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**EVALUATION OF URANIUM GEOCHEMICAL
ANOMALIES IN THE GREENVILLE 1°× 2°
QUADRANGLE (AVALON, GREER, HONEA, AND
NORTHEAST GREENVILLE)**

MASTER

**NATIONAL URANIUM RESOURCE
EVALUATION PROGRAM**

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ABSTRACT

The Savannah River Laboratory (SRL) was involved in the National Uranium Resource Evaluation (NURE) from 1974 through 1981. The SRL role was to design, conduct, and report the data from a geochemical reconnaissance of almost half the continental United States. The purpose of this work was to provide a basis for evaluating the uranium potential of areas and to identify areas meriting conventional geologic followup. More than 275,000 samples of stream sediment, soil, vegetation, and ground or surface water were collected in the program.

As a part of the development program to support interpretation of the geochemical data, SRL conducted a series of field studies to verify anomalies that were identified from reconnaissance data. Subcontractors were selected to conduct field scintillometer surveys, compile geologic maps, collect additional samples, or provide other services needed for a given study.

This report summarizes the results of four small studies that were conducted for SRL by V. S. Griffin, Jr., in the Greenville 1° x 2° quadrangle. Normal editing was not done so the report could be released to the public before the termination of the NURE program. Thus, conceptual errors that may be present have not been corrected, and the reader is cautioned to use professional judgment in interpreting the data.

These studies include original geologic maps and the results of field radioactivity measurements.

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DETAILED GEOLOGIC AND GAMMA RADIATION SURVEY OF THE AVALON QUADRANGLE, GEORGIA AND SOUTH CAROLINA

LOCATION

The area of this investigation lies within the Inner Piedmont geologic belt of the Southeastern U.S. Piedmont physiographic region (King, 1955; Overstreet and Bell, 1965). The northwest flank of the Inner Piedmont underlies the entire area (Figs. A-1 and A-2). Avalon, Georgia, is at the southern edge of the area.

A network of federal, state, and county roads crosses the area and permits ready access to most localities. Although there are considerably more roads than in the Blue Ridge to the west, this area has fewer roads than many areas farther eastward within the Inner Piedmont belt. However, many roadside outcrops of bedrock and saprolite exist, thus facilitating rapid geologic mapping. Soils are useful also in bedrock mapping.

GEOLOGY

The northwest flank of the Inner Piedmont belt (Walhalla Nappe locally) consists of hornblende gneiss (or amphibolite) interlayered with granitoid gneiss and very minor bodies of micaceous schist (Griffin, 1974; 1975; 1977; 1978). Simple pegmatite occurs widely, and all the rocks can generally be called migmatites.

PETROLOGY

Detailed descriptions of hand specimens and the microscopic petrography of these rocks have been previously published (Griffin, 1974; 1975). Only brief petrographic descriptions will be given here.

The hornblende gneiss, or amphibolite, is dark grey to blackish in an unweathered state. As weathering proceeds, the rock becomes reddish yellow to brownish red. Hornblende is the dominant mineral in the amphibolite, but plagioclase is dominant in the hornblende gneiss. Minor amounts of quartz, epidote-clinozoisite, and biotite may occur in many specimens, along with as much as 2% zircon and sphene, augite, and clinocllore chlorite.

Granitoid gneiss is equal in abundance to the hornblende gneiss. The rock is similar to comparable rocks occurring elsewhere within the Inner Piedmont belt. The color is light grey, and the rock typically has a granoblastic texture. The composition varies between true granite and quartz diorite. Microcline is always present, but plagioclase is the dominant feldspar in some specimens. Quartz normally is approximately 30 percent of the rock. Biotite and muscovite are usually present together, but biotite is dominant. Traces of epidote-clinozoisite, opaques, garnet, zircon, and sphene also occur.

The micaceous schist is similar to the mica-rich quartzo-feldspathic rocks described in the Old Pickens quadrangle (Griffin, 1973). Both plagioclase and microcline may occur, but quartz and muscovite are dominant. Biotite is present up to 10 percent, and epidote-clinozoisite, opaques, garnet, and zircon occur in trace amounts.

Some simple pegmatite and alaskite bodies occur widely throughout this assemblage of amphibolite-facies grade. The attitudes vary among concordant, semiconcordant, and discordant. This material, along with some of the granitoid gneiss, constitutes the neosome portion of the migmatite complex, whereas the hornblende gneiss, most granitoid gneiss, and micaceous schist makes up the paleosome fraction.

STRUCTURE

This layered migmatite terrane has been complexly deformed into recumbent/reclined flow folds. This style characterizes not only the outcrop scale, but has been inferred to represent the macroscopic scale as well (Figs. A-1 and A-2). The name Walhalla Nappe is applied to this part of the northwest flank of the Inner Piedmont belt (Griffin, 1974; 1975). Field data (Griffin, 1974) indicate that this large nappe has not been transported far from its root zone. The macroscopic folds plunge gently (10° - 15°) toward the north and east. The pattern in the geologic map is necessarily very interpretive, and it is probably a great simplification of the real geologic condition. This system of flow folds has a conical pattern in π -diagrams (Griffin, 1974, Fig. 9B).

GEOPHYSICS

The total field gamma-ray survey indicates some correspondence between certain rock types and anomalies, and pattern of anomalies reflects certain aspects of the structural picture (Figs. A-3 and A-4).

The highest gamma-ray values occur in the northwestern corner of the map. They correspond to a large body of granitoid gneiss at the border between Georgia and South Carolina. High anomalies (9 to 10 counts per second [cps]) occur also where this body extends eastward along the northern edge of the area in zig-zag pattern that is the result of folding.

Two small anomalies of 11 cps or greater occur in the northwestern central part of the area. These also seem to be associated with nearby granitoid gneiss bodies. A curved line of 7 and 8 cps anomalies runs through the southwestern central part of the area. Two of these anomalies at the convex part of the curve are associated with a thin, continuous layer of micaceous schist. The remainder of the small anomalies in the area are attributable to granitoid gneiss bodies.

DETAILED GEOLOGIC AND GAMMA RADIATION SURVEY
OF THE GREER, SOUTH CAROLINA AREA
(VICINITY OF NORTHEAST GREENVILLE, SOUTH CAROLINA)

LOCATION

The area investigated is situated within the Inner Piedmont geologic belt of the Southeastern U.S. Piedmont physiographic region (King, 1955; Overstreet and Bell, 1965). The core of the Inner Piedmont belt (Griffin, 1971; 1974; 1977; 1978) underlies the entire area (Fig. B-1). Greer, South Carolina, is in the western part of the area, along the border between Greenville and Spartanburg Counties.

An intricate network of federal, state, and county roads crosses the area and permits ready access to most localities. A deep and complete weathering profile extends throughout the area, and few outcrops of bedrock and saprolite exist. With experience, soil can be used to determine the parent bedrock below.

GEOLOGY

The area consists of biotite gneiss, mica schist, and minor amounts of hornblende gneiss (amphibolite) and granitoid gneiss (Figs. B-1 and B-2).

Biotite gneiss consists of quartz, oligoclase plagioclase, and biotite. Muscovite and green epidote-clinozoisite are common accessories. Garnet is an accessory mineral in some places. The rock is dark colored; the soil formed from it is dark red and clay-rich.

The mica schist primarily consists of quartz, muscovite, biotite, and the accessory minerals garnet and sillimanite. This rock is light colored and has a sparkling quality because of the large amount of coarse muscovite. The soil formed from this rock likewise has this sparkling quality where weathering is not far advanced.

Hornblende gneiss is a dark grey rock consisting of hornblende and labradorite plagioclase with accessory amounts of epidote-clinozoisite and garnet. Pyroxene sometimes occurs as an accessory mineral. The pyroxene is commonly diopsidic augite, but orthorhombic pyroxene has been reported (Griffin, 1971; 1974).

Granitoid gneiss is a light grey, equigranular rock with a faintly to strongly foliated fabric. The composition ranges between that of a true granite and that of a quartz diorite. The rock may become chalky white when weathered, but a red stain may cover and permeate the rock where biotite is plentiful.

Regardless of color, the granitoid soils will contain granules of quartz and feldspar.

Minor simple pegmatite and alaskite bodies occur widely. These are closely related to the concordant felsic neosome component in the migmatite. All these bodies are small, rarely greater than a foot or two wide.

The grade of regional metamorphism for this rock assemblage is upper amphibolite facies.

STRUCTURE

Bramlett and Griffin (1978, in press) have discussed the geology of most of this area. They conclude that the area is dominated by a major fold that is asymmetric toward the north-northwest and closes toward the east. Apparently contradictory attitudes of foliation dip (Fig. B-2) occur at the nose of the fold, east of Greer. The presence of foliation dipping southeast and northwest at this part of the major fold is attributed to the existence of smaller secondary folds plicating the eastward plunging nose of this major nappe fold. These northward trending "cross folds" are interpreted as having been formed by crowding and flow of hot, viscous mica gneiss and schist down the eastward plunging axis of the fold as the major nappe was uplifted during orogenesis.

