B.5.1 HAZARDOUS WASTE SITES

B.5.1.1 CS-Area Burning/Rubble Pits (631-1G, 631-5G, and 631-6G)

The three CS-Area burning/rubble pits are near the central portion of the SRP, north of CS-Area and south of Road 5. Pit 631-1G is approximately 61 meters long, 9 meters wide, and 3 meters deep. The two other pits measure 117 meters by 11 meters by 3 meters, and 88 meters by 9 meters by 3 meters.

History of Waste Disposal

Rubble disposed of at these sites reportedly includes paper, cans, lumber, and empty galvanized-steel barrels. See Section B.2.1.6.

Evidence of Contamination

See Section B.2.1.6.

Waste Characterization

See Section B.2.1.6.

B.5.1.2 C-Area Burning/Rubble Pit (131-C)

The C-Area burning/rubble pit is near the central portion of the SRP, northwest of C-Area and north of Road A-7. The site is roughly 107 meters long, 7.6 meters wide, and 3 meters deep. TE

History of Waste Disposal

Rubble disposed of at this site reportedly includes paper, wood, concrete, cans, and empty galvanized steel barrels. See Section B.2.1.6.

Evidence of Contamination

Groundwater monitoring wells were installed at all the burning/rubble pits in 1983 and 1984. Groundwater samples recently obtained from the four wells associated with this site have displayed elevated levels of total organic halogens. No sampling and analysis of the soil underlying the pit have been performed to date.

Waste Characterization

Limited data are available on this site. Most of the available raw data have been gathered via groundwater monitoring (Huber, Johnson, and Marine, 1987). TC

B.5.1.3 Hydrofluoric Acid Spill Area (631-4G)

The hydrofluoric acid spill area is west of the cement plant in the CS-Area south of Road 3. The site measures approximately 9 meters by 9 meters.

History of Waste Disposal

Very little is known about the hydrofluoric acid spill area, except that it predates 1970. The site is identified only by a warning sign indicating the presence of a potentially contaminated area. It is uncertain if a spill occurred at this site, or if contaminated soil or containers are buried there.

Evidence of Contamination

The posted warning sign is the only physical indication at the site that contaminants might be present in the subsurface environment. No soil sampling has been performed to date. Some groundwater sampling data are available from four monitoring wells surrounding the site.

Waste Characterization

Limited data are available for this site. Most data have been gathered via
TC groundwater monitoring of four wells that began in January 1985 (Huber and Bledsoe, 1987a).

The potential for migration of hydrofluoric acid is based largely on the ion-exchange potential of the soil environment. In the saturated pore space of the soil, compartment, hydrofluoric acid would be expected to dissociate and behave like a weak acid (Ka: 6.4×10^{-4}). The fluoride ions would be subject to reactions with colloid-size particles having the capability to exchange ionic constituents adsorbed on the particle surfaces.

Ion-exchange mechanisms (dissolution and precipitation) occur dynamically in the soil, and some fluoride ions probably can be found in solution owing to their displacement by other anionic species (i.e., carbonate and bicarbonate). Soil pH is a factor in ion-exchange selectivity. The data collected from groundwater sources near the hydrofluoric acid spill area indicate that fluoride ions are present, either in solution or adsorbed on colloidal particles (fluoride was detected in four of eight samples, at an average concentration of 0.15 milligram per liter).

Accordingly, there is a potential for groundwater transport of fluoride ions by advection. However, because groundwater flow through the porous medium
TE will introduce more sites for ion exchange, some permanent adsorption of fluoride ions probably will occur. In acidic conditions, attenuation of the fluoride concentration in the groundwater can be expected. Consequently, while migration of fluoride ions will occur, given the relatively low concentrations detected in the groundwater to date (maximum concentration: 0.17 milligram per liter), the attenuation mechanism can be expected to prevail; fluoride concentrations should decrease with increasing distance from the spill area.

B.5.2 LOW-LEVEL RADIOACTIVE WASTE SITE

The Ford Building waste site (643-11G) is north of the Ford Building in the CS-Area (Figure B-11). The site is rectangular, measuring approximately 7 meters by 52 meters. The following paragraphs discuss the waste site disposal
TC history, evidence of contamination, and waste characteristics (Huber et al., 1987).

History of Waste Disposal

The site origin and history are uncertain. The site is chained on three sides and identified by a regulated area sign and a "Clean Pans Only" sign. TE Beyond the chained area are pieces of lumber and a load lugger pan containing soiled rubber gloves. Outside the chained area are weathered shoe covers, step-off pads, and coveralls. Regulated work might have been performed there and the site improperly cleaned.

Evidence of Contamination

Soil characterization studies have not been performed and no monitoring wells have been installed specifically for this waste site. Monitoring wells for the Fire Department training facility and the Ford Building seepage basin are nearby. These wells are all crossgradient from the waste site, and are too far distant from the flow path of groundwater beneath the Ford Building waste TE site to be of value in monitoring groundwater conditions at this site.

Waste Characterization

Evidence indicates that regulated work might have been performed at the site, and protective clothing worn by the personnel was improperly disposed of. An oil line from the Ford Building ruptured in the vicinity of the waste site during the 1970s, releasing unknown quantities of oil.

B.5.3 MIXED WASTE SITE

The Ford Building seepage basin (904-91G) is in the CS-Area (Figure B-11). It is rectangular in shape and has an approximate 600 cubic meters capacity. The following sections discuss the history of disposal, evidence of contamination, and waste characteristics of the basin (Pekkala, Jewell, Holmes, Simmons, and TC Marine, 1987).

History of Waste Disposal

The Ford Building was used to repair the SRP's slightly contaminated process TE equipment. Highly contaminated equipment requiring repair was decontaminated in the individual custodial area before being transported to the Ford Building. Because of the contamination, wastewater generated at the Ford Building during the equipment repair work also contained low levels of contamination. TE Consequently, the wastewater was drained into a 23,000-liter retention tank adjacent to the Ford Building for sampling and radioanalysis. Then it was either released into the seepage basin or sent to Waste Management Operations (WMO) for concentration and disposal.

The purchase of new heat-exchanger heads for the reactor buildings reduced the need for heat-exchanger repairs, and the Ford Building seepage basin was TC retired in 1984. The basin is now dry except for occasionally impounded rainwater. Presently, wastewater generated in the Ford Building is removed for concentration, disposal, or storage.

Evidence of Contamination

In 1985, a comprehensive soil sampling and analysis program was performed to characterize sediment from the floor and walls of the Ford Building seepage basin, as well as sediment beneath the underground pipeline from the retention tank to the basin. Inside the basin, the concentration levels of cesium-137, cobalt-60, and strontium-90 are significantly above background. Along the pipeline, only strontium-90 shows elevated concentration levels. Along the basin walls, none of the radionuclides show elevated concentration levels.

The concentration profiles for most metals and inorganics in the basin floor dropped rapidly to background within the first 0.6 meter of soil depth. The metals with elevated concentration levels (i.e., greater than 2 times background) in the top 8 centimeters of basin soil are aluminum, cadmium, chromium, copper, iron, mercury, nickel, selenium, and zinc. In the soil beneath the pipeline, aluminum, arsenic, cadmium, chromium, and iron have elevated concentration levels. The inorganic ions with elevated concentration levels in the top 8 centimeters of basin soil are ammonia, nitrogen, fluoride, sulfate, and total phosphates. Along the pipeline, only total phosphate levels are elevated. Along the basin walls, none of the inorganic ions show elevated concentration levels. No significant concentrations of organics were detected in the basin floor and walls or beneath the pipeline.

Three monitoring wells are near the Ford Building seepage basin. A statistical analysis of groundwater monitoring data indicates that levels of nitrate, mercury, and lead are elevated. However, the concentrations of these constituents remain below maximum contaminant levels.

