

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Technical Letter
Dribble-8
October 26, 1961

Federal Center, Denver 25, Colorado

Mr. James Reeves
Assistant Manager for Test Operations
Albuquerque Operations Office
U. S. Atomic Energy Commission
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Dear Mr. Reeves:

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TECHNICAL LETTER: Dribble-8

LOG OF EXPLORATORY HOLE 1,
TATUM DOME, LAMAR COUNTY,
MISSISSIPPI

By

Robert V. Chafin, Clarence A. Armstrong,
Richard E. Taylor, and Hobart B. Harris

October 26, 1961

USGS-474-272

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Sincerely yours,

W. S. Twenhofel
Program Supervisor
Special Projects Branch

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Exploratory Hole 1, the first of the series of exploratory drill holes on Tatum Salt Dome, is at Atomic Energy Commission coordinate 9,141 N. and 7,606 E., 951 feet south and 2,394 feet west of the northeast corner of section 14, T. 2 N., R. 16 W., Lamar County, Mississippi, (Figure 1). This location overlies the southwest part of the dome.

The primary purpose of Exploratory Hole 1, as well as the other exploratory holes, is to aid in determining the configuration of the salt dome and to establish that salt extends at least as far outward as the test hole. The hole also was used to determine the depth, altitude, and thickness of the various lithologic units, and to correlate the water-bearing strata with aquifers contiguous to the salt dome. The hole was drilled by E. and S. Drilling Company.

Exploratory Hole 1 was drilled to a depth of 4,517 feet with rotary equipment. A series of wire line logs were run consisting of a Widco single-point electric log from the surface to 375 feet, and Lane Wells logs as follows: induction-electric log from 375 to 1,427 feet, focused log from 375 to 4,496 feet (2 runs), gamma ray log from surface to 4,490 feet, neutron

