AN INVESTIGATION OF WATER SUPPLY PROBLEMS AT ALCORN COLLEGE LORMAN, MISSISSIPPI

by

Wilbur T. Baughman

INFORMATION SERIES MGS-72-3
MISSISSIPPI GEOLOGICAL, ECONOMIC AND TOPOGRAPHICAL SURVEY

WILLIAM HALSELL MOORE
Director and State Geologist

JACKSON, MISSISSIPPI
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STATE OF MISSISSIPPI

Hon. William L. Waller ..... Governor

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AND TOPOGRAPHICAL SURVEY
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LETTER OF TRANSMITTAL

Office of the Mississippi Geological, Economic and
Topographical Survey
Jackson, Mississippi
October 2, 1972

Mr. Gordon W. Gulmon, Chairman
and Members of the Board
Mississippi Geological Survey

Gentlemen:

I am pleased to transmit to you Mississippi Geological Survey Information Series 72-3, "An Investigation of Water Supply Problems at Alcorn A & M College," by Wilbur T. Baughman.

This publication is a result of a request made by Hon. John R. Junkin, Speaker of the House, to the Director of the Survey and to Mr. Gordon W. Gulmon, Chairman of the Board. The investigation is an example of application of geologic principles to solve a problem in the public interest. I believe that it is a very good demonstration of the services that can be rendered to the State of Mississippi by the Mississippi Geological Survey.

Respectfully submitted,

William H. Moore
Director and State Geologist

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INTRODUCTION

On October 12, 1971, the State Geologist and Members of the Mississippi Geological Survey Board were present at a hearing before the Mississippi State Budget Commission. In the discussion of various facets of the Survey's work the problem of finding good water supplies for both the private and public sectors was discussed. Mr. John R. Junkin, Speaker of the Mississippi House of Representatives, made the group aware of a water supply problem at Alcorn A & M College at Lorman, Mississippi. Mr. Junkin informed the group that the water supply at Alcorn is of poor quality requiring constant treatment and is of insufficient quantity. He suggested that the Mississippi Geological Survey investigate this matter with the idea of making recommendations as to a better water supply for this facility.

The Board of the Mississippi Geological Survey consisting of Gordon W. Gulmon, Natchez, Chairman; John K. Gresham, Greenville, Vice Chairman; O. B. Curtis, Jackson; Troy J. Laswell, Starkville; and S. F. Thigpen, Jr., Bay Springs, concurred in Mr. Junkin's suggestion and asked the State Geologist to proceed with this investigation.

The State Geologist directed Mr. Wilbur Baughman, ground water geologist, to assemble data on the present water supply at Alcorn A & M and make recommendations as to what could be done to improve this water supply. Mr. Baughman contacted officials of Alcorn A & M and also Mr. Cecil Yarbro of the State Building Commission and obtained data on the present wells being used at Alcorn. He also obtained the information that was available on previous test holes in the Alcorn area. After examining this information Mr. Baughman concluded that the water supply previously being utilized contained sufficient extraneous matter as to require continuous and costly treatment, and suggested that a logical pattern of test holes in this area would probably find additional usable aquifers.

At this time, Mr. Alvin Bicker and Mr. James May of the Survey staff visited Alcorn College and contacted Alcorn College President, Dr. Walter Washington. Dr. Washington was very interested in upgrading the water supply and offered all cooperation in this project. This cooperation was forthcoming and was extremely helpful throughout the project. Mr. Bicker and Mr. May examined the present water plant and located previous test holes. This information was passed on to Mr. Baughman who took this information along with the other pertinent data which he had developed in this area and proceeded to Alcorn College to undertake a systematic investigation with hopes that it would eventually lead to a better water supply for the College. Information developed by Mr. Baughman and his recommendations comprise the body of this report.