Waste Characterization

TE Table B-19 is an inventory of the radionuclides released into the basin from 1964 to 1984, including the 1984 decay corrections. In addition to radionuclides, trace amounts of surfactants, oils, and grease might have been added to the wastewater stream. Through the end of 1984, the basin received 1,440 cubic meters of wastewater.

TE Table B-19. Radioactive Releases to Ford Building Seepage Basin, 1964-1984 (Ci)[a]

TE

Isotope	Original release	Decay corrected, 1984
Tritium	4.7×10^{2}	1.6×10^{2}
Cobalt-60	6.9×10^{-4}	5.1×10^{-4}
Strontium-90	7.4×10^{-5}	7.0×10^{-5}
Cesium-137	2.4×10^{-4}	2.4×10^{-4}
Alpha (unidentified)	4.9×10^{-4}	4.9000×10^{-4}

TC [a]Source: Pekkala, Jewell, Holmes, Simmons, and Marine, 1987.

B.5.4 MAJOR GEOHYDROLOGIC CHARACTERISTICS

Waste sites in the C- and CS-Areas geographic grouping are on the Aiken Plateau between a tributary of Four Mile Creek and Pen Branch. Site-specific geohydrologic data for this area are sparse; the geohydrologic characteristics probably are similar to those in the F- and H-Areas geographic grouping (3.2 kilometers north). Appendixes A and B (Sections A.2 and B.3.4) discuss the geohydrology of the central portion of the Plant. Recent evidence suggests that a portion of the CS-Area may currently lie in a region of no head reversal (Bledsoe, 1987). TC

Three water supply wells are in the Central Shops area. They are located in the Middendorf/Black Creek (Tuscaloosa) Formation (904-83G), in the McBean (705-72G), and in both the McBean and the Middendorf/Black Creek (905-71G). Figure B-12 shows a log of well 905-71G. Of particular geohydrologic significance are the three major confining beds discussed in Appendix A (i.e., the tan clay, the green clay, and the Ellenton Formation). Although no site-specific information on vertical head gradients is available, this EIS assumes the head relationships are similar to those in F- and H-Areas (Section B.3.4). Hydraulic heads decline with depth down to the Congaree Formation, then reverse and increase with depth in the Middendorf/Black Creek.

Figure B-13 is a water-table map for C-Area. The natural groundwater discharge from the Barnwell and McBean Formations near the Ford Building waste site is believed to be to Pen Branch. The discharge from the Congaree is probably to the Savannah River (e.g., to the southwest) along a gradient of about 0.002 meter per meter (Huber et al., 1987). The water-table at the Ford Building waste site is about 14.6 meters below ground level. TC

B.5.5 ONGOING AND PLANNED MONITORING

Groundwater monitoring is under way at six of the seven waste management facilities in the C- and CS-Area geographic grouping. Well-water samples are analyzed quarterly at hazardous and mixed waste management facilities for RCRA and SCHWMR parameters. Typically, wells are monitored for gross alpha, gross nonvolatile beta, and tritium at low-level waste management facilities. In this geographic area, 15 wells are used to monitor groundwater. DOE plans additional wells for subsurface conditions and contaminant transport.

Characterization generally includes representative sampling of the waste, the soil and sediment under the waste site, and the soil and sediment around overflow ditches and process sewers.

Table B-20 lists the representative monitoring wells at each waste management facility, the site investigations, and the results of groundwater, soil, and vegetation monitoring. TE

B.6 TNX-AREA WASTE SITES

The TNX-Area geographic grouping is approximately 7 kilometers southwest of C-Reactor along Road 3 and about 15 kilometers south of A-Area in the southwest portion of the Plant. Drainage is to the Savannah River, which forms part of the western boundary of the area. The TNX facilities and portions of the D-Area coal-fired powerhouse are in this grouping. The old TNX seepage basin and the D-Area burning/rubble pits define the boundaries of this geographic grouping. Figure B-14 shows the locations of the five waste sites described in the following sections.

B.6.1 HAZARDOUS WASTE SITE

The D-Area burning/rubble pits are near the western perimeter of the Savannah River Plant, west of D-Area and east of Road A-4.7. The site configuration is
TC a trapezoidal area of approximately 7000 square meters.

History of Waste Disposal

Rubble waste disposed of at these pits reportedly included concrete, metal, lumber, and telephone poles. See Section B.2.1.6.

Evidence of Contamination

See Section B.2.1.6.

Waste Characterization

See Section B.2.1.6.

B.6.2 LOW-LEVEL RADIOACTIVE WASTE SITE

The TNX burying ground is part of the TNX facility east of the Savannah River on the terrace known as the Ellenton Plain. The burying ground consists of three known areas on a bluff 45 meters above the Savannah River swamp. The sites known to contain radioactive waste are (1) an area beneath a transformer pad by Building 673-T, (2) a rectangular area beneath Building 711-T, and (3) an L-shaped area beneath Office Trailer Building 676-8T. A fourth area is believed to be east of Building 673-T. The SRP boundary nearest any of the burial sites is the Savannah River, approximately 396 meters west. The following sections discuss the history of waste disposal, evidence of contamina-
TC tion, and waste characteristics of the sites (Dunaway, Johnson, Kingley, Simmons, and Bledsoe, 1987a).

History of Waste Disposal

In 1953, an experimental evaporator containing approximately 590 kilograms of uranyl nitrate exploded at the TNX facility. Because the SRP radioactive waste burial ground (Building 643-G) was not in operation, debris from the explosion was collected and buried at the TNX burying ground (Building 643-5G). The waste included such materials as conduit, drums, tin, and structural steel. The site also received other waste, primarily depleted uranium characteristic of that generated at the process facility. No material was buried at the site after the SRP radioactive waste burial ground became operational.

Most of the material was excavated and sent to the SRP burial ground between 1980 and 1984. The remaining TNX burying sites are beneath asphalt, buildings, and transformer pads at depths of approximately 1.8 to 2.4 meters. An estimated 27 kilograms of uranyl nitrate remain buried. This is approximately 5 percent of the initial buried amount.

Evidence of Contamination

Uranyl nitrate is a possible contaminant of the soils surrounding the TNX burying ground, but no sediment data are available to confirm this possibility. There are no groundwater-monitoring wells in the immediate vicinity of the burying ground. Wells YSB 1A through 4A, around the new TNX seepage basin, are approximately 210 meters east; wells XSB 1 through 4, around the old TNX seepage basin, are approximately 91 meters west. Sections B.6.3.1 and B.6.3.2 discuss groundwater-monitoring data for these wells.

Waste Characterization

The original waste consists of conduit, drums, tin, and structural steel contaminated with uranyl nitrate. The site has also received depleted uranium characteristic of that generated from the process facility, as well as other undescribed waste.

B.6.3 MIXED WASTE SITES

B.6.3.1 TNX Seepage Basin - Old (904-76G)

The old TNX seepage basin is in the southwestern section of the TNX facility (Figure B-14). The basin was constructed in two sections: an inlet section and a large main section. Together they encompassed approximately 0.2 acre. The following sections describe the history of waste disposal, evidence of contamination, and waste characteristics at the seepage basin (Dunaway, Johnson, Kingley, Simmons, Bledsoe, and Smith, 1987; Simmons, Bledsoe, and Bransford, 1985). TC

History of Waste Disposal

The old TNX seepage basin was built in 1958 to receive wastewater from pilot-scale tests conducted at TNX in support of the Defense Waste Processing Facility (DWPF) and the Separations Areas (Dunaway, Johnson, Kingley, Simmons, Bledsoe, and Smith, 1987). In 1980, the basin was closed, and the wastewater flow to the basin was diverted to the new TNX seepage basin (Section B.6.3.2). When it was in operation, the old basin received process wastewater through an underground vitrified pipeline 20 centimeters in diameter. This pipeline entered the basin through the north wall of the settling section. A 13-centimeter weir permitted effluent from the settling section to flow into the main section. A weir of comparable size across the west wall of the main section directed basin overflow down into the nearby TNX swamp along Outfall X-2. During the basin's 22-year loading history, its overflow has created an outfall delta about 30 meters wide inside the swamp. TC

In 1981, the west wall of the basin was breached to drain the standing free waters into the adjacent wetlands. The basin was backfilled with a sand and clay mixture. Currently, part of the top of the old basin is paved with asphalt. Office Trailer Building 675-7T is on this pavement beside an equipment laydown area. Vegetation near the basin and outside the TNX security fence primarily consists of sparse-to-thick woods. Vegetation inside the fence is primarily centipede grass.