Toward the west, structural continuity appears to be maintained between the Greer area and the area between Greer and Greenville (see the companion report on the northeast Greenville area). Along the axis of the Greer nappe, similar fold patterns continue to the area of north Greenville, where biotite gneiss cores the axial part of the nappe mainly consisting of mica schist.

GEOPHYSICS

The total radioactivity field (Fig. B-3) reflects the large-scale structure of the area, as the anomalies have arcuate trends corresponding to the major fold. However, it is clear upon closer examination that the mica schist generally contributes higher radiation values than does the biotite gneiss. Consequently, the radioactivity field is lower in the northern and northeasternmost parts of the area. Some anomalies occur within the biotite gneiss at the southeastern margin of the area.

The derivative geophysical map (Fig. B-4), on the other hand, bears little correlation to single rock type. Although faithfully reflecting the large-scale fold structure, the derivative anomalies seem to be strongest in areas near the contacts between the biotite gneiss and the mica schist. The anomalies are especially great in the eastern and southeastern areas, where these two rock types occur as relatively thin, repetitious units. There is only one large granitoid body recognized within the area. No significant correlation between anomalies and this rock type has been established. None of the many small, simple granitoid

bodies dispersed throughout the area---generally too small to be shown on the map---seem to have any obvious direct bearing on the anomalies.

DETAILED GEOLOGIC AND GAMMA RADIATION SURVEY OF THE HONEA PATH, SOUTH CAROLINA AREA

LOCATION

The area of this investigation lies within the Inner Piedmont geologic belt of the Southeastern U.S. Piedmont physiographic region (King, 1955; Overstreet and Bell, 1965). The core of the Inner Piedmont belt underlies most of the area, but the southeastern flank of the belt extends into the southeastern and southern parts (Fig. C-1). Honea Path, South Carolina, is at the northeastern edge of the area.

An intricate network of federal, state, and county roads crosses the area and permits ready access to most localities. However, deep and extensive weathering has left few outcrops of bedrock and saprolite. Fortunately, soil offers additional data of great value in the preparation of geologic maps.

GEOLOGY

The core of the Inner Piedmont consists of mica schists, biotite gneiss, granitoid gneiss, and lesser quantities of amphibolite, including hornblende gneiss and pegmatite minerals (Griffin, 1971; 1973; 1974; 1978). The southeastern flank of the Inner Piedmont is primarily granitoid gneiss, but amphibolite (hornblende gneiss) occurs in an interlayered fashion (Griffin, 1978). Simple pegmatite is found in this zone, also. Both the core and the southeastern flank are migmatitic, with concordant, semiconcordant, and discordant bodies of granitoid (felsic) neosome.

PETROLOGY

The rocks in the Honea Path area are very similar to comparable rocks studied in detail farther toward the west, along the Georgia border (Griffin, 1973; 1974; 1975; 1978). Because this information is already available, only brief petrographic descriptions will be given here.

Mica schist predominates near Honea Path, in the area of the core. This is a light colored rock composed mainly of quartz, muscovite, lesser biotite, and accessory amounts of sillimanite and garnet.

Granitoid gneiss is the next most abundant rock in the core within the area. The rock is light grey and has a granoblastic texture. The composition varies between true granite and quartz diorite. Coarse-grained pegmatites appear to be closely associated with the granitoid gneiss. The pegmatite bodies are only a foot or two wide. The granite occurs in large bodies, but smaller occurrences are widespread. Many of them have similar dimensions to those of the pegmatites.

Biotite gneiss and hornblende gneiss are rare in the core area near Honea Path.

Granitoid gneiss forming the southeastern flank appears to be identical to that within the core. The pegmatite bodies are also similar to their counterparts in the core.

The hornblende gneiss is compositionally close to basalt, in a bulk chemical sense. Mineralogically, the rock is made up of hornblende and calcic plagioclase. Epidote-clinozoisite is disseminated as an accessory, probably containing the excess calcium as basaltic plagioclase recrystallized to plagioclase in equilibrium at the amphibolite metamorphic facies.

Minor chlorite schist is intimately associated with hornblende gneiss within the southern salient of the southeastern flank into the core. This is located at the southwest corner of the area (Figs. C-1 and C-2). These highly magnesian rocks may represent ultramafic layers within the amphibolite.

The grade of regional metamorphism for rocks of the core and the southeastern flank is upper amphibolite facies.

STRUCTURE

Because there are few outcrops, structural information is sparse. However, available data on attitude of foliation indicate that a northeast-plunging complex of folds occurs within the core. This is dominated near Honea Path by an antiform (Fig. C-2). This detailed information is consistent with more regional maps (Fig. C-1; Griffin, 1978, Figs. 3a and 6), which show this type of folding in and near the area of Honea Path.

The core and southeastern flank are sharply separated by a tectonic slide of major magnitude (Figs. C-1 and C-2). This fault was not directly observed within the area, and it is rarely observed elsewhere. However, the distinct change in rock types (Griffin, 1971), in foliation pole data (Griffin, 1978, Fig. 5), and in map patterns (Figs. C-1 and C-2) attest to the reality of the boundary.

The rocks in the southeastern flank are interpreted to be more complexly folded than those within the core. These folds also appear to plunge northeastward (Griffin, 1977, Fig. 3; 1978, Fig. 6).

GEOPHYSICS

The gamma-ray survey indicates close correspondence between certain rock types and important anomalies (Figs. C-2 and C-3). The highest values lie within the core, in general. The gradient trends within the core follow broadly the northeast-plunging antiform that is due west of Honea Path.

The longest anomaly of very high value (33 cps) coincides with a narrow sill-like body of granitoid gneiss along the southeast limb of the large antiform at the western edge of Honea Path. Southwest of this lies a broad, moderately high anomaly (>20 cps) that is underlain by mica schist intruded by small sill-like pods of granitoid gneiss and pegmatite.

The large phacolith of granite within the western central part of the area has no important anomaly or anomalies within it. However, several minor anomalies exist along and near its margins.

The strongest anomaly is at the slide boundary between the core and southeast flank at the southern margin of the area. Although the value exceeds 40 cps, the anomaly is less than a mile long.

Only one major anomaly was found within the southeast flank. It is about 0.75 mile long and has a value exceeding 30 cps. Its eastward trend suggests a dike crosscutting the trends of local foliation.

In summary, the gamma-ray gradient is influenced by the structural trends. Anomalies within the core of the Inner Piedmont are associated with narrow sill-like granitoid bodies, broad mica schist areas laced with small bodies of pegmatite and granitoid gneiss, and local areas along the tectonic slide.

A crosscutting dike of granitoid gneiss may be responsible for the single important anomaly within the southeastern flank of the Inner Piedmont.

DETAILED GEOLOGIC AND GAMMA RADIATION SURVEY OF THE NORTHEAST GREENVILLE, SOUTH CAROLINA AREA

LOCATION

The area investigated is situated within the Inner Piedmont geologic belt of the Southeastern U.S. Piedmont physiographic region (King, 1955; Overstreet and Bell, 1965). The core portion of the Inner Piedmont belt (Griffin, 1971; 1974; 1977; 1978) underlies the entire area (Fig. D-1). Northeast Greenville, South Carolina, occupies the western part of the area, which extends eastward several miles toward the town of Greer and the line between Greenville and Spartanburg Counties.

An intricate network of federal, state, and county roads crosses the area and permits ready access to most localities. A deep and thorough weathering has left few outcrops of bedrock and saprolite except at higher elevations, such as Paris Mountain. Fortunately, soil can be used to indicate the parent bedrock below.

GEOLOGY

In this area, the core of the Inner Piedmont consists of mica schist, biotite schist, granitoid gneiss, and lesser quantities of amphibolite, including hornblende gneiss and pegmatites (Griffin, 1971; 1974; 1977). The core is migmatitic, with concordant, semiconcordant, and discordant bodies of granitoid (felsic) neosome.

PETROLOGY

The rocks underlying the northeast Greenville area are represented by mica schist, lesser biotite gneiss, minor granitoid gneiss, and very minor amounts of hornblende gneiss (Figs. D-1 and D-2).

The mica schist consists primarily of quartz, muscovite, biotite, and the accessory minerals garnet and sillimanite. This rock is light in hue and has a sparkling quality because of the large amount of coarse muscovite. The soil produced from this rock also has the sparkling quality where weathering has not progressed far.

Biotite gneiss consists of quartz, oligoclase plagioclase, and biotite. Muscovite is a common accessory, as is green epidote-clinozoisite. Garnet is observed at some places as an accessory mineral. The rock is dark in hue, and the soil is dark red and clay-rich.

Granitoid gneiss is a light grey, equigranular rock with a faintly to strongly foliated fabric. The composition ranges between that of a true granite and that of a quartz diorite. The rock may become chalky white where weathered, but a red stain may cover and permeate the rock where biotite is plentiful. Regardless of color, the granitoid soils will contain granules of quartz and feldspar.

