DEPARTMENT OF THE ARMY
US ARMY CHEMICAL SCHOOL
401 ENGINEER LOOP
FORT LEONARD WOOD, MISSOURI 65473-8926

REPLY TO
ATTENTION OF:

Health Physics Office

6 JUL 2000

Orysia Bailey, License Reviewer
U. S. Nuclear Regulatory Commission, Region II
Division of Nuclear Materials Safety
Sam Nunn Atlanta federal Building
61 Forsyth Street SW Suite 23T85
Atlanta, GA 30303-8931

Dear Sir or Madam:

The additional information you requested in your letter dated March 1, 2000 concerning the groundwater assessment of the Pelham Range site is attached.

Sincerely,

Patricia L. Nilo
Colonel, U.S. Army
Commandant

Attachment

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION CONCERNING RADIOACTIVE MATERIALS LICENSE AMENDMENT REQUEST DATED MARCH 2, 1999

Comment 1: **Please provide information regarding:**

a) **Pre-burial mound site conditions. For example was the site excavated or was the site a depression?**

Response: The current site where the burial mound is located was part of the Rideout Field Survey Training Area. The site was cleared, level ground. The site was designated as a burial ground in 1957. The same year, radioactive waste from the waste burial ground on Main Post(Iron Mountain site) was transferred to Pelham Range and buried at the site. Burial of waste continued through the '60s, mostly laboratory trash. In 1972-73 the site was cleared and the mound was created during the excavation of the burial site.

Comment 1b : **Address the current and past land uses at the burial mound, including the date the contaminated soils were relocated to the mound.**

Response: See Response 1 above.

Comment 1c: **Discuss current and past water usage, groundwater pumpage or surface water diversions for drinking water supply and other uses.**

Response: It is reported that a well used as a source of non-potable water is located to the north of Rideout Field near Rideout Hall.

Comment 1d: **Information on climatic conditions for the area such as average monthly precipitation, temperature, and evaporation should be included.**

Response: FTMC is situated in a temperate, humid climate. Summers are hot and long, and winters are usually short and mild to moderately cold. The climate is influenced by frontal systems moving from northwest to southeast, and temperatures change rapidly from warm to cool due to the inflow of northern air. The average annual temperature is 63 degrees Fahrenheit (°F). Summer temperatures usually reach 90 °F or higher about 70 days per year, but temperatures above 100 °F are rare. Freezing temperatures are common but are usually of short duration.

The first frost may arrive by late October. At Anniston, the average date of the first 32 °F temperature is November 6, and the last is March 30. This provides a growing season of 221 days. Snowfall averages 0.5 to 1 inch. On rare occasions, several inches of snow accumulate from a single storm (ESE, 1998).

The average annual rainfall is about 53 inches and is well distributed throughout the year. The more intense rains usually occur during the warmer months, and some flooding occurs nearly every year. Drought conditions are rare. Approximately 80 percent of the flood-producing storms are of the frontal type and occur in the winter and spring, lasting from 2 to 4 days each. Summer storms are usually thunderstorms with intense precipitation over small areas, and these sometimes result in serious local floods. Occasionally, several wet years or dry years occur in series. Annual rainfall records indicate no characteristic order or pattern (ESE, 1998).

Historical monthly averages are listed on SAIC Table 2-1.

Winds in the FTMC area are seldom strong and frequently blow down the valley from the northeast. However, there is no truly persistent wind direction. Normally, only light breezes or calm prevail, except during passages of cyclonic disturbances, when destructive local wind storms develop, some into tornadoes, with winds of 100 miles per hour (mph) or more (ESE, 1998).

Comment 2: **The plan should summarize:**
a) The available information on the hydrologic soil and hydrogeologic conditions of the site or region.

