undeveloped portions of the 200 East Area and half of the undeveloped portions of the 200 West Area. No prehistoric sites were identified. Because most of the 200 Areas are either developed or disturbed, it is unlikely that they contain intact archaeological deposits. Likewise, most of the 400 Area is disturbed and is unlikely to contain intact prehistoric or historic sites. A cultural resources survey found only 12 ha (30 acres) that were undisturbed, and no sites were identified either within the 400 Area or within 2 km (1.2 mi) of the 400 Area. The *Hanford Cultural Resources Management Plan* provides for survey work before construction and has contingency guidelines for handling the discovery of previously unknown archaeological resources encountered during construction (DOE 1996a:3-48).

3.2.9.2 Historic Resources

Historic resources consist of physical properties that postdate the existence of written records. In the United States, historic resources are generally considered to be those that date no earlier than 1492.

3.2.9.2.1 General Site Description

There are 202 historic archaeological sites and other historic localities recorded at Hanford. Of these sites, 1 is included on the National Register as a historic site, and 56 are listed as archaeological sites. Sites and localities that predate the Hanford era include homesteads, ranches, trash scatters, dumps, gold mine tailings, roads, and townsites, including the Hanford townsite and the East White Bluffs townsite and ferry landing. More recent historic structures include the defense reactors and associated materials-processing facilities that played an important role in the Manhattan Project and the Cold War era (DOE 1996a:3-48, 3-49).

Lewis and Clark were the first European Americans to visit this region, during their 1804 to 1806 expedition. They were followed by fur trappers, military units, and miners. It was not until the 1860s that merchants set up stores, a freight depot, and the White Bluffs Ferry on the Hanford Reach, and Chinese gold miners began to work the gravel bars. Cattle ranches opened in the 1880s, and farmers soon followed. Several small thriving towns, including Hanford, White Bluffs, and Ringold, grew up along the riverbanks in the early 20th century.

Other ferries were established at Wahluke and Richmond. These towns and nearly all other structures were razed after the U.S. Government acquired the land for the original Hanford Engineer Works in the early 1940s (part of the Manhattan Project). Plutonium produced at the 100 B-Reactor was used in the first nuclear explosion at the White Sands Missile Range in New Mexico, and later in the bomb that destroyed Nagasaki, Japan, to help end World War II. The Hanford 100 B-Reactor is listed on the National Register and is designated a National Mechanical Engineering Landmark, a National Historic Civil Engineering Landmark, and a National Nuclear Engineering Landmark (DOE 1996a:3-48).

3.2.9.2.2 Proposed Facility Locations

Within the 200 Area, the only National Register–evaluated historic site is the old White Bluffs freight road that crosses diagonally through the 200 West Area. The road, which was originally a Native American trail, has been in continuous use as a transportation route since prehistoric times and has played a role in European-American immigration, regional development, agriculture, and the recent Hanford operations. The road has been determined eligible for inclusion on the National Register by the State Historic Preservation Officer, but the segment in the 200 West Area is considered a noncontributing element (i.e., lacking sufficient integrity to be a significant element of the road). A 100-m (328-ft) restricted zone protects the road from uncontrolled disturbance. Buildings in the 200 Area associated with the Manhattan Project and Cold War era have been evaluated for eligibility for nomination to the National Register and are under review by the State Historic Preservation Officer. No known historic resources have been identified in the 400 Area (DOE 1996b:3-49).

3.2.9.3 Native American Resources

Native American resources are sites, areas, and materials important to Native Americans for religious or heritage reasons. In addition, cultural values are placed on natural resources such as plants, which have multiple purposes within various Native American groups. Of primary concern are concepts of sacred space that create the potential for land-use conflicts.

3.2.9.3.1 General Site Description

In prehistoric and early historic times, the Hanford Reach was heavily populated by Native Americans of various tribal affiliations. The Wanapum and the Chamnapum bands of the Yakama Tribe lived along the Columbia River at what is now Hanford. Some of their descendants still live nearby at Priest Rapids, northwest of Hanford. Palus People, who lived on the lower Snake River, joined the Wanapum and Chamnapum to fish the Hanford Reach, and some inhabited the east bank of the river. Walla Walla and Umatilla People also made periodic visits to fish in the area. These people retain traditional secular and religious ties to the region, and many have knowledge of the ceremonies and lifeways of their culture. The Washani, or Seven Drums religion, which has ancient roots and originated among the Wanapum, is still practiced by many people on the Yakama, Umatilla, Warm Springs, and Nez Perce Reservations. Native plant and animal foods, some of which can be found at Hanford, are used in the ceremonies performed by tribal members (DOE 1996b:4-71).

Consultation is required to identify the traditional cultural properties that are important in maintaining the cultural heritage of Native American tribes. Under separate treaties signed in 1855, the Confederated Tribes and Bands of the Yakama Indian Nation and the Confederated Tribes of the Umatilla Indian Reservation ceded lands to the United States that include the present Hanford Site. Under the treaties, the tribes reserved the right to fish at usual and accustomed places in common with the citizens of the territory, and retained the privilege of hunting, gathering roots and berries, and pasturing horses and cattle upon open, unclaimed land. The Treaty of 1855 with the Nez Perce Tribe includes similar reservations of rights, and the Nez Perce have identified the Hanford Reach as the location of usual and accustomed places for fishing. The Wanapum People are not signatory to any treaty with the United States and are not a federally recognized tribe; however, they live about 8 km (5 mi) west of the

Hanford boundary, they were historical residents of Hanford, and their interests in the area have been acknowledged (DOE 1996b:4-71, 4-72).

All these tribes are active participants in decisions regarding Hanford and have expressed concerns about hunting, fishing, pasture rights, and access to plant and animal communities and important sites. Sites sacred to Native Americans at Hanford include remains of prehistoric villages, burial grounds, ceremonial longhouses or lodges, rock art, fishing stations, and vision quest sites. Culturally important localities and geographic features include Rattlesnake Mountain, Gable Mountain, Gable Butte, Goose Egg Hill, Coyote Rapids, and the White Bluffs portion of the Columbia River (DOE 1996a:3-49).

Consultations (see Chapter 5 and Appendix O) were initiated with appropriate Native American groups to determine any concerns associated with the actions evaluated in this SPD EIS.

3.2.9.3.2 Proposed Facility Locations

Neither the 200 East Area nor the 400 Area is known to contain any Native American resources.

3.2.9.4 Paleontological Resources

Paleontological resources are the physical remains, impressions, or traces of plants or animals from a former geological age.

3.2.9.4.1 General Site Description

Remains from the Pliocene and Pleistocene Ages have been identified at Hanford. The Upper Ringold Formation dates to the Late Pliocene Age and contains fish, reptile, amphibian, and mammal fossil remains. Late Pleistocene Touchet beds have yielded mammoth bones. These beds are composed of fluvial sediments deposited along ridge slopes that surround Hanford at distances greater than 5 km (3.1 mi) from the 200 and 400 Areas (DOE 1996a:3-49).

3.2.9.4.2 Proposed Facility Locations

No paleontological resources have been reported near the 200 and 400 Areas.

3.2.10 Land Use and Visual Resources

3.2.10.1 Land Use

Land may be characterized by its potential for the location of human activities (land use). Natural resource attributes and other environmental characteristics could make a site more suitable for some land uses than for others. Changes in land use may have both beneficial and adverse effects on other resources (biological, cultural, geological, aquatic, and atmospheric).

Hanford covers approximately 1,450 km^2 (560 mi^2) of the southeastern part of the State of Washington and extends over parts of Benton, Grant, and Franklin Counties. The site is owned entirely by the Federal Government and is administered and controlled by DOE (DOE 1996a:3-23).

3.2.10.1.1 General Site Description

The Tri-Cities area southeast of Hanford includes residential, commercial, and industrial land use. This area, encompassing the cities of Richland, Kennewick, and Pasco, is the population center closest to Hanford. Additional cities near the southern boundary of Hanford include Benton City, Prosser, and West Richland (DOE 1996b:4-81). Agriculture is a major land use in the remaining areas surrounding Hanford. In 1996, wheat was the largest crop in terms of area planted in Benton, Franklin, and Grant Counties. Alfalfa, apples, asparagus, cherries, corn, grapes, and potatoes are the other major crops in Benton, Franklin, and Grant Counties (DOE 1996b:4-106). Hanford is a Superfund site, listed on the National Priorities List. Public access to most facility areas is restricted.

DOE has designated the entire Hanford Site as a National Environmental Research Park, an outdoor laboratory for ecological research to study the environmental effects of energy development. The Hanford National Environmental Research Park is a shrub-steppe habitat that contains a wide range of semiarid land ecosystems and offers the opportunity to examine linkages between terrestrial, subsurface, and aquatic environments (DOE 1996a:3-23).

