U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

OPEN-FILE REPORT 94-181
PLATE 1 OF 1

PRELIMINARY GEOLOGIC MAP OF THE SAVANNAH RIVER SITE, AIKEN, ALLENDALE, AND BARNWELL COUNTIES, SOUTH CAROLINA

By
David C. Prowell
1994

SCALE 1:48 000

1 0 1 2 3 MILES
3000 0 3000 6000 9000 12000 15000 FEET
1 0 1 2 KILOMETERS

CONTOUR INTERVAL 10 FEET
SUPPLEMENTARY CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

Produced by the United States Geological Survey
in cooperation with the United States Department of Energy

Compiled from USGS 1:24 000-scale topographic maps dated 1964–1981
Planimetry revised from aerial photographs taken 1981 and 1986, and other source data. Revised information not field checked. Map edited 1987

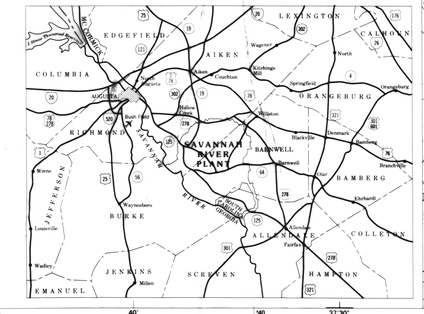
Projection and 10,000-foot grid ticks: South Carolina coordinate system, south zone and Georgia coordinate system, east zone
5000-meter Universal Transverse Mercator grid ticks, zone 17, shown in blue
20,000-foot grid based on U. S. Department of Energy local coordinate system
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 14 meters south and 15 meters west

The entire Savannah River Plant area, exclusive of production and administrative areas, and facilities, has been declared a National Environmental Research Park

UTM GRID AND 1987 MAGNETIC NORTH DECLINATION AT CENTER OF MAP

GRID DECLINATIONS

LOCATION DIAGRAM



EXPLANATION

QUATERNARY

Alluvium -- Qal_1 is fine to very coarse quartz sand in a sparse clay matrix. Sand is typically angular, poorly sorted, and contains small amounts of mica, feldspar, and dark heavy minerals such as rutile, garnet, magnetite, and staurolite. Well-rounded gravels of milky, yellow, and dark-red (rutilated?) quartz derived from quartz veins in the adjacent metamorphic terranes are also present. Crossbedding and infilling of small to large, cross-cutting channels are common. Qal_2 lithology is very similar to younger Qal_1, but strata are slightly more compact and lithified. Secondary iron mineralization, oxidation due to weathering, and primitive soil-profile development are also present.

Pliocene (?)

Dune Sand -- Medium, angular, moderately sorted, tan quartz sand with minor amounts of mica and specks of carbonaceous debris left by decaying roots from modern plants. Deposits are devoid of matrix clays and dark heavy minerals that characterize other units in the study area. Bedding is generally absent, but at a few localities, sand shows well-defined crossbedding and graded bedding.

Miocene (?)

Upland unit -- Unit is characterized by three predominate lithofacies: (1) beds of cross-bedded gravel and poorly-sorted sand, (2) beds of cross-bedded, fine to very coarse sand containing clay clasts and in-situ-weathered feldspar grains, and (3) beds of brightly-colored, massive sandy clay. Coarsest phase is characterized by gravels of polycrystalline vein quartz ranging in diameter from 1.2 to 10 cm (0.5 to 4 in.). Gravels are surrounded by a matrix of fine to very coarse clayey quartz sand with abundant mica and white clay balls. The gravel beds outline the shapes of old fluvial channels with the larger size fraction nearer channel base.

The second and most common lithofacies is pervasively cross-bedded, fine to very coarse sand and grit containing large (4 mm) micas and weathered feldspar grains. Sand is angular to su-angular quartz generally found in a matrix of kaolinitic clay. White kaolinitic clay balls are common and range from coarse sand to cobble size. The sand also contains ferrous heavy minerals that have oxidized to give strata a distinctive red and white mottled appearance. Lithology is best characterized by unusual "spotted" appearance from small (5 mm, 0.2 in.) square to rhombohedral, white clay clasts formed by the in-situ alteration of feldspars.

Massive sandy clay lithofacies is typically found filling channels. The clay shows very little bedding or lithologic variation. The small percentage of sand is coarse, angular quartz, evenly dispersed throughout the surrounding clay. Very-fine, dark, heavy minerals have oxidized and stained the clay intense shades of red, orange, yellow, and purple. Beds have a characteristic hackley fracture probably due to cyclic hydration and desiccation.