Evidence of Contamination

TE In 1984, a program was begun that defined the extent of chemical and radionuclide contamination in the vicinity of the old TNX seepage basin. This program included sampling and analyses of sediment from beneath the basin and continued sampling of the groundwater from seven monitoring wells.

The sampling detected curium-243, curium-244, plutonium-239, plutonium-240, radium-228, thorium-228, uranium-235, silver, chromium, copper, mercury, nickel, and cyanide in the basin sediment. These constituents were concentrated in the northeastern section of the basin within the top 61 centimeters of bottom sediment.

Groundwater monitoring results indicate that mercury, manganese, nickel, total organic halogens, and nitrate are present.

Waste Characterization

Approximately 40 compounds were in use at the TNX facility during the basin's operation. These compounds probably were sent to the basin at some time during its 22-year loading history. Among the significant wastes discharged to the basin were mercury and depleted uranium.

B.6.3.2 TNX Seepage Basin - New (904-102G)

The new TNX seepage basin is in the southeastern section of the TNX facility (Figure B-14). The basin consists of a small inlet section and a large seepage section. An underground pipe connects the two rectangular sections that encompass approximately 1620 square meters of land. A pipe through the southeast wall of the larger section directs the basin overflow down Outfall X-13. This outfall eventually empties into the Savannah River. The following sections describe the history of waste disposal, evidence of contamination, and waste characteristics at the seepage basin (Dunaway, Johnson, Kingley, TC Simmons, and Bledsoe, 1987b).

History of Waste Disposal

The new TNX seepage basin, operating since 1980, replaced the old basin (Section B.6.3.1). It receives process wastewater from pilot-scale tests conducted at the TNX facility in support of the DWPF and the Separations Areas. Batch discharges are neutralized before release to the basin. The basin is scheduled for closure in the third quarter of 1987 when the TNX Effluent Treatment Plant begins operation. The closure of the basin will follow applicable Federal and State regulations.

Evidence of Contamination

Soil samples were collected from cores beneath and adjacent to the basin during the fourth quarter of 1985. Analytical results indicate that no significant organic contamination exists in any of the sediments sampled. Phenol and thorium were detected at low concentrations in one layer of the sediment cores outside the basin. Barium, nickel, chromium, lead, nitrates, phosphate, and sodium were detected in the top 0.15 meter of sediment.

Four groundwater monitoring wells have been installed around the new TNX seepage basin. These wells are sampled quarterly and analyzed for nutrients, anions, metals, organics, radioactivity, and standard constituents.

Waste Characterization

Most of the wastewater sent to the basin after 1983 contains simulated nonradioactive DWPF sludge and other laboratory chemicals. Before 1983, simulated nonradioactive salt supernate was sent to the basin. Tables B-21 and B-22 list the composition of the sludge and supernate, respectively, and Tables B-23 and B-24 provide chemical analyses of the basin influent and effluent, respectively. The influent and effluent data were obtained from a 12-week characterization program initiated in January 1984. Average effluent flow rates are not available. TE

Table B-21. Composition of Simulated DWPF Sludge (percent)[a] TE

Component	Weight
Ferric hydroxide	43.19
Aluminum hydroxide	17.81
Silicon dioxide	4.94
Manganese dioxide	7.41
Sodium hydroxide	4.43
Zeolite[b]	4.87
Sodium nitrate	4.43
Calcium carbonate	5.66
Nickel hydroxide	3.42
Other chemicals	3.84

[a]Source: Dunaway, Johnson, Kingley, Simmons, and Bledsoe, 1987b. TC
[b]Linde Ion-Siv IE-95.

B.6.4 MAJOR GEOHYDROLOGIC CHARACTERISTICS

The near-surface geology of the TNX Area geographic grouping consists of river-terrace deposits of sand, silt, and clay, typically with a significant organic content. These materials are underlain successively by Tertiary sediments, which are difficult to distinguish, and the Ellenton and Middendorf/Black Creek (Tuscaloosa) Formations. Figure B-15 shows the stratigraphy in the vicinity of the old TNX seepage basin inferred from lithologic and geophysical logs developed for a nearby well (XSB-3T). In the central portion of the Plant, the McBean and Congaree Formations are separated by a confining layer described as the green clay (Appendix A).

A detailed water-table map is not available for the area. The natural discharge for the water-table aquifer is to the Savannah River swamp. The vertical head relationships in this area are similar to those in the F-Area where TC

TE Table B-22. Chemical Composition of Simulated Salt Supernate (percent)[a]

Component	Weight
Sodium nitrate	41.6
Sodium nitrite	14.8
Sodium aluminate	9.10
Sodium hydroxide	19.06
Sodium carbonate	6.55
Sodium sulfate	8.34

TC [a]Source: Dunaway, Johnson, Kingley, Simmons, and Bledsoe, 1987b.

TE Table B-23. Analysis of TNX Seepage Basin Influent[a,b]

Parameter	Units	Average	Maximum	Minimum	Number of samples
BOD_5	mg/liter	40	311	<6	56
TSS	mg/liter	35	296	1	53
TDS	mg/liter	124	804	54	36
TOC	mg/liter	13	86	<5	57
Grease and oil	mg/liter	<5	7	<5	8
pH	pH	7.5-8.0	12.3	2.2	1018[c]
Flow rate	m^3/min	0.099	0.33	0.0038	1018[c]

TC [a]Source: Dunaway, Johnson, Kingley, Simmons, and Bledsoe, 1987b.
[b]Values obtained from 24-hour, flow-weighted, composite samples collected from 676-3T manhole.
[c]Hourly.

TC the head in the Middendorf/Black Creek is consistently above that of the Congaree. Thus, water cannot move from the Congaree to the Middendorf/Black Creek Formation. The piezometric surface of the "Tuscaloosa" in the vicinity TC of the TNX facility is commonly above the land surface (Dunaway, Johnson, Kingley, Simmons, and Bledsoe, 1987a). There are no available data on the hydraulic properties of the geologic strata underlying the TNX-Area waste sites.

B.6.5 ONGOING AND PLANNED MONITORING

Groundwater monitoring is proceeding at four of the five waste management facilities in the TNX-Area geographic grouping. Well-water samples are analyzed quarterly for RCRA and SCHWMR parameters at hazardous and mixed waste management facilities. Typically, wells are monitored for gross alpha, gross

Table B-24. Analysis of TNX Seepage Basin Effluent[a,b] TE

Parameter	Units	Average	Maximum	Minimum	Number of samples
BOD_5	mg/liter	29	133	<6	37
TSS	mg/liter	33	108	5	37
TDS	mg/liter	113	168	40	34
TOC	mg/liter	10	17	<5	37
Grease and oil	mg/liter	<5	5	4	10
pH	pH	9.8	11.6	7.5	35

[a]Source: Dunaway, Johnson, Kingley, Simmons, and Bledsoe, 1987b. TC
[b]Values from grab samples of basin overflow at Outfall X-13.

nonvolatile beta, and tritium at low-level waste management facilities. In this geographic area, 15 wells are used to monitor groundwater. DOE plans additional wells to obtain a better definition of subsurface conditions and contaminant transport.

Waste site characterization programs are completed at two of the facilities and are being implemented at two others. Characterization generally includes representative sampling of the waste, the soil and sediment under the waste site, and the soil and sediment around overflow ditches and process sewers.

