Stratigraphy

The geologic units near or intersecting the SRS streams are as follows (Prowell 1994):

- Pen Branch – The Tobacco Road and Dry Branch Formations are exposed in the stream valley.
- Fourmile Branch – The Tobacco Road and Dry Branch Formations are exposed in the stream valley.
- Lower Three Runs – The Tobacco Road and Dry Branch Formations are exposed in the watersheds.
- Steel Creek – The Tobacco Road Formation outcrops along most of the lower end of L-Lake; the Dry Branch Formation outcrops upstream of the lake and downstream of the dam.

Soils

The more common soil mapping units near SRS streams are listed below and illustrated in Figures 4-7, 4-8, and 4-9 (USDA 1990). TE

- Blanton sand, 0-6 percent slopes (BaB)
- Blanton sand, 6-10 percent slopes (BaC)
- Pickney sand, frequently flooded (Pk)
- Troup sand, 0-6 percent slopes (TrB)
- Troup sand, 10-15 percent slopes (TrD)
- Troup sand, 15-25 percent slopes (TuE)

4.2.1.2 <u>Environmental Impacts</u>

4.2.1.2.1 No Action

There would be no effects from this alternative on Pen Branch, Fourmile Branch, or Lower Three Runs soils or geology. The current rate of erosion or accretion of soils by stream action in Steel Creek below the dam would continue, and there would be no effect on the geology related to this watershed.

4.2.1.2.2 Shut Down and Deactivate

This alternative would affect the soils and geology in the streams because the shut down of the River Water System would discontinue outfall discharges; the presence or absence of water would alter the presence and probably the type of nearby soils (i.e., erosion or accretion). TC Stream conditions downstream of the dam would not change because DOE would regulate the flow rate from the dam as the lake recedes, *after which the stream would return to its pre-lake flow rate* [estimated to average 10 cubic feet (0.28 cubic meter) per second] (del Carmen and Paller 1993a). In the part of the watershed currently covered by the lake, soil erosion would initially increase along the sides of the Steel Creek stream valley. This erosion should decrease as vegetation reclaims the slopes. Although the area would revegetate naturally, DOE would encourage revegetation by seeding.

There would be no effects on Lower Three Runs. The Par Pond water level would remain near full pool due to groundwater discharge to the reservoir and thereby maintaining the level of discharge into the stream. TE

4.2.1.2.3 Shut Down and Maintain

The impacts discussed above for the Shut Down and Deactivate Alternative would apply to this alternative.

4.2.2 SURFACE WATER

4.2.2.1 <u>Affected Environment</u>

The streams that received heated effluents from the River Water System are Fourmile Branch via Castor Creek, Pen Branch via Indian Grave Branch, Steel Creek, and Lower Three Runs L10-09 (see Figure 4-25). Section 4.2 describes these streams and their watersheds.

In August 1995 DOE prepared an environmental assessment (EA; DOE 1995a) that addressed the impact of reducing the flow from L-Lake to

Steel Creek to 10 cubic feet (0.28 cubic meter) per second, which was its historic flow level. The EA concluded that reducing Steel Creek to this level would recreate stream conditions that existed before the impoundment of L-Lake. DOE later issued a Finding of No Significant Impact (DOE 1995b).

Discharges to site streams from the River Water System during September 1996 are presented in Table 4-25 (Melendez 1996). The concentration
L10-09 of contaminants in affected streams would increase due to removal of these discharges. Tritium does not present a major contribution to risk under the alternatives in this EIS. Further more, none of the alternatives presented in this EIS would increase the risk of tritium release offsite. However, tritium is a primary sitewide constituent of concern with regard to the maximum exposed offsite individual and the onsite exposed worker. Tritium concentrations in the affected streams were measured in September
L10-09 1996 (Fledderman 1997). Table 4-26 presents this information and corresponding stream flows as well as the prediction tritium concentrations under No Action and the shutdown alternatives. Human health and ecological impacts associated with increased tritium concentrations are discussed in Section 4.2.8 and Appendix B, respectively.

TE **Table 4-25.** Discharges to onsite streams (cubic feet per second).