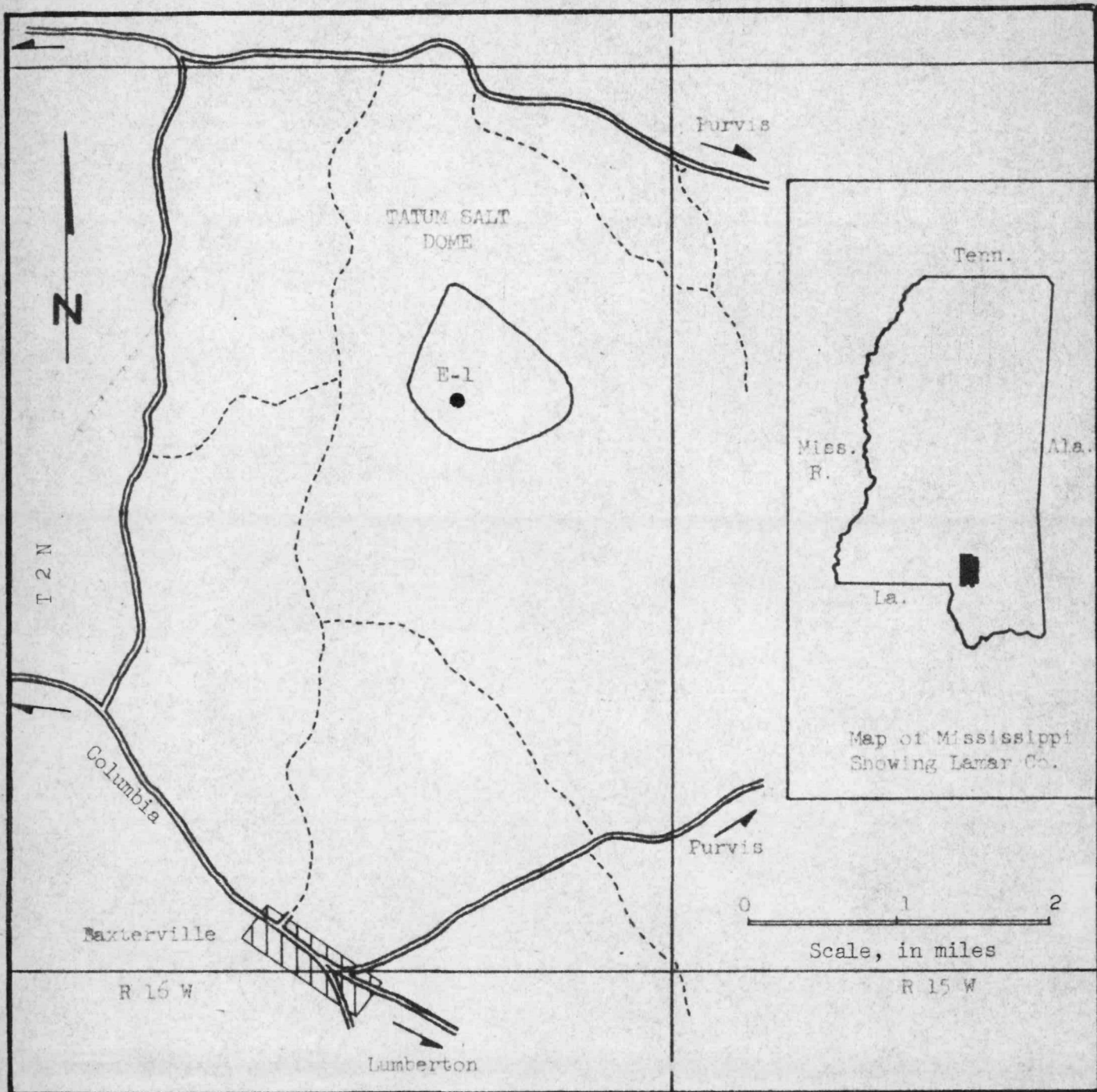


Figure 1--Location of Exploratory Test Hole 1 with relation to Tatum Salt Dome, Lamar County, Mississippi

log from surface to 4,503 feet, acoustilog from 375 to 4,500 feet, and a Sperry-Sun directional survey from surface to 4,500 feet.

Three general rock types, classified by origin, were encountered in the test hole. The uppermost rocks are of sedimentary origin and were deposited in the open sea or in estuaries, and as continental deposits in stream channels or on flood plains. The middle group of rocks, the dome caprock, is the residue and alteration products of the residue left from solution of the salt as the dome slowly rose. The lowermost rock is salt which comprises the core of the salt dome. The salt originally was deposited as chemical precipitates in a large saline basin. After deposition and subsequent burial, the weight of the overlying sediments caused the salt to flow upward as a plastic mass through zones of weakness to form a salt dome.

The lithologic units encountered in the sedimentary rocks from the surface downward are: Terrace Deposits, composed of yellowish-gray, sandy clay; Pascagoula and Hattiesburg Clays undifferentiated, composed of greenish-gray to light-gray, silty clay and fine to very coarse sand; Catahoula Sandstone, composed of greenish-gray clay and fine to coarse sand in the upper part and light-gray, calcareous sand and sandy limestone containing fossiliferous zones in the lower part. The lower calcareous part of the Catahoula Sandstone is sometimes referred to as a false caprock because the drilling and geophysical characteristics are similar to those found in the true caprock. The false caprock may be equivalent to the *Heterostegina* Limestone although Miocene fossils have not yet been definitely identified in it.

The true caprock which underlies the Catahoula Sandstone is composed of two dominant lithologic units. The upper unit is gray to brown crystalline limestone. The limestone contains zones of high permeability, in which varying quantities of drilling fluid were reported lost while drilling; for example, approximately 50 barrels of fluid were lost in a 2½ hour period while drilling near 977 feet. The limestone contains some lenses of gray to brown, medium-grained, calcareous, loose sand. The sand may be either contained as lenses within the limestone or as interfingering lenses of the Catahoula Sandstone with the caprock limestone. The lower lithologic unit of the caprock is composed of gray anhydrite. The limestone and anhydrite of the caprock are separated by a bed of gypsum a few feet thick.

The salt stock which underlies the caprock is composed principally of white to gray, translucent, crystalline halite, with minor quantities of anhydrite. The different lithologies and the most significant aquifers are shown on figure 2.