Table B-25 lists the representative monitoring wells at each waste management facility, the site investigations that have occurred, and the results of groundwater, soil, and vegetation monitoring. TE

B.7 D-AREA WASTE SITES

This geographic grouping is approximately 1000 meters west of Road A (South Carolina Highway 125) and 1200 meters north of the D-Area steam plant (Figure B-14).

B.7.1 HAZARDOUS WASTE SITE

B.7.1.1 D-Area Waste Oil Basin (631-G) TE

The D-Area waste oil basin is in the western portion of the Plant, north of D-Area and west of Road A. The basin is approximately 117 meters long, 16 meters wide, and 2 meters deep.

History of Waste Disposal

The D-Area waste oil basin began receiving waste oil products from D-Area in 1952. This oil might have been contaminated with hydrogen sulfide. Other liquids potentially contaminated with toxic chemicals were brought to the oil basin. In 1973, when burning waste oil ceased plantwide, waste oils not TE acceptable for powerhouse incineration were deposited in the basin. The basin possibly received waste oil containing chlorinated organic compounds and other organics (Huber, Johnson, and Bledsoe, 1987). The basin was closed in January 1975 and was backfilled with soil. Approximately 0.3 meter of standing oil remained in the basin when it was backfilled.

Evidence of Contamination

Sampling and analysis of the soils beneath the basin have not been performed; however, the intention to do so in the future is documented. Three groundwater monitoring wells were installed near the basin in May 1983, and groundwater sampling began in March 1984. A fourth groundwater monitoring well was installed in June 1984. Based on groundwater monitoring results, tetrachloroethylene was selected for environmental assessment (Huber, Johnson, and Bledsoe, 1987).

Waste Characterization

Limited information is available on the nature and extent of contamination associated with the D-Area oil seepage basin. Historic data indicate oily wastes were deposited in large volumes, and some might have been contaminated with chlorinated compounds and other toxic chemicals.

B.7.2 MAJOR GEOHYDROLOGIC CHARACTERISTICS

The D-Area waste oil basin is located on a terrace deposit of the Savannah River. These sands, silts, and clays are 6 to 12 meters thick and blanket the underlying Tertiary deposits (COE, 1952). No detailed geologic data are available for the immediate area; however, the subsurface geology should be similar to the hydrostratigraphy of the nearby TNX basins (Section B.6.4). A U.S. Army Corps of Engineers study in D-Area (COE, 1952) indicates that a calcareous zone, a zone of low penetration resistance and high drill-mud loss, occurs between an elevation of 35 and 21 meters.

Four RCRA-type monitoring wells have been installed near the basin at depths of 10.7 to 12.8 meters from the ground surface. The water table in these wells has a depth of about 6 meters. The natural discharge from the water-table aquifer is to the Savannah River swamp. The higher piezometric surface in the Congaree and Middendorf/Black Creek (Tuscaloosa) aquifers at this location indicates that the hydraulic gradient of groundwater in confined aquifers is upward. Groundwater movement is downward in the water table (Huber, Johnson, and Bledsoe, 1987).

B.7.3 ONGOING AND PLANNED MONITORING

Groundwater monitoring is proceeding at the single waste-management facility in the D-Area geographic grouping. Four wells are used to monitor groundwater near this facility. Well-water samples are analyzed quarterly for RCRA and SCHWMR parameters.

A waste site characterization program is being implemented at the facility. Characterization generally includes representative sampling of the waste, the soil and sediment under the waste site, and the soil and sediment around overflow ditches and process sewers.

Table B-26 lists the representative monitoring wells at the waste management facility, the site investigations that have occurred, and the results of groundwater, soil, and vegetation monitoring. TE

B.8 ROAD A AREA WASTE SITE

This geographic grouping is approximately 400 meters southwest of Road A near the Road 6 intersection (Figure B-16). It is about 3 kilometers east of TNX and D-Area facilities.

B.8.1 MIXED WASTE SITE

B.8.1.1 Road A Chemical Basin (904-111G) TE

The Road A chemical basin is also known as the Baxley Road dump. It is approximately 800 meters west of the intersection of SRP Roads A and 6 (Figure B-16). The original basin was irregular in shape with average side dimensions of approximately 30 meters by 53 meters. The following sections describe the history of disposal, evidence of contamination, and waste characteristics at the basin (Pickett, Muska, and Bledsoe, 1987). TC

History of Waste Disposal

The history of disposal at the Road A chemical basin is vague. The basin was closed and backfilled in 1973. An area significantly larger than the original basin was graded and revegetated with vetch (Sericea lespedeza). The regraded area, about 3.6 acres, is surrounded by pines and hardwoods with a large stand of bottomland hardwood approximately 200 meters downslope.

Evidence of Contamination

No characterization studies of the soils beneath or around the basin have been performed. The analytical results from four monitoring wells indicate that lead is the only constituent that is significantly elevated in a downgradient well. TC

Waste Characterization

The nature and quantities of materials disposed in the basin are not known. A 1983 report lists the contents as miscellaneous radioactive and chemical aqueous wastes (Ross and Green, 1983). Based on slightly elevated levels in monitoring wells, lead and uranium-238 were selected for environmental analysis. TC

B.8.2 MAJOR GEOHYDROLOGIC CHARACTERISTICS

The Road A chemical basin is on the Aiken Plateau close to the escarpment that separates the Plateau from the Ellenton Plain. The ground surface in the basin area slopes toward the Ellenton Plain at a gradient of about 0.08 meter per meter. Four Mile Creek, Pen Branch, and the Savannah River are located approximately 1829 meters northwest, 2134 meters east, and 5486 meters west, respectively, from the basin site (Pickett, Muska, and Bledsoe, 1987). TC

No detailed geologic data are available on the vicinity of the Road A chemical basin. Four monitoring wells are near the basin; however, these wells are only about 18 meters deep. The closest borings with good geologic control include one well (XSB-3T) at the TNX facility, approximately 6 kilometers west-northwest of the basin (see Section B.6.4), and two wells drilled in D-Area by the U.S Army Corps of Engineers (COE, 1952). A well cluster (seven to eight wells) is currently being installed about 2.6 kilometers southeast of the basin. This well-drilling operation includes a continuously cored geologic boring at a depth of about 300 meters below the ground surface. The stratigraphy for this geographic grouping is believed to be similar to that shown in Figure B-15 for the TNX facility (Section B.6.4). The formational contacts at the Road A chemical basin would be slightly deeper than those shown in Figure B-15 because the unconsolidated coastal-plain sediments strike about N. 60°E and dip to the southeast at about 2 to 4 meters per kilometer, and the basin is geologically down-dip from well XSB-3T (Siple, 1967).

TC

The water table at the Road A chemical basin is at an elevation of about 52 meters, or a depth of about 9 meters below the ground surface (Pickett, Muska, and Bledsoe, 1987). The water table is probably within the McBean Formation and discharges westward to the Savannah River swamp. The natural discharge of the Congaree Formation is to Pen Branch, the Savannah River, and the marshes and swamps of the river. The vertical head relationships for this area are assumed to be similar to those in the F-Area where Middendorf/Black Creek (Tuscaloosa) heads are higher than the Congaree heads (Pickett, Muska, and Bledsoe, 1987). Thus, water discharges from the Middendorf/Black Creek upward into the overlying sediments in the Savannah River Valley.

TC

B.8.3 ONGOING AND PLANNED MONITORING

Groundwater monitoring is proceeding at the single waste management facility in the Road A Area geographic grouping. Four wells in this geographic area are used to monitor groundwater in the vicinity of this facility. Well-water samples are analyzed quarterly for RCRA and SCHWMR parameters.

TE

Table B-27 lists the representative monitoring wells at the waste management facility, the site investigations, and the results of groundwater, soil, and vegetation monitoring.

B.9 K-AREA WASTE SITES

The approximate boundaries of the K-Area geographic grouping are Road B on the south and Road 6 on the northwest. This grouping is formed by waste sites associated with K-Reactor. Drainage is primarily to Indian Grave Branch, a tributary of Pen Branch. Figure B-17 locates the waste sites in this grouping and shows its proximity to the Road A Area waste site.

