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ASSESSMENT OF THE GEOTHERMAL/GEOPRESSURE POTENTIAL OF THE GULF COASTAL PLAIN OF ALABAMA

MASTER

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Geological Survey of Alabama
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1980

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CONTENTS

Page

LIST OF FIGURES iv
LIST OF TABLES vii
LIST OF APPENDICES vii

ABSTRACT viii
EXECUTIVE SUMMARY ix

INTRODUCTION (By Gary V. Wilson) 1
Study Objectives 2
Previous Studies 4
Research Methods and Report Presentation 5

GEOLOGIC SETTING (By Gary V. Wilson) 7
Stratigraphy and Structure of Southwest Alabama 7
Stratigraphy and Structure of Southeast Alabama 20
Composition, Age, and Configuration of Basement Rocks. . 21

REGIONAL STRATIGRAPHY OF UPPER JURASSIC SMACKOVER CARBONATES OF SOUTHWEST ALABAMA (By Ernest A. Mancini) . . . 28
Introduction 28
Geologic Setting 30
Stratigraphy and Lithofacies 36
Reservoir Rocks 51
Thermal Alteration 53
Summary and Conclusions 53

SMACKOVER PETROGRAPHY (By D. Joe Benson) 57
Introduction 57
Lithofacies 57
Porosity 61
Primary Porosity 61
Secondary Porosity 69
Porosity Summary 71

GEOPHYSICAL DATA (By Gary V. Wilson) 72
Southwest Alabama 72
Southeast Alabama 76

CONTENTS (Continued)

	Page
LOG ANALYSES FOR THE DETERMINATION OF FORMATION PRESSURES AND TEMPERATURES IN SOUTH ALABAMA (By George C. Wang)	80
Introduction	80
Well-Logging Methods for Detecting and Evaluating Abnormal Formation Pressures	80
Geopressured Wells in Southwest Alabama	84
Determination of Abnormally Pressured Zones	86
Quantitative Pressure Evaluation	99
Origin of Abnormally High Pressures	101
Geothermal Investigation	102
Geopressure Summary	105
THERMAL VARIATIONS AND ANOMALIES IN THE SUBSURFACE OF THE ALABAMA COASTAL PLAIN (By Gary V. Wilson)	106
Data Compilation, Reliability, and Presentation	106
Geothermal Gradient Maps of Southwest Alabama	111
Isothermal Maps of Southwest Alabama	115
Temperature Map of the Norphlet Formation	120
Geothermal Gradient Map of Southeast Alabama	120
Correlation of Thermal, Geological, and Geophysical Data	122
A Warm "Spring" in Houston County	125
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS (By Gary V. Wilson)	127
REFERENCES	137

List of Figures

Figure		Page
1.	Index map of Alabama showing area of study	3
2.	Generalized stratigraphic column of Cenozoic and Mesozoic units in the oil and gas producing areas of southwest Alabama	8
3.	Regional isopach map of the Smackover Formation in southwest Alabama and northwest Florida	10
4.	Regional isopach map of the Haynesville Formation in southwest Alabama and northwest Florida	12
5.	Oil and gas test-well data sheet	14
6.	Major structural features of southwest Alabama and northwest Florida	15
7.	Regional structure map on top of Norphlet Formation (Jurassic age)	19
8.	Index map to wells penetrating pre-Mesozoic basement and Mesozoic volcanic rock under the Coastal Plain of Alabama	23
9.	Configuration of the basement surface of southwest Alabama from well data	25
10.	Configuration of the basement surface of southeast Alabama from well data	27
11.	Jurassic subsurface stratigraphy in southwest Alabama	29
12.	Paleogeographic map of southwest Alabama during Smackover time and locations of wells from which cores were studied	32
13.	Regional structure map on top of the Smackover Formation in southwest Alabama	34
14.	Carbonate lithologies identified in the core from Placid, Jackson no. 1, 4 miles north of Toxey, Choctaw County, Alabama	38
15.	Carbonate lithologies identified in the core from Inexco, W. J. Britton no. 1, 12 miles northwest of Chatom, Washington County, Alabama	40
16.	Carbonate lithologies identified in the core from Getty, C. D. Broughton no. 3, 7.5 miles northwest of Uriah, Monroe County, Alabama	42
17.	Carbonate lithologies identified in the core from Getty, Blacksher Estate no. 1, 1 mile northwest of Uriah, Monroe County, Alabama	43
18.	Carbonate lithologies identified in the core from Exxon, W. D. Harrigan no. 1, 8 miles northeast of Coffeeville, Clarke County, Alabama	45
19.	Carbonate lithologies identified in the core from Exxon, L & N Railroad no. 1, 1.5 miles west of Pollard, Escambia County, Alabama	46
20.	Carbonate lithologies identified in the core from Getty, Peter Klein no. 1, 12 miles northeast of Mobile County, Alabama	49

List of Figures (Continued)

Figure Page

21. Carbonate lithologies identified in the core from Chevron-Shell, J. A. Bryars no. 1, 5 miles south of Stockton, Baldwin County, Alabama 50
22. Interpretation of crustal structure in southeast Mississippi from refraction seismic data 73
23. Bouguer gravity map of southwest Alabama 75
24. Vertical magnetic intensity map of southwest Alabama 77
25. Bouguer gravity map of southeast Alabama 78
26. Geopressured wells in southwest Alabama and geothermal gradients 83
27. Geopressured wells in southwest Alabama and geopressure gradients 85
28. Well no. 1708, shale resistivity versus depth 87
29. Well no. 1777, shale resistivity versus depth 88
30. Well no. 1791, shale resistivity versus depth 89
31. Well no. 1907, shale resistivity versus depth 90
32. Well no. 2075, shale resistivity versus depth 91
33. Well no. 2141, shale resistivity versus depth 92
34. Well no. 2149, shale resistivity versus depth 93
35. Well no. 2339, shale resistivity versus depth 94
36. Areal extent of porous and permeable sand within permeable lower Haynesville Formation of southwest Alabama 97
37. Compensated Neutron Formation Density Log through porous and permeable sand within lower Haynesville Formation in Southeastern Exploration, Shomo Land Unit 31-11 (Permit 1791), Monroe County, Alabama 98
38. Temperature versus depth in Damson Oil Corporation, Tyler Odom no. 1 (Permit 1053A), Washington County, Alabama 109
39. Geothermal gradient map of southwest Alabama (calculated from maximum recorded temperatures in oil and gas test-wells that bottom in Cretaceous age rocks) 113
40. Geothermal gradient map of southwest Alabama (calculated from maximum recorded temperatures in oil and gas test wells that bottom in pre-Cretaceous age rocks) 114
41. 158°F (70°C) Isothermal map of southwest Alabama 116
42. 212°F (100°C) Isothermal map of southwest Alabama 117
43. 302°F (150°C) Isothermal map of southwest Alabama 118
44. Bottom-hole temperatures in the Norphlet Formation of southwest Alabama 121
45. Geothermal gradient map of southeast Alabama 123
46. Baldwin County map showing locations of wells for which geothermal data are listed in Appendix B 171
47. Bullock County map showing locations of wells for which geothermal data are listed in Appendix B 176
48. Butler County map showing locations of wells for which geothermal data are listed in Appendix B 178

List of Figures (Continued)