The hornblende gneiss is a dark grey rock consisting of hornblende, labradorite plagioclase, and accessory amounts of epidote-clinzoisite and garnet. Pyroxene sometimes occurs also as an accessory mineral. The pyroxene is usually diopsidic augite, but orthorhombic pyroxene has also been reported (Griffin, 1971; 1974).

Minor simple pegmatite and alaskite bodies occur widely (Fig. D-1). These are closely related to the concordant felsic neosome component in the migmatite. All of these granitoid bodies are small, rarely greater than a foot or two wide.

The grade of regional metamorphism for this rock assemblage is upper amphibolite facies.

STRUCTURE

The rocks in the northeast Greenville area are distributed into a complex pattern of folds. The general pattern suggests a large fold (nappe) structure plunging in an eastward direction (Fig. D-1). Megascopic (outcrop sized) isoclinal folds in the northern part of the area indicate that the large fold probably plunges about 10° to 15° toward the east.

Biotite gneiss cores the fold along the axial fold at the southwestern corner of the quadrangle and borders it on the north. Irregular contacts between the mica schist and biotite gneiss in the north probably are the result of minor folds due to tectonic stretching in the direction of tectonic transport---the a axis---during forward flow of the nappe.

The northeast Greenville fold complex continues eastward into the fold structure underlying the Greer and Greenville-Spartanburg Airport area (see the map in the companion report on the Greer area). Bramlett and Griffin (1978, in press) discuss the characteristics of and complications surrounding this nappe fold. If their conclusions for the Greer area are valid, they likely apply to the northeast Greenville area as well.

Bramlett and Griffin (1978, in press) conclude that the major fold of the Greer and Greenville-Spartanburg Airport area is an autochthonously rooted nappe with an axial plane dipping about 45° toward the south (their cross-section A-A'). The distribution of foliation attitudes across the northeast Greenville area permits a similar conclusion there.

GEOPHYSICS

The total radioactivity field (Fig. D-3) follows the outlines of the large-scale fold system of the area (Fig. D-2). Anomalies are more often associated with the mica schist. In the north, where biotite gneiss predominates, the total radiation values are lowest. However, specific anomalies, both positive and negative, are localized in the mica schist where minor bodies of biotite gneiss or granitoid gneiss exist.

The derivative geophysical map (Fig. D-4) yields fewer but more outstanding anomalies. The anomalies are usually found within the mica schist in the vicinity of smaller bodies of biotite gneiss or granitoid gneiss, thus suggesting some relationship. Anomalies do not occur within the mica schist wherever small bodies of the other two types of rock exist, but the relationship is valid most of the time. The largest anomaly lies within the biotite gneiss at the northwest corner of the area.

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USER'S GUIDE TO THE DATA TABLES

Table 1 presents the analytical and field data for the ground water samples collected in the Avalon study. Uranium was determined by neutron activation analysis and is reported in parts per billion (ppb). The elements Br, Cl, F, Mn, Na, V, Al, and Dy were analyzed by neutron activation analysis and are reported in parts per million (ppm). Helium was determined by mass spectroscopy and is reported in ppm.

Conductivity, alkalinity, pH, and temperature were measured in the field. Conductivity is reported in micromhos per centimeter. Alkalinity is reported as milliequivalents of sulfuric acid required per liter of sample to titrate to a pH of about 4.5. Temperature is given in degrees Celsius.

WELLDEPTH

The depth is given in feet as provided by the householder. A "U" indicates that the depth is not known.

WELLAGE

The ages of sampled wells are recorded. A "." means the age of the well is unknown. Wells less than 1 year old were not sampled.

WELLTYPE

Sampled wells are classified by method of construction. The types listed are:

1. Drilled; denotes wells formed by rotary drills or augers
2. Dug; denotes wells dug by manual or mechanical scooping equipment
3. Driven; denotes wells formed by vertical pile drivers
4. Unknown

WELLPOINT

The positions at which samples were taken are listed in this column. The positions listed are relative positions in plumbing systems. The entries and their meanings are:

1. Immediately after storage tank
2. From pipe before storage tank
3. Direct from pump
4. Direct from well or spring

5. From municipal system
6. Unknown
7. Other

WELLPIPE

The major materials used in pipes are listed in this column.
The entries used and their meanings are:

1. Galvanized
2. Copper
3. Plastic
4. Steel
5. Lead
6. Unknown
7. Other

WELLUSE

This column describes the primary use of water from the wells.

1. Human drinking
2. Animal drinking
3. Irrigation
4. All other purposes

WELLODOR

Hydrogen sulfide odors in well water are noted. The entries
in this column and their meanings are:

1. No odor
2. Weak H₂S odor
3. Strong H₂S odor
4. Other

WELLFREQ

This column lists the frequency of use of sampled wells.
The entries and their meanings are:

1. Continuous (more than once daily)
2. Once daily
3. Once weekly
4. Once monthly
5. Less than once monthly
6. Not in use

Table 2 presents analytical and key field data for the sediment samples collected in the Avalon study. Conductivity, alkalinity, and pH of the stream water were measured in the field. The elements U, Th, Hf, Ce, Fe, Mn, Na, Sc, Ti, and V were analyzed in sediment samples by neutron activation analysis. Minus signs (-) represent "less than," and "M" indicates missing data. The stream sediment samples were sieved into four size fractions for analysis. These sizes are designated in the table by the following code in the SRL I.D.:

- S6 >40 mesh
- S7 40 to 100 mesh
- S8 100 to 200 mesh
- S9 <200 mesh

Table 3 presents supplementary analytical data for the sediment samples collected in the Avalon study. These seven additional elements were determined by neutron activation analysis and are reported in parts per million.

Table 4 presents the field data for the ground water and stream sediment samples collected in the Avalon study.

VELOCITY	STMLEVEL	STMCOLOR
1. Stagnant	1. Dry	1. Clear
2. Slow	2. Low	2. Brown clear
3. Moderate	3. Normal	3. Cloudy
4. Fast	4. High	4. Muddy
5. Torrent	5. Flood	5. Algal
6. Dry		6. Other

The water description provides an indication of the general condition of the water at the time of sampling. SRMFLOW indicates the rate of flow, using the listed descriptors, at the sampled location [that is, if a stream is sampled in rapids, the 4 (Fast) or 5 (Torrent) may apply; but if the same stream were sampled above or below the rapids, the 2 (Slow) or 3 (Moderate) descriptors might be more accurate]. STMLEVEL describes the water level relative to its apparent normal level. STMCOLOR indicates the amount and type of dissolved or suspended load in the water, on the basis of color. If a large amount of algae was suspended in the water, 5 (Algal) is entered. If the water was transparent, but had a definite brown or black color, then 2 (Brown-clear) is entered.

STMWIDTH AND STMDEPTH

1. <1/2 ft	6. 8-16 ft
2. 1/2-1 ft	7. 16-32 ft
3. 1-2 ft	8. >32 ft
4. 2-4 ft	9. Dry
5. 4-8 ft	

An estimate of the average width and depth of the stream over the 100 to 200 ft of stream length where the sample was collected.

RELIEF

1. Flat
2. Low, 0-50 ft
3. Gentle, 50-200 ft
4. Moderate, 200-1000 ft
5. High, >1000 ft

Relief is an indicator of local surface expression. The area included around a sample site will usually not exceed a few hundred yards in mountainous terrain, but it may be half a mile or more in relatively flat areas.

STRBED

1. Depositing
2. Eroding
3. Unknown

The column labeled STRBED is coded with the appropriate descriptor listed above. A steeply inclined stream bed with fast-moving water can usually be considered as eroding, whereas a nearly level, slow-moving stream may indicate a depositing channel (that is, the stream is depositing its load of sand, silt, or other sediment in areas of calm water). The chosen descriptor indicates the general nature of the stream.

VEGDENS

1. Barren
2. Sparse
3. Moderate
4. Dense
5. Very Dense

These descriptors indicate the amount of plant growth in the immediate area of the sample site. The density is a subjective observation made in relation to visibility, ease of access, and other considerations.

WEATHER

1. Sunny/clear
2. Overcast
3. Light rain
4. Heavy rain
5. Snowy
6. Other

The weather descriptor is a general indicator of the conditions prevalent at the time of sampling.

TEMP

The water temperature, taken at the time of sampling, is recorded to the nearest degree Celsius (°C).

Table 5 presents analytical and selected field data for the stream water samples collected in the Avalon study. Uranium was determined by neutron activation analysis and is reported in ppb. The elements Br, Cl, F, Mn, Na, V, Al, and Dy were analyzed by neutron activation analysis and are reported in ppm.

Conductivity, alkalinity, pH, and temperature were measured in the field and are described in the introduction to Table 1.