B.9.1 HAZARDOUS WASTE SITES

B.9.1.1 K-Area Burning/Rubble Pit (131-K)

K-Area burning/rubble pit is near the central portion of the Plant, east of K-Area and between Road 6-4.21 and Road 6-4.2. The site is rectangular, approximately 71 meters long, 10 meters wide, and 3 meters deep.

History of Waste Disposal

Rubble waste disposed at this site reportedly included paper, lumber, cans, empty galvanized steel drums, and scrap metal. See Section B.2.1.6.

Evidence of Contamination

See Section B.2.1.6.

Waste Characterization

See Section B.2.1.6.

B.9.1.2 K-Area Acid/Caustic Basin (904-80G)

The K-Area acid/caustic basin is one of six such basins in the Reactor and Separations areas. These basins are unlined earthen depressions with nominal dimensions 15 meters long, 15 meters wide, and 2 meters deep.

History of Waste Disposal

See Section B.3.1.1.

Evidence of Contamination

See Section B.3.1.1. Identification of the environmental impacts of the basins is in progress. A program to sample the contents and the soils beneath the basins is under way. A review of existing data from the monitoring wells installed around all the basins, except that in H-Area, shows no significant impacts on groundwater quality; however, some slight increases in sulfate, conductivity, and pH levels are noted for some of the basins.

Waste Characterization

See Section B.3.1.1.

B.9.2 LOW-LEVEL RADIOACTIVE WASTE SITES

B.9.2.1 K-Area Bingham Pump Outage Pit (643-1G)

The Bingham pump outage pits are outside the perimeter fences of K-, L-, P-, and R-Areas near the center of the Plant. They are between 7.2 and 9.8 kilometers from the nearest SRP boundaries. The K-Area pit is 9 kilometers from the nearest boundary on a gentle slope above a tributary of Indian Grave Branch 290 meters away. The following sections describe the history of waste disposal, evidence of contamination, and waste characteristics at the K-Area Pit (Pekkala, Jewell, Holmes, and Marine, 1987a).

History of Waste Disposal

Normally, all radioactive solid waste generated in the reactor areas is sent to solid waste burial ground 643-G/643-7G. An exception to this practice was made during 1957 and 1958 when the reactor areas initiated major modifications to their primary and secondary cooling water systems. C-Area was the first to modify, followed by K-, L-, P-, and R-Areas. The outages became known as the "Bingham pump outages." No pumps are buried in the waste pits. All radioactive waste generated was surveyed, and solid waste with very low levels of surface contamination was buried between May and September 1957 in a pit near the area. The pit contains miscellaneous construction equipment such as pipes, cables, ladders, drums, and boxes of miscellaneous hardware (Fenimore and Horton, 1974). The waste, with a volume of about 7700 cubic meters, was covered with clean backfill, including a final cover at least 1.2 meters thick.

The K-Area pit has been inactive since 1958; vegetation has grown uncontrollably over it.

Evidence of Contamination

In 1970, radioactivity in samples of vegetation from the surface of the
Bingham pump outage pits was compared with activity in vegetation growing at
the SRP perimeter. The vegetation from the outage pits showed little or no
TE elevation in activity (Table B-28). There are no nearby monitoring wells to
provide groundwater information on the pits, and there is no history of pit
TC sediment characterization or core sampling. The bottom of the pit is 12
meters above the water table.

TE Table B-28. Radioactivity in Vegetation at Bingham Pump Outage Pits and at Plant Boundary (pCi/g)

		Alpha				Nonvolatile beta			
		Pits		Plant boundary		Pits		Plant boundary	
Area	Facility	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.[1]
K	643-1G	0.2	0.3	0.2	0.6	28	34	21	31
L	643-2G	0.8	1.8	0.2	0.6	35	48	21	31
L	643-3G	0.8	1.8	0.2	0.6	35	48	21	31
P	643-4G	0.4	0.6	0.2	0.6	23	27	21	31
R	643-8G	0.2	0.5	0.2	0.6	37	51	21	31
R	643-9G	0.2	0.5	0.2	0.6	37	51	21	31
R	643-10G	0.2	0.5	0.2	0.6	37	51	21	31

Waste Characterization

The radiation level of the construction material buried at all the Bingham pump outage pits was measured at less than 25 milliroentgens per hour; no alpha activity was noted. A conservative maximum estimate of the amount of activity buried in each area is 1 curie. Table B-13 lists the radionuclide inventory. TE

B.9.2.2 K-Area Reactor Seepage Basin (904-65G) TE

Seepage basin 904-65G is outside the K-Area perimeter fence (Figure B-17). It is 41 meters long, 21 meters wide, and 2 meters deep with a volume of 1.6 x 10^3 cubic meters. The basin was constructed by excavating below grade and backfilling around the sides at grade level to form earthen dike walls. The basin did not overflow; water was released to the environment by evaporation and seepage. The following sections describe the history of disposal, evidence of contamination, and waste characteristics of the basin (Pekkala, Jewell, Holmes, and Marine, 1987b). TC

History of Waste Disposal

See Section B.4.2.4. In addition to purge water from the K-Reactor disassembly basins, the K-Area reactor seepage basin received very low-level TE radioactive wastewater from other sources in the reactor area. This water had to meet the same contamination control limits as disassembly-basin purge water before it could be released to the seepage basin. Conventional water treatment chemicals also entered the disassembly-basin water in small amounts through additions for pH control, filter promotion, algae treatment, and minimal additions of wastewater to the settler tank from other sources in the reactor buildings. The seepage basin in K-Area was active from 1957 to 1960. It has not been backfilled.

Evidence of Contamination

Core samples were obtained from the basin in 1978, and most of the radioactivity was found to be in the top 30 centimeters of the cores. The maximum cesium-137 and strontium-90 concentrations were 510 and 140 picocuries per gram, respectively.

Four groundwater monitoring wells were installed around the K-Area seepage basin in 1984. As determined from the three downgradient wells, 1985 annual average alpha and nonvolatile beta activity ranged from 0.10 to 0.23 and 0.04 to 2.9 picocuries per liter, respectively. The 1985 annual average for tritium ranged from 110,000 to 160,000 picocuries per liter.

Waste Characteristics

Although many different radionuclides have been discharged to the seepage basin, tritium, strontium-90, and cesium-137 account for almost all the radioactivity. The radionuclide contaminants entered the disassembly-basin water as a film of water on the irradiated components discharged from the reactor tank to the disassembly basin. Table B-29 is an inventory of radionuclides TE released to the seepage basin. No significant quantities of chemical contaminants are believed to have been discharged to the seepage basin.

TE

Table B-29. Radioactive Releases to K-Area Reactor Seepage Basin (Ci)[a,b]

Isotope	Release
Tritium[c]	1.2×10^{2}
Cobalt-60	2.6×10^{-3}
Strontium-90	1.4×10^{-2}
Cesium-137	7.8×10^{-2}

TC

[a]Source: Pekkala, Jewell, Holmes, and Marine, 1987b.
[b]Values cumulative for years 1957-1960. All values are decay-corrected through 1985.
[c]Most tritium believed to have left basin via atmosphere or groundwater.

B.9.3 MAJOR GEOHYDROLOGIC CHARACTERISTICS

The waste sites in the K-Area geographic grouping are located with Indian Grave Branch on the west and Pen Branch on the east, where the water table below the area discharges. Little site-specific information is available for the subsurface geology; however, K-Area hydrostratigraphy is believed to be similar to the regional hydrostratigraphy discussed in Appendix A. Water-level measurements from other wells in the vicinity of K-Area have been used to construct a water-table map for the vicinity (Figure B-18).