Response: Soils at Rideout Field consist of the Anniston and Allen series of soils. The Anniston and Allen Series of soils consists of strongly acidic, deep, well-drained soils that have developed in old, local alluvium. The parent material washed from the adjacent higher-lying Linker, Muskingum, Enders, and Montevallo soils, which developed from weathered sandstone, shale, and quartzite. Sandstone and quartzite gravel and cobbles, as much as 8 inches in diameter, are on the surface and throughout the soil.

Soils of this site fall into the Anniston and Allen gravelly loams, six to ten percent slopes, eroded (AcC2) (U.S. Department of Agriculture [USDA], 1961). Some severely eroded areas may be common on the surface for this soil type, as well as a few shallow gullies. The depth to bedrock ranges from 2 feet to greater than 10 feet. The typical soil description is 2 to 10 feet of well-drained stony loam to clay loam over stratified local alluvium, limestone or shale bedrock. The depth to the water table is likely greater than 20 feet.

FTMC and Pelham Range lie within the Appalachian fold and thrust belt. Southeastward-dipping thrust faults with associated minor folding are the predominant structural features. Geologic contacts generally strike northeast/southwest to north/south parallel to the faults; repetition of section is common. Geologic formations within Pelham Range and FTMC range in age from Precambrian to Mississippian. It appears the geological unit at Rideout field is the Floyd Shale. On the eastern boundary of FTMC, Talladega Slate crops out in a narrow band between the county line and the easternmost exposure of the Paleozoic rocks (ESE, 1998).

The Weisner Formation, locally a sandstone and quartzite with thin-bedded shale, is the basal formation of the unmetamorphosed sedimentary rocks. It is capped by the Shady Dolomite, followed in turn by the Rome Formation and the Conasauga Formation, all of Cambrian Age. The Shady Dolomite is a thin, gray, medium- to thick-bedded dolomite with some limestone beds. The Rome Formation is composed of colored shale with thin, interbedded sandstones and calcareous layers, and the Conasauga Formation is composed of interbedded limestones and shale (ESE, 1998).

Primary controls on groundwater flow are topography and bedrock permeability. Precipitation and subsequent infiltration provide recharge to the groundwater flow system. Points of discharge occur as springs, effluent streams, and lakes (ESE, 1998).

Groundwater on FTMC occurs principally in the quartzites of the Weisner Formation in the Choccolocco Mountains and locally in lower Ordovician carbonates. Fracture zones associated with thrust faults may locally enhance bedrock permeability. Shallow groundwater flow probably follows topography, with groundwater movement toward Cane Creek (ESE, 1998).

Groundwater flow on Pelham Range is known only near monitor well locations because of the large areal extent of Pelham Range and the sparsity of groundwater monitoring points. The measured groundwater elevations ranged between 677.1 and 1,043.2 feet above mean sea level (ft-msl) on the Main Post and between 546.0 and 668.6 ft-msl at sites on Pelham Range (SAIC, 1995). It is anticipated the shallow groundwater flow at Rideout Field is toward Cane Creek.

Comment 2b: **Hydrologic parameters for Cane Creek which is located approximately 4,200 feet downgradient from the burial mound, should be obtained.**

Response: The Cane/Cave Creek watershed is among the six major watersheds occurring within Calhoun County. Cane Creek, with its tributaries, originates on the Fort McClellan Reservation. (SAIC, 1999).

Cane Creek, which flows westward across the center of Pelham Range and its tributaries, drains almost all of Pelham Range. Drainage entering the range from the south originates at Anniston Army Depot, which joins Pelham Range to the south. One drainageway located in the southwestern corner traverses this low some 800 yards to the north, and all water collected in the low eventually drains into Cane Creek. Other surface water features include Lake Conteras, Cane Creek Lake, Willet Springs and Blue Hole. Drainage from the Cane/Cave Creek watershed on Fort McClellan and Pelham Range ultimately empties into the Coosa River. Floodplains up to 2,500 feet wide traverse this sector and slope toward the center of the range. The wide floodplains are absent in the southern portion of the range. (SAIC, 1999).

