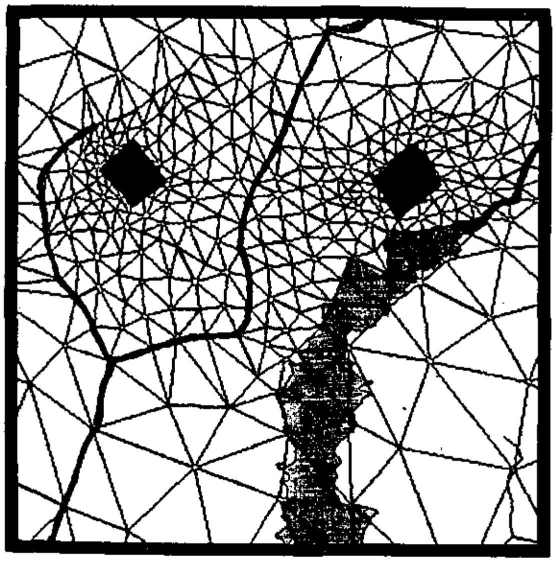
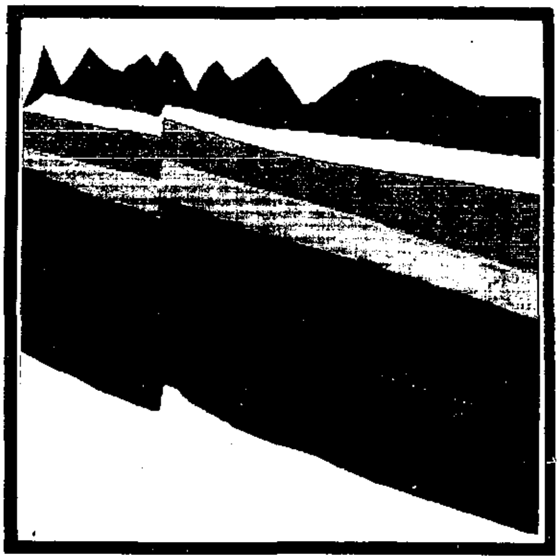
WSRC-RP-89-1198

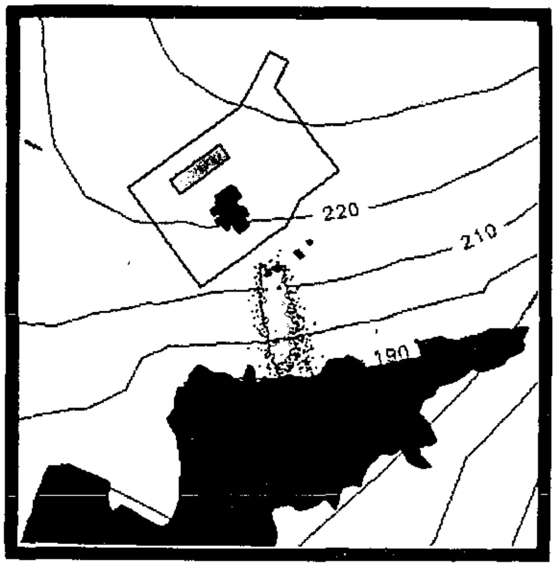
FINAL REPORT

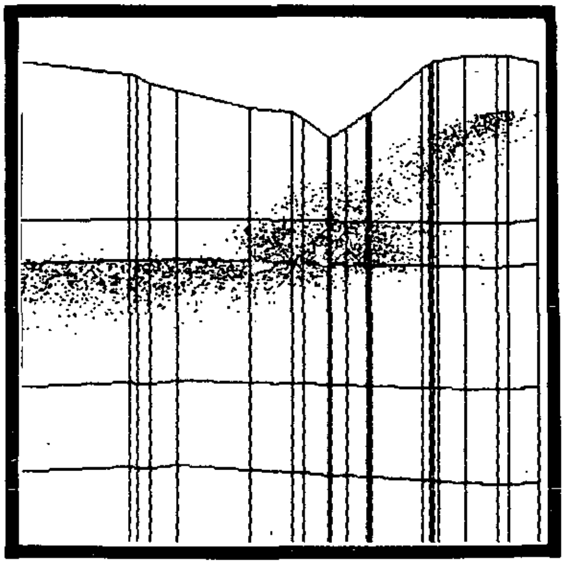
NUMERICAL SIMULATION OF GROUNDWATER FLOW AND CONTAMINANT TRANSPORT AT THE K, L, AND P AREAS OF THE SAVANNAH RIVER SITE AIKEN, SOUTH CAROLINA

NOVEMBER 1989









prepared for:

Westinghouse Savannah River Company

Camp Dresser & McKee Inc.
Atlanta, Georgia

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637/2

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1.0 INTRODUCTION

The Department of Energy (DOE) is preparing an Environmental Impact Statement (EIS) as part of the process for continuing operation of three reactors at the Savannah River Site (SRS). The SRS is a major DOE facility located near Aiken, South Carolina. The three reactors are known as the K, L, and P reactors and their locations within the SRS are shown in **Figure 1-1**. Site maps for the three reactor areas are presented in **Figures 1-2** through **1-4**. As required by the National Environmental Policy Act (NEPA), the EIS must address the potential environmental consequences to human health and the environment of this "major federal action." Some of the possible consequences are related to subsurface transport of radionuclides released to seepage basins during normal reactor operation. To assist in the evaluation of the potential subsurface environmental impacts of these releases, Camp Dresser & McKee Inc. (CDM) was contracted in June of 1989 to develop a three-dimensional groundwater flow and contaminant transport model which will simulate the movement of radionuclides at each of the reactor areas after they enter the groundwater system through the seepage basins. This report describes the development, calibration, and simulation results of the groundwater flow and contaminant transport model developed for this task.

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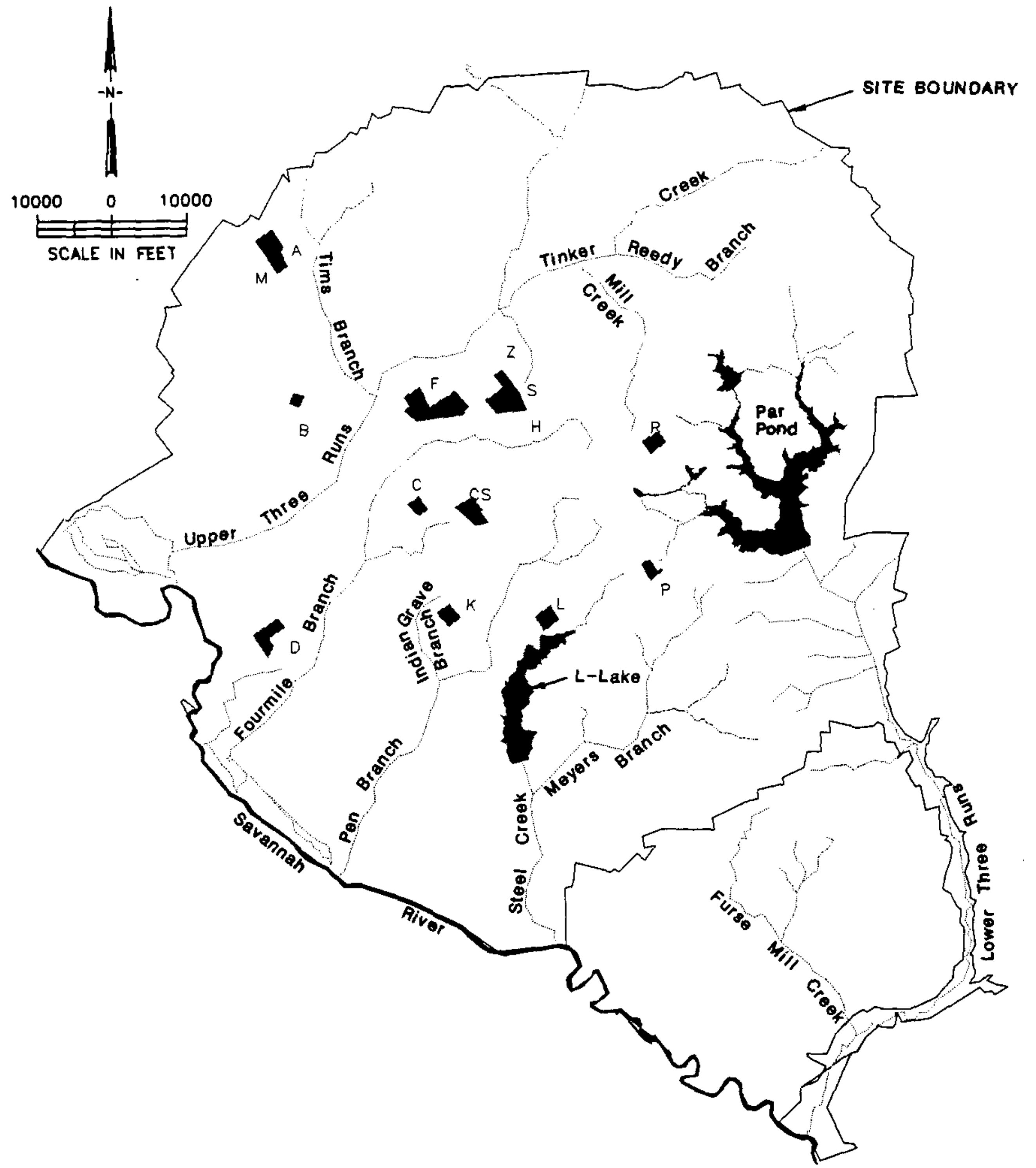

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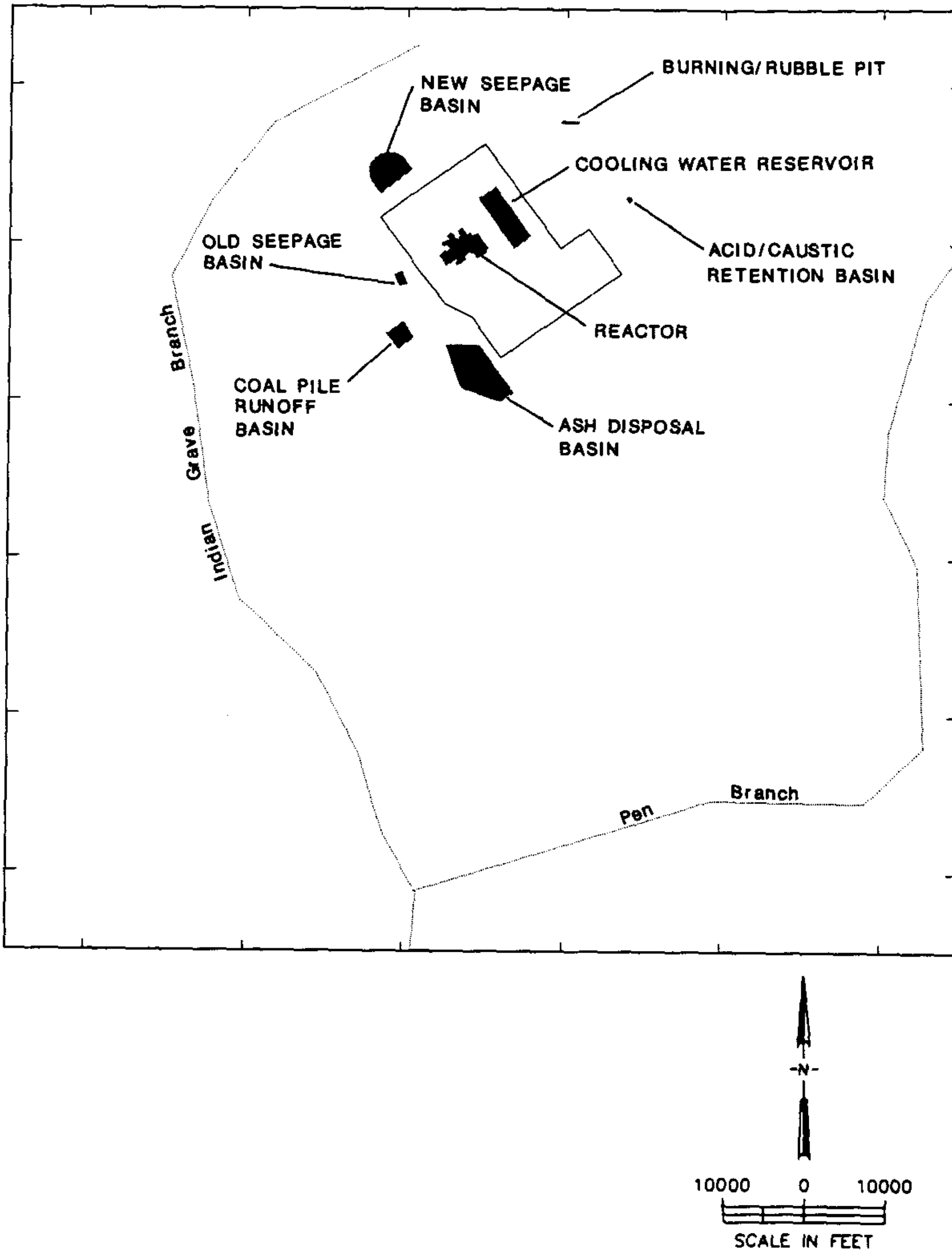
SITE BASE MAP

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 1-1



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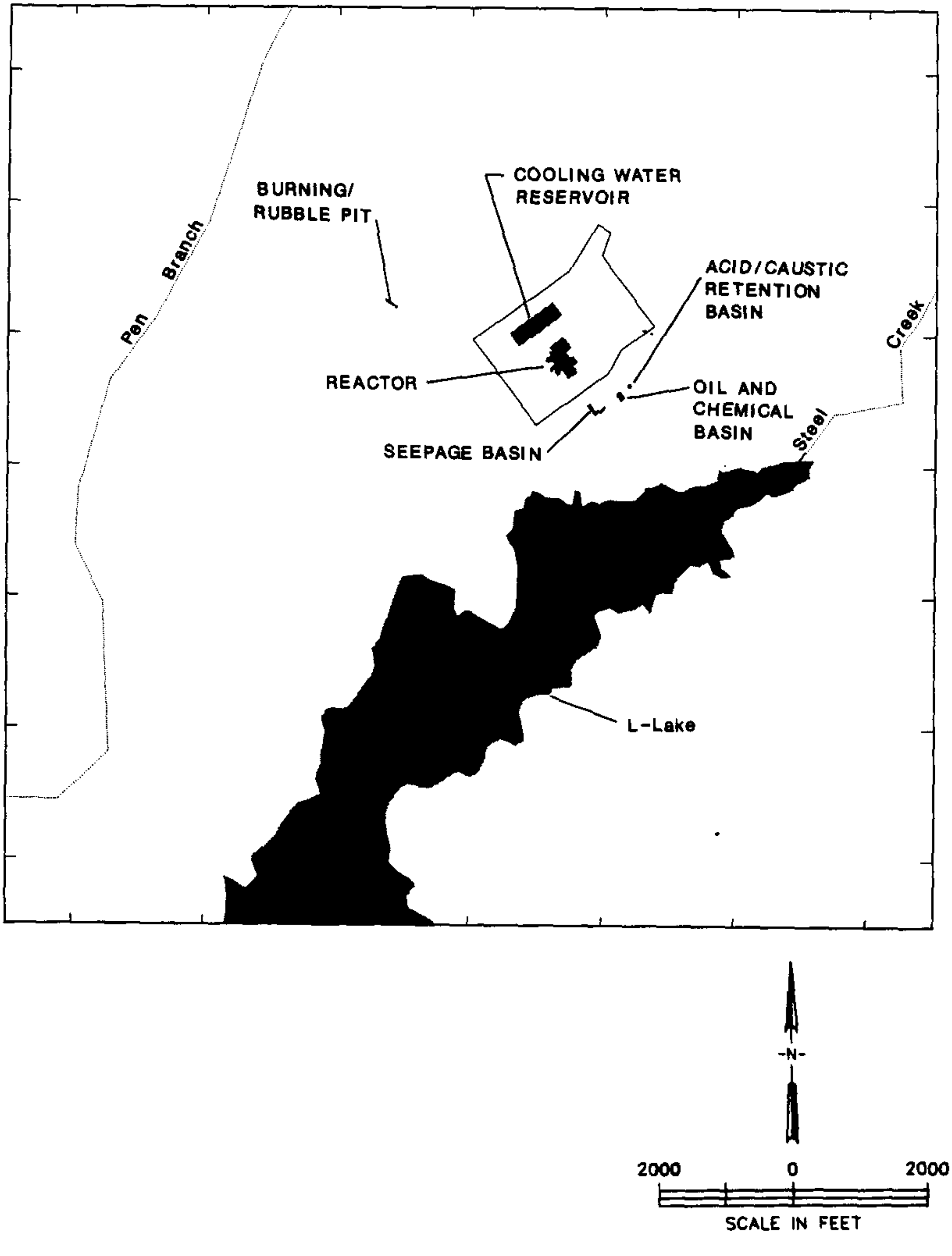
K REACTOR AREA SITE MAP

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 1-2

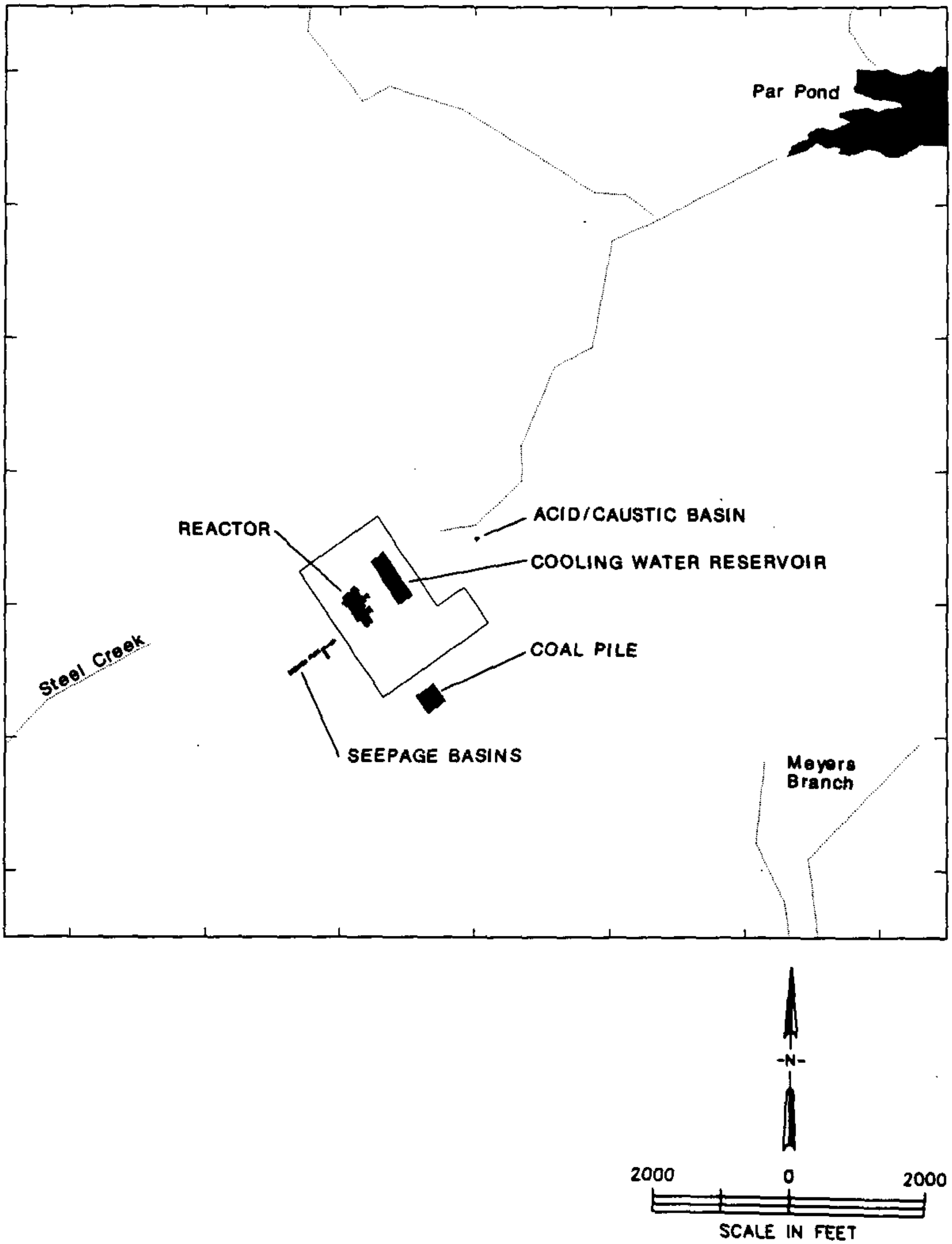


CAMP DRESSER & McKEE INC.

L REACTOR AREA SITE MAP

SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

FIGURE NO. 1-3



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P REACTOR AREA SITE MAP

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 1-4

2.0 HYDROGEOLOGY

The SRS is located in the Aiken Plateau physiographic division of the Upper Atlantic Coastal Plain province of South Carolina. The center of the SRS is about 30 miles southeast of the Fall Line that separates the Atlantic Coastal Plain tectonic province from the piedmont tectonic province. Crystalline rocks of Precambrian and Paleozoic age underlie a major portion of the gently seaward-dipping Coastal Plain sediments of Cretaceous and younger age. Sediment-filled basins of Triassic and Jurassic age occur within the crystalline basement throughout the Coastal Plain of Georgia and the Carolinas. One of these, the Dunbarton Triassic Basin, underlies parts of the SRS.

The Aiken Plateau underlying the SRS slopes from an elevation of approximately 700 feet above mean sea level at the Fall Line to an elevation of about 250 feet above mean sea level to the southeast. The surface of the Aiken Plateau, which is highly dissected, is characterized by broad, interfluvial areas and narrow, steep-sided valleys. Because of the SRS's proximity to the Piedmont region, it has somewhat more relief than the near-coastal areas. Onsite elevations range from about 80 to 425 feet above mean sea level.

The SRS is generally well-drained although small, poorly drained depressions occur. The Savannah River system is the principal surface water drainage system at the SRS. The Savannah River adjoins the plant along its southwestern boundary. The total drainage area of the river (approximately 10,600 square miles) encompasses all or parts of 41 counties in Georgia, South Carolina, and North Carolina. Over 77 percent of the drainage area is upstream of the SRS. The SRS is drained almost entirely by five streams: Upper Three Runs Creek, Four Mile Creek, Pen Branch Creek, Steel Creek, and Lower Three Runs Creek. These streams originate on the Aiken Plateau and descend 100 to 200 feet before discharging to the Savannah River.

Three distinct hydrogeologic systems underlie the SRS: (1) the Coastal Plain sediments where groundwater flows through porous sands, clays and limestones; (2) the crystalline metamorphic rock beneath the Coastal Plain sediments where groundwater flows through small fractures in schist, gneiss, and quartzite; and

(3) the Dunbarton Basin within the crystalline metamorphic complex, where groundwater flows through intergranular spaces in indurated mudstones, siltstones, sandstones, and conglomerates. This study focused solely on the Coastal Plain sediments aquifer system.

2.1 HYDROSTRATIGRAPHY

The Coastal Plain sediments aquifer system at the SRS is very complex. The geology indicates a depositional environment with many interbedded clay, silt, and sand lenses creating an intricate three-dimensional flow system. Upon detailed inspection, however, the aquifer system can be divided into six main hydrostratigraphic units, which are composed of several geologic stratigraphic units (see **Figure 2-1**). A geologic stratigraphic cross-section through the three reactor areas is presented in **Figure 2-2**. The location of this geologic stratigraphic cross-section is shown in **Figure 2-3**.

The Cape Fear stratigraphic unit is a dense clay which acts as an aquitard at the base of the aquifer system and therefore forms the base aquitard hydrostratigraphic unit. Overlying the base aquitard is the regional cretaceous-age aquifer (hereafter referred to as Aquifer 1). This hydrostratigraphic unit is composed of unconsolidated sediments from the Middendorf, Black Creek, and Steel Creek stratigraphic units. Aquifer 1 is approximately 500 feet thick and is an excellent source of high quality water and can sustain yields of up to 1000 gallons per minute (gpm) in water supply wells. The upper 20 feet, on average, of the Steel Creek unit is a dense silty clay of low permeability. This 20-foot thick silty clay formation, combined with the Ellenton stratigraphic unit overlying it, forms a leaky aquitard (hereafter referred to as the "Ellenton" Aquitard) which is approximately 100 feet thick. Although the Ellenton formation does contain some coarse sand lenses, the strings and lenses of clays throughout the unit makes it an effective aquitard. Overlying the Ellenton formation is a tertiary-age aquifer (hereafter referred to as Aquifer 2) comprised of the Snapp, Four Mile, and Congaree stratigraphic units. This hydrostratigraphic unit is approximately 100 feet thick and consists predominantly of fine to medium and medium to coarse, well sorted sands. This aquifer is not nearly as prolific as Aquifer 1, but can sustain yields up to 100 gpm in water supply wells. Overlying Aquifer 2 is the

Hydrogeologic Unit	Stratigraphic Unit (s)
Water Table	Upland Tobacco Road Dry Branch Clinchfield
"Green Clay" Aquitard	Santee
Aquifer 2 or Tertiary Age	Congaree Four Mile Snapp
"Ellenton" Aquitard	Ellenton and 20 feet of Steel Creek
Aquifer 1 or Cretaceous Age	Steel Creek Black Creek Middendorf
Base Aquitard	Cape Fear

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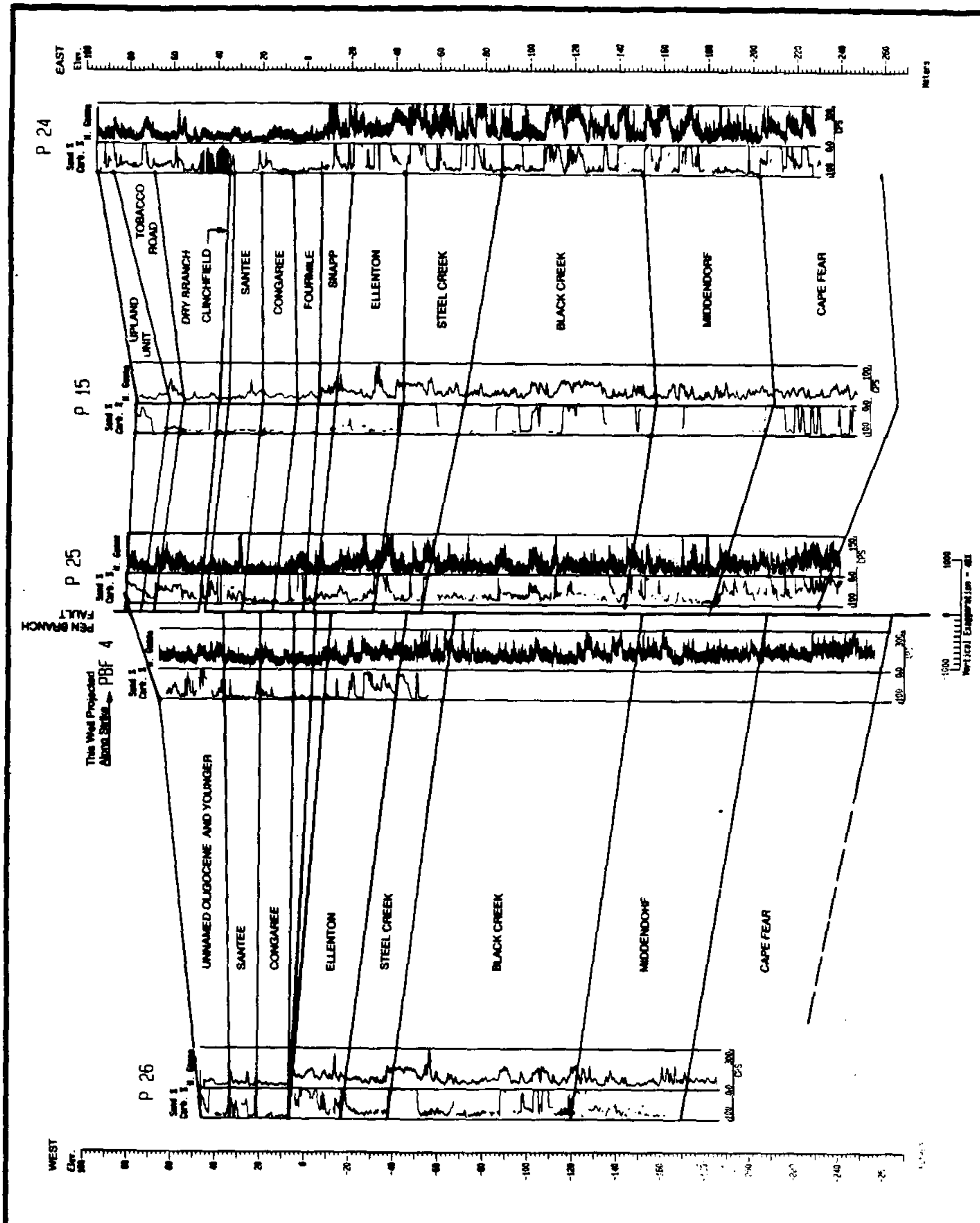
HYDROSTRATIGRAPHIC AND GEOLOGIC STRATIGRAPHIC UNITS

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 2-1



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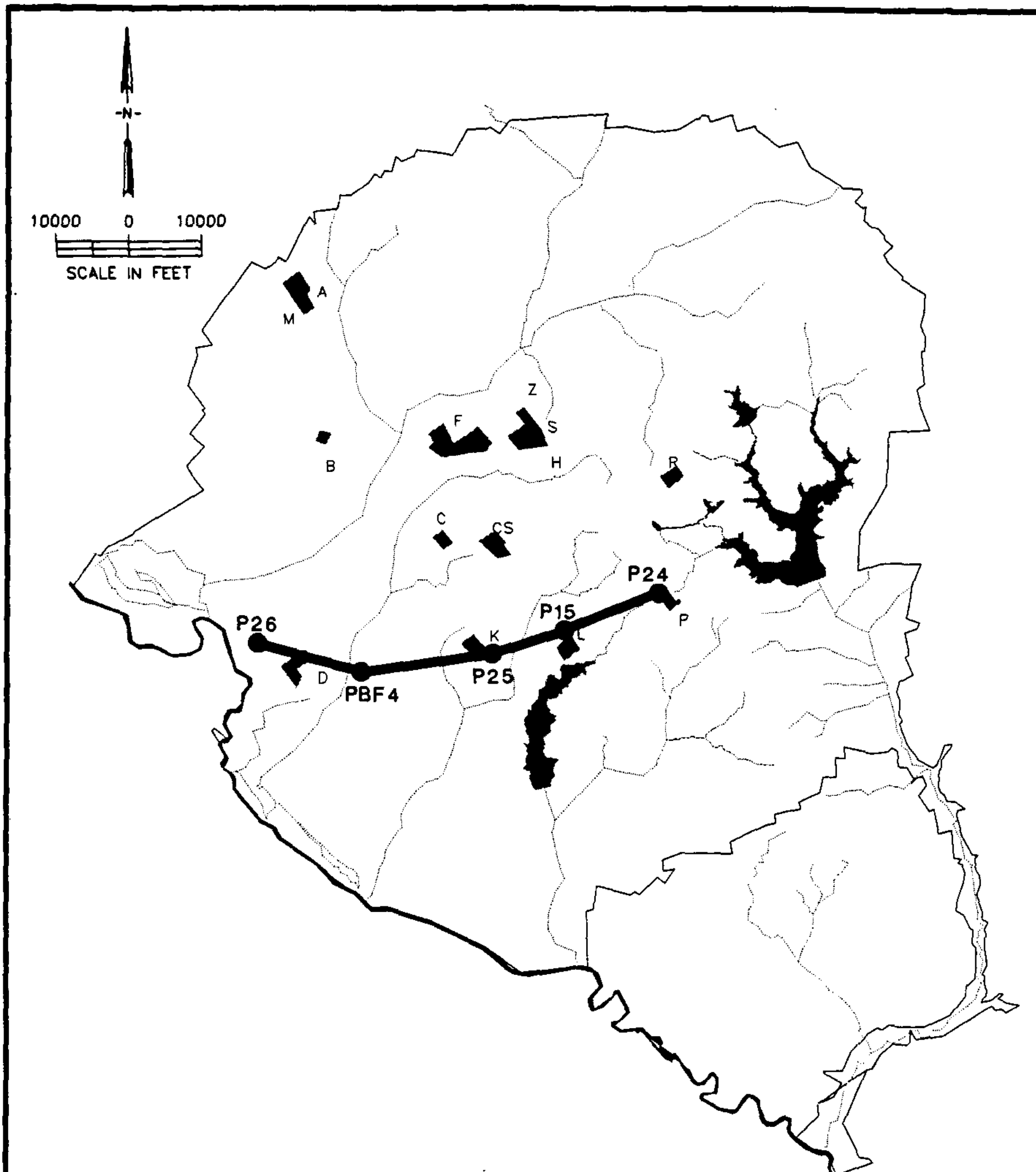
GEOLOGIC STRATIGRAPHIC CROSS-SECTION

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO.
2-2



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GEOLOGIC STRATIGRAPHIC CROSS-SECTION LOCATION

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO.

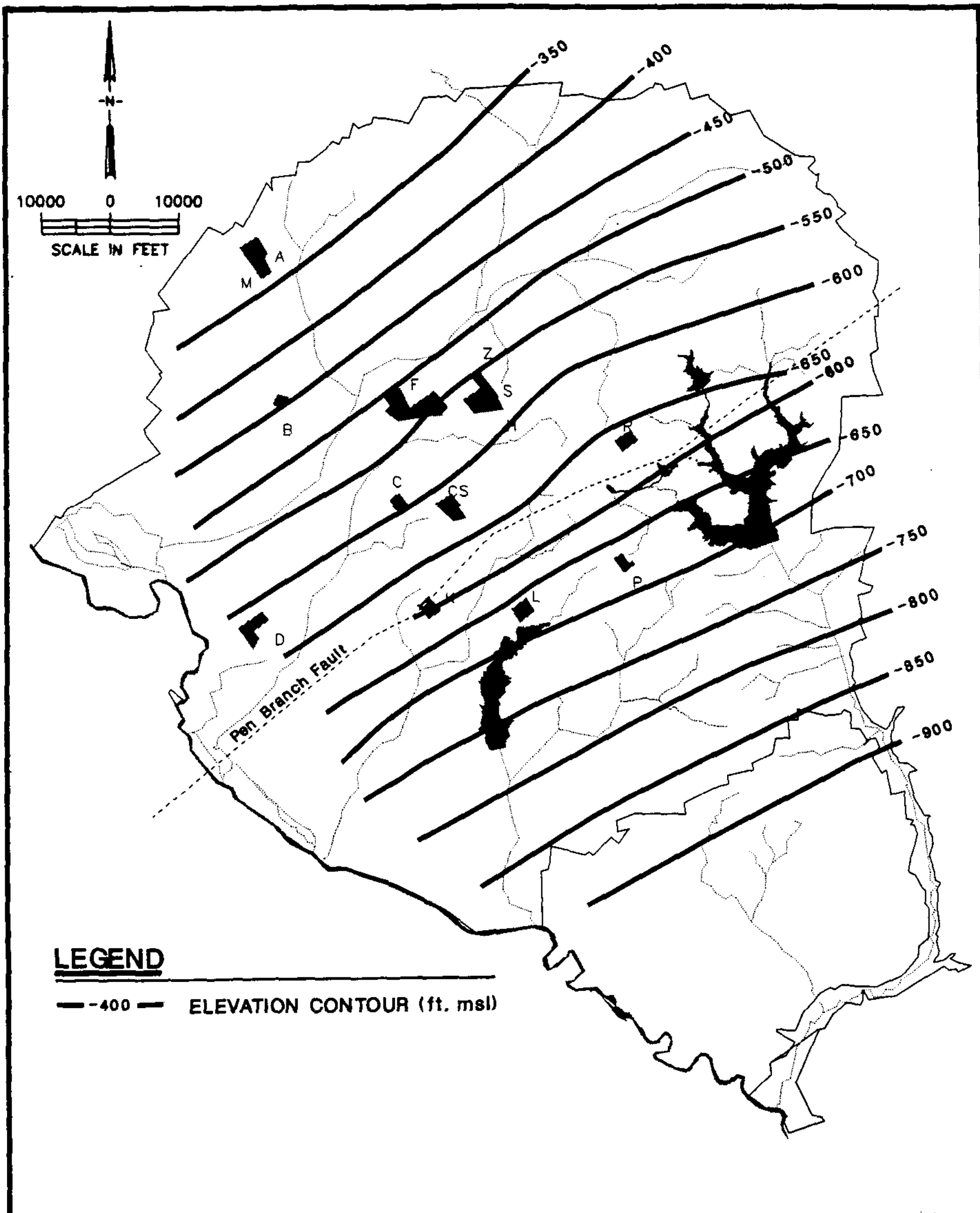
2-3

Santee stratigraphic unit which acts as leaky aquitard (hereafter referred to as the "Santee" Aquitard) which is approximately 50 feet thick.

This unit is often called the "green clay" because of the interbedded greenish glauconite. The Santee unit, however, is actually mostly composed of fine silty material with interbedded clays. Overlying the "Santee" Aquitard is the water table hydrostratigraphic unit which is not by strict definition an aquifer because of its low water producing capabilities. Several wells screened in the water table at the SRS cannot even produce 1 gpm for a substantial period. Nevertheless, it is a distinct and important hydrostratigraphic feature at the SRS since any aquifer contamination entering at the surface must first flow through the water table unit before entering other hydrostratigraphic units or discharging to surface waters. Thickness of the water table unit varies greatly (from 0 to approximately 200 feet) across the site due to the changing topography.

In some areas of the SRS, it may be necessary to modify or subdivide the hydrostratigraphic units to include local features. For example, to effectively describe the hydrostratigraphy in the northern part of the SRS, it is necessary to insert a leaky aquitard in the water table unit thus dividing the water table into three hydrostratigraphic units. This aquitard has been previously referred to as the "tan clay". At the K, L, and P reactor areas, however, evidence from core descriptions and geophysical logs indicates that the tan clay is very sporadic and thin in these areas and is therefore not a consistent unit.

The elevations of the five lower hydrostratigraphic units are presented in **Figures 2-4** through **2-8** for most of the SRS. Land surface elevations indicating the top of the water table unit are presented for the K, L, and P reactor areas in **Figures 2-9** through **2-11**, respectively. The Pen Branch Fault, a significant geologic feature extending from northeast to southwest through the middle of the SRS, is also shown in Figures 2-4 through 2-8. This fault causes an offset in the hydrostratigraphic formations that can be quantified by extrapolating up to the fault from both sides. The significance of the Pen Branch Fault to groundwater flow in the Coastal Plain sediments aquifer system was evaluated during development of the groundwater flow model and is discussed further in Section 3.3.



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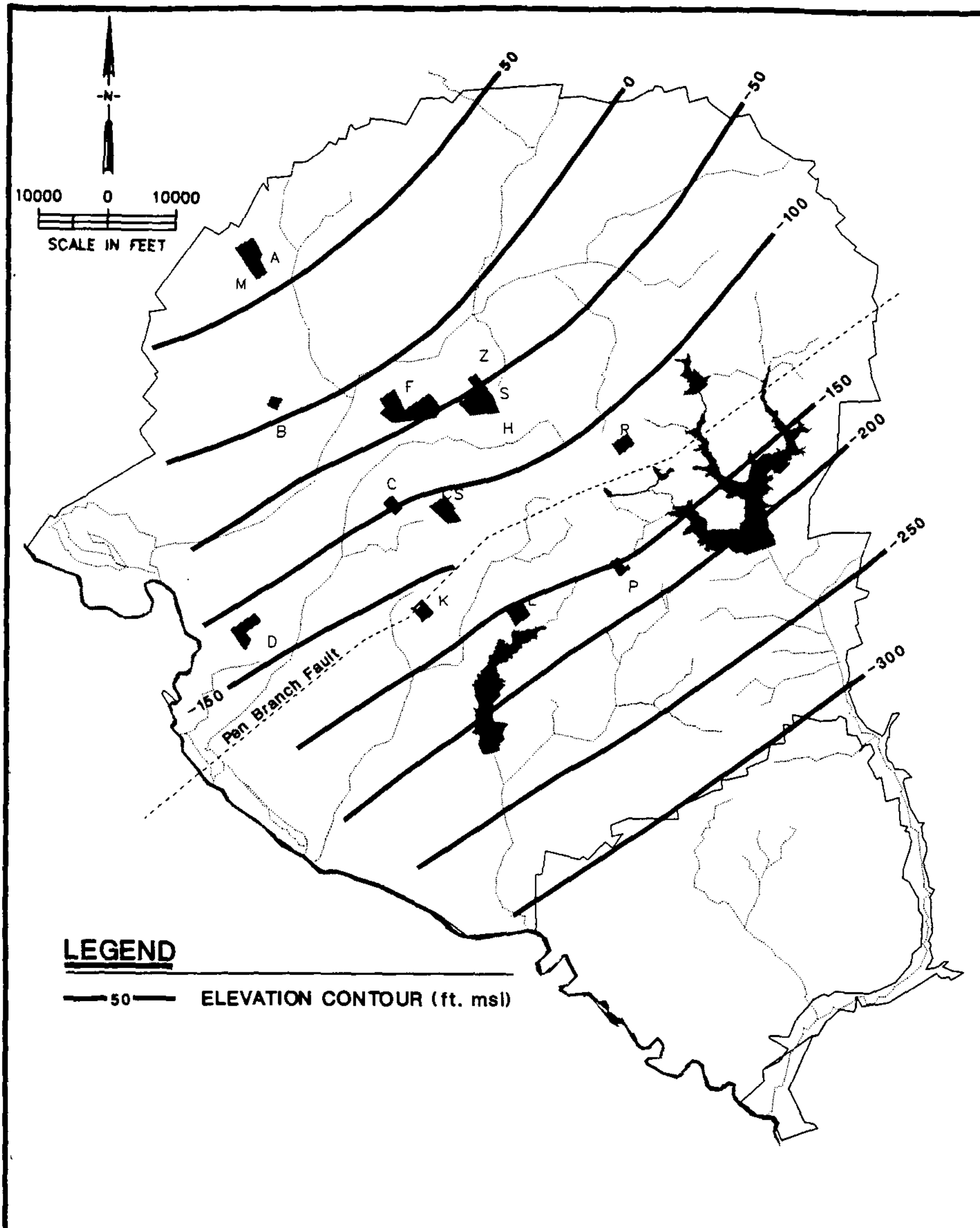
ELEVATIONS OF THE TOP OF THE BASE AQUITARD

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO.

2-4



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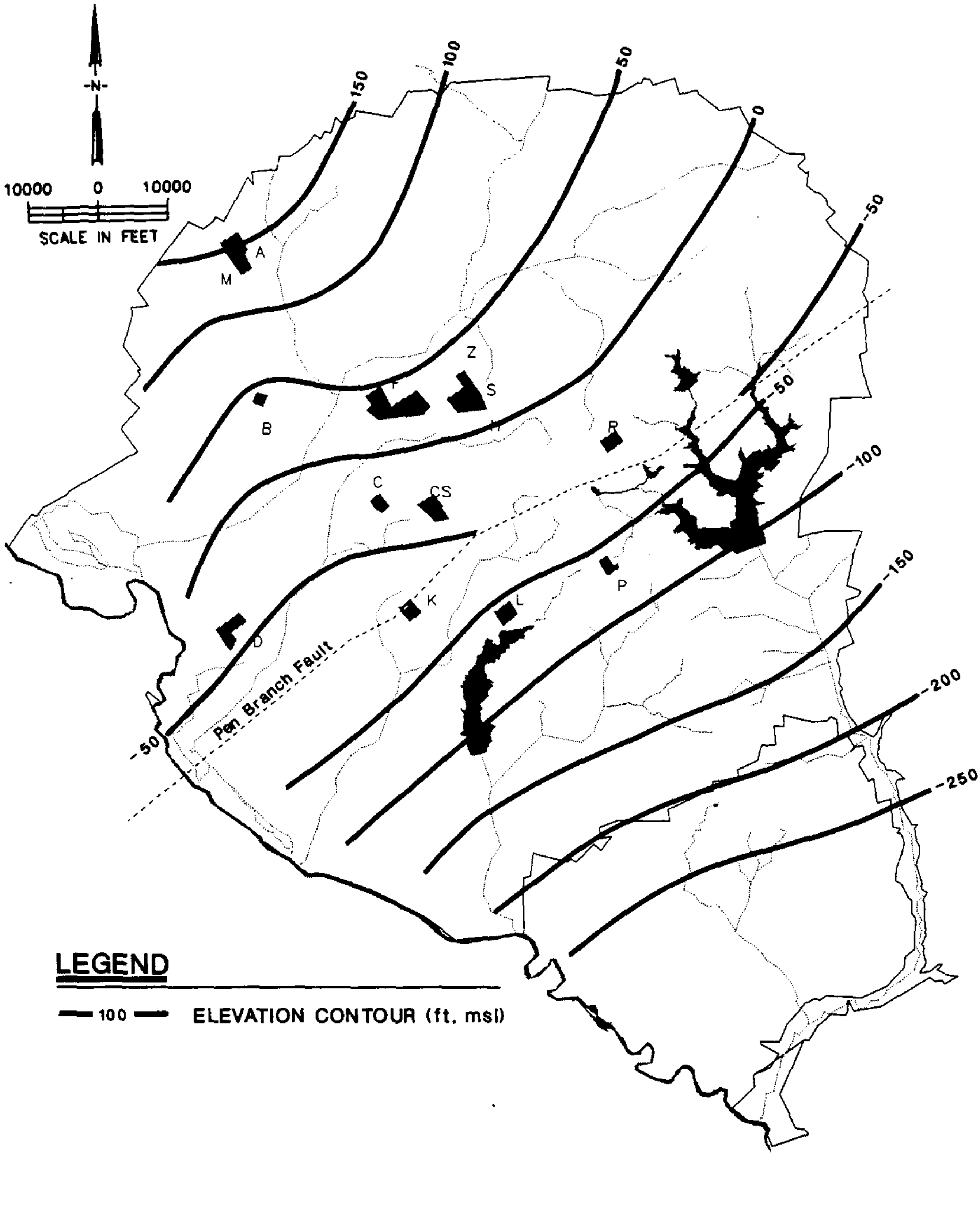
ELEVATIONS OF THE TOP OF AQUIFER 1

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 2-5



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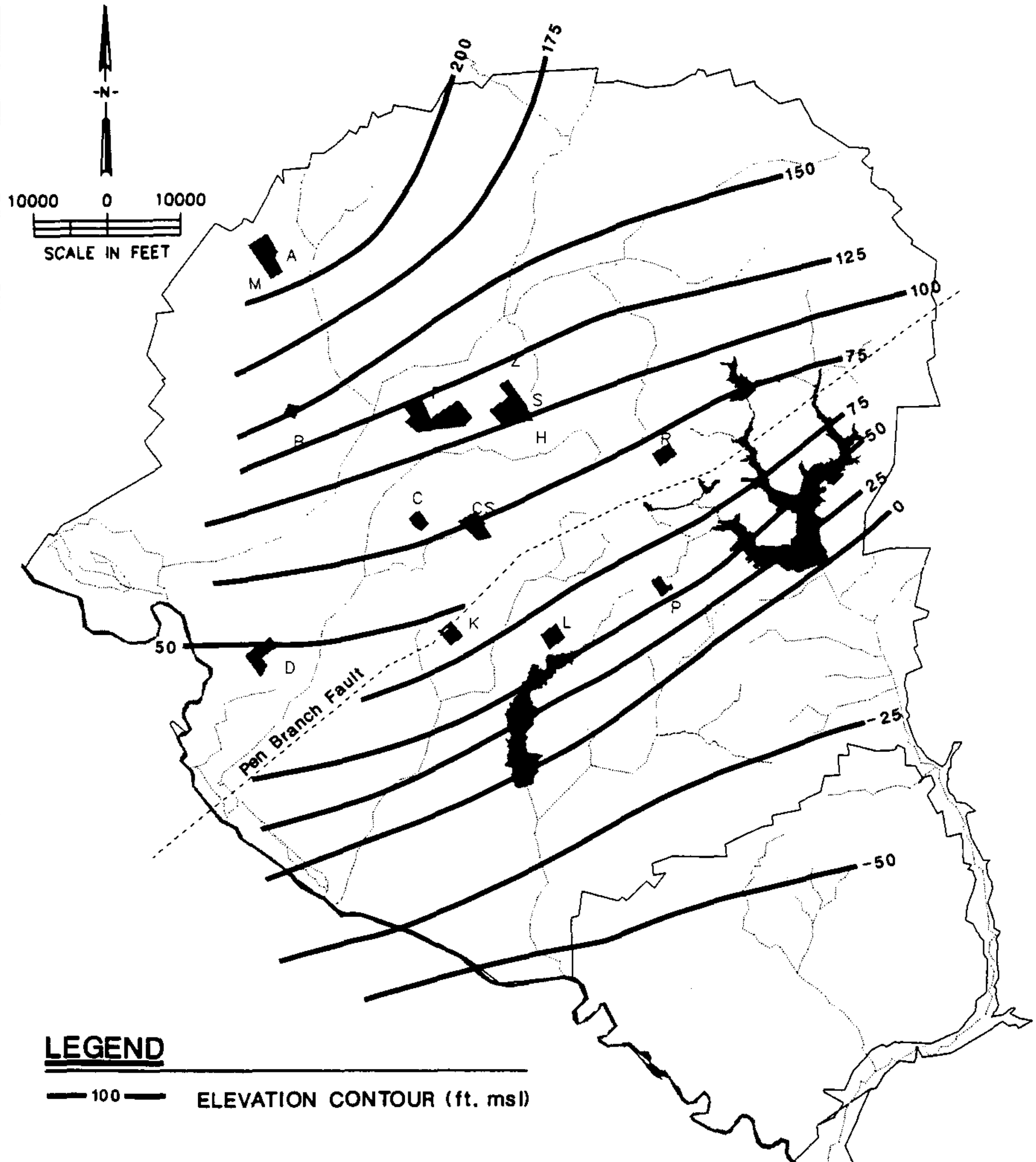
ELEVATIONS OF THE TOP OF THE "ELLENTON" AQUITARD

SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

FIGURE NO. 2-6



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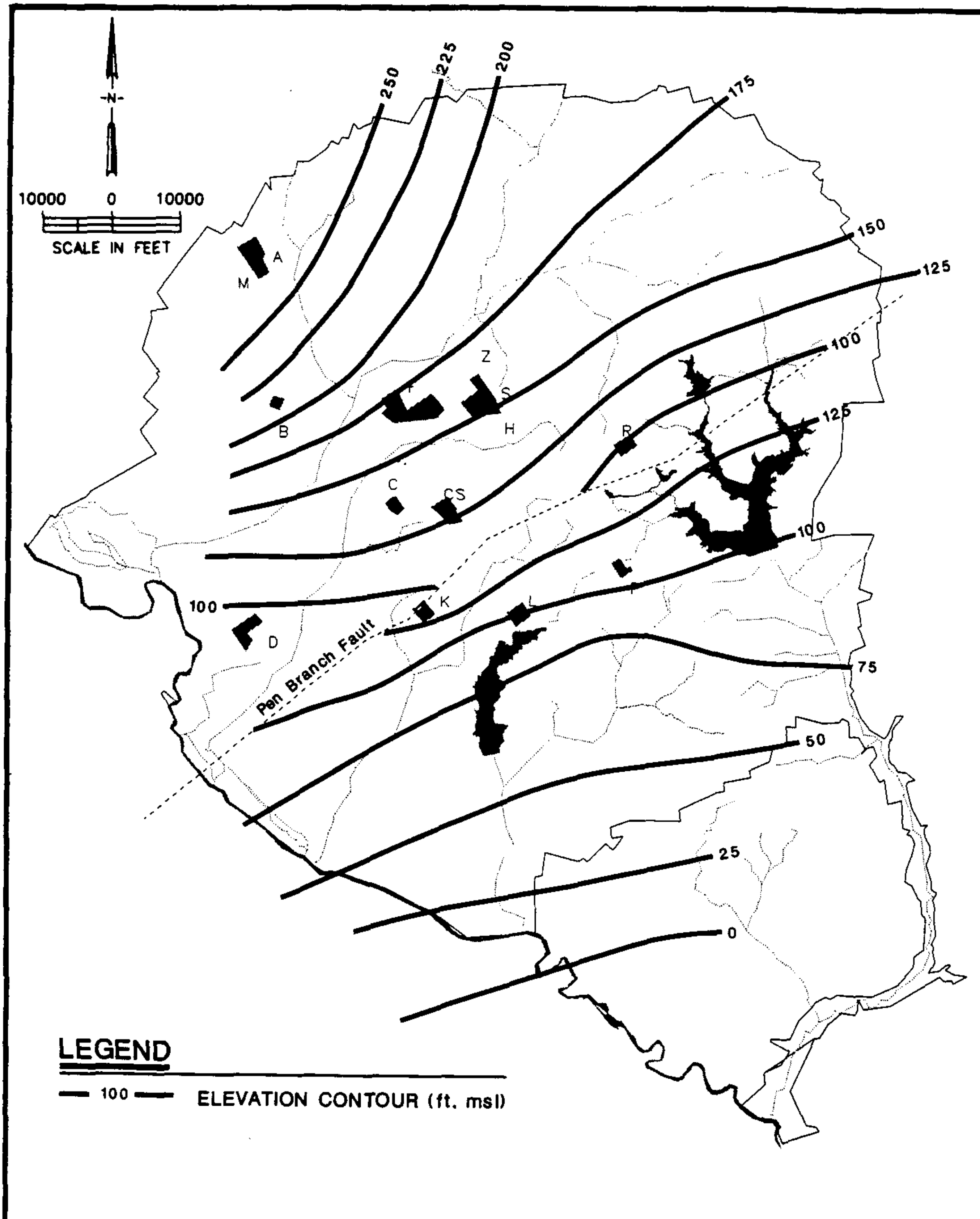
ELEVATIONS OF THE TOP OF AQUIFER 2

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO.