Land-use categories at Hanford include reactor operations, waste operations, administrative support, operations support, sensitive areas (including environmentally or culturally important areas), R&D and engineering development, and undeveloped areas. Generalized land uses at Hanford and vicinity are shown in Figure 3–9. Approximately 6 percent of Hanford has been disturbed and is occupied by operational facilities (DOE 1995b:4-1). Hanford contains a variety of widely dispersed facilities, including old reactors, R&D facilities, and various production and processing plants. The largest category of existing Hanford land use is sensitive areas. Approximately 665 km^2 (257 mi^2), nearly half the site, have been designated as ecological study areas or refuges. Sensitive open-space areas include the Fitzner-Eberhardt Arid Lands Ecology Reserve near Rattlesnake Mountain and two areas north of the Columbia River: the Saddle Mountain National Wildlife Refuge, administered by the USFWS, and the Wahluke Slope Wildlife Recreation Area, managed by the Washington State Department of Fish and Wildlife (DOE 1996b:4-109). Other special-status lands in the vicinity include McNary National Wildlife Refuge, administered by the USFWS, and the Columbia River Islands Area of Critical Environmental Concern and McCoy Canyon, both administered by the Bureau of Land Management (BLM).

The Fitzner-Eberhardt Arid Lands Ecology Reserve, encompassing approximately 315 km^2 (122 mi^2) in the southwestern portion of Hanford, is managed as a habitat and wildlife reserve and environmental research center by the USFWS (DOE 1996b:4-109, Sandberg 1998a). The Rattlesnake Hills Research Natural Area of the Arid Lands Ecology Reserve remains the largest Research Natural Area in the State of Washington. Because public access to the Arid Lands Ecology Reserve has been restricted since 1943, the shrub-steppe habitat is virtually undisturbed. This geographic area contains a number of small, contaminated sites that were remediated in 1994 and 1995 and have been revegetated (DOE 1996b:4-109).

The Columbia River, which is adjacent to and runs through the Hanford Site, is used for public boating, water skiing, fishing, and hunting of upland game birds and migratory fowl. Public access is allowed on certain islands, while other areas are considered sensitive because of unique habitats and the presence of cultural resources (DOE 1996b:4-109). The area known as the Hanford Reach includes the quarter-mile strip of public land on either side of the last free-flowing, nontidal segment of the Columbia River. In 1988, Congress passed Public Law 100-605, known as the *Comprehensive Conservation Study of the Hanford Reach of the Columbia River*, which required the Secretary of the Interior to prepare a study in consultation with the Secretary of Energy to evaluate outstanding features of the Hanford Reach (DOE 1996b:4-109). The results of this study can be found in the *Hanford Reach of the Columbia River Comprehensive River Conservation Study and Environmental Impact Statement* (NPS 1994). The study recommends that Congress designate an 80-km (50-mi) segment of the Columbia River extending downstream from below Priest Rapids Dam to near Johnson Island (river mile 346.5 to river mile 396) as a National Wildlife Refuge and Wild and Scenic River.

About 2,400 ha (5,930 acres) or 1.7 percent of the total acreage at Hanford is available for radioactive waste management facilities (DOE 1997a:4-20). Onsite programmatic and general purpose space totals approximately 799,000 m^2 (8.6 million ft^2). Fifty-one percent or approximately 408,000 m^2 (4.4 million ft^2) is general purpose space, including offices, laboratories, shops, warehouses, and other support facilities. The remaining 392,000 m^2 (4.2 million ft^2) of space is devoted to programmatic facilities, including processing, evaporation, filtration, waste recovery, waste treatment, waste storage facilities, and R&D laboratories (Mecca 1997a:120).

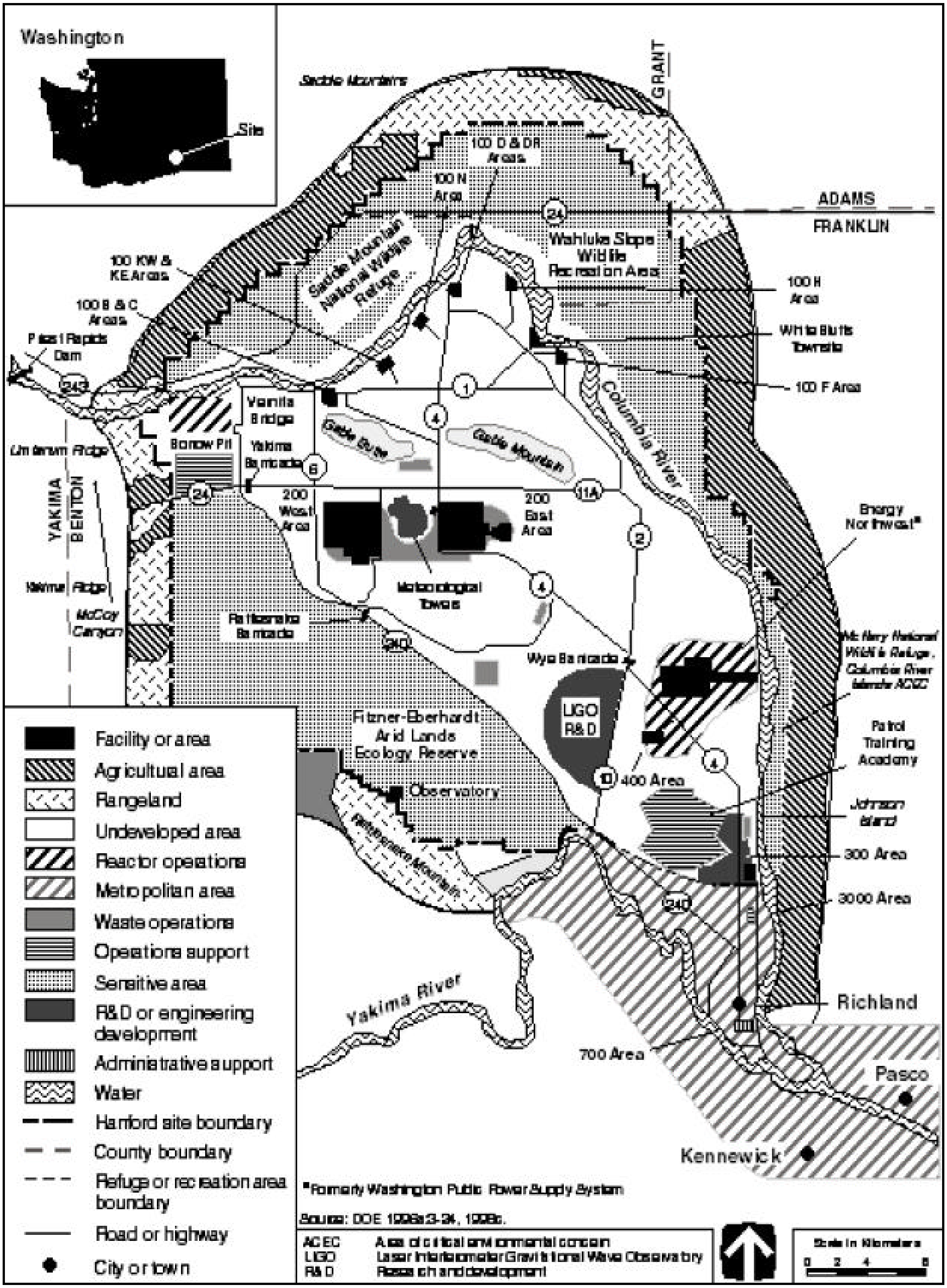

Figure 3–9. Generalized Land Use at Hanford and Vicinity

The 200 East Area is on the Central Plateau. This areas occupies about 11 km^2 (4.2 mi^2) and is dedicated to fuel reprocessing, waste-processing management, and disposal activities. Waste operations and operations support are the primary land uses. The Environmental Restoration Disposal Facility provides disposal capacity for environmental remediation waste generated during remediation of the Hanford Site (DOE 1996b:4-110).

The 400 Area occupies 0.6 km^2 (0.2 mi^2) and is about 8 km (5 mi) northwest of the 300 Area (DOE 1995b:4-2). It is the site of FFTF used in the testing of breeder reactor systems. Also in this area is FMEF, an unused building designed to fabricate fast breeder reactor fuel.

The *Hanford Site Development Plan* provides an overview of land use, infrastructure, and facility requirements to support the DOE missions at Hanford (DOE 1996b:4-109). Included in the plan is a Master Plan section that outlines the relationship of the land and the infrastructure required to support Hanford Site missions (DOE 1996b:4-109). The DOE Richland Operations Office has undertaken new comprehensive land-use planning to define how to best use the land at Hanford for the next 30 to 40 years (DOE 1996a:3-23). Its *Comprehensive Land-Use Plan* identifies existing and planned land uses, with accompanying restrictions; covers a specific timeframe; and will be updated as necessary.

Private lands bordering Hanford are subject to the planning regulations of Benton, Franklin, and Grant Counties and the city of Richland. Most of the land at Hanford is situated in Benton County. Benton County and the city of Richland have a comprehensive land-use planning process under way, with deadlines mandated under the State of Washington Growth Management Act of 1990 (DOE 1996a:3-23).

Under separate treaties signed in 1855, lands occupied by the present Hanford Site were ceded to the United States by the Confederated Tribes and Bands of the Yakama Indian Nation and by the Confederated Tribes of the Umatilla Indian Reservation (DOE 1996b:4-115). Under these treaties, the tribes retained the right to fish in their usual and accustomed places, and to hunt, gather roots and berries, and pasture horses and cattle on open, unclaimed lands. Tribal fishing rights have been recognized as effective within the Hanford Reach. DOE considers Hanford's past nuclear materials production mission and its current mission of waste management inconsistent with the continued exercise of these treaty-reserved privileges (DOE 1996b:4-115, 4-116).