Stream	September 1996	No Action	Shutdown
Steel Creek (headwaters via P-13)	8.6	0	0
L-Lake (via L-07)	36.7	10.7	0.9[a]
Lower Three Runs	0	0	0
Fourmile Branch (via C-004 to Castor Creek)	0.6	0	0
Pen Branch (via K-18 to Indian Grave Branch)	16.5	0.9[b]	0.9[a]
Total Discharge	62.4	11.6	1.8

a. Maximum well water discharge.
b. Includes 0.45 cubic feet per second river water and 0.45 cubic feet per second maximum well water.

TE **Table 4-26.** Total flows and tritium concentrations in onsite streams.

	Total downstream of confluence (cfs)			Tritium concentration (pCi/ml)		
Stream	September 1996	No Action	Shutdown	September 1996	No Action	Shutdown
Steel Creek (above Road B)	4.96	3	3	NA[a]	NA	NA
Steel Creek (below L-Lake)	44.5	10	10	10.65	47.4	47.4
Steel Creek at Road A (includes Meyers Branch)	69	34.5	34.5	6.87	13.7	13.7
Lower Three Runs (below Par Pond)	22.3	10	10[b]	1	2.2	2.2
Fourmile Branch at Road A-12.2	19.9	19.3	19.3	227	234	234
Pen Branch at Road A-13.2	34.4	18.8	18.8[c]	62.8	115	115

a. NA = Not available.
b. Minimum release for no action and shutdown.
c. Discharges and base flow from Indian Grave Branch is included.

Indian Grave Branch/Pen Branch

Pen Branch follows a southwesterly path from its headwaters about 2 miles (3.2 kilometers) northeast of K-Area to the Savannah River swamp (Figure 4-25). After entering the swamp, the creek flows parallel to the river for about 5 miles (8 kilometers) before it enters and mixes with the waters of Steel Creek about 0.2 mile (0.3 kilometer) from the mouth of that stream. In its headwaters, Pen Branch is a largely undisturbed blackwater stream, similar to the headwater reaches of Fourmile Branch. Indian Grave Branch is a tributary of Pen Branch. | TE

Effluents Contribution – Until K-Reactor shutdown in 1988, Indian Grave Branch received thermal effluent from K-Reactor. With reactor discharge, the natural flow of about 10 cubic feet (0.28 cubic meter) per second increased to about 400 cubic feet (11.3 cubic meters) per second. At present, Indian Grave Branch receives nonthermal effluents (i.e., nonprocess cooling water, ash basin effluent waters, powerhouse waste water, and sanitary waste water) from K-Area and sanitary effluent from the Central Shops Area (Wike et al. 1994).

Flow – From July through September 1996, the average discharge from the K-11 (K-Reactor) outfall to Indian Grave Branch was 16.6 cubic feet (0.47 cubic meter) per second (Melendez 1996). Stream discharge in Indian Grave Branch upstream from the discharge canal averaged 1.35 cubic feet (0.04 cubic meter) per second during Water Year 1994 (Wike et al. 1994). Flow in Pen Branch upstream of the confluence with Indian Grave Branch averaged 7.7 cubic feet (0.22 cubic meter) per second from 1983 through 1991 (Table 4-27). During Water Years 1994 and 1995 the discharges in Pen Branch at Road A-13.2 (Figure 4-26) averaged 50.9 cubic feet (1.4 cubic meters) per second and 55.8 cubic feet (1.6 cubic meters) per second respectively (Wike et al. 1994; USGS 1996). | TE

Water Temperature – During reactor operation, mean temperatures [93° to 118°F (33.5° to 48.1°C)] (Wike et al. 1994) in thermal portions of Pen Branch ranged from 64° to 91°F (18 to 33°C) above those of the upstream nonthermal waters (Table 4-28). The temperatures at the thermal sites fluctuated more widely than those of the nonthermal sites because of the reactor cycle. The shutdown of K-Reactor in 1987 resulted in a decrease in temperatures in the Pen Branch System to an average of 72°F (22°C) (Wike et al. 1994). | TE