2-7



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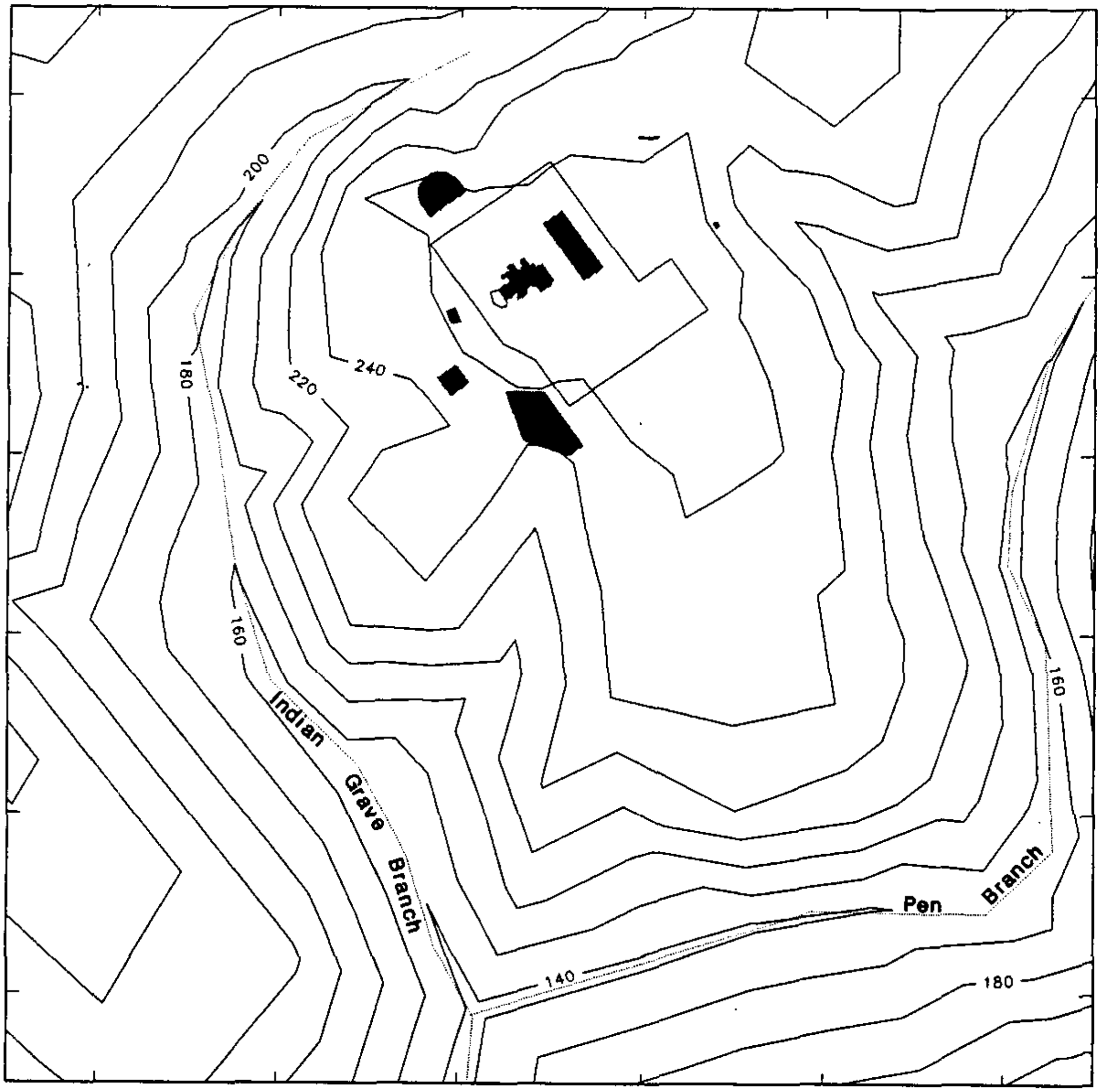
ELEVATIONS OF THE TOP OF THE "SANTEE" AQUITARD

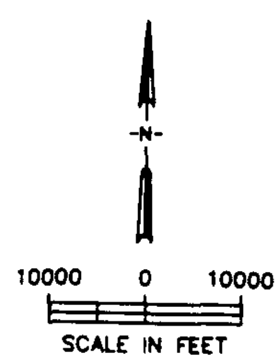
SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

FIGURE NO. 2-8



LEGEND

—200— ELEVATION CONTOUR (ft. msl)



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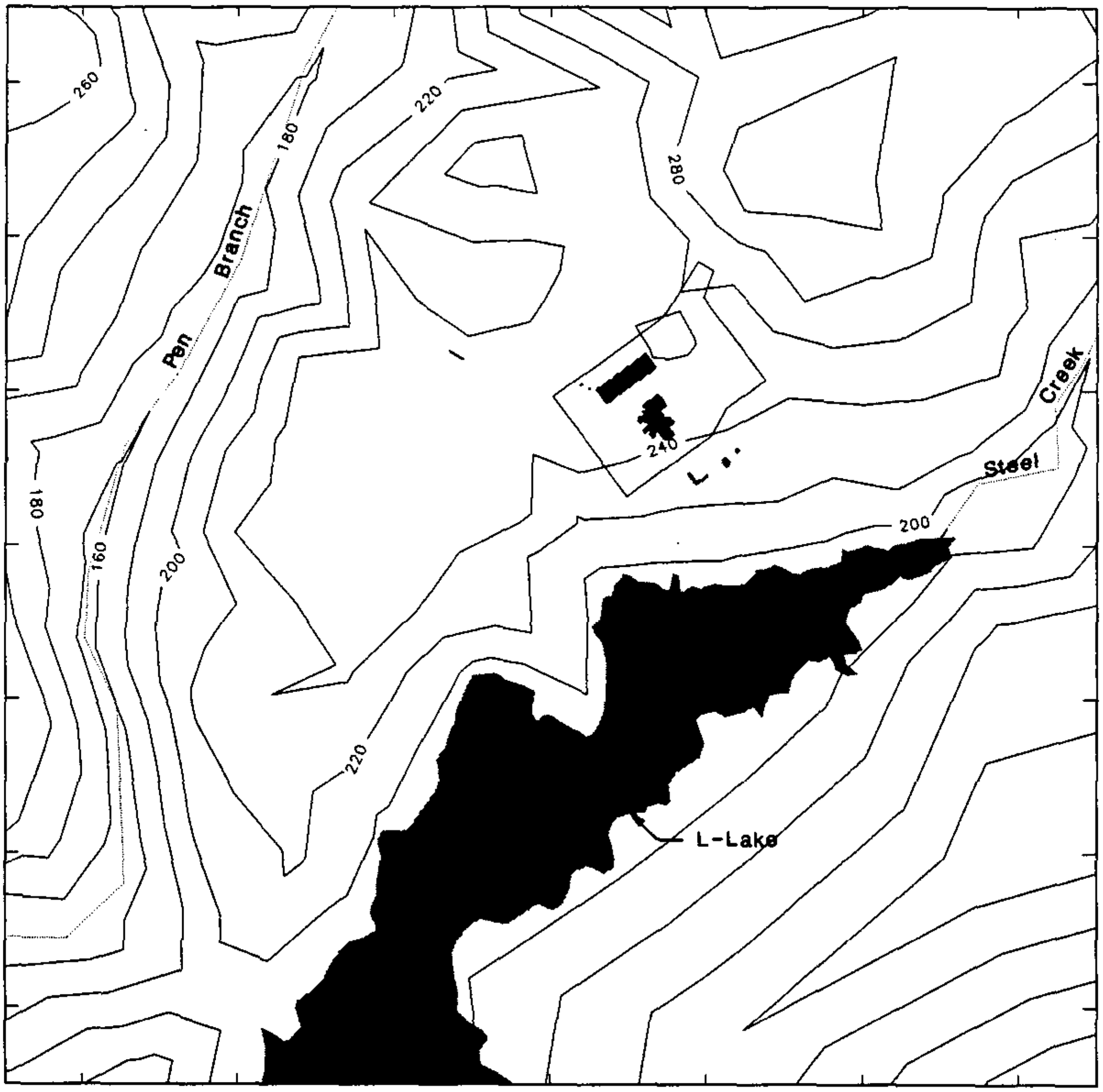
LAND SURFACE ELEVATIONS AT K REACTOR AREA

SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

FIGURE NO. 2-9



LEGEND

——200—— ELEVATION CONTOUR (ft. msl)

2000 0 2000

SCALE IN FEET

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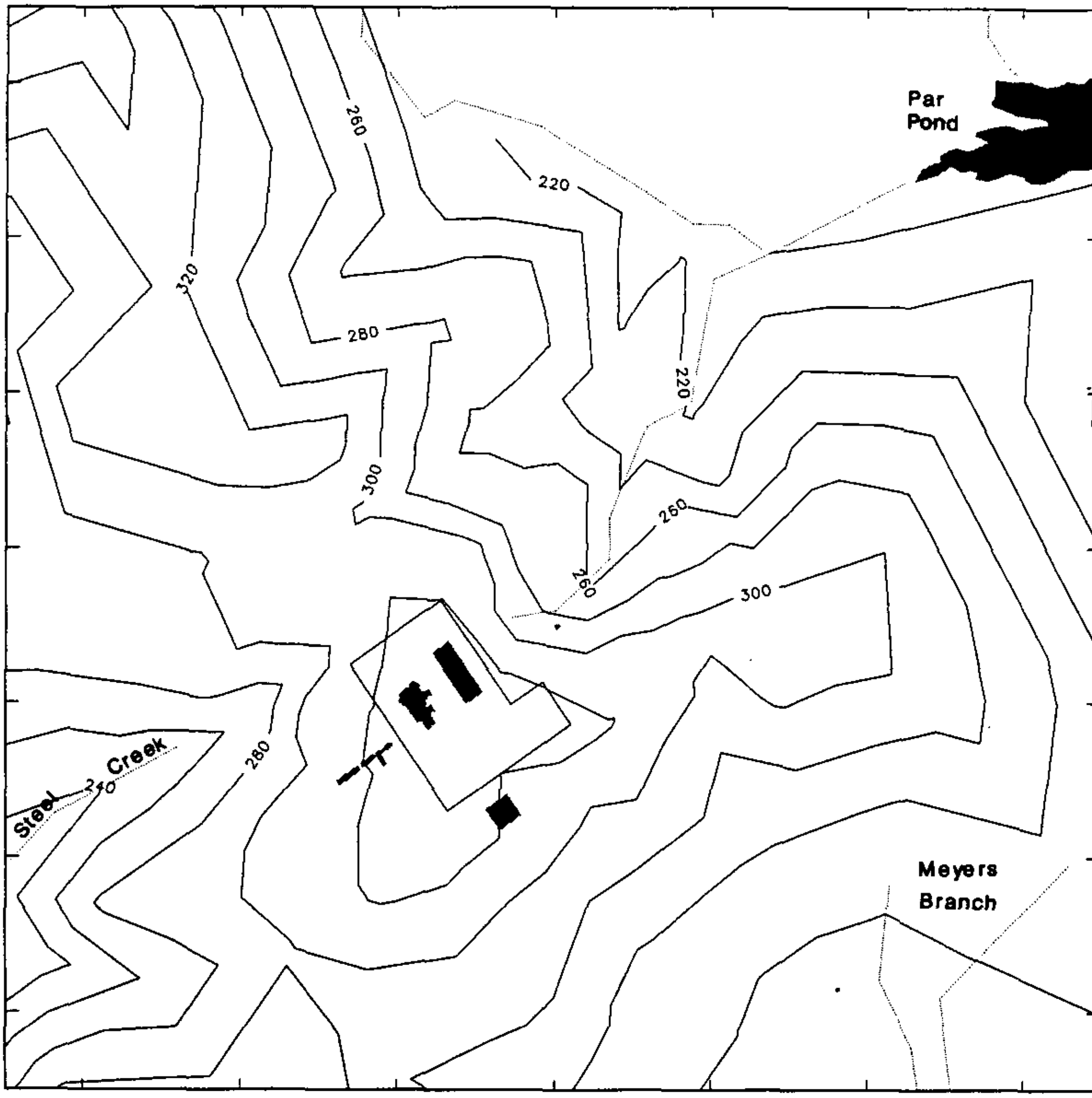
LAND SURFACE ELEVATIONS AT L REACTOR AREA

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 2-10



LEGEND

—300— ELEVATION CONTOUR (ft. msl)

-N-

2000 0 2000

SCALE IN FEET

CAMP DRESSER & McKEE INC.

LAND SURFACE ELEVATIONS AT P REACTOR AREA

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

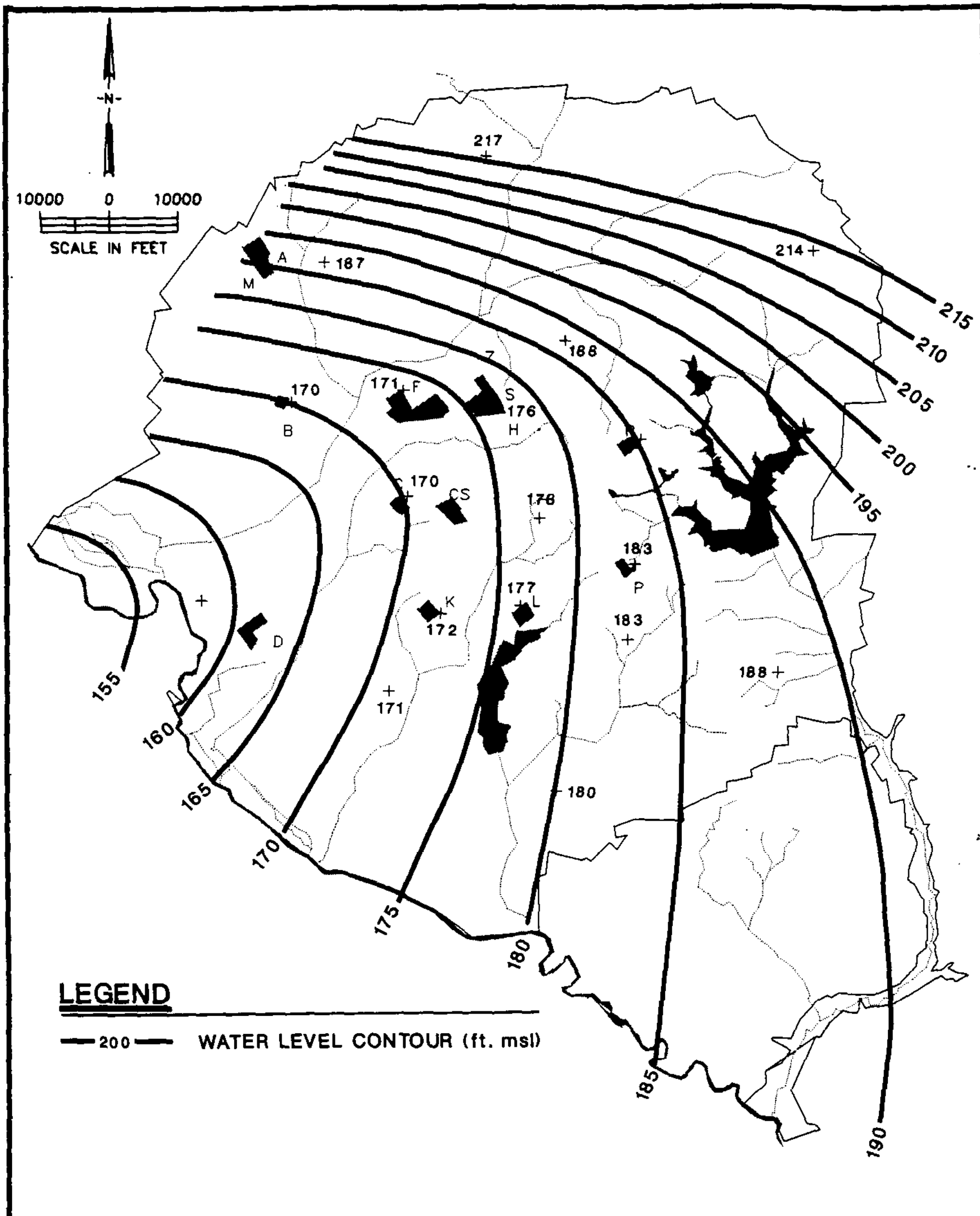
FIGURE NO. 2-11

2.2 GROUNDWATER FLOW

The Coastal Plain sediments are heterogeneous and anisotropic with respect to the hydraulic properties controlling groundwater flow. This heterogeneous and anisotropic nature of the sediments has a significant impact on groundwater flow in the aquifer system. For instance, one of the more important properties of the sediments, hydraulic conductivity, is generally 10 to 1000 times greater in the horizontal direction (parallel to the bedding plane) than in the vertical direction (perpendicular to the bedding plane). This anisotropy results in a significantly greater rate of groundwater flow laterally within the hydrostratigraphic units than between units. The hydraulic properties of the Coastal Plain sediments aquifer system were evaluated during development of the groundwater flow model and are discussed further in Section 3.3. The rest of this section focuses on hydraulic heads in the aquifer system and groundwater flow directions.

In general, in the Coastal Plain sediments aquifer system, groundwater flow is seaward from the higher areas of the Aiken Plateau toward the shoreline. At the SRS, however, a major modification in the general groundwater flow direction is created by the influence of the Savannah River and its tributaries. Generally, groundwater at the SRS flows from northeast to southwest toward the Savannah River.

The direction of groundwater flow is governed both by the aquifer properties and the hydraulic gradients of the system. Potentiometric surface maps for the two Coastal Plain sediments aquifers at the SRS are presented in **Figures 2-12** through **2-14**. Figures 2-12 and 2-13 are potentiometric surface maps of the observed hydraulic heads in the lower and upper portions of Aquifer 1, respectively. Because of the significant variation in hydraulic head throughout the thickness of Aquifer 1 in the southern section of the SRS, two potentiometric surface maps are needed to adequately depict flow in this aquifer. In the northern section of the SRS, hydraulic heads in the upper and lower portions of Aquifer 1 are nearly identical and flow is toward the Savannah River in both. Moving toward the south at the SRS, however, flow in the lower portion of Aquifer 1 starts diverging from the direction of flow in the upper



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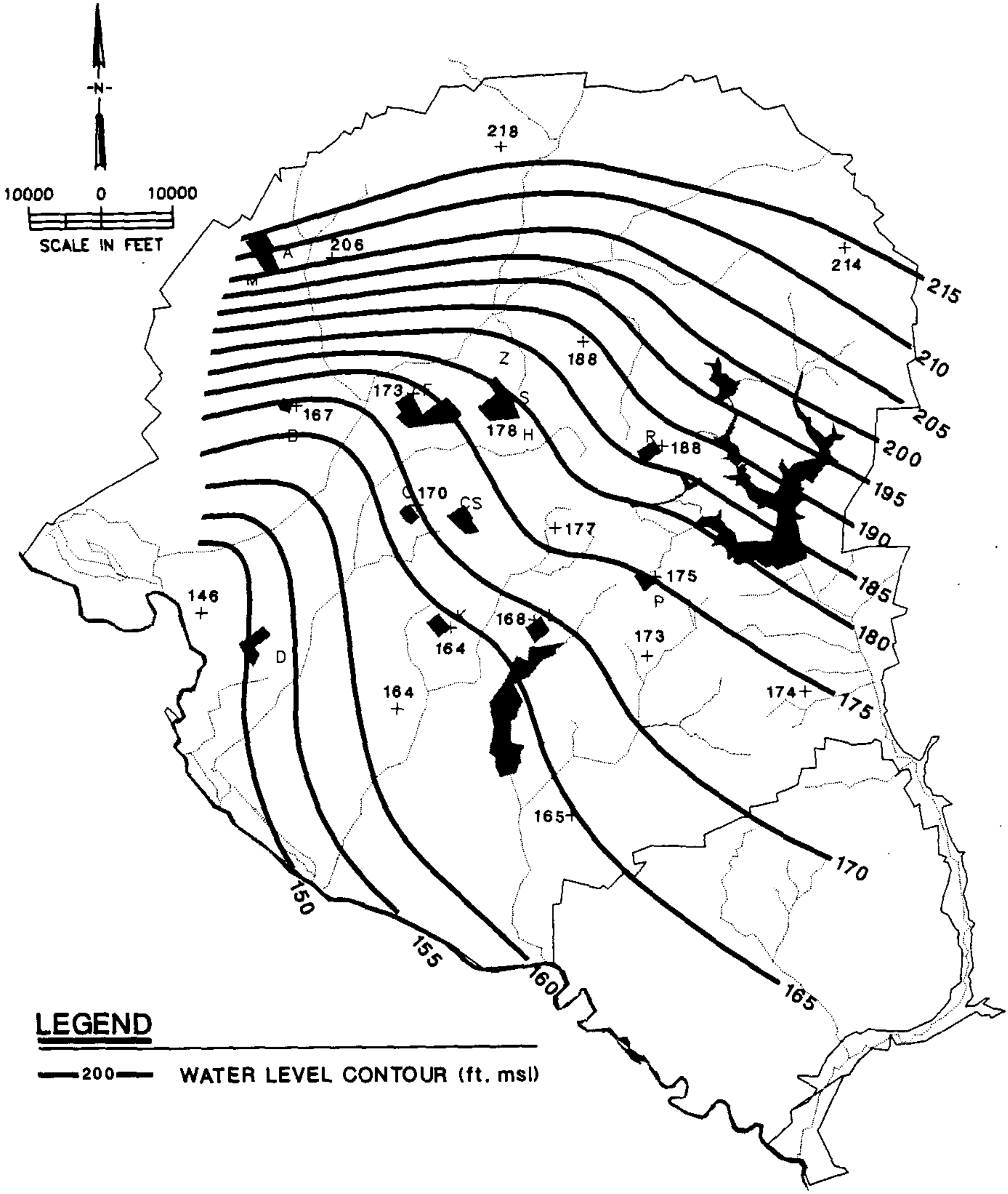
EQUIPOTENTIAL CURVES FOR THE LOWER PORTION OF AQUIFER 1

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO.

2-12



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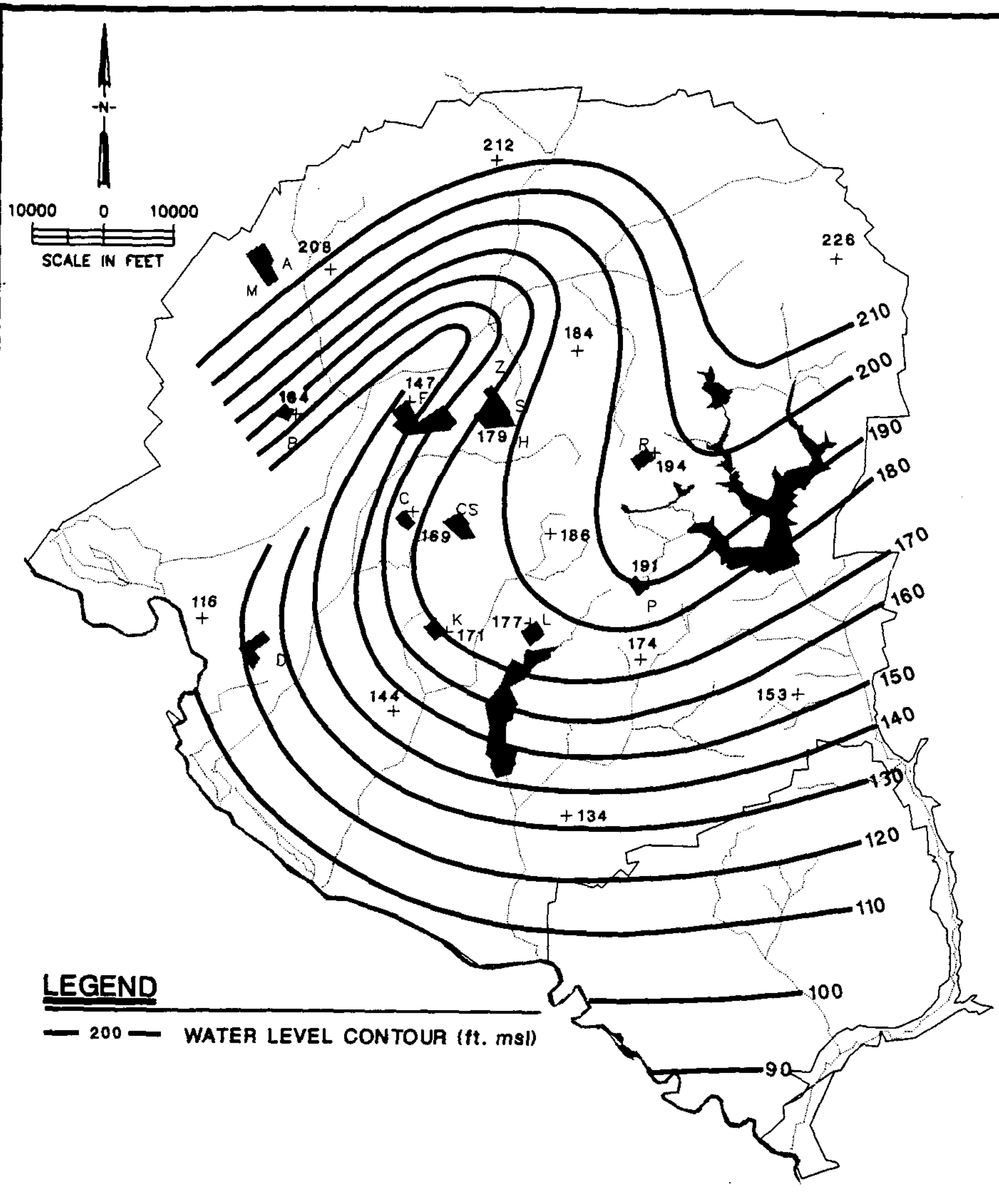
EQUIPOTENTIAL CURVES FOR THE UPPER PORTION OF AQUIFER 1

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 2-13



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EQUIPOTENTIAL CURVES FOR AQUIFER 2

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO.

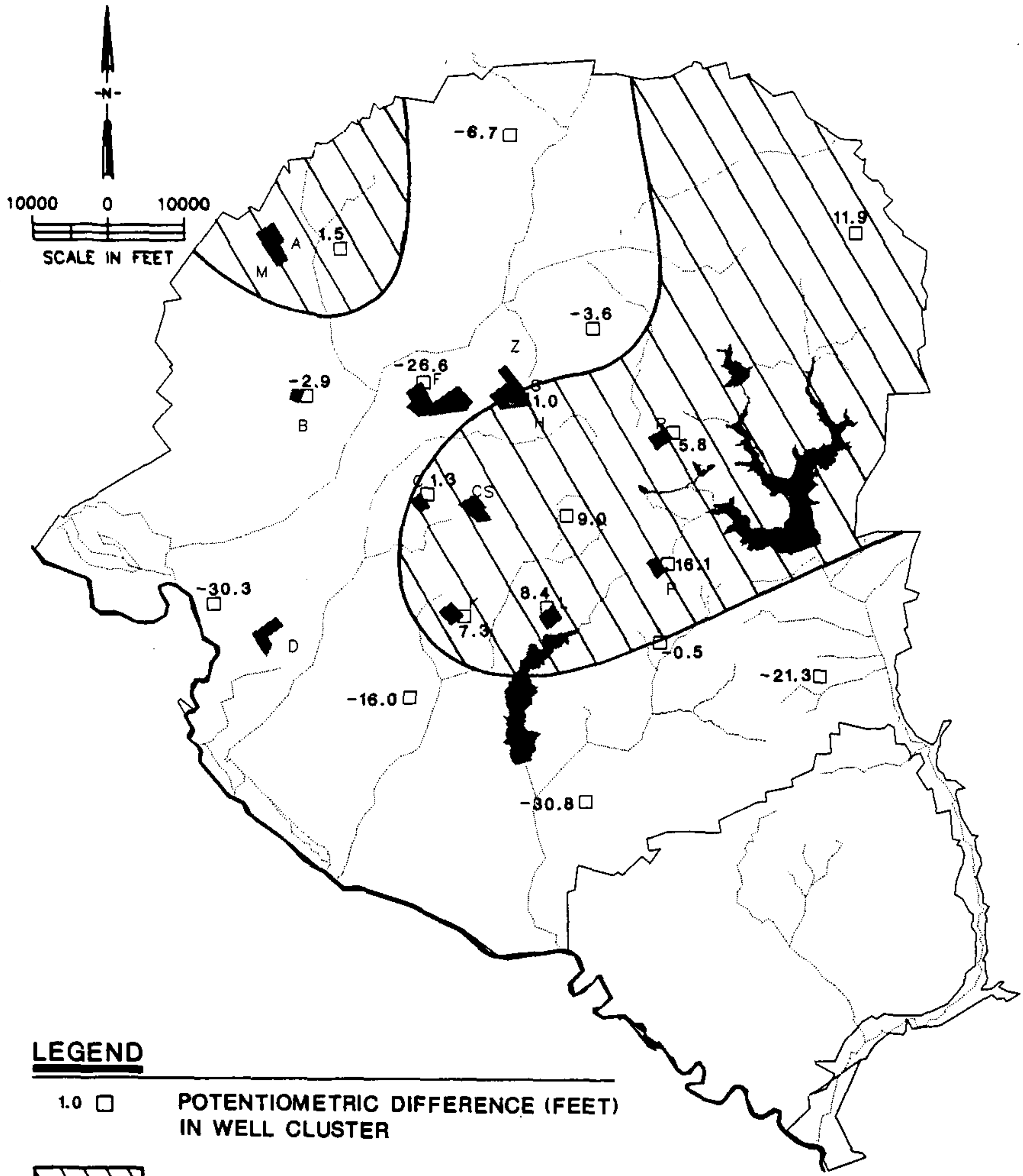
2-14

portion until eventually, flow in the lower portion of Aquifer 1 is mostly parallel to the Savannah River while flow in the upper portion is mostly perpendicular to the Savannah River. This divergence in flow is created by the complex hydrogeologic conditions at the SRS combined with the discharge boundary condition created by the Savannah River. All water in Aquifer 1 ultimately discharges to the Savannah River, but because of the complex hydrogeologic conditions, water in the lower portion of Aquifer 1 is forced to take a different path to get there.

Figure 2-14 is a potentiometric surface map of the observed hydraulic heads in Aquifer 2. Hydraulic heads and groundwater flow directions do not vary significantly throughout the thickness of Aquifer 2 so that one potentiometric surface map adequately depicts flow in this aquifer. In the northwestern section of the SRS, groundwater flow in Aquifer 2 is generally toward Upper Three Runs Creek as exemplified by the equipotential lines bending around this surface water.feature. Since Upper Three Runs Creek incises Aquifer 2, this creek is a major discharge boundary for Aquifer 2 and local flow toward the creek is to be expected. In the central and southeastern sections of the SRS, however, where the influence of Upper Three Runs Creek is less than that of the Savannah River, groundwater in Aquifer 2 generally flows toward and discharges to the Savannah River.

Vertical flow between Aquifer 1 and Aquifer 2 is variable across the SRS. **Figure 2-15** presents a potentiometric difference map between Aquifer 2 and the upper portion of Aquifer 1. As illustrated in Figure 2-15, in some areas of the SRS, the hydraulic gradient, and hence flow, is downward from Aquifer 2 to Aquifer 1. In other areas, flow is upward from Aquifer 1 to Aquifer 2. This upward flow gradient has previously been referred to as a "head reversal" and prevents water in Aquifer 2 from entering Aquifer 1 in those areas. Note, however, that there is no "head reversal" below the K, L, and P reactor areas so that Aquifer 2 is recharging Aquifer 1 in these areas.

Groundwater flow in the water table unit is highly variable and generally follows the surface topography. Due to the sparsity of water level data in the water table unit, observed water level contour maps could not be drawn for the



CAMP DRESSER & McKEE INC.

POTENTIOMETRIC DIFFERENCES BETWEEN AQUIFER 2 AND THE UPPER PORTION OF AQUIFER 1

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 2-15

water table unit. Since groundwater generally follows the surface topography, however, some indirect observations regarding groundwater flow directions can be inferred based on the topography and the water level data that are available. At the K reactor site, groundwater flow in the water table unit diverges from the reactor area toward the south and east where it discharges into Pen Branch Creek, and toward the west where it discharges into Indian Grave Branch Creek. At the L reactor site, groundwater flow in the water table unit diverges from the reactor area toward the south where it discharges into L-Lake, and toward the west where it discharges into Pen Branch Creek. At the P reactor site, the P reactor lies on top of a water table "mound." Groundwater flow in the water table unit at the P reactor site thus diverges in all directions from the reactor area. Surface water discharge points are Steel Creek to the southwest, Meyers Branch Creek to the southeast, and Par Pond and its tributary to the northeast. At all three reactor sites, the hydraulic head in the water table unit is higher than the hydraulic head in Aquifer 1. Groundwater thus also flows vertically from the water table unit, through the "Santee" Aquitard, down into Aquifer 2. The majority of recharge to the water table unit comes from rainfall. The depths to the water table at the K, L, and P reactors are approximately 50 feet, 20 feet, and 30 feet, respectively.

2.3 GROUNDWATER USE

At present, water is not withdrawn from the crystalline metamorphic basement rocks at the SRS. Most of the water at the SRS is withdrawn from Aquifer 1 which is the most important regional aquifer in the vicinity. Some pumpage from Aquifer 2 also occurs at the SRS for domestic use, but this pumpage is relatively insignificant compared to that from Aquifer 1. At the K, L, and P reactor sites, all pumpage is from Aquifer 1. Total groundwater pumpage at the SRS during the first quarter of 1989 averaged approximately 6335 gpm. Distribution of this pumpage is shown in **Table 2-1**.

TABLE 2-1

GROUNDWATER USE*
SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

Location	Wells	Plant Coordinates North	East	Pumping Rate (gpm)
K Area	905-94K	53170	41500	200
	905-95K	53230	41300	
L Area	905-104L	47128	51250	250
	905-105L	46690	51250	
P Area	905-92P	42950	65700	360
	905-93P	43150	65650	
C Area	905-90C	66730	46720	320
	905-91C	66730	46520	
CS Area	905-71G	62134	52404	80
	905-83G	61394	52202	
F Area	905-79F	78045	54220	1615
	905-100F	76430	53950	
	905-101F	77980	54598	
	905-102F	77280	54250	
H Area	905-66H	72115	62202	1435
	905-80H	71664	62641	
	905-87H	70775	62228	
	905-88H	71405	63150	
	905-108H	70552	63189	
B Area	905-59B	86713	42602	75
	905-67B	86693	42622	
A/M Area	905-20A	104000	50615	2000
	905-31A	103150	50615	
	905-53A	105011	50757	
	905-68A	106266	50266	
	905-82A	103330	51100	
	905-98A	105290	51989	

Reference: SC Water Resources Commission Report, 1989.

* Water withdrawn from Aquifer 1.

3.0 GROUNDWATER FLOW MODEL DEVELOPMENT

The first step in any contaminant transport study is to develop the hydraulic or flow model for the aquifer system. The hydraulic model provides the groundwater velocity field for a companion contaminant transport model. For simple cases or where only gross estimations are desired, the hydraulic model can be as basic as a uniform flow field. For moderately complex cases where groundwater flow is essentially two-dimensional, a two-dimensional numerical computer model may be more appropriate. For very complex cases where groundwater flow must be represented in three dimensions, as is the case for the SRS, a three-dimensional numerical computer model is necessary.

Digital computers allow solution of the large set of simultaneous equations that are involved in studying cause and effect relationships in heterogeneous aquifer systems with a wide variety of boundary conditions. The variable lithology (sand, clay, limestone, etc.) and the complex recharge/discharge boundary system (streams, rivers, lakes, and rainfall) at the SRS require an analysis procedure beyond ordinary analytical methods. A valid digital computer model can predict the effects of variations in pumpage, stream levels, and climatic conditions on aquifer system water levels. Head changes predicted by the model can then be used to analyze directions and extent of contaminant movement.

3.1 MODEL DESCRIPTION

The groundwater flow model code used in this analysis is the DYNFLOW (DYNamic groundwater FLOW simulation) computer program developed by CDM in 1982. This code uses a Galerkin finite element formulation to solve the partial differential equation that describes the transient, three-dimensional flow of a homogeneous incompressible fluid through a heterogeneous, anistropic medium. The program uses linear finite elements, and incorporates induced infiltration from streams, artificial and natural recharge or discharge, and heterogeneous and anisotropic hydraulic properties. The program handles both linear (confined) and nonlinear (unconfined) aquifer flow conditions, and has special routines to handle a change in status from a confined to unconfined situation. The program also has a "rising water" scheme to allow drainage to local streams if the potentiometric head in a phreatic aquifer rises to the elevation of the stream bed or land surface.

3.1.1 NUMERICAL METHOD

The governing equation for three-dimensional groundwater flow is

$$S_s \frac{\partial h}{\partial t} = \frac{\partial}{\partial x}\left(K_x \frac{\partial h}{\partial x}\right) + \frac{\partial}{\partial y}\left(K_y \frac{\partial h}{\partial y}\right) + \frac{\partial}{\partial z}\left(K_z \frac{\partial h}{\partial z}\right)$$

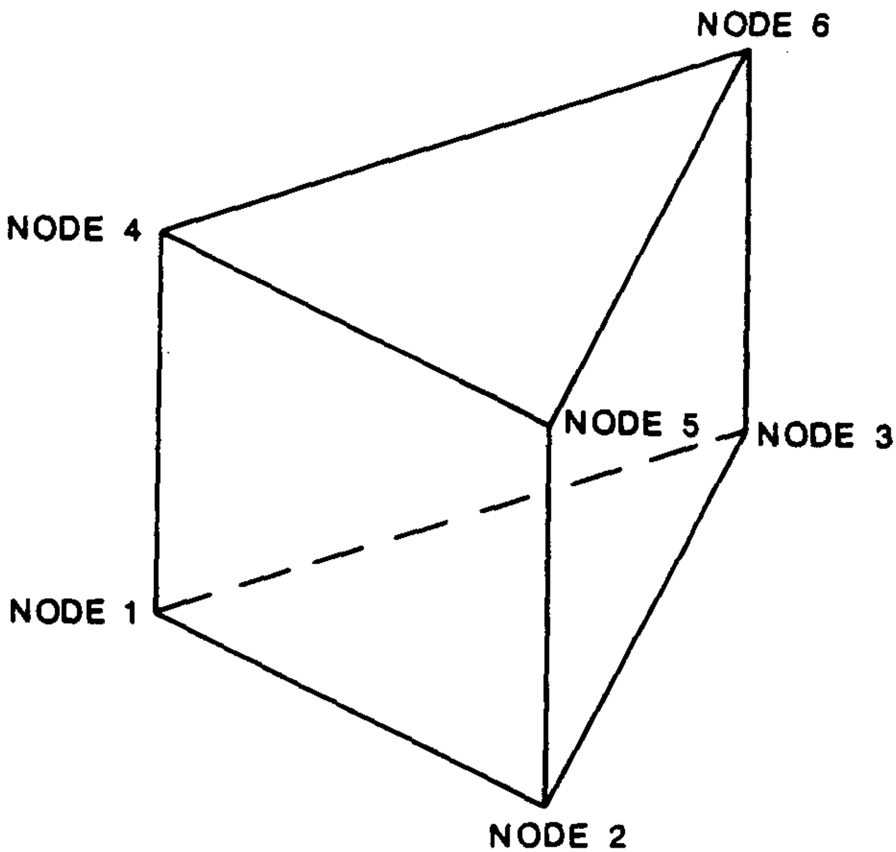
where

h = hydraulic head (length)
K_x, K_y, K_z = principal components of the hydraulic conductivity tensor (x, y, and z assumed to be the principal directions) (length/time)
S_s = specific storativity (1/length)
t = time

This equation is based on two laws of groundwater flow. The first is Darcy's Law, which states that flow "Q" in any direction is directly proportional to the head gradient "dh/ds" in that direction. The second is the Law of Mass Conservation, which requires that the change in net flow from a volume of aquifer equal the rate of change of storage in that volume.

Exact mathematical solutions to this partial differential equation of flow under complex boundary and initial conditions are not known, but numerical solutions of high accuracy can be obtained using a digital computer. DYNFLOW uses a Galerkin finite element technique to solve this equation. In concept, the finite element method involves the following steps:

- o Divide the region under consideration into a finite number of discrete sub-regions (elements) with simple geometries. In DYNFLOW, the basic working element in three dimensions is a vertical triangular prism with six nodes as shown in **Figure 3-1**.
- o Assume the manner in which the hydraulic head, h, can vary throughout each element (i.e., linear variation, quadratic variation, etc.). In DYNFLOW, the head varies linearly throughout the element.



CAMP DRESSER & McKEE INC.

THREE-DIMENSIONAL WORKING ELEMENT

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-1

- On the basis of the simple element geometry and the assumption of the hydraulic potential variation, write (local) equations for flux in terms of the hydraulic head at selected points (nodes) on the boundary of each element.
- Assemble the equations for each element (local) into a regional (global) system of equations.
- Solve the regional (global) system of equations for the hydraulic head or flux at each node. In DYNFLOW, the equations are solved by Gaussian Elimination.

The application of the finite element method as used by DYNFLOW is documented in the DYNFLOW Users Manual (CDM, 1984). In addition, several excellent descriptions of the Galerkin technique exist in the literature (Wilson et al., 1970; Pinder and Gray, 1977).