3.2.10.1.2 Proposed Facility Locations

The 200 East Area is on a plateau about 11 km (6.8 mi) from the Columbia River. The 200 East and West Areas cover about 16 km^2 (6.2 mi^2) and have been dedicated for some time to fuel-reprocessing and waste management and disposal activities (DOE 1995b:4-2). Waste operations are confined primarily to the 200 Areas. The 200 East Area had previously been used to reprocess irradiated nuclear fuel and to store the resulting waste (DOE 1996c:4-50). The land is currently disturbed and is designated for waste operations. The distance from the 200 East Area to the nearest site boundary is approximately 10 km (6.2 mi).

The land in the 400 Area is currently disturbed and is designated for reactor operations. The distance from the 400 Area to the nearest site boundary is 7 km (4.3 mi).

3.2.10.2 Visual Resources

Visual resources are natural and human-created features that give a particular landscape its character and aesthetic quality. Landscape character is determined by the visual elements of form, line, color, and texture. All four elements are present in every landscape; however, they exert varying degrees of influence. The stronger the influence exerted by these elements in a landscape, the more interesting the landscape. The more visual variety that exists with harmony, the more aesthetically pleasing the landscape.

3.2.10.2.1 General Site Description

Hanford is in the Pasco Basin of the Columbia Plateau north of the city of Richland, which is at the confluence of the Yakima and Columbia Rivers. The topography of land in the vicinity of Hanford ranges from generally flat to gently rolling. Rattlesnake Mountain, rising to 1,060 m (3,480 ft) above mean sea level, forms the southwestern boundary of the site (DOE 1995a:4-33). Gable Mountain and Gable Butte are the highest land forms within the site, rising approximately 60 m (200 ft) and 180 m (590 ft), respectively. The Columbia River flows through the northern part of the site and, turning south, forms part of the eastern site boundary. White Bluffs, steep whitish-brown bluffs adjacent to the Columbia River and above the northern boundary of the river in this region, are a striking feature of the landscape (Neitzel 1996:4.125).

Typical of the regional shrub-steppe desert, the site is dominated by widely spaced, low-brush grasslands. A large area of unvegetated, mobile sand dunes extends along the east boundary, and unvegetated blowouts are scattered throughout the site. Hanford is characterized by mostly undeveloped land, with widely spaced clusters of industrial buildings along the southern and western banks of the Columbia River and at several interior locations.

The adjacent visual landscape consists primarily of rural rangeland and farms; the city of Richland, part of the Tri-Cities area, is the only adjoining urban area. Viewpoints affected by DOE facilities are primarily associated with the public access roadways (including State Routes 24 and 240, Hanford Road, Horn Rapids Road, Route 4 South, and Steven Drive), the bluffs, and the northern edge of the city of Richland. The Energy Northwest (formerly WPPSS) nuclear reactors and DOE facilities are brightly lit at night and are highly visible from many areas. Developed areas are consistent with a Visual Resource Management (VRM) Class IV designation, while the remainder of the Hanford Site ranges from VRM Class III to Class IV (DOI 1986a, 1986b).

Site facilities across Hanford can be seen from elevated locations (e.g., Gable Mountain), a few public roadways (State Routes 24 and 240), and the Columbia River. State Route 24 provides public access to the northern portion of the site. The height of structures ranges from about 3 to 30 m (10 to 100 ft), with a few stacks and towers that reach 60 m (200 ft). Viewsheds along this highway include limited views of the Columbia River where the road drops down into the river valley. A turnout on State Route 24 along the north side of the river offers views of the river and B- and C-Reactors. A rest stop along the road to the south of the river provides views of the Umtanum Ridge to the west, the Saddle Mountains to the north, and the Columbia River valley to the east and west (DOE 1996b:4-96). State Route 240 provides public access to the southwestern portion of the Hanford Site. Viewsheds along this highway include the flat, open lands of the Arid Lands Ecology Reserve in the foreground to the west, with the prominent peaks of Rattlesnake Mountain and the extended ridgelines of the Rattlesnake Hills in the background. From the highway, views are expansive due to the flat terrain, with Saddle Mountain in the distance to the north and steam plumes from the Energy Northwest reactor cooling towers often visible in the distance to the east. Views of DOE facilities from the surface of the Columbia River are generally blocked by high riverbanks; however, steam plumes from the Energy Northwest facility are visible.

3.2.10.2.2 Proposed Facility Locations

Facilities in the 200 East Area are in the interior of the Hanford Site and cannot be seen from the Columbia River or State Route 24. Views to the east from State Route 240 include fairly flat terrain, with the structures of the 200 East and 200 West Areas in the middle ground with Gable Butte and Gable Mountain visible in the background. Developed areas within the 200 East Area are consistent with a VRM Class IV designation. Natural features of visual interest within a 40-km (25-mi) radius include the Columbia River at 10 km (6.2 mi), Gable Butte at 10 km (6.2 mi), Rattlesnake Mountain at 14 km (8.7 mi), and Gable Mountain at 5.3 km (3.3 mi).

FMEF, the tallest building in the 400 Area, is 30 m (100 ft) tall and can be seen from State Route 240. Developed areas within the 400 Area are consistent with a VRM Class IV designation (DOI 1986a, 1986b). Natural features of visual interest within a 40-km (25-mi) radius include the Columbia River at 6.8 km (4.2 mi), Gable Butte at 27 km (17 mi), Rattlesnake Mountain at 17 km (11 mi), and Gable Mountain at 19 km (12 mi) (Mecca 1997a:18).

3.2.11 Infrastructure

Site infrastructure includes those utilities and other resources required to support construction and continued operation of mission-related facilities identified under the various proposed alternatives.

3.2.11.1 General Site Description

Hanford has numerous research, processing, and administrative facilities. An extensive infrastructure system supports these facilities, as shown in Table 3–12.

Table 3–12. Hanford Sitewide Infrastructure Characteristics

Resource	Current Usage	Site Capacity
Transportation		
Roads (km)	420	420
Railroads (km)	204[a]	204[a]
Electricity		
Energy consumption (MWh/yr)	323,128	2,484,336
Peak load (MW)	60.7	283.6
Fuel		
Natural gas (m^3/yr)	459,200	20,804,000
Oil (l/yr)	9,334,800	14,775,000[b]
Coal (t/yr)	NA[c]	NA[c]
Water (l/yr)	2,754,000,000	8,263,000,000

[a] DOE is in the process of discontinuing rail service to most of Hanford (see Section 3.2.11.1.1).
[b] As supplies get low, more can be supplied by truck or rail.
[c] See Section 3.2.1.1.1.
Key: NA, not applicable.
Source: Teal 1997:4.

3.2.11.1.1 Transportation

Hanford has a network of paved roads, with 104 km (65 mi) of the 420 km (261 mi) of these roads accessible to the public. The site is crossed by State Route 240, which is the main route traveled by the public. Most onsite employees travel Route 4, the primary highway from the Tri-Cities area to most Hanford outer work locations. A recently constructed access road between State Route 240 and the 200 West Area has alleviated peak traffic congestion on Route 4. Access to the outer areas (100 and 200 Areas) is controlled by DOE at the Yakima, Wye, and Rattlesnake barricades (DOE 1996a:3-26; Mecca 1997a:126).

Onsite rail transport to Hanford is provided by a short-line railroad. Hanford's railroad is a Class III Railroad System, as defined by the Federal Railroad Administration. Its common carrier tie is with the Union Pacific Railroad in Richland (DOE 1996a:3-26; Mecca 1997a:126). The site railroad is in transition from DOE ownership to the Port of Benton with a planned date of October 1, 1998. At that time only the southern portion of the rail line that is connected to and serviced by Union Pacific would be transferred. It is expected that the Port of Benton will also have track rights as far north as the Energy Northwest (formerly WPPSS) reactors. By September 30, 1998, DOE rail operations will be discontinued. There are no current plans for service north of the Energy Northwest reactor site (Sandberg 1998a).

3.2.11.1.2 Electricity

Most site electric power is purchased from the Bonneville Power Administration and routed through substations and switching stations in a manner that provides supply redundancy on the electrical transmission and distribution systems. Bonneville Power Administration electric power is provided to three distinct systems on the Hanford Site, the 100/200 Area System, the 300 Area System, and the 400 Area System (Mecca 1997a:137). Power for the 700, 1100, and 3000 Areas is provided by the city of Richland (DOE 1996b:4-93).

3.2.11.1.3 Fuel

Natural gas, provided by the Cascade Natural Gas Corporation, is used in a few locations at Hanford. Fuel oil and propane are also used in some areas. Oil capacity is only limited by the number of deliveries by truck (DOE 1996a:3-27).

3.2.11.1.4 Water

The Columbia River is the primary source of raw water for Hanford. Average annual river flow through the site is approximately 203 million l/min (54 million gal/min) (Mecca 1997a:126). The Export Water System supplies raw river water to the 100-B, 100-D, 200 East, 200 West, and 251-W potable water filtration and treatment systems. Daily pumping averages about 72 million l/day (19 million gal/day) (Rohl 1994:2-2). Wells supply water to the 400 Area and a variety of low-use facilities at remote locations (Mecca 1997a:126).

3.2.11.1.5 Site Safety Services

The Hanford fire department operates four fire stations within the Hanford Site. The stations are strategically located to ensure minimum response time to all facilities. The fire department also provides the site with ambulance, emergency medical technicians, and advanced first aid-certified firefighters (Mecca 1997a:154).