Figure Page

49. Choctaw County map showing locations of wells for which geothermal data are listed in Appendix B 180
50. Area within Choctaw County showing locations of wells included in Appendix B that bottom in Cretaceous age rocks . 181
51. Area within Choctaw County and northwest Clarke County shwoing locations of wells included in Appendix B that bottom in Jurassic age rocks 182
52. Clarke County map showing locations of wells for which geothermal data are listed in Appendix B 196
53. Area within Clarke County showing locations of wells for which geothermal data are listed in Appendix B 197
54. Coffee County map showing locations of wells for which geothermal data are listed in Appendix B 207
55. Conecuh County map showing locations of wells for which geothermal data are listed in Appendix B 209
56. Covington County map showing locations of wells for which geothermal data are listed in Appendix B 212
57. Crenshaw County map showing locations of wells for which geothermal data are listed in Appendix B 214
58. Dallas County map showing locations of wells for which geothermal data are listed in Appendix B 216
59. Escambia County map showing locations of wells for which geothermal data are listed in Appendix B 218
60. Area within Escambia County showing locations of wells included in Appendix B that bottom in Cretaceous age rocks . 219
61. Area within Escambia County showing locations of wells included in Appendix B that bottom in Jurassic age rocks . . 220
62. Geneva County map showing locations of wells for which geothermal data are listed in Appendix B 232
63. Henry County map showing locations of wells for which geothermal data are listed in Appendix B 234
64. Houston County map showing locations of wells for which geothermal data are listed in Appendix B 236
65. Lowndes County map showing locations of wells for which geothermal data are listed in Appendix B 238
66. Marengo County map showing locations of wells for which geothermal data are listed in Appendix B 240
67. Mobile County map showing locations of wells for which geothermal data are listed in Appendix B 242
68. Monroe County map showing locations of wells for which geothermal data are listed in Appendix B 251
69. Pike County map showing locations of wells for which geothermal data are listed in Appendix B 255
70. Washington County map showing locations of wells for which geothermal data are listed in Appendix B 257
71. Wilcox County map showing locations of wells for which geothermal data are listed in Appendix B 263

List of Tables

Table | Page

1. Kerogen analyses (Smackover Formation) 54
2. Smackover cores used to determine lithofacies and porosity development 58
3. Carbonate mineralogy as determined by x-ray diffraction analysis 59
4. Characteristics of lithofacies 62
5. Porosity types and abundance in lithofacies studied 67
6. Overpressured wells in southwest Alabama 95
7. Abnormal pressures and pressure gradients 100
8. Summary of geothermal gradient calculations 104

List of Appendices

Appendix | Page

A. Petrographic descriptions of selected Smackover cores . . . 146
B. Geothermal data for south Alabama 170

EXECUTIVE SUMMARY

This report provides comprehensive data for a reconnaissance overview and assessment of the potential for the future development of geothermal resources in the area of the Alabama Coastal Plain. Surface and near-surface indicators of geothermal resources, such as natural hot springs, near-surface thermal halos, and recent volcanism, are absent in the area. For this reason, the investigation was oriented toward an evaluation of the geothermal and geopressure variations and anomalies in the subsurface, and the study was based on data provided by wire-line logs of oil and gas test wells. Because of the inherent restrictions imposed by these types of data, a thorough evaluation of the geothermal potential for the area is not possible. However, these data do provide the important background information necessary for more detailed studies in the future and also suggest certain areas where these studies should be conducted.

Various types of data were examined from more than 1,300 wells in south Alabama. These included maximum recorded temperatures, mud weights, rock resistivities as related to geopressure, formation tops, fault locations, and depths to basement rock. In addition, petrographic studies were performed on selected cores from the Smackover Formation, a carbonate rock unit that is considered to have potential in some areas as a hydrothermal reservoir.

The Alabama Coastal Plain area is underlain by a conduction-dominated, deep sedimentary basin, a type of geothermal regime that comprises the largest part of the world's geothermal energy resource base. Geothermal gradients generally range from low to moderate (1.0 to 1.8°F/100 feet). Because sediments reach great thicknesses in some areas, temperatures in excess of 300°F have been encountered in deep wells (below 17,000 feet). Several factors may, however, prohibit the development of these deep potential geothermal resources. First, there is an economic restriction imposed by the extremely high cost of drilling to these depths. Secondly, these deep, high temperature rocks often display poor reservoir characteristics (low porosities and permeabilities).

A petrographic study was made of the Jurassic age Smackover Formation, which underlies most of southwest Alabama at depths ranging from 6,000 to 19,000 feet. This carbonate rock unit apparently has sufficient porosity and permeability in some areas to be considered a potential geothermal reservoir. These areas include the southern parts of Choctaw, Clarke, Monroe, and Baldwin Counties and the western part of Washington County. Fluid production records, however, are available only where the formation is productive of oil, and its potential to produce steam or hot water in other areas is unknown. The same is true for the sandstones of the Norphlet Formation, which underlie the Smackover.

The Haynesville Formation, which overlies the Smackover, has been found to contain abnormally high geopressures in parts of Baldwin County and the southern parts of Clarke, Monroe, and Washington Counties. A number of oil and gas test wells have encountered geopressured Haynesville

shales confined above and below by impermeable anhydrite beds. These overpressured shales have a tendency to "flow" into the borehole, thus producing drilling problems, which are avoided by the use of high-density drilling muds. Because these zones occur in intervals composed of anhydrite, gypsum and shale, or rock of poor reservoir qualities, this Haynesville section will not have potential for future geothermal development unless future drilling encounters porous and permeable rock within the interval. The Haynesville Formation does, however, have some potential in a 200-square-mile area located in southernmost Clarke, northernmost Baldwin and southwest Monroe Counties, where a porous and permeable sand zone is encased within massive salt deposits in the lower part of the formation. Over the low-relief salt-cored anticline of the South Carlton oil field in southernmost Clarke County, this sand lies just below a depth of 15,500 feet where it is found to be highly overpressured with a temperature exceeding 260°F.

Another area worthy of future scrutiny and with possible potential for geothermal development is located southeast of the city of Bay Minette in Baldwin County. A test well located on a large regional magnetic high was reported to have a temperature of 218°F at a subsea-level depth of 7,336 feet. With this temperature and depth the calculated gradient is 2.07°F/100 feet, a value significantly higher than the average gradient for the area. Of importance, however, is the fact that this is a one-well anomaly and no additional wells are located within the area for confirmation. Judgement on the potential of this area must await additional drilling.

In the subsurface of the southwest Alabama Coastal Plain, coarse-clastic, sedimentary rocks with hydrothermal aquifer potential are present in the undifferentiated Lower Cretaceous section and in the Cotton Valley Group of Late Jurassic age. These rocks lie at depths as great as 4,000 feet below the surface in the northern part of the area to a depth of 17,000 feet or more in the downdip area along the gulf coast. With the low to moderate geothermal gradients found here, the temperature at these depths will range from about 120°F to as much as 300°F. These sediments overlie the Haynesville Formation, which in some areas has been found to contain abnormally high geopressures and gradients, but which is generally found to have poor-quality reservoir rocks.

In southeast Alabama, warm water from "Sealy Springs" in Houston County has been used for many years as mineral baths. This "spring" is actually an artesian well that was originally drilled as an oil and gas test in the late 1920's. The well casing was perforated at a depth of 4,280 feet and the well began flowing water at a temperature of 112°F and at a rate of 180 gpm. A chemical analysis of the water indicates that it contains only slightly more than 10,000 ppm dissolved solids.