Dissolved Oxygen – Dissolved oxygen concentrations in natural waters are inversely related to water temperature, as reflected in the data obtained during the 1987 Comprehensive Cooling Water Study. The mean dissolved oxygen concentrations in the thermal waters were much lower (5.3 to 7.5 milligrams per liter or 87 to 90 percent saturation) than those at the nonthermal site. The mean dissolved oxygen concentration was 8.12 milligrams per liter at the Pen Branch nonthermal site (Table 4-29; Wike et al. 1994). Because there has been no thermal input to the Pen Branch system for 5 years, the mean dissolved oxygen concentration of 8.5 milligrams per liter at Road A-17 is now similar to the concentrations measured at the nonthermal site during the Comprehensive Cooling Water Study (Wike et al. 1994). | TE | TE

Table 4-27. Flow summary for Pen Branch (cubic feet per second).[a,b] | TE

Station name	Period of record	Range: Mean	Low	High	7Q10	7-day low flow
Road B	1983-1991	7.7	0.2	372	0.36	0.22
Road A-13.2	1976-1991	273[c]	20	760[c]	25.4	22

a. Source: Wike et al. (1994).
b. To convert cubic feet to cubic meters, multiply by 0.028317.
c. High flows are the flows of reactor cooling water discharge.

Table 4-28. Pen Branch field data (CCWS).[a,b] TE

Location	Water temperature (°C)	pH	Stream maximum depth (cm)[c]	Stream velocity (cm/sec)
01 Pen Branch at Road B				
Mean	15.2	6.93	75	48
Range	1.4-24.0	5.10-9.00	40-164	9-140
Samples	46	46	28	40
02 Indian Grave Branch downstream of K-Reactor effluent				
Mean	48.1	7.42	100	183
Range	7.6-68.0	5.90-8.70	31-143	45-260
Samples	46	46	34	
03 Pen Branch at Road A-13.2				
Mean	42.6	7.42	119	124
Range	7.1-60.0	5.60-8.59	91-127	7-180
Samples	45	44	28	39
04 Pen Branch at Road A-17				
Mean	33.5	8.11	29	15
Range	7.90-46.3	5.70-9.25	23-41	-15-140
Samples	46	45	21	39

a. Source: Wike et al. (1994).
b. CCWS = Comprehensive Cooling Water Study.
c. To convert centimeters to inches, multiply by 0.3937.

Castor Creek/Fourmile Branch

Fourmile Branch receives effluents from F-, H-, and C-Areas (Figure 4-27). Before DOE placed C-Reactor in standby in 1985, heated Savannah River water discharged from C-Reactor to Fourmile Branch via Castor Creek (Wike et al. 1994).

Flow – At present, C-Area receives only a small amount of river water, from valve leakage that ultimately discharges to Fourmile Branch (Gladden 1996b). During Water Year 1996, this discharge (at C-003) averaged 0.59 cubic foot (0.017 cubic meter) per second (Melendez 1996). Upstream from the confluence of the C-Area discharge with Fourmile Branch at monitoring station A-7 (see Figure 4-27), the Fourmile Branch discharge averaged 14.7 cubic feet (0.42 cubic meter) per second in Water Year 1994 (Wike et al. 1994) and 21.3 cubic feet (0.6 cubic meter) per second in Water Year 1995 (USGS 1996). Similar flows have been observed in past years; the average discharge at Road A-7 for 1972 to 1991 was 17.8 cubic feet (0.50 cubic meter) per second (Table 4-30). TE

Temperature – Since the shutdown of C-Reactor, temperatures in Fourmile Branch at Road A ranged from 43° to 88°F (6.2° to 31°C) and averaged 65°F (18.5°C). The wide temperature fluctuations reflect seasonal differences. Temperatures upstream, at Road A-7, reflect a similar range [43° to 79°F (6.4° to 26°C)] and

TE | **Table 4-29.** Pen Branch physical characteristics and general chemistry (CCWS).[a,b]

Location	Dissolved oxygen (mg/l)	Specific conductance (μmhos/cm)[c]	Turbidity (NTU)	Total suspended solids (mg/l)
01 Pen Branch at Road B				
Mean	8.12	45.6	10.6	9.63
Range	5.80-12.3	28.2-75.0	3.10-52.2	0.25-72.4
Samples	46	38	43	45
02 Indian Grave Branch downstream of K-Reactor effluent				
Mean	5.32	74.6	21.4	10.0
Range	2.70-11.5	50.7-90.1	7.30-61.5	0.25-43.2
Samples	45	36	43	45
04 Pen Branch at Road A-17				
Mean	7.53	71.9	14.6	4.63
Range	5.50-12.3	47.7-98.3	3.8-57.4	0.25-36.7
Samples	45	38	43	45

a. Source: Wike et al. (1994).
b. CCWS = Comprehensive Cooling Water Study.
c. To convert centimeters to inches, multiply by 0.3937.