Two strings of steel casing were installed from the surface as follows: 9 5/8-inch to 376 feet and 4 1/2-inch to 952 feet. The 9 5/8-inch was set as surface casing during drilling, and upon completion of drilling the 4 1/2-inch casing was set in order to convert the test hole to a hydrologic observation well in the limestone caprock. However, the observation well was not completed under this program of work and the cement used to set the smaller casing was not drilled out.

Samples of rotary cuttings were taken during the course of drilling at approximately 20-foot intervals by the drilling crews. The samples were taken from the shale shaker and are described in table 1.

Table 1.--Description of samples from Exploratory Test Hole 1
Datum: Rotary table, elevation 280.5 feet.

	Thickness (feet)	Depth (feet)
Terrace Deposits		
Missing-----	20	20
Clay, grayish-yellow, sandy-----	20	40
Pascagoula and Hattiesburg Clays undifferentiated (Top at 40 feet, interpreted from electric log and samples)		
Clay, grayish-green-----	100	140
Clay, medium-gray-----	40	180
Clay, light greenish gray; with quartz and chert pebbles and pyrites-----	20	200
Clay, light greenish gray, silty-----	100	300
Silt, light olive gray, slightly sandy, very clayey, micaceous, calcareous-----	20	320
Silt, light olive gray, sandy, clayey, pyritic, micaceous, calcareous-----	20	340
Silt, light olive gray, sandy, clayey, pyritic, micaceous, calcareous-----	20	360
Silt, light olive gray, sandy, very clayey, micaceous, calcareous; with few fragments of light-gray, crypto- crystalline limestone-----	20	380
Silt, light olive gray, sandy, clayey, lignitic, calcareous-----	5	385
Sand, light-gray, silty to fine, clayey-----	55	440
Conglomerate, black, tan, and milky chert, clear to frosted quartz, and fragments of lignite-----	20	460
Clay, very light gray, sandy-----	40	500
Clay, light olive gray, silty, with very fine sand, pyritic, lignitic-----	20	520

Description of samples of Exploratory Test Hole 1---Continued

	Thickness (feet)	Depth (feet)
Clay, light olive gray, silty, slightly sandy, pyritic, slightly calcareous-----	20	540
Sand, light-gray, silty to very fine, very clayey-----	20	560
Missing-----	20	580
Conglomerate, clear to milky, very coarse, subangular to rounded, polished sand, weathered quartz and black chert pebbles, yellowish-gray, soft siltstone, and pyrite-----	100	680
Clay, light olive gray, silty; contains chert and quartz pebbles and very coarse sand-----	20	700
Sand, medium light gray, clayey to silty and very coarse to pebbly-----	20	720
Clay, medium light gray, silty, pyritic; with chert and quartz pebbles-----	20	740
Silt, light olive gray, slightly sandy, clayey, micaceous-----	20	760
Sand, light-gray, very coarse to pebbly, clayey, pyritic; with light olive gray silt-----	20	780
Catahoula Sandstone (Top at 795 feet, interpreted from electric log)		
Sand, light-gray, coarse to pebbly, clayey, silty, pyritic-----	20	800
Sand, light-gray, fine to coarse, clayey, pyritic-----	20	820
Clay, light-gray, sandy-----	40	860
Sand, light-gray, coarse to fine, subrounded; with gray and greenish-gray clay, pyrites, and black chert pebbles-----	60	920