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FIGURE A-1. Preliminary Geologic Map of Northwest South Carolina. Study area is located within the heavy black rectangle.

FIGURE A-2. Detailed Geologic Map of the South Carolina Inner Piedmont Belt. Study area is located within the heavy black square.

FIGURE A-3. Geologic Map of the Avalon Quadrangle, Georgia - South Carolina.

0 ——— 1 Mile

Contours: C.P.S.
Gamma Radiation

AVALON QUAD., GA.-S.C.
Geophysics By
Villard S. Griffin, Jr., 1978

FIGURE A-4. Contour Map of the Total Count Gamma Ray Survey
(Numbers within the Δ are U/Th values).

FIGURE A-5. Sample Location Map (Underlined sites indicate numbers duplicated on the field map. In addition, sediment sites 021 and 024 and ground water sites 520, 525, and 547 are missing).

FIGURE A-6. Stream Drainage Map.

FIGURE B-1. Preliminary Geologic Map of the South Carolina Inner Piedmont Belt Showing Location of the Study Area.

FIGURE B-3. Contour Map of the Total Count Gamma Ray Survey.

FIGURE B-4. Contour Map of the U/Th Values.

FIGURE B-5. Location of Selected Cultural Features Within the Area of Study.

FIGURE C-1. Preliminary Geologic Map of the South Carolina Inner Piedmont Belt Showing Location of the Area of Study.

FIGURE C-2. Geologic Map of the Study Area.

FIGURE C-3. Contour Map of the Total Count Gamma Ray Survey.

FIGURE D-1. Preliminary Geologic Map of the Inner Piedmont Belt in South Carolina Showing Location of the Study Area.

FIGURE D-3. Contour Map of the Total Count Gamma Ray Survey.

FIGURE D-4. Contour Map of the U/Th Values.

FIGURE D-5. Location of Selected Cultural Features Within the Area of Study.

FIGURE E-1. Geologic Map of the Antreville, SC, Area

Table 1. Ground Water Data for the Avalon Study

I D	U	B R	C L	F	M N	N A	V	A L	D Y	H E	P H	C O N D	A L K	T E M P	W E L D E P T H	W E L A G E	W E L T Y P E	W E L P O I N T	W E L P I P E	W E L U S E	W E L O D O R	W E L F R E Q
501	-0.002		8500	47	63.00	3910	0.5	65.0	-0.1	5	6.0	50	20.5	23	30	28	3	2	3	1	1	1
502	-0.002	37.00	8900	28	79.20	10460	-0.1	31.0	-0.1	5	6.0	100	13.5	24	50	20	1	7	7	1	1	1
503	1.570	13.10	4600	286	211.60	11120	0.4	37.0	-0.1	22	7.9	225	22.1	20	400	1	1	1	3	1	1	1
504	0.040		4600	32	55.00	3720	1.3	138.0	-0.1	6	6.3	70	23.5	20	45	10	1	1	1	1	1	1
505	0.010	11.10	4700	37	61.50	5940	0.3	55.0	-0.1	5	6.6	90	30.5	22	85	4	1	7	1	1	1	1
506	0.390	34.60	7100	42	80.60	6360	-0.1	62.0	-0.1	6	6.6	100	24.5	22	100	7	1	7	1	1	1	1
507	-0.002		16600		103.80	6980	-0.1	M	-0.1	6	5.6	120	10.5	22	60	15	2	1	3	1	1	1
508	0.034		19600	16	108.30	9390	0.5	37.0	-0.1	6	5.6	140	7.5	24	80	25	2	1	1	1	1	1
509	-0.002	18.10	15700	20	74.30	9910	-0.1	90.0	-0.1	6	6.1	125	25.5	20	80	35	2	3	3	1	1	1
510	-0.002	11.10	4400	15	44.50	3260	-0.1	49.0	-0.1	5	5.8	40	20.5	22	50	10	2	1	3	1	1	1
511	-0.002		7000	65	110.70	7290	1.1	82.0	0.3	6	5.2	105	35.5	25	19	13	1	7	3	1	1	1
512	-0.002		5000		51.00	3320	1.2	73.0	-0.1	6	5.1	80	30.5	23	37	4	1	1	7	1	1	1
513	-0.002		5100	17	62.70	3850	-0.1	65.0	-0.1	6	5.4	55	20.5	23	30	25	2	1	7	1	1	1
514	-0.002	14.00	5200		89.10	3720	0.3	64.0	-0.1	7	5.1	60	15.5	26	54	18	2	1	3	1	1	1
515	0.049		5400	31	75.70	2800	1.0	1522.0	-0.1	7	5.9	65	20.5	22	30	5	2	7	3	1	1	1
516	0.001		4800	31	66.00	4360	1.0	469.0	-0.1	6	6.7	70	24.5	22	50	7	3	7	1	1	1	1
517	0.031		13500	45	107.80	9370	-0.1	156.0	-0.1	5	5.7	140	20.5	22	30	10	2	7	7	3	1	1
518	0.062		4000	63	68.10	3000	0.6	276.0	-0.1	6	6.5	65	25.5	21	300	1	1	1	1	1	1	1
519	0.038	18.40	4200		71.20	2350	-0.1	1305.0	-0.1	5	6.4	45	7.5	23	60	6	1	7	3	1	1	1
520	-0.002		9300	41	94.50	6580	-0.1	58.0	-0.1	5	6.5	105	26.5	21	120	4	1	7	2	1	1	1
521	-0.002		6500	56	74.30	6150	1.1	89.0	-0.1	6	6.8	65	18.5	21	45	52	2	4	7	1	1	1
522	0.134	19.10	5500	77	76.00	4700	2.6	861.0	-0.1	6	7.2	115	46.5	22	100	9	1	7	1	1	1	1
523	0.027	12.50	4800	22	74.80	2560	0.5	463.0	-0.1	5	6.5	80	22.5	21	60	10	1	7	3	1	1	1
524	0.039		5700		82.30	2210	1.9	1390.0	-0.1	M	M	M	M	.	U	.	.	.	.	.	.	.
525	0.018	95.50	15200	35	95.50	7970	1.0	741.0	-0.1	5	6.0	70	5.5	20	60	100	2	1	1	1	1	1
526	-0.002	83.60	5300	29	83.60	5160	1.2	260.0	-0.1	5	6.4	65	17.5	21	100	.	1	7	3	1	1	1
527	0.056	92.80	9200	48	92.80	5460	-0.1	596.0	-0.1	5	6.3	70	24.5	20	60	10	1	7	3	1	1	1
528	0.043	71.90	4000		71.90	3360	5.6	1216.0	-0.1	6	6.1	40	14.5	22	100	5	1	7	1	1	1	1
529	4.548	83.30	6700	92	83.30	4210	2.8	90.0	-0.1	7	6.6	120	44.5	22	850	1	1	7	2	1	1	1
530	0.053		28100	21		7490	0.4	147.0	0.2	7	6.2	190	26.5	21	60	20	2	1	3	1	1	1
531	-0.002	68.60	6200		68.60	2910	1.1	139.0	-0.1	6	6.6	60	17.5	22	65	2	1	7	3	1	1	1
532	-0.002	83.50	7400	14	83.50	4180	-0.1	134.0	-0.1	6	6.0	75	10.5	21	60	70	2	7	3	1	1	1
533	0.014	83.50	6300	15	83.50	4060	0.5	75.0	-0.1	7	6.5	75	42.5	20	U	.	4	3	6	1	1	1
534	0.007	82.10	9500	29	82.10	5230	-0.1	98.0	-0.1	M	M	M	M	.	U	.	.	.	.	.	.	.
535	0.130	92.80	4900	93	92.80	5680	-0.1	135.0	-0.1	8	7.5	140	20.2	21	365	5	1	7	3	1	1	1
536	-0.002		M			M	-0.1	M	-0.1	6	6.2	35	6.5	20	50	20	2	7	1	1	1	1
537	-0.002	101.30	14100	22	101.30	5100	-0.1	239.0	-0.1	6	6.1	70	10.5	21	U	12	2	7	3	1	1	1
538	0.010	170.20	13800		170.20	4300	-0.1	83.0	-0.1	6	6.6	80	21.5	21	80	50	2	1	1	3	1	3
539	0.002		6200		68.86	10780	2.0	86.1	-0.1	6	5.9	40	5.5	21	30	60	2	1	1	2	1	1
540	0.007		4200	120	68.86	10470	2.0	86.1	-0.1	6	6.5	70	18.5	21	37	15	1	1	1	1	1	1
541	0.085	292.64	3900	138	86.07	8690	-0.1	154.9	-0.1	6	6.3	45	15.5	22	100	2	1	7	1	1	1	1
542	-0.002		3300	52	34.43	9230	-0.1	137.7	-0.1	6	6.4	65	8.5	21	70	20	2	7	1	1	1	1
543	0.020	619.70	3500	155	34.43	9090	2.0	103.3	-0.1	6	6.8	50	19.5	19	125	15	1	7	1	1	1	1
544	0.013	1532.05	3600	120	51.64	9660	2.0	86.1	-0.1	6	6.4	70	23.5	21	50	19	1	7	3	1	1	1
545	0.015		3200	155	86.07	9520	2.0	68.9	-0.1	7	7.3	110	35.5	20	200	16	1	7	7	1	1	1
546	-0.002	912.34	8200		34.43	9300	2.0	103.3	-0.1	5	6.0	80	9.5	19	50	40	2	7	1	1	1	1
547	1.400	722.99	3500	69	51.64	9610	-0.1	51.6	-0.1	10	7.4	115	40.5	19	350	12	1	1	3	1	1	1
548	-0.002		4700		292.64	8900	-0.1	103.3	-0.1	7	6.2	30	7.5	19	50	100	2	4	7	1	1	1
549	0.008	705.77	3900		51.64	8660	-0.1	189.4	-0.1	5	5.5	15	4.5	21	30	15	2	1	1	1	1	1
550	-0.002	344.28	5500		34.43	8380	-0.1	154.9	-0.1	6	5.8	110	8.5	21	35	6	1	7	3	1	1	1