The water-table elevation is about 60 meters. The estimated piezometric head in the Congaree Formation is about 43 meters, and about 51 meters in the Middendorf/Black Creek (Tuscaloosa). Thus, there is a downward hydraulic gradient to the Congaree, below which the gradient is upward (Ward, Johnson, and Marine, 1987). Recent evidence suggests that the upward gradient does not
TC currently exist in the K-Area (Bledsoe, 1987).

B.9.4 ONGOING AND PLANNED MONITORING

Groundwater monitoring is proceeding at three of the four waste management facilities in the K-Area geographic grouping. Well-water samples are analyzed quarterly for RCRA and SCHWMR parameters at hazardous waste management facilities. Wells are typically monitored for gross alpha, gross nonvolatile beta, and tritium at low-level waste management facilities. At least 12 wells in this geographic area are used to monitor groundwater in the vicinity of the facilities. DOE plans additional wells to better define subsurface conditions and contaminant transport.

A waste site characterization program has been completed at two of the facilities and is being implemented at the other two. Characterization generally includes representative sampling of the waste, the soil and sediment under the waste site, and the soil and sediment around overflow ditches and process sewers.

TE | Table B-30 lists the representative monitoring wells at each waste management facility, the site investigations that have occurred, and the results of groundwater, soil, and vegetation monitoring.

B.10 L-AREA WASTE SITES

This geographic grouping is formed by waste sites near L-Reactor, which went on standby status in 1968 and resumed operation in November 1985. This grouping is approximately 4 kilometers east of K-Reactor, north of Road B. Figure B-19 shows the locations of the waste sites in the L-Area geographic grouping. Within the boundaries of this grouping are the CMP pits and the L-Area burning/rubble pit, acid/caustic basin, and oil and chemical basin. Drainage is to Pen Branch on the west, and Steel Creek and L-Lake on the east.

B.10.1 HAZARDOUS WASTE SITES

B.10.1.1 L-Area Burning/Rubble Pit (131-L)

The L-Area burning/rubble pit is near the central portion of the Savannah River Plant, northwest of L-Area, north of Road 7, and east of Road 7-1. The site is rectangular, approximately 70 meters long, 9 meters wide, and 3 meters deep.

History of Waste Disposal

Rubble waste disposed at this site reportedly included paper, lumber, cans, empty galvanized steel drums, scrap metal, and batteries. See Section B.2.1.6.

Evidence of Contamination

See Section B.2.1.6.

Waste Characterization

See Section B.2.1.6.

B.10.1.2 L-Area Acid/Caustic Basin (904-79G)

The L-Area acid/caustic basin is one of six such basins in the Reactor and Separations Areas. These basins are unlined earthen depressions with nominal dimensions of 15 meters long, 15 meters wide, and 2 meters deep.

History of Waste Disposal

See Section B.3.1.1.

Evidence of Contamination

See Section B.3.1.1.

Waste Characterization

See Section B.3.1.1.

B.10.1.3 CMP Pits (080-17G, 17.1G, 18G, 18.1G, 18.2G, 18.3G, 19G)

The CMP pits consist of seven unlined pits that were used for the disposal of selected nonradioactive wastes. The pits were near the center of the Plant at the top of a hill near the head of Pen Branch. They are arranged linearly in two rows with 3 to 7 meters between the ends of adjacent pits. Each pit is 3 to 5 meters wide, 15 to 23 meters long, and 3 to 5 meters deep.

History of Waste Disposal

The CMP pits were used for waste disposal from 1971 to 1979. Typical waste disposed in the pits included drums of solvents such as trichloroethylene and tetrachloroethylene, and other liquid wastes such as fluorocarbons, oil, paint thinner, and acid. Beryllium, titanium, calcium, and cadmium were disposed of in a separate metals pit. Odd-shaped items such as spray cans and gas cylinders were placed in the pits in containers of various sizes. The waste in the CMP pits was excavated in 1984 and is being stored until it can be incinerated. The pits have been backfilled and closed.

Evidence of Contamination

Twenty-one groundwater monitoring wells were installed at the site to document the extent of existing contamination. Benzene, methylene chloride, tetrachloroethylene, toluene, and bis (2-ethylhexyl) phthalate have been detected in the groundwater at monitoring well CMP-9C (Scott, Kolb, Price, and Bledsoe, 1987). TC TE

Waste Characterization

Incomplete records partially document disposed wastes at the CMP pits. Site remedial work in 1984 included removal of wastes and contaminated soils. The results of the remedial work indicate that 99.5 percent of the wastes and contaminated soils had been removed from the site. An estimated 1500 cubic meters of contaminated soil remain.

B.10.2 LOW-LEVEL RADIOACTIVE WASTE SITES

B.10.2.1 L-Area Bingham Pump Outage Pit (643-2G)

L-Area Bingham Pump Outage Pit 643-2G is outside the L-Area perimeter fence near the center of the SRP. The pit is 9 kilometers from the nearest Plant boundary. It is on a gentle slope above the nearest flowing stream, a tributary of Pen Branch that is 360 meters away. The following sections discuss the history of waste disposal, evidence of contamination, and waste characteristics at this pit (Pekkala, Jewell, Holmes, and Marine, 1987a). TC

History of Waste Disposal

Section B.4.2.1 describes the general history of the Bingham Pump outage pits. The L-Area pit was active from September to November 1957. It is backfilled and overgrown with vegetation. TC

Evidence of Contamination

TC No groundwater monitoring, sediment characterization, or core sampling has been performed at the outage pits, but vegetation sampling was performed in 1970. The vegetation showed elevated but low levels of contamination (see Section B.4.2.1). The water table is presently 2 meters below the bottom of the pit.

Waste Characterization

Section B.4.2.1 discusses the waste characteristics of the Bingham Pump outage pits.

B.10.2.2 L-Area Bingham Pump Outage Pit (643-3G)

L-Area Bingham Pump Outage Pit 643-3G is outside the L-Area perimeter fence near the center of the Plant. The pit is 9 kilometers from the nearest SRP boundary. It is situated on a gentle slope above the nearest flowing stream, TE a tributary of Pen Branch that is 360 meters away.

History of Waste Disposal

Section B.4.2.1 describes the general history of the Bingham Pump outage pits. This pit was active from September 1957 to January 1958, and is TE backfilled and overgrown with vegetation.

TE Evidence of Contamination

See Section B.10.2.1.

Waste Characteristics

See Section B.4.2.1.

B.10.3 MIXED WASTE SITES

TE B.10.3.1 L-Area Oil and Chemical Basin (904-83G)

The L-Area oil and chemical basin is outside the L-Area perimeter fence and between the acid/caustic basin and the area seepage basin (Figure B-18). The TC unlined earthen basin has a surface area of 860 square meters and a capacity of approximately 2.3 million liters. The nearest Plant boundary is approximately 9.8 kilometers from the basin. The following sections describe the history of disposal, evidence of contamination, and waste characteristics at TC the basin (Pekkala, Jewell, Price, and Bledsoe, 1987).

History of Waste Disposal

This basin began operation in 1961 and remained active until 1979. Although L-Reactor was placed on standby status in 1968, releases of wastewater to the TE basin continued.

The basin has been inactive since 1979. Rainfall has kept some water in the basin at all times. The permeability of the basin floor probably has decreased by releases of oil and chemical mixtures.

Evidence of Contamination

Nine sediment cores were taken in the basin in early 1985. Approximately 0.3 to 0.6 meter of soft black ooze with a moisture content of 50 to 90 percent, followed by the tough basin-floor material, was encountered. Preliminary analyses indicate very low levels of contamination from metals; for example, no samples exceeded the EP-toxicity test criteria. TE

The upper 10 to 20 centimeters of sludge typically contain 1,000 to 10,000 picocuries per gram (dry weight) of radioactive material, dominated by cobalt-60 and unidentified beta emitters. The next 20 centimeters typically contain about 20,000 picocuries per gram (dry weight). Below this level, the basin floor material drops rapidly to background levels for most substances. Petroleum hydrocarbons were not detected in any samples. The basin water contains tritium, strontium-90, cobalt-60, cesium-137, and nitrate.