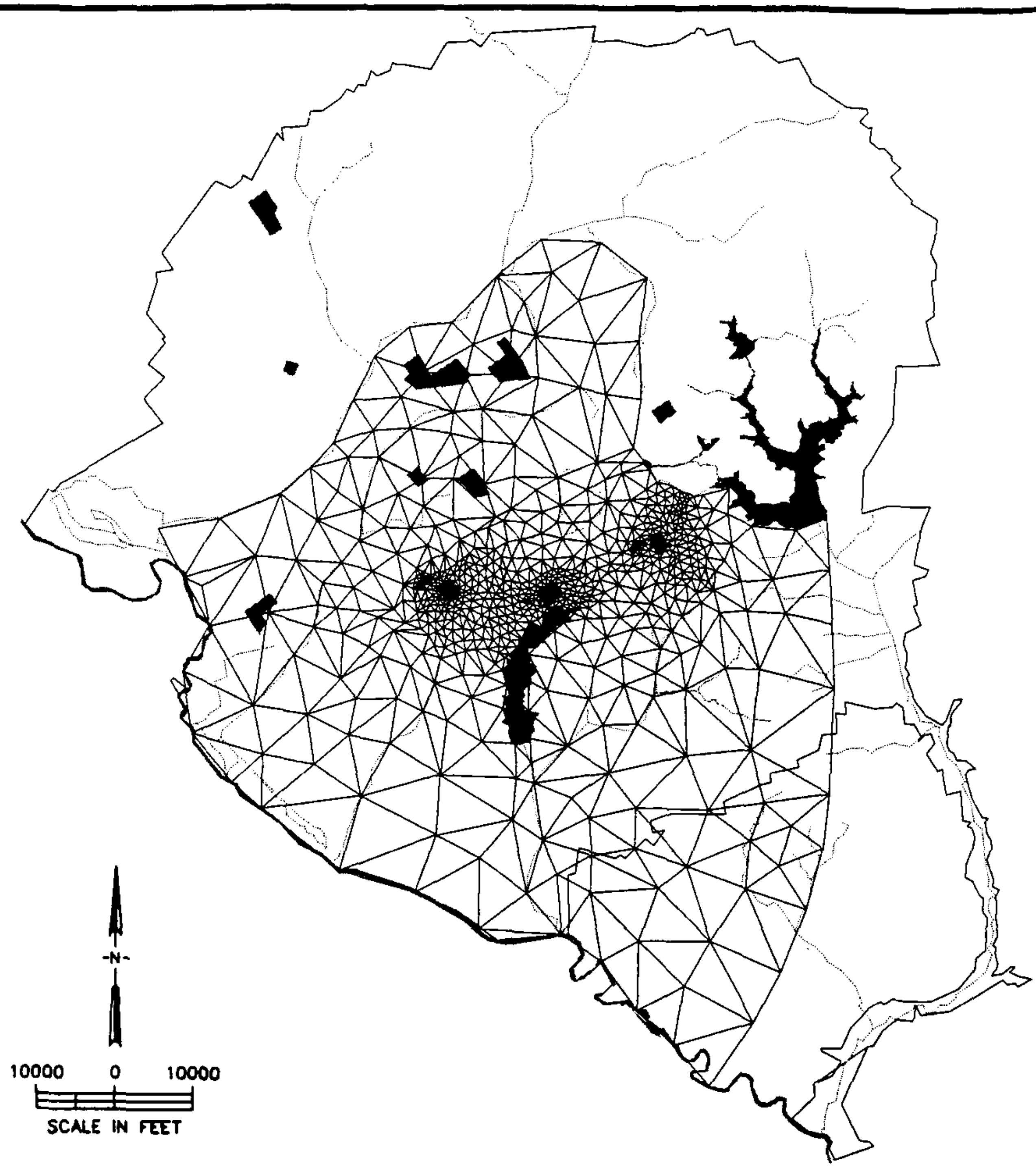
3.1.2 DATA REQUIREMENTS

The first step in applying this model to a specific area is to develop the finite element grid system. X, Y, and Z coordinates for each node must be input to the model. Generally, the X and Y coordinates are user dependent, and are chosen to represent significant physical features. The Z coordinate is usually chosen to represent the top of some hydrostratigraphic unit.

The second step in the application of this model is the specification of hydrogeologic properties for each element. The hydrogeologic properties include both horizontal and vertical hydraulic conductivity, and the storage coefficient or specific yield of the unit if transient (changing with time) simulations are to be performed. Other hydrogeologic conditions, including boundary conditions, rainfall recharge, starting head elevations, and well pumpages must also be specified where appropriate.

3.2 MODEL SETUP

The finite element grid used in this analysis is shown superposed on a base map of the SRS in **Figure 3-2**. The grid was developed such that all significant physical features such as streams, lakes, the Savannah River, the Pen Branch



CAMP DRESSER & McKEE INC.

MODEL FINITE ELEMENT GRID

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO.

3-2

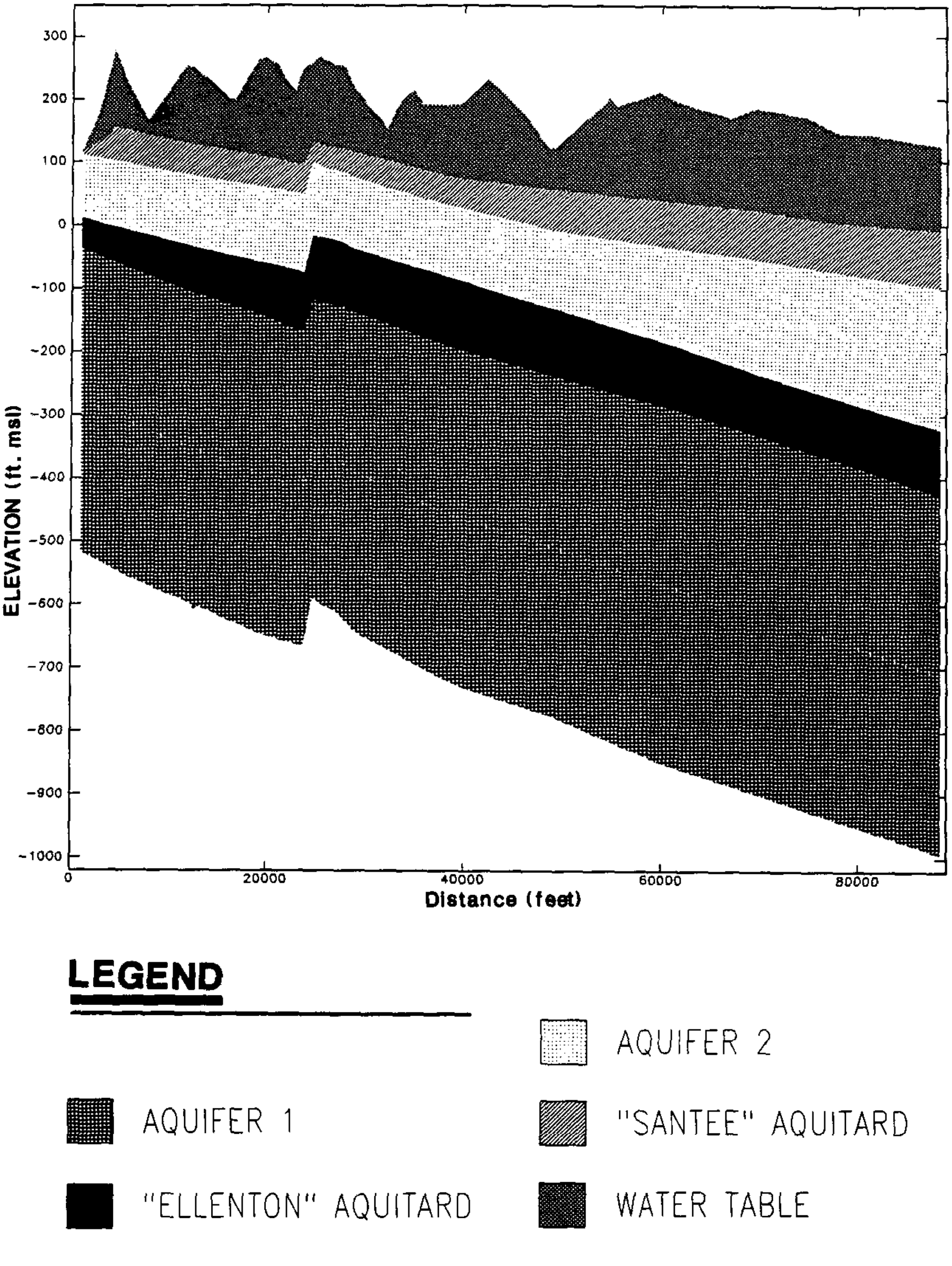
Fault, wells, and the three reactor areas could be adequately represented in the model. On the southwestern side, the border extends along the Savannah River. On the northwestern side, the grid extends along Upper Three Runs Creek. On the northeastern side, the border extends along Mill Creek and Par Pond. On the southeastern side, the border does not extend along any surface water feature, but it is located far enough from the reactor sites such that all significant features affecting groundwater flow to and from the reactor sites are included in the model.

The grid consists of 701 nodes and 1349 elements. A variable size grid system is used so that aquifer impacts can be evaluated over a large area while still maintaining sufficient detail within the reactor areas. The grid network is most dense around the reactor areas where radionuclides are released. A dense element network in these areas allows the head distribution to be calculated at a degree of resolution that is suitable for simulating the movement of radionuclides from the seepage basins.

The vertical grid consists of seven levels of nodes that define six layers and five hydrostratigraphic units (one hydrostratigraphic unit is divided in half for better discretization). The seven node levels represent the following hydrostratigraphic unit boundaries:

- o Level 1 - Top of the Base Aquitard
- o Level 2 - Middle of the Aquifer 1
- o Level 3 - Top of Aquifer 1
- o Level 4 - Top of the "Ellenton" Aquitard
- o Level 5 - Top of Aquifer 2
- o Level 6 - Top of the "Santee" Aquitard
- o Level 7 - Land Surface (top of water table unit)

The hydrostratigraphic elevations input to the model were presented previously in Figures 2-2 through 2-9 . Cross- sectional views of the model hydrostratigraphic units are shown in **Figures 3-3** and **3-4**. The locations of these cross-sections are shown in **Figure 3-5**.



CAMP DRESSER & McKEE INC.

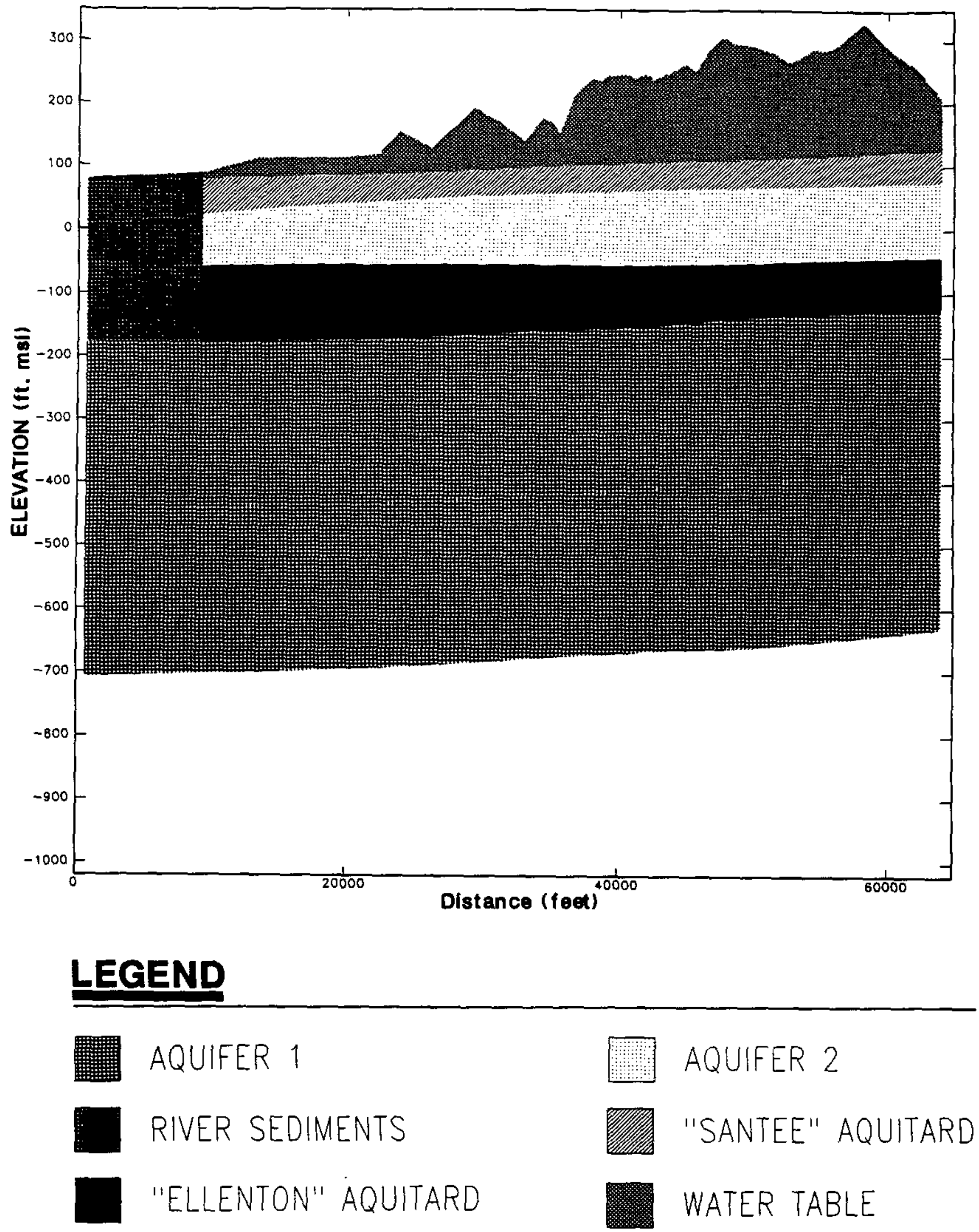
NW – SE MODEL HYDROSTRATIGRAPHIC CROSS-SECTION

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO.

3–3



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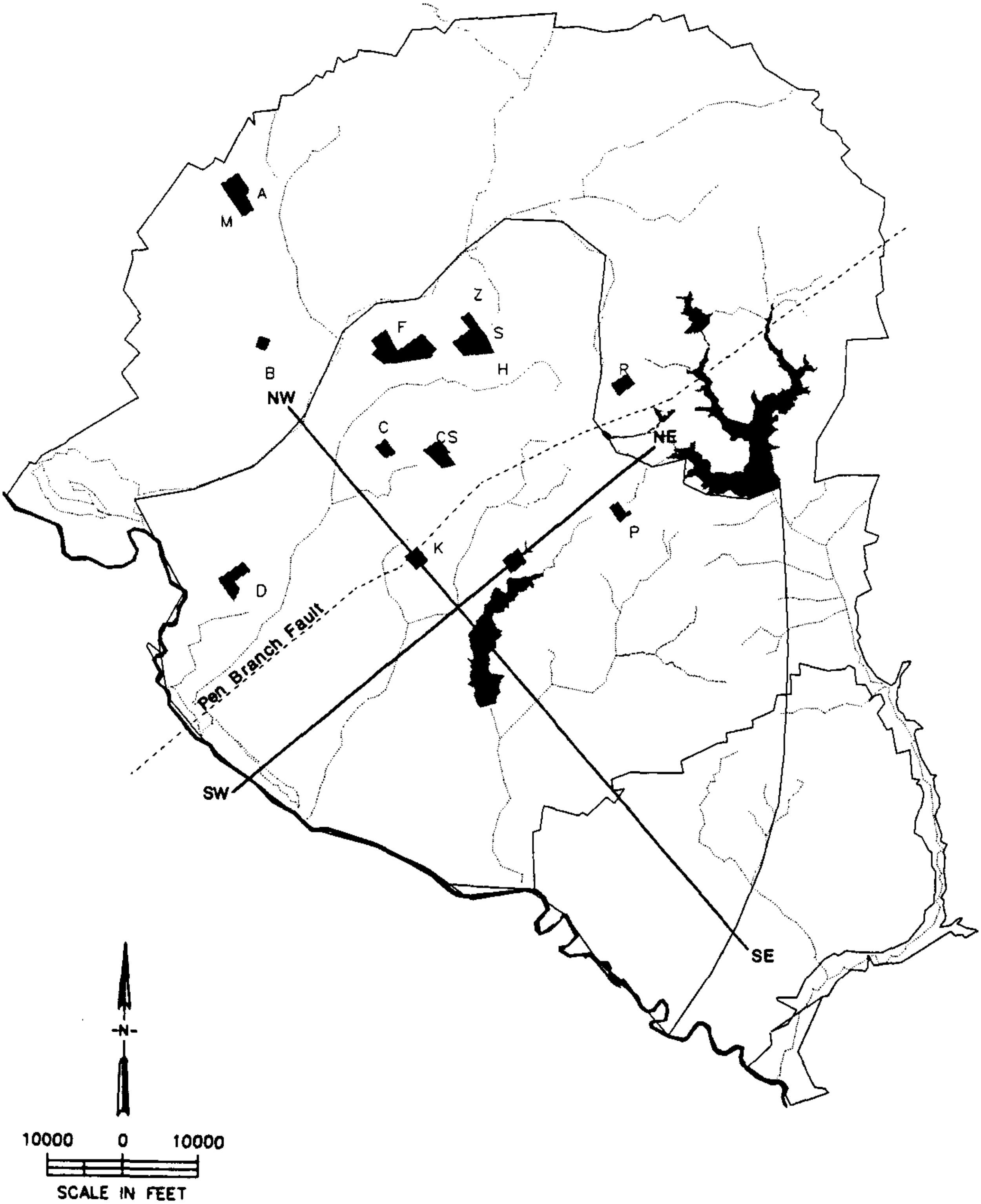
SW - NE MODEL HYDROSTRATIGRAPHIC CROSS-SECTION

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO.

3-4



CAMP DRESSER & McKEE INC.

MODEL CROSS-SECTION LOCATIONS

SAVANNAH RIVER SITE

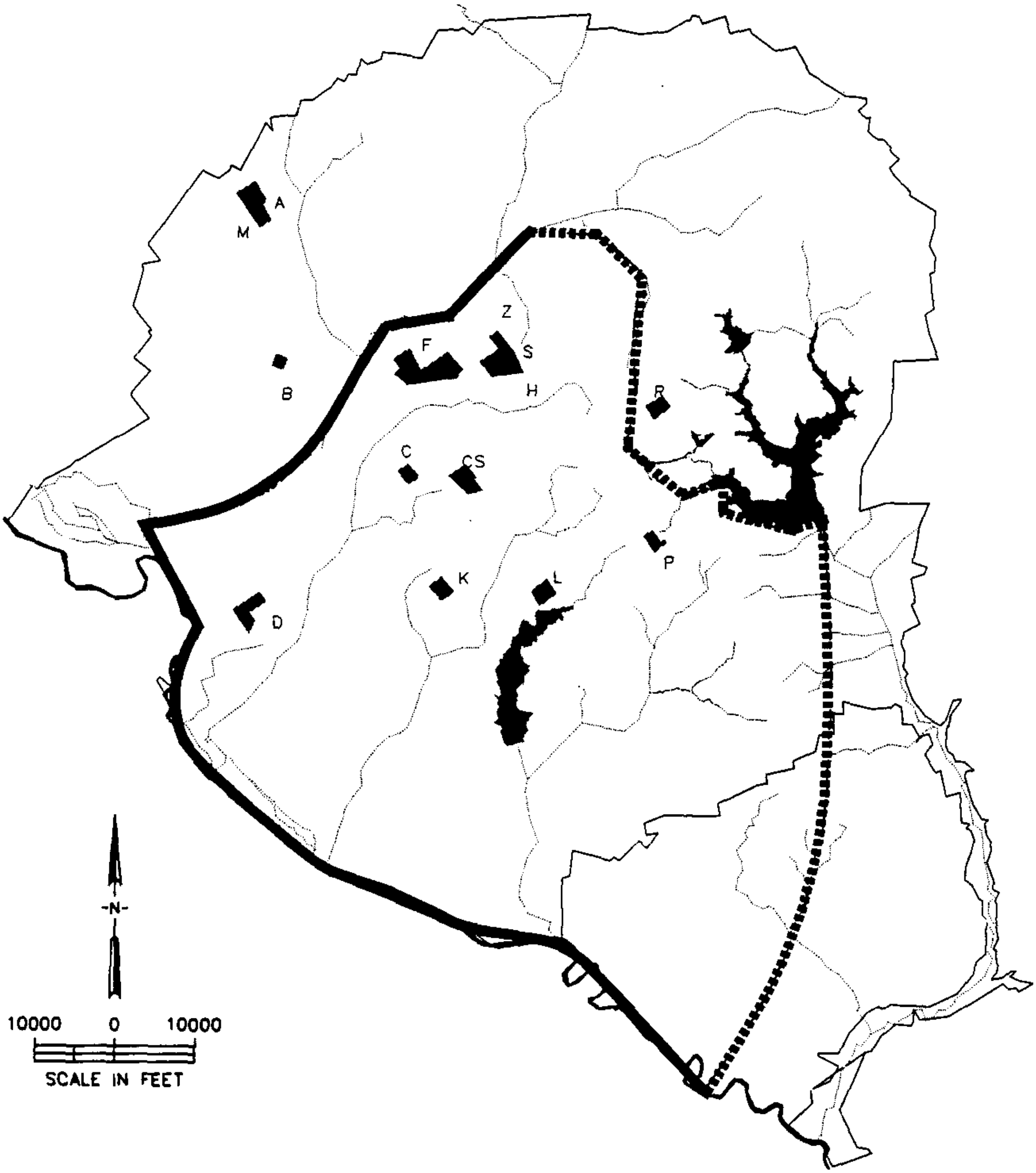
AIKEN, SOUTH CAROLINA

FIGURE NO. 3-5

The size of the model area was selected based on the prevailing boundary conditions. DYNFLOW can simulate two types of boundary conditions. One is a specified head condition and the other is a specified flow condition. With specified head conditions, the head is held constant at a predetermined elevation during the simulation. With specified flow conditions, the head may change but the head gradient remains constant during the simulation. Ideally, model boundaries are chosen so that they coincide with actual stable hydrologic boundaries. Since only a few truly stable hydrologic boundaries exist at the SRS (i.e., the Savannah River and Upper Three Runs Creek), the other model boundaries are located far enough from the reactor sites so that conditions imposed on the boundaries do not significantly alter simulation results within the areas of interest, as long as the conditions imposed are realistic.

Boundary conditions imposed along the borders of the model vary between a specified head condition and a "no flow" condition (see **Figures 3-6** through **3-12**), whichever is more representative of observed groundwater flow conditions in each aquifer and aquitard. The distribution of specified heads along the model borders was estimated based on available, current (1986-1989), observation well water level data (see **Appendix A**), as well as surface water measurements taken along the Savannah River and other surface water features at the SRS. At the bottom of the model (Level 1), a vertical "no flow" condition is specified at every node in the model, thus preventing any leakage in or out of the model through the base aquitard. Streams and swampy areas located in the interior of the model grid are represented through a "rising" head boundary condition. In these areas, the water table is allowed to rise to land surface, but not above it. If the water table is driven above the land surface, a discharge flux sufficient to keep the water table at land surface is introduced. This discharge flux represents a surface discharge of water which is lost from the groundwater system as surface flow. The final boundary condition imposed in the model is for L-Lake which is modeled as a specified head condition at the top of the groundwater system (Level 7).

Two forms of aquifer stress are incorporated in the model: rainfall recharge and aquifer pumpage. Based on previous studies performed at the SRS, rainfall recharge is estimated to be 15 inches per year. This recharge is applied



LEGEND

SPECIFIED HEAD CONDITION

"NO FLOW" CONDITION

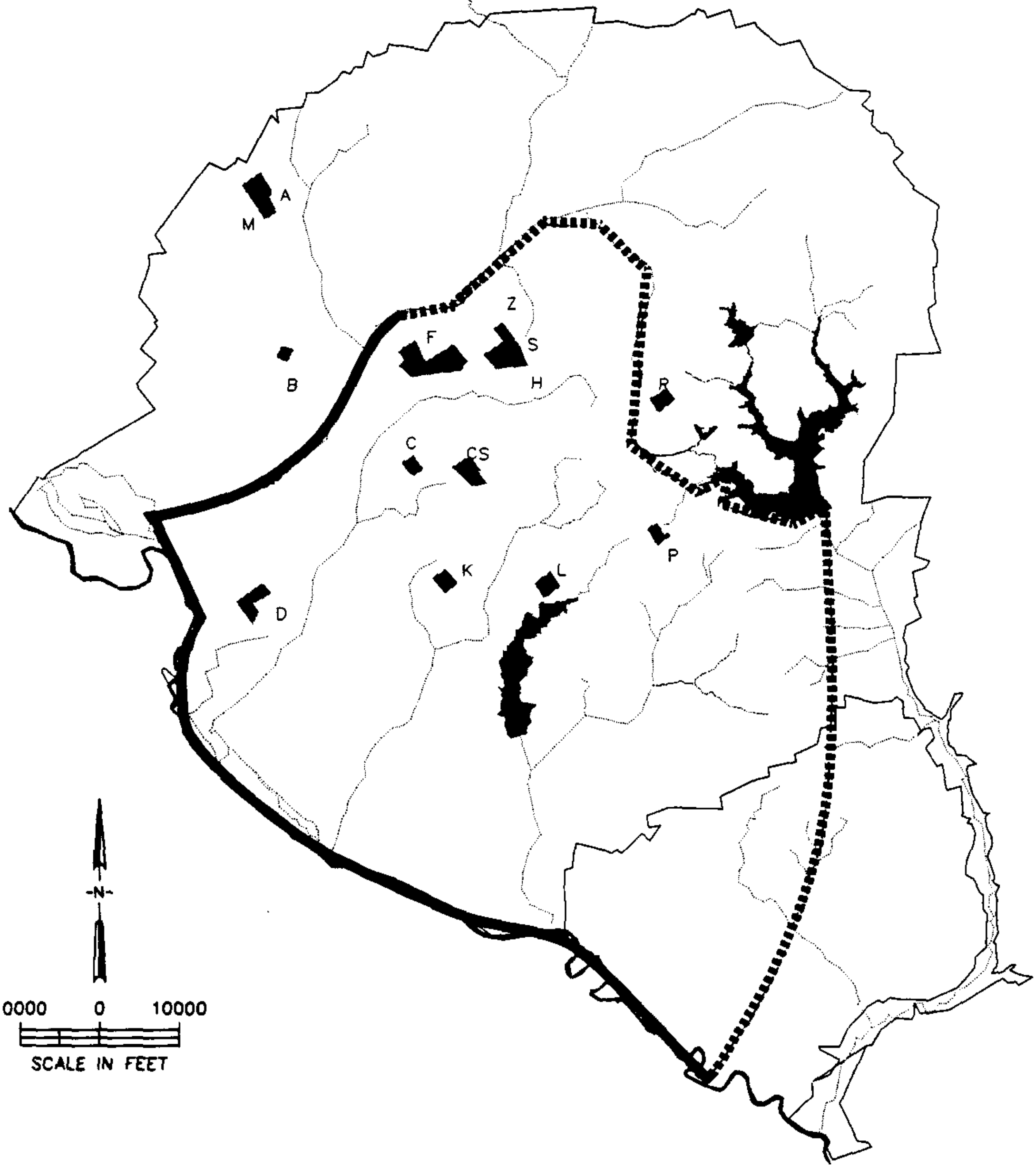
CAMP DRESSER & McKEE INC.

BORDER BOUNDARY CONDITIONS FOR LEVEL 1 - BOTTOM OF AQUIFER 1

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-6

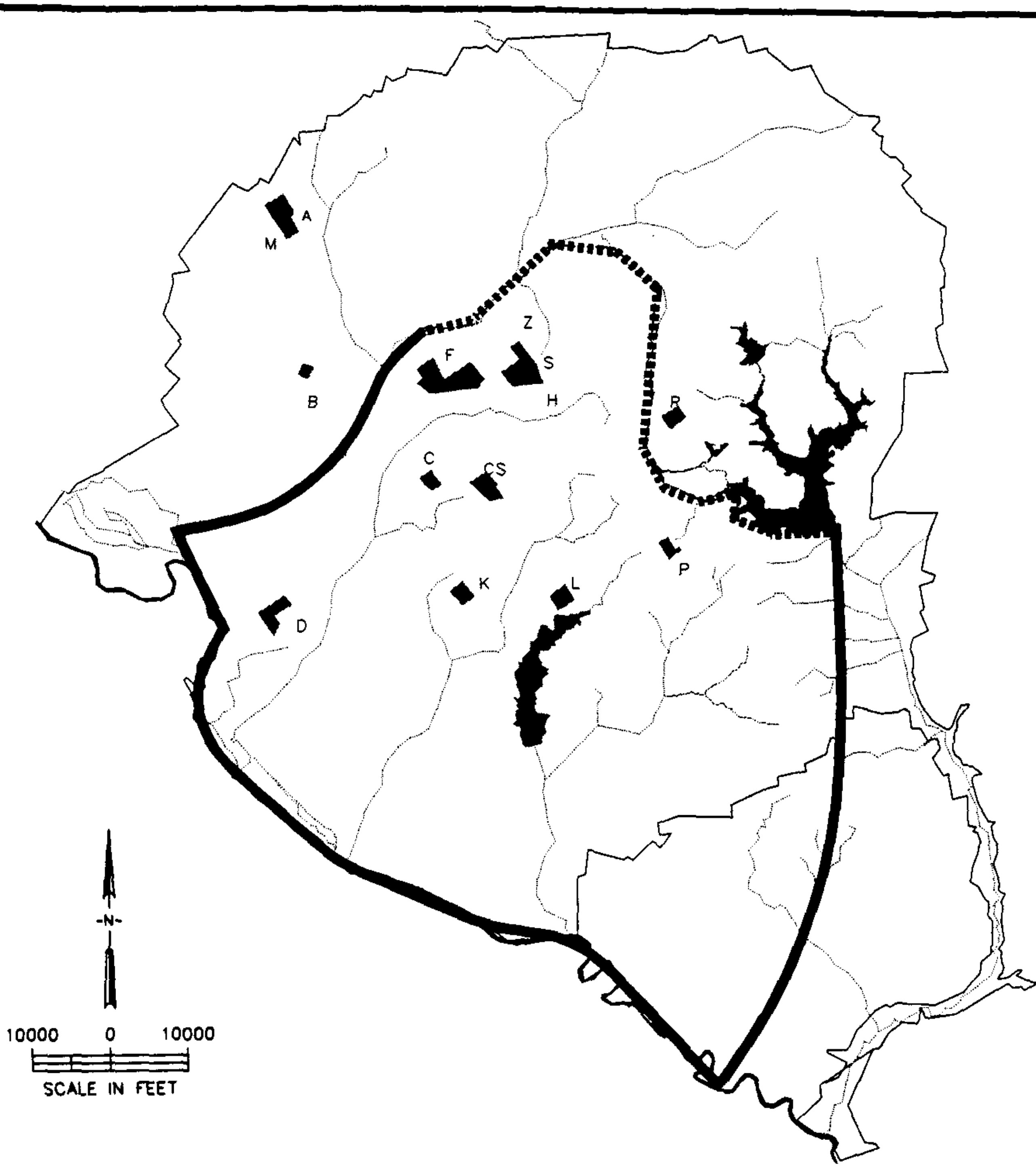


LEGEND

SPECIFIED HEAD CONDITION
"NO FLOW" CONDITION

CAMP DRESSER & McKEE INC.
BORDER BOUNDARY CONDITIONS FOR LEVEL 2 - MIDDLE OF AQUIFER 1
SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

FIGURE NO.
3-7



LEGEND

SPECIFIED HEAD CONDITION

"NO FLOW" CONDITION

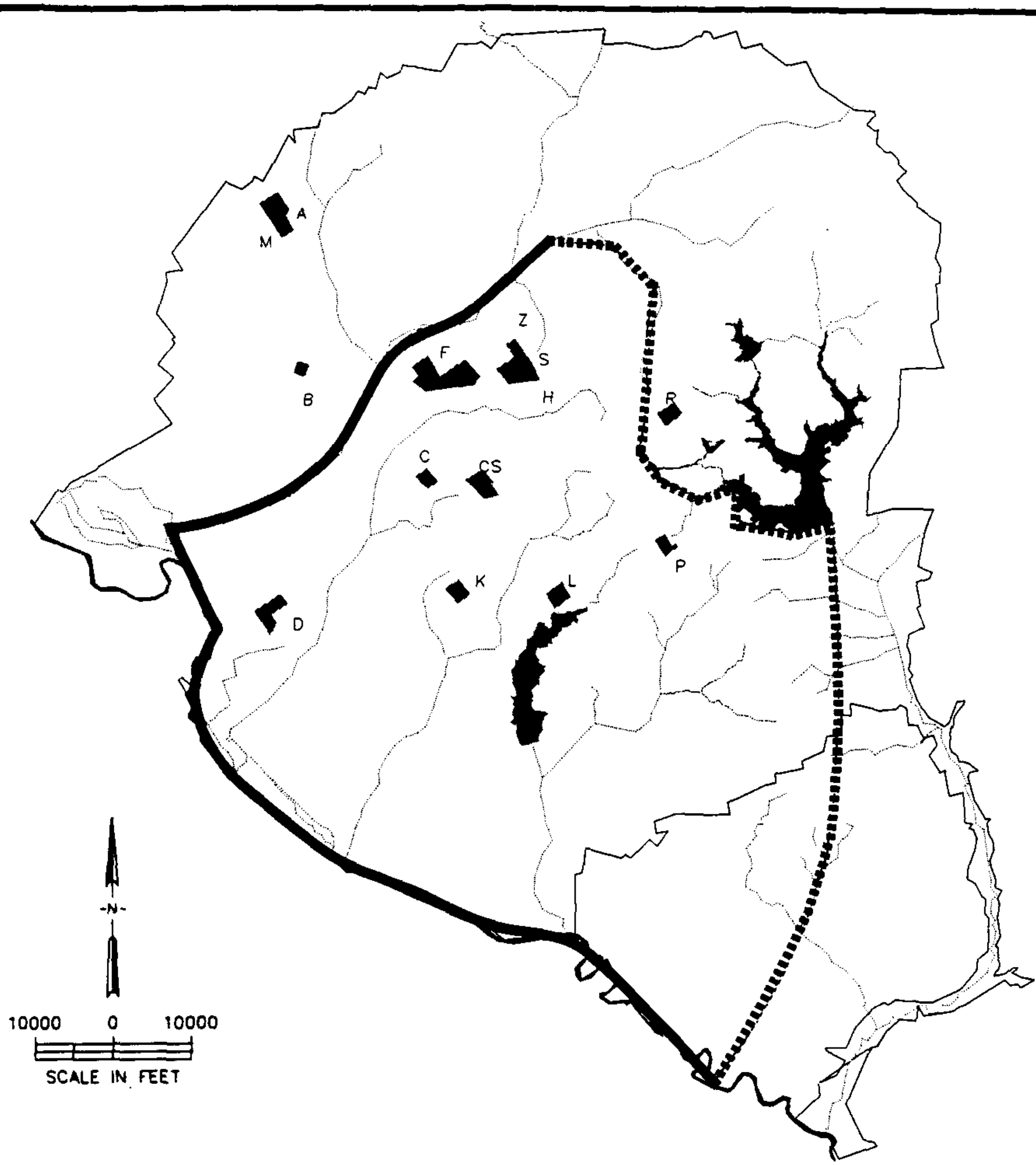
CAMP DRESSER & McKEE INC.

BORDER BOUNDARY CONDITIONS FOR LEVEL 3 – TOP OF AQUIFER 1

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-8



LEGEND

SPECIFIED HEAD CONDITION

"NO FLOW" CONDITION

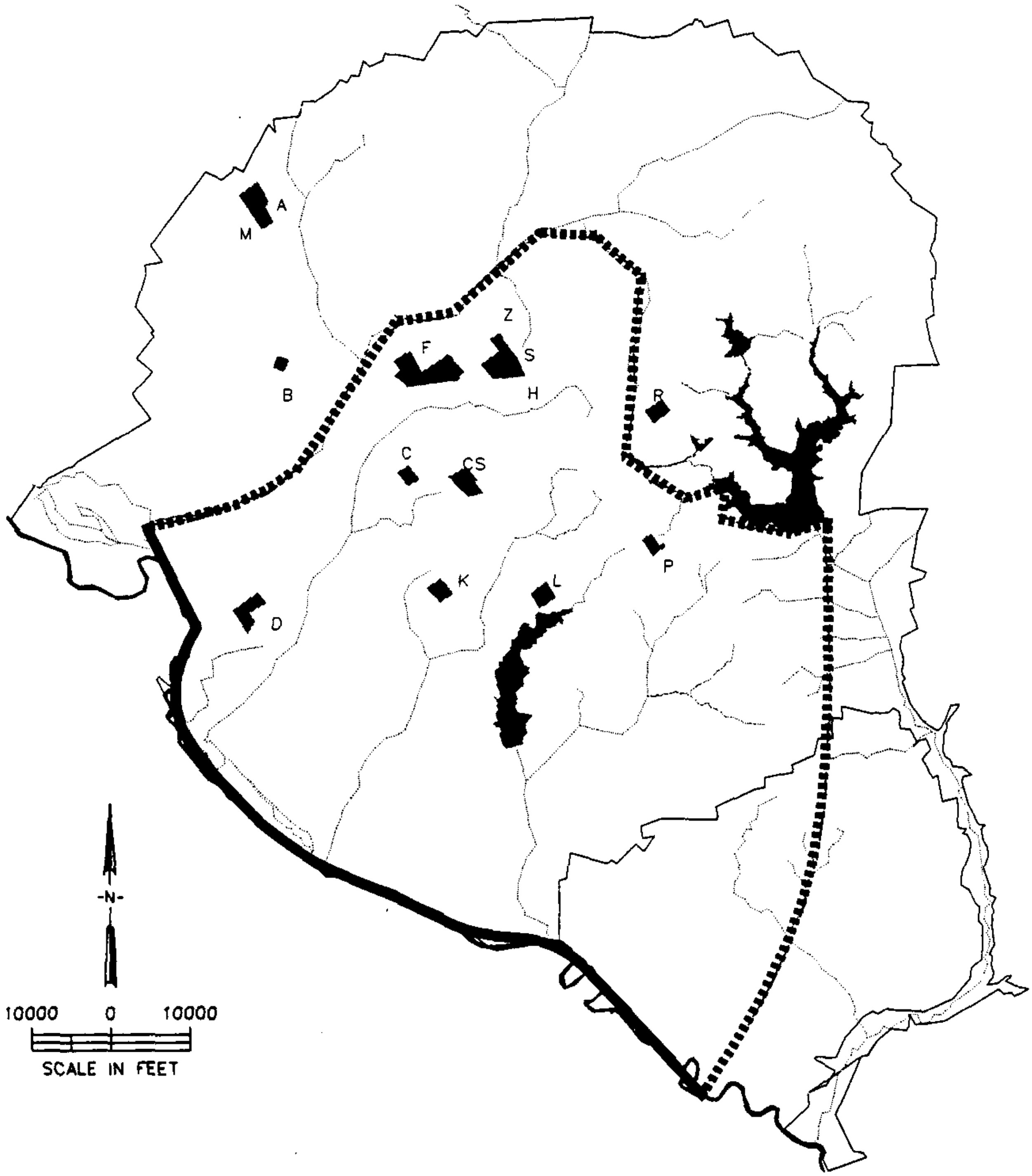
CAMP DRESSER & McKEE INC.

BORDER BOUNDARY CONDITIONS FOR LEVEL 4 – BOTTOM OF AQUIFER 2

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3–9



LEGEND

SPECIFIED HEAD CONDITION

"NO FLOW" CONDITION

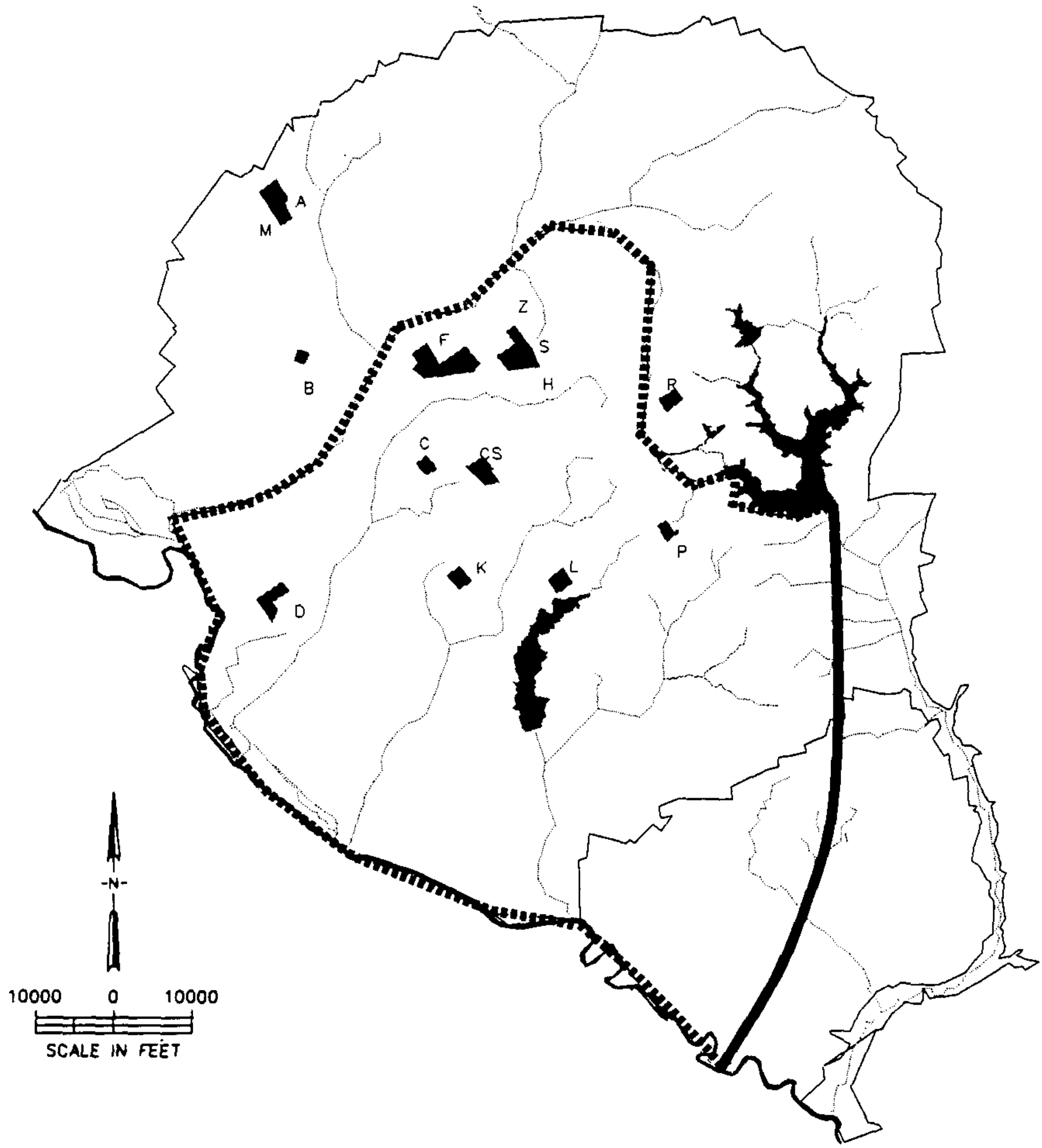
CAMP DRESSER & McKEE INC.

BORDER BOUNDARY CONDITIONS FOR LEVEL 5 - TOP OF AQUIFER 2

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-10

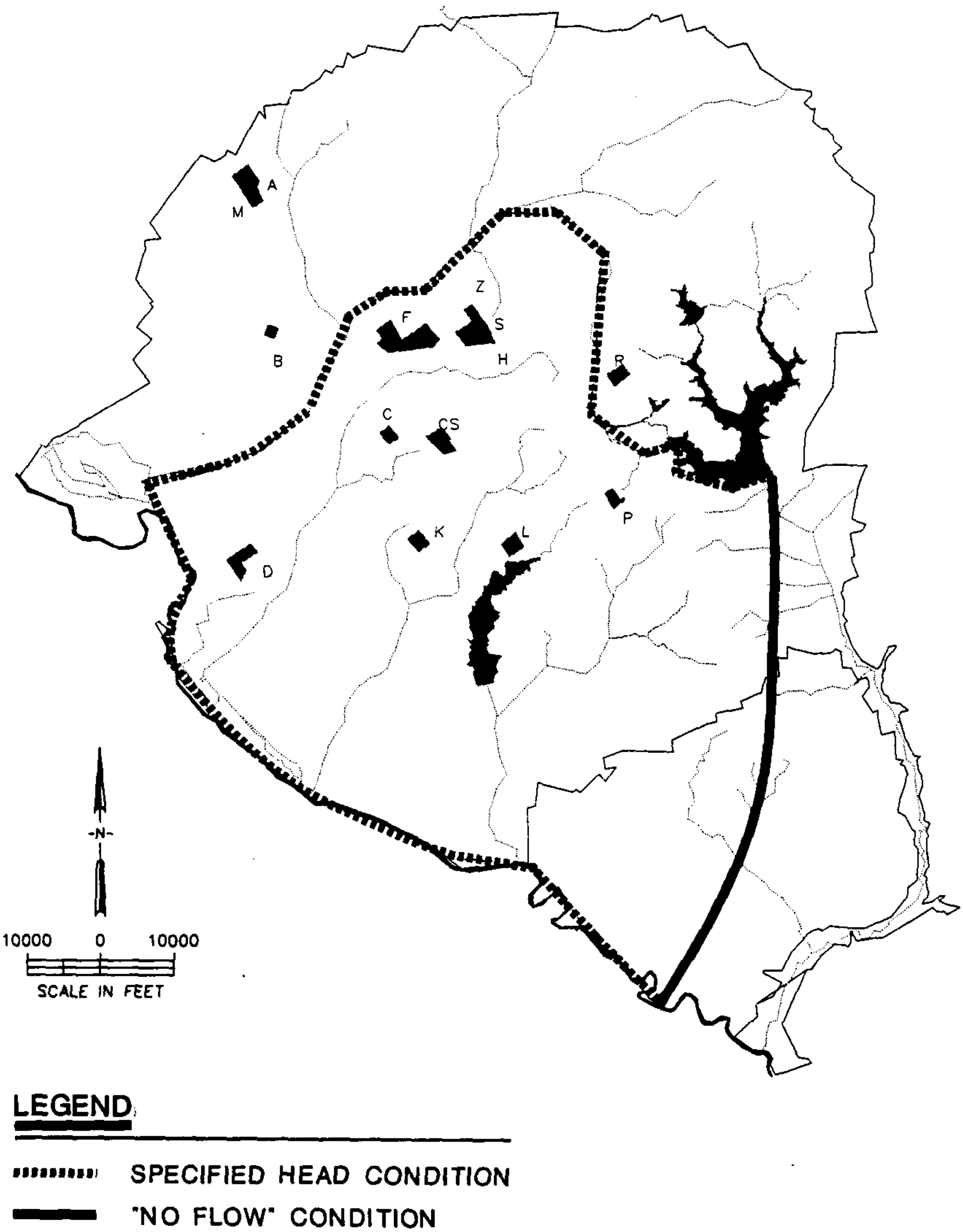


LEGEND

SPECIFIED HEAD CONDITION

"NO FLOW" CONDITION

CAMP DRESSER & McKEE INC. BORDER BOUNDARY CONDITIONS FOR LEVEL 6 - BOTTOM OF WATER TABLE	FIGURE NO. 3-11
SAVANNAH RIVER SITE AIKEN, SOUTH CAROLINA	



CAMP DRESSER & McKEE INC.

BORDER BOUNDARY CONDITIONS FOR LEVEL 7 - TOP OF WATER TABLE

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-12

uniformly over the entire model area. Aquifer pumping rates applied in the model were presented previously in Table 2-1. These rates are based on well production flows measured during the first quarter in 1989. These rates also represent anticipated future use at the SRS.

3.3 MODEL CALIBRATION

Before a model can be used as a predictive tool, it should be calibrated to confirm that the model adequately represents groundwater flow in the aquifer system. The procedure for this involves selecting an inventory period from the past where data are sufficient to investigate the distribution of model parameters. Model-generated water levels, flows, and/or flow patterns are compared to observed water levels, flows, and/or flow patterns, and a sequence of adjustments in model parameters is made so that the predictions more closely reproduce the observations. During this process, however, the value of individual parameters must be kept within realistic limits. Parameters that are considered to be least reliable are usually modified more than other parameters.