Table 2. Key Field Measurements and Analytical Data for the Avalon Study Sediments

SRL I.D. *****	PH	COND. UM/CM	AKMXD MEQ/L	U PPM	TH PPM	HF PPM	CE PPM	FE PPM	HH PPM	HA PPM	SC PPM	TI PPM	V PPM
001 S6	7.1	80	14.50	1.5	2	7	-8	10000	250	4920	4.8	1500	25
001 S7	7.1	80	14.50	3.6	3	30	19	14100	450	4380	11.0	3000	40
001 S8	7.1	80	14.50	2.4	2	14	13	14800	420	5060	10.0	2400	36
001 S9	7.1	80	14.50	8.8	9	71	44	26900	730	3520	14.0	4700	60
002 S6	7.2	55	12.50	1.2	-1	8	-6	15100	710	6700	10.8	M	39
002 S7	7.2	55	12.50	7.7	16	62	96	37500	1140	4810	15.6	10600	83
002 S8	7.2	55	12.50	6.0	9	50	49	32500	1250	4650	20.9	12100	67
002 S9	7.2	55	12.50	4.7	9	44	35	13000	570	1730	8.8	4700	46
003 S6	7.4	35	16.50	6.7	9	4	94	15200	250	5370	4.3	2400	28
003 S7	7.4	35	16.50	14.8	66	41	325	30100	680	5610	16.9	8600	63
003 S8	7.4	35	16.50	13.0	55	28	315	23500	730	5830	13.8	8900	70
003 S9	7.4	35	16.50	17.4	62	89	429	42000	800	7850	16.3	9900	53
004 S6	7.1	75	15.50	1.6	8	1	-14	11600	270	5040	4.6	1100	15
004 S7	7.1	75	15.50	7.6	4	154	M	38700	1180	5370	16.8	8900	73
004 S8	7.1	75	15.50	8.0	8	171	27	46200	990	4290	20.7	8000	83
004 S9	7.1	75	15.50	8.1	10	140	46	32500	1010	4950	16.0	8500	103
005 S6	7.1	60	16.52	0.8	-1	5	-3	32300	320	6960	9.7	2600	60
005 S7	7.1	60	16.52	11.2	11	178	39	90300	2130	7850	25.5	22100	179
005 S8	7.1	60	16.52	11.8	7	182	25	89100	2340	8550	23.9	22700	177
005 S9	7.1	60	16.52	7.5	-4	102	-25	80700	940	4800	27.1	9400	115
006 S6	7.6	40	16.50	1.7	4	M	16	24300	380	12820	8.8	2200	55
006 S7	7.6	40	16.50	5.4	19	12	32	45500	910	9130	19.5	9300	156
006 S8	7.6	40	16.50	4.6	10	9	72	45000	730	8190	21.0	7200	110
006 S9	7.6	40	16.50	12.3	43	48	195	53100	920	5960	29.6	11100	166
007 S6	7.7	45	14.50	0.9	-1	2	-18	12600	240	10310	7.5	1100	36
007 S7	7.7	45	14.50	6.1	13	30	53	42000	840	13510	22.5	5600	65
007 S8	7.7	45	14.50	3.8	5	12	40	24400	680	11240	14.7	4800	62
007 S9	7.7	45	14.50	9.1	15	53	102	54900	790	8620	19.3	5800	63
008 S6	8.1	35	11.50	1.6	7	6	31	8400	370	7970	7.6	1500	47
008 S7	8.1	35	11.50	5.3	9	20	52	34900	960	6400	17.6	7000	111
008 S8	8.1	35	11.50	3.2	6	12	-15	22700	680	4560	11.6	4900	81
008 S9	8.1	35	11.50	1.1	3	20	15	6200	80	170	1.4	1400	139
009 S6	6.9	60	20.50	1.2	-1	3	12	8500	490	2760	7.5	1500	25
009 S7	6.9	60	20.50	5.6	8	44	46	33700	1130	5170	18.5	6800	99
009 S8	6.9	60	20.50	5.1	10	33	47	35800	1000	3310	13.9	5900	63
009 S9	6.9	60	20.50	6.5	10	33	59	39100	1450	6890	17.7	5900	123
010 S6	6.6	55	18.50	0.7	2	1	-10	9200	170	5820	2.5	1500	29
010 S7	6.6	55	18.50	15.1	38	76	188	66500	2160	8160	29.5	27400	221
010 S8	6.6	55	18.50	13.2	34	61	139	77500	1870	5250	19.2	26300	197
010 S9	6.6	55	18.50	14.3	29	118	137	54200	1190	10170	29.0	15300	176
011 S6	6.8	50	10.50	1.6	5	7	-16	14300	360	4390	3.3	2000	45
011 S7	6.8	50	10.50	5.2	10	40	35	30900	430	4770	16.9	5200	99
011 S8	6.8	50	10.50	4.1	6	31	32	25500	490	7430	13.9	5200	89
011 S9	6.8	50	10.50	9.0	14	77	43	40200	520	5430	22.7	4600	166
012 S6	7.3	60	17.50	0.6	-1	3	-3	14500	330	2810	5.9	3200	25
012 S7	7.3	60	17.50	3.1	2	31	16	46600	930	3600	17.5	13900	75
012 S8	7.3	60	17.50	2.4	2	21	10	35500	980	3570	15.2	13100	62
012 S9	7.3	60	17.50	0.1	-1	M	221	-6000	1540	670	0.6	400	31
013 S6	7.3	55	14.50	1.5	9	4	77	25500	590	13170	8.3	M	100
013 S7	7.3	55	14.50	10.4	33	10	209	97100	1620	6130	24.7	26700	342
013 S8	7.3	55	14.50	8.4	25	7	180	90800	1620	4550	16.6	25200	330
013 S9	7.3	55	14.50	11.1	47	15	241	101100	2490	11620	35.3	31900	319
014 S6	6.8	35	10.50	1.3	2	6	-5	59700	880	1450	10.2	13800	75
014 S7	6.8	35	10.50	3.0	3	29	-4	76300	2020	2000	24.9	37600	199
014 S8	6.8	35	10.50	2.4	2	20	-6	70900	1540	1470	19.3	15600	155