In terms of geothermal potential, southeast Alabama is similar to much of the Atlantic Coastal Plain, where recent studies have concluded that the optimum sites for development will be associated with igneous intrusions into the basement complex. It is possible that these intrusions will be the source of abnormally high heat flow due to their radiogenic element content. There does appear to be some correlation in southeast Alabama between the higher calculated geothermal gradients and

regional gravity maxima. Conclusive evidence is not available, however, since there is a sparsity or total lack of well data in much of southeast Alabama and also an absence of detailed gravity data.

Beneath the southeast Alabama Coastal Plain, the Haynesville Formation is absent and overpressured zones have not been encountered in test wells and are not expected to be found by future drilling. Here, geothermal gradients range from slightly less than 1.0 to slightly more than 1.8°F/100 feet. In the southern tier of counties, including Houston, Geneva, and Covington, temperatures of about 180°F or more may be expected at depths of 7,000 to 13,000 feet. Present at these depths are potential hydrothermal aquifers composed of coarse-grained clastic sediments that overlie basement rocks.

Future development of the potential geothermal resources lying beneath the Alabama Coastal Plain will be restricted to low or moderate temperature, non-electric applications. These constitute a significant potential energy source for possible applications in space heating and cooling and certain agricultural and industrial processes. If future geothermal development in this area is ever to be realized, continued research is needed. It is recommended that future research include the following:

1. The drilling of research geothermal wells and (or) the conversion of dry and abandoned oil and gas wells to research wells.
2. Heat-flow studies from a shallow drill-hole program throughout the area.

3. Gravity and magnetic surveys in southeast Alabama for the purpose of locating basement intrusives.

4. A continuing monitoring program of oil and gas test drilling, including acquisition of data on downhole temperatures, pressures, and rock porosities and permeabilities.

INTRODUCTION

The demands on fossil-fuel energy resources as well as their costs have continued to grow at a rapid pace over the past several decades. In recent years interest has grown in "new," supplemental forms of energy including the potential of the large quantities of heat within the earth, or geothermal energy.

Much of the heat the earth contains is distributed too diffusely throughout the uppermost crust to be considered recoverable. In addition there are a number of restrictions on the utilization of geothermal energy sources, including locality as well as interrelated geologic, hydrologic, temperature, geochemical, and economic constraints. The near-future utilization of geothermal resources as a source of energy will likely occur only in local areas where relatively high temperatures are found at moderate depths and within permeable rocks capable of yielding large volumes of heat-transporting fluids to wells over a long period of time.

Estimates of the geothermal resources of the United States differ by as much as six orders of magnitude. This wide variation is due to a number of factors, primarily the ambiguous definitions of the term "resources" as used by various authors. In addition, there is an inadequate knowledge of the distribution of geothermal "resources" and the geologic environments in which they occur, and an uncertainty in the technological limitations that will be involved in their exploitation.

This study of the geothermal/geopressure potential of the Gulf Coastal Plain of Alabama was made possible by funds provided by the United States Department of Energy (67% of total funds), the Geological Survey of Alabama (21%), and the University of Alabama (12%), and the project was initiated in January 1979.

Study Objectives

The primary objective of this study of the Alabama Gulf Coastal Plain was to identify and interpret geothermal and geopressure anomalies of possible significance to the search for future supplemental sources of energy in the state (figure 1). For many years the only areas considered favorable for the utilization of geothermal resources were located in tectonically active regions where there was either active volcanism or where volcanism had occurred in late Cenozoic time. Also, much of the past research, exploration and development of the geothermal resources of the United States have been directed toward those sources suitable for electric power generation. Recently, however, more emphasis has been placed on research and exploration in deep sedimentary basins where low to moderate geothermal resources may be utilized in many direct-use applications.

The Alabama Coastal Plain does not display the characteristics that in the past have been considered to be indicative of areas of high geothermal potential--namely, recent volcanism, natural hot springs, and near-surface thermal halos. This reconnaissance report results from an effort to provide a comprehensive data base for the "hidden" thermal and geopressure variations and anomalies in the subsurface and an effort to interpret and correlate these features with the known geology.

FIGURE 1. Index map of Alabama showing area of study

Previous Studies

In 1969 a committee was appointed for Alabama to take part in the collection of data to be used in the "Geothermal Survey of North America," a project sponsored by the American Association of Petroleum Geologists. Shelton (1974) reported on some of the preliminary findings of this survey and stated that

> ". . . the map represents the geothermal regime in sedimentary rocks, which is thought to reflect a summation of a number of geologic and geophysical parameters expressed as thermal conduction and thermal convection and hydrodynamics."

Geothermal gradient values in the continental U.S. were found to range from 0.6°F/100 ft of depth in south Florida to 3.0°F/100 ft in eastern Oregon. Temperature measurements taken during the logging of about 160 oil and gas test wells in the south Alabama coastal plain were included in this survey. Geothermal gradient values were calculated for these wells and the area was included in a computer-contoured gradient map (American Association of Petroleum Geologists Research Commission, 1976). Data accumulated for this survey in south Alabama indicate a gradient range from 1.0 to 2.0°F/100 ft of depth.

Smith (1979) reported the results of two heat-flow measurements in the Alabama Gulf Coastal Plain: one in east-central Marengo County and the other in north-central Bullock County. These measurements, which were both determined to be 0.7 heat-flow units (hfu), are considered to be low heat-flow values and are consistent with Smith's findings of 21 heat-flow calculations in the Gulf Coastal Plains of Florida, Alabama, Mississippi, and Louisiana which range from 0.4 hfu to 1.7 hfu. One heat-flow measurement is available for north-central Mobile County, this value being 0.95 hfu (Renner, 1979).

The south Alabama Coastal Plain was included in a comparative study of the geothermal potential of the Atlantic Coastal Plain region (Mitchell, 1979). The study incorporated geologic, engineering and economic factors on a local level. In this report, counties were selected where the geothermal gradient was found to exceed 1.6°F/100 ft of depth in areas where sedimentary rocks exceed 1,000 feet in thickness. Three south Alabama counties listed as potential areas are Baldwin, Marengo, and Pike.

A number of geophysical and geological studies have been conducted in south Alabama. Many of these are referred to in this report and included in the reference section.

Research Methods and Report Presentation

Because surface- and near-surface indicators of geothermal potential are absent in south Alabama, the basic data used in this evaluation study came from down-hole temperatures and pressure information provided by logs of oil and gas test wells. The limitations of these types of data are discussed later in this report.

The scope of this study incorporated and was limited to the following procedures:

Procedure 1. Geothermal and geopressure data were compiled from oil and gas test-well logs

Procedure 2. Geothermal and geopressure variations and anomalies were interpreted and correlated with the geology of the area. A geologic survey included a study of all previous reports and maps, both published and unpublished. Also, a new study which was made on geologic

structure in south Alabama included the correlation of more than 1,000 oil and gas test well logs for formation tops and fault locations. A structural and petrographic study of "basement" rocks was also conducted. In addition, a stratigraphic and petrographic study was made for the Jurassic age Smackover Formation, which in neighboring Mississippi has been found to be highly geopressured in several locations.

Procedure 3. Geophysical data were compiled, interpreted, and correlated with geothermal and geopressure anomalies and known geologic features.

Various geotemperature-related maps were prepared for this report. These maps are based on bottom-hole or maximum recorded temperatures taken during logging operations for oil and gas test wells. These temperatures are recorded on well-log headings along with the elapsed time from the cessation of drilling-fluid circulation to the initiation of logging. All of these logs are on file at the State of Alabama Oil and Gas Board building located on the University of Alabama campus.