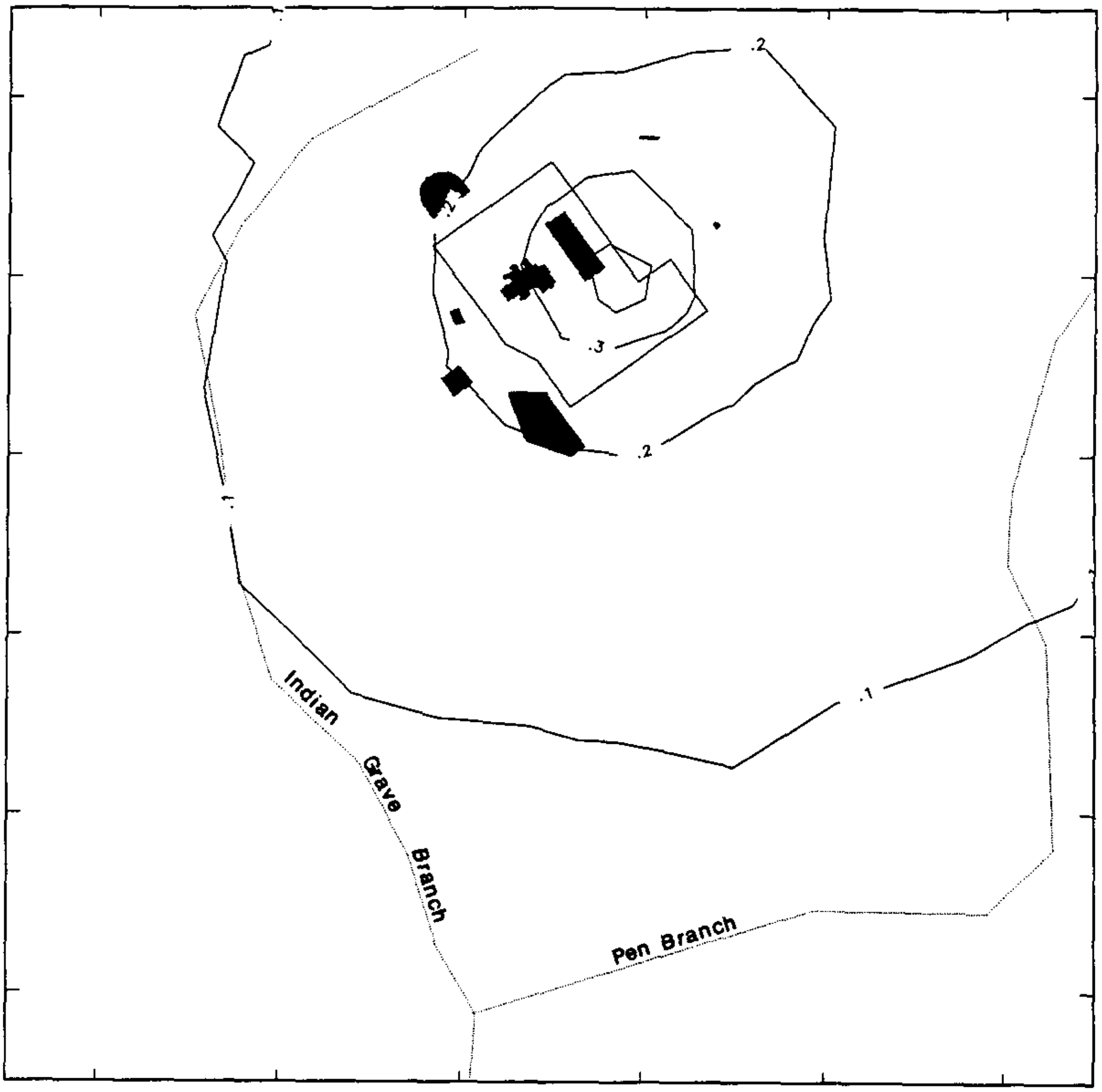
The primary concern in the calibration process is the global response of the model. Although small areas within the model may not match historical data for all hydrologic conditions, systematic errors are investigated and eliminated, if possible, and focus is placed on the specific areas of interest. Differences between observed and computed water levels or flows do not necessarily invalidate the overall analysis. The scale of the model must be considered as well as the reliability and quantity of data. Water level and flow measurements are point measurements and may be impacted by local stresses or heterogeneities which may not be incorporated in the model due to their unknown existence and/or the lack of model resolution. The goal of the flow model, however, is not to simulate every local stress and heterogeneity if it is not within the resolution of the model, but to simulate general water levels, flows, and flow patterns for the scale and domain of the model.

The flow model developed in this study was calibrated under steady-state conditions. Steady-state conditions exist when flow into the aquifer system equals flow out of the aquifer system, and storage does not change with time. When calibrating under steady-state conditions, all aquifer parameters affect the results to some degree, except the storage coefficients (specific storage and specific yield). The storage coefficients are only important when running the model in a transient (heads changing through time) mode. Therefore, the storage coefficients are not included in the calibrated flow model.

The flow model was calibrated using average observed water levels calculated for the period 1986 - 1989. The calibration well data are presented in Appendix A. The average observed water levels were calculated by averaging all the available water level measurements at each well. For some wells (mainly water table wells), quarterly water level measurements were available. For other wells (mainly Aquifer 1 and Aquifer 2 wells), only two or three water level measurements were available. The assumption inherent in this calibration is that the average observed water levels calculated as described above represent steady-state water levels for the rainfall recharge and groundwater pumpage stress conditions imposed. Generally, the water levels do not appear to fluctuate more than a few feet and the greatest fluctuations occur in the water table wells where the most data were available. In addition, pumpage at the SRS, although having decreased steadily, has not varied significantly over the past few years (GeoTrans, 1988), nor has it had any significant impact on groundwater levels, particularly at the reactor site areas. Simulated drawdown contours due to pumpage at the three reactor areas are presented in **Figures 3-13** through **3-15**. Rainfall for the period 1986 - 1989 also did not vary significantly from normal rainfall (see **Table 3-1**). Therefore, the average observed water levels used for calibration of the flow model are most likely, reasonably representative of steady-state water levels for the stress conditions imposed.

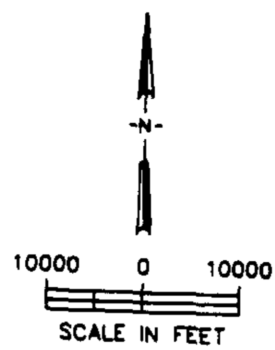
Prior to calibration, ranges of values for the various calibration parameters (hydraulic conductivities) were established. These ranges are based on data and results of previous hydrogeologic studies at the SRS as well as typical values determined for similar geologic materials. The ranges established for the calibration parameters are shown in **Table 3-2**.

Prior to and during calibration, property zones (areas with the same hydraulic properties) were established for each of the hydrostratigraphic units. The



LEGEND

—.3— DRAWDOWN CONTOUR (feet)



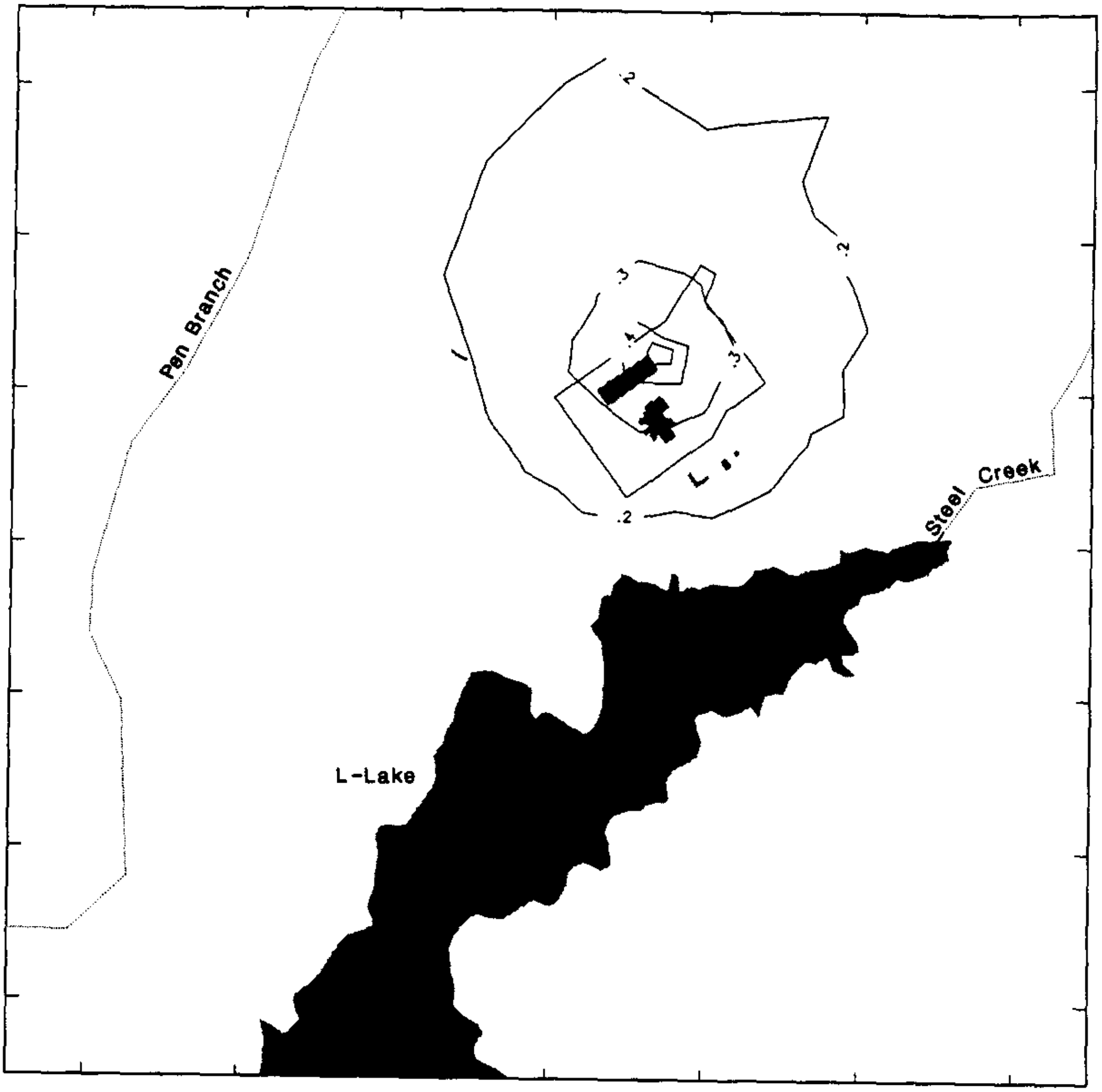
CAMP DRESSER & McKEE INC.

SIMULATED DRAWDOWN IN AQUIFER 1 AT K REACTOR AREA

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-13



LEGEND

—.3— DRAWDOWN CONTOUR (feet)

-N-

10000 0 10000
SCALE IN FEET

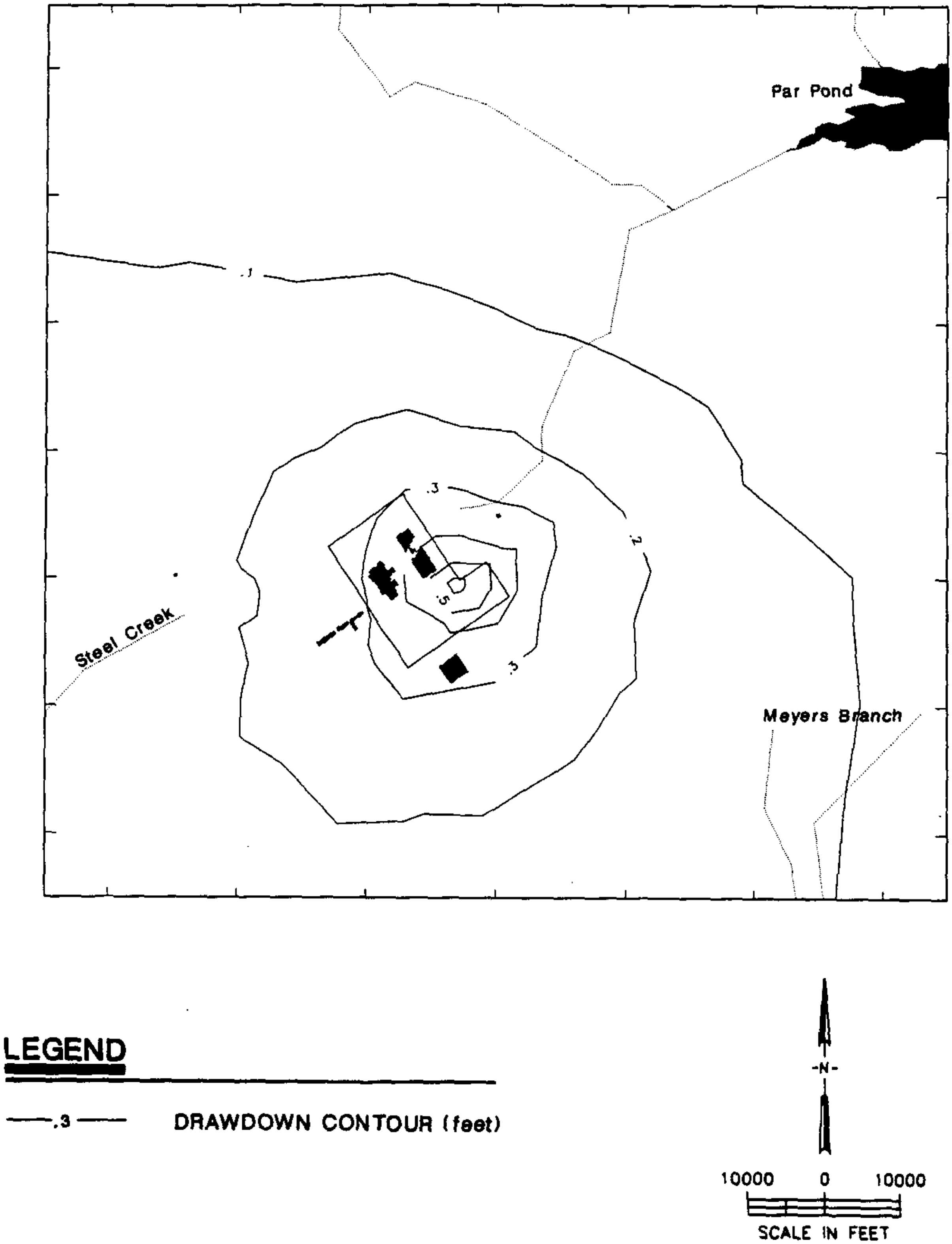
CAMP DRESSER & McKEE INC.

SIMULATED DRAWDOWN IN AQUIFER 1 AT L REACTOR AREA

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-14



CAMP DRESSER & McKEE INC.

SIMULATED DRAWDOWN IN AQUIFER 1 AT P REACTOR AREA

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-15

TABLE 3-1

RAINFALL DATA
SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

Month	1986 Rainfall (inches)	1987 Rainfall (inches)	1988 Rainfall (inches)	1989 Rainfall (inches)	1986-1989 Average Rainfall (inches)	Normal Rainfall (inches)
January	1.35	10.04	6.35	2.96	5.18	4.39
February	2.12	6.24	1.95	3.64	3.49	4.27
March	3.50	5.48	2.83	5.33	4.28	5.36
April	0.89	0.80	2.92	4.16	2.19	3.85
May	1.94	5.39	3.63	6.64	4.40	4.22
June	9.60	4.11	5.73	6.85	6.57	4.33
July	3.27	1.76	3.12	---	2.72	4.72
August	8.51	9.61	4.78	---	7.63	4.38
September	0.94	4.35	4.40	---	3.23	4.14
October	3.89	0.37	5.52	---	3.26	2.19
November	6.62	4.43	1.64	---	4.23	2.24
December	4.46	2.08	0.82	---	2.45	3.60
Total	47.09	54.66	43.69	---	49.63	47.69

Source: National Climatic Data Center Station "Aiken 4 NE".

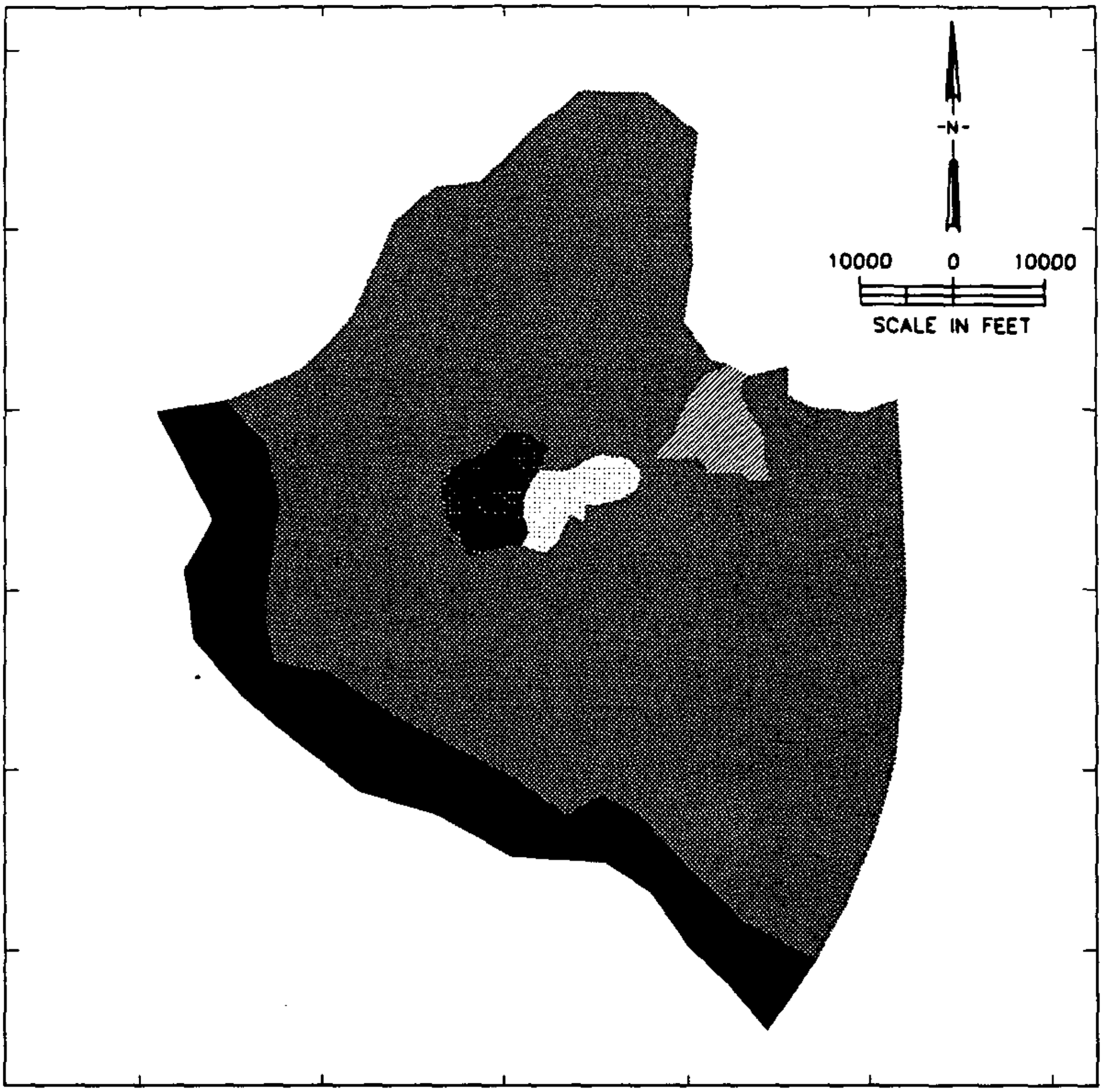
TABLE 3-2

HYDRAULIC CONDUCTIVITY RANGES
SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

Hydrostratigraphic Unit	Horizontal Hydraulic Conductivity (ft/day)	Vertical Hydraulic Conductivity (ft/day)
Aquifer 1	30 - 250	0.0001 - 0.1
"Ellenton" Aquitard	0.1 - 50	0.00001 - 0.01
Aquifer 2	1.0 - 150	0.001 - 0.1
"Santee" Aquitard	0.01 - 1.0	0.00001 - 0.01
Water Table	0.1 - 10	0.001 - 0.1
Savannah River Sediments	0.1 - 50	0.001 - 0.1

various property zones finally adopted at the end of calibration are shown in **Figures 3-16** through **3-20**. In the water table unit and in the "Santee" Aquitard, three property zones, one for each of the three reactor areas, were established to isolate these areas from the rest of the SRS during calibration, since they are the areas of most concern in this study. By isolating the three areas, each could be addressed separately during calibration. Also in the water table unit and the "Santee" Aquitard, and in Aquifer 2 and the "Ellenton" Aquitard, a separate property zone was established along the Savannah River to represent river sediments. Previous studies at the SRS have indicated that a zone of high leakance along the Savannah River must exist to allow drainage of Aquifers 1 and 2 into the Savannah River. The results of calibration of the flow model concur with this observation. Finally, in Aquifer 1, two zones (north and south) divided by the Pen Branch Fault were established. This division was necessary due to the different groundwater flow characteristics exhibited north and south of the Pen Branch Fault as described in Section 2.2.

In the "Ellenton" Aquitard, a separate property zone was also established for the Pen Branch Fault. This segregation of the fault zone from the rest of the unit was made to facilitate a conservative EIS analysis. Originally, during calibration, the fault zone was not addressed separately from the rest of the model, because there are no data indicating that the fault zone is having a significant impact on groundwater flow at the SRS, at least on a sitewide basis. If the fault is having an impact on groundwater flow, the impacts are local and the observation well network is not dense enough to define them. The groundwater flow model was therefore calibrated without separate property zones for the fault zone. After calibration was completed, however, a sensitivity analysis was performed on the vertical hydraulic conductivity values used along the fault zone for each of the aquitards to see if higher values for the vertical conductivities could be used without affecting the calibration results. The results indicated that the vertical hydraulic conductivity of the "Santee" Aquitard along the fault zone is a very sensitive parameter in this model and any change in this parameter significantly affects the calibration results. Therefore, the value for the vertical hydraulic conductivity of the fault zone in the "Santee" Aquitard was left as calibrated. The vertical hydraulic conductivity of the "Ellenton" Aquitard along the fault zone, however, is not a very sensitive parameter in this model with regard to calibration, and can be



LEGEND

	WATER TABLE – K AREA
RIVER SEDIMENTS	WATER TABLE – L AREA
WATER TABLE– GENERAL	WATER TABLE – P AREA

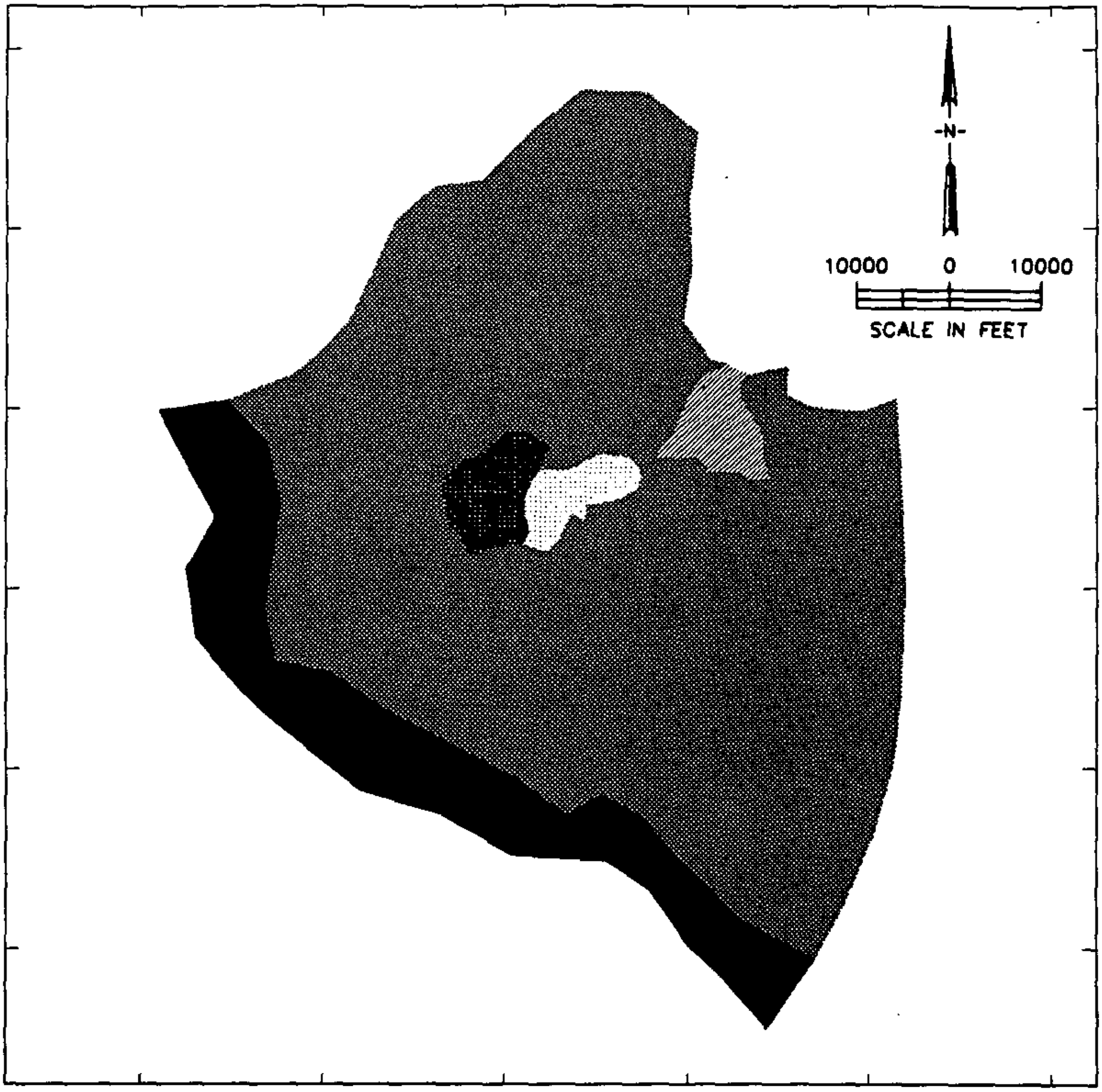
CAMP DRESSER & McKEE INC.

MODEL PROPERTY ZONES FOR WATER TABLE

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3–16



LEGEND

RIVER SEDIMENTS

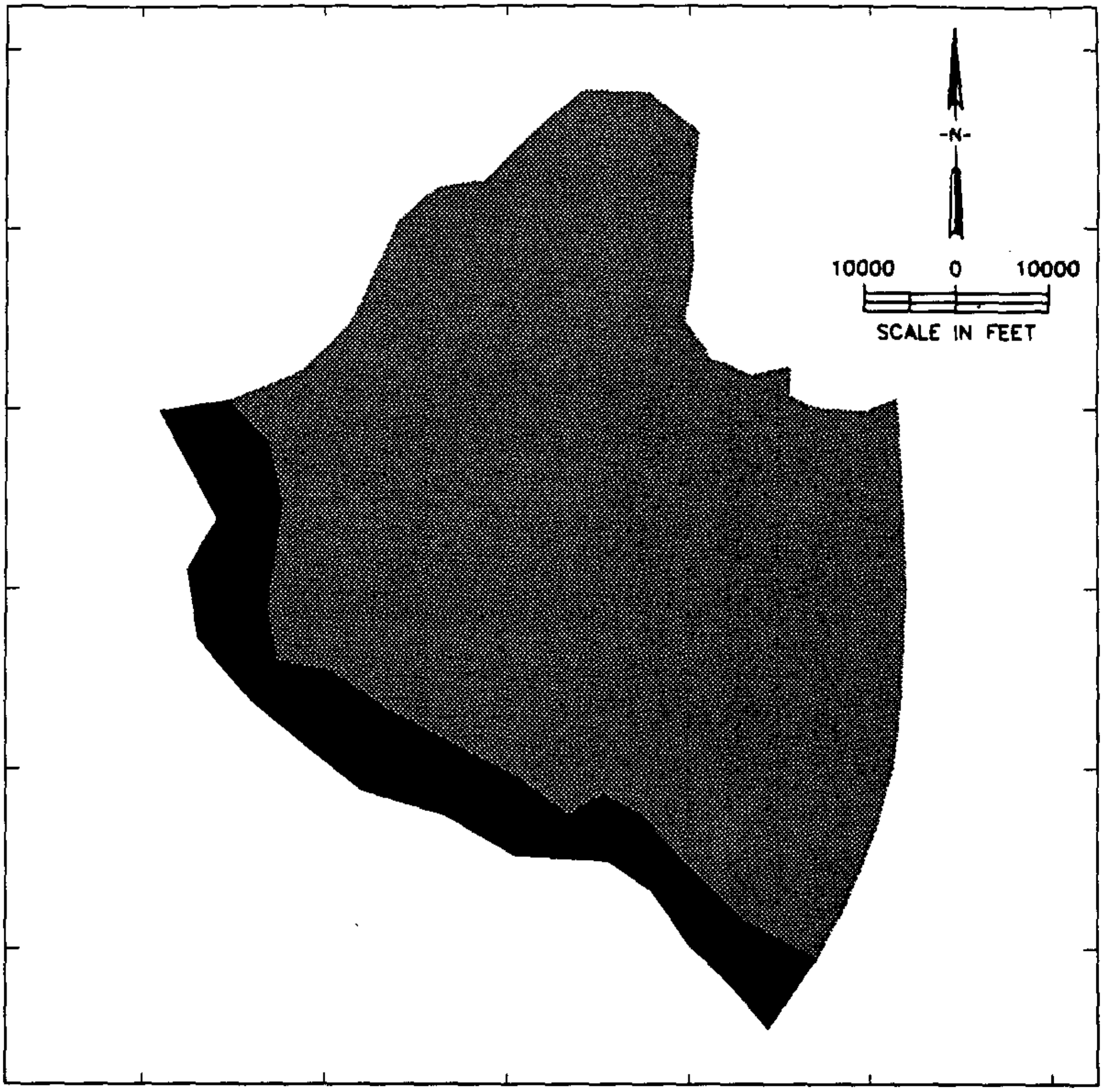
"SANTEE" - GENERAL

"SANTEE" - K AREA

"SANTEE" - L AREA

"SANTEE" - P AREA

CAMP DRESSER & McKEE INC. MODEL PROPERTY ZONES FOR "SANTEE" AQUITARD	FIGURE NO.
SAVANNAH RIVER SITE AIKEN, SOUTH CAROLINA	3-17



LEGEND

RIVER SEDIMENTS

AQUIFER 2

CAMP DRESSER & McKEE INC.

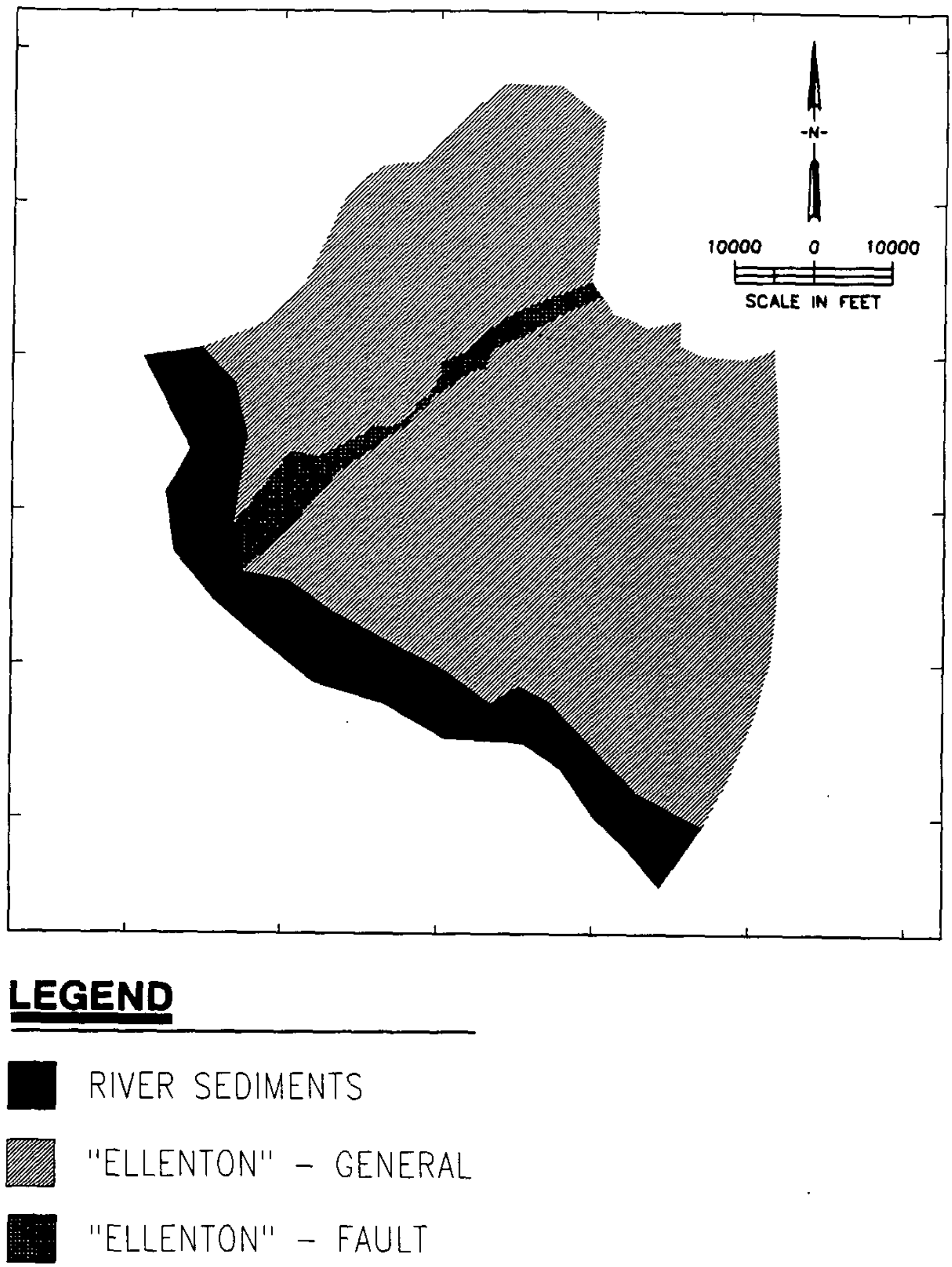
MODEL PROPERTY ZONES FOR AQUIFER 2

FIGURE NO.

3-18

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA



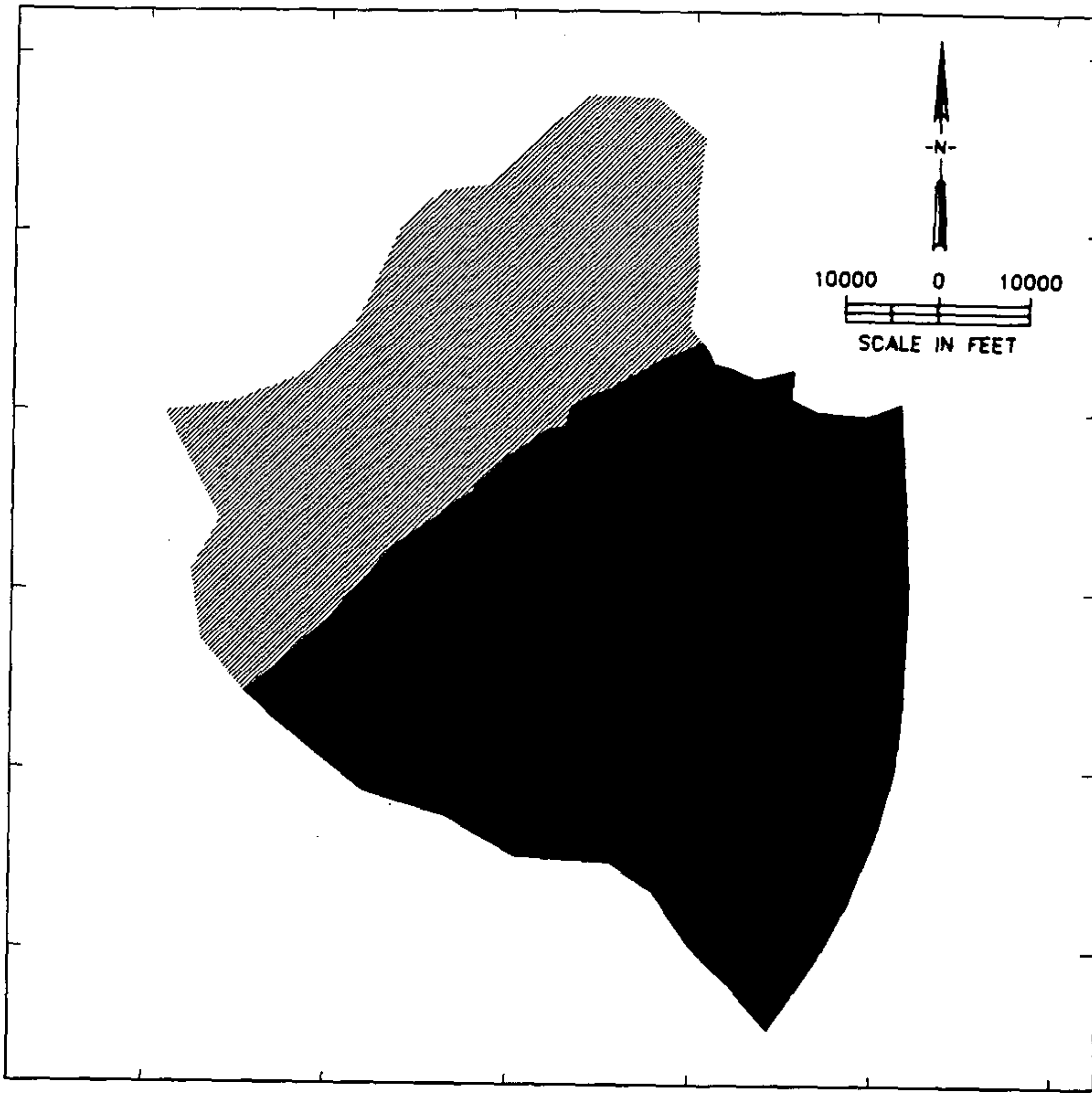
CAMP DRESSER & McKEE INC.

MODEL PROPERTY ZONES FOR "ELLENTON" AQUITARD

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-19



LEGEND

AQUIFER 1 - SOUTH

AQUIFER 1 - NORTH

CAMP DRESSER & McKEE INC.

MODEL PROPERTY ZONES FOR AQUIFER 1

SAVANNAH RIVER SITE

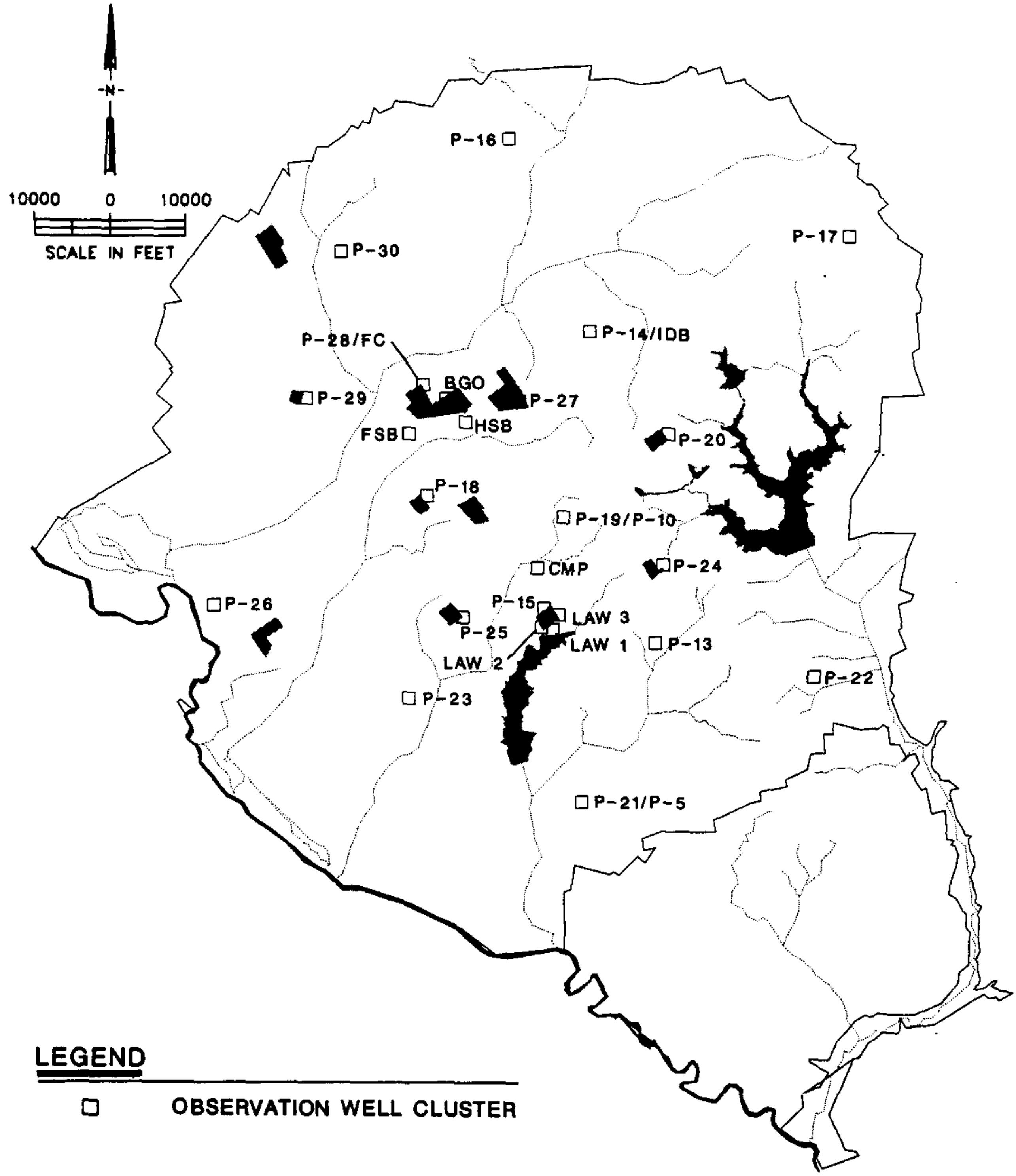
AIKEN, SOUTH CAROLINA

FIGURE NO. 3-20

increased 50-fold over the value calibrated for the rest of the SRS without any significant effects on the calibration results. A separate property zone, with the higher value of vertical hydraulic conductivity assigned to it, was therefore established for the fault zone in the "Ellenton" Aquitard to facilitate a conservative EIS analysis. The higher vertical hydraulic conductivity allows for easier transport of contamination down into Aquifer 1 which is a primary concern in this EIS.

Following each calibration run, the model-generated water levels and flow patterns were compared to the observed water levels and flow patterns both visually and statistically, to help evaluate the effect of a given set of input parameters (hydraulic conductivities) on the modeled water levels. In addition, a parameter optimization program was used to help guide the calibration process. Over 50 calibration runs were made during the calibration process. The locations of the observation wells used for calibration (hereafter called calibration wells) are shown in **Figures 3-21** through **3-24**. The final calibration hydraulic conductivities are listed in **Table 3-3**. A comparison of the simulated water levels and the observed water levels is presented in **Table 3-4**. A summary of the statistics for the model calibration results is presented in **Table 3-5**. The simulated water level contour maps for the bottom of Aquifer 1, the top of Aquifer 1, and the top of Aquifer 2 are shown in **Figures 3-25** through **3-27**, respectively. The simulated water level contour maps for the water table at the K, L, and P reactor sites are shown in **Figures 3-28** through **3-30**, respectively.

As can be seen in the above figures and tables, model results compare quite favorably to the observed data. A few wells show large differences between observed and simulated water levels, but these differences are probably due to local heterogeneities in the aquifer system which, due to their unknown characteristics, are not incorporated in the model. These differences, although important on a very local scale, are not as significant with regard to the reactor site scale of the model, and should therefore not invalidate the results of this study.



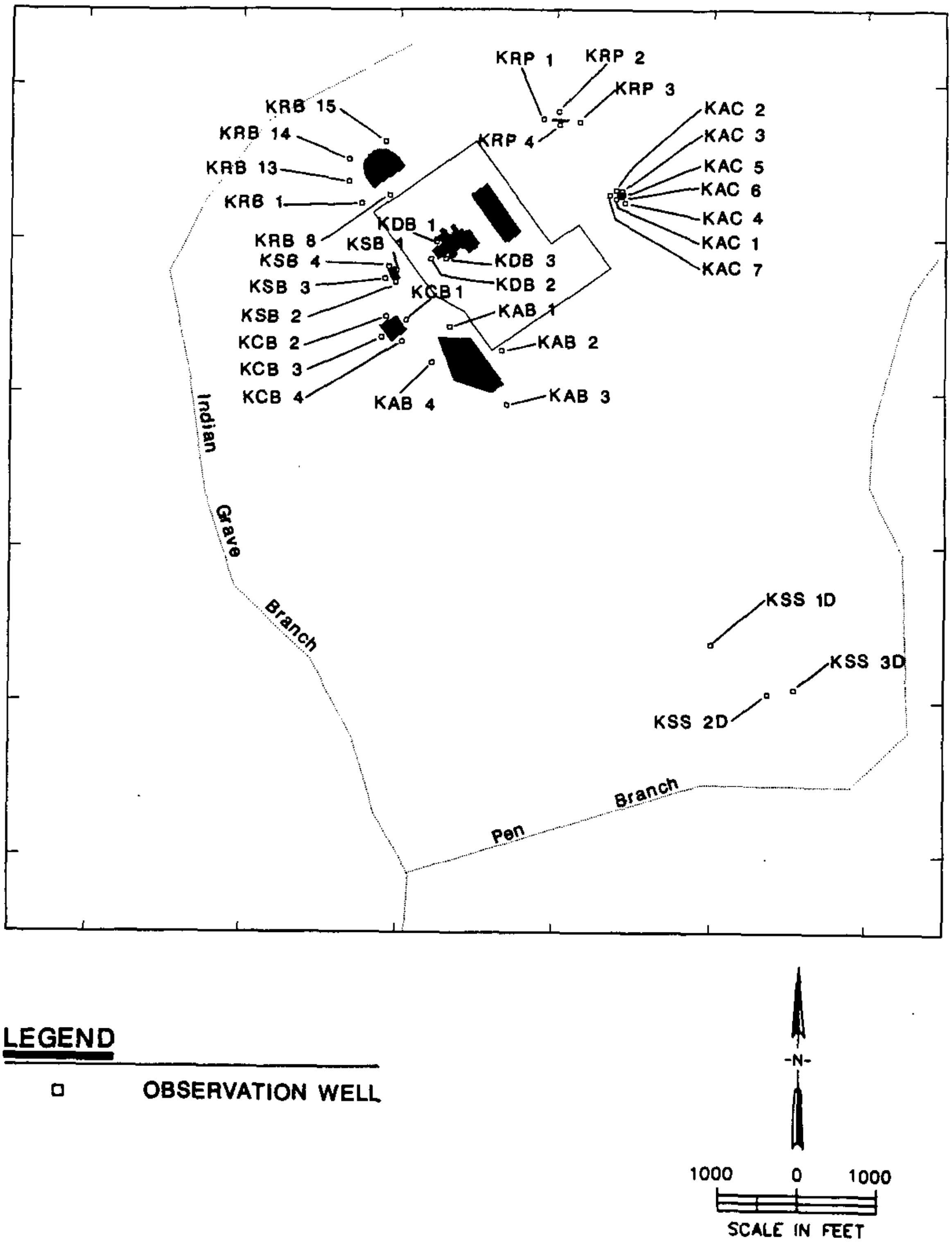
CAMP DRESSER & McKEE INC.

LOWER AQUIFER SYSTEM CALIBRATION WELL CLUSTERS

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-21



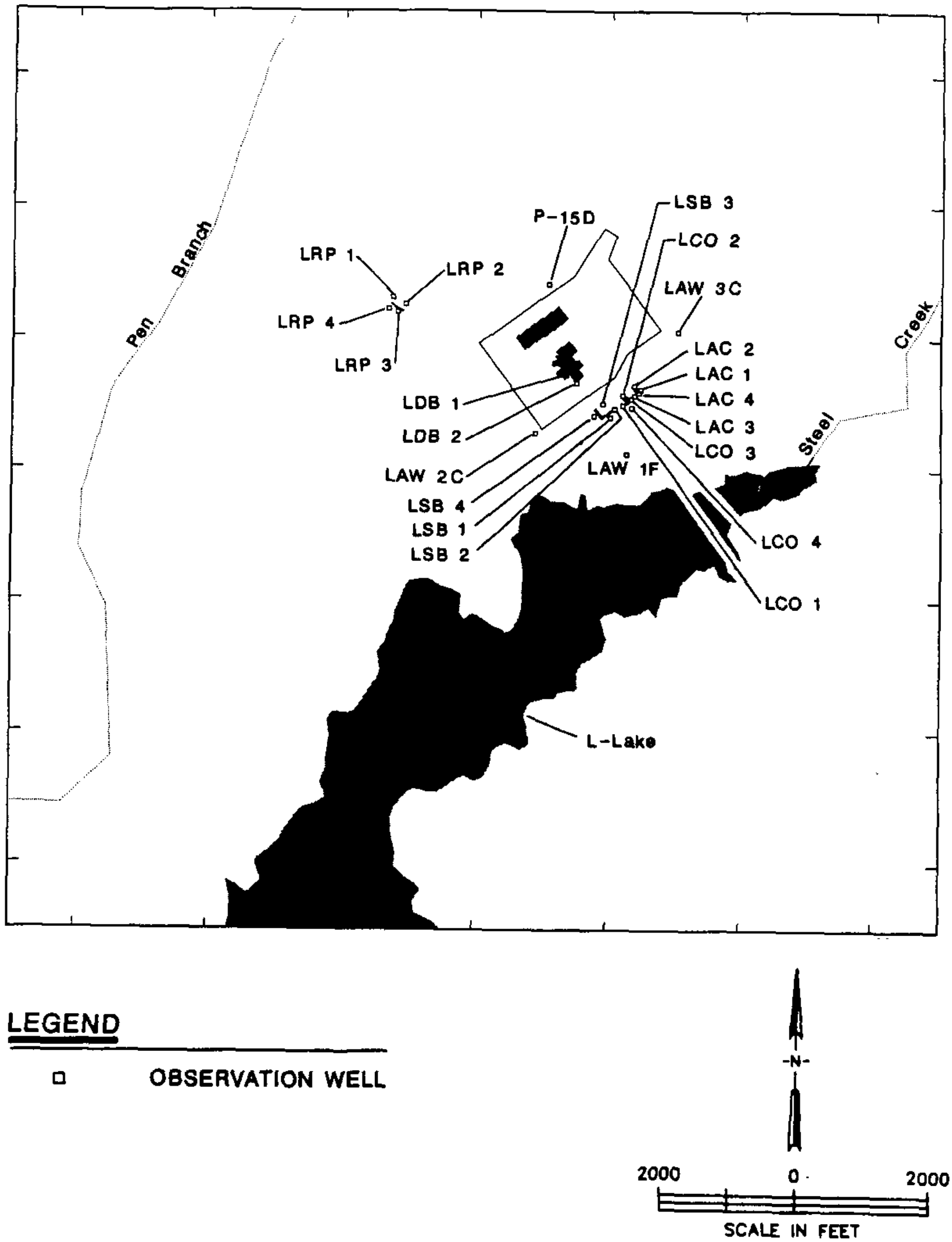
CAMP DRESSER & McKEE INC.