Table 2. Continued

SRL I.D. *****	PH	COND. UM/CM	AKMXD MEQ/L	U PPM	TH PPM	HF PPM	CE PPM	FE PPM	MN PPM	NA PPM	SC PPM	TI PPM	V PPM
014 S9	6.8	35	10.50	3.8	11	24	-23	108400	2040	2320	42.2	15700	184
015 S6	6.0	25	6.50	0.8	-1	4	-1	9600	200	8540	3.6	M	30
015 S7	6.0	25	6.50	8.2	27	19	161	25700	840	7610	13.4	7000	106
015 S8	6.0	25	6.50	4.2	11	8	83	28400	610	8300	11.0	6400	90
015 S9	6.0	25	6.50	15.9	57	40	313	49600	1240	5330	21.4	7700	160
016 S6	6.9	45	13.50	0.9	-1	4	-10	24500	590	13930	10.6	3500	68
016 S7	6.9	45	13.50	5.2	12	20	45	53500	1110	7400	26.5	11400	119
016 S8	6.9	45	13.50	3.7	8	11	24	48700	1290	9430	22.3	49900	154
016 S9	6.9	45	13.50	8.9	17	51	-31	70500	1030	6600	29.8	8000	114
017 S6	7.4	50	18.50	2.0	6	8	-4	25300	420	2130	10.7	1900	70
017 S7	7.4	50	18.50	15.1	55	76	261	69500	1230	1950	17.0	15100	220
017 S8	7.4	50	18.50	10.5	42	49	268	53200	920	1600	13.1	10200	152
017 S9	7.4	50	18.50	5.4	15	38	81	29100	340	660	8.0	4100	59
018 S6	M	M	M	1.9	5	6	37	27700	370	1300	11.4	2900	63
018 S7	M	M	M	4.4	12	17	54	47900	660	1010	18.9	6300	148
018 S8	M	M	M	4.1	15	15	94	55900	580	890	20.9	4100	108
018 S9	M	M	M	5.2	18	14	82	70200	750	660	23.7	M	174
019 S6	7.5	50	17.50	1.4	-1	7	-7	25100	480	3820	17.3	3900	43
019 S7	7.5	50	17.50	4.1	6	44	21	45700	1250	4880	25.0	10000	96
019 S8	7.5	50	17.50	2.8	5	22	30	27100	880	3710	18.8	6200	70
019 S9	7.5	50	17.50	8.6	14	122	31	68400	1450	4150	32.5	10600	98
020 S6	7.3	30	10.50	1.1	2	2	-10	6200	190	3180	1.8	600	11
020 S7	7.3	30	10.50	2.7	4	18	18	7900	230	3070	4.9	700	13
020 S8	7.3	30	10.50	2.4	4	17	13	9400	270	3370	5.6	800	25
020 S9	7.3	30	10.50	5.3	7	31	36	12400	370	4110	5.9	1900	29
021 S6	7.5	50	13.50	3.1	4	55	55	19000	320	2760	8.4	1400	23
021 S7	7.5	50	13.50	15.5	10	506	43	23200	420	2910	12.6	1700	30
021 S8	7.5	50	13.50	14.7	12	499	37	16400	490	4000	10.4	2600	37
021 S9	7.5	50	13.50	10.2	20	283	58	34300	550	3650	10.3	4400	33
022 S6	6.9	45	11.50	0.8	2	4	-20	8800	160	5650	4.4	800	16
022 S7	6.9	45	11.50	6.0	8	43	25	27200	480	7470	10.5	3400	59
022 S8	6.9	45	11.50	3.8	6	25	-15	19100	390	7070	13.8	2700	53
022 S9	6.9	45	11.50	13.1	25	95	108	43800	900	7960	26.8	7600	115
023 S6	7.6	40	12.50	2.5	5	2	32	18000	270	6990	2.8	2400	47
023 S7	7.6	40	12.50	13.8	52	34	286	42300	870	7310	11.8	11500	97
023 S8	7.6	40	12.50	7.6	1	14	-1	-1400	730	8120	9.1	9300	80
023 S9	7.6	40	12.50	16.0	64	79	296	52300	930	7220	22.0	11200	116
024 S6	7.3	40	13.50	0.8	3	3	-4	17100	300	6870	5.1	2500	58
024 S7	7.3	40	13.50	5.1	13	23	33	48300	970	3720	11.3	14500	170
024 S8	7.3	40	13.50	1.9	4	5	19	33500	540	3200	5.0	7700	103
024 S9	7.3	40	13.50	10.7	37	64	157	87800	1280	4000	22.9	16400	191
025 S6	7.1	50	16.50	0.8	5	3	13	13900	350	10060	12.9	2200	32
025 S7	7.1	50	16.50	3.2	12	20	34	29200	700	14030	19.3	5400	67
025 S8	7.1	50	16.50	2.0	8	7	-14	27200	500	11170	12.5	3800	49
025 S9	7.1	50	16.50	9.7	17	70	96	37600	1300	13440	27.1	12000	146
026 S6	6.8	45	12.50	1.6	4	5	15	10400	310	3740	6.2	1700	34
026 S7	6.8	45	12.50	5.4	7	65	21	17400	430	4560	11.5	3300	57
026 S8	6.8	45	12.50	3.6	-1	38	29	17500	270	3210	7.3	2300	30
026 S9	6.8	45	12.50	7.2	9	54	102	36600	540	3230	6.2	6000	62
027 S6	7.2	35	9.50	1.9	2	19	26	10800	130	1670	2.6	1100	15
027 S7	7.2	35	9.50	13.4	9	378	21	13400	290	2000	5.1	2700	30
027 S8	7.2	35	9.50	14.8	6	503	-7	11600	230	2070	7.4	2100	36
027 S9	7.2	35	9.50	13.7	11	340	29	22600	420	2720	8.9	5700	68
028 S6	7.6	55	19.50	0.5	-1	4	10	33300	760	5120	8.3	2800	73
028 S7	7.6	55	19.50	7.9	5	158	-5	57700	1630	3390	27.5	13200	152
028 S8	7.6	55	19.50	5.9	8	119	23	60200	1790	4770	26.0	12300	148
028 S9	7.6	55	19.50	10.7	13	199	-13	77200	1720	3630	31.9	16800	162

Table 3. Supplementary Analytical Data for the Avalon Study Sediments

THE FOLLOWING ELEMENTAL CONCENTRATIONS ARE IN PPM

SRL I.D.	AL	DY	EU	LA	SM	YB	LU
001 S6	33400	M	-1.0	3	1	3.0	M
001 S7	49600	0.5	-1.2	7	2	2.5	0.4
001 S8	45300	M	-1.0	6	2	2.0	0.3
001 S9	63900	2.6	-1.0	23	5	7.9	1.2
002 S6	27400	0.3	-1.0	4	2	M	0.3
002 S7	40800	M	-1.2	34	8	13.2	2.1
002 S8	41200	M	-1.4	27	6	5.5	1.3
002 S9	32900	2.0	-1.6	19	6	5.2	1.0
003 S6	20000	17.7	-1.5	34	7	20.6	3.3
003 S7	30500	13.2	2.2	137	34	34.4	4.4
003 S8	32500	4.9	3.1	161	29	25.9	3.5
003 S9	63700	21.9	-1.2	164	40	41.1	6.7
004 S6	21400	0.3	-1.0	6	2	M	M
004 S7	45700	M	-1.0	15	4	4.2	1.2
004 S8	45300	M	-1.9	15	6	8.1	1.4
004 S9	64000	3.4	1.0	18	5	6.6	1.3
005 S6	29800	0.3	M	3	1	M	0.2
005 S7	50600	2.5	-1.0	13	4	22.5	3.7
005 S8	47300	2.1	-2.1	10	5	20.7	3.6
005 S9	80800	0.7	-1.0	23	9	12.6	2.1
006 S6	41800	3.8	-1.0	9	3	3.2	0.5
006 S7	55900	4.4	-1.0	36	7	12.2	1.4
006 S8	52000	1.7	-1.0	30	6	10.9	1.2
006 S9	97600	21.3	-2.3	94	19	21.1	3.0
007 S6	35600	M	-1.0	2	1	M	M
007 S7	76600	1.3	-1.0	41	9	7.0	1.6
007 S8	54300	0.3	-1.0	21	5	6.0	0.9
007 S9	82600	4.7	-1.0	64	12	8.2	2.0
008 S6	34300	M	-1.0	13	2	M	0.1
008 S7	55200	0.8	2.6	33	3	5.5	0.7
008 S8	42400	0.7	-1.0	19	5	M	0.9
008 S9	3500	1.0	M	9	1	M	M
009 S6	27100	M	-1.0	5	2	M	0.1
009 S7	69700	0.8	-1.0	19	4	4.8	0.7
009 S8	56500	0.7	-1.0	20	5	5.6	0.8
009 S9	99300	2.0	-1.1	25	5	3.0	0.3
010 S6	22000	M	-1.0	3	1	M	0.2
010 S7	40300	3.4	-1.2	93	17	23.1	3.7
010 S8	33000	3.7	-1.3	92	16	20.3	3.2
010 S9	82800	9.7	-1.0	60	15	15.6	3.0
011 S6	36500	0.5	-1.0	7	1	M	M
011 S7	61500	M	-1.0	17	3	3.6	0.9
011 S8	65900	1.3	-1.0	13	2	M	0.5
011 S9	70800	0.6	2.6	22	4	5.6	1.1
012 S6	16800	0.1	0.8	3	1	M	M
012 S7	31700	7.7	0.6	7	2	3.3	0.4
012 S8	30300	0.2	-1.0	3	2	M	0.2
012 S9	1300	0.5	3.3	205	11	4.7	0.4
013 S6	32200	0.4	-1.0	21	7	M	M
013 S7	34500	2.2	-1.3	89	24	17.9	2.6