This report is divided into separate and distinct sections, three of which concern the geology of the area. Geophysical, geothermal, and geopressure data are each presented in separate parts. The final section of this report summarizes the findings of the study and designates the most promising areas for future geothermal development and resource utilization, and, finally, presents recommendations for future studies.

GEOLOGIC SETTING

Stratigraphy and Structure of Southwest Alabama

The southwest Alabama Coastal Plain area is located on the east flank of the Mississippi Embayment of the northern Gulf Coast Basin. Sedimentary rocks and sediments present here range in age from Paleozoic to Holocene. The thickest deposits occur in Washington County (estimated thickness 25,000 feet). In the study area, known Paleozoic sedimentary rocks are limited to parts of northernmost Choctaw and Marengo Counties where they underlie several thousand feet of Cretaceous sediments. Holocene sediments are restricted to coastal areas and major stream and river valleys. Triassic, Jurassic, and Early Cretaceous deposits occur only in the subsurface. Figure 2 is a generalized stratigraphic column representing most of southwest Alabama with brief descriptions of rock types and also symbols indicating those units in which oil and gas have been found.

The Eagle Mills Formation of Triassic age occurs locally as graben-fill, red-bed clastics and is the oldest of the Mesozoic formations. The Werner Formation, which consists predominantly of anhydrite with varying amounts of shale, sand, and metamorphic rock fragments, is the lowermost rock unit of Jurassic age. Neither the Eagle Mills nor the Werner Formations are widespread beneath the southwest Alabama Coastal Plain and their areas of occurrence are not well delineated.

In southwest Alabama the Louann Salt of Jurassic age ranges in thickness from zero to several thousand feet. The updip limit of

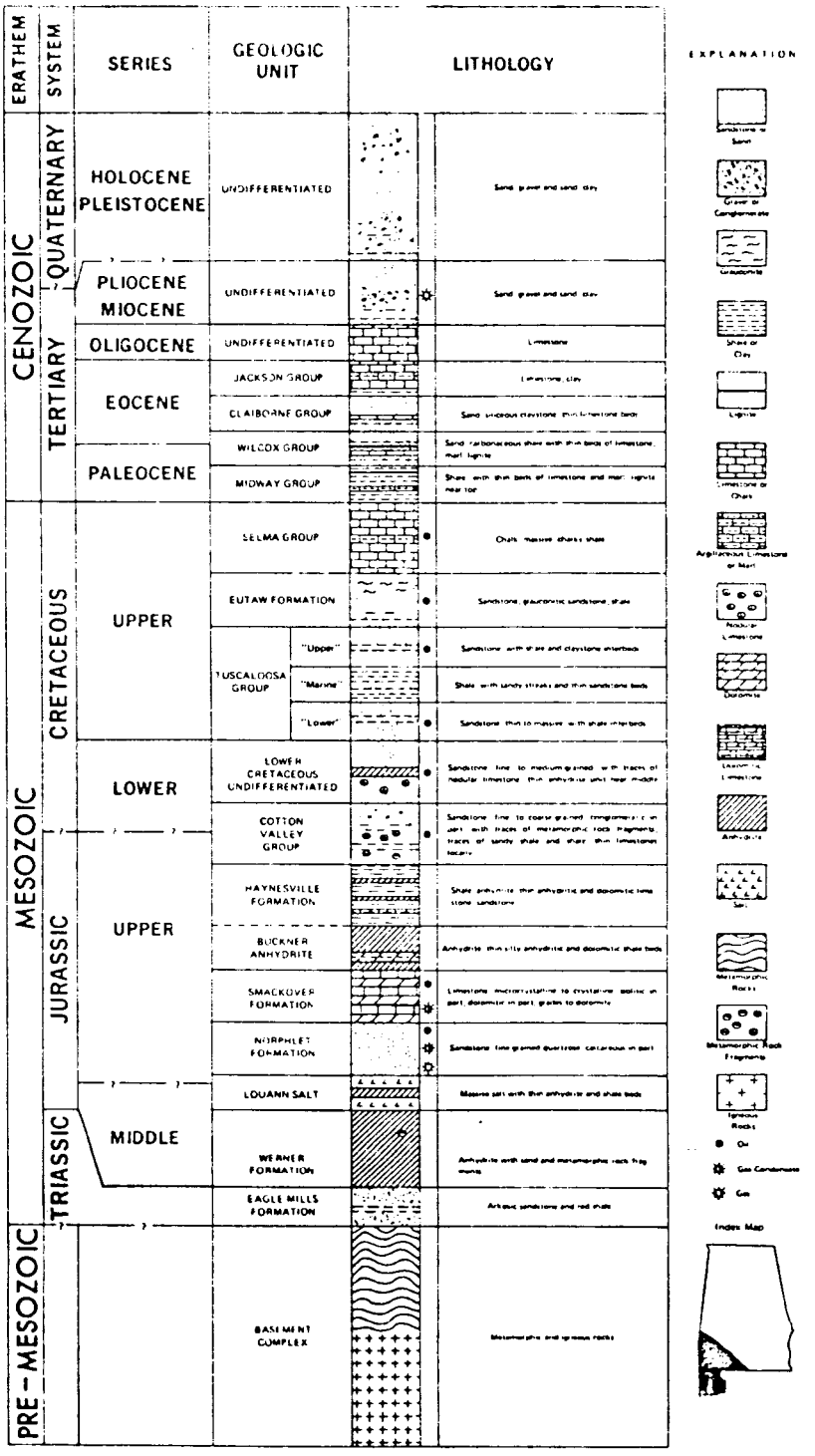


FIGURE 2. Generalized stratigraphic column of Cenozoic and Mesozoic units in the oil and gas producing areas of southwest Alabama

relatively thick deposits of this salt section approximates the Gilbertown-West Bend-Pollard fault system, although a thin section of Louann has been penetrated in several wells located a few miles updip from these faults. The major depocenter for the salt was located in the Mississippi Interior Salt Basin or Perry Basin, the axis of which extends from Mississippi into central Washington County, Alabama.

The Norphlet Formation of Jurassic age is generally a well-cemented, low-porosity, fine-grained, quartzose sandstone that ranges in thickness from zero to several hundred feet. It is the deepest rock formation from which oil and gas is produced in southwest Alabama and, therefore, most deep test wells bottom in this unit. Even where productive, permeabilities seldom exceed 100 millidarcies. The updip limit of the Norphlet approximates that of the overlying Smackover Formation.