The northern portion of Pelham Range contains broad rolling topography punctuated by isolated rounded knobs rising 75 to 90 ft above the surrounding terrain. Creek floodplains up to 2,500 ft wide traverse the northern portion of the range. The southern sector also contains knobby terrain; however, the knobs are more closely spaced, thus eliminating the broad, rolling land between the them. Wide floodplains are absent in the southern portion of the range. A large, relatively flat area called the Battle Drill Area is situated near the central western boundary. (ESE, 1998)

Comment 2c: **Useful hydrologic parameter would be whether the stream is perennial or intermittent and its average daily discharge.**

Response: A study for Cane Creek, completed by the U.S. Geological Survey, "Low–Flow and Flow-Duration Characteristics of Alabama Streams", 1994, reports a 7-day, 2-year low-flow of 1.9 ft^3/s as characteristic of Cane Creek near Anniston. The station location for this reading was a bridge on a county road, 0.5 miles northwest of State Highway 11, and 5 miles north of Anniston. Cane Creek is perennial at the location downgradient from Rideout Field.

Comment 3: **The native soils beneath the burial mound and the contaminated soils comprising the burial mound should be evaluated. The textures, depths, mineralogy, and water holding capacity of these soils should be examined. These data will provide information that can be used in evaluating infiltration rates of precipitation, surface runoff, and the transport of the radionuclides.**

Response: This information will be collected during the installation of monitoring wells planned for the investigation of this area. Lithologic descriptions, depth to water, and blow counts, will be collected upon the installation of each monitoring well planned.

Comment 4: **Existing hydrogeologic data for this area should be compiled and examined. This would include a topographic map of the site, which can be used to delineate surface water drainage and to estimate water table elevations for perennial surface water features.**

Response: There is not any historic hydrogeologic information that has been collected for this area. During installation of planned monitoring wells, hydrogeologic data will be collected for this area. A topographic map is attached to show surface water drainage. Water table elevations and the direction of groundwater flow will be defined with the well installation program.

Comment 5: **Hydrogeologic and geologic reports, including maps and logs of wells and boreholes of this area should be evaluated. These maps and logs can be used to estimate the following parameters for the site:**

a) Elevation of the water table or potentiometric surface of the upper aquifer;
b) Groundwater flow directions within the upper or shallow aquifer;
c) Thickness of the unsaturated zone (the interval from the root zone, approximately the soil depth to the saturated zone, the water table);
d) Hydraulic parameters of the aquifer (hydraulic conductivity and specific yield or storage coefficient).

Response: None of this information is available at this time. Investigations have been completed approximately 1 mile away, but the geologic unit of this area is entirely different from this area. Therefore, the information requested above cannot be provided until further investigation has been completed.

Comment 6: **The geochemistry of Co-60 and Cs-137 in the soils, unsaturated materials, and saturated materials of this area should be evaluated using existing research. Information on the solubility and retardation of these radionuclides should be obtained for the different pH and mineralogy scenarios possible at this time.**

Response: None of this information is available.

Comment 7: **Based upon the availability of the above data and upon the development of a groundwater conceptual model for the burial site, a preliminary evaluation should be submitted. This preliminary evaluation can be used to determine new data that should be collected to obtain critical missing parameters and to develop a monitoring plan to assess the potential or existing or future Co-60 and Cs-137 contamination of the groundwater.**

Response: Because there are no monitoring wells and only minimal hydrogeologic information for this area, the Army feels development of a conceptual model would not benefit the investigation at this time. However, the Army intends to install 3 monitoring wells (2 downgradient and 1 upgradient) at this area to collect actual hydrogeologic and groundwater data.

References

Environmental Science and Engineering, Inc. (ESE), 1998, ***Final Environmental Baseline Survey, Fort McClellan, Alabama,*** prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, January.

U.S. Department of Agriculture (USDA), 1961, ***Soil Survey, Calhoun County, Alabama***, Soil Conservation Service, Series 1958, No. 9, September 1961.