3.2.11.2 Proposed Facility Locations

A summary of the infrastructure characteristics of the 200 East Area and the 400 Area's FMEF is shown in Table 3–13.

Table 3–13. Hanford Infrastructure Characteristics for 200 East Area and FMEF

	200 East Area		FMEF	
Resource	**Current Usage**	**Capacity**	**Current Usage**	**Capacity**
Electricity				
Energy consumption (MWh/yr)	66,671	345,000	7,300	61,000
Peak load (MW)	16.6	40.0	4.1	26.6
Fuel				
Natural gas (m^3/yr)	NA	NA	NA	NA
Oil (l/yr)	7,294,220[a]	NA[b]	760	18,900[b]
Coal (t/yr)	NA	NA	NA	NA
Water (l/yr)	688,600,000	2,596,000,000	41,690,000	397,950,000

[a] See Sandberg 1998c.
[b] As supplies get low, more can be supplied by truck or rail.
Key: FMEF, Fuels and Materials Examination Facility; NA, not applicable.
Source: Teal 1997:4.

3.2.11.2.1 Electricity

Power to the 100/200 Area electrical system is provided from two sources, the Bonneville Power Administration Midway substation at the northwestern site boundary, and a transmission line from the Bonneville Power Administration Ashe substation. The 100/200 Area electrical system consists of about 80 km (50 mi) of 230-kV transmission lines, six primary substations, about 217 km (135 mi) of 13.8-kV distribution lines, and 124 secondary substations. The 100/200 Area transmission and distribution systems, as with the Bonneville Power Administration source lines, have redundant routings to ensure electrical service to individual areas and designated facilities within those areas (Mecca 1997a:137). The substation providing power to the 200 Area has a peak load capacity of 40 MW (Teal 1997:4).

Primary electric power to the 400 Area is provided by two 115-kV Bonneville Power Administration transmission lines, one from the Bonneville Power Administration Benton substation and the second from the Bonneville Power Administration White Bluffs substation. There is one 13.8-kV tie line from the 300 Area to the 400 Area emergency power system that also provides alternate power for maintenance outages. Redundancy in the distribution lines to designated facilities ensures continuity of service and rerouting of power for maintenance of system components. The approximate lengths of distribution lines in the 400 Area are as follows: 13.8-kV lines, 7.3 km (4.5 mi); 2.4-kV lines, 518 m (1,700 ft); and 480-V lines, 14.6 km (9.1 mi). There are two substations in the 400 Area: 451A, which serves FFTF reactor and associated buildings, and 451B, which serves FMEF and associated buildings (Mecca 1997a:168, 169). The peak load capacity for FMEF is 26.6 MW and the current usage is 4.1 MW (Teal 1997:4).

3.2.11.2.2 Fuel

Coal-fire steam generation facilities have been shut down at Hanford. The conversion to oil-fired sources was completed in 1998 (see Section 3.2.1.1.1). Fuel usage at 200 Area would be about 7,294,220 l/yr (1,926,935 gal/yr) (Sandberg 1998c). Fuel usage and capacity at FMEF are 760 l/yr (201 gal/yr) and 18,900 l/yr (4,993 gal/yr), respectively (Teal 1997:4).

3.2.11.2.3 Water

The 200 East Area is the major consumer of raw water delivered via the Export Water System. That water is received at the 11.4-million-l (3-million-gal) 282-E Reservoir at a capacity of 9,842 l/min (2,600 gal/min). Monthly average potable water flow in the 200 East Area ranges between 3,028 and 3,312 l/min (800 and 875 gal/min). Daily average flow can vary widely, depending primarily on area activity (Rohl 1994:2-5, 2-6).

The 400 Area receives water from three underground deep-water wells. Each of these wells has a pumping capacity of 833 l/min (220 gal/min). Water is pumped to three aboveground storage tanks that have a combined capacity of 3,028,320 l (800,000 gal). The observed flow ranges from 681 l/min (180 gal/min) during the summer months to 284 l/min (75 gal/min) during the winter months (Rohl 1994:2-7).

3.3 INEEL

INEEL is in southeastern Idaho and is 55 km (34 mi) west of Idaho Falls, 61 km (38 mi) northwest of Blackfoot, and 35 km (22 mi) east of Arco (see Figure 2–3). The site has about 445 km (277 mi) of roads, both paved and unpaved, and 48 km (30 mi) of railroad track (DOE 1996a:3-104).

There are 450 buildings and 2,000 support structures at INEEL with more than 279,000 m^2 (3 million ft^2) of floor space in varying conditions of utility. INEEL has approximately 25,100 m^2 (270,000 ft^2) of covered warehouse space and an additional 18,600 m^2 (200,000 ft^2) of fenced yard space. The total area of the various machine shops is 3,035 m^2 (32,665 ft^2) (DOE 1996a:3-104).

There have been 52 research and test reactors at INEEL used over the years to test reactor systems, fuel and target design, and overall safety. In addition to its nuclear reactor research, other INEEL facilities are operated to support reactor operations. These facilities include HLW and LLW processing and storage sites, hot cells, analytical laboratories, machine shops, laundry, railroad, and administrative facilities. Other activities include management of one of DOE's largest storage sites for LLW and TRU waste. Until 1992, spent reactor fuels were reprocessed at INTEC to recover enriched uranium and other isotopes. Due to a DOE decision to terminate spent fuel reprocessing, INTEC was transferred to the DOE Office of Environmental Management program for disposition. INTEC contains the new Waste Calcining Facility, which processes liquid HLW streams to a calcined solid (granular form). Beginning in the early part of the next century, a waste immobilization facility will convert the calcined solids into a glass or ceramic for disposal in a Federal repository. Additionally, miscellaneous spent fuel from both DOE and commercial sources is scheduled for interim storage at INTEC. Within the existing security perimeter, the Fuel Processing Facility (FPF) is a special nuclear material storage and processing facility that is 95 percent complete and has never been operated (DOE 1996a:3-104).

DOE activities at INEEL have been divided among eight distinct and geographically separate function areas as listed in Table 3–14.

DOE Activities. Environmental management activities include R&D for waste processing at the Power Burst Facility and providing waste management expertise to the Radioactive Waste Management Complex. The Power Burst Facility performs R&D for waste reduction programs and the Boron Neutron Capture Therapy Program. Waste management efforts at INEEL are directed toward safe and environmentally sound treatment, storage, and disposal of radioactive, hazardous, and sanitary waste. Major waste reduction facilities include the Waste Engineering Development Facility, the Waste Experimental Reduction Facility, and the Mixed Waste Storage Facility (DOE 1996a:3-104).

The following additional DOE activities are at INEEL:

- The Test Area North complex consists of several experimental reactors and support facilities conducting R&D activities on reactor performance. These facilities include the technical support facility, the containment test facility, the water reactor research test facility, and the inertial engine test facility. The inertial engine test facility has been abandoned, and no future activities are planned. The remaining facilities support ongoing programs.

- Materials testing and environmental monitoring activities were conducted in the Auxiliary Reactor Area. The facilities in this area are scheduled for decontamination and decommissioning.

Table 3–14. Current Missions at INEEL

Mission	Description	Sponsor
Argonne National Laboratory–West	Conduct research and develop technology to deal with nuclear issues such as stabilization of spent nuclear fuel; development and qualification of high-level nuclear waste forms; characterization, treating and stabilization of mixed waste to allow disposal; nuclear facility decommissioning; and similar activities.	Office of Nuclear Energy; Assistant Secretary for Environmental Management
Radioactive Waste Management Complex	Provide waste management functions for present and future site and DOE needs.	Assistant Secretary for Environmental Management
Power Burst Area	Perform waste processing, technology research, and development; provide interim storage for hazardous wastes.	Assistant Secretary for Environmental Management
Test Area North	Perform research on spent nuclear fuel casks, and spent nuclear fuel handling systems. Perform disassembly and decommissioning of large radioactive equipment. House a project to manufacture armor packages for Army tanks.	Office of Nuclear Energy
Test Reactor Area	Perform irradiation service, develop nuclear instruments, and conduct safety programs; develop methods to meet radioactive release limits.	Office of Nuclear Energy; Office of Naval Reactors
Idaho Nuclear Technology and Engineering Center	Provide spent fuel storage and high-level waste processing.	Assistant Secretary for Environmental Management
Naval Reactors Facility	Standby facility for conducting ship propulsion reactor research and training.	Office of Naval Reactors
Central Facilities Area	Provide centralized support services for the site.	Idaho Operations Office

Source: DOE 1996a:3-105.

- The ANL–W facility area consists of several major complexes, including the Experimental Breeder Reactor II, Transient Reactor Test Facility, Zero Power Physics Reactor, Hot Fuel Examination Facility, Fuel Cycle Facility, and Fuel Manufacturing Facility. The Experimental Breeder Reactor II was used to demonstrate the integral fast reactor concept. The Transient Reactor Test Facility and the Zero Power Physics Reactor are used to conduct reactor analysis and safety experiments. The Hot Fuel Examination Facility provides inert-atmosphere containment for handling and examining irradiated reactor fuel. The Fuel Cycle Facility has been modified for the integral fast reactor program to demonstrate remote reprocessing and refabrication. The Fuel Manufacturing Facility is used to manufacture metallic fuel elements and store plutonium material.

- The Test Reactor Area contains the Advanced Test Reactor. This reactor is used for irradiation testing of reactor fuels and material properties; instrumentation for naval reactors; and production of radioisotopes in support of nuclear medicine, industrial applications, research, and product sterilization.