PRESENT WATER SUPPLY

At the present time the water supply at Alcorn A & M College is from an aquifer at approximately 200 feet. This acquifer is in a Terrace deposit above the Miocene Formations. A chemical analysis of water from this aquifer was performed by the Mississippi State Board of Health. This analysis is as follows:

Total hardness as $CaCO_3$	334 ppm
Alkalinity (M)	354 ppm
Calcium as Ca	127.40 ppm
Magnesium as Mg	3.88 ppm
Total Iron	0.6 ppm
Free Carbon Dioxide	77 ppm
pH	7.0
Chlorides	.5 ppm

No color

With proper treatment water from this aquifer meets public health standards. However, the calcium carbonate content and total hardness of this water makes treatment very expensive. In addition the water has caused much damage to boilers, tap faucets, hot water heaters, etc. Hardness of 50 to 150 is acceptable for most purposes, however laundries and other industries using large quantities of soap generally find it profitable to reduce hardness to 50 ppm. Recent tests have shown the hardness of Alcorn's water to be as high as 426 ppm.

There are two Miocene aquifers which are developed in the Alcorn area. The upper Miocene aquifer, 335 feet to 475 feet deep, has been used as a source of water supply for the College but is not now being used. An analysis by the Mississippi State Board of Health on water from this aquifer is as follows:

Total dissolved solids	322.38 ppm
Total hardness as $CaCO_3$	37.56 ppm
Alkalinity (P)	0 ppm
Alkalinity (M)	288 ppm
Calcium as Ca	9.15 ppm
Magnesium as Mg	3.58 ppm
Total iron	0.3 ppm
Free Carbon Dioxide	40 ppm
pH	7.2
Fluorides	0 ppm
Chlorides	8 ppm
SO_4	5.40 ppm

No color

Water from this aquifer should meet quality standards with little or no treatment. Analysis from the lower Miocene aquifer, approximately 700 feet deep, is as follows:

Total Dissolved solids	960 ppm
Chlorides	270 ppm
Total iron	.3 ppm
pH	8.0

270 Color

Waters from this aquifer are not capable of producing potable water. The most objectionable qualities of this water are a red color (270), total dissolved solids of 960 ppm and chloride 270 ppm. Electrical logs of oil tests in this area show no aquifer capable of producing fresh water in the Alcorn area below the above described sands.

FIELD INVESTIGATIONS

The most logical way to obtain a good water supply for the College seems to be the location of sufficient developments of the middle aquifer (335 feet to 475 feet), to augment or replace the present source of supply. In January 1972 the Mississippi Geological Survey moved its portable drilling rig into the Alcorn area and proceeded to drill test holes at locations thought to be favorable for such aquifer development. The location of these test holes, present wells and previous test holes are indicated on Plate 1. Test Hole No. 72-1 penetrated 31 feet of the aquifer from 335 feet to 366 feet; Test Hole No. 72-2A encountered no development of sand in this zone; Test Hole No. 72-3 penetrated 56 feet of sand from 400 feet to 456 feet; Test Hole No. 72-4 found 27 feet of sand from 380 feet to 407 feet; Test Hole No. 72-5 penetrated 47 feet of sand from 316 feet to 363 feet and after an 11 foot clay break an additional 16 feet of sand from 375 feet to 391 feet was encountered. Electrical logs of these test holes with a stipled area showing the aquifer development are on Plate 2.

RECOMMENDATIONS

Survey representatives were informed by Mr. Charles Jackson, Water System Engineer at Alcorn, that approximately 500,000 gallons of water per day is used in supplying the College. If repairs and renovations to the present water lines could be made and some conservation practices initiated, Mr. Jackson feels that 400,000 gallons of water per day would be sufficient to sustain demands made by the Campus even with an increased enrollment. On the basis of our investigations it is our opinion that such a supply can be developed from the Miocene aquifer

at 335 feet to 475 feet without adversely affecting the water level of the area. This would be possible with properly spaced and conservatively pumped wells. It is our opinion that the drilling of three new wells and the replacing or reworking of the existing well on the southern part of the Campus would supply this amount of water. Care should be taken that proper monitoring of the static water levels be practiced, if and when such wells are drilled. Accurate knowledge of the static water level changes could insure proper production.

Wells could be drilled as follows:

1. Test Hole Location 72-1: At this location a well could be drilled capable of producing 150 gpm. It would be advisable to produce this well at 100 gpm at a desired pressure with the above mentioned capacity as a reserve.