U.S. Geologic Survey, 1994, ***Low-Flow and Flow-Duration Characteristics of Alabama Streams***, prepared in cooperation with the Alabama Department of Environmental Management and the Tennessee Valley Authority, Tuscaloosa, Alabama.

Science Applications International Corporation (SIAC), 1999, ***Draft Final Remedial Investigations / Baseline Risk Assessment Report, Fort McClellan, Alabama,*** prepared for U.S. Army Corps, Mobile, Alabama, February.

Table 2-1. Normal and Total Precipitation (inches) by Month at Anniston Airport, Anniston, Alabama

Month	Average 1961-1990[a]	1990[b]	1991[c]	1992[d]	1993[e]	1994[f]	1995[g]	1996[g]	1997[h]
January	5.30	7.56	4.25	4.09	7.67	3.50	3.43	7.99	5.08
February	5.07	8.99	6.24	6.32	2.54	5.04	7.35	3.58	5.07
March	6.34	8.65	6.45	4.47	7.17	7.42	4.26	8.75	6.34
April	5.25	1.90	4.76	2.85	3.19	5.81	2.54	2.81	5.25
May	4.23	2.94	7.61	2.17	5.11	2.95	2.36	3.63	4.23
June	3.71	2.63	7.29	5.96	4.96	6.6	2.4	2.63	3.71
July	4.46	3.37	2.39	4.44	0.80	8.3	2.44	--	4.46
August	3.90	0.58	2.4	6.47	3.16	2.89	2.92	--	3.9
September	3.57	0.58	3.53	5.28	1.71	2.69	7.12	--	3.57
October	2.74	2.65	0.53	2.12	2.68	3.68	9.35	--	2.74
November	3.72	3.03	3.82	10.32	3.96	4.33	6.94	--	3.72
December	4.81	2.47	4.66	5.71	4.42	3.62	4.77	--	4.81

[a] Data obtained from *Monthly Station Normals, Anniston FAA AP, 1961-1990*, NOAA, National Climatic Data Center, 1992.

[b] Data obtained from *Climatological Data Annual Summary, Alabama, 1990*, Vol. 96, No. 13, NOAA.

[c] Data obtained from *Annual Climatological Summary for 1991, Anniston FAA Airport*, NOAA, National Climatic Data Center, 1993.

[d] Data obtained from *Summary of the Day Data (Form 5670) for 1992, Anniston FAA Airport*, NOAA, National Climatic Data Center, 1993.

[e] Data obtained from *Summary of the Day Data (Form 5670) for 1993, Anniston FAA Airport*, NOAA, National Climatic Data Center, 1994.

[f] Data obtained from *Summary of the Day Data (Form 5670) for 1994, Anniston FAA Airport*, NOAA, National Climatic Data Center, 1994.

[g] Data obtained from *The Weather Resource* at www.cdc.noaa.com on June 25, 1998.