TE | an average of 63°F (17°C) (see Table 4-31; Wike et al. 1994).

Dissolved Oxygen – From 1987 to 1991, dissolved oxygen concentrations in Fourmile Branch at Road A-7 ranged from 5.0 to TE | 12.0 milligrams per liter (Table 4-32). Concentrations of dissolved oxygen are directly related to water temperature and the wide ranges listed are the result of seasonal temperature fluctuations (Wike et al. 1994).

Steel Creek

The headwaters of Steel Creek originate near P-Reactor (Figure 4-25). Flow from the outfall of the L-Lake Dam travels about 3 miles (5 kilometers) through the Steel Creek corridor before entering the Savannah River Swamp and then another 2 miles (3.2 kilometers) before entering the Savannah River. At present, the headwaters of Steel Creek (at P-Area) receive treated effluent from the P-Area sanitary water treatment facility combined with river water overflow from the P-Area 186-Basin (Wike et al. 1994). Since DOE diverted P-Area flow from Par Pond to Steel Creek, this discharge (March through September 1996) has averaged 8.6 cubic feet (0.24 cubic meter) per second (Melendez 1996).

DOE began an extensive water quality monitoring study, the L-Lake/Steel Creek Biological Monitoring Program, after the construction of L-Lake. This study assessed various components of the Steel Creek system and identified changes due to the operation of L-Reactor or discharges from L-Lake. DOE placed sampling stations throughout the Steel Creek corridor, marsh, swamp, and channel (Figure 4-28). TE | Table 4-33 lists the range of values for 34 water quality parameters for Steel Creek from November 1985 to December 1991 (Wike et al. 1994). In addition, sampling at Road A is part of routine SRS monitoring.

Table 4-32. Fourmile Branch physical characteristics and general chemistry.[a] TE

Location	Dissolved oxygen (mg/l)	Specific conductance (µmhos/cm)	Turbidity (NTU)	Total suspended solids (mg/l)
01 Fourmile Branch at Road E-1	(CCWS)[b]			
Mean	6.79	24.3	10.1	13.8
Range	2.30-11.6	12.5-40.7	1.3-60	0.25-270
Samples	46	38	43	45
02 Fourmile Branch at Road A-7	(1987-1991)			
Mean	8.4	56.5	8.2	5.1
Range	5.0-12	0.15-112	1.0-42	0.0-27
Samples	60	60	60	60
03 Fourmile Branch at Road 3	(CCWS)			
Mean	7.81	70.0	20.8	7.82
Range	5.20-12.40	31.5-96.9	0.3-394.0	0.25-152.10
Samples	46	38	43	44
04 Fourmile Branch at Road A	(1987-1991)			
Mean	7.9	44.3	5.2	3.1
Range	6.5-12	11-103	1.0-23	1.0-47
Samples	60	60	60	60
05 Fourmile Branch at Road A-12.2	(CCWS)			
Mean	5.99	87.0	18.5	9.31
Range	3.50-11.8	59.3-108.2	4.3-118.0	0.25-109.70
Samples	46	45	43	45

a. Source: Wike et al. (1994).
b. CCWS = Comprehensive Cooling Water Study.

Flow – During Water Year 1996, the mean flow at Road A was 59.2 cubic feet (1.7 cubic meters) per second (Melendez 1996). The mean flow for 1985 to 1991 was 185 cubic feet (5.2 cubic meters) per second (Table 4-34). The mean flow at the L-Lake outfall for Water Year 1996 was 41.5 cubic feet (1.2 cubic meters) per second (Melendez 1996). TE

As previously discussed in this section, DOE prepared an EA in 1995 (DOE 1995a) that addressed the impact of reducing the flow from L-Lake to Steel Creek to 10 cubic feet (0.28 cubic meter) per second. The EA concluded that reducing the Steel Creek flows would result in the reestablishment of stream conditions that existed before the creation of SRS.