2. Test Hole Location 72-3: At this location a well could be drilled capable of producing 250 gpm. This well could be produced at 175 gpm with desired pressure.

3. Test Hole Location 72-4: At this location a well could be drilled capable of producing 150 gpm. This well could be produced at 100 gpm with desired pressure.

4. Reworking the old well on the southern part of the Campus and producing at 125 gpm. An alternate to No. 4 would be to construct a new well at Test Hole Location 72-5 capable of producing 250 gpm and producing at 150 gpm.

The above plan would yield 500 gpm and the alternate would yield 525 gpm. Either of these plans coupled with the additional storage would be capable of sustaining the demand for the present time and would be sufficient for future needs for a number of years.

Production of 500 gpm would have a peak design of 720,000 gpd. This is 220,000 gpd above present usage. The alternate plan of 525 gpm would have a peak design yield of 756,000 gpd or 256,000 gpd more than present usage. With the additional capacity planned in the drilling of the wells a production of 800 gpm, or 1,152,000 gpd could be obtained for periods of increased need for a short time.

The Survey was asked by the Mississippi State Building Commission to assemble cost data for construction of the aforementioned wells, pipe lines and an additional 500,000 gallon storage facility for Alcorn College. The figures assembled are estimates as of January 1, 1972 and should not be considered or construed to be firm prices.

WELLS:

One 375' gravel wall well designed to produce 150 gpm with 100 gpm pump; one 410' gravel wall well designed to produce 150 gpm with 100 gpm pump; one 460' gravel wall well designed to produce 250 gpm with 175 gpm pump; and one 390' gravel wall well designed to produce 250 gpm with 150 gpm pump, each including controls, gate valves, check valves and ready to tie in to pipelines.

Estimated cost	$140,000.00
Estimated cost for first three stated wells and reworking existing well on south side of campus would be approximately	$115,000.00

REMOTE CONTROLS FOR WELLS:

± $1,000.00/well or $4,000.00

PIPELINES:

± 6800' 8" CIP (coated)	$17,000.00
Alternate 8" PVC	14,000.00

(Price is for pipelines being installed by college — includes cost of material only)

EASEMENTS FOR PIPELINES & WELL LOTS:

2 Lots @ $1500.00	$ 3,000.00
Easements	1,000.00
	$ 4,000.00

STORAGE FACILITY:

500,000 gal. elevated tank	$275,000.00
(Alt.) 500,000 gal. ground storage	200,000.00

SUMMARY OF COST ESTIMATES:

4 wells	$140,000.00
Remote controls	4,000.00
*8" CIP Lines	17,000.00
Easements and Lots	4,000.00
	$165,000.00

Additional storage would be needed then as is the case now.