K REACTOR AREA WATER TABLE CALIBRATION WELLS

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-22

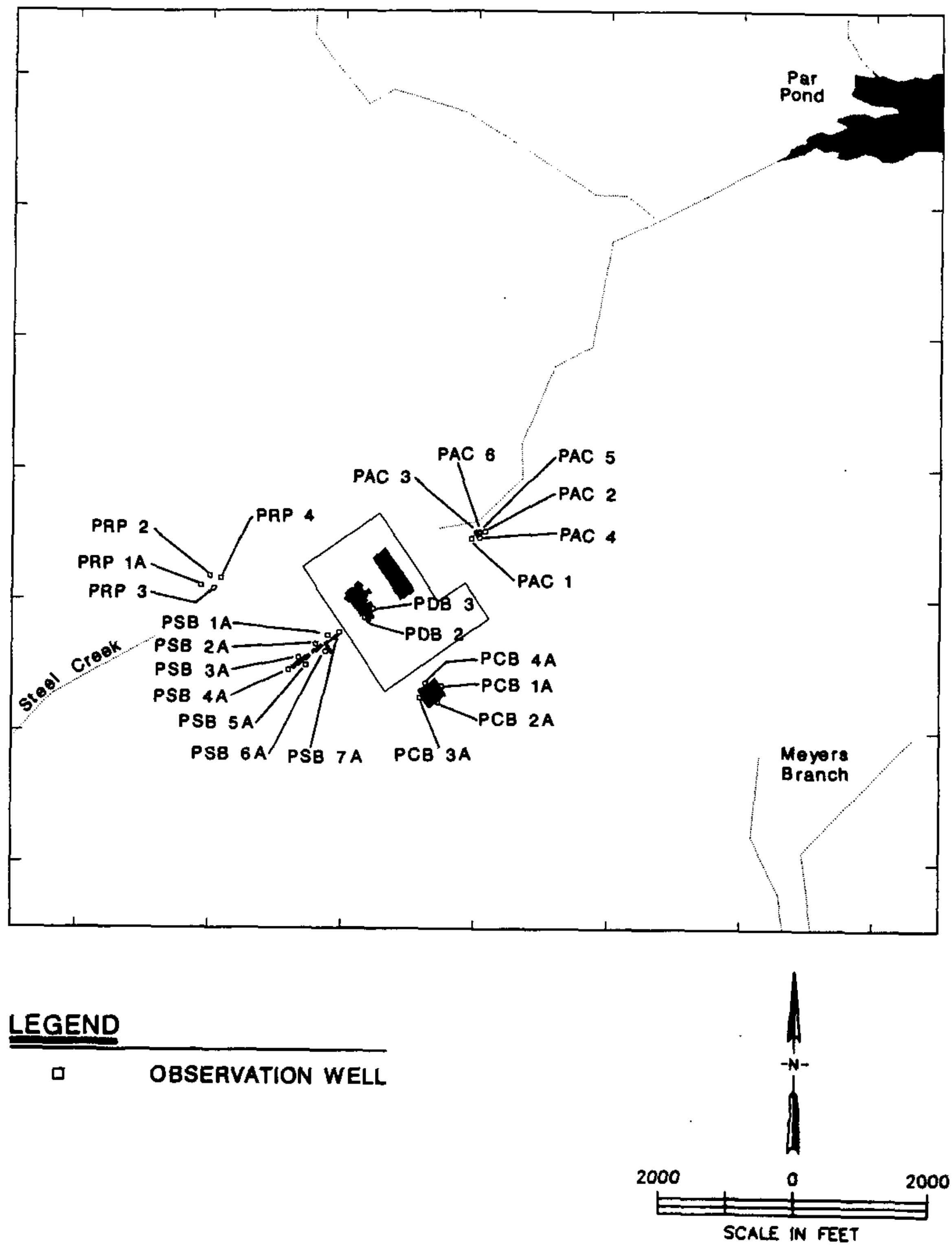


CAMP DRESSER & McKEE INC.

L REACTOR AREA WATER TABLE CALIBRATION WELLS

SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

FIGURE NO.
3-23



CAMP DRESSER & McKEE INC.

P REACTOR AREA WATER TABLE CALIBRATION WELLS

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO.

3-24

TABLE 3-3

CALIBRATED HYDRAULIC CONDUCTIVITIES
SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

Hydrostratigraphic Unit	Horizontal Hydraulic Conductivity (ft/day)	Vertical Hydraulic Conductivity (ft/day)
Aquifer 1 - Northern Section	65	0.1
Aquifer 1 - Southern Section	250	0.0001
"Ellenton" Aquitard - General	2.9	0.00016
"Ellenton" Aquitard - Fault Zone	2.9	0.008
Aquifer 2	15	0.01
"Santee" Aquitard - General	0.4	0.00035
"Santee" Aquitard - K Area	0.025	0.00068
"Santee" Aquitard - L Area	0.11	0.00001
"Santee" Aquitard - P Area	0.041	0.0014
Water Table - General	10	0.004
Water Table - K Area	5.6	0.1
Water Table - L Area	7.5	0.02
Water Table - P Area	2.3	0.006
Savannah River Sediments	29	0.008

TABLE 3-4

CALIBRATION WELL OBSERVED AND SIMULATED WATER LEVELS
SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

Unit	Well ID	Observed Water Level (ft msl)	Simulated Water Level (ft msl)	Difference (feet)
Water Table	KAB 1	210.51	210.09	-0.42
	KAB 2	214.86	211.60	-3.26
	KAB 3	207.85	208.86	1.01
	KAB 4	207.81	207.43	-0.38
	KAC 1	216.18	217.60	1.42
	KAC 2	216.96	217.96	1.00
	KAC 3	218.09	217.82	-0.27
	KAC 4	215.16	216.88	1.72
	KAC 5	219.18	217.81	-1.37
	KAC 6	218.74	217.70	-1.04
	KAC 7	215.62	217.95	2.33
	KCB 1	208.73	206.77	-1.96
	KCB 2	206.85	205.00	-1.85
	KCB 3	205.77	204.00	-1.77
	KCB 4	208.40	205.81	-2.59
	KDB 1	209.97	210.48	0.51
	KDB 2	209.07	210.03	0.96
	KDB 3	209.98	211.03	1.05
	KRB 1	208.14	203.05	-5.09
	KRB 13	206.08	200.94	-5.14
	KRB 14	204.03	200.59	-3.44
	KRB 15	205.58	204.73	-0.85
	KRB 8	209.84	206.07	-3.77
	KRP 1	217.34	217.55	0.21
	KRP 2	217.29	218.19	0.90
	KRP 3	217.01	219.26	2.25
	KRP 4	216.48	218.09	1.61
	KSB 1	207.12	206.57	-0.55
	KSB 2	206.88	206.31	-0.57
	KSB 3	206.40	205.27	-1.13
	KSB 4A	206.23	205.75	-0.48
	KSS 1D	170.91	178.98	8.07
	KSS 2D	160.65	167.33	6.68
	KSS 3D	159.98	166.33	6.35
	LAC 1	213.50	213.37	-0.13
	LAC 2	213.96	214.09	0.13
	LAC 3	213.48	212.47	-1.01
	LAC 4	213.54	212.55	-0.99
	LAW 1F	199.46	201.55	2.09
	LAW 2C	204.47	207.34	2.87
	LAW 3C	228.92	220.44	-8.48
	LCO 1	211.82	211.78	-0.04

TABLE 3-4
(Continued)

Unit	Well ID	Observed Water Level (ft msl)	Simulated Water Level (ft msl)	Difference (feet)
Water Table (cont.)	LCO 2	213.59	213.21	-0.38
	LCO 3	213.29	212.54	-0.75
	LCO 4	209.72	210.97	1.25
	LDB 1	215.17	215.34	0.17
	LDB 2	214.97	214.36	-0.61
	LRP 1	206.53	211.89	5.36
	LRP 2	207.53	213.65	6.12
	LRP 3	206.93	213.39	6.46
	LRP 4	206.22	210.93	4.71
	LSB 1	208.86	210.02	1.16
	LSB 2	209.48	211.36	1.88
	LSB 3	213.79	212.23	-1.56
	LSB 4	213.78	210.33	-3.45
	PAC 1	284.32	275.15	-9.17
	PAC 2	270.75	269.04	-1.71
	PAC 3	271.78	272.56	0.78
	PAC 4	283.91	272.25	-11.66
	PAC 5	269.50	272.32	2.82
	PAC 6	270.81	272.53	1.72
	PCB 1A	284.68	282.95	-1.73
	PCB 2A	282.92	280.58	-2.34
	PCB 3A	283.85	282.11	-1.74
	PCB 4A	283.01	282.84	-0.17
	PDB 2	278.81	277.26	-1.55
	PDB 3	278.93	277.35	-1.58
	PRP 1A	248.55	261.81	13.26
	PRP 2	254.46	263.96	9.50
	PRP 3	253.49	261.45	7.96
	PRP 4	257.24	264.55	7.31
	PSB 1A	277.38	278.63	1.25
	PSB 2A	275.70	278.66	2.96
	PSB 3A	275.34	277.74	2.40
	PSB 4A	274.08	276.09	2.01
	PSB 5A	276.12	279.84	3.72
	PSB 6A	278.05	280.25	2.20
	PSB 7A	277.66	279.02	1.36
	P-15D	227.54	225.23	-2.31
	P-24C	249.59	247.86	-1.73
	P-25D	210.17	215.13	4.96
"Santee" Aquitard	LAW 1E	201.00	195.89	-5.11
	P-15C	213.34	210.63	-2.71
	P-24B	227.89	224.11	-3.78
	P-25C	196.71	197.12	0.40

TABLE 3-4
(Continued)

Unit	Well ID	Observed Water Level (ft msl)	Simulated Water Level (ft msl)	Difference (feet)
Aquifer 2	BGO 14A	157.16	157.68	0.52
	BGO 16A	160.05	159.64	-0.41
	BGO 18A	159.79	160.54	0.75
	BGO 25A	158.08	158.10	0.02
	BGO 6A	158.43	159.24	0.81
	BGO 8A	158.89	158.50	-0.39
	CMP 12A	179.92	180.03	0.11
	CMP 15A	178.88	179.15	0.27
	CMP 8A	181.17	180.77	-0.40
	FC-2A	146.66	149.20	2.54
	FC-2B	146.59	148.23	1.64
	FSB 100	150.75	152.25	1.50
	FSB 101	150.60	152.25	1.65
	FSB 76B	151.31	151.74	0.43
	FSB 78B	153.35	152.51	-0.84
	FSB 79B	156.82	154.68	-2.14
	FSB 87B	150.79	150.68	-0.11
	FSB 96A	152.31	151.53	-0.78
	FSB 97A	151.17	151.32	0.15
	FSB 98A	150.48	151.16	0.68
	FSB 99A	149.87	150.90	1.03
	HSB 117	164.48	164.52	0.04
	HSB 118	165.99	165.41	-0.58
	HSB 119	165.22	165.05	-0.17
	HSB 120	164.84	164.84	00.00
	HSB 121	170.03	168.75	-1.28
	HSB 122	169.72	168.85	-0.87
	HSB 123	169.80	169.35	-0.45
	HSB 139	171.63	170.45	-1.18
	HSB 65A	169.89	169.19	-0.70
	HSB 68A	170.52	168.99	-1.53
	HSB 69A	170.40	168.52	-1.88
	HSB 83A	171.71	170.94	-0.77
	HSB 84A	171.06	168.25	-2.81
	HSB 85A	167.64	167.18	-0.46
	HSB 86A	167.19	166.01	-1.18
	IDB-1B	184.11	187.00	2.89
	LAW 1C	173.29	171.98	-1.31
	LAW 1D	173.23	172.40	-0.83
	LAW 2B	172.72	171.69	-1.03
	LAW 3B	174.77	175.43	0.66
	P-13A	172.73	174.45	1.72
	P-13B	174.96	175.68	0.72
	P-15B	176.88	175.74	-1.14
	P-18A	170.97	162.95	-8.02

TABLE 3-4
(Continued)

Unit	Well ID	Observed Water Level (ft msl)	Simulated Water Level (ft msl)	Difference (feet)
Aquifer 2 (cont.)	P-18B	167.85	163.50	-4.35
	P-19A	185.79	184.47	-1.32
	P-21A	134.08	137.17	3.09
	P-21B	133.00	137.37	4.37
	P-22A	153.07	154.70	1.63
	P-22B	152.21	154.90	2.69
	P-23A	148.25	145.48	-2.77
	P-23B	140.03	145.68	5.65
	P-24A	191.37	193.06	1.69
	P-26A	115.76	114.66	-1.10
	P-27B	178.92	179.60	0.68
"Ellenton" Aquitard	FSB 76A	154.70	151.77	-2.93
	FSB 78A	155.05	152.60	-2.45
	FSB 79A	156.63	154.80	-1.83
	FSB 87A	153.26	150.77	-2.49
	LAW 1A	170.71	168.78	-1.93
	LAW 1B	172.14	170.75	-1.39
	LAW 2A	169.98	168.50	-1.48
	LAW 3A	171.88	169.58	-2.30
	P-13TD	172.68	172.37	-0.31
	P-15A	175.52	172.50	-3.02
	P-25A	170.96	167.28	-3.68
Aquifer 1	IDB-1A	187.73	189.97	2.24
	LAW 1TD	168.44	169.31	0.87
	P-15TD	168.49	169.35	0.86
	P-19TD	176.76	174.99	-1.77
	P-21TD	164.84	162.79	-2.05
	P-22TD	174.40	174.86	0.46
	P-23TE	164.20	159.63	-4.57
	P-24TD	175.23	175.80	0.57
	P-25TE	163.66	165.34	1.68
	P-26TD	146.06	149.93	3.87
	P-27TE	177.94	178.48	0.54
	P-28A	173.21	174.71	1.50
	P-13TC	173.25	174.78	1.53
	P-14TC	190.09	190.09	00.00
	P-15TC	170.83	171.50	0.67
	P-18TC	169.46	168.49	-0.97
	P-18TD	169.67	168.69	-0.98
	P-19TC	176.88	175.29	-1.59
	P-21TC	165.13	169.15	4.02
	P-22TC	174.32	177.86	3.54
	P-23TC	168.24	165.05	-3.19

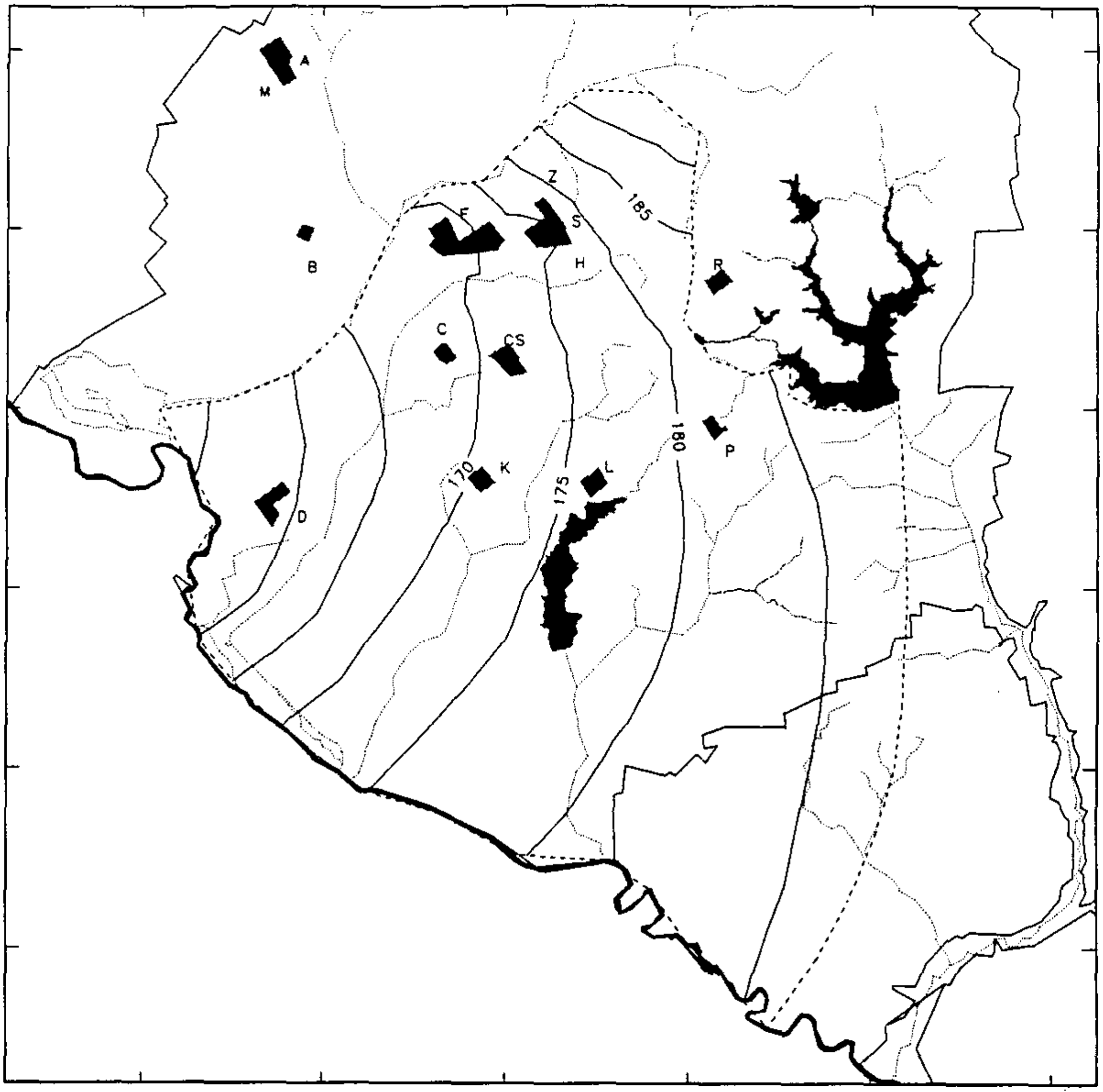
TABLE 3-4
(Continued)

Unit	Well ID	Observed Water Level (ft msl)	Simulated Water Level (ft msl)	Difference (feet)
Aquifer 1 (cont.)	P-23TD	164.44	161.55	-2.89
	P-24TC	175.31	176.95	1.64
	P-25TC	166.34	167.37	1.03
	P-25TD	166.13	166.03	-0.10
	P-27TC	177.99	177.25	-0.74
	P-27TD	177.66	177.79	0.13
	P-28TC	172.42	172.42	00.00
	P-28TD	173.19	173.13	-0.06
	P-28TE	173.16	174.00	0.84
	P-13TB	182.88	176.86	-6.02
	P-14TB	188.14	189.80	1.66
	P-15TB	177.34	172.84	-4.50
	P-18TB	169.88	168.35	-1.53
	P-19TB	178.02	175.55	-2.47
	P-21TB	179.74	173.49	-6.25
	P-22TB	187.40	181.67	-5.73
	P-23TB	170.25	167.43	-2.82
	P-24TB	183.03	179.65	-3.38
	P-25TB	170.75	169.42	-1.33
	P-27TB	177.70	176.44	-1.26
	P-28TB	171.72	171.38	-0.34
	P-10A	178.26	176.77	-1.49
	P-13TA	182.80	179.96	-2.84
	P-14TA	187.94	188.56	0.62
	P-15TA	177.42	175.60	-1.82
	P-18TA	170.24	168.75	-1.49
	P-19TA	178.26	176.26	-2.00
	P-22TA	187.85	185.62	-2.23
	P-23TA	170.61	169.95	-0.66
	P-24TA	183.20	181.93	-1.27
	P-25TA	171.94	171.52	-0.42
	P-27TA	176.16	175.60	-0.56
	P-28TA	171.23	169.33	-1.90
	P-5A	179.78	178.48	-1.30

TABLE 3-5

CALIBRATION SUMMARY STATISTICS
SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

Unit	Average Water Level Difference (feet)	Standard Deviation of Differences (feet)
Water Table (including "Santee" Aquitard)	0.38	3.86
Aquifer 2 (including "Ellenton" Aquitard)	-0.40	2.04
Aquifer 1	-0.80	2.24
Overall	-0.19	3.01



LEGEND

—— 170 —— WATER LEVEL CONTOUR (ft. msl)

- - - - - - - - - MODEL GRID BOUNDARY

-N-

10000 0 10000

SCALE IN FEET

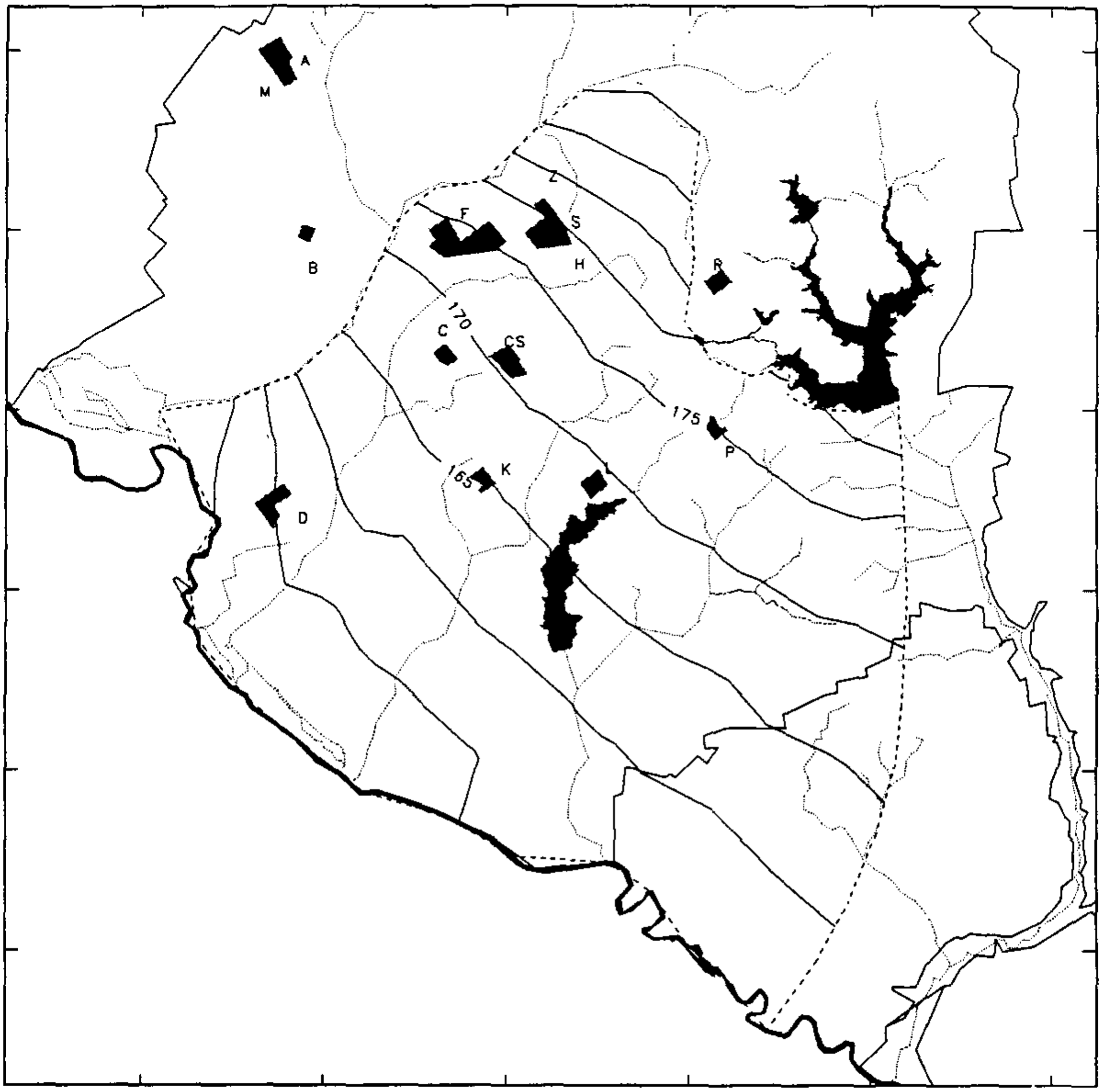
CAMP DRESSER & McKEE INC.

SIMULATED EQUIPOTENTIAL CURVES FOR THE BOTTOM OF AQUIFER 1

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

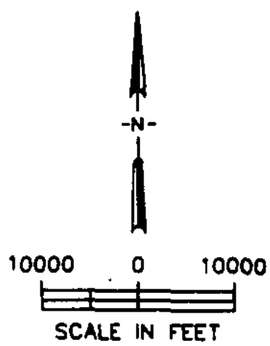
FIGURE NO. 3-25



LEGEND

—170— WATER LEVEL CONTOUR (ft. msl)

- - - - - - - - MODEL GRID BOUNDARY



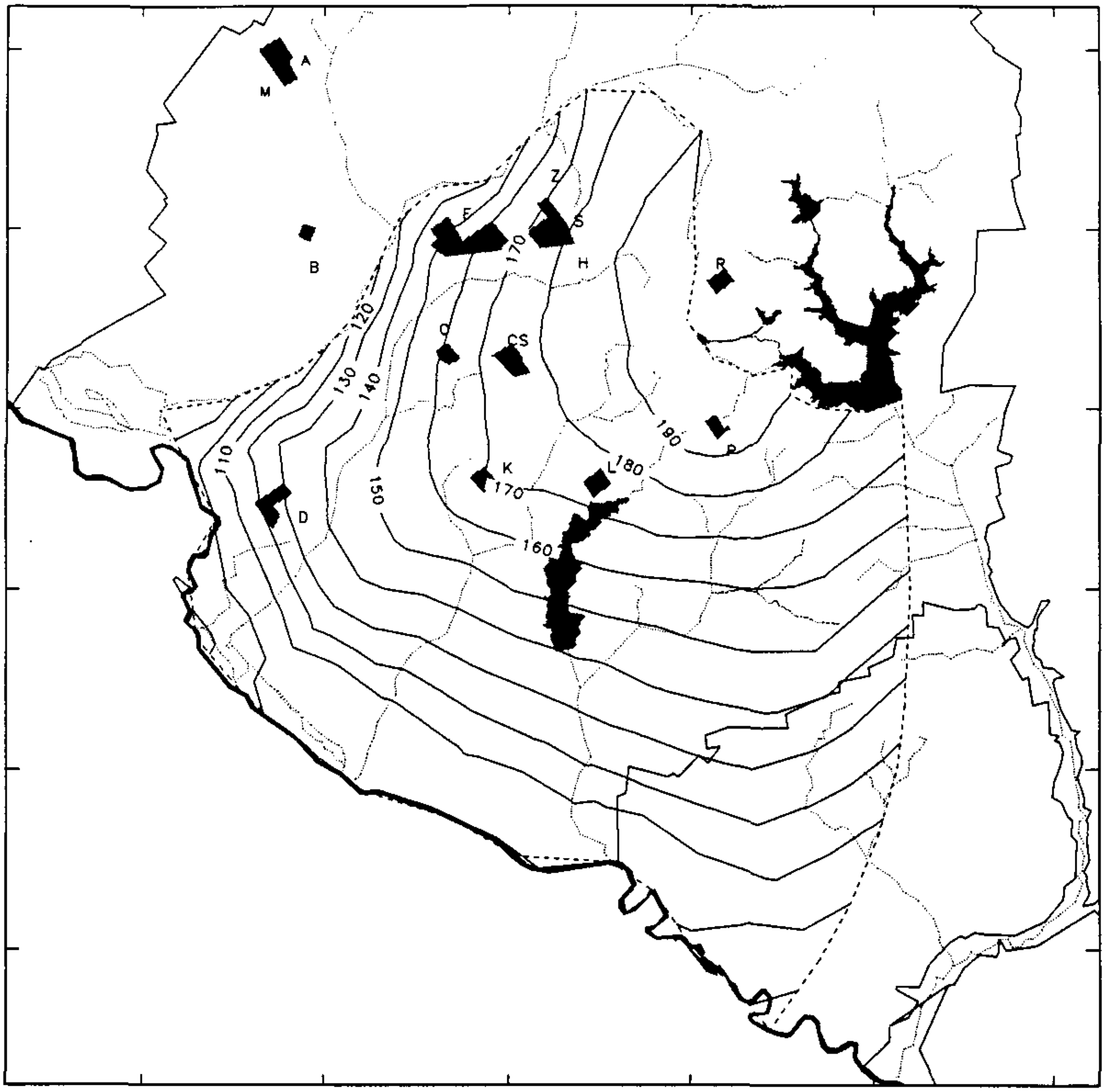
CAMP DRESSER & McKEE INC.

SIMULATED EQUIPOTENTIAL CURVES FOR THE TOP OF AQUIFER 1

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

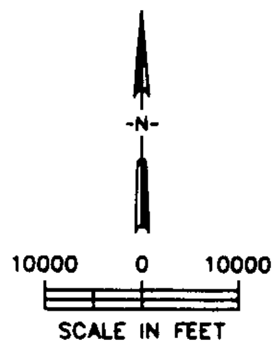
FIGURE NO. 3-26



LEGEND

—170— WATER LEVEL CONTOUR (ft. msl)

- - - - - - - - MODEL GRID BOUNDARY



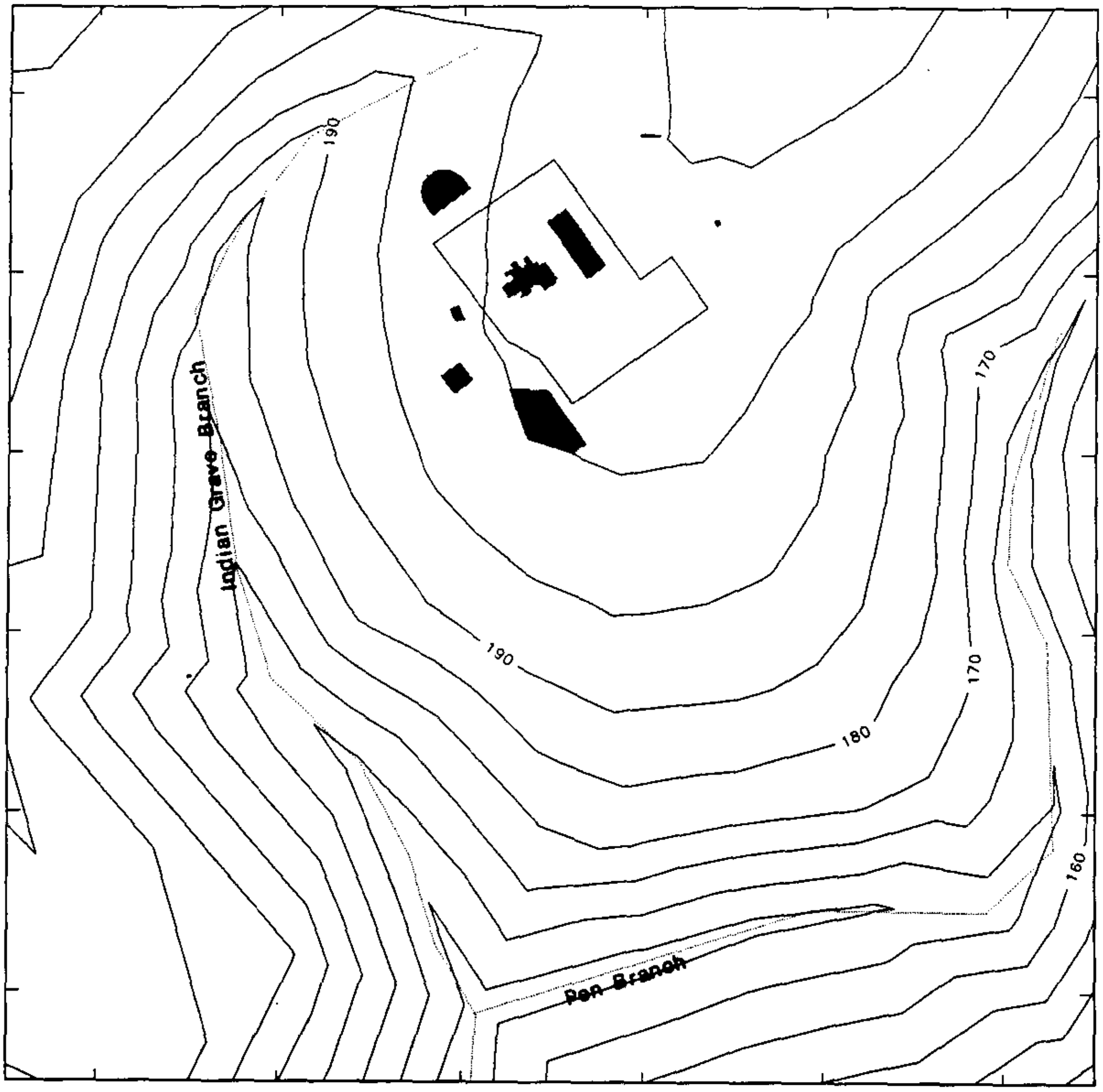
CAMP DRESSER & McKEE INC.

SIMULATED EQUIPOTENTIAL CURVES FOR AQUIFER 2

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-27



LEGEND

—— 160 —— WATER LEVEL CONTOUR (ft. msl)

-N-

1000 0 1000

SCALE IN FEET

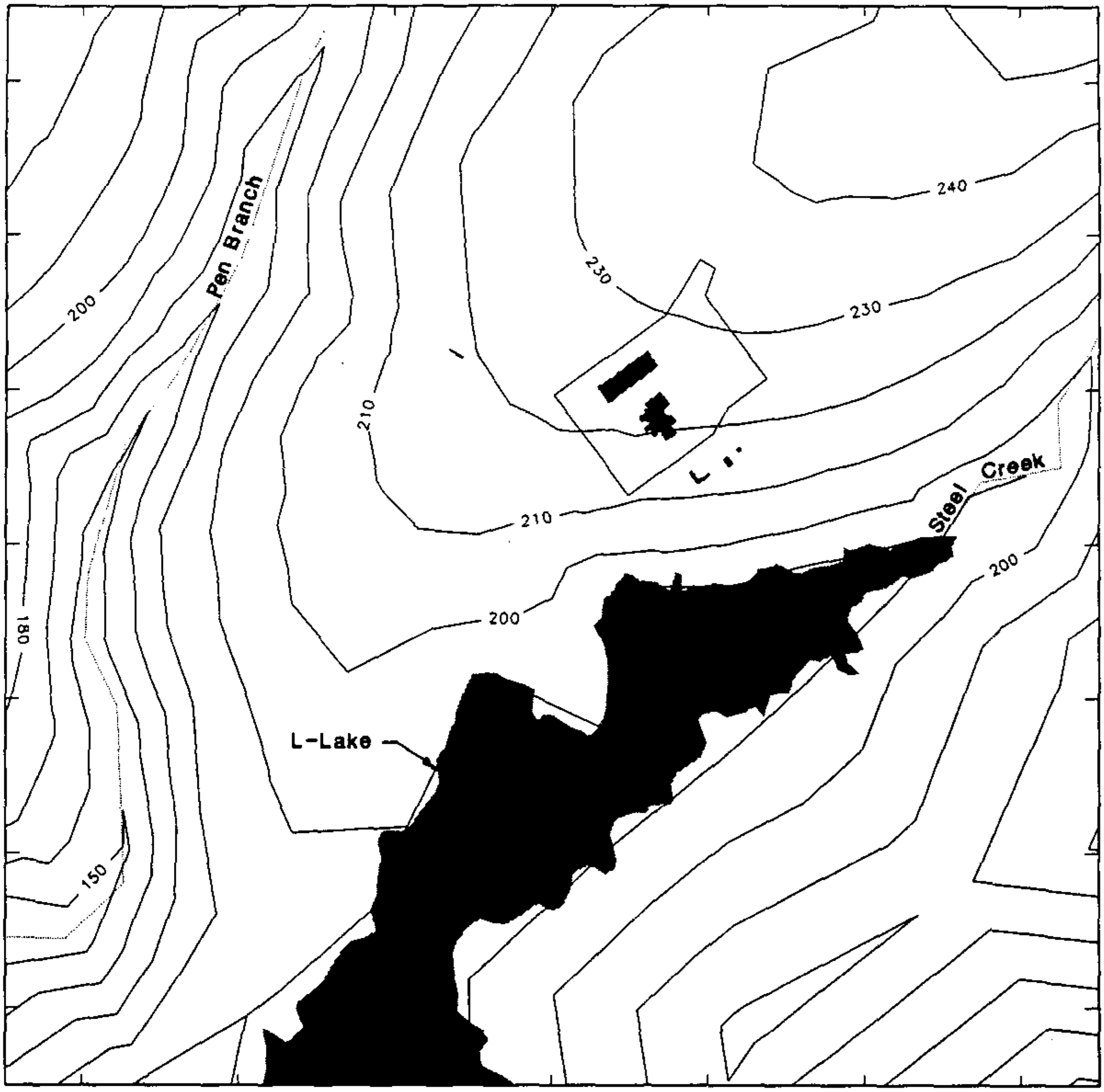
CAMP DRESSER & McKEE INC.

SIMULATED WATER TABLE ELEVATIONS AT K REACTOR AREA

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-28



LEGEND

—240— WATER LEVEL CONTOUR (ft. msl)

-N-

2000 0 2000

SCALE IN FEET

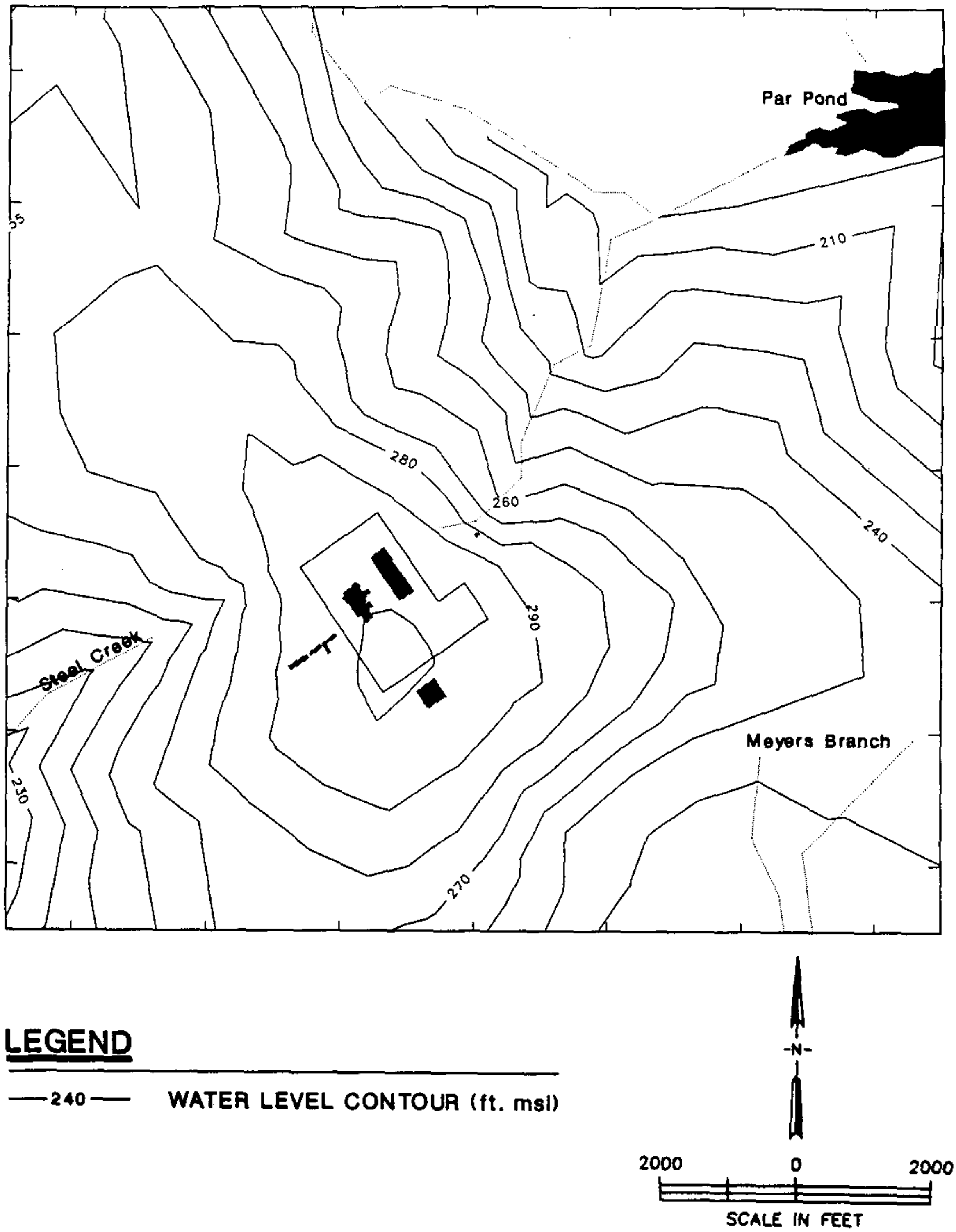
CAMP DRESSER & McKEE INC.

SIMULATED WATER TABLE ELEVATIONS AT L REACTOR AREA

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-29



CAMP DRESSER & McKEE INC.

SIMULATED WATER TABLE ELEVATIONS AT P REACTOR AREA

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 3-30

4.0 CONTAMINANT TRANSPORT MODEL DEVELOPMENT

The next step in this study was to develop a compatible contaminant transport model to simulate the movement of radionuclides in the groundwater system. These models can vary from simple analytic equations to complex numerical computer models. Because of the complexity of this contaminant transport problem, the companion contaminant transport model for DYNFLOW called DYNTRACK (DYNamic particle TRACKing) was selected.

DYNTRACK is a computer program that simulates three-dimensional contaminant transport in the saturated zone of an aquifer system, and uses the same three-dimensional finite element grid discretization used for DYNFLOW. DYNTRACK can simulate contaminant movement for conservative constituents with dispersion, as well as constituents subject to first-order decay and/or adsorption. Thus, DYNTRACK permits the evaluation of complicated contaminant transport problems.

4.1 MODEL DESCRIPTION

Two basic approaches have been historically taken in analysis of contaminant movement: the Euleriam and the Lagrangian. The Eulerian approach solves the governing mass transport equation directly, generally using finite element or finite difference techniques, and provides a continuous contaminant field. This approach analyzes the variation over time of a variable (in this case, contaminant concentration) at fixed points within a region.

The Lagrangian approach analyzes the variation in time and space of a fixed value (mass of contaminant). This method is usually implemented using a random walk technique for statistically significant numbers of particles (each of which represents a discrete parcel of mass). DYNTRACK uses this approach.

4.1.1 RANDOM WALK METHOD

The differential equation describing transport of conservative contaminants in groundwater flow is:

$$\Theta \frac{\partial C}{\partial t} = \frac{\partial}{\partial x_i} \left(\Theta D_{ij} \frac{\partial C}{\partial x_j} \right) - q_i \frac{\partial C}{\partial x_i}$$

where

C = concentration (mass/length**3)
Θ = effective porosity
q_i = specific discharge (length/time)
D_{ij} = dispersion coefficient matrix (length**2/time)

Note that the first item on the right-hand side of the equation represents the dispersive flux as embodied by Fick's Law and the second represents the convective flux.

As noted previously, DYNTRACK uses the random walk method to solve the contaminant transport equation. This method utilizes a statistical model of the microscopic movement of pollutant "particles." Each particle has an associated weight, decay rate, and retardation rate. Contaminant concentration is computed from the particle distribution at any time as the total particle weight divided by the water volume in which the specific particles reside. The model operates by moving particles within a computed hydraulic gradient field (DYNFLOW) in discrete time steps. Velocities computed from the simulated head field are used to compute the convective movement of the particles during a given time step. A random component is then added to simulate the effect of dispersion. In DYNTRACK, a random deflection based on a given probability density function is assigned to each particle in each time step. The probability density function is directly related to the dispersion coefficient. Total contaminant mass within a given groundwater volume provides a measure of the contaminant concentration. Thus, as the total number of particles representing a given mass is increased, the approximation becomes more accurate.

The application of the random walk method as used by DYNTRACK is documented in the DYNTRACK Users Manual (CDM, 1984). In addition, several excellent descriptions of the fundamentals behind this method exist in the literature (Bear, 1972; Fischer, et al., 1979; Weiss, 1983).

4.1.2 DATA REQUIREMENTS

As noted previously, DYNTRACK uses the same three-dimensional finite element grid representation of aquifer geometry, flow field, and stratigraphy as in DYNFLOW. Additional data requirements include specification of values for the following properties for each element:

- o Effective Porosity - connected or mobile pore space
- o Retardation Factor - coefficient used to calculate adsorption/desorption of contaminants
- o Contaminant Decay Rate - coefficient used to calculate first order decay of a contaminant
- o Longitudinal Dispersivity - coefficient used to calculate dispersion in the direction of mean flow
- o Transverse Dispersivity - coefficient used to calculate dispersion in the direction perpendicular to mean flow
- o Vertical Dispersion Anisotropy Factor - coefficient used to calculate the suppression of vertical dispersion due to the bedded nature of geologic deposits

4.2 MODEL SETUP

Because of the lack of observed contaminant transport data at the SRS, calibration of the contaminant transport properties described above was not possible. Instead, best estimates of the contaminant transport properties, as identified by Looney, et al. (1987), were used in the model. The estimated contaminant transport property values for the radionuclides of concern in this analysis (see Section 5.1) are presented in **Table 4-1**.

TABLE 4-1

ESTIMATED CONTAMINANT TRANSPORT PROPERTIES
SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

Parameter	H-3	CO-60	SR-90	RU-106	SB-125	CS-134	CS-137	CE-144	PM-147
Longitudinal Dispersivity (ft)	50	50	50	50	50	50	50	50	50
Transverse Dispersivity (ft)	5	5	5	5	5	5	5	5	5
Vertical Dispersion Anisotropy Factor	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Effective Porosity	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Retardation Factor	1	81	65	1300	32000	4000	4000	8000	3200
Half-Life (years)	12.3	5.25	28.6	1.01	2.77	2.06	30.1	0.78	2.50

Reference: Looney, et al., 1987.

5.0 SIMULATION RESULTS

5.1 PROBLEM DEFINITION

The average annual mass loading rate and half-life of each radionuclide released to the reactor seepage basins are presented in **Table 5-1**. The mass loading rates were calculated based on records of releases at the C, K, and P seepage basins for the years 1984 - 1986. To reduce the number of radionuclides to be analyzed with the contaminant transport model, radionuclides with a half-life less than 0.5 years were eliminated from further consideration. The nine remaining radionuclides are presented in **Table 5-2** along with the average mass loading rates and concentrations of the radionuclides in the water discharged to each seepage basin. The concentrations were calculated based on the mass loading rates and an average discharge of 2×10^7 liters/year. Also included in Table 5-2 are the nine radionuclide concentrations that the U.S. Environmental Protection Agency (EPA) allows in drinking water. EPA standard 40 CFR 141.16 specifies that drinking water may contain no concentration of radionuclides that yields a radiation dose over 4 millirem/year. Note that the concentration standards presented in Table 5-2 are those concentrations of the radionuclides which yield a radiation dose of 4 millirem/year on an individual basis. If more than one radionuclide is present in the drinking water, the concentration of each must be less than the standard such that the total radiation dose exposure is less than 4 millirem/year.