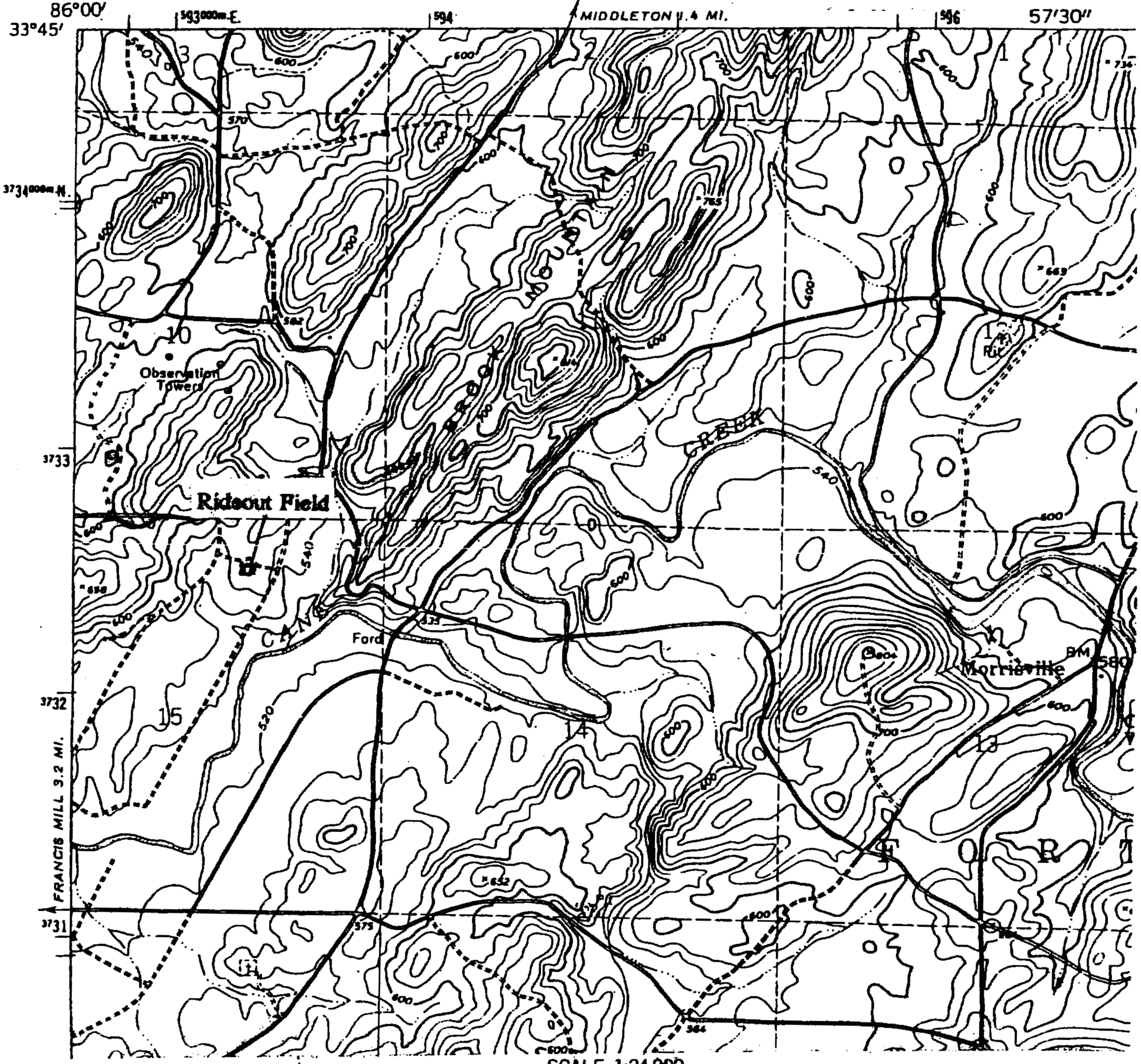
[h] Data obtained from National Weather Service, Birmingham, Alabama, Anniston monthly normals and records 1997.

-- Data not available

3751 I SE (OHATCHEE)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EULATON QUADRANGLE
ALABAMA–CALHOUN CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 ANNISTON 15' QUADRANGLE



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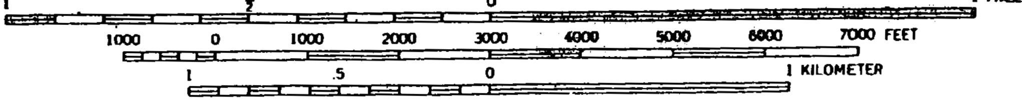
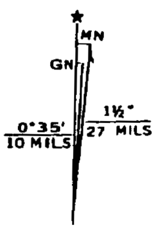


CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

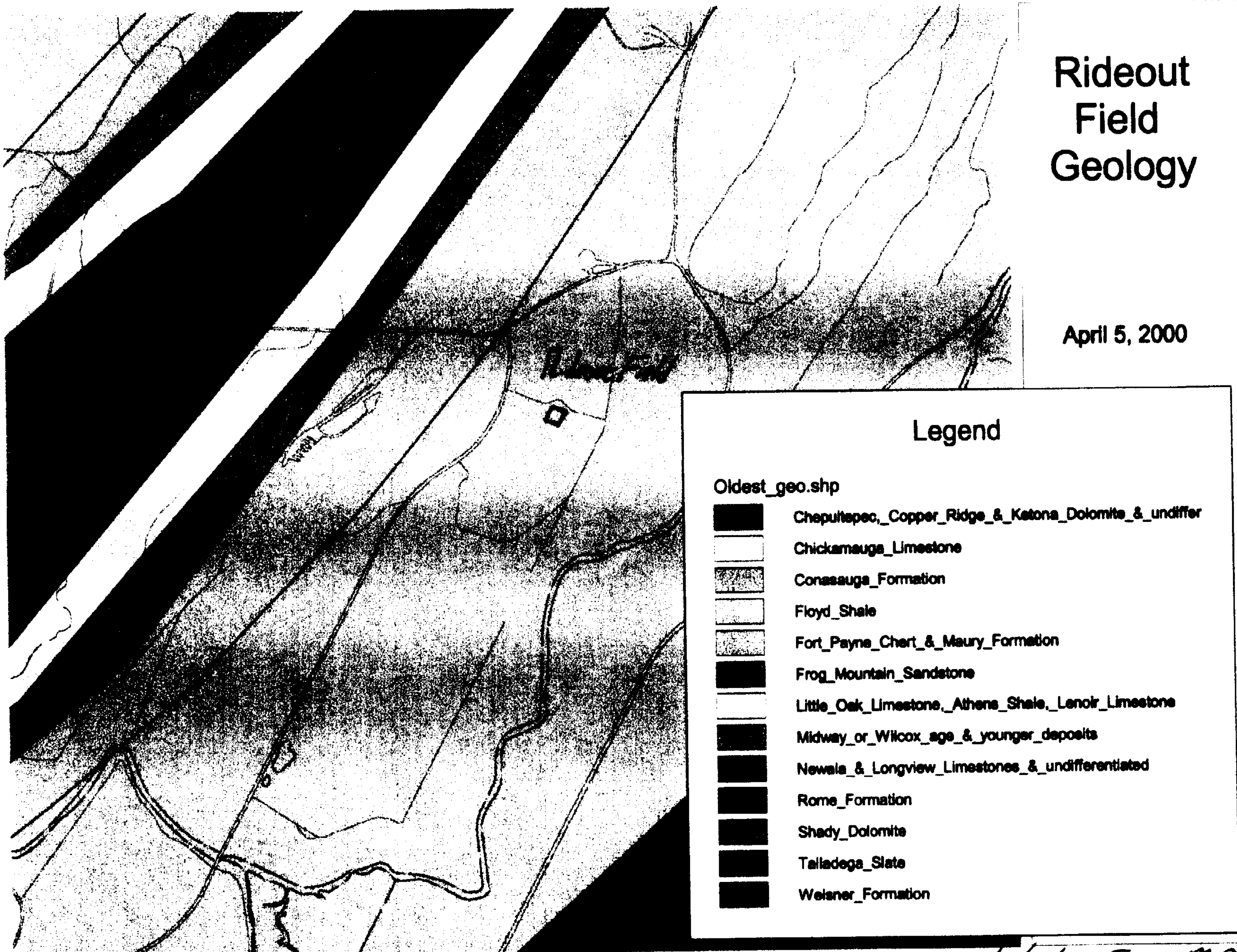


ID AND 1972 MAGNETIC NORTH
NATION AT CENTER OF SHEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

Rideout Field Geology

April 5, 2000



Geology data provided by Fort McClellan, Groundwater Availability in Calhoun County, Alabama, Geologic Survey of Alabama