Barnwell Group --

Tobacco Road Sand -- Poorly to moderately sorted, angular to sub-angular, fine to very coarse quartz sand with mica and heavy-mineral suite dominated by brown ilmenite and sillimanite. Other heavy minerals include zircon, rutile, brown hornblende, and staurolite. Matrix of kaolinitic clay gives internal cohesion to sand. Coarser-grained beds are slightly to moderately burrowed whereas finer, better-sorted beds are heavily bioturbated. Cross-bedding, white kaolin clasts, and thin wisps of white clay characterize the formation. Basal contact commonly marked by one or more thin layers of ovoid-shaped quartz gravel.

Dry Branch Formation -- Beds of calcareous clay, clay, thinly-interbedded sand and clay, and sand in a coarsening-upwards sequence. Basal lithofacies is massive to thickly-bedded, well-sorted clayey sand with a calcareous matrix. Thin beds of calcareous laminated clay, and thin beds of limestone, chert, and silica-cemented sand are locally present. Lithofacies is locally characterized by beds or bioherms of large oyster shells (Crassostrea gigantissma). Thinly laminated clay beds commonly separated by very thin layers of fine sand and silt are present above the basal calcareous beds. The clay fraction is kaolinite in outcrop but may contain montmorillonite in the subsurface. Clay in most outcrops typically appears tan to orange-brown or less commonly pale green with no trace of organic debris; however, in some outcrops and in subsurface samples, clay can be carbonaceous and typically light to dark green to gray. Unweathered samples may contain molds of leaves and bivalve shells. Beds of fine to medium, angular to sub-angular, moderately to well-sorted sand characterize the top of formation. The sand is largely quartz with mica and dark heavy minerals such as brown ilmenite, zircon, brown hornblende/biotite, staurolite, sillimanite, kyanite and magnetite. Small-scale crossbedding and flaser bedding are common. Evidence of burrowing organisms or fossil remnants is rare.

TERTIARY

Eocene

McBean Formation -- Basal part of formation contains white to buff, fossiliferous sandy limestone and calcareous sand, and dark olive green marl. Well-preserved shells of gastropods and pelecypods are common. Above these basal beds, the sediments are moderately to well-sorted, rounded to subrounded, fine to medium quartz sand with fine gravel, well-laminated beds of green montmorillonitic clay, and crudely-stratified beds of white to pale green fine sand. White mica, glauconite, phosphate, polished blue quartz grains, and fine dark heavy minerals are common in the sandier beds. The heavy mineral suite includes ilmenite/brown ilmenite, leucoxene, zircon, sillimanite, kyanite, monazite, and magnetite. The most updip beds are thinly laminated green clays and poorly sorted, fine to coarse, angular to sub-angular quartz in a medium-green to orange illite/smectite clay matrix. Larger quartz grains (clear and blue) tend to be polished and well-rounded. Large (3 mm) mica flakes, glauconite, and shell ghosts are locally present. Outcropping sand and clay beds are characterized by dark-brown to black spots of manganese probably concentrated during weathering. Basal contact in outcrop areas is commonly bored by marine organisms.

Huber and Congaree Formations Undifferentiated

Huber Formation -- Fine to very coarse, poorly sorted, angular quartz sand in a matrix of white kaolin. Accessory minerals include white mica, lignite, and dark heavy minerals such as sillimanite, ilmenite, staurolite, rutile, garnet, and magnetite. Beds containing kaolin clay balls and very coarse crossbedded sand are common. Sparse clay-lined burrows are locally present in the finer sand beds. Top of formation is characterized by thick, massive, white kaolin beds, locally of commercial value. The clay is typically compact and brittle with sharp, conchoidal fractures. Well laminated, medium- to dark-gray carbonaceous lenses occur locally in kaolin deposits and contain well-preserved microfloras.

Congaree Formation -- Moderately to well-sorted, fine to coarse, sub-angular to sub-rounded quartz sand in a buff to light-gray clay matrix with small quantities of very fine, dark heavy minerals and white mica. The heavy mineral assemblage is characterized by sillimanite, ilmenite, staurolite, rutile, garnet, and magnetite. Detrital mica varies in size from small (< 1 mm) to quite large (4 mm) and is generally more prevalent in the clay-rich intervals. Most of this sand is enclosed in a sparse clay matrix of off-white kaolin, and bedding is generally flat to weakly crossbedded. Clays may be light gray due to finely disseminated carbonaceous matter or less commonly stained pale orange from oxidation of iron-bearing heavy minerals. Thin (0.6 cm; 0.25 in), clay-enriched silty laminae are present in this formation as are faint clay-coated walls of burrows of marine organisms.

CONTACT -- Dotted where concealed

OUTCROP

▲ Single exposure

♦ Series of exposures

● FC4A DRILL HOLE AND IDENTIFICATION NUMBER

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1988