The Smackover Formation of Late Jurassic age is a predominantly carbonate section that is the primary target for oil and gas exploration in the area. In Alabama this formation ranges in thickness from 0 to about 550 feet (figure 3). It thickens in a westward direction and attains its maximum thickness of more than 1,200 feet in the central part of the Mississippi Interior Salt Basin. Geopressured geothermal reservoirs have been found in this interior salt basin in secondary porosity zones of Smackover carbonates and sandstones. These reservoirs have high temperatures (356° to 482°F), and contain highly saline waters or diagenetic and metamorphic gases (CH_4, H_2S, and CO_2), all of which are believed to result from Late Cretaceous igneous activity at great depths (Jones, 1977). Because the Smackover is recognized as a potential geothermal reservoir, stratigraphic and petrographic studies were

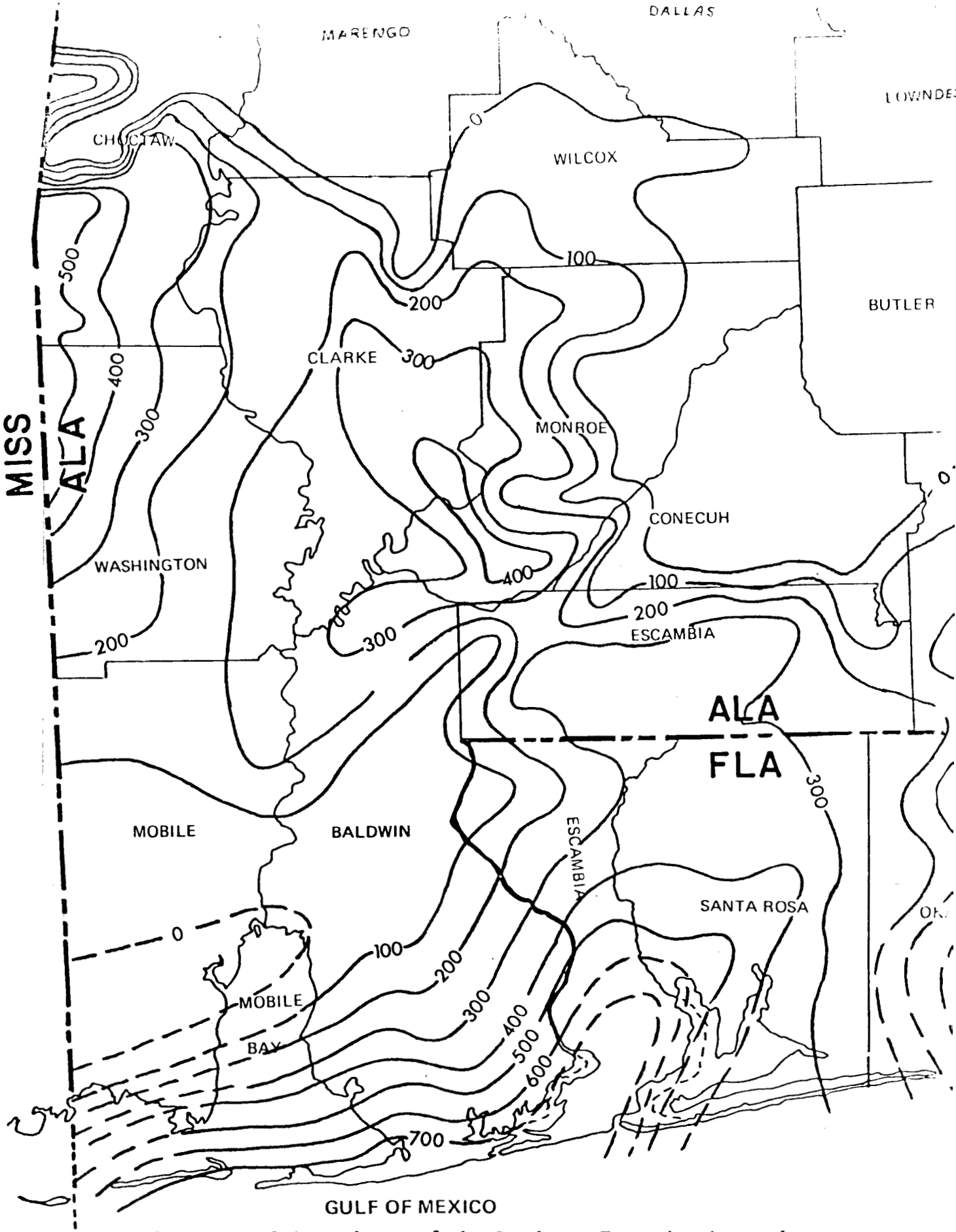


FIGURE 3. Regional isopach map of the Smackover Formation in southwest Alabama and northwest Florida (modified from Wilson, 1975)
contour interval = 100 feet

made of cores from this formation. The results are included as a separate section of this report.

The Haynesville Formation of Late Jurassic age, which consists predominantly of anhydrite and dark-colored shale with lesser amounts of sandstone and limestone, ranges in thickness from 0 to more than 2,800 feet (figure 4). Sandstones occur mostly in the updip areas; in the downdip areas thick salt deposits may occur in the lower part of this formation, which has an areal extent that approximates that of the Smackover. In some parts of southwest Alabama tight and impermeable rocks of the Haynesville act as "insulators" and "pressure seals." This important characteristic is discussed in later parts of this report.

The Cotton Valley Group of Late Jurassic and Early Cretaceous age; thick, undifferentiated Lower Cretaceous sediments; and the Late Cretaceous Tuscaloosa Group and Eutaw Formation all consist predominantly of interbedded sandstones and shales. This section reaches a combined thickness of almost 11,000 feet near the coast. Porosities and permeabilities of these sandstones can be quite good. The thickest sands occur in the Cotton Valley and Tuscaloosa Groups. The uppermost deposits of the Cretaceous are the massive chalks of the Selma Group that range in thickness from 900 to 1,500 feet.

Tertiary sediments of the area are sands, clays, marls, and limestones, with some thin lignites. Quaternary sediments are mostly sands and gravels with lesser amounts of clay. Tertiary and Quaternary deposits reach a combined maximum thickness of approximately 6,000 feet near the coast.