Low levels of radioactivity have been detected in monitoring wells near the basin. Chlorinated organics (TOH) as high as 100 parts per billion have been detected in two monitoring wells, but are not detectable in the basin water.

Waste Characterization

The L-Area oil and chemical basin received about 205,000 liters of wastewater annually. The total volume discharged through 1979 was 3.9×10^6 liters. The waste liquids consisted of small volumes of oil on top of water. The wastewater usually contained some chemicals that were not appropriate for discharge to SRP streams, regular seepage basins, or the waste management system in 200-Area. The oil in the wastewater drums or 1900-liter skid containers was only a small part of the total waste. Radioactive oil on the plant site usually was mixed with the absorbent Oil-dri and sent to the Burial Ground in 190-liter drums. The waste liquids sent to the L-Area oil and chemical basin came from all over the Plant, but were primarily from the reactor areas. Wastewater from the Building 717-G Hot Shop was sent to the basin until 1967. TC

As indicated in Table B-31, the major nuclides discharged to the basin include tritium, cobalt-60, strontium-90, cesium-137, and unidentified alpha and beta gamma. The current inventory is decay-corrected. The inventory shows a small amount of radioactivity that was released to the basin through Works Engineering repairs at the basin or in Building 717-G. Several filters in the reactor building's distillation and purification facilities had high radiation levels, and underwater work was necessary for personnel protection. A tank filled with water was placed inside the basin perimeter fence and used for shielding. After repairs were completed, including disassembly and assembly, the water was drained to the basin. TE

B.10.4 MAJOR GEOHYDROLOGIC CHARACTERISTICS

Waste sites in the L-Area geographic grouping are on the Aiken Plateau between Pen Branch to the west and Steel Creek to the east-southeast. Site-specific geologic investigations conducted in the vicinity of L-Area and the CMP pits

TE

Table B-31. Summary of Radioactive Releases to L-Area Oil and Chemical Basin 904-83G (Ci)[a]

Isotope	Original release	Decay-corrected inventory
Tritium	3.4556×10^{4}	1.1553×10^{4}
Sulfur-35	1.6000×10^{-2}	7.6563×10^{-7}
Cobalt-60	3.7915	2.7935×10^{-1}
Strontium-90	3.7039×10^{-1}	2.1986×10^{-1}
Ruthenium 103, -106	3.5937×10^{1}	6.3956×10^{-5}
Cesium-134	1.0590×10^{-3}	4.4993×10^{-5}
Cesium-137	1.6210	9.9224×10^{-1}
Cerium 44, -141	9.5232×10^{-2}	1.8354×10^{-6}
Promethium-147	1.9828	8.3285×10^{-3}
Alpha (unidentified)	2.2852×10^{-3}	2.2852×10^{-3}
Beta-gamma (unidentified)	1.5550×10^{-3}	1.5550×10^{-3}

TC

[a]Source: Pekkala, Jewell, Price, and Bledsoe, 1987.

reveal that the hydrostratigraphy of the area is similar to that discussed in Appendix A. Significant site-specific characteristics are as follows (Scott, Kolb, Price, and Bledsoe, 1987; Pekkala, Jewell, Price, and Bledsoe, 1987; DOE, 1984a, b):

TC

1. Upland unit. The transmissivity of gravel beds can be high but that of clays can be low.

2. Barnwell Formation. Clay lenses are nearly impermeable to downward infiltrating water. Sands should have moderate permeability.

3. McBean Formation. Lime sands and clays (calcarenite and marl) are generally of low permeability, but coarse, fossiliferous limestone lenses can be very permeable. The green clay at the base of the McBean Formation is about 7 meters thick in the vicinity of L-Area.

4. Congaree Formation. Interlayered sands, calcareous sands, and clays near the top of the formation should have moderate permeability. The thick (15-meter) clean sands near the base of this formation are very permeable and form a good aquifer.

5. Ellenton Formation. Most lithologies have low permeability; this generality can be deceiving because channel sands could provide very high permeability locally.

6. Upper Middendorf/Black Creek. The Middendorf/Black Creek section in hole CMP-11 begins at a depth of 125 meters (about 34 meters below

sea level). The principal sediments are fine, silty sands with occasional layers of silty clay or coarse sand. The interval from 126 to 161 meters has four clay layers, each about 0.6 meter thick.

In general, the sands become coarser toward the bottom of this interval. The permeability of the silty sands should be low to moderate and that of the coarser sands moderate to high.

The tan clay is not readily evident in data on the area derived from foundation borings, drillers' logs, and geophysical logs; however, even in other areas of the Plant where it supports a significant head difference, this clay layer is not always apparent in soil cores. The calcareous zone is evident in the McBean Formation. At depths of 30 to 40 meters from the ground surface, solution voids can exist, as indicated by mud losses and rod drops during the drilling of observation wells near the CMP pits (Scott, Kolb, Price, and Bledsoe, 1987). These areas are patchy with little or no interconnection of TC
void areas.

Pump tests have been performed at monitoring wells in the vicinity of the CMP pits. Transmissivity data for various strata are summarized below (Pekkala, Jewell, Price, and Bledsoe, 1987): TC

Well	Stratum screened	Transmissivities measured (m^2/day)
CMP-8B	McBean (Aiken) fine sands	9.1
CMP-10, 11, 12, 14B, 15B	McBean moldic limestone Barnwell/Dry Branch	<185 0.5
CMP-8A, 12A, 15A	Congaree	75, 3, 0.2

Figure B-20 is a water-table map for the area. The map is from data collected in December 1963 when a number of shallow piezometers were available for the area. Recent data from several new wells (Pekkala, Jewell, Price, and Bledsoe, 1987) indicate that the water table is now 1 to 2 meters lower than TC
shown in Figure B-20.

Near the CMP pits, the hydraulic heads of three wells screened in the lower part of the Congaree are between 55.2 and 56.1 meters. Water-level measurements for one well in the upper Tuscaloosa Formation indicate a head of 52.1 meters above mean sea level. Thus, there is a downward gradient of about 4 meters of head across the Ellenton Formation near the CMP pits (Scott, Kolb, Price, and Bledsoe, 1987). TC In the vicinity of L-Area, the water level in the Congaree is at an elevation of 53.5 meters, and that in the Middendorf/Black Creek (Tuscaloosa) is at 52.2 meters (Ward, Johnson, and Marine, 1987). TC

Judging from these water-level measurements, the head reversal found in other areas of the Plant is not present in this area. Recent (April 1987) evidence is in agreement with these earlier observations (Bledsoe, 1987).

B.10.5 ONGOING AND PLANNED MONITORING

Groundwater monitoring is proceeding at 10 of the 12 waste management facilities in the L-Area geographic grouping. Well-water samples are analyzed quarterly for RCRA and SCHWMR parameters at hazardous and mixed waste management facilities. Typically, wells are monitored for gross alpha, gross nonvolatile beta, and tritium at low-level waste management facilities. At least 21 wells in this geographic area are used to monitor groundwater in the vicinity of the 12 facilities. DOE plans additional wells to obtain a better definition of subsurface conditions and contaminant transport.

Waste site characterization programs are complete at nine facilities and are being implemented at another. Characterization generally includes representative sampling of the waste, the soil and sediment under the waste site, and the soil and sediment around overflow ditches and process sewers.

Table B-32 lists the representative monitoring wells at each waste management facility; the site investigations that have occurred; and the results of groundwater, soil, and vegetation monitoring. TE

B.11 P-AREA WASTE SITES

This geographic grouping is formed by waste sites associated with P-Reactor, which is approximately 4 kilometers northeast of L-Reactor (Figure B-21). Located along Road F, P-Reactor is southwest of Par Pond, through which its cooling water is recirculated. The northeast portion of this grouping drains to Par Pond, and the southwest portion drains to the headwaters of Steel Creek.