*500,000 gal. elev. storage $275,000.00

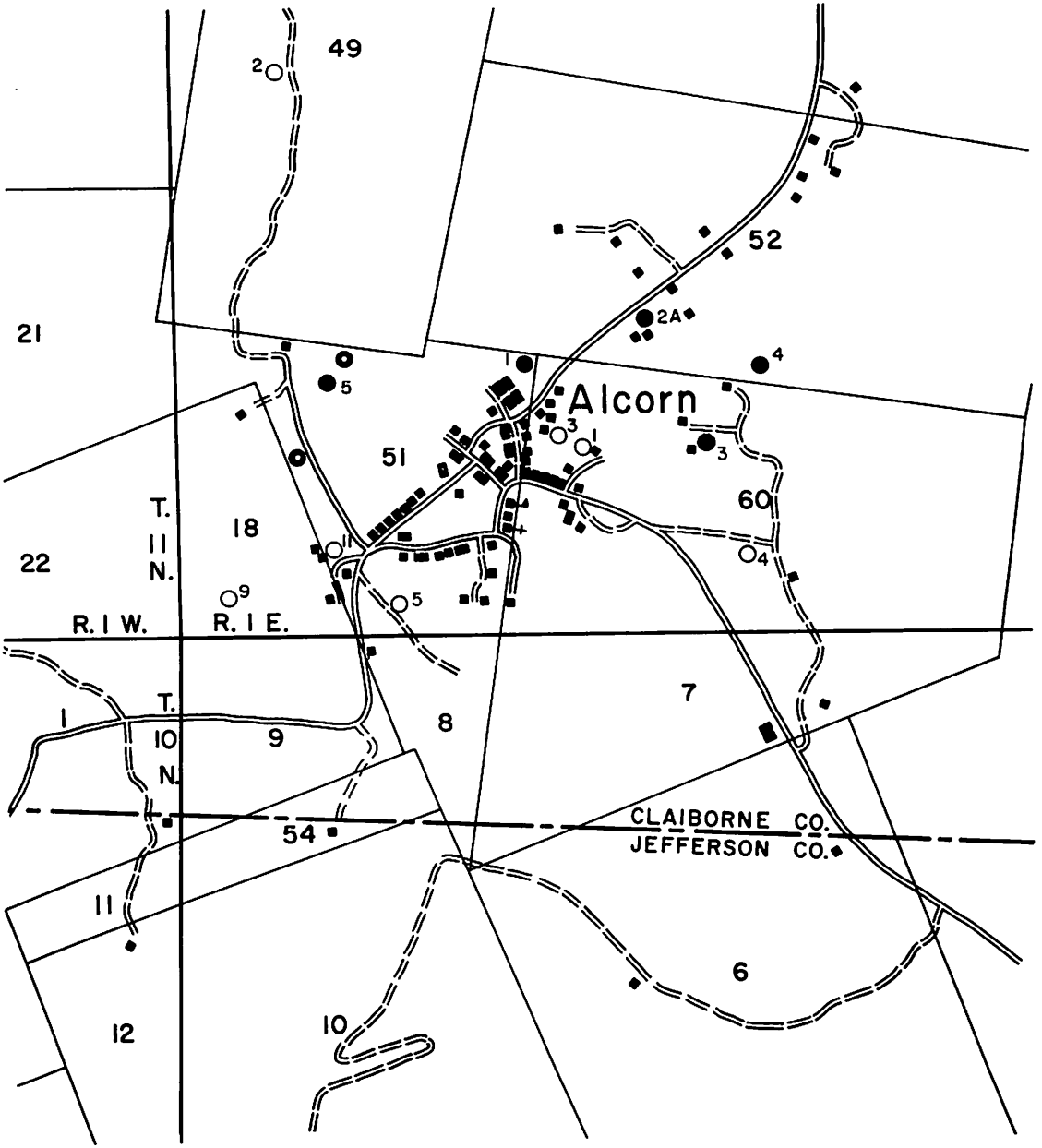
Note: All estimates are exclusive of engineering fees.

*Estimates supplied by Mr. Charles Jackson, water system engineer. Pipe line construction would be handled by Alcorn—this cost is for materials only.

We believe that the implementation of the recommended plan would insure a good water supply for Alcorn College. The additional storage facility is badly needed because in the event of fire the present storage area would be rapidly depleted.

ACKNOWLEDGMENTS

The Mississippi Geological Survey wishes to acknowledge the cooperation of Dr. Walter Washington and his staff. Also, Mr. D'Anjou, plant engineer; Mr. Jackson, water system engineer, and Mr. Buck, plumbing superintendent. Mr. Cecil Yarbro of the Mississippi State Building Commission was very helpful in furnishing background data for this report. We also appreciate the cooperation of Mr. J. C. McDonald of the Mississippi State Board of Health, and Mr. Ernest Boswell and Mr. James Callahan of the U. S. Geological Survey Water Resources Branch. Singer-Lavne Company and other water well contractors in the area furnished cost estimates and other technical advice.