- The Naval Reactors Facility is operated under jurisdiction of DOE's Pittsburgh Naval Reactors Office. Included at this facility are the submarine prototypes and the expended core facility. Activities include testing of advanced design equipment and new systems for current naval nuclear propulsion plants and obtaining data for future designs.

- The Central Facilities Area provides sitewide support services, including transportation, shop services, health services, radiation monitoring, and administrative offices.

Non-DOE Activities. Non-DOE activities at INEEL include research being conducted by the National Oceanic and Atmospheric Administration (NOAA), U.S. Geological Survey, and various institutions of higher learning. These activities support the designation of INEEL as a National Environmental Research Park (DOE 1996a:3-106).

3.3.1 Air Quality and Noise

3.3.1.1 Air Quality

Air pollution refers to any substance in the air that could harm human or animal populations, vegetation, or structures, or that unreasonably interferes with the comfortable enjoyment of life and property. Air pollutants are transported, dispersed, or concentrated by meteorological and topographical conditions. Air quality is affected by air pollutant emission characteristics, meteorology, and topography.

3.3.1.1.1 General Site Description

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 EC (42 EF); average monthly temperatures range from a minimum of -8.8 EC (16.1 EF) in January to a maximum of 20 EC (68 EF) in July. The average annual precipitation at INEEL is 22 cm (8.7 in) (Clawson, Start, and Ricks 1989:55, 77). Prevailing winds at INEEL are southwest to west-northwest with a secondary maximum frequency from the north-northeast to northeast. The average annual windspeed is 3.4 m/s (7.5 mph) (DOE 1996a:3-112). Additional information related to meteorology and climatology at INEEL is presented in Appendix F of the *Storage and Disposition PEIS* (DOE 1996a:F-8–F-11).

INEEL is within the Eastern Idaho Intrastate AQCR #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 (EPA 1997d). The nearest nonattainment area for particulate matter is in Pocatello, about 80 km (50 mi) to the south. Applicable NAAQS and Idaho State ambient air quality standards are presented in Table 3–15.

The nearest PSD Class I area to INEEL is Craters of the Moon National Monument, Idaho, about 53 km (33 mi) west-southwest from the center of the site. There are no other Class I areas within 100 km (62 mi) of INEEL. PSD permits have been obtained for the coal-fired steam-generating facility next to INTEC and FPF, which is not expected to be operated (DOE 1996a:3-112).

The primary sources of air pollutants at INEEL include calcination of high-level radioactive liquid waste, combustion of coal for steam, and combustion of fuel oil for heating. Other emission sources include waste burning, coal piles, industrial processes, vehicles, and fugitive dust from burial and construction activities. Table 3–15 presents the existing ambient air concentrations attributable to sources at INEEL, which are based on maximum emissions for the year 1990. These emissions were modeled using meteorological data from 1992 (DOE 1996a:3-112–3-114). Actual annual emissions from sources at INEEL are less than these levels, and the estimated concentrations bound the actual INEEL contribution to ambient levels. Only those pollutants that would be emitted for any of the surplus plutonium disposition alternatives are presented. Concentrations shown in Table 3–15 attributable to INEEL are in compliance with applicable guidelines and regulations.

Measured air pollutant concentrations at INEEL air-monitoring locations during 1995 indicates an annual average nitrogen dioxide concentration of 3.8 Fg/m^3; sulfur dioxide concentrations of 15 Fg/m^3 for

Table 3–15. Comparison of Ambient Air Concentrations From INEEL Sources With Most Stringent Applicable Standards or Guidelines, 1990

Pollutant	Averaging Period	Most Stringent Standard or Guideline (Fg/m^3)[a]	Concentration (Fg/m^3)
Criteria pollutants			
Carbon monoxide	8 hours	10,000[b]	284
	1 hour	40,000[b]	614
Nitrogen dioxide	Annual	100[b]	4
Ozone	8 hours	157[c]	(d)
PM_{10}	Annual	50[b]	3
	24 hours	150[b]	33
$PM_{2.5}$	3-year annual	15[c]	(e)
	24 hours (98th percentile over 3 years)	65[c]	(e)
Sulfur dioxide	Annual	80[b]	6
	24 hours	365[b]	135
	3 hours	1,300[b]	579
Hazardous and other toxic compounds			
Benzene	Annual	0.12[f]	0.029
[Text deleted.]			

[a] The more stringent of the Federal and State standards is presented if both exist for the averaging period. The National Ambient Air Quality Standards (NAAQS) (EPA 1997a), 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 1-hr ozone standard is attained when the expected number of days per year with maximum hourly average concentrations above the standard is #1. The 1-hr ozone standard applies only to nonattainment areas. The 8-hr ozone standard is attained when the 3-year average of the annual fourth-highest daily maximum 8-hr average concentration is less than or equal to 157 Fg/m^3. The 24-hr particulate matter standard is attained when the expected number of days with a 24-hr average concentration above the standard is #1. The annual arithmetic mean particulate matter standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard.

[b] Federal and State standard.

[c] Federal standard.

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

[e] No data is available with which to assess $PM_{2.5}$ concentrations.

[f] Acceptable ambient concentration listed in *Rules for the Control of Air Pollution in Idaho.* The concentration applies only to new (not existing) sources and is used here as a reference level.

[Text deleted.]

Note: The NAAQS also include standards for lead. No sources of lead emissions have been identified for any of the alternatives presented in Chapter 4. Emissions of other air pollutants not listed here have been identified at INEEL, but are not associated with any of the alternatives evaluated. These other air pollutants are quantified in the *Storage and Disposition PEIS* (DOE 1996a). EPA recently revised the ambient air quality standards for particulate matter and ozone. The new standards, finalized on July 18, 1997, changed the ozone primary and secondary standards from a 1-hr concentration of 235 Fg/m^3 (0.12 ppm) to an 8-hr concentration of 157 Fg/m^3 (0.08 ppm). During a transition period while States are developing State implementation plan revisions for attaining and maintaining these standards, the 1-hr ozone standard will continue to apply in nonattainment areas (EPA 1997b:38855). For particulate matter, the current PM_{10} annual standard is retained, and two $PM_{2.5}$ standards are added. These standards are set at a 15-Fg/m^3 3-year annual arithmetic mean based on community-oriented monitors and a 65-Fg/m^3 3-year average of the 98th percentile of 24-hr concentrations at population-oriented monitors. The revised 24-hr PM_{10} standard is based on the 99th percentile of 24-hr concentrations. The existing PM_{10} standards will continue to apply in the interim period (EPA 1997c:38652).

Source: Abbott, Crockett, and Moor 1997:7; EPA 1997a; ID DHW 1995.

3-hr averaging, 10 Fg/m^3 for 24-hr averaging, and 2.1 Fg/m^3 for the annual average; and an annual average total suspended particulate concentration of 15 Fg/m^3 (Abbott, Crockett, and Moor 1997:7). Measured concentrations attributable to INEEL are in compliance with applicable guidelines and regulations. Additional information on ambient air quality at INEEL and detailed information on emissions of other pollutants at INEEL are provided in the *INEEL Site Environmental Report for 1995* (Mitchell, Peterson, and Hoff 1996:6-4–6-6).

3.3.1.1.2 Proposed Facility Location

The meteorological conditions for INEEL are considered to be representative of the INTEC area. Primary sources of pollutants at INTEC include the New Waste Calcining Facility and coal-fired steam-generating facilities (Mitchell, Peterson, and Hoff 1996:6-4, 6-5). These facilities are sources of carbon monoxide, nitrogen dioxide, sulfur dioxide, and PM_{10}. The Waste Calcining Facility is a large source of nitrogen dioxide at INEEL.

3.3.1.2 Noise

Noise is unwanted sound that interferes or interacts negatively with the human or natural environment. Noise may disrupt normal activities or diminish the quality of the environment.

3.3.1.2.1 General Site Description

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 would not be measurable or would be barely distinguishable from background levels (DOE 1996a:3-112).

Existing INEEL-related noises of public significance are from the transportation of people and materials to and from the site and in-town facilities via buses, trucks, private vehicles, helicopters, and freight trains. Noise measurements along U.S. Route 20 about 15 m (50 ft) from the roadway indicate that the sound levels from traffic range from 64 to 86 dBA and that the primary source is buses (71 to 80 dBA) (Abbott, Brooks, and Martin 1991:64). While few people reside within 15 m (50 ft) 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 average sound level is in the range of 35 to 50 dBA (EPA 1974:B-4). 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 (DOE 1996a:F-32).

The EPA guidelines for environmental noise protection recommend an average day-night average sound level of 55 dBA as sufficient to protect the public from the effects of broadband environmental noise in typically quiet outdoor and residential areas (EPA 1974:29). Land-use compatibility guidelines adopted by the Federal Aviation Administration and the Federal Interagency Committee on Urban Noise indicate that yearly day-night average sound levels less than 65 dBA are compatible with residential land uses and levels up to 75 dBA are compatible with residential uses if suitable noise reduction features are incorporated into structures (DOT 1995). It is expected that for most residences near INEEL, the day-night average sound levels are compatible with the residential land use, although for some residences along major roadways noise levels may be higher than 65 dBA.