Based on the contaminant transport properties, source concentrations, and EPA drinking water standards presented in Tables 4-1 and 5-2 for the nine radionuclides of concern, the number of radionuclides to be further analyzed with the contaminant transport model was narrowed down to three: tritium, strontium-90, and cesium-137. Four of the radionuclides (cobalt-60, ruthenium-106, antimony-125, and polonium-147) were not considered further because they are released at concentrations at least two times below drinking water standards, and they are significantly retarded as they move through the soil. The two other radionuclides (cesium-134 and cerium-144) were not considered further because comparison of the contaminant transport properties

TABLE 5-1

RADIONUCLIDE RELEASES TO SEEPAGE BASINS
SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

Radionuclide	Average Seepage Basin Loading Rate (Ci/yr)	Half-Life (years)
Tritium	4030	12.3
Phosphorus-32	0.00041	0.04
Sulfur-35	0.00943	0.24
Chromium-51	0.07300	0.08
Cobalt-58	0.00171	0.20
Cobalt-60		5.25
Strontium-89	0.00054	0.14
Strontium-90	0.00034	28.6
Zirconium-95	0.01793	0.18
Niobium-95		0.18
Ruthenium-103	0.00096	0.11
Ruthenium-106		1.01
Antimony-124	0.00227	0.16
Antimony-125		2.77
Iodine-131	0.00880	0.02
Cesium-134	0.00312	2.06
Cesium-137	0.03183	30.1
Cerium-141	0.01373	0.09
Cerium-144		0.78
Polonium-147	0.00293	2.50

TABLE 5-2

RADIONUCLIDE SOURCE PARAMETERS
SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

Radionuclide	Average Seepage Basin Loading Rate (Ci/yr)	Average Seepage Basin Discharge Concentration (pCi/l)	EPA Drinking Water Standard* (pCi/l)
Tritium	4,030	200,000,000	20,000
Cobalt-60	0.00171	86	200
Strontium-90	0.00034	17	8
Ruthenium-106	0.00096	48	300
Antimony-125	0.00227	114	4,000
Cesium-134	0.00312	156	80
Cesium-137	0.03183	1,590	100
Cerium-144	0.01373	685	80
Polonium-147	0.00293	146	1,600

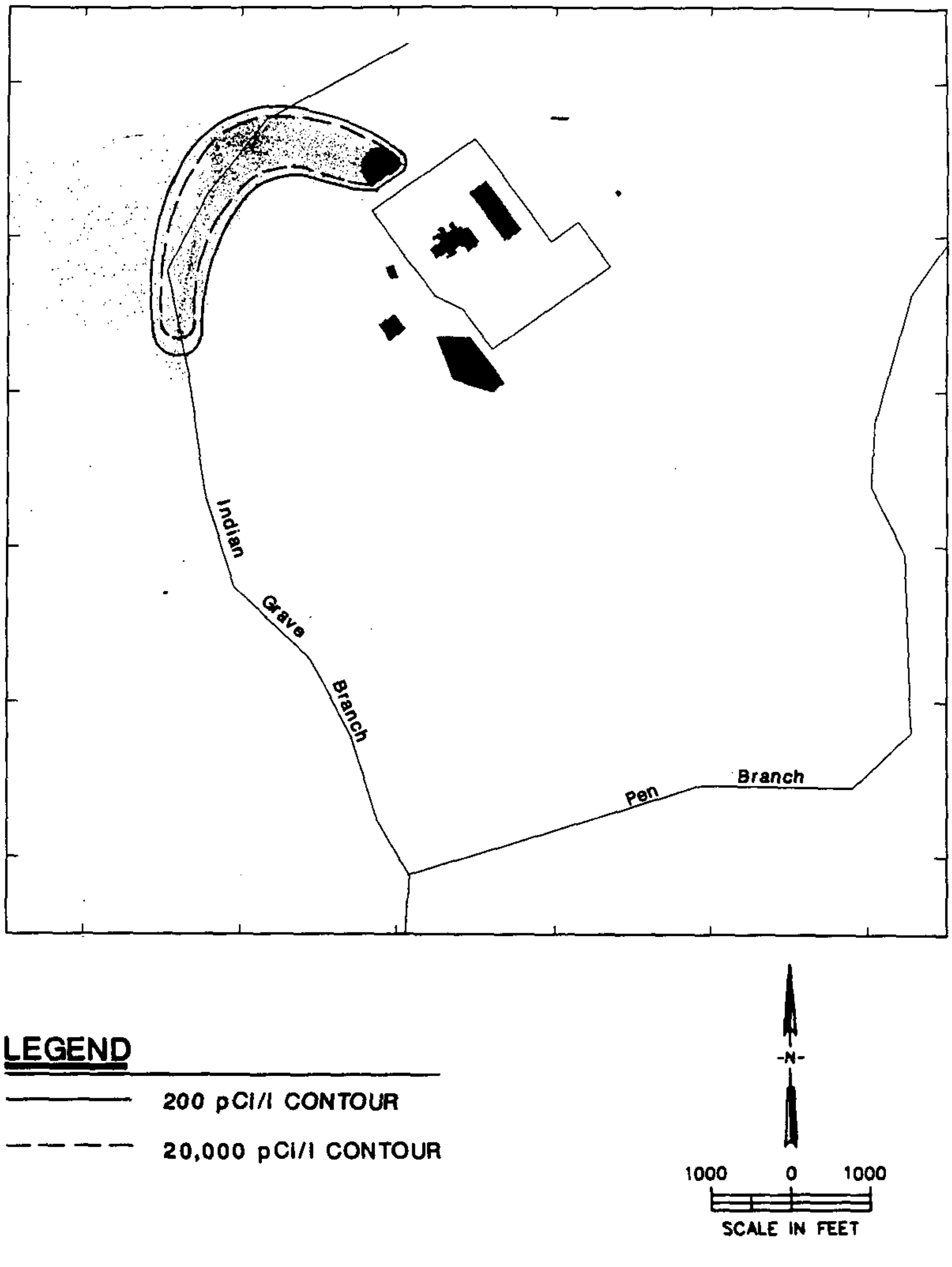
* EPA standard 40 CFR 141.16 specifies that drinking water may contain no concentration of radionuclides that yields a radiation dose over 4 millirem/year. Note that the concentration standards presented here are those concentrations of the radionuclides which yield a radiation dose of 4 millirem/year on an individual basis. If more than one radionuclide is present in the drinking water, the concentration of each must be less than the standard such that the total radiation dose exposure is less than 4 millirem/year.

and source strengths of these two radionuclides with that of cesium-137 indicates that the subsurface environmental impacts from cesium-137 will in all regards be greater. Both cesium-134 and cerium-144 have shorter half-lives than cesium-137, and are released at lower concentrations relative to their EPA drinking water standards. In addition, the retardation factor for cerium-144 is greater than that of cesium-137, while the retardation factor for cesium-134 is equivalent to that of cesium-137. Analysis of the subsurface impacts of tritium, strontium-90, and cesium-137 therefore provides a worst case environmental consequences evaluation since they represent the more mobile, persistent, and/or strongest (concentration) of the nine radionuclides of concern. The impact of the six other radionuclides will be less than that of the three selected radionuclides.

To further provide a worst case impacts analysis, the contaminant transport model simulations included a steady source loading rate at each of the seepage basins with radionuclides being released directly into the groundwater system. No allowance was made for decay and retardation as the radionuclides move through the unsaturated zone. The model was run until a steady-state plume for concentrations above 1/100 of the drinking water standard was reached. This standard was chosen as a conservative criterion for impact evaluation. Steady-state plume simulations were achievable due to the loss of contamination through surface water discharge and/or radioactive decay.

5.2 GROUNDWATER IMPACTS

The simulated steady-state plumes for the three radionuclides analyzed are shown in **Figures 5-1** through **5-11**. The worst subsurface environmental impacts occur with the release of tritium. Tritium is the only radionuclide for which groundwater concentrations above the drinking water standard are simulated at a distance of more than a few hundred feet from each of the seepage basins. In addition, tritium is the only radionuclide for which the simulated steady-state plume for 1/100 of the drinking water standard intercepts a surface water body and also moves down into Aquifer 2. Retardation of the other two radionuclides, especially cesium-137, prevents them from moving very fast so that before they



LEGEND

————	200 pCi/l CONTOUR
— — — —	20,000 pCi/l CONTOUR

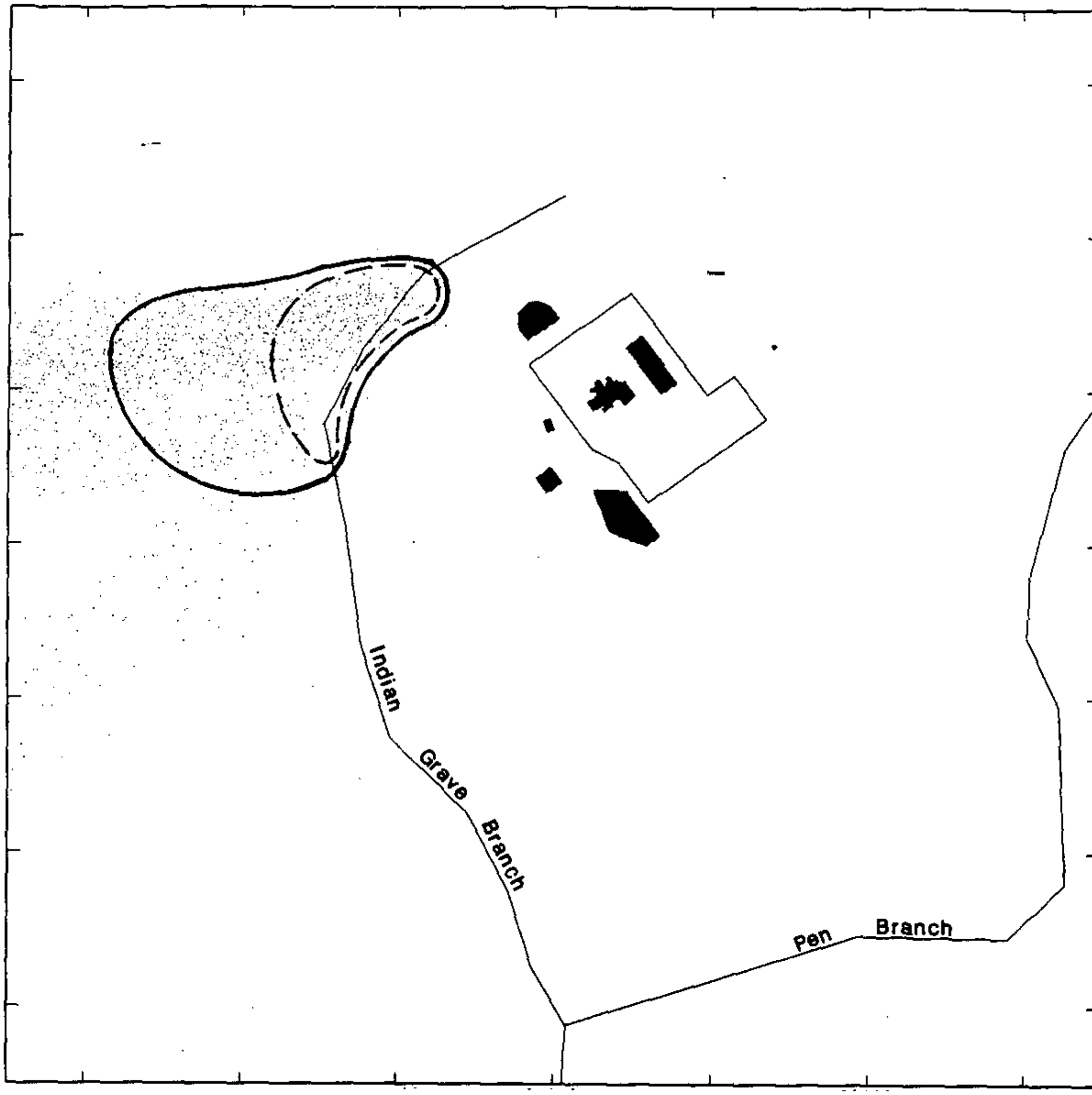
CAMP DRESSER & McKEE INC.

SIMULATED WATER TABLE TRITIUM PLUME FROM K REACTOR SEEPAGE BASIN

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

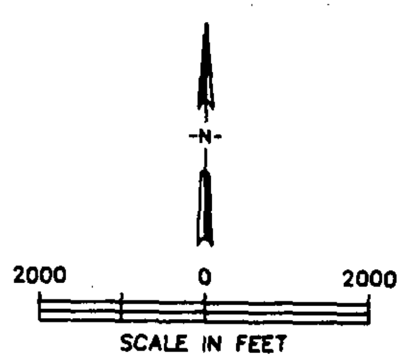
FIGURE NO. 5-1



LEGEND

200 pCi/l CONTOUR

20,000 pCi/l CONTOUR



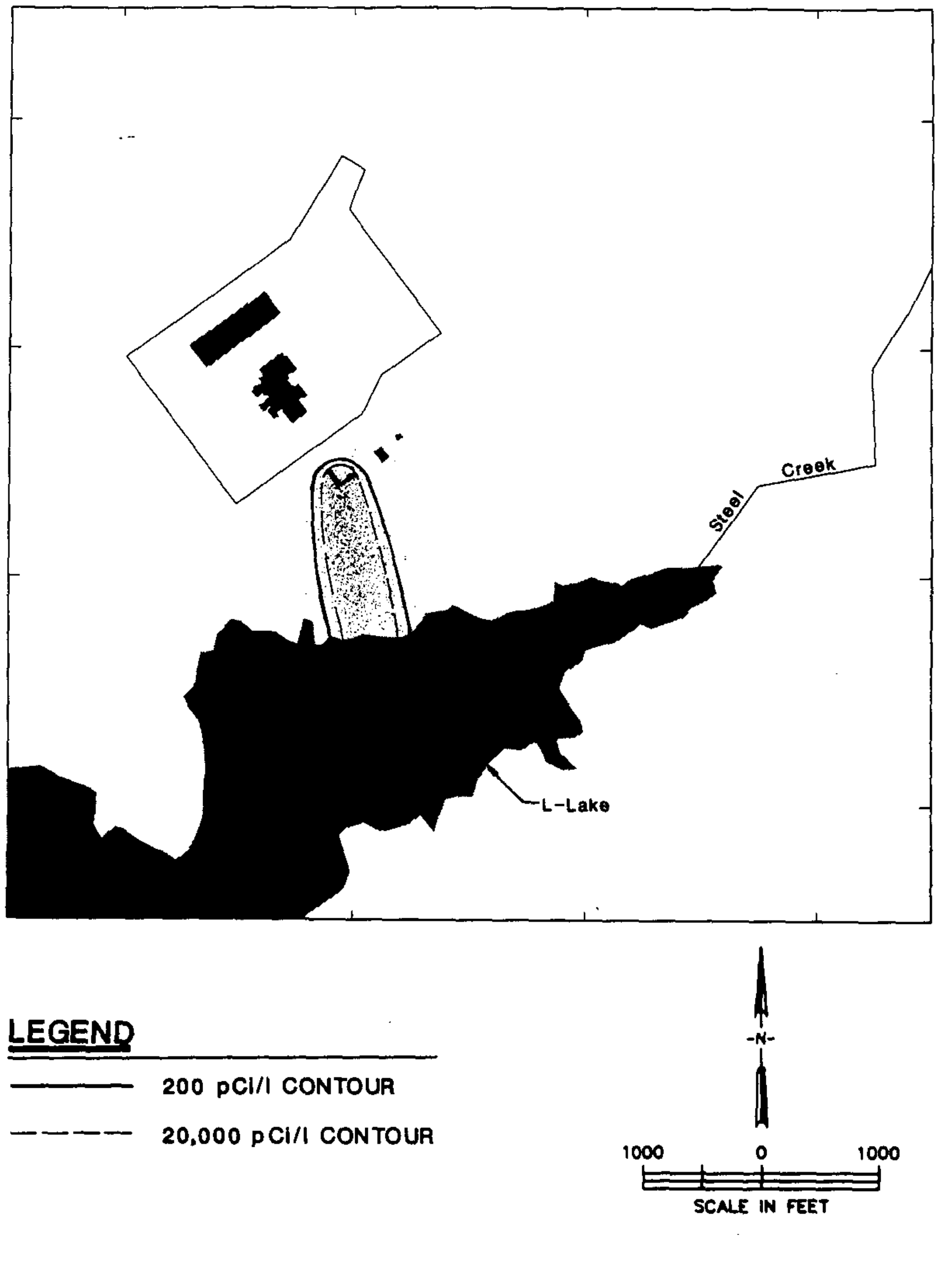
CAMP DRESSER & McKEE INC.

SIMULATED AQUIFER 2 TRITIUM PLUME FROM K REACTOR SEEPAGE BASIN

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 5-2



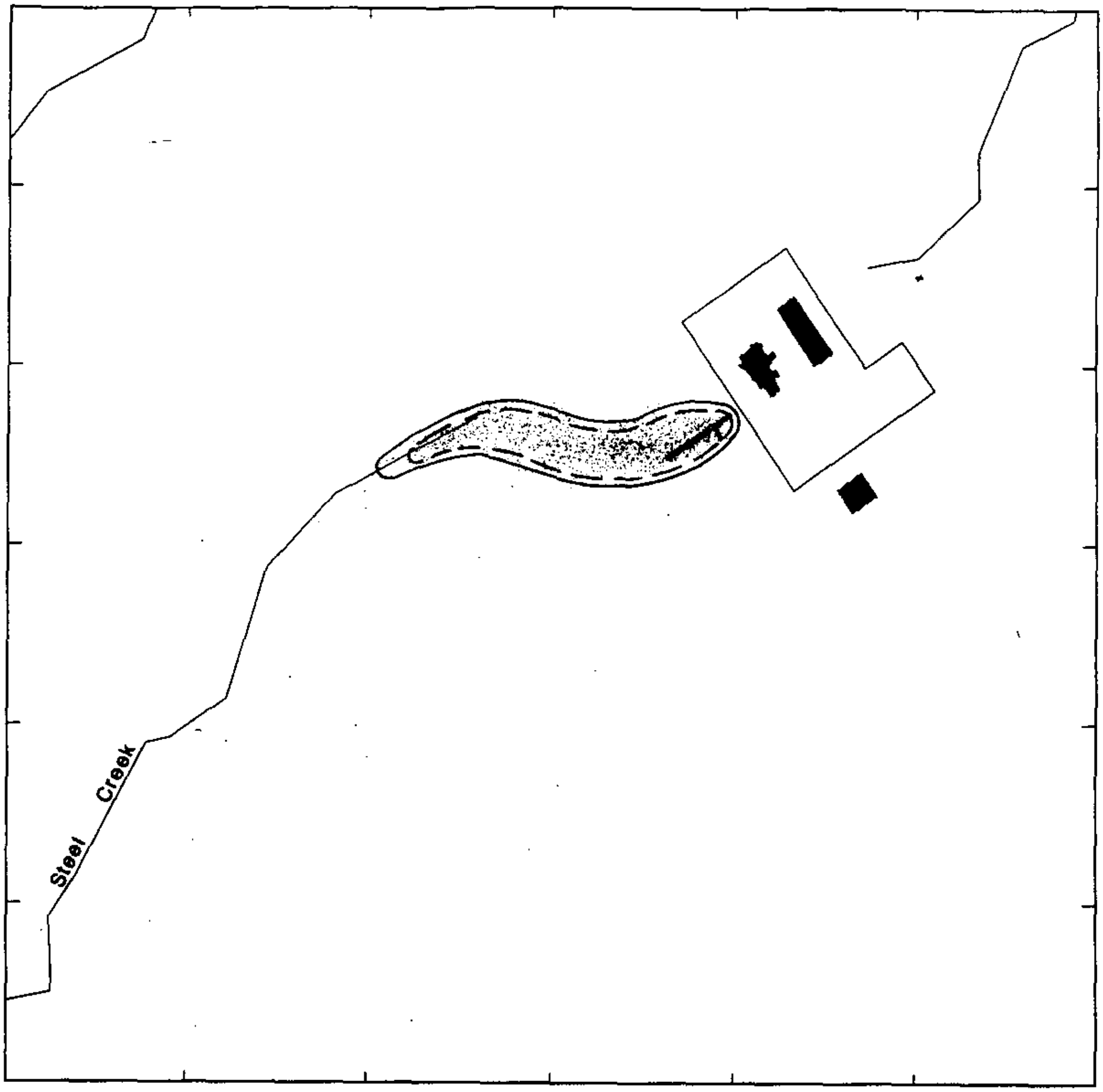
CAMP DRESSER & McKEE INC.

SIMULATED WATER TABLE TRITIUM PLUME FROM L REACTOR SEEPAGE BASIN

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 5-3



LEGEND

—— 200 pCi/l CONTOUR

– – – 20,000 pCi/l CONTOUR

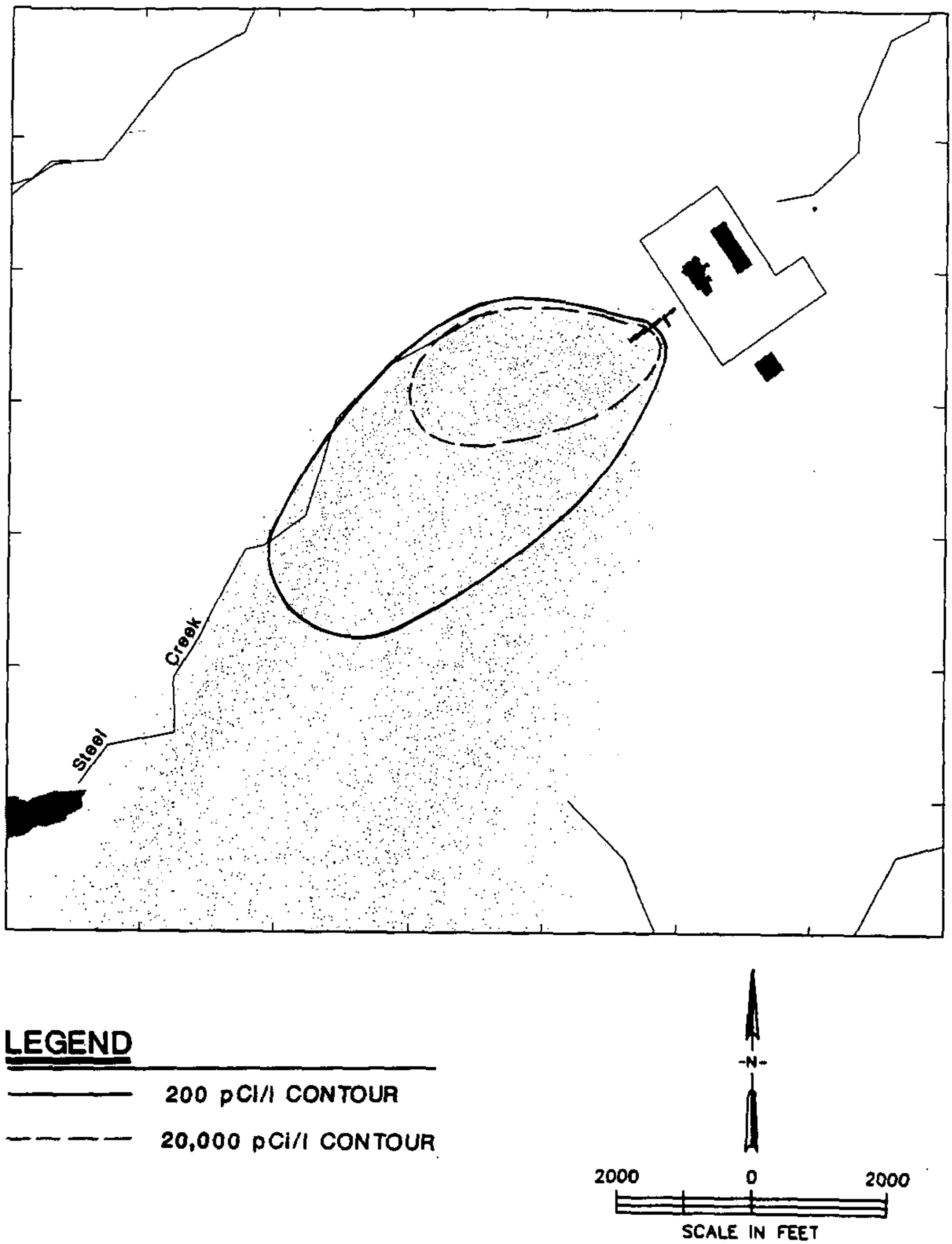
CAMP DRESSER & McKEE INC.

SIMULATED WATER TABLE TRITIUM PLUME FROM P REACTOR SEEPAGE BASIN

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 5-4



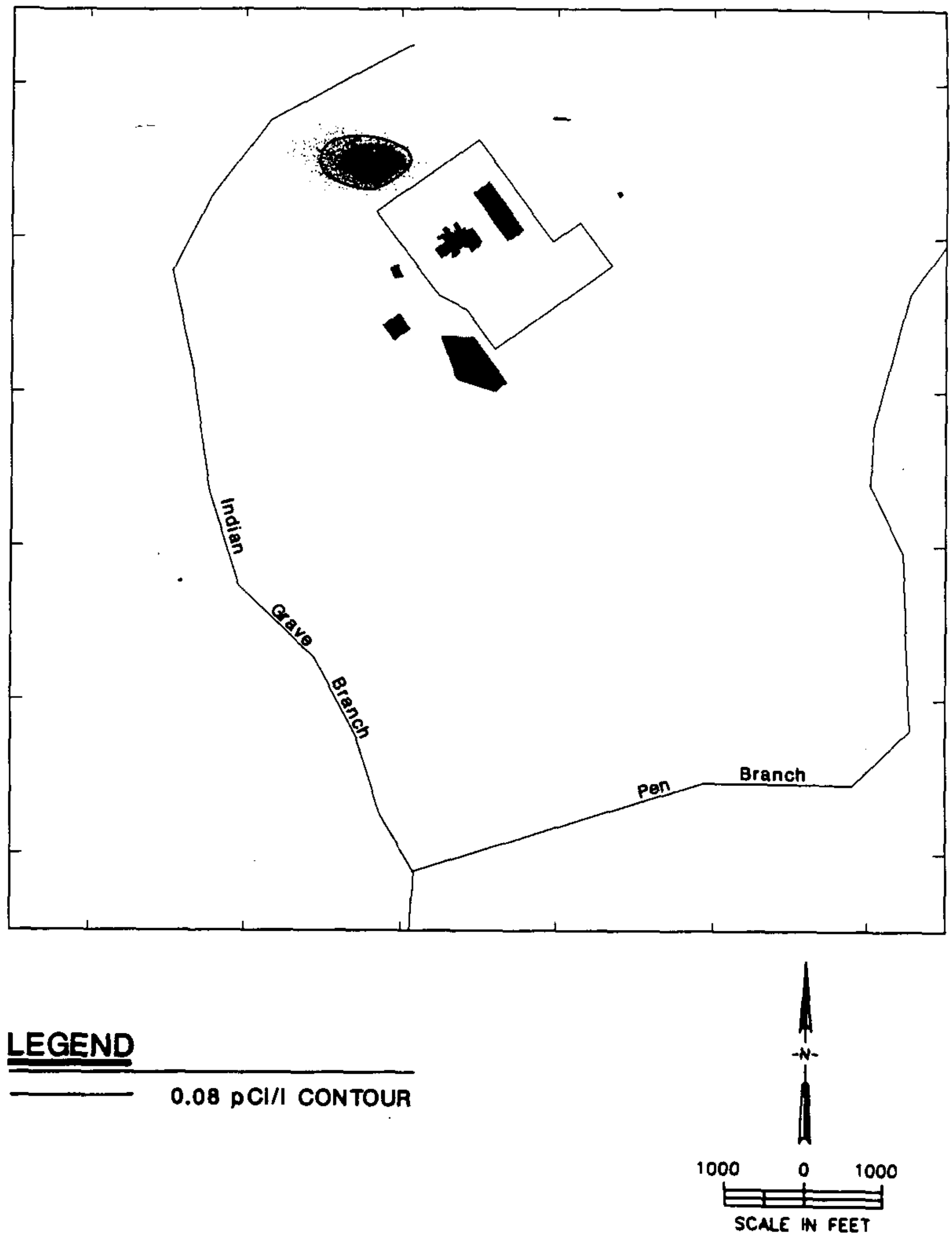
CAMP DRESSER & McKEE INC.

SIMULATED AQUIFER 2 TRITIUM PLUME FROM P REACTOR SEEPAGE BASIN

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 5-5



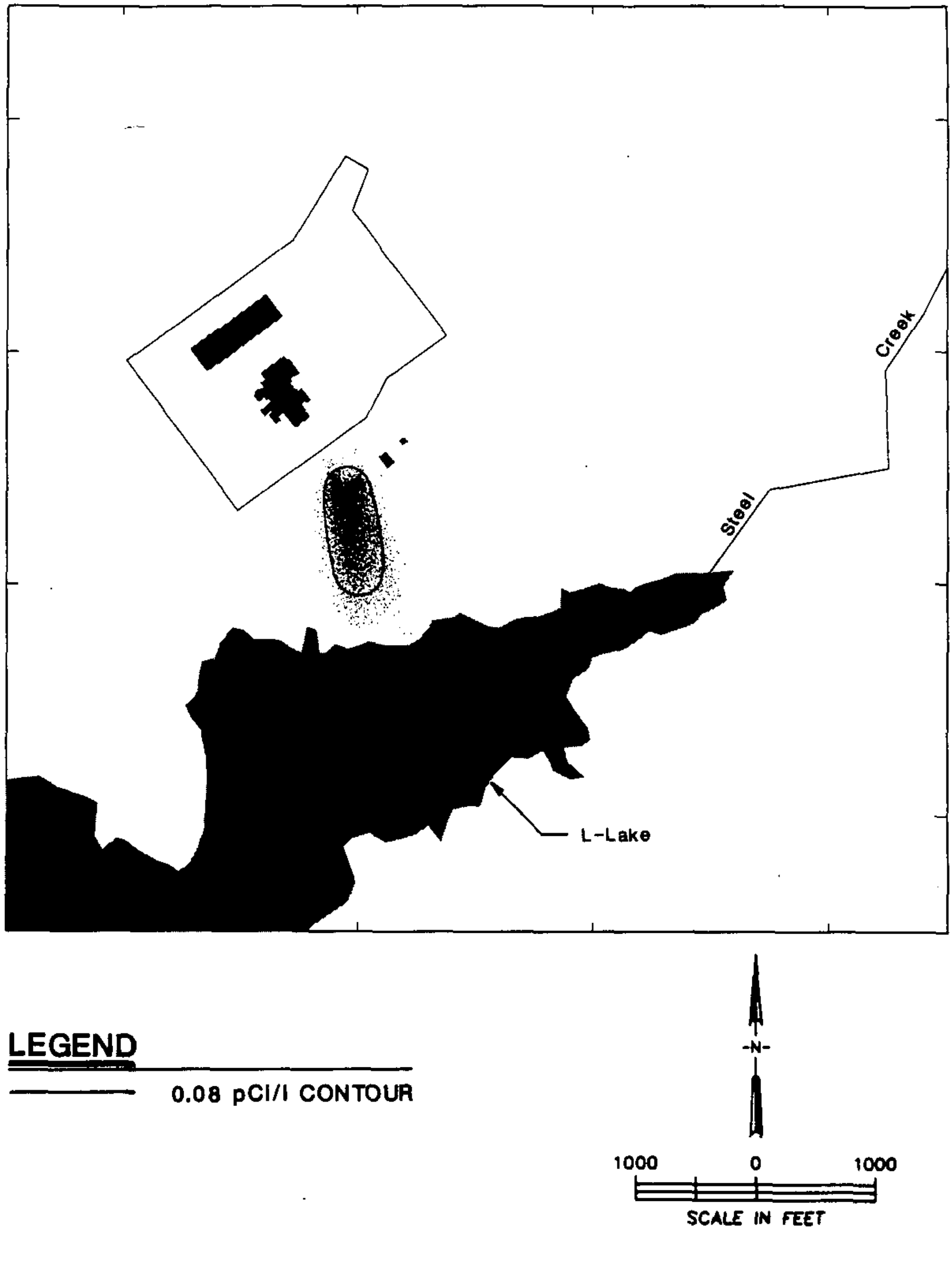
CAMP DRESSER & McKEE INC.

SIMULATED WATER TABLE STRONTIUM-90 PLUME FROM K REACTOR SEEPAGE BASIN

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 5-6



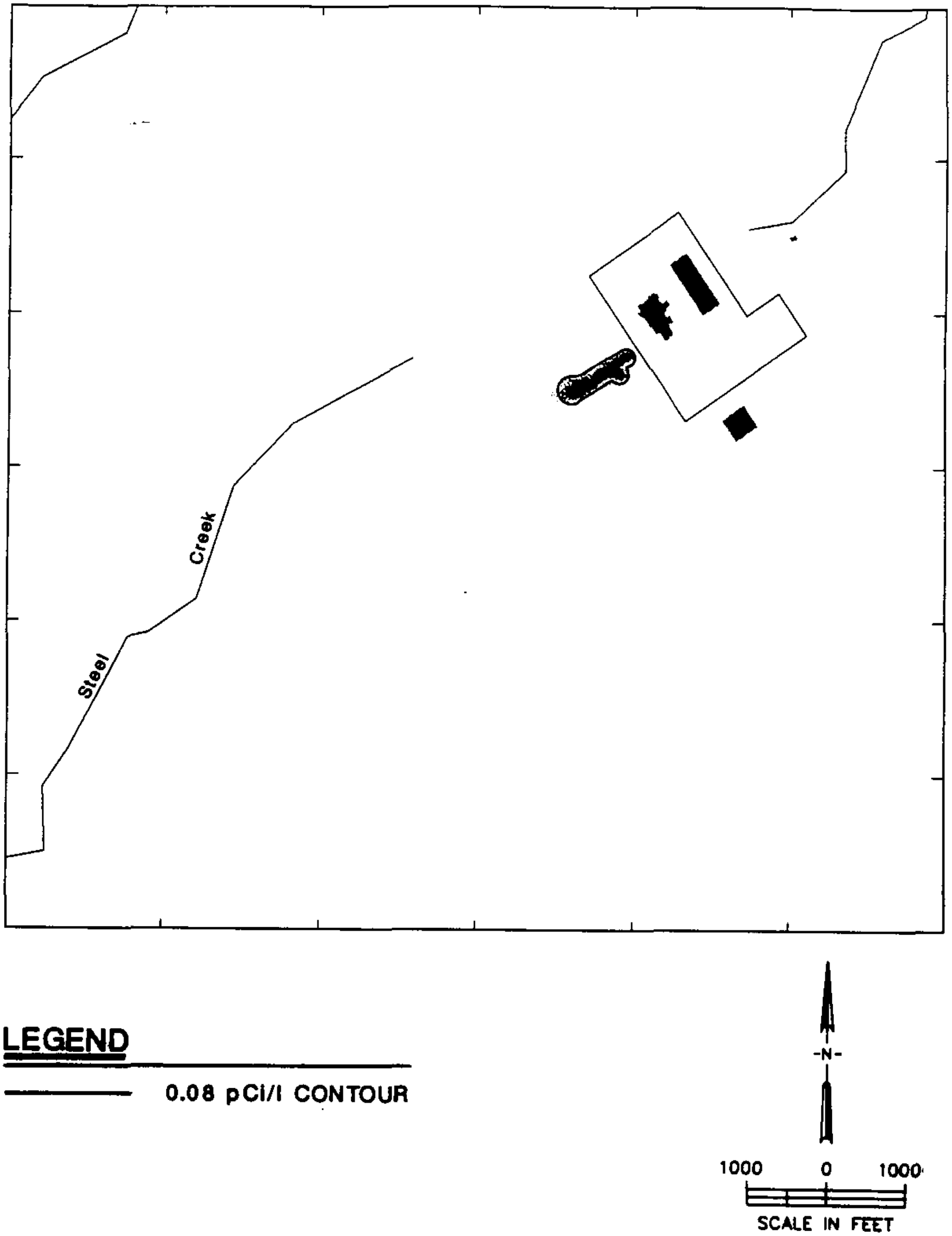
CAMP DRESSER & McKEE INC.

SIMULATED WATER TABLE STRONTIUM-90 PLUME FROM L REACTOR SEEPAGE BASIN

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 5-7



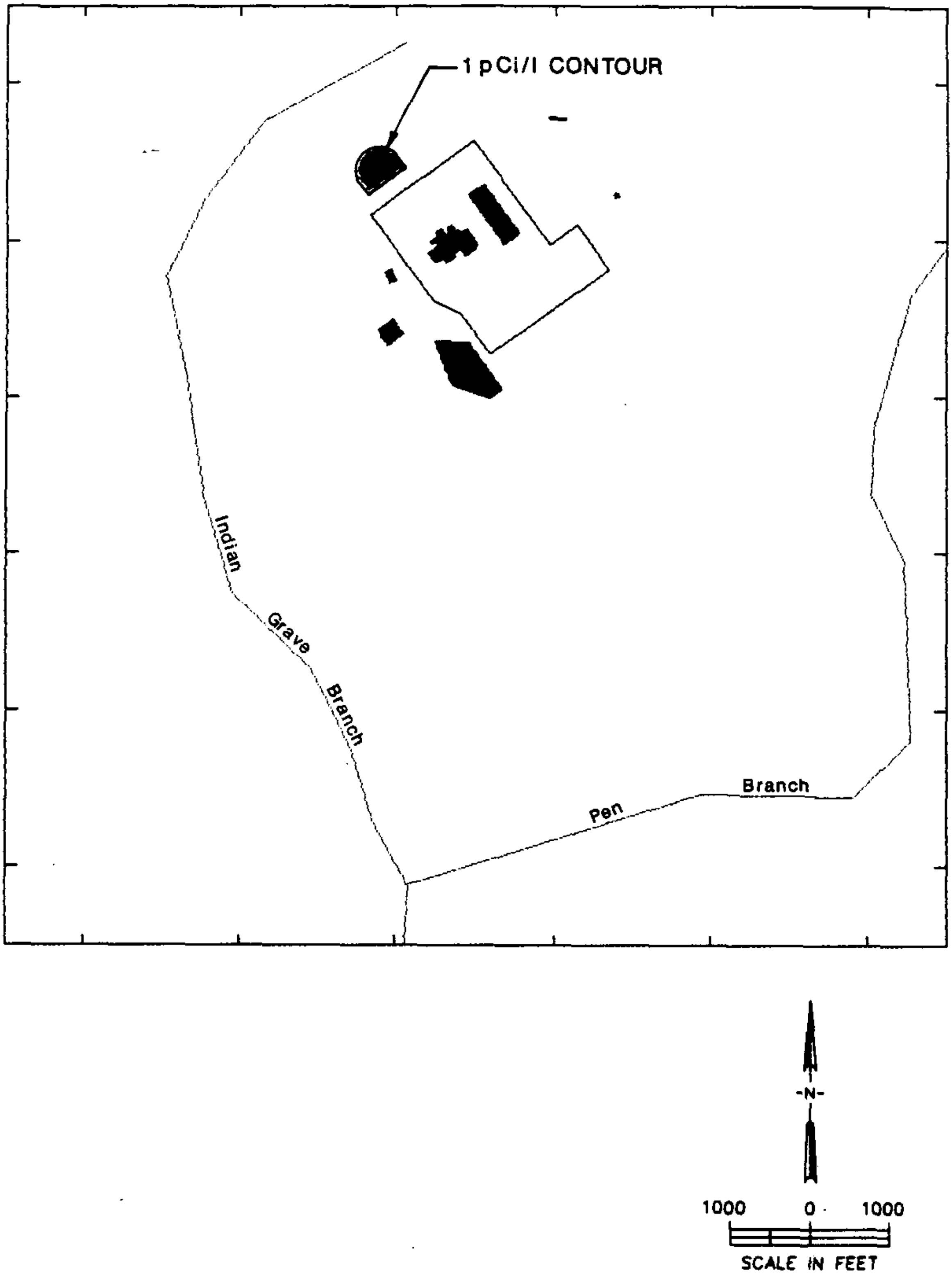
CAMP DRESSER & McKEE INC.

SIMULATED WATER TABLE STRONTIUM-90 PLUME FROM P REACTOR SEEPAGE BASIN

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 5-8



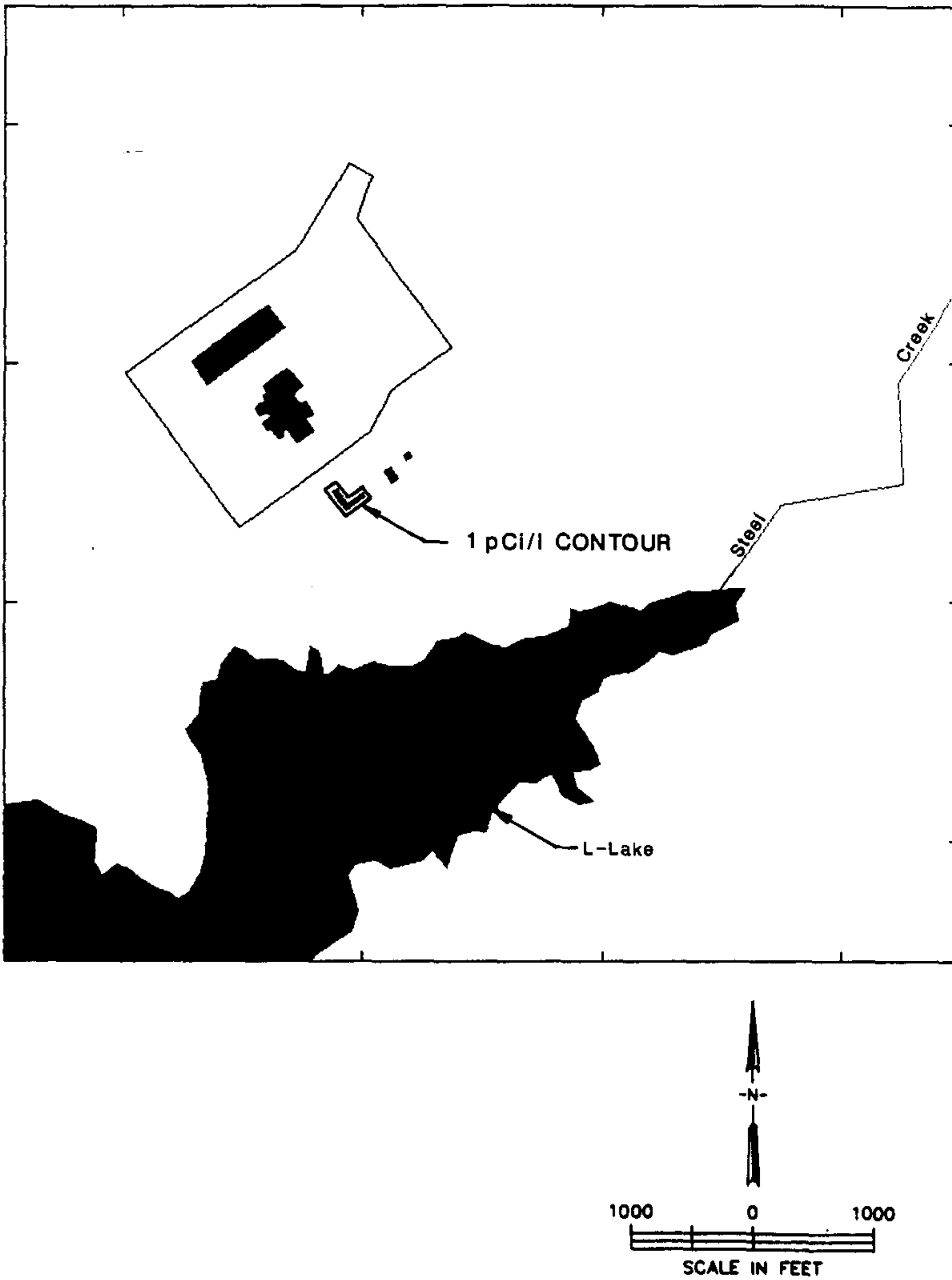
CAMP DRESSER & McKEE INC.

SIMULATED WATER TABLE CESIUM-137 PLUME FROM K REACTOR SEEPAGE BASIN

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 5-9



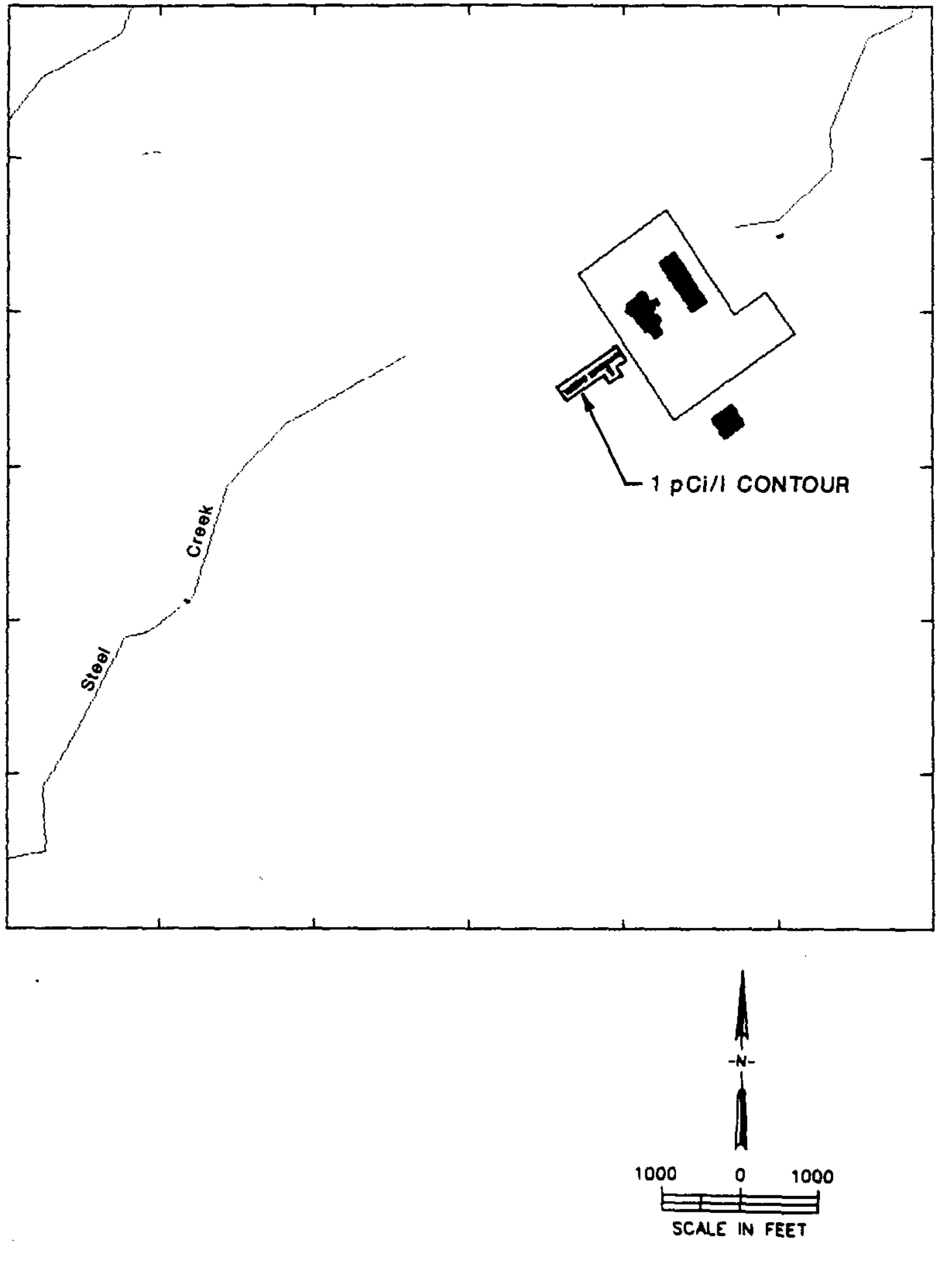
CAMP DRESSER & McKEE INC.