49
52
21
Alcorn
51
60
22
18
T.
11
N.
R. 1 W.
R. 1 E.
7
8
9
T.
10
N.
CLAIBORNE CO.
JEFFERSON CO.
54
11
6
12
10
LEGEND
PREVIOUS TEST HOLES
OLD WELLS
TEST HOLES DRILLED BY MGS

72-1

MISSISSIPPI GEOLOGICAL SURVEY

WIDCO

DATE 1-11-72 ELECTRICAL LOG FILE NO. K11

MISSISSIPPI, CLAIBORNE COUNTY, T. 11N, R. 1E, Section, 51

Location: NEAR NE CORNER OF SECTION

OWNER ALCORN A & M COLLEGE TH #72-1

LORMAN, MISSISSIPPI

LOG INTERVAL 4' TO 390' DATUM: G.L.

TO ELEVATION: 245' TOPO

RUN NO.	1	2
DATE	1-11-72	
T.D., CASING	-	
T.D., LOGGER	390'	
T.D., DRILLER	390'	

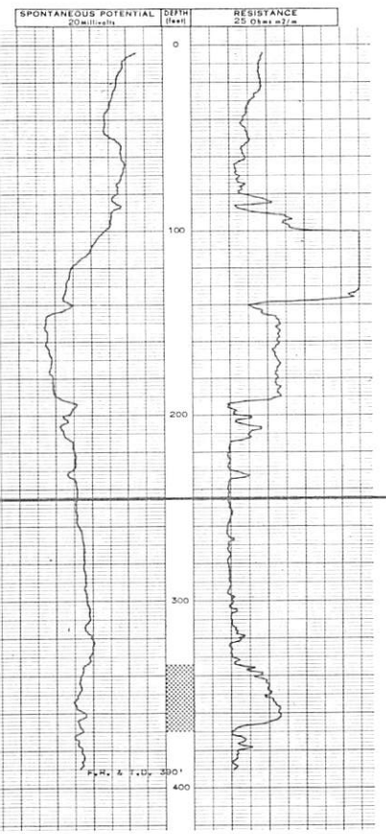
FLUID RESISTIVITY ___ OHMS AT ___° F.

FLUID LEVEL 0 FEET

NATURE OF FLUID

REMARKS: DRLD. BY MISS. GEOL. SURVEY, SURVEY HAS SAMPLES. W. BAUGHMAN, GEOL; R. WARREN, DRLR; J. WARREN, HELPER.

RECORDER: W. BAUGHMAN



72-2A

MISSISSIPPI GEOLOGICAL SURVEY

WIDCO

DATE 1-19-72 ELECTRICAL LOG FILE NO. K13

MISSISSIPPI, CLAIBORNE COUNTY, T. 11N, R. 1E, Section, 52

Location: FR SW COR. OF SEC. GO 2200' E ALONG SL, THENCE N @ RA 535' (APPROX)

OWNER ALCORN A & M COLLEGE TH #72-2A (PATTON EST. PROPERTY)

LORMAN, MISSISSIPPI

LOG INTERVAL 6' TO 401' DATUM: G.L.

TO ELEVATION: 250' TOPO

RUN NO.	1	2
DATE	1-19-72	
T.D., CASING	-	
T.D., LOGGER	401'	
T.D., DRILLER	401'	

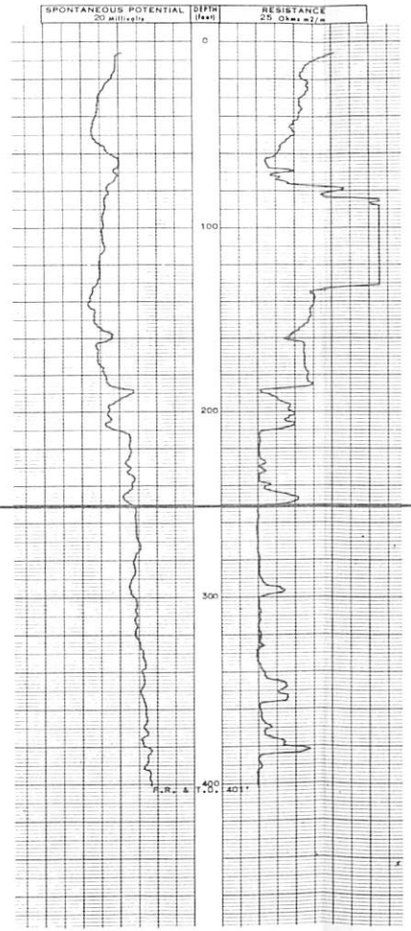
FLUID RESISTIVITY ___ OHMS AT ___° F.