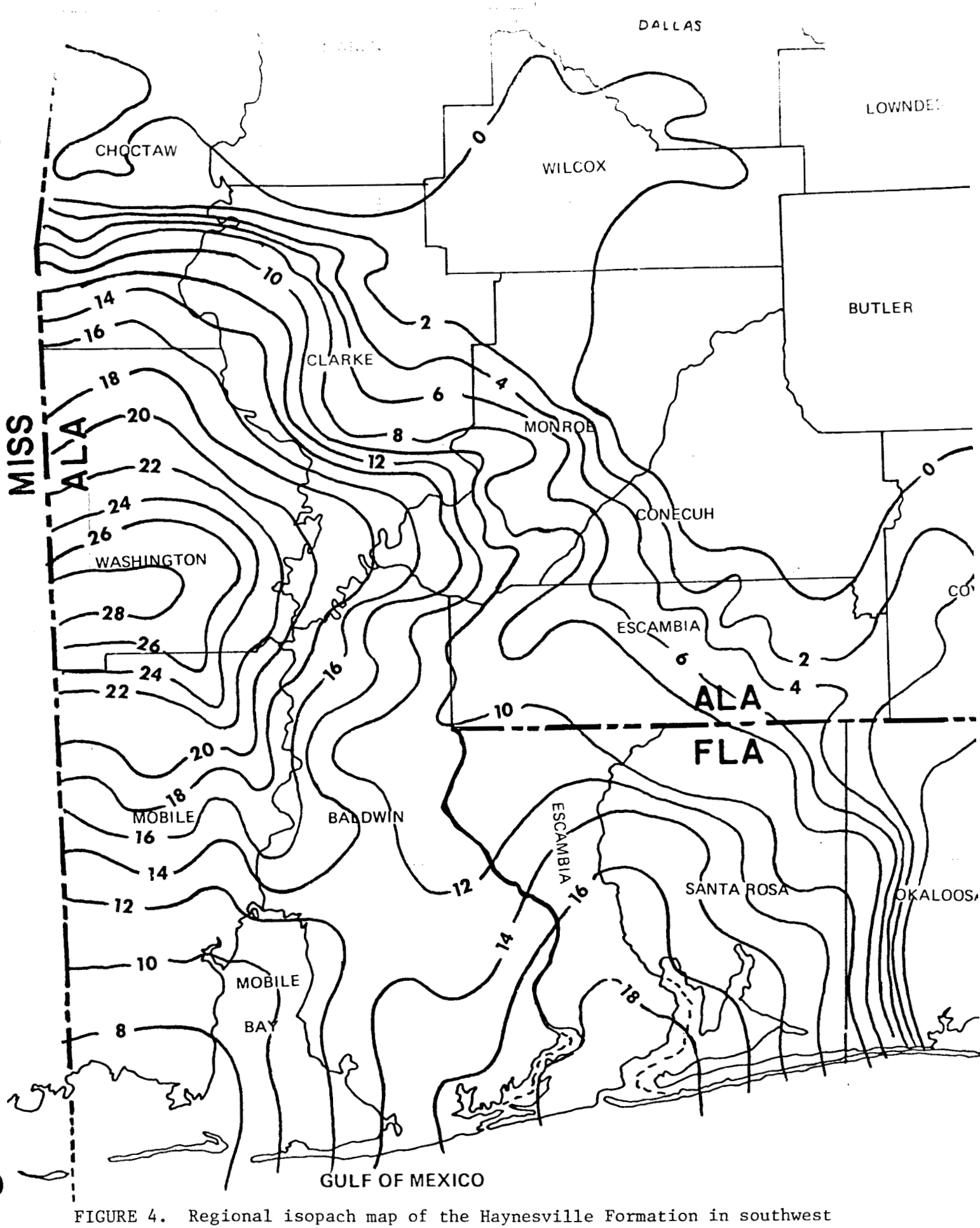


FIGURE 4. Regional isopach map of the Haynesville Formation in southwest Alabama and northwest Florida (modified from Wilson, 1975)
contour interval = 200 feet (contour values are in hundreds of feet)

A structural geologic study of the southwest Alabama Coastal Plain incorporated the correlation and study of more than 1,000 electric logs from deep oil and gas test wells in the area. Logs from these wells were correlated and interpreted for formation tops and faults. Figure 5 is an example of the type of data sheet used in this study.

The major structural features of southwest Alabama are: (1) eastern limit of the Mississippi Interior Salt Basin; (2) the Wiggins Uplift or "posiment" and related Conecuh Arch; (3) the Hatchetigbee Anticline; (4) the Gilbertown-West Bend-Pollard fault zone; and (5) the Jackson fault and Mobile delta fault zone (figure 6). Other important structural features of the area include the Jurassic age Wilcox and Covington embayments, the McIntosh and Klepac piercement salt domes, and the salt-related Chatom, Citronelle, Chunchula, Hatter's Pond and South Carlton domes.

The axis of the Mississippi Interior Salt Basin extends into Washington County, Alabama, from Mississippi. This basin, which includes all of Washington County and the southernmost part of Choctaw and northernmost part of Mobile Counties, was an actively subsiding depocenter throughout the Mesozoic and into the early Cenozoic. Subsidence rates were greatest during the early depositional history of the northern Gulf Coast basin as evidenced by the deposition of several thousand feet of Louann Salt. Smackover and Haynesville sediments also reach maximum thicknesses in this basin. (See figures 3 and 4.)

The Wiggins Uplift, and related Conecuh Arch, are associated with a positive crustal feature that influenced depositional rates in that it subsided more slowly than adjacent areas, especially during Jurassic

State Alabama

Permit No. 1825
API No. 01-025-20043
GSA No.
Core No.
Cored /Recovered
11,247-260/13'

Core Received all

Samples
none collected

Operator: Exxon Corporation Permit No. 1825
Fee: Gross Tuscaloosa Unit 14-8 County/Field: Clarke / Homocitas
Location: Surface-Sec. 14, T. 10 N., R. 2W.; 1750' SNL & 660' WE
Bottom-Hole Loc.
Date permitted: 2-2-73 Spudded 2-9-73 Completed 4-12-73 Status oil/abn.
Proposed depth: 11,700'; TD-Logger 11,598'; TD-Driller 11,59
Elevation: GL 79' DF 94' KB 95.8'; Driller: Dual
Formation at surface: Oligocene; Formation at TD: Norphlet
Casing record: 16" @ 50'; 9 5/8" @ 3,058'; 5 1/2" @ 11,590'
Plugging record: 11074-11292; 2900'-3000'; 0-30'
Logs made: DIL, CNFD; Logs received: DIL, CNFD
Well treatment: none
Perforations: 11276-286; 11306-08; 11354-56
Production tests: Smackover Formation; 418 BOPD; Cor. Grav. 41.4° API
209 MCF/D; GOR 500:1; %SW 0.5; TP 1,050 #; CP 0; Choke
Remarks: abandoned 7/20/78

BHT @ 11,598' = 181°F 8 hrs AC

Formation or Marker	Reported	DIL	Other	Top-Elev.	Thickness	
			CNFD			
Selma		TNL				
Eutaw ss		4,576		-4,480		
"marine" Tuscaloosa		6,276				
Lower Tuscaloosa		6,400		-6304		
Lower Cretaceous		6,812				
3,300' FAULT		8,830		-8,734		
Mooringsport		FO				
Cotton Valley		T/FO			—	
Haynesville		10240			996	
H,N 55		10448				
H1		10629				
H2		10938				
Smackover		11,236	11,236	-11,140	264	
Norphlet		11,500	11,500	-11,404	—	