Steel Creek flows below the L-Lake dam have averaged 41.5 cubic feet (1.17 cubic meters) per second (Water Year 1996) during a period when one river water pump operated continuously, pumping approximately 28,000 gallons per minute (1.8 cubic meters per second) to the reactor areas (Melendez 1996). The surplus water from the reactor areas (overflow from 186-Basins) discharged to L-Lake, along wi h flows from

TE | **Table 4-34.** Flow summary for Steel Creek (cubic feet per second).[a,b]

Station	Period of record	Mean	Range: Low	Range: High	7Q10	7-day low flow
Road A at SRS	1985-1991	185	7.7	500	12.9	11.6

a. Source: Wike et al. (1994).
b. To convert cubic feet to cubic meters, multiply by 0.028317.

P-Area and natural inflows from the Steel Creek watershed.

Temperature – Since the construction of L-Lake, Steel Creek water temperatures measured at the Road A monitoring station have been similar to preconstruction conditions, ranging from 45° to 86°F (7.1° to 30°C), with expected seasonal fluctuations, and an average of 66°F (19°C). Similar temperatures occurred throughout the Steel Creek corridor (Wike et al. 1994). The mean temperature at the L-Lake outfall during 1992 was 66°F (19°C), the minimum was 49°F (9°C), and the maximum was 84°F (29°C) (Wike et al. 1994). These readings were similar to values recorded in previous years (1990 and 1991).

pH measurements – The pH of Steel Creek at Road A ranged from 5.6 to 8.3 during the period from 1987 to 1991. Before the construction of L-Lake, pH measurements were comparable, ranging from 6 to 8 (Wike et al. 1994). The 1992 mean (6.5), minimum (5.7), and maximum (7.9) pH values at the L-Lake outfall were similar to the values for 1990 and 1991 (Wike et al. 1994).

Dissolved Oxygen – Dissolved oxygen concentrations at the Steel Creek Road A station from 1987 to 1991 ranged from 5 to 12 milligrams per liter (Wike et al. 1994). In the Steel Creek swamp, dissolved oxygen concentrations as low as 0.6 milligram per liter were recorded. Dissolved oxygen measurements for 1992 were a minimum of 7.4 milligrams per liter, a mean of 9.5 milligram per liter, and a maximum of 12.4 milligrams per liter (Wike et al. 1994). These readings were similar to measurements from previous years (Wike et al. 1994). Seasonal fluctuations occur because the solubility of oxygen in fresh water is inversely proportional to the temperature.

Total Suspended Solids and Turbidity – Mean total suspended solids (TSS) and turbidity levels in Steel Creek at Road A were 5.3 milligrams per liter and 3.7 NTU, respectively, from 1987 to 1991 (Wike et al. 1994). These levels were within the ranges measured before the construction of L-Lake.

On several occasions (November and December 1985, May and September 1986, February 1987, July 1988, and February 1989), TSS levels at Steel Creek corridor stations between the dam and the delta were considerably above normal, TE | as high as 204 milligrams per liter (Table 4-33). These concentrations might have been related to high TSS levels in L-Lake discharge waters, the increased discharge volume from L-Lake, or storm events that eroded the bank and increased sediment transport at a particular station. Mean TSS values did not exceed 5 milligrams per liter during 1992. Baseline TSS levels in Steel Creek were similar to levels in Meyers Branch, a tributary to Steel Creek (Wike et al. 1994).

Major Anions and Cations – Alkalinity concentrations in Steel Creek at Road A ranged from 1 to 21 milligrams of calcium carbonate per liter from 1987 to 1991. Mean chloride and sulfate concentrations measured from 1987 to 1991 at Road A were 6.7 and 6.9 milligrams per liter, respectively (Wike et al. 1994).

From 1987 to 1991 calcium concentrations at Road A ranged from 1.9 to 3.8 milligrams per liter and sodium concentrations ranged from 5.4 to 11.0 milligrams per liter (Wike et al. 1994).

Magnesium concentrations ranged from 0.89 to 1.4 milligrams per liter.

From 1987 to 1991 aluminum ranged from less than 0.01 to 0.16 milligram per liter, iron ranged from less than 0.02 to 0.26 milligram per liter, and manganese ranged from less than 0.01 to 0.17 milligram per liter at Road A (Wike et al. 1994).