Table 3. Continued

THE FOLLOWING ELEMENTAL CONCENTRATIONS ARE IN PPM

SRL I.D.	AL	DY	EU	LA	SM	YB	LU
013 S8	24100	2.1	3.5	83	22	19.3	2.4
013 S9	67700	12.8	4.7	126	40	29.9	3.9
014 S6	26900	M	-1.0	3	1	1.2	0.2
014 S7	58200	0.6	-1.0	6	2	3.2	0.5
014 S8	47500	0.4	-1.0	5	2	2.2	0.3
014 S9	83300	0.5	-1.2	10	3	M	1.0
015 S6	27900	0.1	-1.0	5	2	M	0.1
015 S7	56600	3.6	-1.3	71	13	9.3	1.3
015 S8	48700	0.6	-1.0	35	7	10.6	0.9
015 S9	82600	4.8	3.2	161	29	25.0	3.2
016 S6	38500	M	-1.0	5	1	M	M
016 S7	56700	4.7	-1.0	26	6	11.0	1.4
016 S8	53400	0.9	-1.0	15	4	6.9	0.8
016 S9	100700	15.0	-1.0	50	15	12.7	3.4
017 S6	24400	4.2	-1.0	17	5	3.1	0.5
017 S7	36300	6.5	2.1	141	34	37.5	4.5
017 S8	28400	4.1	2.5	115	34	43.5	4.1
017 S9	28300	5.2	-1.0	42	13	11.7	1.6
018 S6	57500	0.4	-1.0	8	1	M	M
018 S7	110900	0.8	-1.0	18	4	3.1	0.4
018 S8	91200	0.3	3.5	19	6	4.3	0.5
018 S9	144200	M	-1.0	25	4	3.4	0.2
019 S6	27100	0.2	-1.0	2	2	M	M
019 S7	47100	0.3	0.7	9	4	3.7	1.0
019 S8	33200	M	-1.0	6	3	3.8	0.4
019 S9	77300	0.8	-1.0	21	7	9.4	1.4
020 S6	36600	M	M	6	2	M	M
020 S7	51200	1.0	-1.0	10	2	M	0.2
020 S8	54700	5.4	-1.0	12	2	M	M
020 S9	65600	M	-1.0	15	4	M	0.3
021 S6	46700	0.1	2.3	23	6	M	M
021 S7	55300	10.2	2.2	31	6	14.6	2.1
021 S8	56200	M	1.7	21	7	10.2	1.9
021 S9	87300	M	-1.1	26	5	M	0.9
022 S6	24300	M	-1.0	4	1	M	M
022 S7	54000	1.3	1.2	21	7	10.5	1.3
022 S8	47900	3.6	1.9	16	5	6.2	0.7
022 S9	90100	M	-1.6	47	11	13.2	2.4
023 S6	21600	5.3	-1.0	8	2	7.5	1.0
023 S7	44200	25.2	2.7	148	33	31.3	4.3
023 S8	36600	5.5	-1.0	M	M	0.9	M
023 S9	90900	9.2	-3.2	141	29	29.8	4.7
024 S6	36100	0.3	-1.0	3	1	1.7	0.1
024 S7	48400	3.3	-1.0	20	6	4.5	1.0
024 S8	26300	0.4	-1.0	9	2	3.1	0.4
024 S9	71800	M	2.4	53	11	15.3	3.1
025 S6	47700	0.5	M	10	3	2.0	M
025 S7	63700	0.3	1.6	12	2	4.0	0.8
025 S8	60300	0.4	-1.2	11	2	3.6	0.3
025 S9	86500	0.9	2.6	27	6	12.2	1.7

Table 3. Continued

THE FOLLOWING ELEMENTAL CONCENTRATIONS ARE IN PPM

 SRL I.D.

	AL	DY	EU	LA	SM	YB	LU
026 S6	25500	1.9	-1.0	8	2	M	0.2
026 S7	60000	M	-1.0	17	4	4.7	0.5
026 S8	44500	M	-1.1	11	2	M	0.5
026 S9	66000	0.3	1.4	34	8	6.0	1.7
027 S6	26300	0.2	-1.0	7	1	1.0	M
027 S7	43600	M	-1.0	13	3	9.3	1.9
027 S8	42800	3.3	-1.0	12	3	10.2	1.9
027 S9	119700	0.9	-1.0	24	4	8.0	1.7
028 S6	22600	M	1.4	2	1	M	M
028 S7	42400	M	-1.0	10	5	6.6	1.4
028 S8	43300	0.4	1.4	8	4	5.6	0.9
028 S9	72800	M	-1.2	15	5	7.1	1.9

Table 4. Supplementary Field Data for the Avalon Study

***** ***** ***** * I.D. ***** ***** *****		SAMPDATE	VE LO CI TI TY	ST R W I D T H	ST R D E P T H	RE L I E F	ST M L E V E L	ST R C O L O R	ST R B E D	VE G D E N S	RE L I E F	WE A T H E R	TE M P
001 S6	7/17/78	3	3	7	3	3	3	3	1	3	3	1	20
001 S7	7/17/78	3	3	7	3	3	3	3	1	3	3	1	20
001 S8	7/17/78	3	3	7	3	3	3	3	1	3	3	1	20
001 S9	7/17/78	3	3	7	3	3	3	3	1	3	3	1	20
002 S6	7/17/78	3	3	5	2	3	3	2	1	4	3	1	20
002 S7	7/17/78	3	3	5	2	3	3	2	1	4	3	1	20
002 S8	7/17/78	3	3	5	2	3	3	2	1	4	3	1	20
002 S9	7/17/78	3	3	5	2	3	3	2	1	4	3	1	20
003 S6	7/17/78	3	3	3	1	2	3	1	1	3	2	1	22
003 S7	7/17/78	3	3	3	1	2	3	1	1	3	2	1	22
003 S8	7/17/78	3	3	3	1	2	3	1	1	3	2	1	22
003 S9	7/17/78	3	3	3	1	2	3	1	1	3	2	1	22
004 S6	7/17/78	3	3	6	2	3	2	1	1	4	3	1	21
004 S7	7/17/78	3	3	6	2	3	2	1	1	4	3	1	21
004 S8	7/17/78	3	3	6	2	3	2	1	1	4	3	1	21
004 S9	7/17/78	3	3	6	2	3	2	1	1	4	3	1	21
005 S6	7/17/78	3	3	3	1	3	2	1	2	3	3	1	23
005 S7	7/17/78	3	3	3	1	3	2	1	2	3	3	1	23
005 S8	7/17/78	3	3	3	1	3	2	1	2	3	3	1	23
005 S9	7/17/78	3	3	3	1	3	2	1	2	3	3	1	23
006 S6	7/17/78	3	3	4	1	3	2	1	2	3	3	1	20
006 S7	7/17/78	3	3	4	1	3	2	1	2	3	3	1	20
006 S8	7/17/78	3	3	4	1	3	2	1	2	3	3	1	20
006 S9	7/17/78	3	3	4	1	3	2	1	2	3	3	1	20
007 S6	7/17/78	3	3	5	2	2	2	1	1	4	2	1	23
007 S7	7/17/78	3	3	5	2	2	2	1	1	4	2	1	23
007 S8	7/17/78	3	3	5	2	2	2	1	1	4	2	1	23
007 S9	7/17/78	3	3	5	2	2	2	1	1	4	2	1	23
008 S6	7/18/78	2	4	4	1	3	2	1	2	3	3	1	20
008 S7	7/18/78	2	4	4	1	3	2	1	2	3	3	1	20
008 S8	7/18/78	2	4	4	1	3	2	1	2	3	3	1	20
008 S9	7/18/78	2	4	4	1	3	2	1	2	3	3	1	20
009 S6	7/16/78	3	3	5	2	2	2	1	2	4	2	1	22
009 S7	7/16/78	3	3	5	2	2	2	1	2	4	2	1	22
009 S8	7/16/78	3	3	5	2	2	2	1	2	4	2	1	22
009 S9	7/16/78	3	3	5	2	2	2	1	2	4	2	1	22
010 S6	7/18/78	3	3	4	1	2	2	1	2	3	2	1	22
010 S7	7/18/78	3	3	4	1	2	2	1	2	3	2	1	22
010 S8	7/18/78	3	3	4	1	2	2	1	2	3	2	1	22
010 S9	7/18/78	3	3	4	1	2	2	1	2	3	2	1	22
011 S6	7/18/78	3	3	4	1	1	2	1	2	4	1	1	20
011 S7	7/18/78	3	3	4	1	1	2	1	2	4	1	1	20
011 S8	7/18/78	3	3	4	1	1	2	1	2	4	1	1	20
011 S9	7/18/78	3	3	4	1	1	2	1	2	4	1	1	20
012 S6	7/19/78	3	3	4	1	3	2	1	2	3	3	1	19
012 S7	7/19/78	3	3	4	1	3	2	1	2	3	3	1	19
012 S8	7/19/78	3	3	4	1	3	2	1	2	3	3	1	19
012 S9	7/19/78	3	3	4	1	3	2	1	2	3	3	1	19
013 S6	7/19/78	3	3	4	1	2	2	1	2	3	2	1	20
013 S7	7/19/78	3	3	4	1	2	2	1	2	3	2	1	20