3.3.1.2.2 Proposed Facility Location

No distinguishing noise characteristics have been identified at the INTEC area. INTEC is far enough—about 12 km (7.5 mi)—from the site boundary that noise levels from the facilities are not measurable or are barely distinguishable from background levels.

3.3.2 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.

3.3.2.1 Waste Inventories and Activities

INEEL manages the following types of waste: HLW, TRU, mixed TRU, LLW, mixed LLW, hazardous, and nonhazardous. HLW would not be generated by surplus plutonium disposition activities at INEEL, and therefore, will not be discussed further. Waste generation rates and the inventory of stored waste from activities at INEEL are provided in Table 3–16. Table 3–17 summarizes the INEEL waste management capabilities. More detailed descriptions of the waste management system capabilities at INEEL are included in the *Storage and Disposition PEIS* (DOE 1996a:3-141–145, E-33–E-48) and the *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DOE 1995b:2.2-30).

Table 3–16. Waste Generation Rates and Inventories at INEEL

Waste Type	Generation Rate (m^3/yr)	Inventory (m^3)
TRU[a]		
Contact handled	0	39,300
Remotely handled	0	200
LLW	2,624	18,634
Mixed LLW		
RCRA	180	25,734
TSCA	<1	2
Hazardous	835[b]	NA[c]
Nonhazardous		
Liquid	2,000,000[d]	NA[c]
Solid	62,000	NA[c]

[a] Includes mixed TRU waste.
[b] Includes 760 m^3 that is recyclable.
[c] Generally, hazardous and nonhazardous wastes are not held in long-term storage.
[d] Projected annual average generation for 1997–2006.
Key: LLW, low-level waste; NA, not applicable; RCRA, Resource Conservation and Recovery Act; TRU, transuranic; TSCA, Toxic Substances Control Act.
Source: DOE 1996d:15, 16, except hazardous and nonhazardous solid waste (DOE 1996a:3-142, 3-143) and nonhazardous liquid waste (Werner 1997).

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 (DOE 1996a:3-141). More information on regulatory requirements for waste disposal is provided in Chapter 5.

Table 3–17. Waste Management Capabilities at INEEL

			Applicable Waste Type					
Facility Name/Description	**Capacity**	**Status**	**TRU**	**Mixed TRU**	**LLW**	**Mixed LLW**	**Haz**	**Non-Haz**
Treatment Facility (m^3/yr except as otherwise specified)								
INTEC HEPA Filter Leach, m^3/day	0.21	Online		X		X		
INTEC Debris Treatment and Containment, m^3/day	88	Part B permit pending		X		X		
Advanced Mixed Waste Treatment Project	6,500	Planned for 2003		X		X		
[Text deleted.]								
ANL–W Remote Treatment Facility	42	Planned for 2000	X	X	X	X		
ANL–W HFEF Waste Characterization Area	37	Online	X	X				
INTEC Waste Immobilization Facility	48	Planned for 2020		X	X	X		
INTEC Liquid Effluent Treatment and Disposal Facility	11,365	Online				X		
INTEC HLW Evaporator	6,138	Online		X	X	X		
INTEC Process Equipment Waste Evaporator	13,000	Online		X	X	X		
ANL–W Sodium Processing Facility	698	Online				X		
Test Area North Cask Dismantlement	11	Online				X		
WROC - Debris Sizing, kg/hr	1,149	Planned for 2000			X	X		
WROC - Macroencapsulation, kg/hr	2,257	Planned for 1999				X		
WROC - Stabilization, m^3/day	7.6	Online				X		
WERF	49,610	Online			X	X	X	
INTEC Cold Waste Handling Facility	3,700	Online						X
INTEC Sewage Treatment Plant	3,200,000	Online						X
Storage Facility (m^3)								
ANL–W Radioactive Sodium Storage	75	Online		X		X		
ANL–W Sodium Components Maintenance Shop	200	Online				X		
ANL–W Radioactive Scrap and Waste Storage	193	Online	X	X	X	X		

Facility Name/Description	Capacity	Status	Applicable Waste Type					
			TRU	Mixed TRU	LLW	Mixed LLW	Haz	Non-Haz
ANL–W EBR II Sodium Boiler Drain Tank	64	Online				X		
ANL–W HFEF Waste Characterization Area	37	Online	X	X				
INTEC Tank Farm	12,533	Online		X		X		

Table 3–17. Waste Management Capabilities at INEEL (Continued)

Facility Name/Description	Capacity	Status	Applicable Waste Type					
			TRU	Mixed TRU	LLW	Mixed LLW	Haz	Non-Haz
INTEC FDP HEPA Storage	25	Online		X		X		
INTEC NWCF HEPA Storage	56	Online		X		X		
INTEC CPP-1619 Storage	45	Online				X	X	
INTEC CPP-1617 Staging	8,523	Online				X	X	
[Text deleted.]								
RWMC Storage Area-1, 2, and R	64,900	Online	X	X	X[a]	X[a]		
RWMC Waste Storage	112,400	Online	X	X	X[a]	X[a]		
RWMC Intermediate-Level Storage	100	Online	X					
[Text deleted.]								
WROC PBF Mixed LLW 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	X	
Test Area North 628 SMC Container Storage	125	Online				X	X	
Disposal Facility(m^3/yr)								
RWMC Disposal Facility	37,700	Online			X			
CFA Landfill Complex	48,000	Online						X
Percolation Ponds	2,000,000	Online						X

[a] Waste with alpha contamination greater than 10 but less than 100 nCi/g.

Key: ANL–W, Argonne National Laboratory–West; CFA, Central Facilities Area; CPP, Chemical Processing Plant; EBR, Experimental Breeder Reactor; FDP, Fluorinel Dissolution Process; Haz, hazardous; HEPA, high-efficiency particulate air; HFEF, Hot Fuel Examination Facility; HLW, high-level waste; INTEC, Idaho Nuclear Technology and Engineering Center; LLW, low-level waste; NWCF, New Waste Calcining Facility; PBF, Power Burst Facility; RWMC, Radioactive Waste Management Complex; SMC, Specific Manufacturing Complex; SPERT, Special Power Excursion Reactor Test; TRU, transuranic; WERF, Waste Experimental Reduction Facility; WROC, Waste Reduction Operations Complex.

Source: Abbott 1998; Abbott, Crockett, and Moor 1997:20; Depperschmidt 1999; Moor 1998; Werner 1997.

3.3.2.2 Transuranic and Mixed Transuranic Waste

TRU waste generated since 1972 is segregated into contact-handled and remotely handled categories and stored at the Radioactive Waste Management Complex in a form designed for eventual retrieval (DOE 1996a:3-144). Some TRU waste is also stored at the Radioactive Scrap and Waste Facility at ANL–W (DOE 1995b:2.2-36). There is very little TRU waste generated at INEEL. Most of the TRU waste in storage was received from the Rocky Flats Environmental Technology Site (DOE 1996a:3-144). TRU waste will be treated to meet WIPP waste acceptance criteria, packaged in accordance with DOE and DOT requirements, and transported to WIPP for disposal (DOE 1996a:3-144). The first shipment of TRU waste to WIPP was made in April 1999 (DOE 1999c).

The existing treatment facilities for TRU waste at INEEL are limited to testing, characterization, and repackaging. The planned Waste Characterization Facility will characterize TRU waste and either reclassify it (if it is found to be LLW) for disposal on the site, or prepare it so that it meets WIPP waste acceptance criteria (DOE 1996a:E-35).

The Advanced Mixed Waste Treatment Project will be a private sector treatment facility. This facility shall (1) treat waste to meet WIPP waste acceptance criteria, RCRA Land Disposal Restrictions (LDR), and required Toxic Substances Control Act standards; (2) reduce waste volume and life-cycle cost to DOE; and (3) perform tasks in a safe and environmentally compliant manner (Mitchell, Peterson, and Hoff 1996:3-16). Construction of a mixed LLW Disposal Facility and Plasma Hearth Treatment Facility are being considered to support commercial treatment of mixed TRU waste and alpha-contaminated mixed LLW subject to funding restraints and additional NEPA review (DOE 1996a:E-35).

Waste containing between 10 and 100 nCi/g of transuranic radionuclides is called alpha LLW. Although this waste is technically considered LLW rather than TRU waste, it cannot be disposed of at INEEL because it does not meet all INEEL LLW disposal facility acceptance criteria. Alpha LLW and alpha mixed LLW are managed together as part of the TRU waste program. It is expected that these wastes will be treated by the Advanced Mixed Waste Treatment Project and then disposed of at WIPP (DOE 1995b:2.2-34, 2.2-35).

3.3.2.3 Low-Level Waste

Liquid LLW is either evaporated and processed to calcine or solidified before disposal (DOE 1996a:E-35). INTEC has the capability to treat aqueous LLW. Liquid LLW is concentrated at the INTEC process equipment waste evaporator, with the condensed vapor processed by the Liquid Effluent Treatment and Disposal Facility. The concentrated materials remaining after evaporation are pumped to the INTEC tank farm (DOE 1995b:2.2-39). Some small volumes of liquid LLW are solidified at the Waste Experimental Reduction Facility for disposal at the Radioactive Waste Management Complex. In addition, small volumes of aqueous LLW are discharged to the double-lined pond at the Test Reactor Area for evaporation (DOE 1995b:2.2-39).