Nutrients – Total phosphorus is the only form of phosphorus measured as part of the routine water quality monitoring program. From 1987 to 1991 the mean total phosphorus concentrations in Steel Creek at Road A was 0.032 milligram per liter, and the range was less than 0.01 to 0.36 milligram per liter (Wike et al. 1994). Similar ranges occurred in the corridor and swamp.

Organic nitrogen, ammonia, and nitrate are measured as part of the routine water quality monitoring program in Steel Creek at Road A. The means for these forms of nitrogen were as follows: organic nitrogen - 0.37 milligram per liter; ammonia - 0.076 milligram per liter; and nitrate - 1.00 milligram per liter (Wike et al. 1994).

Priority Pollutants – A special study to determine the levels of volatile, acid, and base/neutral organics in Steel Creek determined that concentrations of all 88 tested organics were below detection limits at both the Road B and Road A sampling locations (Wike et al. 1994).

Pesticides, Herbicides, and PCBs – Water samples are collected annually from Steel Creek at Road A as part of the routine water quality monitoring program and analyzed for pesticides, herbicides, and PCBs. From 1987 to 1991 no analytes were detected in Steel Creek (Wike et al. 1994).

Steel Creek Chemical Assessment

Water quality values during the Steel Creek Biological Monitoring Program were similar to the range of values reported for other regional lotic systems, and typical of southeastern waters in general (Wike et al. 1994).

During parts of the study, downstream gradients were observed between corridor Stations 275 and 290 (Figure 4-28) for temperature; dissolved oxygen; pH; total organic and inorganic carbon; ortho- and total phosphorus; nitrite-nitrogen, nitrate-nitrogen, and ammonia-nitrogen; total inorganic nitrogen; silica; total aluminum; total and dissolved iron; total and dissolved sodium; chloride; total and dissolved magnesium; total and dissolved potassium; and total and dissolved calcium. These differences were attributed to such natural conditions as cooling, metabolic activity of stream organisms, or chemical reactions (Wike et al. 1994).

Pre- and postimpoundment data for 1985 to 1989 indicated that increases in temperature, conductivity, total phosphorus, nitrate-nitrogen, ammonia-nitrogen, total and dissolved sodium, and chloride, and decreases in pH have occurred in relation to preimpoundment conditions documented during the Comprehensive Cooling Water Study. These changes reflected differences between releases of water from L-Lake (dominated by Savannah River water) and the natural drainage of the Steel Creek basin (Wike et al. 1994).

Lower Three Runs

From the Par Pond Dam, Lower Three Runs flows about 15 miles (24 kilometers) before it enters the Savannah River (Wike et al. 1994).

Water Quality – Lower Three Runs is a nonthermal stream with water temperatures that vary seasonally, but usually remain below 31°C (88°F) (Wike et al. 1994). Tables 4-35 and 4-36 list water quality data, and Figure 4-29 shows the locations of sampling stations. The greatest pH range among the Lower Three Runs sampling locations (5.5 to 8.8) occurred at Road B (just below the dam). The lowest dissolved oxygen concentration (2.4 milligrams per liter) was also at Road B; downstream dissolved oxygen concentrations were all greater than 4.5 milligrams per liter.

Lower Three Runs Flow – During Water Year 1996, the mean flow in Lower Three Runs below Par Pond was 28.0 cubic feet (0.80 cubic meter) per second (Melendez 1996). Flows were seasonal with the winter and spring months (October to March) having the highest average flows, 38.0 cubic feet (1.1 cubic meters) per second. The average flow from April to September was 17.0 cubic feet (0.5 cubic meter) per second. Average flow at Road B based on the period of record ending in 1991 was 36.5 cubic feet (1.0 cubic meter) per second. Table 4-37 presents flows at the next downstream station, Patterson Mill, which are about a twofold increase from those at Road B (Wike et al. 1994).

4.2.2.2 Environmental Impacts

4.2.2.2.1 No Action

Under the No-Action Alternative, DOE would continue to operate a small 5,000-gallon-per-minute (0.3-cubic-meter-per-second) pump to maintain L-Lake levels. The minimum flows from L-Lake into Steel Creek would be approximately 10 cubic feet (0.28 cubic meter) per second. Lower Three Runs would continue to receive 10 cubic feet per second. Under No Action, only natural flows from the headwaters of Steel Creek and Fourmile Branch would occur. The following paragraphs discuss the impacts of reduced or absent river water flows to each of these stream systems.