Table 4. Continued

***** ***** ***** * I.D. ***** ***** *****		SAMPDATE	VELOCITY	STRN IDTH	STR DEPTH	RELIEF	STM L EVEL	STR COLOR	STR BED	VEG DENS	RELIEF	WEATHER	TEMP
013 S8	7/19/78	3	4	1	2	2	2	1	2	3	2	1	20
013 S7	7/19/78	3	4	1	2	2	2	1	2	3	2	1	20
014 S6	7/19/78	3	4	1	2	2	2	1	2	4	2	2	21
014 S7	7/19/78	3	4	1	2	2	2	1	2	4	2	2	21
014 S8	7/19/78	3	4	1	2	2	2	1	2	4	2	2	21
014 S9	7/19/78	3	4	1	2	2	2	1	2	4	2	2	21
015 S6	7/19/78	1	5	2	3	3	2	3	2	3	3	1	20
015 S7	7/19/78	1	5	2	3	3	2	3	2	3	3	1	20
015 S8	7/19/78	1	5	2	3	3	2	3	2	3	3	1	20
015 S9	7/19/78	1	5	2	3	3	2	3	2	3	3	1	20
016 S6	7/20/78	3	4	2	3	3	3	1	2	4	3	1	18
016 S7	7/20/78	3	4	2	3	3	3	1	2	4	3	1	18
016 S8	7/20/78	3	4	2	3	3	3	1	2	4	3	1	18
016 S9	7/20/78	3	4	2	3	3	3	1	2	4	3	1	13
017 S6	7/20/78	3	4	2	2	2	2	1	2	3	2	1	19
017 S7	7/20/78	3	4	2	2	2	2	1	2	3	2	1	19
017 S8	7/20/78	3	4	2	2	2	2	1	2	3	2	1	19
017 S9	7/20/78	3	4	2	2	2	2	1	2	3	2	1	19
018 S6	7/20/78	6	9	9	3	3	1	6	2	3	3	1	M
018 S7	7/20/78	6	9	9	3	3	1	6	2	3	3	1	M
018 S8	7/20/78	6	9	9	3	3	1	6	2	3	3	1	M
018 S9	7/20/78	6	9	9	3	3	1	6	2	3	3	1	M
019 S6	7/20/78	3	4	1	3	3	3	1	2	3	3	1	19
019 S7	7/20/78	3	4	1	3	3	3	1	2	3	3	1	19
019 S8	7/20/78	3	4	1	3	3	3	1	2	3	3	1	19
019 S9	7/20/78	3	4	1	3	3	3	1	2	3	3	1	19
020 S6	7/20/78	3	3	1	3	3	2	1	2	3	3	1	18
020 S7	7/20/78	3	3	1	3	3	2	1	2	3	3	1	18
020 S8	7/20/78	3	3	1	3	3	2	1	2	3	3	1	18
020 S9	7/20/78	3	3	1	3	3	2	1	2	3	3	1	18
021 S6	7/20/78	3	3	1	2	2	2	1	2	4	2	1	19
021 S7	7/20/78	3	3	1	2	2	2	1	2	4	2	1	19
021 S8	7/20/78	3	3	1	2	2	2	1	2	4	2	1	19
021 S9	7/20/78	3	3	1	2	2	2	1	2	4	2	1	19
022 S6	7/20/78	3	3	1	3	3	2	1	2	3	3	1	19
022 S7	7/20/78	3	3	1	3	3	2	1	2	3	3	1	19
022 S8	7/20/78	3	3	1	3	3	2	1	2	3	3	1	19
022 S9	7/20/78	3	3	1	3	3	2	1	2	3	3	1	19
023 S6	7/20/78	3	4	1	3	2	2	1	2	4	3	1	20
023 S7	7/20/78	3	4	1	3	2	2	1	2	4	3	1	20
023 S8	7/20/78	3	4	1	3	2	2	1	2	4	3	1	20
023 S9	7/20/78	3	4	1	3	2	2	1	2	4	3	1	20
024 S6	7/20/78	3	3	1	3	2	2	1	2	4	3	1	20
024 S7	7/20/78	3	3	1	3	2	2	1	2	4	3	1	20
024 S8	7/20/78	3	3	1	3	2	2	1	2	4	3	1	20
024 S9	7/20/78	3	3	1	3	2	2	1	2	4	3	1	20
025 S6	7/20/78	3	5	1	2	2	2	1	1	4	2	1	21
025 S7	7/20/78	3	5	1	2	2	2	1	1	4	2	1	21
025 S8	7/20/78	3	5	1	2	2	2	1	1	4	2	1	21
025 S9	7/20/78	3	5	1	2	2	2	1	1	4	2	1	21

Table 4. Continued.

***** ***** ***** * I.D. ***** ***** *****		SAMPDATE	VE LO CI TY	ST RW ID TH	ST RD EP TH	RE LI EF	ST ML EV EL	ST RC OL OR	ST RB ED	VE GD EN S	RE LI EF	WE AT HER	TE MP
026 S6	7/21/78	3	6	5	3	3	3	2	2	3	3	1	18
026 S7	7/21/78	3	6	5	3	3	3	2	2	3	3	1	18
026 S8	7/21/78	3	6	5	3	3	3	2	2	3	3	1	18
026 S9	7/21/78	3	6	5	3	3	3	2	2	3	3	1	18
027 S6	7/21/78	3	5	4	3	3	2	3	2	3	3	1	19
027 S7	7/21/78	3	5	4	3	3	2	3	2	3	3	1	19
027 S8	7/21/78	3	5	4	3	3	2	3	2	3	3	1	19
027 S9	7/21/78	3	5	4	3	3	2	3	2	3	3	1	19
028 S6	7/21/78	3	5	2	3	3	2	1	2	3	3	1	19
028 S7	7/21/78	3	5	2	3	3	2	1	2	3	3	1	19
028 S8	7/21/78	3	5	2	3	3	2	1	2	3	3	1	19
028 S9	7/21/78	3	5	2	3	3	2	1	2	3	3	1	19

Table 5. Stream Water Data for the Avalon Study

ID	U	BR	CL	F	MN	NA	V	AL	DY	HE	PH	COND	ALK	TEMP
001	0.089	80.0	9600	234	119.6	8800	0.9	2719	-0.1	M	7.1	80	14.50	20
002	0.044	25.9	5100	46	123.4	5280	1.5	2268	-0.1	M	7.2	55	12.50	20
003	0.072	.	6100	27	.	5510	-0.1	2229	-0.1	M	7.4	35	16.50	22
004	0.045	.	5900	52	169.8	5510	-0.1	1922	-0.1	M	7.1	75	15.50	21
005	0.067	.	4000	99	138.6	4980	6.6	4218	-0.1	M	7.1	60	16.52	23
006	0.039	.	4700	28	95.0	4780	3.9	1629	-0.1	M	7.6	40	16.50	20
007	0.524	.	M	44	.	1160	11.7	3141	0.1	M	7.7	45	14.50	23
008	-0.002	.	7300	14	123.4	4230	0.5	518	-0.1	M	8.1	35	11.50	20
009	0.028	.	5800	92	571.3	5340	1.2	570	-0.1	M	6.9	60	20.50	22
010	-0.002	.	5200	62	77.4	4560	1.3	642	-0.1	M	6.6	55	18.50	22
011	0.219	999.9	2300	.	108.2	2270	5.2	6513	-0.1	M	6.8	50	10.50	20
012	0.026	.	7200	.	163.7	4300	1.1	1104	0.1	M	7.3	60	17.50	19
013	0.020	14.8	7000	50	69.8	5580	1.5	776	-0.1	M	7.3	55	14.50	20
014	0.159	181.3	M	123	224.6	780	-0.1	3860	-0.1	M	6.8	35	10.50	21
015	0.028	91.1	4300	34	68.2	2770	1.7	1311	-0.1	M	6.0	25	6.50	20
016	0.029	.	5700	63	112.4	6110	1.1	929	-0.1	M	6.9	45	13.50	18
017	0.036	49.4	5700	107	142.4	5410	3.0	1055	-0.1	M	7.4	50	18.50	19
019	0.022	.	5200	19	98.9	3570	1.1	857	0.1	M	7.5	50	17.50	19
020	0.709	789.0	M	.	.	4000	11.2	4285	1.1	M	7.3	30	10.50	18
021	0.060	.	4800	.	93.2	4280	-0.1	1861	-0.1	M	7.5	50	13.50	19
022	-0.002	.	6100	37	59.8	3530	0.4	110	-0.1	M	6.9	45	11.50	19
023	-0.002	.	5500	55	52.8	3440	1.1	597	-0.1	M	7.6	40	12.50	20
024	0.040	18.3	4800	67	104.0	3080	4.3	1746	-0.1	M	7.3	40	13.50	20
025	-0.002	.	4700	32	231.5	3330	1.2	630	-0.1	M	7.1	50	16.50	21
026	0.040	.	5500	47	97.7	3950	-0.1	979	-0.1	M	6.8	45	12.50	18
027	-0.002	12.0	4300	.	77.0	2770	0.5	1147	-0.1	M	7.2	35	9.50	19
028	0.002	.	4900	.	81.9	3130	0.8	452	-0.1	M	7.6	55	19.50	19