SIMULATED WATER TABLE CESIUM-137 PLUME FROM L REACTOR SEEPAGE BASIN

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 5-10



CAMP DRESSER & McKEE INC.

SIMULATED WATER TABLE CESIUM-137 PLUME FROM P REACTOR SEEPAGE BASIN

SAVANNAH RIVER SITE

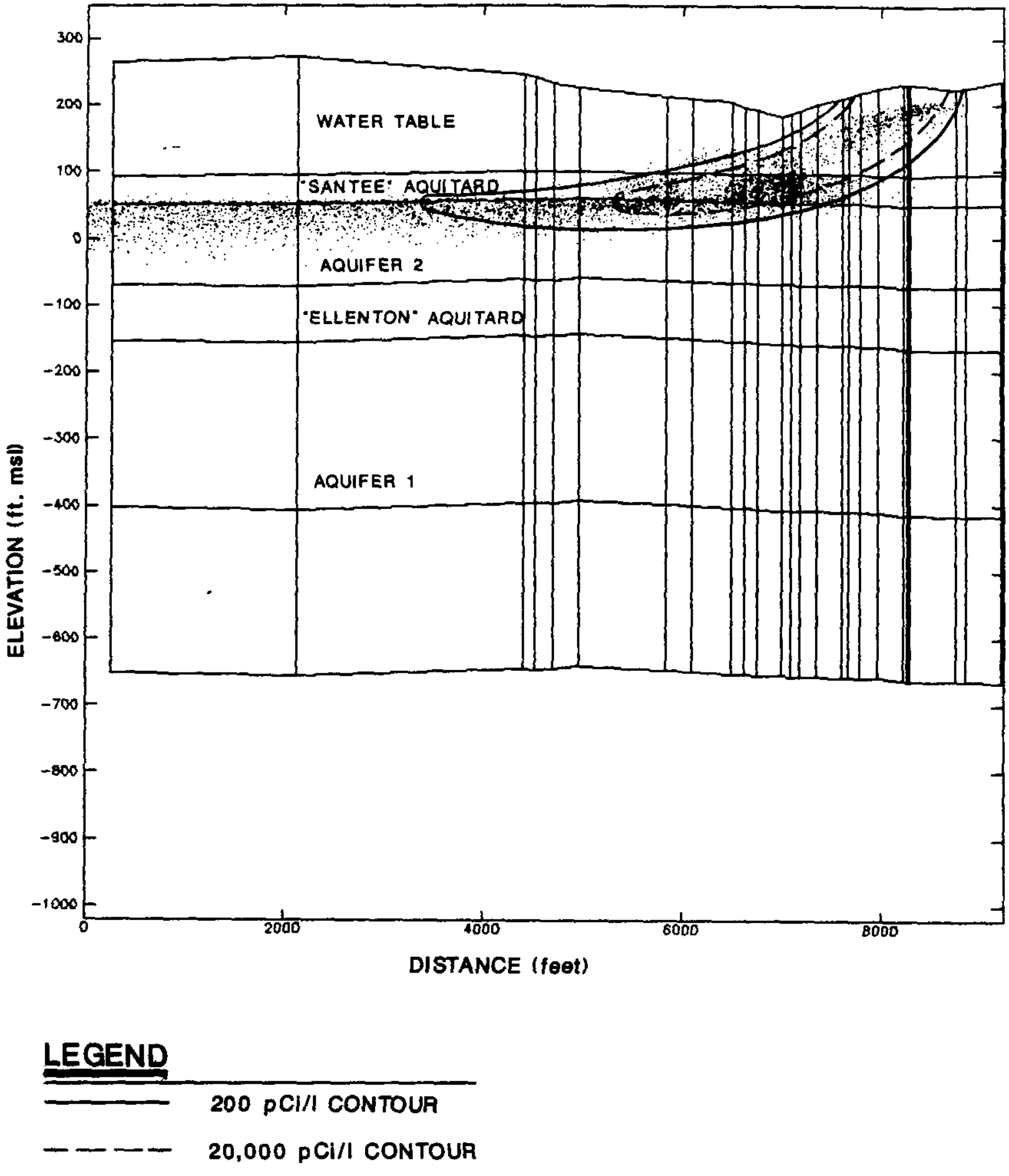
AIKEN, SOUTH CAROLINA

FIGURE NO. 5-11

can move very far they have decayed to concentrations well below drinking water standards. At the K reactor, while both the 200 pCi/l and 20,000 pCi/l tritium contours extend to Indian Grave Branch Creek in the water table, and beyond the creek in Aquifer 2, the 0.08 pCi/l strontium-90 contour extends only about half the distance to Indian Grave Branch Creek, and the 1 pCi/l cesium-137 contour extends less than a few hundred feet from the seepage basin. At the L reactor, while both the 200 pCi/l and 20,000 pCi/l tritium contours extend far enough from the seepage basin (in the water table only) to be intercepted by L-Lake, the 0.08 pCi/l strontium-90 contour extends only about two-thirds the distance to L-Lake, and the 1 pCi/l cesium-137 contour extends less than a few hundred feet from the seepage basin. At the P reactor, while both the 200 pCi/l and 20,000 pCi/l tritium contours extend to Steel Creek in the water table, and further downgradient in Aquifer 2, both the 0.08 pCi/l strontium-90 and the 1 pCi/l cesium-137 contours extend less than a few hundred feet from the seepage basin. Therefore, because the subsurface impacts from strontium-90 and cesium-137 releases are not nearly as extensive as the impacts from tritium releases, the rest of the subsurface environmental impacts analysis concentrated on evaluating the impacts of tritium release.

Cross-sections of the tritium plumes are shown in **Figures 5-12** through **5-14**. These cross-sections were taken along the main axes of the plumes. At the L reactor site, migration of tritium is limited to the water table unit, while at the K and P reactor sites, tritium migrates downward into Aquifer 2. At none of the three sites, however, does tritium migrate down any further than Aquifer 2 at concentrations above 1/100 of the drinking water standard.

The simulated steady-state tritium plume volumes are presented in **Table 5-3**. The plume volumes presented were calculated based on the three-dimensional shape of the plume and an assumed effective porosity of 0.20. The greatest volume of affected groundwater is at the P reactor site, while the smallest volume of affected groundwater is at the L reactor site. This variation in plume volumes is to be expected since most of the tritium at the L area leaves the groundwater system relatively quickly through surface water discharge, while very little of the tritium leaves the P area through surface water discharge (see Section 5-3). Thus, although the tritium moves more slowly at the P reactor site, the tritium



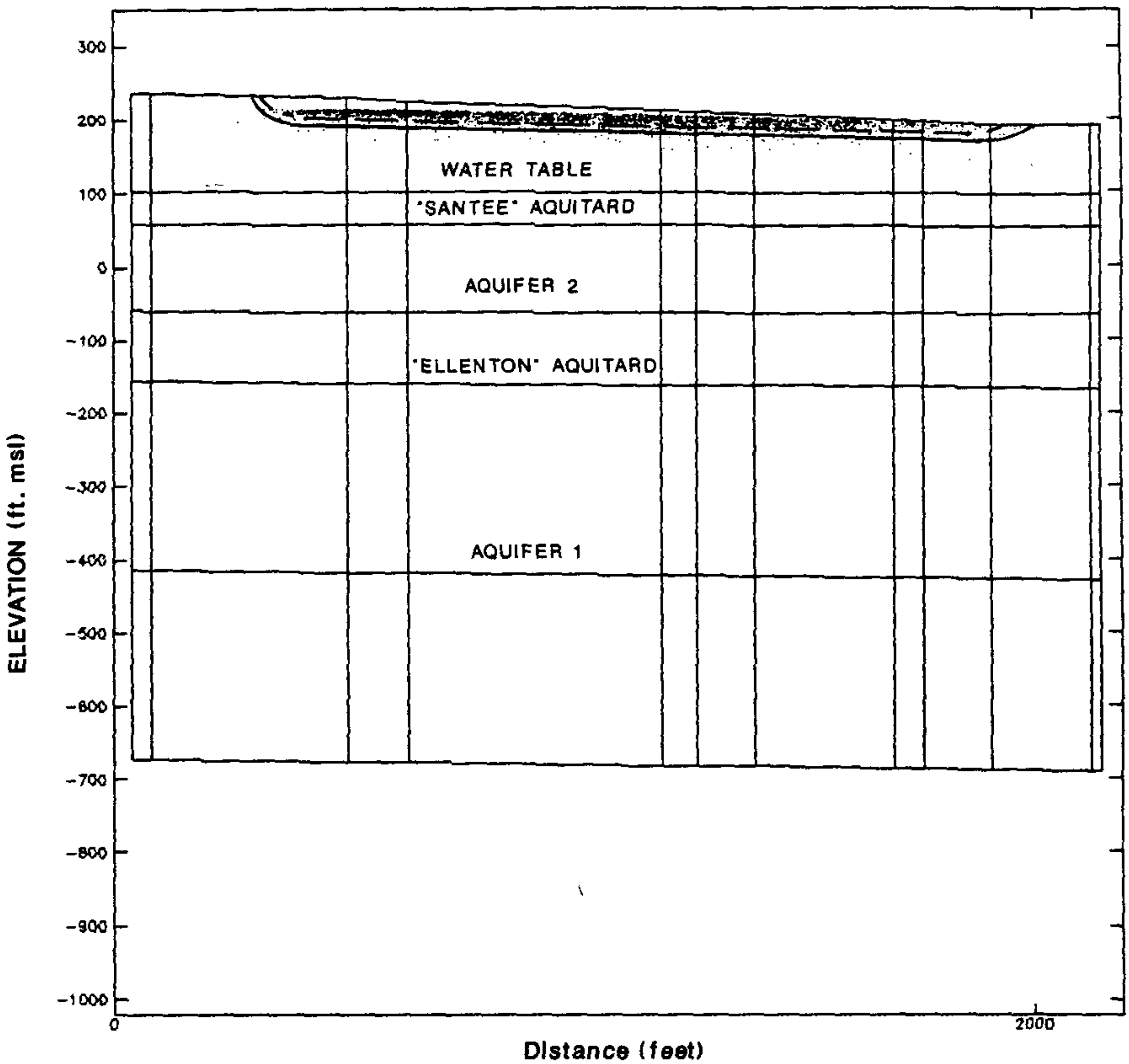
CAMP DRESSER & McKEE INC.

SIMULATED TRITIUM PLUME CROSS-SECTION FROM K REACTOR SEEPAGE BASIN

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO. 5-12



LEGEND

——— 200 pCi/l CONTOUR

– – – – 20,000 pCi/l CONTOUR

CAMP DRESSER & McKEE INC.

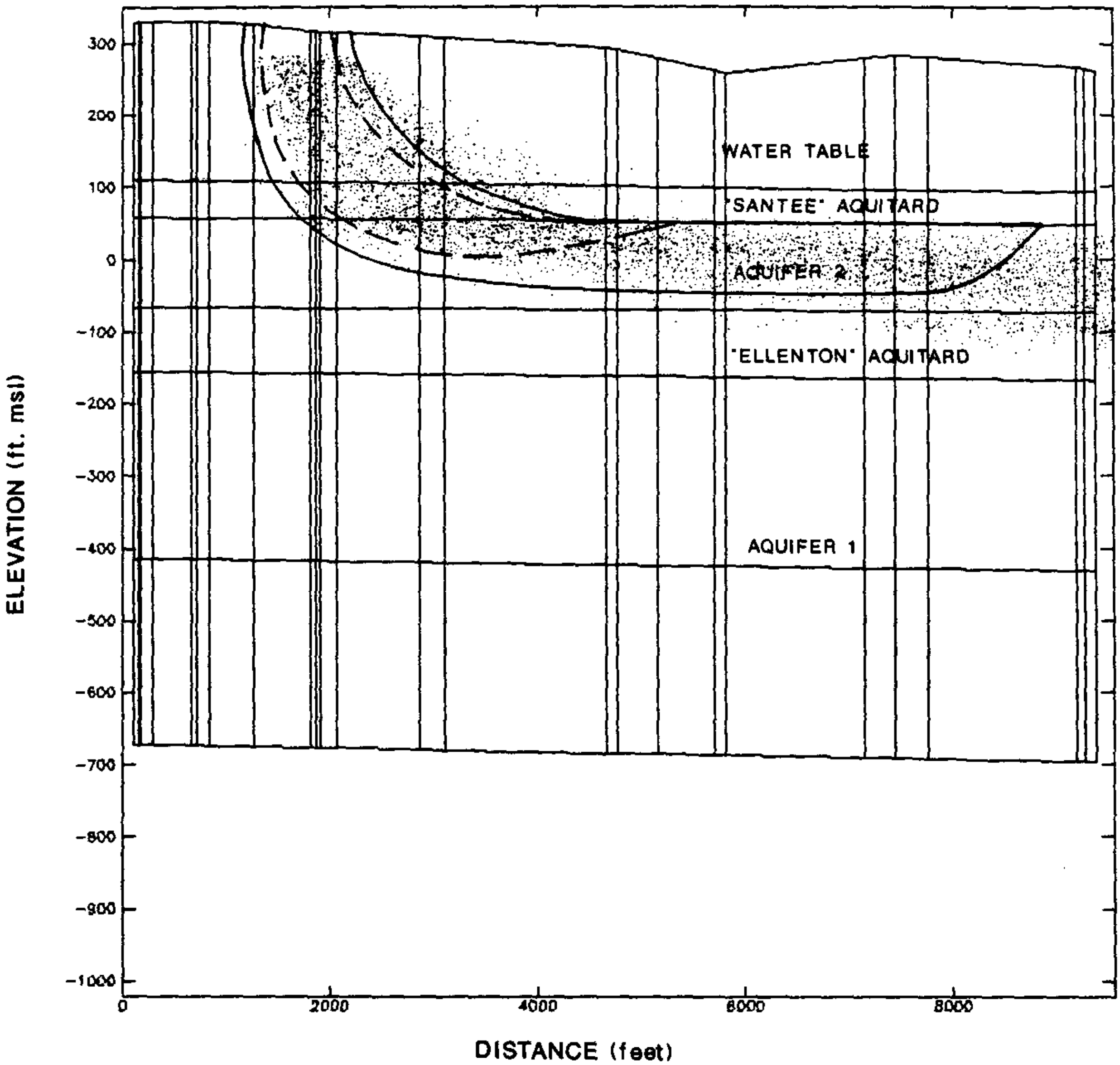
SIMULATED TRITIUM PLUME CROSS-SECTION FROM L REACTOR SEEPAGE BASIN

SAVANNAH RIVER SITE

AIKEN, SOUTH CAROLINA

FIGURE NO.

5-13



LEGEND

——— 200 pCi/l CONTOUR

– – – – 20,000 pCi/l CONTOUR

CAMP DRESSER & McKEE INC. SIMULATED TRITIUM PLUME CROSS-SECTION FROM P REACTOR SEEPAGE BASIN SAVANNAH RIVER SITE AIKEN, SOUTH CAROLINA	FIGURE NO. 5-14

TABLE 5-3

SIMULATED STEADY-STATE TRITIUM PLUME VOLUMES
SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

Location	Unit	20,000 pCi/l Plume Volume (MG)	200 pCi/l Plume Volume (MG)
K Area	Water Table[a]	110	290
	Aquifer 2[b]	60	1,030
	Total	170	1,320
L Area	Water Table	5	25
P Area	Water Table[a]	95	260
	Aquifer 2[b]	410	7,920
	Total	505	8,180

[a] Includes the water table unit and the upper half of the "Santee" Aquitard.

[b] Includes Aquifer 2 and the lower half of the "Santee" Aquitard.

contamination at steady-state covers a much larger area and volume of groundwater.

5.3 SURFACE WATER IMPACTS

The simulated steady-state tritium groundwater to surface water mass fluxes are presented in **Table 5-4**. Also presented in Table 5-4 are the groundwater discharges to surface water along the reaches where tritium is discharged, and the average groundwater discharge concentration of tritium at the three reactor sites. At the L reactor site, most of the tritium (67%) eventually leaves the groundwater system through surface water discharge to L-Lake. Model simulations indicate that tritium reaches L-Lake within 5 years after release to the L reactor seepage basin. The remaining tritium (33%) leaves the system through radioactive decay. At the K reactor site, some of the tritium (38%) eventually leaves the groundwater system through surface water discharge to Indian Grave Branch Creek, but most of the tritium (62%) is lost through radioactive decay. Model simulations indicate that tritium reaches Indian Grave Branch Creek within 6 years after release to the K reactor seepage basin. At the P reactor site, very little tritium (0.2%) is lost through surface water discharge to Steel Creek, while the majority (99.8%) is eventually lost through radioactive decay. Model simulations indicate that what little tritium does discharge into Steel Creek reaches the creek within 30 years after discharge to the P reactor seepage basin. The primary reason most of the tritium eventually leaves the groundwater system through radioactive decay instead of surface water discharge at the K and P reactor sites, is because most of the tritium migrates down vertically before it moves horizontally to a surface water discharge feature at these sites. At the L reactor site, however, horizontal groundwater velocities are greater than at the K and P reactor sites, and the surface water discharge feature (L-Lake) is closer to the seepage basin, thus allowing more tritium to exit the groundwater system through surface water discharge.

TABLE 5-4

SIMULATED STEADY-STATE TRITIUM FLUXES
SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

Flux	K Area	L Area	P Area
Mass Inflow to Seepage Basin (Ci/year)	4,030	4,030	4,030
Radioactive Decay (Ci/year)	2,490	1,320	4,020
Mass Outflow to Surface Water (Ci/year)	1,540	2,710	10
Affected Groundwater Discharge to Surface Water (ft^3/day)	68,500	9,530	30,000
Average Groundwater Discharge Concentration of Tritium (pCi/ml)	2,200	28,000	32

6.0 SUMMARY

Camp Dresser & McKee Inc. (CDM) has developed a state-of-the-art, three-dimensional, groundwater flow and contaminant transport model package which can simulate the movement of radionuclides (and other contaminants) in groundwater at the K, L, and P reactor areas of the Savannah River Site (SRS). The hydraulic properties in the flow model were calibrated under steady-state conditions using average water levels measured in observation wells located throughout the SRS. Best estimates of the contaminant transport properties were incorporated in the contaminant transport model. Because of the lack of observed contaminant transport data, the contaminant transport properties could not be not calibrated.

The model package was used to simulate the movement of radionuclides at each of the reactor areas after they enter the groundwater system through the reactor seepage basins. This analysis was performed for the Department of Energy as part of their process for continuing operation of the K, L, and P reactors. As required by the National Environmental Policy Act, an environmental impact statement must be prepared addressing the potential environmental consequences to human health and the environment of this "major federal action." The results of this study will assist the Department of Energy in preparing this environmental impact statement by identifying the potential subsurface environmental impacts of radionuclide releases at the three reactor sites during normal reactor operations.

The simulation results indicate that the worst subsurface environmental impacts will occur with the release of tritium. Tritium is the only radionuclide released for which groundwater concentrations above the drinking water standard could extend a distance of more than a few hundred feet from each of the seepage basins. In addition, tritium is the only radionuclide for which the simulated steady-state plume for concentrations above 1/100 of the drinking water standard (a conservative criterion for impact evaluation) could intercept a surface water body and also move down into Aquifer 2. The other radionuclides of concern decay to low concentrations relative to the drinking water standards before they can move very far.

At the L reactor site, the simulation results indicate tritium migration will be limited to the water table unit. The tritium remaining after decay (approximately 67%) will then leave the aquifer system through surface water discharge to L-Lake as early as 5 years after release. At the K and P reactor sites, the simulation results indicate tritium may migrate down into Aquifer 2 at concentrations greater than 1/100 of the drinking water standard, but not into Aquifer 1. At the K reactor site, some tritium (approximately 33%) may also leave the aquifer system through surface water discharge to Indian Grave Branch Creek as early as 6 years after release. At the P reactor site, however, very little tritium (approximately 0.2%) will be lost through surface water discharge to Steel Creek, and only after about 30 years from the time of release.

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APPENDIX A

CALIBRATION WELL DATA

Well	Plant Coordinates North	Plant Coordinates East	Model Coordinates X	Model Coordinates Y	Screen Zone Elevation	Unit	Average Water Elevation	1986 First Quarter Water Elevation	1986 Second Quarter Water Elevation	1986 Third Quarter Water Elevation
BGO 6A	76487.2	58316.8	57752.1	80626.8	117.5-107.5	Congaree	158.43	--	--	--
BGO 8A	76569.0	57618.3	57138.9	80282.4	115.3-105.3	Congaree	158.89	--	--	--
BGO 14A	76377.5	55838.3	55811.5	79081.2	119.6-109.6	Congaree	157.16	--	--	--
BGO 16A	75757.0	56194.2	56464.1	78788.4	112.5-102.5	Congaree	160.05	--	--	--
BGO 18A	75599.9	56699.7	56965.4	78958.4	109.5- 99.5	Congaree	159.79	--	--	--
BGO 25A	76158.5	55668.1	55802.5	78803.9	114.1-104.1	Congaree	158.08	--	--	--
CMP 8A	52671.2	54270.2	68477.5	58981.0	23.5- 13.7	Congaree	181.17	181.00	181.20	181.20
CMP 12A	51949.2	53524.6	68298.7	57958.7	32.1- 22.1	Congaree	179.92	180.20	178.90	180.30
CMP 15A	51357.2	52896.8	68138.7	57110.7	24.2- 14.2	Congaree	178.88	178.90	178.50	178.80
FSB 76A	76131.9	51391.6	52358.5	76268.7	47.4- 36.9	Ellenton	154.70	154.20	155.30	153.90
FSB 76B	76122.4	51394.0	52366.0	76262.4	109.7- 99.2	Congaree	151.31	150.80	151.60	150.30
FSB 78A	74757.7	50172.8	52180.2	74440.6	37.5- 27.0	Ellenton	155.05	155.20	156.00	154.70
FSB 78B	74765.9	50178.8	52180.3	74450.7	92.8- 82.4	Congaree	153.35	153.50	154.30	152.70
FSB 79A	73664.5	50149.6	52804.0	73542.5	34.4- 24.0	Ellenton	156.63	157.00	157.20	156.30
FSB 79B	73666.1	50159.2	52810.9	73549.5	91.2- 80.7	Congaree	156.82	157.20	157.10	156.10
FSB 87A	75601.7	50115.8	51638.0	75089.8	43.6- 33.1	Ellenton	153.26	153.10	153.90	152.50
FSB 87B	75597.0	50104.9	51631.9	75079.6	100.5- 90.0	Congaree	150.79	150.10	151.00	149.60
FSB 96A	74882.2	49778.7	51788.2	74309.6	95.7- 85.7	Congaree	152.31	--	--	--
FSB 97A	75171.2	49965.7	51769.6	74653.3	95.8- 85.8	Congaree	151.17	--	--	--
FSB 98A	75389.8	50121.6	51767.2	74921.8	94.7- 84.7	Congaree	150.48	--	--	--
FSB 99A	75675.6	50314.8	51755.6	75266.6	102.9- 92.9	Congaree	149.87	--	--	--
FSB 100A	75534.4	50958.4	52359.2	75530.7	105.8- 95.8	Congaree	150.75	--	--	--
FSB 101A	75719.0	51191.3	52439.1	75816.9	102.9- 92.9	Congaree	150.60	--	--	--
HSB 65A	72436.2	58436.0	60229.7	77419.6	73.2- 62.5	Congaree	169.89	169.50	170.40	169.60
HSB 68A	71526.9	56892.1	59515.2	75776.4	58.0- 47.5	Congaree	170.52	170.60	170.70	169.90
HSB 69A	71549.4	56465.1	59156.5	75543.7	93.1- 83.1	Congaree	170.40	--	--	--
HSB 83A	71638.3	58604.1	60834.7	76872.9	76.0- 65.2	Congaree	171.71	171.80	171.90	171.40
HSB 84A	71592.9	56351.0	59038.7	75511.8	75.6- 64.4	Congaree	171.06	171.60	171.80	170.60
HSB 85A	73791.9	58943.4	59843.3	78814.6	71.1- 61.1	Congaree	167.64	167.60	168.60	167.10
HSB 86A	72520.2	55985.9	58198.2	76047.4	73.9- 63.1	Congaree	167.19	167.40	167.70	166.90
HSB 117A	72733.6	55170.1	57412.8	75740.5	94.1- 84.1	Congaree	164.48	--	--	--
HSB 118A	72696.4	55775.6	57924.5	76066.3	101.0- 91.0	Congaree	165.99	--	--	--
HSB 119A	73082.5	56100.2	57960.2	76569.4	103.3- 93.3	Congaree	165.22	--	--	--
HSB 120A	73395.1	56431.9	58044.8	77017.3	101.0- 91.0	Congaree	164.84	--	--	--
HSB 121A	72024.8	57389.6	59625.0	76471.7	98.3- 88.3	Congaree	170.03	--	--	--
HSB 122A	72195.9	57747.4	59813.9	76820.4	95.4- 85.4	Congaree	169.72	--	--	--
HSB 123A	72189.8	58124.8	60122.8	77037.3	102.3- 92.3	Congaree	169.80	--	--	--
HSB 139A	71127.4	57365.4	60132.9	75731.4	97.6- 87.6	Congaree	171.63	--	--	--
KAB 1	53055.6	39919.7	56642.0	50856.8	224.0-194.0	Water Table	210.51	207.60	208.00	208.80
KAB 2	52410.8	40277.9	57310.8	50545.7	228.6-198.6	Water Table	214.86	212.30	212.70	213.40
KAB 3	51807.7	39918.4	57374.4	49846.5	223.0-193.0	Water Table	207.85	205.20	205.10	204.90
KAB 4	52807.1	39457.0	56413.7	50383.8	217.0-187.0	Water Table	207.81	204.80	204.40	206.20
KAC 1	53167.0	42614.8	58756.8	52531.1	229.0-199.0	Water Table	216.18	217.10	216.80	215.10
KAC 2	53255.5	42677.2	58755.3	52639.4	225.4-195.4	Water Table	216.96	217.60	216.90	215.90
KAC 3	53201.8	42723.9	58824.6	52623.4	225.8-195.8	Water Table	218.09	219.40	218.90	216.40
KAC 4	53053.5	42676.4	58873.4	52475.5	208.0-178.0	Water Table	215.16	215.80	215.90	214.20
KAC 5	53161.7	42716.3	58842.0	52586.5	224.3-204.3	Water Table	219.18	--	--	--
KAC 6	53139.9	42693.5	58836.4	52555.4	224.6-204.6	Water Table	218.74	--	--	--
KAC 7	53252.9	42574.5	58673.7	52576.9	223.0-203.0	Water Table	215.62	--	--	--
KCB 1	53453.0	39523.1	56087.5	50945.2	213.6-183.6	Water Table	208.73	205.80	205.50	208.80
KCB 2	53634.4	39337.1	55830.4	50982.6	217.7-187.7	Water Table	206.85	204.40	204.80	206.50
KCB 3	53440.5	39139.2	55784.3	50709.4	214.1-184.1	Water Table	205.77	203.30	203.60	205.50
KCB 4	53256.1	39315.6	56035.4	50663.9	218.9-188.9	Water Table	208.40	205.70	206.30	207.20
KDB 1	54050.5	40425.9	56466.7	51959.2	205.8-184.8	Water Table	209.97	--	--	--
KDB 2	53907.3	40241.4	56401.6	51734.9	203.5-182.5	Water Table	209.07	--	--	--

Well	Plant Coordinates North	Plant Coordinates East	Model Coordinates X	Model Coordinates Y	Screen Zone Elevation	Unit	Average Water Elevation	1986 First Quarter Water Elevation	1986 Second Quarter Water Elevation	1986 Third Quarter Water Elevation
KDB 3	53794.6	40393.7	56591.0	51733.2	205.4-184.2	Water Table	209.98	--	--	--
KRB 1	55015.3	39952.1	55516.3	52461.2	--	Water Table	208.14	208.40	213.00	207.40
KRB 8	54893.6	40302.1	55870.9	52568.5	--	Water Table	209.84	211.80	210.30	211.00
KRB 13	55344.2	39986.6	55350.8	52747.6	--	Water Table	206.08	206.90	206.80	205.90
KRB 14	55566.7	40158.5	55359.1	53028.6	--	Water Table	204.03	204.90	203.10	203.90
KRB 15	55476.3	40669.3	55825.5	53255.7	--	Water Table	205.58	206.20	205.30	209.50
KRP 1	54544.0	42471.2	57831.2	53560.7	237.0-207.0	Water Table	217.34	217.80	217.80	216.80
KRP 2	54503.6	42681.6	58025.2	53651.7	229.2-199.2	Water Table	217.29	218.00	218.10	216.50
KRP 3	54248.7	42814.3	58282.4	53523.4	237.5-207.5	Water Table	217.01	217.90	217.90	216.90
KRP 4	54362.9	42590.3	58034.0	53484.2	218.7-188.7	Water Table	216.48	217.00	216.90	215.90
KSB 1	54044.4	39806.8	55969.4	51590.4	205.6-175.6	Water Table	207.12	206.70	205.70	206.40
KSB 2	53927.6	39703.4	55954.4	51435.1	203.8-173.8	Water Table	206.88	205.90	205.30	205.00
KSB 3	54040.2	39625.3	55825.0	51480.3	199.7-169.7	Water Table	206.40	205.40	205.00	205.90
KSB 4A	54140.4	39756.7	55872.4	51638.6	199.6-169.6	Water Table	206.23	205.90	205.40	204.20
KSS 1D	47758.9	40220.2	59998.5	46748.4	177.5-157.4	Water Table	170.91	--	--	--
KSS 2D	46803.9	40438.3	60736.3	46104.0	164.7-144.6	Water Table	160.65	--	--	--
KSS 3D	46644.4	40749.3	61081.6	46157.8	159.3-139.3	Water Table	159.98	--	--	--
LAC 1	45238.8	51318.8	70458.5	51233.4	221.1-191.1	Water Table	213.50	213.80	214.20	212.70
LAC 2	45330.4	51270.2	70365.4	51278.9	223.4-193.4	Water Table	213.96	214.20	214.90	212.90
LAC 3	45201.9	51186.8	70373.4	51125.9	220.7-190.7	Water Table	213.48	213.80	214.10	212.50
LAC 4	45213.1	51270.4	70434.5	51184.1	215.3-185.3	Water Table	213.54	213.60	214.30	212.50
LAW 1A	44563.6	50628.0	70296.6	50281.1	(157.2-162.2)	Ellenton	170.71	--	--	--
LAW 1B	44562.5	50615.6	70287.2	50272.9	(93.6- 98.6)	Ellenton	172.14	--	--	--
LAW 1C	44562.4	50603.6	70277.5	50265.8	(29.0- 34.0)	Congaree	173.29	--	--	--
LAW 1D	44562.0	50595.6	70271.3	50260.8	11.6- 6.6	Congaree	173.23	--	--	--
LAW 1E	44561.2	50579.0	70258.3	50250.3	95.1- 90.1	Santee	201.00	--	--	--
LAW 1F	44562.1	50567.1	70248.2	50244.1	185.9-165.9	Water Table	199.46	--	--	--
LAW 1TD	44564.1	50640.5	70306.4	50288.8	(212.9-217.9)	Steel Creek	168.44	--	--	--
LAW 2A	45626.5	49637.6	68870.6	50558.8	(147.2-152.2)	Ellenton	169.98	--	--	--
LAW 2B	45641.0	49635.5	68860.3	50569.3	(4.8- 9.8)	Congaree	172.72	--	--	--
LAW 2C	45610.9	49638.7	68880.6	50546.8	191.2-171.2	Water Table	204.47	--	--	--
LAW 3A	45585.8	52266.2	71021.0	52071.0	(159.0-164.0)	Ellenton	171.88	--	--	--
LAW 3B	45600.7	52269.5	71014.9	52085.0	4.0-(1.0)	Congaree	174.77	--	--	--
LAW 3C	45616.1	52272.9	71008.6	52099.4	214.9-194.9	Water Table	228.92	--	--	--
LCO 1	45198.2	50957.7	70190.3	50988.3	225.8-195.8	Water Table	211.82	211.30	212.70	211.10
LCO 2	45317.8	51043.4	70189.3	51135.4	226.6-196.6	Water Table	213.59	213.70	214.40	211.70
LCO 3	45203.0	51113.2	70313.3	51083.6	226.3-196.3	Water Table	213.29	213.40	214.40	212.50
LCO 4	45087.4	51036.1	70318.8	50944.7	222.3-192.3	Water Table	209.72	210.80	211.10	209.10
LDB 1	46067.3	50530.6	69333.9	51440.3	215.0-185.0	Water Table	215.17	215.20	215.60	213.10
LDB 2	45886.5	50590.5	69488.6	51329.3	214.5-184.5	Water Table	214.97	213.00	212.90	213.50
LRP 1	48548.6	49128.7	66741.3	52623.7	215.8-185.8	Water Table	206.53	205.90	205.80	204.90
LRP 2	48352.9	49214.4	66925.6	52515.7	214.7-184.7	Water Table	207.53	202.50	--	206.30
LRP 3	48333.6	49057.7	66810.2	52408.0	221.4-191.4	Water Table	206.93	205.30	--	205.20
LRP 4	48440.2	48964.7	66672.3	52439.6	203.3-173.3	Water Table	206.22	205.30	205.60	204.60
LSB 1	45153.1	50700.9	70009.0	50800.8	222.7-192.7	Water Table	208.86	210.10	208.80	208.20
LSB 2	45224.0	50824.5	70067.4	50930.9	225.0-195.0	Water Table	209.48	211.00	209.80	208.90
LSB 3	45388.7	50729.7	69893.8	51008.4	226.6-196.6	Water Table	213.79	214.20	213.00	213.00
LSB 4	45321.6	50513.0	69758.0	50826.7	221.5-191.5	Water Table	213.78	215.90	213.80	214.10
PAC 1	43543.3	66753.4	83941.7	58934.2	283.9-253.9	Water Table	284.32	285.20	284.10	283.80
PAC 2	43527.7	66980.9	84135.0	59055.3	277.9-247.9	Water Table	270.75	269.70	270.20	268.90
PAC 3	43585.6	66861.4	84004.3	59031.9	282.9-252.9	Water Table	271.78	279.80	270.60	269.10

Well	Plant Coordinates North	Plant Coordinates East	Model Coordinates X	Model Coordinates Y	Screen Zone Elevation	Unit	Average Water Elevation	1986 First Quarter Water Elevation	1986 Second Quarter Water Elevation	1986 Third Quarter Water Elevation
PAC 4	43495.4	66863.2	84058.7	58960.0	280.6-250.6	Water Table	283.91	283.30	283.90	283.30
PAC 5	43561.7	66907.1	84055.3	59039.4	275.1-255.1	Water Table	269.50	--	--	--
PAC 6	43580.1	66894.7	84034.4	59047.0	275.2-255.2	Water Table	270.81	--	--	--
PCB 1A	41988.2	65070.6	83494.5	56687.0	293.5-263.5	Water Table	284.68	286.20	285.90	284.50
PCB 2A	41821.4	64891.4	83447.5	56446.7	287.8-257.8	Water Table	282.92	284.40	284.20	282.50
PCB 3A	42036.0	64706.3	83171.6	56511.5	292.7-262.7	Water Table	283.85	285.30	284.10	283.00
PCB 4A	42171.0	64901.4	83250.1	56735.4	292.9-262.9	Water Table	283.01	284.20	284.00	282.40
PDB 2	43513.1	64743.1	82333.2	57728.1	268.7-247.7	Water Table	278.81	--	--	--
PDB 3	43542.2	64938.2	82473.9	57866.3	269.1-248.1	Water Table	278.93	--	--	--
PRP 1A	45349.8	63032.7	79869.8	58208.6	262.9-232.9	Water Table	248.55	247.90	248.30	246.60
PRP 2	45389.5	63229.0	80005.3	58356.1	264.1-234.1	Water Table	254.46	259.80	252.70	251.40
PRP 3	45200.7	63165.5	80064.9	58166.0	258.6-228.6	Water Table	253.49	246.90	253.90	252.10
PRP 4	45270.9	63341.0	80165.6	58326.0	262.9-232.9	Water Table	257.24	256.90	256.90	255.60
PSB 1A	43619.3	64141.4	81784.0	57460.3	287.4-257.4	Water Table	277.38	277.40	277.40	278.00
PSB 2A	43612.4	63916.5	81606.1	57322.6	287.2-257.2	Water Table	275.70	277.00	276.60	277.10
PSB 3A	43599.8	63590.4	81349.7	57120.7	286.5-256.5	Water Table	275.34	275.50	275.50	275.00
PSB 4A	43534.2	63347.0	81191.3	56924.5	285.5-255.5	Water Table	274.08	273.10	274.20	273.40
PSB 5A	43440.5	63606.5	81456.3	57001.3	292.3-262.3	Water Table	276.12	276.00	276.10	275.70
PSB 6A	43436.0	63975.7	81757.7	57214.6	292.1-262.1	Water Table	278.05	277.80	278.00	280.60
PSB 7A	43553.3	64301.0	81951.9	57500.7	289.0-259.0	Water Table	277.66	277.60	278.00	278.20
P-13B	35600.0	60000.0	83147.3	48538.4	3-(7)	Congaree	174.96	--	--	--
P-13A	35600.0	60000.0	83147.3	48538.4	(57- 67)	Congaree	172.73	--	--	--
P-13TD	35600.0	60000.0	83147.3	48538.4	(177-187)	Ellenton	172.68	--	--	--
P-13TC	35600.0	60000.0	83147.3	48538.4	(377-387)	Black Creek	173.25	--	--	--
P-13TB	35600.0	60000.0	83147.3	48538.4	(497-507)	Black Creek	182.88	--	--	--
P-13TA	35600.0	60000.0	83147.3	48538.4	(656-677)	Middendorf	182.80	--	--	--
IDB-1B	72396.1	76407.1	74791.9	87950.5	98- 93	Congaree	184.11	--	--	--
IDB-1A	72402.7	76412.7	74792.6	87959.2	(50- 55)	Steel Creek	187.73	--	--	--
P-14TC	72432.5	76432.1	74790.7	87994.7	(197-207)	Black Creek	190.09	--	--	--
P-14TB	72453.9	76425.7	74773.0	88008.2	(262-272)	Black Creek	188.14	--	--	--
P-14TA	72444.9	76439.6	74789.5	88009.1	(524-547)	Middendorf	187.94	--	--	--
P-15D	47350.2	51130.3	69065.0	52830.7	240-219	Water Table	227.54	--	--	--
P-15C	47293.6	51408.4	69323.2	52948.4	103- 93	Santee	213.34	--	--	--
P-15B	47023.2	51532.1	69582.2	52802.3	58- 48	Congaree	176.88	--	--	--
P-15A	46755.3	51376.3	69613.7	52494.0	(87- 97)	Ellenton	175.52	--	--	--
P-15TD	46737.8	51053.5	69362.8	52290.1	(197-207)	Steel Creek	168.49	--	--	--
P-15TC	47381.9	51271.0	69160.2	52939.1	(356-367)	Black Creek	170.83	--	--	--
P-15TB	47304.9	50975.5	68966.4	52703.1	(456-467)	Black Creek	177.34	--	--	--
P-15TA	47007.9	50863.7	69050.5	52397.1	(617-638)	Middendorf	177.42	--	--	--
P-16A**	98219.4	82271.0	64356.9	112288.4	131-120	Congaree	211.79	--	--	--
P-16TD**	98205.3	82275.9	64369.1	112279.9	40- 30	Steel Creek	218.46	--	--	--
P-16TC**	98210.6	82290.0	64377.4	112292.4	(120-130)	Black Creek	220.85	--	--	--
P-16TB**	98216.2	82303.8	64385.3	112305.1	(184-194)	Black Creek	221.11	--	--	--
P-16TA**	98222.0	82318.1	64393.5	112318.2	(349-359)	Middendorf	217.31	--	--	--
P-17B**	63196.0	109823.6	107233.7	100149.9	132-122	Congaree	226.58	--	--	--
P-17A**	63201.3	109837.3	107241.7	100162.2	42- 32	Congaree	226.34	--	--	--
P-17TD**	63215.3	109833.1	107230.0	100171.1	(68- 78)	Ellenton	213.52	--	--	--
P-17TC**	63210.0	109818.7	107221.5	100158.3	(278-288)	Black Creek	214.40	--	--	--
P-17TB**	63204.7	109805.0	107213.5	100146.0	(358-368)	Black Creek	214.65	--	--	--
P-17TA**	63199.1	109791.0	107205.5	100133.2	(517-527)	Middendorf	213.98	--	--	--
P-18B	67578.9	47680.9	54384.0	67168.2	76- 66	Congaree	167.85	--	--	--
P-18A	67592.8	47688.1	54381.6	67183.6	21- 11	Congaree	170.97	--	--	--

Well	Plant Coordinates North	Plant Coordinates East	Model Coordinates X	Model Coordinates Y	Screen Zone Elevation	Unit	Average Water Elevation	1986 First Quarter Water Elevation	1986 Second Quarter Water Elevation	1986 Third Quarter Water Elevation
P-18TD	67618.1	47678.0	54358.6	67198.2	(180-190)	Black Creek	169.67	--	--	--
P-18TC	67605.8	47669.6	54359.0	67183.3	(258-268)	Black Creek	169.46	--	--	--
P-18TB	67592.7	47660.6	54359.4	67167.4	(370-380)	Black Creek	169.88	--	--	--
P-18TA	67578.5	47652.8	54361.5	67151.3	(534-554)	Middendorf	170.24	--	--	--
P-19A	55347.1	60031.3	71565.3	64532.2	(28- 38)	Congaree	185.79	--	--	--
P-19TD	55342.1	60016.8	71556.5	64519.6	(128-138)	Steel Creek	176.76	--	--	--
P-19TC	55328.2	60022.2	71569.0	64511.6	(230-240)	Black Creek	176.88	--	--	--
P-19TB	55309.8	60029.4	71585.7	64500.9	(316-326)	Black Creek	178.02	--	--	--
P-19TA	55295.9	60034.6	71598.1	64492.7	(458-469)	Middendorf	178.26	--	--	--
P-10A	55280.0	60049.0	71619.1	64488.3	(544-554)	Middendorf	178.26	--	--	--
P-20B**	56081.7	76816.7	84712.9	74993.0	48- 28	Congaree	193.67	--	--	--
P-20TD**	56094.1	76768.1	84666.3	74974.4	(148-158)	Steel Creek	187.91	--	--	--
P-21B	24641.8	40757.6	74021.4	28362.5	(72- 82)	Congaree	133.00	--	--	--
P-21A	24649.7	40779.6	74034.6	28381.9	(145-155)	Congaree	134.08	--	--	--
P-21TD	24667.4	40769.3	74015.9	28390.1	(268-278)	Steel Creek	164.84	--	--	--
P-21TC	24670.9	40754.2	74001.6	28384.1	(461-471)	Black Creek	165.13	--	--	--
P-21TB	24674.6	40739.2	73987.3	28378.3	(599-609)	Black Creek	179.74	--	--	--
P-5A	24649.0	40617.0	73903.5	28285.7	(767-777)	Middendorf	179.78	--	--	--
P-22B	20611.6	73529.8	102903.1	44365.6	(22- 34)	Congaree	152.21	--	--	--
P-22A	20614.9	73515.1	102889.3	44359.6	(134-144)	Congaree	153.07	--	--	--
P-22TD	20600.8	73510.9	102894.2	44345.8	(309-319)	Steel Creek	174.40	--	--	--
P-22TC	20597.9	73525.5	102907.7	44352.0	(416-426)	Black Creek	174.32	--	--	--
P-22TB	20595.4	73540.6	102921.4	44358.8	(555-565)	Black Creek	187.40	--	--	--
P-22TA	20593.4	73555.3	102934.4	44365.9	(715-735)	Middendorf	187.85	--	--	--
P-23B	48101.2	30925.3	52277.7	41561.8	49- 44	Congaree	140.03	--	--	--
P-23A	48114.9	30914.5	52260.9	41566.5	(26- 36)	Congaree	148.25	--	--	--
P-23TE	48117.2	30894.7	52243.5	41556.7	(152-162)	Steel Creek	164.20	--	--	--
P-23TD	48104.5	30903.2	52257.9	41551.4	(232-242)	Black Creek	164.44	--	--	--
P-23TC	48085.6	30900.0	52266.4	41534.3	(397-407)	Black Creek	168.24	--	--	--
P-23TB	48075.7	30923.3	52291.1	41540.0	(506-516)	Black Creek	170.25	--	--	--
P-23TA	48063.3	30931.3	52304.8	41534.6	(616-636)	Middendorf	170.61	--	--	--
P-24C	43112.8	66576.3	84051.5	58481.8	183-153	Water Table	249.59	--	--	--
P-24B	43127.8	66573.0	84040.0	58492.0	94- 84	Santee	227.89	--	--	--
P-24A	43142.2	66569.7	84028.9	58501.7	9-(2)	Congaree	191.37	--	--	--
P-24TD	43139.3	66554.9	84018.6	58490.7	(176-187)	Steel Creek	175.23	--	--	--
P-24TC	43125.3	66558.2	84029.5	58481.3	(271-282)	Black Creek	175.31	--	--	--
P-24TB	43110.4	66561.7	84041.1	58471.3	(482-492)	Black Creek	183.03	--	--	--
P-24TA	43096.2	66565.2	84052.3	58461.9	(638-659)	Middendorf	183.20	--	--	--
P-25D	52491.9	42246.1	58855.4	51768.2	225-205	Water Table	210.17	--	--	--
P-25C	52506.1	42244.1	58845.4	51778.5	110-100	Santee	196.71	--	--	--
P-25A	52535.8	42240.0	58824.6	51800.1	(34- 44)	Ellenton	170.96	--	--	--
P-25TE	52552.7	42253.5	58825.6	51821.7	(134-145)	Steel Creek	163.66	--	--	--
P-25TD	52538.2	42254.9	58835.3	51810.8	(194-205)	Black Creek	166.13	--	--	--
P-25TC	52523.3	42257.1	58845.8	51800.1	(309-320)	Black Creek	166.34	--	--	--
P-25TB	52508.3	42259.1	58856.2	51789.1	(454-465)	Black Creek	170.75	--	--	--
P-25TA	52493.6	42261.0	58866.4	51778.3	(583-605)	Middendorf	171.94	--	--	--
P-26A	72010.4	18055.9	27812.5	53339.7	31-21	Congaree	115.76	--	--	--
P-26TD	72001.7	18067.5	27827.0	53339.5	(89- 99)	Steel Creek	146.06	--	--	--
P-27B	70405.9	64000.3	65924.7	79047.7	94- 74	Congaree	178.92	--	--	--
P-27TE	70439.7	64006.0	65909.4	79078.4	(106-116)	Steel Creek	177.94	--	--	--
P-27TD	70425.4	64010.2	65921.2	79069.3	(206-216)	Black Creek	177.66	--	--	--
P-27TC	70410.8	64014.5	65933.3	79060.1	(286-296)	Black Creek	177.99	--	--	--
P-27TB	70396.7	64018.5	65944.8	79051.0	(406-416)	Black Creek	177.70	--	--	--

Well	Plant Coordinates North	Plant Coordinates East	Model Coordinates X	Model Coordinates Y	Screen Zone Elevation	Unit	Average Water Elevation	1986 First Quarter Water Elevation	1986 Second Quarter Water Elevation	1986 Third Quarter Water Elevation
P-27TA	70382.0	64022.9	65957.0	79041.7	(533-543)	Middendorf	176.16	--	--	--
FC-2B	79251.4	55424.0	53787.0	81162.6	84- 79	Congaree	146.59	--	--	--
FC-2A	79243.6	55423.8	53791.5	81156.2	57- 53	Congaree	146.66	--	--	--
P-28A	79275.2	55487.9	53824.7	81219.4	(47- 58)	Steel Creek	173.21	--	--	--
P-28TE	79296.4	55514.8	53834.0	81252.4	(123-135)	Black Creek	173.16	--	--	--
P-28TD	79293.5	55500.2	53823.9	81241.5	(213-223)	Black Creek	173.19	--	--	--
P-28TC	79291.1	55485.6	53813.5	81230.9	(272-283)	Black Creek	172.42	--	--	--
P-28TB	79288.9	55471.4	53803.3	81220.8	(336-358)	Black Creek	171.72	--	--	--
P-28TA	79284.3	55441.1	53781.5	81199.3	(462-495)	Middendorf	171.23	--	--	--
P-29C**	86485.1	42775.4	39302.4	79579.8	136-126	Congaree	164.67	--	--	--
P-29B**	86476.1	42763.7	39298.2	79565.7	87- 77	Congaree	164.26	--	--	--
P-29A**	86466.5	42751.6	39294.0	79550.8	(38- 49)	Steel Creek	167.14	--	--	--
P-29TD**	86455.7	42761.5	39308.4	79547.9	(142-164)	Black Creek	168.71	--	--	--
P-29TC**	86464.2	42773.0	39312.7	79561.5	(223-244)	Black Creek	169.28	--	--	--
P-29TA**	86482.6	42796.2	39320.7	79590.0	(403-424)	Middendorf	169.37	--	--	--
P-30C**	98969.2	57099.6	43552.5	98099.2	205-195	Congaree	208.88	--	--	--
P-30B**	98983.3	57103.8	43547.6	98113.1	135-125	Congaree	207.79	--	--	--
P-30A**	98997.7	57108.5	43542.9	98127.5	85- 75	Ellenton	207.12	--	--	--
P-30TD**	98992.0	57121.6	43556.9	98130.6	15- 4	Steel Creek	206.33	--	--	--
P-30TC**	98976.3	57117.5	43562.8	98115.5	(95-106)	Black Creek	204.58	--	--	--
P-30TB**	98962.1	57113.2	43567.7	98101.5	(214-236)	Black Creek	199.24	--	--	--
P-30TA**	98933.3	57104.5	43577.5	98073.1	(329-351)	Middendorf	186.60	--	--	--

NOTES:

All elevations are feet above/below mean sea level. Values in parentheses () indicate below mean sea level.