4.2.2.2.2 Shut Down and Deactivate

DOE expects no impacts to Indian Grave Branch/Pen Branch, Fourmile Branch, or Lower Three Runs beyond those described for the No-Action Alternative (Section 4.2.2.2.1). If L-Lake emptied, Steel Creek would receive natural base flows, which would vary but are likely to average 10 cubic feet (0.28 cubic meter) per second at the dam location.

Under this alternative, the L-Lake water level would recede to that of the original stream, and there would be a potential for an occasional discharge of sediments accumulated upstream of the dam. Such a discharge would depend on the amount of water impounded at the discharge structure and the possibility for impoundment sediment in the area of the outlet structure. Depending on the depth of the water at the structure, sediment deposited in the area could be resuspended and transported to Steel Creek below the dam during high water flow periods and storm events. The amount of sediment impounded in the area would depend on the effectiveness of revegetation and other erosion control measures implemented during lake drawdown. The addition of suspended solids to the stream during stormwater events is a potential ecological impact, as discussed in Section 4.2.5.

Table 4-37. Flow summary for Lower Three Runs (cubic feet per second).[a,b]

Station name	Period of record	Range				
		Mean	Low	High	7Q10	7-day low flow
Patterson Mill	1974-1991	85	13	743	15.6	15.1

a. Source: Wike et al. (1994).
b. To convert cubic feet to cubic meters, multiply by 0.028371.

4.2.2.2.3 Shut Down and Maintain

This alternative would produce the same impacts as the Shut Down and Deactivate Alternative, but a restart of the River Water System could increase flows to the streams.

4.2.3 GROUNDWATER

This section describes groundwater conditions in the vicinity of potentially affected SRS streams (Steel Creek, Pen Branch, Fourmile Branch, and Lower Three Runs).

4.2.3.1 Affected Environment

Hydrogeologic Setting

In general on the SRS, the water table aquifer and the first confined aquifer recharge to the streams that incise them. The water table aquifer discharges to both Steel Creek and Pen Branch tributaries. The groundwater flow to Steel Creek and L-Lake from the L-Area is toward the southeast. The groundwater flow to Pen Branch from L-Area is to the northwest. Although groundwater discharges to L-Lake in its upstream portions, lake water at the L-Lake dam recharges the water table aquifer. The net flux of groundwater in the first confined aquifer is believed to originate from L-Lake and the water table aquifer (del Carmen and Paller 1993b). Further downstream, the aquifers resume discharge to the stream in a southerly direction. Below the Par Pond Dam, the water table aquifer and first confined aquifer discharge to the Lower Three Runs stream valley. Hydraulic properties for the aquifers are not available for specific stream areas. Therefore, Tables 4-1 and 4-2 list general sitewide data.

4.2.3.2 Environmental Impacts

4.2.3.2.1 No Action

DOE anticipates no changes in current conditions for the water table aquifer or the first confined aquifer because the lake level would be maintained.

4.2.3.2.2 Shut Down and Deactivate

Water Table Aquifer

The current outfall from L-Area would be eliminated and L-Lake levels would lower. Because L-Lake discharges to the water table aquifer below the dam and into Steel Creek, groundwater gradients, levels, and flow rates of the aquifer would decrease over the near term but would eventually return to the natural hydrogeologic state. Groundwater properties would remain stable downstream from the dam.

Fourmile Branch and headwaters of Steel Creek would not receive outfall discharges from the River Water System. The water table aquifer at Lower Three Runs would not be affected because its source of water is not directly related to the River Water System.

First Confined Aquifer

Because none of the SRS streams and their outfalls currently or directly affect the properties of this aquifer, shutting down the River Water System would not have an effect.

4.2.3.2.3 Shut Down and Maintain

The impacts described in Section 4.2.3.2.2 would also apply to this alternative.

4.2.4 AIR RESOURCES

4.2.4.1 Affected Environment

The climate, meteorology, and ambient air quality for the SRS streams are equivalent to those for the SRS, which is discussed in Section 4.1.4.1. DOE assumes that joint wind frequency data from the L-Area tower and meteorological and climatological data from other SRS locations would be applicable to the streams.