Most solid LLW at INEEL is sent to the Waste Experimental Reduction Facility for treatment by incineration, compaction, size reduction, or stabilization before shipment for disposal at the Radioactive Waste Management Complex or offsite disposal facilities (Werner 1997). Disposal occurs in pits and concrete-lined soil vaults in the subsurface disposal area of the Radioactive Waste Management Complex (DOE 1995b:2.2-39). About 40 percent of the LLW generated at INEEL (that contain less than 10 nCi/g of radioactivity) is buried in shallow trenches; the remaining 60 percent at the Radioactive Waste Management Complex following treatment for volume reduction. Additionally, some LLW is shipped off the 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 (Mitchell, Peterson, and Hoff 1996:3-26), although some proposals would close the LLW Disposal Facility by 2006 (DOE 1998d:B-4).

3.3.2.4 Mixed Low-Level Waste

Mixed LLW is divided into two categories for management purposes: alpha mixed LLW and beta-gamma mixed LLW. Most of the alpha mixed LLW stored at INEEL is waste that has been reclassified from mixed TRU waste and is managed as part of the TRU waste program. Therefore, this section deals only with beta-gamma mixed LLW (DOE 1995b:2.2-39, 2.2-40).

Mixed LLW, including polychlorinated biphenyls–contaminated LLW, is stored in several onsite areas awaiting the development of treatment methods (DOE 1996a:3-144). Mixed LLW is stored at the Mixed Waste Storage Facility (or Waste Experimental Reduction Facility Waste Storage Building) and portable storage units at the Power Burst Facility area. In addition, smaller quantities of mixed LLW are stored in various facilities at INEEL including the Hazardous Chemical/Radioactive Waste Facility at INTEC, and the Radioactive Sodium Storage Facility and Radioactive Scrap and Waste Storage Facility at ANL–W (DOE 1995b:2.2-41). 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 (DOE 1996a:E-39).

Aqueous mixed LLW is concentrated at INTEC. The condensate from the waste evaporator is then processed by the Liquid Effluent Treatment and Disposal Facility. The concentrated material remaining after evaporation (mixed LLW) is pumped to the INTEC tank farm for storage (DOE 1995a:2.2-42, 2.2-43).

As part of the site treatment plans required by the FFCA, preferred treatment options have been identified to eliminate the hazardous waste component for many types of mixed LLW (DOE 1995b:2.2-42). Mixed LLW is or will be processed to RCRA LDR treatment standards through several treatment facilities. Those treatment facilities and operational status are: (1) Waste Experimental Reduction Facility Incinerator (operational), (2) Waste Experimental Reduction Facility Stabilization (operational), (3) Test Area North cask dismantlement (operational), (4) Sodium Process Facility (operational), (5) High-Efficiency Particulate Air (HEPA) Filter Leach (operational), (6) Waste Reductions Operations Complex Macroencapsulation (October 1999), (7) Waste Reduction Operations Complex Mercury Retort (March 2000), (8) Debris Treatment (September 2000), and (9) Advanced Mixed Waste Treatment Project (March 2003). Commercial treatment facilities are also being considered, as appropriate (Werner 1997). Currently, limited amounts of mixed LLW are disposed of at Envirocare of Utah (Werner 1997).

3.3.2.5 Hazardous Waste

About 1 percent of the total waste generated at INEEL is hazardous waste. Most of the hazardous waste generated annually at INEEL is transported off the site for treatment and disposal (DOE 1995b:2.2-45). Offsite shipments are surveyed to determine that the wastes have no radioactive content (are not mixed waste) (DOE 1996a:3-145). 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 (DOE 1995b:2.2-46).

3.3.2.6 Nonhazardous Waste

More than 94 percent of the waste generated at INEEL is classified as industrial waste and is disposed of on the site in a landfill complex in the Central Facilities Area and at the Bonneville County landfill (DOE 1995b:2.2-47). The onsite landfill complex contains separate areas for petroleum-contaminated media, industrial waste, and asbestos waste (Werner 1997). The onsite landfill is 4.8 ha (12 acres) and is being expanded by 91 ha (225 acres) to provide capacity for at least 30 years (DOE 1996a:3-145).

The Cold Waste Handling Facility was recently put into operation at INTEC. This system allows increased volumes of nonhazardous waste to be inspected, recycled, shredded, compacted, and segregated, thereby reducing the amount of material sent to disposal (Mitchell, Peterson, and Hoff 1996:3-24).

Sewage is disposed of in surface impoundments in accordance with terms of the October 7, 1992, consent order. Waste in the impoundments is allowed to evaporate; the resulting sludge is placed in the landfill. Solids are separated and reclaimed where possible (DOE 1996a:3-145). Nonhazardous service wastewater generated at INTEC is disposed to percolation ponds at a flow rate of 3.8 million to 7.6 million l/day (1 million to 2 million gal/day) (Werner 1997). The INTEC sanitary sewer system collects and transfers sanitary waste to the sewage treatment lagoons east of INTEC for treatment and disposal. This system has a capacity of 3,200,000 m^3/yr (4,190,000 yd^3/yr) (Abbott, Crockett, and Moor 1997:20).

3.3.2.7 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 DOE Idaho Operations Office published its first waste minimization plan in 1990, which defined specific goals, methodology, responsibility, and achievements of programs and organizations. The achievements and progress have been updated at least annually (DOE 1996a:E-33).

The INEEL waste minimization program has significantly reduced the quantities of hazardous waste generated at INEEL. For example, in 1992, 760 m^3 (994 yd^3) of hazardous waste was recycled. Recyclable hazardous materials include metals (such as bulk lead, mercury, chromium), solvents, fuel, and other waste materials (DOE 1995b:2.2-45). Soon the use of nonhazardous chemicals and the recycling of those for which there is no substitute should nearly eliminate the generation of hazardous waste (DOE 1996a:E-39).

Another goal of the INEEL waste minimization program is to reduce nonhazardous waste generation by 50 percent over the next 5 years (DOE 1996a:3-145). During 1993–1995, INEEL recycled more than 680,400 kg (1.5 million lb) of paper and cardboard (Mitchell, Peterson, and Hoff 1996:3-26). Efforts are also under way to expand the recycling program to include asphalt and metals and to convert scrap wood into mulch (DOE 1995b:2.2-48).

3.3.2.8 Preferred Alternatives From the WM PEIS

Preferred alternatives from the WM PEIS (DOE 1997a:summary, 97) are shown in Table 3–18 for the four waste types analyzed in this SPD EIS. A decision on the future management of these wastes could result in the construction of new waste management facilities at INEEL and the closure of other facilities. Decisions on the various waste types are expected to be announced in a series of RODs to be issued on this WM PEIS. In fact, the TRU waste ROD was issued on January 20, 1998 (DOE 1998a), with the hazardous waste ROD issued on August 5, 1998 (DOE 1998b). The TRU waste ROD states that DOE will develop and operate mobile and fixed facilities to characterize and prepare TRU waste for disposal at WIPP. Each DOE site that has, or will generate, TRU waste will, as needed, prepare and store its TRU waste on the site. The hazardous waste ROD states that most DOE sites will continue to use offsite facilities for the treatment and disposal of major portions of the nonwastewater hazardous waste, with ORR and SRS continuing to treat some of their own hazardous waste on the site in existing facilities where this is economically favorable. More detailed information and DOE's alternatives for the future configuration of waste management facilities at INEEL is presented in the WM PEIS, and the hazardous waste and TRU waste RODs.

3.3.3 Socioeconomics

Statistics for employment and regional economy are presented for the REA as defined in Appendix F.9, which encompasses 13 counties around INEEL located in Idaho and Wyoming. Statistics for population, housing, community services, and local transportation are presented for the ROI, a four-county area (in Idaho) in which 94.4 percent of all INEEL employees reside as shown in Table 3–19. In 1997, INEEL employed 8,291 persons (about 5.5 percent of the REA civilian labor force) (Werner 1997).

3.3.3.1 Regional Economic Characteristics

Selected employment and regional economy statistics for the INEEL REA, Idaho, and Wyoming are summarized in Figure 3–10. Between 1990 and 1996, the civilian labor force in the REA increased 26 percent to the 1996 level of 150,403. In 1996, the annual unemployment average in the REA was 4.8 percent, which was slightly less than the annual unemployment average for Idaho (5.2 percent) and Wyoming (5 percent) (DOL 1999).