** - Well is not in model domain. Well used for establishing model boundary conditions only.
-- - Data not available.

Well	1986 Fourth Quarter Water Elevation	1987 First Quarter Water Elevation	1987 Second Quarter Water Elevation	1987 Third Quarter Water Elevation	1987 Fourth Quarter Water Elevation	1988 First Quarter Water Elevation	1988 Second Quarter Water Elevation	1988 Third Quarter Water Elevation	1988 Fourth Quarter Water Elevation
BGO 6A	--	--	--	--	--	159.81	158.19	157.40	158.31
BGO 8A	--	--	--	--	--	158.82	159.10	156.27	161.35
BGO 14A	--	--	--	--	--	157.75	157.34	156.67	156.87
BGO 16A	--	--	--	--	--	160.70	161.11	160.43	157.97
BGO 18A	--	--	--	--	--	160.68	159.80	160.24	158.43
BGO 25A	--	--	--	--	--	158.62	158.26	157.55	157.88
CMP 8A	181.20	182.04	182.70	181.06	180.73	181.23	181.11	180.52	180.09
CMP 12A	180.00	180.73	181.38	180.40	179.74	180.36	180.10	179.14	177.82
CMP 15A	179.00	179.74	180.40	180.73	178.43	178.83	178.84	177.73	176.68
FSB 76A	154.40	154.82	156.13	157.11	154.49	154.36	155.10	153.86	152.75
FSB 76B	150.90	151.21	152.52	153.50	151.54	151.00	151.68	150.47	150.26
FSB 78A	155.20	155.47	154.82	155.14	154.49	155.40	155.22	154.59	154.34
FSB 78B	153.70	153.83	153.50	152.85	152.85	153.60	153.72	152.92	152.77
FSB 79A	156.20	156.78	156.46	157.11	156.46	157.05	156.66	155.91	156.45
FSB 79B	156.70	156.78	156.78	157.44	156.46	157.26	157.09	156.47	156.47
FSB 87A	152.50	153.83	154.16	154.82	152.85	153.05	153.80	152.38	152.18
FSB 87B	153.90	150.55	151.54	152.19	150.22	150.44	150.80	149.49	149.68
FSB 96A	--	--	--	--	152.85	152.44	152.71	151.78	151.78
FSB 97A	--	--	--	--	151.54	151.26	151.63	150.60	150.80
FSB 98A	--	--	--	--	150.55	150.79	151.11	150.03	149.93
FSB 99A	--	--	--	--	150.22	149.98	150.30	149.50	149.34
FSB 100A	--	--	--	--	151.21	150.87	151.15	150.11	150.39
FSB 101A	--	--	--	--	150.88	151.52	150.81	150.46	149.33
HSB 65A	170.00	170.89	169.58	170.89	168.92	170.28	169.87	169.67	169.09
HSB 68A	--	171.22	171.22	171.22	170.56	170.46	170.38	169.86	169.56
HSB 69A	--	--	--	--	--	--	170.79	170.38	170.02
HSB 83A	171.60	172.20	171.87	172.53	171.87	171.71	171.66	171.15	170.80
HSB 84A	170.90	171.54	171.22	171.54	170.89	171.11	170.84	170.42	170.24
HSB 85A	167.40	167.94	168.26	168.26	167.28	167.70	167.51	167.43	166.61
HSB 86A	167.30	167.94	166.95	167.94	166.62	167.36	167.16	166.58	166.49
HSB 117A	--	--	--	--	--	--	165.03	164.32	164.09
HSB 118A	--	--	--	--	--	166.08	166.43	165.98	165.46
HSB 119A	--	--	--	--	--	165.71	--	165.03	164.91
HSB 120A	--	--	--	--	--	165.18	165.20	164.78	164.20
HSB 121A	--	--	--	--	--	170.36	170.38	170.05	169.34
HSB 122A	--	--	--	--	--	170.28	170.26	169.18	169.16
HSB 123A	--	--	--	--	--	170.48	170.44	169.15	169.13
HSB 139A	--	--	--	--	--	--	172.26	171.44	171.18
KAB 1	209.60	210.25	212.22	213.53	211.23	212.15	211.97	210.44	210.38
KAB 2	212.60	213.86	217.46	217.79	215.50	212.50	217.73	216.05	216.38
KAB 3	205.10	206.97	209.59	210.58	208.61	210.79	210.73	208.31	208.30
KAB 4	206.70	207.62	209.92	210.58	208.61	209.87	209.54	207.87	207.63
KAC 1	214.90	216.48	218.78	217.14	216.81	215.60	214.60	215.24	215.65
KAC 2	215.10	219.43	220.09	217.46	216.81	215.69	215.19	216.28	217.02
KAC 3	216.10	219.43	220.42	218.45	217.79	216.50	216.32	218.35	219.05
KAC 4	213.50	215.82	217.46	216.48	215.50	214.61	213.57	214.33	214.70
KAC 5	--	--	--	--	--	--	--	--	219.18
KAC 6	--	--	--	--	--	--	--	--	218.74
KAC 7	--	--	--	--	--	--	--	--	215.62
KCB 1	208.30	208.28	210.25	211.89	210.58	209.87	209.48	208.16	207.80
KCB 2	207.20	206.31	208.28	209.59	209.26	207.75	207.11	205.67	205.36
KCB 3	205.90	205.66	207.30	208.28	207.95	206.64	206.12	204.62	204.42
KCB 4	208.10	207.95	209.92	210.90	210.25	209.68	209.15	207.90	207.76
KDB 1	--	209.59	210.90	211.56	210.90	209.80	209.61	209.09	208.33
KDB 2	--	208.61	209.92	210.90	209.92	209.00	208.78	208.05	207.41

Well	1986 Fourth Quarter Water Elevation	1987 First Quarter Water Elevation	1987 Second Quarter Water Elevation	1987 Third Quarter Water Elevation	1987 Fourth Quarter Water Elevation	1988 First Quarter Water Elevation	1988 Second Quarter Water Elevation	1988 Third Quarter Water Elevation	1988 Fourth Quarter Water Elevation
KDB 3	--	209.59	210.90	211.89	210.90	209.77	209.62	209.01	208.14
KRB 1	206.90	206.97	209.59	209.59	208.28	207.24	207.08	206.67	206.51
KRB 8	208.80	208.94	211.23	210.90	209.92	209.15	208.84	208.68	208.50
KRB 13	205.20	205.66	207.30	207.30	206.31	205.36	205.37	204.75	--
KRB 14	203.20	204.02	205.98	205.33	204.02	203.60	203.72	203.43	203.22
KRB 15	204.20	205.98	206.64	205.66	205.00	204.67	204.76	204.75	204.33
KRP 1	216.50	216.81	219.10	219.10	218.45	217.47	216.32	216.12	215.78
KRP 2	216.30	216.15	221.07	218.45	218.12	216.93	216.16	216.08	215.67
KRP 3	216.60	218.12			218.45	217.20	216.54	214.45	216.00
KRP 4	216.00	217.14	218.78	216.15	217.46	216.41	215.45	215.47	215.07
KSB 1	206.50	205.66	208.94	208.94	208.61	207.73	207.33	206.78	206.11
KSB 2	206.50	205.33	208.61	208.94	208.61	207.59	208.22	206.68	205.91
KSB 3	206.50	205.00	207.95	208.28	207.95	206.93	206.62	206.05	205.25
KSB 4A	206.60	205.33	208.28	207.95	208.28	204.12	206.82	206.32	205.54
KSS 1D	--	--	--	--	--	--	--	--	170.91
KSS 2D	--	--	--	--	--	--	--	--	160.65
KSS 3D	--	--	--	--	--	--	--	--	159.98
LAC 1	211.90	217.14	217.79	215.82	215.82	213.77	213.81	213.33	212.68
LAC 2	212.20	216.81	218.12	216.15	216.48	214.31	214.24	213.82	213.31
LAC 3	212.10	217.79	218.12	212.54	216.15	212.96	213.91	213.51	213.06
LAC 4	211.60	217.79	217.79	215.82	216.15	213.78	213.95	213.36	212.89
LAW 1A	--	--	--	--	--	--	--	--	--
LAW 1B	--	--	--	--	--	--	--	--	--
LAW 1C	--	--	--	--	--	--	--	--	--
LAW 1D	--	--	--	--	--	--	--	--	--
LAW 1E	--	--	--	--	--	--	--	--	--
LAW 1F	--	--	--	--	--	--	--	--	--
LAW 1TD	--	--	--	--	--	--	--	--	--
LAW 2A	--	--	--	--	--	--	--	--	--
LAW 2B	--	--	--	--	--	--	--	--	--
LAW 2C	--	--	--	--	--	--	--	--	--
LAW 3A	--	--	--	--	--	--	--	--	--
LAW 3B	--	--	--	--	--	--	--	--	--
LAW 3C	--	--	--	--	--	--	--	--	--
LCO 1	210.30	215.82	215.50	213.86	214.18	212.09	212.33	211.62	211.12
LCO 2	212.00	215.50	217.79	216.15	216.48	214.09	214.11	213.30	213.16
LCO 3	211.70	216.15	217.46	215.50	215.82	213.69	213.67	213.12	212.75
LCO 4	207.80	215.82	213.53	211.23	211.89	209.85	210.62	209.50	208.57
LDB 1	212.80	216.48	217.79	217.14	215.82	214.80	215.17	214.75	213.41
LDB 2	212.70	217.14	218.12	217.46	216.15	214.81	215.52	214.79	213.49
LRP 1	204.70	--	207.95	208.61	208.28	207.40	--	206.23	205.56
LRP 2	205.70	207.62	210.58	209.59	209.59	208.58	208.07	207.44	206.88
LRP 3	204.90	205.98	209.59	209.26	208.61	207.78	207.13	206.54	205.93
LRP 4	204.80	205.66	208.61	208.61	208.28	205.18	206.54	206.01	205.45
LSB 1	206.50	215.50	212.22	209.92	210.58	208.63	209.27	208.42	207.35
LSB 2	207.40	216.48	213.20	210.90	211.56	209.37	210.08	209.24	208.12
LSB 3	211.20	220.74	217.79	215.50	215.82	214.26	214.26	214.08	212.48
LSB 4	210.70	222.38	219.43	215.50	216.15	213.91	214.62	214.11	211.49
PAC 1	282.20	287.66	286.67	284.05	284.05	283.63	284.34	283.22	282.91
PAC 2	268.20	274.21	273.22	272.24	271.91	270.63	270.76	269.78	269.24
PAC 3	268.80	274.21	273.88	271.58	271.91	270.85	270.90	269.98	269.74

Well	1986 Fourth Quarter Water Elevation	1987 First Quarter Water Elevation	1987 Second Quarter Water Elevation	1987 Third Quarter Water Elevation	1987 Fourth Quarter Water Elevation	1988 First Quarter Water Elevation	1988 Second Quarter Water Elevation	1988 Third Quarter Water Elevation	1988 Fourth Quarter Water Elevation
PAC 4	282.50	285.69	285.69	284.38	284.05	283.67	284.05	283.27	283.07
PAC 5	--	--	--	--	--	--	--	--	269.50
PAC 6	--	--	--	--	--	--	--	--	270.81
PCB 1A	284.00	286.67	287.33	285.69	285.69	284.04	283.73	283.15	279.27
PCB 2A	281.90	285.69	285.69	284.38	282.41	282.37	282.02	281.33	278.16
PCB 3A	282.40	287.98	289.30	284.70	284.05	282.93	282.86	281.65	277.92
PCB 4A	281.90	285.36	285.69	284.38	284.05	282.35	281.86	281.35	278.57
PDB 2	276.10	279.46	281.42	281.42	280.11	278.61	278.06	277.65	276.45
PDB 3	275.60	279.78	281.75	281.42	280.11	278.74	278.37	277.98	276.58
PRP 1A	246.20	251.58	251.58	249.61	249.61	248.23	248.98	247.77	246.28
PRP 2	250.60	260.10	259.45	255.84	254.20	252.94	253.84	252.20	250.49
PRP 3	250.70	259.12	258.79	254.86	253.87	253.23	255.10	252.82	250.46
PRP 4	255.00	261.09	261.42	258.79	257.48	256.64	256.89	255.71	254.45
PSB 1A	275.60	278.14	281.10	279.78	278.47	276.55	276.05	275.51	274.59
PSB 2A	274.90	--	--	--	--	275.84	275.29	275.00	273.88
PSB 3A	273.50	276.18	278.80	278.14	276.83	274.56	273.94	273.57	272.50
PSB 4A	272.20	274.86	278.47	277.16	275.85	273.46	272.77	272.22	271.30
PSB 5A	274.40	277.16	279.78	279.13	277.82	275.32	274.65	274.12	273.22
PSB 6A	276.20	278.47	281.10	280.77	279.46	277.00	276.41	275.81	275.01
PSB 7A	276.20	277.82	280.44	279.78	279.13	277.10	276.48	275.97	275.16
P-13B	--	--	--	--	--	--	--	--	--
P-13A	--	--	--	--	--	--	--	--	--
P-13TD	--	--	--	--	--	--	--	--	--
P-13TC	--	--	--	--	--	--	--	--	--
P-13TB	--	--	--	--	--	--	--	--	--
P-13TA	--	--	--	--	--	--	--	--	--
IDB-1B	--	--	--	--	--	--	--	--	--
IDB-1A	--	--	--	--	--	--	--	--	--
P-14TC	--	--	--	--	--	--	--	--	--
P-14TB	--	--	--	--	--	--	--	--	--
P-14TA	--	--	--	--	--	--	--	--	--
P-15D	--	--	--	--	--	--	--	--	--
P-15C	--	--	--	--	--	--	--	--	--
P-15B	--	--	--	--	--	--	--	--	--
P-15A	--	--	--	--	--	--	--	--	--
P-15TD	--	--	--	--	--	--	--	--	--
P-15TC	--	--	--	--	--	--	--	--	--
P-15TB	--	--	--	--	--	--	--	--	--
P-15TA	--	--	--	--	--	--	--	--	--
P-16A**	--	--	--	--	--	--	--	--	--
P-16TD**	--	--	--	--	--	--	--	--	--
P-16TC**	--	--	--	--	--	--	--	--	--
P-16TB**	--	--	--	--	--	--	--	--	--
P-16TA**	--	--	--	--	--	--	--	--	--
P-17B**	--	--	--	--	--	--	--	--	--
P-17A**	--	--	--	--	--	--	--	--	--
P-17TD**	--	--	--	--	--	--	--	--	--
P-17TC**	--	--	--	--	--	--	--	--	--
P-17TB**	--	--	--	--	--	--	--	--	--
P-17TA**	--	--	--	--	--	--	--	--	--
P-18B	--	--	--	--	--	--	--	--	--
P-18A	--	--	--	--	--	--	--	--	--

Well	1986 Fourth Quarter Water Elevation	1987 First Quarter Water Elevation	1987 Second Quarter Water Elevation	1987 Third Quarter Water Elevation	1987 Fourth Quarter Water Elevation	1988 First Quarter Water Elevation	1988 Second Quarter Water Elevation	1988 Third Quarter Water Elevation	1988 Fourth Quarter Water Elevation
P-18TD	--	--	--	--	--	--	--	--	--
P-18TC	--	--	--	--	--	--	--	--	--
P-18TB	--	--	--	--	--	--	--	--	--
P-18TA	--	--	--	--	--	--	--	--	--
P-19A	--	--	--	--	--	--	--	--	--
P-19TD	--	--	--	--	--	--	--	--	--
P-19TC	--	--	--	--	--	--	--	--	--
P-19TB	--	--	--	--	--	--	--	--	--
P-19TA	--	--	--	--	--	--	--	--	--
P-10A	--	--	--	--	--	--	--	--	--
P-20B**	--	--	--	--	--	--	--	--	--
P-20TD**	--	--	--	--	--	--	--	--	--
P-21B	--	--	--	--	--	--	--	--	--
P-21A	--	--	--	--	--	--	--	--	--
P-21TD	--	--	--	--	--	--	--	--	--
P-21TC	--	--	--	--	--	--	--	--	--
P-21TB	--	--	--	--	--	--	--	--	--
P-5A	--	--	--	--	--	--	--	--	--
P-22B	--	--	--	--	--	--	--	--	--
P-22A	--	--	--	--	--	--	--	--	--
P-22TD	--	--	--	--	--	--	--	--	--
P-22TC	--	--	--	--	--	--	--	--	--
P-22TB	--	--	--	--	--	--	--	--	--
P-22TA	--	--	--	--	--	--	--	--	--
P-23B	--	--	--	--	--	--	--	--	--
P-23A	--	--	--	--	--	--	--	--	--
P-23TE	--	--	--	--	--	--	--	--	--
P-23TD	--	--	--	--	--	--	--	--	--
P-23TC	--	--	--	--	--	--	--	--	--
P-23TB	--	--	--	--	--	--	--	--	--
P-23TA	--	--	--	--	--	--	--	--	--
P-24C	--	--	--	--	--	--	--	--	--
P-24B	--	--	--	--	--	--	--	--	--
P-24A	--	--	--	--	--	--	--	--	--
P-24TD	--	--	--	--	--	--	--	--	--
P-24TC	--	--	--	--	--	--	--	--	--
P-24TB	--	--	--	--	--	--	--	--	--
P-24TA	--	--	--	--	--	--	--	--	--
P-25D	--	--	--	--	--	--	--	--	--
P-25C	--	--	--	--	--	--	--	--	--
P-25A	--	--	--	--	--	--	--	--	--
P-25TE	--	--	--	--	--	--	--	--	--
P-25TD	--	--	--	--	--	--	--	--	--
P-25TC	--	--	--	--	--	--	--	--	--
P-25TB	--	--	--	--	--	--	--	--	--
P-25TA	--	--	--	--	--	--	--	--	--
P-26A	--	--	--	--	--	--	--	--	--
P-26TD	--	--	--	--	--	--	--	--	--
P-27B	--	--	--	--	--	--	--	--	--
P-27TE	--	--	--	--	--	--	--	--	--
P-27TD	--	--	--	--	--	--	--	--	--
P-27TC	--	--	--	--	--	--	--	--	--
P-27TB	--	--	--	--	--	--	--	--	--

Well	1986 Fourth Quarter Water Elevation	1987 First Quarter Water Elevation	1987 Second Quarter Water Elevation	1987 Third Quarter Water Elevation	1987 Fourth Quarter Water Elevation	1988 First Quarter Water Elevation	1988 Second Quarter Water Elevation	1988 Third Quarter Water Elevation	1988 Fourth Quarter Water Elevation
P-27TA	--	--	--	--	--	--	--	--	--
FC-2B	--	--	--	--	--	--	--	--	--
FC-2A	--	--	--	--	--	--	--	--	--
P-28A	--	--	--	--	--	--	--	--	--
P-28TE	--	--	--	--	--	--	--	--	--
P-28TD	--	--	--	--	--	--	--	--	--
P-28TC	--	--	--	--	--	--	--	--	--
P-28TB	--	--	--	--	--	--	--	--	--
P-28TA	--	--	--	--	--	--	--	--	--
P-29C**	--	--	--	--	--	--	--	--	--
P-29B**	--	--	--	--	--	--	--	--	--
P-29A**	--	--	--	--	--	--	--	--	--
P-29TD**	--	--	--	--	--	--	--	--	--
P-29TC**	--	--	--	--	--	--	--	--	--
P-29TA**	--	--	--	--	--	--	--	--	--
P-30C**	--	--	--	--	--	--	--	--	--
P-30B**	--	--	--	--	--	--	--	--	--
P-30A**	--	--	--	--	--	--	--	--	--
P-30TD**	--	--	--	--	--	--	--	--	--
P-30TC**	--	--	--	--	--	--	--	--	--
P-30TB**	--	--	--	--	--	--	--	--	--
P-30TA**	--	--	--	--	--	--	--	--	--

NOTES:

All elevations are feet above/below mean sea level. Values in parentheses () indicate below mean sea level.

** - Well is not in model domain. Well used for establishing model boundary conditions only.
-- - Data not available.

Well	9/84 Water Elevation	5/85 Water Elevation	3/86 Water Elevation	7/87 Water Elevation	8/18/88 Water Elevation	9/15/88 Water Elevation	10/17/88 Water Elevation	11/29/88 Water Elevation	12/20/88 Water Elevation
BGO 6A	--	--	--	--	--	--	--	--	--
BGO 8A	--	--	--	--	--	--	--	--	--
BGO 14A	--	--	--	--	--	--	--	--	--
BGO 16A	--	--	--	--	--	--	--	--	--
BGO 18A	--	--	--	--	--	--	--	--	--
BGO 25A	--	--	--	--	--	--	--	--	--
CMP 8A	--	--	--	--	--	--	--	--	--
CMP 12A	--	--	--	--	--	--	--	--	--
CMP 15A	--	--	--	--	--	--	--	--	--
FSB 76A	--	--	--	--	--	--	--	--	--
FSB 76B	--	--	--	--	--	--	--	--	--
FSB 78A	--	--	--	--	--	--	--	--	--
FSB 78B	--	--	--	--	--	--	--	--	--
FSB 79A	--	--	--	--	--	--	--	--	--
FSB 79B	--	--	--	--	--	--	--	--	--
FSB 87A	--	--	--	--	--	--	--	--	--
FSB 87B	--	--	--	--	--	--	--	--	--
FSB 96A	--	--	--	--	--	--	--	--	--
FSB 97A	--	--	--	--	--	--	--	--	--
FSB 98A	--	--	--	--	--	--	--	--	--
FSB 99A	--	--	--	--	--	--	--	--	--
FSB 100A	--	--	--	--	--	--	--	--	--
FSB 101A	--	--	--	--	--	--	--	--	--
HSB 65A	--	--	--	--	--	--	--	--	--
HSB 68A	--	--	--	--	--	--	--	--	--
HSB 69A	--	--	--	--	--	--	--	--	--
HSB 83A	--	--	--	--	--	--	--	--	--
HSB 84A	--	--	--	--	--	--	--	--	--
HSB 85A	--	--	--	--	--	--	--	--	--
HSB 86A	--	--	--	--	--	--	--	--	--
HSB 117A	--	--	--	--	--	--	--	--	--
HSB 118A	--	--	--	--	--	--	--	--	--
HSB 119A	--	--	--	--	--	--	--	--	--
HSB 120A	--	--	--	--	--	--	--	--	--
HSB 121A	--	--	--	--	--	--	--	--	--
HSB 122A	--	--	--	--	--	--	--	--	--
HSB 123A	--	--	--	--	--	--	--	--	--
HSB 139A	--	--	--	--	--	--	--	--	--
KAB 1	--	--	--	--	--	--	--	--	--
KAB 2	--	--	--	--	--	--	--	--	--
KAB 3	--	--	--	--	--	--	--	--	--
KAB 4	--	--	--	--	--	--	--	--	--
KAC 1	--	--	--	--	--	--	--	--	--
KAC 2	--	--	--	--	--	--	--	--	--
KAC 3	--	--	--	--	--	--	--	--	--
KAC 4	--	--	--	--	--	--	--	--	--
KAC 5	--	--	--	--	--	--	--	--	--
KAC 6	--	--	--	--	--	--	--	--	--
KAC 7	--	--	--	--	--	--	--	--	--
KCB 1	--	--	--	--	--	--	--	--	--
KCB 2	--	--	--	--	--	--	--	--	--
KCB 3	--	--	--	--	--	--	--	--	--
KCB 4	--	--	--	--	--	--	--	--	--
KDB 1	--	--	--	--	--	--	--	--	--
KDB 2	--	--	--	--	--	--	--	--	--

Well	9/84 Water Elevation	5/85 Water Elevation	3/86 Water Elevation	7/87 Water Elevation	8/18/88 Water Elevation	9/15/88 Water Elevation	10/17/88 Water Elevation	11/29/88 Water Elevation	12/20/88 Water Elevation
KDB 3	--	--	--	--	--	--	--	--	--
KRB 1	--	--	--	--	--	--	--	--	--
KRB 8	--	--	--	--	--	--	--	--	--
KRB 13	--	--	--	--	--	--	--	--	--
KRB 14	--	--	--	--	--	--	--	--	--
KRB 15	--	--	--	--	--	--	--	--	--
KRP 1	--	--	--	--	--	--	--	--	--
KRP 2	--	--	--	--	--	--	--	--	--
KRP 3	--	--	--	--	--	--	--	--	--
KRP 4	--	--	--	--	--	--	--	--	--
KSB 1	--	--	--	--	--	--	--	--	--
KSB 2	--	--	--	--	--	--	--	--	--
KSB 3	--	--	--	--	--	--	--	--	--
KSB 4A	--	--	--	--	--	--	--	--	--
KSS 1D	--	--	--	--	--	--	--	--	--
KSS 2D	--	--	--	--	--	--	--	--	--
KSS 3D	--	--	--	--	--	--	--	--	--
LAC 1	--	--	--	--	213.41	213.28	213.20	212.20	211.99
LAC 2	--	--	--	--	213.99	213.78	213.65	212.99	212.53
LAC 3	--	--	--	--	213.59	213.34	213.21	212.55	212.13
LAC 4	--	--	--	--	213.64	213.39	213.22	212.43	211.85
LAW 1A	--	174.01	--	--	170.16	169.65	170.15	169.88	170.00
LAW 1B	--	175.37	--	--	171.87	171.60	171.70	171.50	171.50
LAW 1C	--	175.52	--	--	173.12	173.08	172.77	172.68	172.55
LAW 1D	--	175.45	--	--	173.05	173.00	172.68	172.57	172.54
LAW 1E	--	199.06	--	--	201.82	201.98	201.58	200.99	200.75
LAW 1F	--	199.63	--	--	199.70	200.26	199.55	198.55	198.30
LAW 1TD	--	171.31	--	--	167.32	168.78	167.74	167.57	167.66
LAW 2A	--	173.21	--	--	169.22	169.43	169.25	169.03	169.25
LAW 2B	--	174.83	--	--	172.55	172.38	172.35	172.00	172.06
LAW 2C	--	203.70	--	--	205.36	205.67	205.12	204.03	203.60
LAW 3A	--	177.13	--	--	171.17	171.08	170.95	170.86	170.73
LAW 3B	--	177.40	--	--	174.52	174.52	174.32	174.10	174.04
LAW 3C	--	231.27	--	--	230.75	231.08	230.18	227.05	226.18
LCO 1	--	--	--	--	211.74	211.49	211.41	210.53	210.16
LCO 2	--	--	--	--	213.77	213.35	213.39	212.60	212.19
LCO 3	--	--	--	--	213.48	213.02	212.90	212.02	211.65
LCO 4	--	--	--	--	209.49	209.49	208.95	207.79	207.28
LDB 1	--	--	--	--	--	--	--	--	--
LDB 2	--	--	--	--	--	--	--	--	--
LRP 1	--	--	--	--	--	--	--	--	--
LRP 2	--	--	--	--	--	--	--	--	--
LRP 3	--	--	--	--	--	--	--	--	--
LRP 4	--	--	--	--	--	--	--	--	--
LSB 1	--	--	--	--	208.33	208.45	207.78	206.78	206.16
LSB 2	--	--	--	--	209.32	209.20	208.74	207.66	207.16
LSB 3	--	--	--	--	213.65	214.32	213.32	211.77	211.23
LSB 4	--	--	--	--	213.25	214.21	212.87	210.33	209.58
PAC 1	--	--	--	--	--	--	--	--	--
PAC 2	--	--	--	--	--	--	--	--	--
PAC 3	--	--	--	--	--	--	--	--	--

Well	9/84 Water Elevation	5/85 Water Elevation	3/86 Water Elevation	7/87 Water Elevation	8/18/88 Water Elevation	9/15/88 Water Elevation	10/17/88 Water Elevation	11/29/88 Water Elevation	12/20/88 Water Elevation
PAC 4	--	--	--	--	--	--	--	--	--
PAC 5	--	--	--	--	--	--	--	--	--
PAC 6	--	--	--	--	--	--	--	--	--
PCB 1A	--	--	--	--	--	--	--	--	--
PCB 2A	--	--	--	--	--	--	--	--	--
PCB 3A	--	--	--	--	--	--	--	--	--
PCB 4A	--	--	--	--	--	--	--	--	--
PDB 2	--	--	--	--	--	--	--	--	--
PDB 3	--	--	--	--	--	--	--	--	--
PRP 1A	--	--	--	--	--	--	--	--	--
PRP 2	--	--	--	--	--	--	--	--	--
PRP 3	--	--	--	--	--	--	--	--	--
PRP 4	--	--	--	--	--	--	--	--	--
PSB 1A	--	--	--	--	--	--	--	--	--
PSB 2A	--	--	--	--	--	--	--	--	--
PSB 3A	--	--	--	--	--	--	--	--	--
PSB 4A	--	--	--	--	--	--	--	--	--
PSB 5A	--	--	--	--	--	--	--	--	--
PSB 6A	--	--	--	--	--	--	--	--	--
PSB 7A	--	--	--	--	--	--	--	--	--
P-13B	178.00	--	--	--	--	--	--	--	--
P-13A	175.00	--	--	--	--	--	--	--	--
P-13TD	175.00	--	--	--	--	--	--	--	--
P-13TC	176.00	--	--	--	--	--	--	--	--
P-13TB	185.00	--	--	--	--	--	--	--	--
P-13TA	185.00	--	--	--	--	--	--	--	--
IDB-1B	186.00	--	--	--	--	--	--	--	--
IDB-1A	189.00	--	--	--	--	--	--	--	--
P-14TC	196.00	--	--	--	--	--	--	--	--
P-14TB	189.00	--	--	--	--	--	--	--	--
P-14TA	191.00	--	--	--	--	--	--	--	--
P-15D	234.00	--	--	--	--	--	--	--	--
P-15C	218.00	--	--	--	--	--	--	--	--
P-15B	179.00	--	--	--	--	--	--	--	--
P-15A	178.00	--	--	--	--	--	--	--	--
P-15TD	170.00	--	--	--	--	--	--	--	--
P-15TC	170.00	--	--	--	--	--	--	--	--
P-15TB	179.00	--	--	--	--	--	--	--	--
P-15TA	179.00	--	--	--	--	--	--	--	--
P-16A**	--	--	213.29	--	--	--	--	--	--
P-16TD**	--	--	220.10	--	--	--	--	--	--
P-16TC**	--	--	221.80	--	--	--	--	--	--
P-16TB**	--	--	222.71	--	--	--	--	--	--
P-16TA**	--	--	218.77	--	--	--	--	--	--
P-17B**	--	--	227.79	--	--	--	--	--	--
P-17A**	--	--	227.62	--	--	--	--	--	--
P-17TD**	--	--	215.15	--	--	--	--	--	--
P-17TC**	--	--	215.34	--	--	--	--	--	--
P-17TB**	--	--	215.67	--	--	--	--	--	--
P-17TA**	--	--	215.17	--	--	--	--	--	--
P-18B	--	--	168.98	--	--	--	--	--	--
P-18A	--	--	178.82	--	--	--	--	--	--

Well	9/84 Water Elevation	5/85 Water Elevation	3/86 Water Elevation	7/87 Water Elevation	8/18/88 Water Elevation	9/15/88 Water Elevation	10/17/88 Water Elevation	11/29/88 Water Elevation	12/20/88 Water Elevation
P-18TD	--	--	168.87	--	--	--	--	--	--
P-18TC	--	--	168.95	--	--	--	--	--	--
P-18TB	--	--	168.98	--	--	--	--	--	--
P-18TA	--	--	169.92	--	--	--	--	--	--
P-19A	--	--	187.17	--	--	--	--	--	--
P-19TD	--	--	176.46	--	--	--	--	--	--
P-19TC	--	--	176.21	--	--	--	--	--	--
P-19TB	--	--	177.74	--	--	--	--	--	--
P-19TA	--	--	178.03	--	--	--	--	--	--
P-10A	--	--	178.49	--	--	--	--	--	--
P-20B**	--	--	194.20	--	--	--	--	--	--
P-20TD**	--	--	188.18	--	--	--	--	--	--
P-21B	--	--	134.36	--	--	--	--	--	--
P-21A	--	--	135.47	--	--	--	--	--	--
P-21TD	--	--	166.20	--	--	--	--	--	--
P-21TC	--	--	166.26	--	--	--	--	--	--
P-21TB	--	--	180.87	--	--	--	--	--	--
P-5A	--	--	180.92	--	--	--	--	--	--
P-22B	--	--	153.19	--	--	--	--	--	--
P-22A	--	--	154.17	--	--	--	--	--	--
P-22TD	--	--	175.79	--	--	--	--	--	--
P-22TC	--	--	175.70	--	--	--	--	--	--
P-22TB	--	--	188.40	--	--	--	--	--	--
P-22TA	--	--	188.85	--	--	--	--	--	--
P-23B	--	--	141.24	--	--	--	--	--	--
P-23A	--	--	148.70	--	--	--	--	--	--
P-23TE	--	--	164.78	--	--	--	--	--	--
P-23TD	--	--	164.93	--	--	--	--	--	--
P-23TC	--	--	169.56	--	--	--	--	--	--
P-23TB	--	--	170.36	--	--	--	--	--	--
P-23TA	--	--	171.24	--	--	--	--	--	--
P-24C	--	--	--	250.80	--	--	--	--	--
P-24B	--	--	--	245.20	--	--	--	--	--
P-24A	--	--	--	193.20	--	--	--	--	--
P-24TD	--	--	--	174.10	--	--	--	--	--
P-24TC	--	--	--	174.30	--	--	--	--	--
P-24TB	--	--	--	182.30	--	--	--	--	--
P-24TA	--	--	--	183.10	--	--	--	--	--
P-25D	--	--	--	212.30	--	--	--	--	--
P-25C	--	--	--	198.90	--	--	--	--	--
P-25A	--	--	--	171.60	--	--	--	--	--
P-25TE	--	--	--	156.10	--	--	--	--	--
P-25TD	--	--	--	163.60	--	--	--	--	--
P-25TC	--	--	--	164.20	--	--	--	--	--
P-25TB	--	--	--	170.10	--	--	--	--	--
P-25TA	--	--	--	171.70	--	--	--	--	--
P-26A	--	--	--	117.10	--	--	--	--	--
P-26TD	--	--	--	145.70	--	--	--	--	--
P-27B	--	--	--	179.40	--	--	--	--	--
P-27TE	--	--	--	177.60	--	--	--	--	--
P-27TD	--	--	--	178.00	--	--	--	--	--
P-27TC	--	--	--	177.10	--	--	--	--	--
P-27TB	--	--	--	177.70	--	--	--	--	--

Well	9/84 Water Elevation	5/85 Water Elevation	3/86 Water Elevation	7/87 Water Elevation	8/18/88 Water Elevation	9/15/88 Water Elevation	10/17/88 Water Elevation	11/29/88 Water Elevation	12/20/88 Water Elevation
P-27TA	--	--	--	175.30	--	--	--	--	--
FC-2B	--	--	--	147.20	--	--	--	--	--
FC-2A	--	--	--	147.10	--	--	--	--	--
P-28A	--	--	--	173.40	--	--	--	--	--
P-28TE	--	--	--	173.30	--	--	--	--	--
P-28TD	--	--	--	173.30	--	--	--	--	--
P-28TC	--	--	--	172.30	--	--	--	--	--
P-28TB	--	--	--	172.40	--	--	--	--	--
P-28TA	--	--	--	171.30	--	--	--	--	--
P-29C**	--	--	--	167.10	--	--	--	--	--
P-29B**	--	--	--	166.40	--	--	--	--	--
P-29A**	--	--	--	167.90	--	--	--	--	--
P-29TD**	--	--	--	169.10	--	--	--	--	--
P-29TC**	--	--	--	169.20	--	--	--	--	--
P-29TA**	--	--	--	169.40	--	--	--	--	--
P-30C**	--	--	--	209.80	--	--	--	--	--
P-30B**	--	--	--	209.00	--	--	--	--	--
P-30A**	--	--	--	207.90	--	--	--	--	--
P-30TD**	--	--	--	206.90	--	--	--	--	--
P-30TC**	--	--	--	205.20	--	--	--	--	--
P-30TB**	--	--	--	198.50	--	--	--	--	--
P-30TA**	--	--	--	187.40	--	--	--	--	--

NOTES:

All elevations are feet above/below mean sea level. Values in parentheses () indicate below mean sea level.

** - Well is not in model domain. Well used for establishing model boundary conditions only.
-- - Data not available.

Well	1/25/89 Water Elevation	2/13/89 Water Elevation	5/23/89 Water Elevation	6/29/89 Water Elevation
BGO 6A	--	--	--	--
BGO 8A	--	--	--	--
BGO 14A	--	--	--	--
BGO 16A	--	--	--	--
BGO 18A	--	--	--	--
BGO 25A	--	--	--	--
CMP 8A	--	--	--	--
CMP 12A	--	--	--	--
CMP 15A	--	--	--	--
FSB 76A	--	--	--	--
FSB 76B	--	--	--	--
FSB 78A	--	--	--	--
FSB 78B	--	--	--	--
FSB 79A	--	--	--	--
FSB 79B	--	--	--	--
FSB 87A	--	--	--	--
FSB 87B	--	--	--	--
FSB 96A	--	--	--	--
FSB 97A	--	--	--	--
FSB 98A	--	--	--	--
FSB 99A	--	--	--	--
FSB 100A	--	--	--	--
FSB 101A	--	--	--	--
HSB 65A	--	--	--	--
HSB 68A	--	--	--	--
HSB 69A	--	--	--	--
HSB 83A	--	--	--	--
HSB 84A	--	--	--	--
HSB 85A	--	--	--	--
HSB 86A	--	--	--	--
HSB 117A	--	--	--	--
HSB 118A	--	--	--	--
HSB 119A	--	--	--	--
HSB 120A	--	--	--	--
HSB 121A	--	--	--	--
HSB 122A	--	--	--	--
HSB 123A	--	--	--	--
HSB 139A	--	--	--	--
KAB 1	--	--	--	--
KAB 2	--	--	--	--
KAB 3	--	--	--	--
KAB 4	--	--	--	--
KAC 1	--	--	--	--
KAC 2	--	--	--	--
KAC 3	--	--	--	--
KAC 4	--	--	--	--
KAC 5	--	--	--	--
KAC 6	--	--	--	--
KAC 7	--	--	--	--
KCB 1	--	--	--	--
KCB 2	--	--	--	--
KCB 3	--	--	--	--
KCB 4	--	--	--	--
KDB 1	--	--	--	--
KDB 2	--	--	--	--

Well	1/25/89 Water Elevation	2/13/89 Water Elevation	5/23/89 Water Elevation	6/29/89 Water Elevation
KDB 3	--	--	--	--
KRB 1	--	--	--	--
KRB 8	--	--	--	--
KRB 13	--	--	--	--
KRB 14	--	--	--	--
KRB 15	--	--	--	--
KRP 1	--	--	--	--
KRP 2	--	--	--	--
KRP 3	--	--	--	--
KRP 4	--	--	--	--
KSB 1	--	--	--	--
KSB 2	--	--	--	--
KSB 3	--	--	--	--
KSB 4A	--	--	--	--
KSS 1D	--	--	--	--
KSS 2D	--	--	--	--
KSS 3D	--	--	--	--
LAC 1	211.12	210.95	212.35	212.28
LAC 2	211.82	211.61	212.78	212.62
LAC 3	211.55	211.30	212.51	212.26
LAC 4	210.93	210.77	212.34	212.27
LAW 1A	170.25	170.37	171.55	171.11
LAW 1B	171.70	171.80	171.80	172.53
LAW 1C	172.82	172.92	173.85	173.62
LAW 1D	172.77	172.85	173.80	173.60
LAW 1E	200.45	200.42	201.35	201.56
LAW 1F	198.08	198.05	200.55	201.89
LAW 1TD	168.25	167.87	169.20	168.66
LAW 2A	169.53	169.68	170.85	170.37
LAW 2B	172.24	172.35	173.35	173.07
LAW 2C	203.32	203.00	205.00	205.93
LAW 3A	171.13	171.30	172.40	172.05
LAW 3B	174.30	174.40	174.95	175.15
LAW 3C	225.85	225.30	230.35	231.20
LCO 1	209.37	209.99	210.87	210.70
LCO 2	211.60	211.19	212.64	212.31
LCO 3	211.15	210.86	211.90	211.90
LCO 4	206.87	206.61	208.66	209.24
LDB 1	--	--	--	--
LDB 2	--	--	--	--
LRP 1	--	--	--	--
LRP 2	--	--	--	--
LRP 3	--	--	--	--
LRP 4	--	--	--	--
LSB 1	205.91	210.53	208.16	208.41
LSB 2	206.53	206.24	208.80	209.28
LSB 3	210.65	210.32	213.40	214.65
LSB 4	209.09	208.83	214.04	215.17
PAC 1	--	--	--	--
PAC 2	--	--	--	--
PAC 3	--	--	--	--

Well	1/25/89 Water Elevation	2/13/89 Water Elevation	5/23/89 Water Elevation	6/29/89 Water Elevation
PAC 4	--	--	--	--
PAC 5	--	--	--	--
PAC 6	--	--	--	--
PCB 1A	--	--	--	--
PCB 2A	--	--	--	--
PCB 3A	--	--	--	--
PCB 4A	--	--	--	--
PDB 2	--	--	--	--
PDB 3	--	--	--	--
PRP 1A	--	--	--	--
PRP 2	--	--	--	--
PRP 3	--	--	--	--
PRP 4	--	--	--	--
PSB 1A	--	--	--	--
PSB 2A	--	--	--	--
PSB 3A	--	--	--	--
PSB 4A	--	--	--	--
PSB 5A	--	--	--	--
PSB 6A	--	--	--	--
PSB 7A	--	--	--	--
P-13B	--	--	173.58	173.29
P-13A	--	--	171.74	171.44
P-13TD	--	--	172.09	170.95
P-13TC	--	--	172.43	171.33
P-13TB	--	--	182.01	181.63
P-13TA	--	--	181.90	181.51
IDB-1B	--	--	183.35	182.98
IDB-1A	--	--	187.36	186.83
P-14TC	--	--	187.54	186.73
P-14TB	--	--	187.96	187.46
P-14TA	--	--	186.65	186.18
P-15D	--	--	224.37	224.25
P-15C	--	--	211.13	210.88
P-15B	--	--	175.94	175.69
P-15A	--	--	174.44	174.13
P-15TD	--	--	167.75	167.72
P-15TC	--	--	171.45	171.04
P-15TB	--	--	176.69	176.34
P-15TA	--	--	176.81	176.46
P-16A**	--	--	211.02	211.07
P-16TD**	--	--	217.65	217.62
P-16TC**	--	--	220.44	220.32
P-16TB**	--	--	220.41	220.22
P-16TA**	--	--	216.58	216.58
P-17B**	--	--	226.10	225.86
P-17A**	--	--	225.80	225.59
P-17TD**	--	--	211.75	213.65
P-17TC**	--	--	214.07	213.78
P-17TB**	--	--	214.35	213.93
P-17TA**	--	--	213.59	213.19
P-18B	--	--	167.28	167.28
P-18A	--	--	167.07	167.02

Well	1/25/89 Water Elevation	2/13/89 Water Elevation	5/23/89 Water Elevation	6/29/89 Water Elevation
P-18TD	--	--	170.98	169.17
P-18TC	--	--	170.20	169.24
P-18TB	--	--	170.78	169.88
P-18TA	--	--	170.88	169.92
P-19A	--	--	185.34	184.87
P-19TD	--	--	177.33	176.48
P-19TC	--	--	177.89	176.54
P-19TB	--	--	178.53	177.78
P-19TA	--	--	178.75	178.00
P-10A	--	--	178.49	177.79
P-20B**	--	--	193.60	193.22
P-20TD**	--	--	188.05	187.51
P-21B	--	--	132.62	132.01
P-21A	--	--	133.65	133.12
P-21TD	--	--	164.51	163.81
P-21TC	--	--	164.91	164.21
P-21TB	--	--	179.20	179.15
P-5A	--	--	179.19	179.24
P-22B	--	--	151.78	151.65
P-22A	--	--	152.57	152.47
P-22TD	--	--	174.12	173.29
P-22TC	--	--	174.00	173.25
P-22TB	--	--	186.85	186.94
P-22TA	--	--	187.33	187.36
P-23B	--	--	139.55	139.30
P-23A	--	--	148.08	147.98
P-23TE	--	--	164.09	163.74
P-23TD	--	--	164.35	164.05
P-23TC	--	--	167.75	167.40
P-23TB	--	--	170.79	169.59
P-23TA	--	--	170.42	170.17
P-24C	--	--	249.15	248.82
P-24B	--	--	219.36	219.11
P-24A	--	--	190.53	190.38
P-24TD	--	--	175.92	175.66
P-24TC	--	--	175.98	175.66
P-24TB	--	--	183.53	183.26
P-24TA	--	--	183.37	183.12
P-25D	--	--	209.12	209.10
P-25C	--	--	195.66	195.56
P-25A	--	--	170.72	170.57
P-25TE	--	--	167.61	167.26
P-25TD	--	--	167.65	167.15
P-25TC	--	--	167.64	167.19
P-25TB	--	--	171.27	170.88
P-25TA	--	--	172.25	171.87
P-26A	--	--	115.33	114.86
P-26TD	--	--	146.67	145.82
P-27B	--	--	178.91	178.44
P-27TE	--	--	178.63	177.58
P-27TD	--	--	178.06	176.93
P-27TC	--	--	179.00	177.88
P-27TB	--	--	178.22	177.17

Well	1/25/89 Water Elevation	2/13/89 Water Elevation	5/23/89 Water Elevation	6/29/89 Water Elevation
P-27TA	--	--	177.82	175.35
FC-2B	--	--	146.41	146.17
FC-2A	--	--	146.55	146.32
P-28A	--	--	173.32	172.90
P-28TE	--	--	173.27	172.90
P-28TD	--	--	173.35	172.92
P-28TC	--	--	172.66	172.31
P-28TB	--	--	171.03	171.74
P-28TA	--	--	170.03	172.36
P-29C**	--	--	163.47	163.44
P-29B**	--	--	163.20	163.19
P-29A**	--	--	166.84	166.69
P-29TD**	--	--	168.62	168.41
P-29TC**	--	--	169.43	169.20
P-29TA**	--	--	169.32	169.38
P-30C**	--	--	208.54	208.29
P-30B**	--	--	207.42	206.94
P-30A**	--	--	206.84	206.61
P-30TD**	--	--	206.59	205.51
P-30TC**	--	--	205.06	203.48
P-30TB**	--	--	200.74	198.47
P-30TA**	--	--	185.89	186.51

NOTES:

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-- - Data not available.

Derivative Classifier: D B Moore, Section Manager WSRC-RP-89-1198

NUMERICAL SIMULATION OF GROUNDWATER FLOW AND CONTAMINANT TRANSPORT AT THE K, L, AND P AREAS OF THE SAVANNAH RIVER SITE, AIKEN, SOUTH CAROLINA (U)

November 10, 1989

J. S. Haselow
M. D. Taylor (with Camp, Dresser & McKee)

Approved by: D. B. Moore, Manager
Environmental Sciences Section
Savannah River Laboratory

WESTINGHOUSE SAVANNAH RIVER COMPANY
SAVANNAH RIVER SITE
AIKEN, SC 29808

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