Description of samples of Exploratory Test Hole 1---Continued

	Thickness (feet)	Depth (feet)
Clay, light greenish gray, soft, slightly calcareous; contains loose, angular sand with much pyrite and trace of light-brown, very finely crystalline limestone-----	20	940
Cap Rock Limestone (Top at 950 feet, interpreted from electric log and samples)		
Limestone, light-gray, finely crystalline; gray, fine to medium, calcareous sand-----	20	960
Limestone, gray to brown, finely crystalline-----	20	980
Limestone, gray to brown; with light-gray, fine to coarse, calcareous sand-----	20	1,000
Limestone, gray, finely crystalline-----	20	1,020
Limestone, light-gray, sandy; contains large amber calcite crystals-----	20	1,040
Limestone, light-gray, sandy; and dark-gray, finely crystalline limestone-----	20	1,060
Cap Rock, Anhydrite (Top at 1,070 feet, interpreted from electric log)		
Anhydrite, gray, finely crystalline; with minor light gray gypsum-----	60	1,120
Anhydrite, gray, coarsely crystalline; with soft, white, chalky material-----	20	1,140
Anhydrite, gray, coarsely crystalline-----	370	1,510
Salt Stock (Top at 1,510 feet, interpreted from focused log)		
Salt, white, crystalline; contains anhydrite and green shale-----	90	1,600
Salt, white, crystalline; crystalline anhydrite and dark brownish black shale-----	10	1,610
Salt, white, crystalline-----	2,907	4,517

Section 14, T. 2 N., R. 15 W.
 Elevation 266.8 feet above sea level
 Datum, rotary table, elevation 290.5 feet
 Lithology from binocular microscopic examination
 of cuttings; boundaries of lithologic zones
 interpreted from electric log.

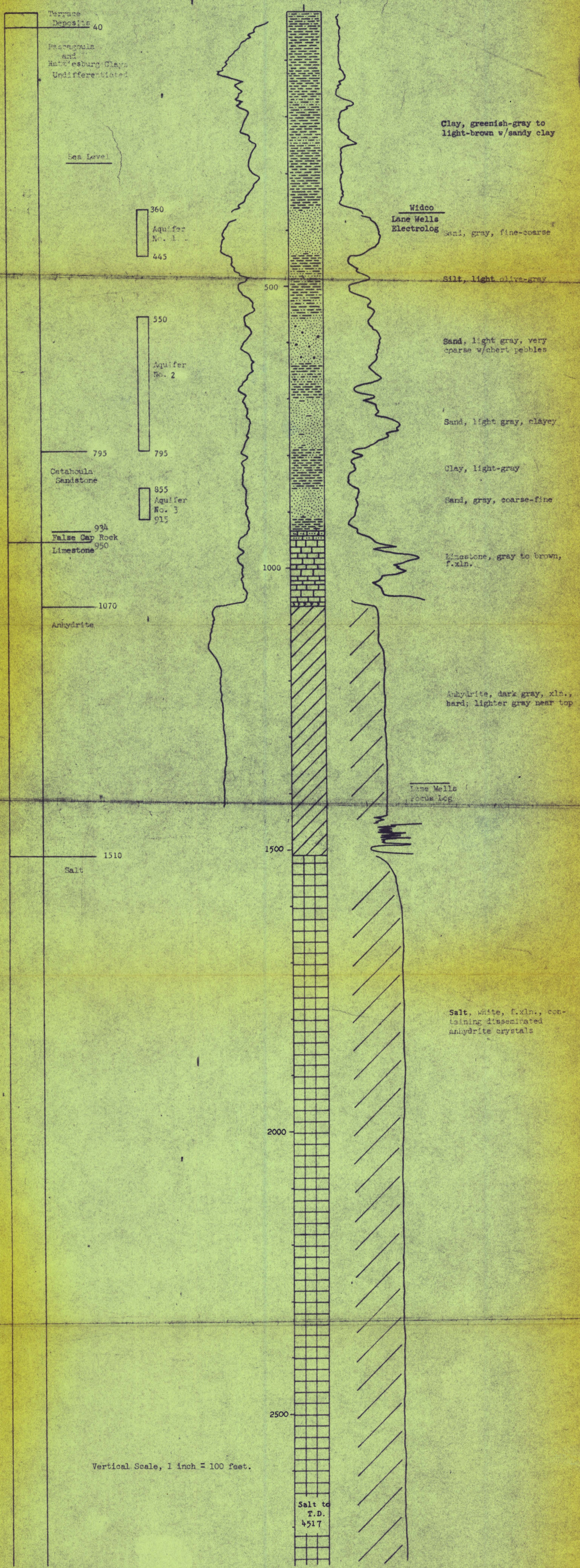


Figure 2.--Lithologic and electrical logs of Exploratory Test Hole 1, Tatum salt dome, showing most significant aquifers.