FIGURE 5. Oil and gas test-well data sheet

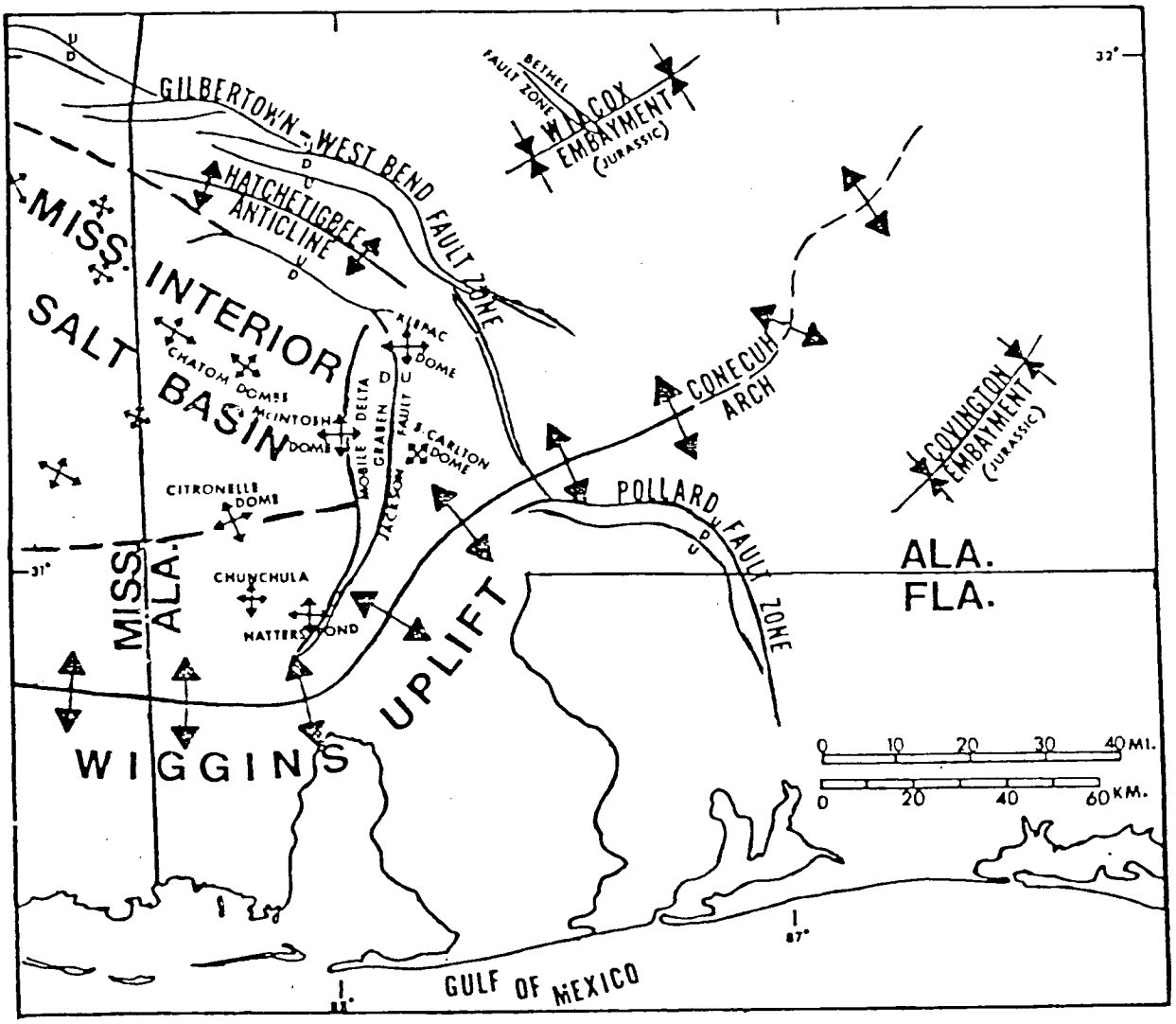


FIGURE 6. Major structural features of southwest Alabama and northwest Florida (from Wilson, 1975)

time. The thinning of early basin deposits that occurs across this feature is more pronounced in carbonates, evaporites, and marine shale units. The depositional thicknesses of thick, coarse clastic deposits are more closely related to subsidence rates influenced by "loading." The axis of the Wiggins Uplift extends through central Mobile County, thence northeastward through northern Baldwin, and northeast Escambia Counties, and into southwest and central Conecuh County.

A number of salt-related structures occur within and adjacent to the interior salt basin of Washington County. Jacoby (1974) discusses the possibility of salt domes acting as conductors of heat. Since rock salt has a much higher thermal conductivity than other sedimentary rocks, a salt dome may act as a heat transfer medium from its hotter, deep-seated source to the shallower and cooler sediments that it intrudes. Jones (1970) also feels that salt diapirs of the Gulf Coast area may play an important role in establishing and maintaining the geothermal flux in their vicinity and may act as "heating rods" extending upwards from great depths.

In southwest Alabama, although several "piercement" salt structures are present, only one known feature can be considered a "shallow salt structure," that being the McIntosh salt dome which is located in southwest Washington County and on the west flank of the Mobile delta fault system. This salt mass was penetrated at a depth of 410 feet below the surface in Humble, #1 Washington Lumber and Turpentine Corporation core-test located in irregular section 29 (normal section 6 location) of T. 3 N., R. 1 E. It has been reported that brine-test wells, located 3/4 mile east of the Humble well, encountered salt at 2,500 to 3,000

feet. Another large piercement salt structure is the Klepac dome located in southwest Clarke County, adjacent to the large Jackson fault. Humble, #1 Champion-Klepac (P #735) in section 4, T. 5 N., R. 2 E., penetrated piercement Louann Salt at a depth of 11,172 feet. The crest of the Bouguer gravity anomaly associated with the Klepac dome is probably centered in the vicinity of sections 21 and 22, some 3 miles south of the Humble well (McWilliams and Joiner, 1970a). It is probable that the crest of this piercement salt mass has not been drilled; because seismic information is unavailable for study, its depth cannot be estimated.

The Hatchetigbee Anticline is a large, salt-cored structure on the north flank of the interior salt basin. It extends from west-central Clarke County through the northeast corner of Washington County and into south-central Choctaw County. This structure began forming during the Cretaceous with movement continuing through much of the Tertiary, and it is expressed in the surface geology of the area. The Chatom, Citronelle, Chunchula and South Carlton domes are all non-piercement, deep salt structures. The Hatter's Pond field is associated with a deep, piercement salt dome below 17,000 feet.

A series of major fault zones and grabens are present in the southwest part of the Alabama Coastal Plain. These are normal faults which most commonly show growth characteristics, that is, displacements along them increase substantially with depth and abnormally thick sediments occur within grabens. These grabens are wedge-shaped features that are relatively broad on the surface and decrease in width with depth, many

disappearing into master faults deep in the Jurassic section. Figure 7 is a regional structure contour map which shows the locations of these faults at the Norphlet Formation horizon. The largest of these fault zones is the Mobile delta graben system that strikes north-south in the vicinity of the Washington-Clarke County and Mobile-Baldwin County lines. The Jackson fault is the largest of this system and is downthrown to the west. It is essentially an eastern structural boundary for the Mississippi interior salt basin, and can be recognized along part of its length by displacements of outcropping formations. In Marshall Young, #1 C. E. Gilmore (P #895), located in section 28 of T. 6 N., R. 2 E., the Jackson fault was penetrated at a depth of 4,000 feet where its displacement was almost 5,000 feet. In Humble, #1 Champion-Klepac (P #735) this fault has a displacement of 4,100 feet at a depth of only 2,450 feet. It is speculated that, along parts of its length, displacements along the Jackson fault may reach or exceed 7,000 feet.

The down-to-east faults of the Mobile Delta System are numerous and a few of these are quite large. Murphy Oil Corporation, #1 Laubenthal (P #2297), located in section 33 of T. 5 N., R. 1 E., in Washington County, is cut at a depth of 11,350 feet by a fault with an estimated displacement of 5,700 feet.

The Gilbertown-West Bend-Pollard fault zones are part of the peripheral fault system that rims the northern Gulf Coast basin from Texas to Florida. These are normal faults that are tension-related structures varying greatly in length and displacement, and they also show strong growth characteristics. A good example of increasing displacements with