FLUID LEVEL ___ FEET

NATURE OF FLUID

REMARKS: DRLD. BY MISS. GEOL. SURV. SURVEY HAS SAMPLES. W. BAUGHMAN, GEOL; R. WARREN, DRLR; J. WARREN, HELPER.

RECORDER: W. BAUGHMAN



72-3

MISSISSIPPI GEOLOGICAL SURVEY

WIDCO

DATE 1-26-72 ELECTRICAL LOG FILE NO. K14

MISSISSIPPI, CLAIBORNE COUNTY, T. 11N, R. 1E, Section, 60

Location: FR NW COR. OF SEC. GO 1850' E ALONG SL, THENCE N @ RA 600' TO LOC. (APPROX)

OWNER ALCORN A & M COLLEGE TH # 72-3 (CHAS. CLARK PROPERTY)

LORMAN, MISSISSIPPI

LOG INTERVAL 4' TO 471' DATUM: G.L.

TO ELEVATION: 262' TOPO

RUN NO.	1	2
DATE	1-26-72	
T.D., CASING	-	
T.D., LOGGER	471'	
T.D., DRILLER	471'	

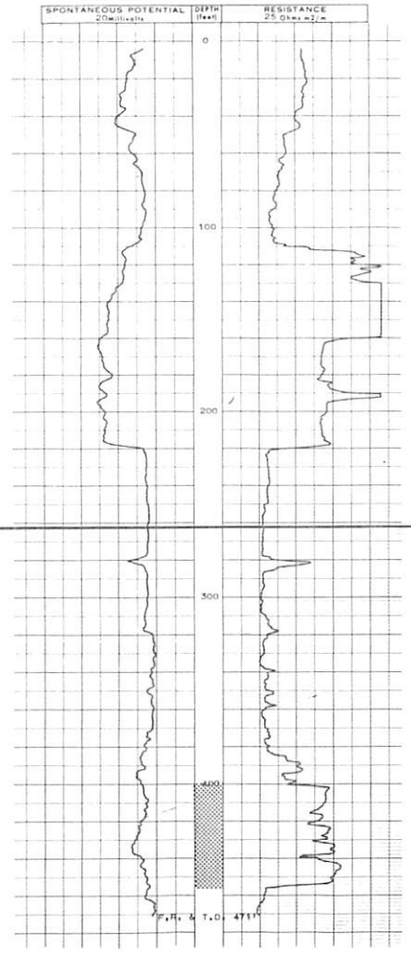
FLUID RESISTIVITY ___ OHMS AT ___° F.

FLUID LEVEL 0 FEET

NATURE OF FLUID

REMARKS: DRLD. BY MISS. GEOL. SURV. SURVEY HAS SAMPLES. W. BAUGHMAN, GEOL.; R. WARREN, DRLR.; J. WARREN, HELPER.

RECORDER: W. BAUGHMAN



72-4

MISSISSIPPI GEOLOGICAL SURVEY

WIDCO

DATE 2-10-72 ELECTRICAL LOG FILE NO. K16

MISSISSIPPI, CLAIBORNE COUNTY, T. 11N, R. 1E, Section, 52

Location: APPROX 2400' E ALONG SL FR NW COR SEC 60 & 150' S @ RA TO LOC

OWNER ALCORN A & M COLLEGE TH # 72-4 (WILLIAMS PROPERTY)

LORMAN, MISSISSIPPI

LOG INTERVAL 5' TO 471' DATUM: G.L.