In 1995, service activities represented the largest sector of employment in the REA (27.1 percent). This was followed by retail trade (20.4 percent), and government (19.5 percent). The totals for these employment sectors

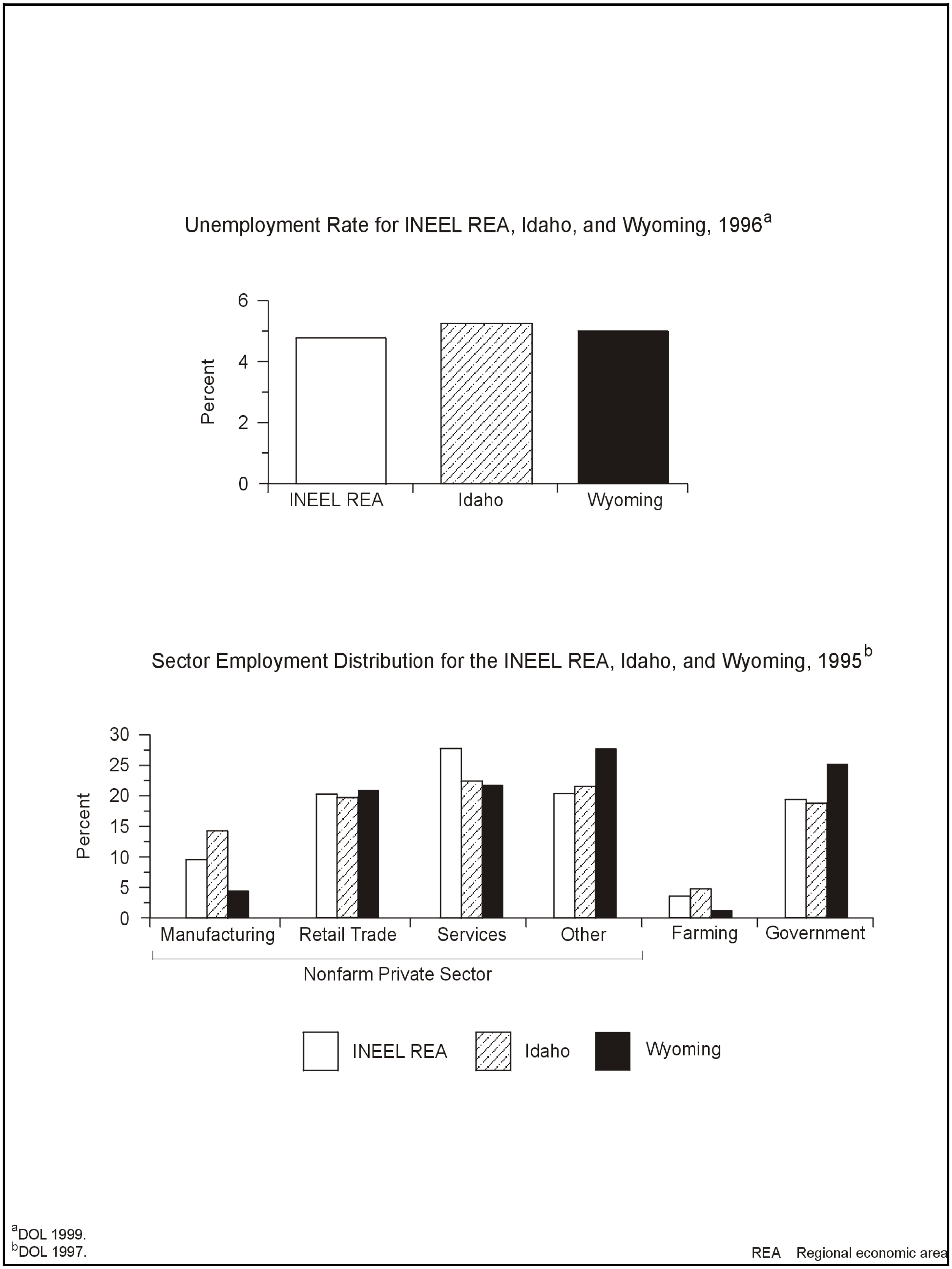

Figure 3–10. Employment and Local Economy for the INEEL Regional Economic Area and the States of Idaho and Wyoming

Table 3–18. Preferred Alternatives From the WM PEIS

Waste Type	Preferred Action
TRU and mixed TRU	DOE prefers the regionalized alternative for treatment and storage of INEEL's TRU waste. Under this alternative, some TRU waste could be received from RFETS for treatment.[a]
LLW	DOE prefers to treat INEEL's LLW on the site. INEEL could be selected as one of the regional disposal sites for LLW.
Mixed LLW	DOE prefers regionalized treatment at INEEL. This includes the onsite treatment of INEEL's wastes and could include treatment of some mixed LLW generated at other sites. INEEL could be selected as one of the regional disposal sites for mixed LLW.
Hazardous	DOE prefers to continue to use commercial facilities for hazardous waste treatment.[b]

[a] ROD for TRU waste (DOE 1998a) states that "each of the Department's sites that currently has or will generate TRU waste will prepare and store its TRU waste on site. . . ."
[b] ROD for hazardous waste (DOE 1998b) selected the preferred alternative at INEEL.
Key: LLW, low-level waste; RFETS, Rocky Flats Environmental Technology Site; TRU, transuranic.
Source: DOE 1997a:summary, 97.

Table 3–19. Distribution of Employees by Place of Residence in the INEEL Region of Influence, 1997

County	Number of Employees	Total Site Employment (Percent)
Bonneville	5,553	67
Bingham	1,077	13
Bannock	615	7.4
Jefferson	583	7
ROI total	7,828	94.4

Source: Werner 1997.

in Idaho were 21.5 percent, 19.6 percent, and 18.7 percent, respectively. The totals for these employment sectors in Wyoming were 21.1 percent, 20.8 percent, and 25 percent, respectively (DOL 1997).

3.3.3.2 Population and Housing

In 1996, the ROI population totaled 213,547. Between 1990 and 1996, the ROI population increased by 10.6 percent, compared with an 17.5 percent increase in Idaho's population (DOC 1997). Between 1980 and 1990, the number of housing units in the ROI increased by 6.7 percent, compared with the 10.2 percent increase in Idaho. The total number of housing units in the ROI for 1990 was 69,760 (DOC 1994). The 1990 ROI homeowner vacancy rate was 2.1 percent compared with the Idaho's rate of 2.0 percent. The ROI renter vacancy rate was 8.3 percent compared with the Idaho's rate of 7.3 percent (DOC 1990a). Population and housing trends are displayed in Figure 3–11.

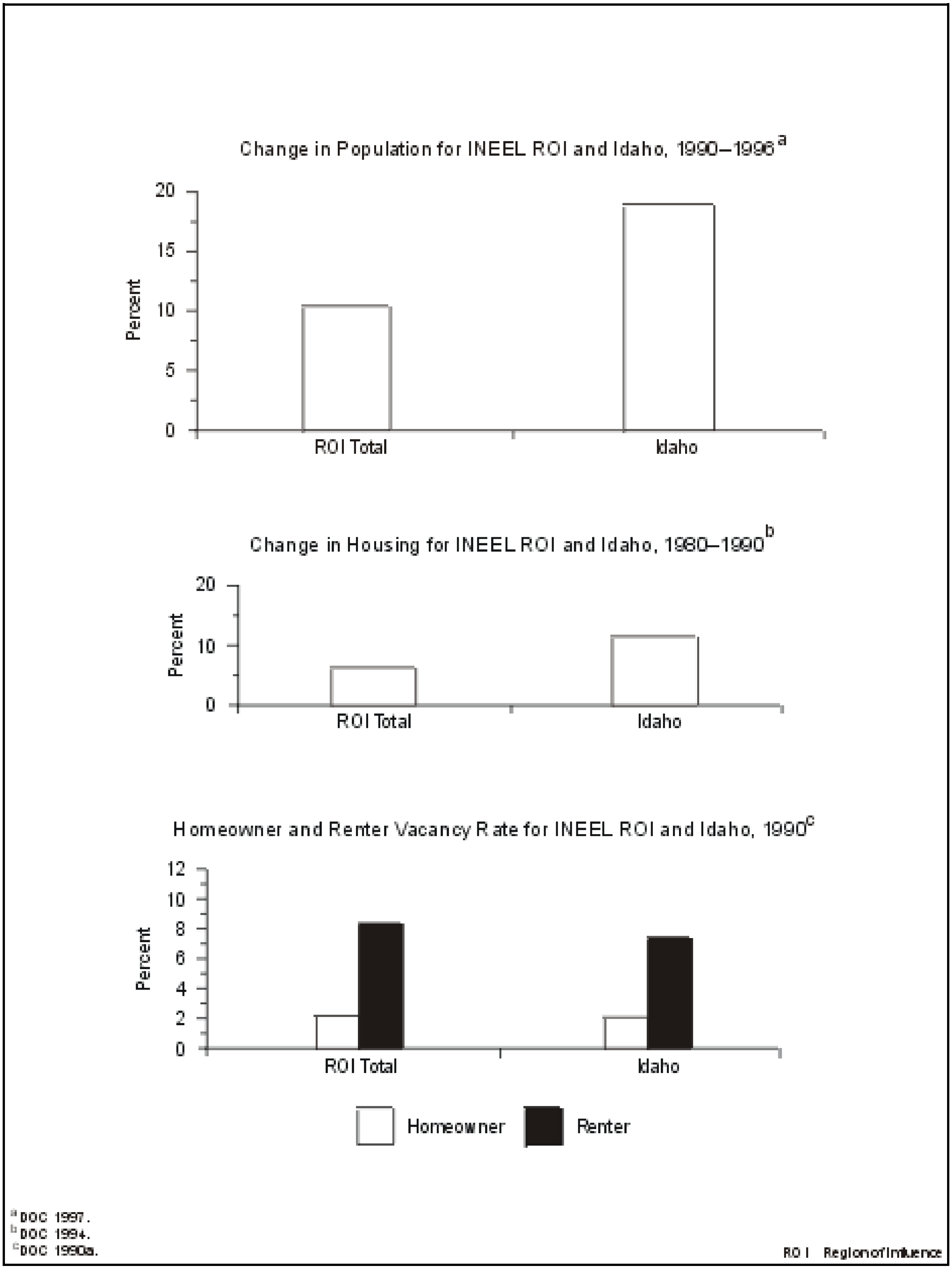

Figure 3–11. Population and Housing for the INEEL Region of Influence and the State of Idaho