B.11.1 HAZARDOUS WASTE SITES

B.11.1.1 P-Area Burning/Rubble Pit (131-P)

The P-Area burning/rubble pit is northwest of P-Area and south of Road C-7. The site is nearly rectangular, approximately 64 meters long, 9 meters wide, and about 3 meters deep. TE

History of Waste Disposal

Rubble waste disposed of at this site included paper, wood, concrete, scrap metal, cans, and empty galvanized-steel barrels. See Section B.2.1.6.

Evidence of Contamination

See Section B.2.1.6.

Waste Characterization

See Section B.2.1.6.

B.11.1.2 P-Area Acid/Caustic Basin (904-78G)

The P-Area acid/caustic basin is one of six such basins in the Reactor and Separations Areas. These basins are unlined earthen depressions with nominal dimensions of 15 meters long, 15 meters wide, and 2 meters deep.

History of Waste Disposal

See Section B.3.1.1.

Evidence of Contamination

See Section B.3.1.1.

Waste Characterization

See Section B.3.1.1.

B.11.2 LOW-LEVEL RADIOACTIVE WASTE SITE

B.11.2.1 P-Area Bingham Pump Outage Pit (643-4G) TE

The P-Area Bingham pump outage pit 643-4G is outside the P-Area perimeter fence. This pit is 9.8 kilometers from the nearest Plant boundary. It is on a gentle slope just east of the divide between Steel Creek and Par Pond. The following sections describe the history of waste disposal, evidence of contamination, and waste characteristics at the P-Area pit (Pekkala, Jewell, Holmes, and Marine, 1987a). TC

History of Waste Disposal

Section B.4.2.1 describes the general history of the Bingham pump outage pits. The P-Area pit was active from January to November 1958, then was backfilled and allowed to revegetate.

Evidence of Contamination

No groundwater monitoring, sediment characterization, or core sampling has been performed at the outage pits. Vegetation sampling in 1970 showed elevated but low levels of radioactivity (see Section B.4.2.1). TC

Waste Characterization

See Section B.4.2.1.

B.11.3 MAJOR GEOHYDROLOGIC CHARACTERISTICS

The P-Area waste sites within this geographic grouping are on the Aiken Plateau between Steel Creek and Par Pond. Site-specific geologic investigations have not been conducted in the vicinity of P-Area; however, regional subsurface geology discussed in Appendix A is believed to be representative of the area. Four RCRA-type wells have been installed near P-Area. The depth to the water table in these wells ranges from 6.4 to 10.7 meters below the ground surface (Huber, Johnson, and Marine, 1987). Figure B-22 is a water-table map TC for the area. The natural discharge from the water-table aquifer is to Steel Creek west of P-Area and to tributaries of Par Pond to the east-northeast. This map, however, indicates expected head relationships only for general areas; site-specific information will be necessary to confirm the relationship for this area.

B.11.4 ONGOING AND PLANNED MONITORING

Groundwater monitoring is proceeding at two of the three waste management facilities in the P-Area geographic grouping. Well-water samples are analyzed quarterly for RCRA and SCHWMR parameters at hazardous waste management facilities. Typically, wells are monitored for gross alpha, gross nonvolatile beta, and tritium at low-level waste management facilities. At least eight wells in this geographic area are used to monitor groundwater in the vicinity of the six facilities. Additional wells are planned to obtain a better definition of subsurface conditions and contaminant transport.

Waste site characterization generally includes representative waste, the soil and sediment under the waste site, and the soil and sediment around overflow ditches and process sewers.

Table B-33 lists the representative monitoring wells at each waste management facility, the site investigations that have occurred, and the results of groundwater, soil, and vegetation monitoring. TE

B.12 MISCELLANEOUS AREA WASTE SITES

This section describes two waste sites, the SRL oil test site and the Gunsite 720 rubble pit, which are not within the boundaries of the 10 geographic groupings described in previous sections. The SRL oil test site is south of Road 3, a short distance from the CS-Area (see Figure B-11). The Gunsite 720 rubble pit is west of Road A, about 10 kilometers south of A-Area and 5 kilometers north of D-Area (see Figure B-14).

B.12.1 HAZARDOUS WASTE SITES

B.12.1.1 SRL Oil Test Site (080-16G)

The SRL oil test site is about 600 meters east of the intersection of Roads 3 and 5, and approximately the same distance south of the Central Shops complex near the central portion of the Plant. The site consists of 24 test plots with dimensions of 3.7 meters by 10.7 meters. Two other test plots with dimensions of 3 meters by 70 meters were added to the site subsequently. TC

History of Waste Disposal

The 26 test plots at the SRL oil test site were developed as part of a study to evaluate the biodegradation rate of waste oil. The plots received machine cutting oil characterized as having a viscosity similar to heavy automobile engine oil. The original 24 plots (12 test plots and 12 control plots) were constructed in 1975. Waste oil purchased offsite was sprayed onto the 12 test plots. Each oil plot received 415 liters of waste oil, was tilled to a depth of 15 centimeters, received another application of 415 liters, and was tilled again. Commercial fertilizer was applied to the plots at four different rates.

In 1976 two additional plots reportedly were built. One plot received 3120 liters of hydraulic fluid and the other received 4160 liters of paint thinner. TE

In 1978 a site use permit was requested to facilitate the disposal of about 50 drums of waste oil per year at the SRL oil test site, but the disposal of additional waste as a result of this request is not known. No waste oils were discarded at this site after 1980.

Evidence of Contamination

Two soil cores reportedly were taken from each test plot and analyzed at depths of 0 to 15 centimeters, 15 to 30 centimeters, and 30 to 45 centimeters. The plots were sampled before oil application, immediately after, 1 month after, about every 3 months after for 2 years, and then at 5 years. The results of the analysis revealed that over the 5-year period, no significant amounts of hydrocarbons were found at the 30- to 45-centimeter depth and slightly elevated hydrocarbons were found at the 15- to 30-centimeter depth (see Figure B-23). The results of an analysis of several chemical parameters revealed some increases of phosphorus, potassium, and calcium, but all concentrations (except phosphorus at the 0.15-centimeter depth) returned to background levels after 1 year.

The only contaminants that appear to be present at the site are asphalt rubble and residual waste oil that, for the most part, has been retained in the top 15 centimeters of the soil. A small amount might have migrated as deep as 30 centimeters. TC

Currently, there are no groundwater monitoring wells located at this site. TE

Waste Characterization

A lack of specific chemical/analytical data of the waste materials present at the site makes specific evaluations difficult. However, based on the limited data available, the potential for contaminant migration appears to be small. Samples from borings taken at the sites show that hydrocarbons exist at depths of 15 to 30 centimeters below the surface and marginally at the 30- to 45-centimeter depth. TC

B.12.1.2 Gunsite 720 Rubble Pit

The Gunsite 720 rubble pit (SRP map coordinates N80,000, E27,350) is an open area near D-Area, west of the first northbound dirt road from Road A-2. The site covers about 35 square meters. TC

History of Waste Disposal

The Gunsite 720 rubble pit consists of eight semiburied, corroded, 208-liter drums of unknown origin. There are no records of the disposal; however, the drums are suspected to contain nonradioactive liquid-chemical waste.

Evidence of Contamination

To date, no studies have been performed to determine the nature of the contents of the drums or the extent and levels of contamination.

Waste Characterization

Limited data are available on possible wastes disposed of at this site (Huber and Bledsoe, 1987b). TC

B.12.2 MAJOR GEOHYDROLOGIC CHARACTERISTICS

Representative data on the two waste sites in this geographic grouping are contained in Section B.5.4 for the SRL oil test site and Section B.6.4 for the Gunsite 720 rubble pit. In addition, Appendix A describes the important geologic and subsurface hydrologic characteristics of the SRP.

B.12.3 ONGOING AND PLANNED MONITORING

Table B-34 lists the site investigations that have occurred at each facility and the results of any groundwater, soil, and vegetation monitoring. TE

At present, there are no monitoring wells near the SRL oil test site or the Gunsite 720 rubble pit.