TO ELEVATION: 265' TOPO

RUN NO.	1	2
DATE	2-27-72	
T.D., CASING	-	
T.D., LOGGER	471'	
T.D., DRILLER	471'	

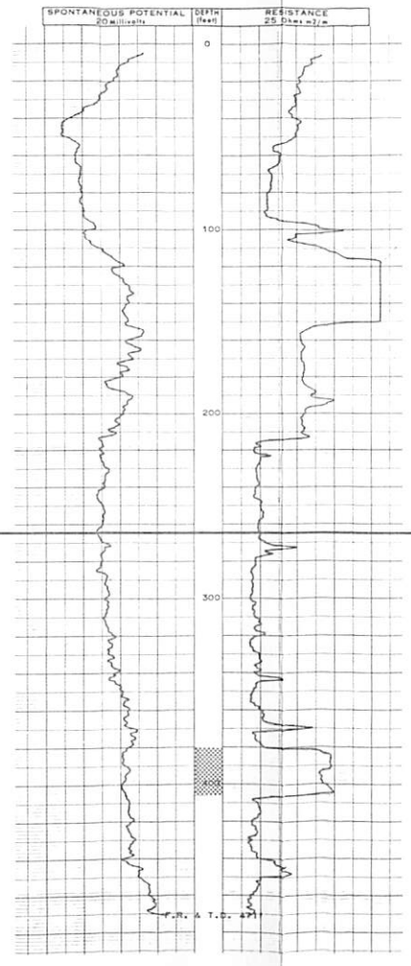
FLUID RESISTIVITY ___ OHMS AT ___° F.

FLUID LEVEL 0 FEET

NATURE OF FLUID

REMARKS: DRLD. BY MISS. GEOL. SURVEY, SURVEY HAS SAMPLES. W. BAUGHMAN, GEOL.; R. WARREN, DRLR.; J. WARREN, HELPER.

RECORDER: W. BAUGHMAN



72-5

MISSISSIPPI GEOLOGICAL SURVEY

WIDCO

DATE 2-22-72 ELECTRICAL LOG FILE NO. K17

MISSISSIPPI, CLAIBORNE COUNTY, T. 11N, R. 1E, Section, 51

Location: APPROX 900' W ALONG SL FR SE COR SEC 49 & 450' S @ RA TO LOC

OWNER ALCORN A & M COLLEGE TH # 72-5

LORMAN, MISSISSIPPI

LOG INTERVAL 10' TO 401' DATUM: G.L.

TO ELEVATION: 245' TOPO

RUN NO.	1	2
DATE	2-18-72	
T.D., CASING	-	
T.D., LOGGER	401'	
T.D., DRILLER	401'	

FLUID RESISTIVITY ___ OHMS AT ___° F.

FLUID LEVEL 10 FEET

NATURE OF FLUID

REMARKS: DRLD. BY MISS. GEOL. SURVEY, SURVEY HAS SAMPLES. W. BAUGHMAN, GEOL.; R. WARREN, DRLR.; J. WARREN, HELPER.

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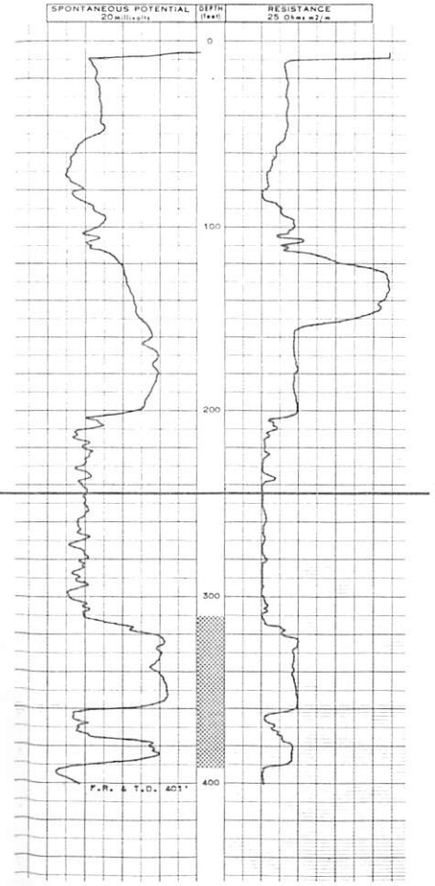

sea level

PLATE 2 - ELECTRICAL LOGS SHOWING DESIRABLE AQUIFERS AVAILABLE FOR WATER SUPPLY AT ALCORN A & M COLLEGE.