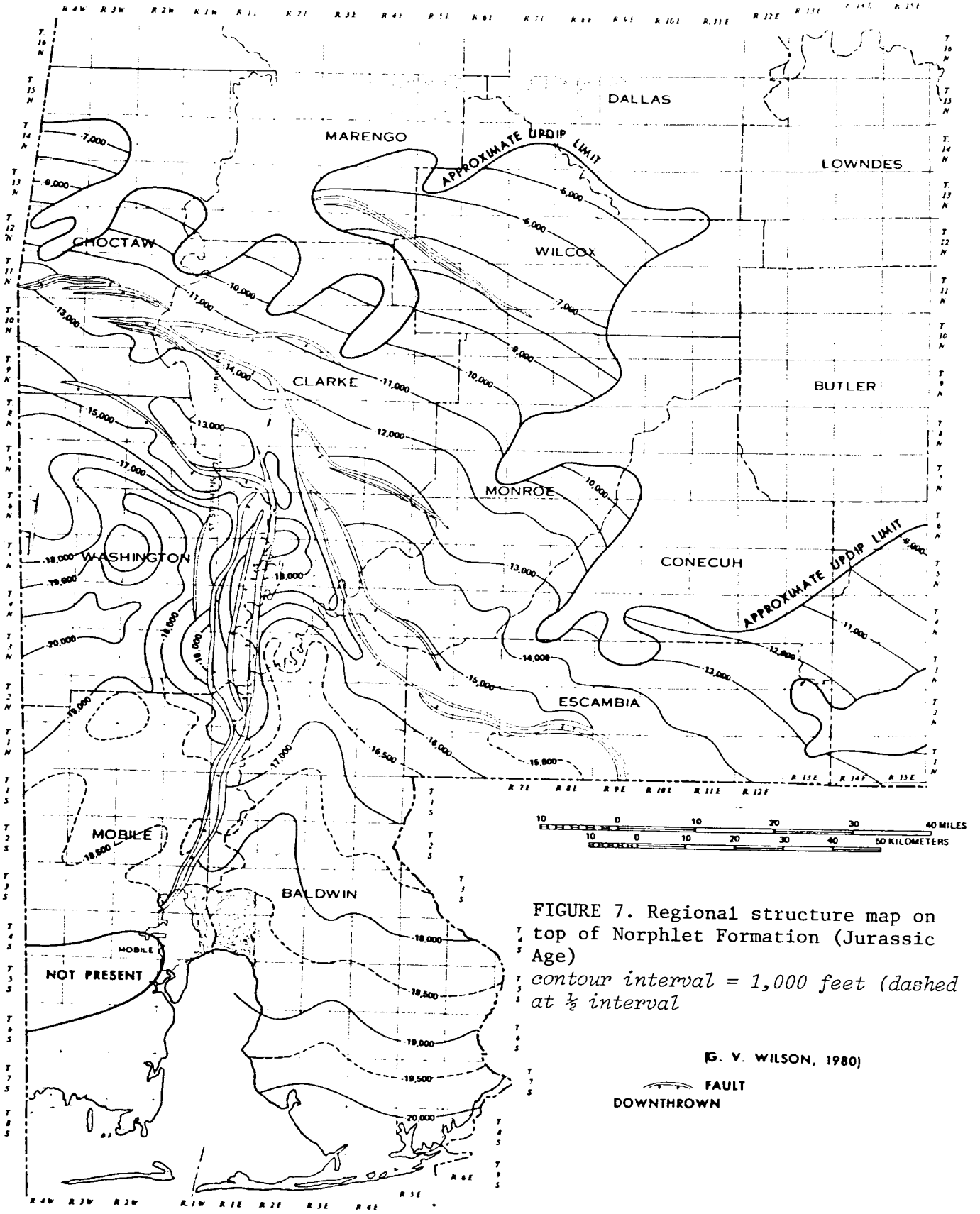


FIGURE 7. Regional structure map on top of Norphlet Formation (Jurassic Age)
contour interval = 1,000 feet (dashed at ½ interval

depth is the fault which is the south boundary of the deep, elongated anticline of Choctaw County's Womack Hill oil field, which produces from the Smackover Formation. This fault has a displacement greater than 3,500 feet in the Haynesville Formation at a depth below 9,000 feet, whereas 1.5 miles to the north and in an updip direction the fault has been mapped on the surface where its displacement is 150 feet (Copeland and others, 1976). In the subsurface these faults have an average dip of 50° to 55°; however, near the surface and in outcrop, dips often steepen to 80° or more.

The most pronounced fault movements along the peripheral fault system, as indicated by increases in sediment thicknesses within grabens, were initiated during the deposition of the upper part of the Lower Cretaceous and continued into the Tertiary. Chalks of the Selma Group often reach one-and-a-half times or more their normal thicknesses within these grabens.

The Wilcox and Covington embayments were shallow, slowly subsiding features separated by the Wiggins Uplift and Conecuh Arch. These embayments were restricted to the Jurassic and are expressed by the areal limits of Jurassic deposits in the subsurface. (See figures 3 and 4.)

Stratigraphy and Structure of Southeast Alabama

Mesozoic sedimentary rocks and sediments underlying the southeast Alabama Coastal Plain range in age from Triassic to Miocene. Rocks of Triassic and Early Cretaceous ages occur only in the subsurface as do those of Jurassic age, which are present in parts of Covington County but are not known to be present in other counties to the east and northeast. The thickest known sedimentary deposits of the area occur in southwest

Covington County, where thickness of combined Mesozoic and Cenozoic sediments exceeds 13,000 feet. Unknown thicknesses of Triassic sediments are present in grabens in southeast Alabama. In Crenshaw County the A. R. Temple, #1 Smith in section 26, T. 8 N., R. 16 E. (P #145) was bottomed at 10,830 feet in Triassic (?) sedimentary rocks. Several wells in Barbour County were reported to have bottomed in rocks of questionable Triassic age (Moore and Joiner, 1969). Geophysical and test-well data are insufficient to locate and define sediment-filled Triassic grabens in the area. It should also be noted that unknown thicknesses of Paleozoic sedimentary rocks of the Suwannee Basin underlie Houston County (Arden, 1974).

With the exception of the thick chalks of the Late Cretaceous age Selma Group and thin Oligocene limestones, sediments underlying the area are made up almost entirely of sands and clays. These dip from south to southwest at 20 to 50 feet per mile. Because the area lies outside of the salt basin, basement tectonics rather than salt tectonics dominate the structural setting. Excluding the possible large Triassic grabens in the area, structures are of much smaller magnitude than those salt-related features underlying the southwest Alabama Coastal Plain. Subsurface structures of southeast Alabama are not well known due to sparsity of well control and a lack of detailed geophysical information.

Composition, Age, and Configuration of Basement Rocks

Herein, the term "basement" denotes the rocks upon which the lowermost Mesozoic sediments were deposited. Basement may refer to early Mesozoic igneous rocks, Paleozoic sedimentary, or Paleozoic or Precambrian metamorphic and igneous rocks.

Neathery and Thomas (1975) reported on the nature of the pre-Mesozoic basement rocks underlying the Alabama Coastal Plain. Based on lithologic and structural characteristics, these rocks were divided into four provinces: (1) Paleozoic sedimentary rocks (folded, in part thrust faulted, and similar to those found in the Appalachian outcrop area to the northeast); (2) Talladega slate belt (slate, quartzite, phyllite, marble, and fine-grained schist similar to rocks in outcrop in Alabama's Piedmont); (3) Piedmont metamorphic and igneous belt (predominantly gneiss and aluminous schist, intruded by felsic and mafic igneous rocks); and (4) Suwannee Basin (Paleozoic shale and sandstone) (figure 8).

In the area of study, Paleozoic sedimentary rocks are restricted to the northernmost parts of Choctaw and Marengo Counties and to the Suwannee basin fringe area of Houston County in the southeast corner of the state. Rocks of the Talladega slate belt occur in a belt underlying the northwestern parts of Dallas, Wilcox and Clarke Counties and the central and southern parts of Marengo and Choctaw County. Rocks classified as being in the Piedmont belt underlie most of the southwest Alabama Coastal Plain. Rocks of the Piedmont belt and Suwannee basin are overlain in part by Mesozoic volcanic rocks which have been encountered in a number of wells in southeast Alabama and have also been found in wells located near the southeast corner of Conecuh and northeast corner of Escambia Counties and in the proximity of the Fairfield gravity maximum, which is discussed later in this report. In addition to the volcanics in the area of the Fairfield anomaly, other Mesozoic volcanics (olivine basalt and diabase) have been encountered in Barbour County and along

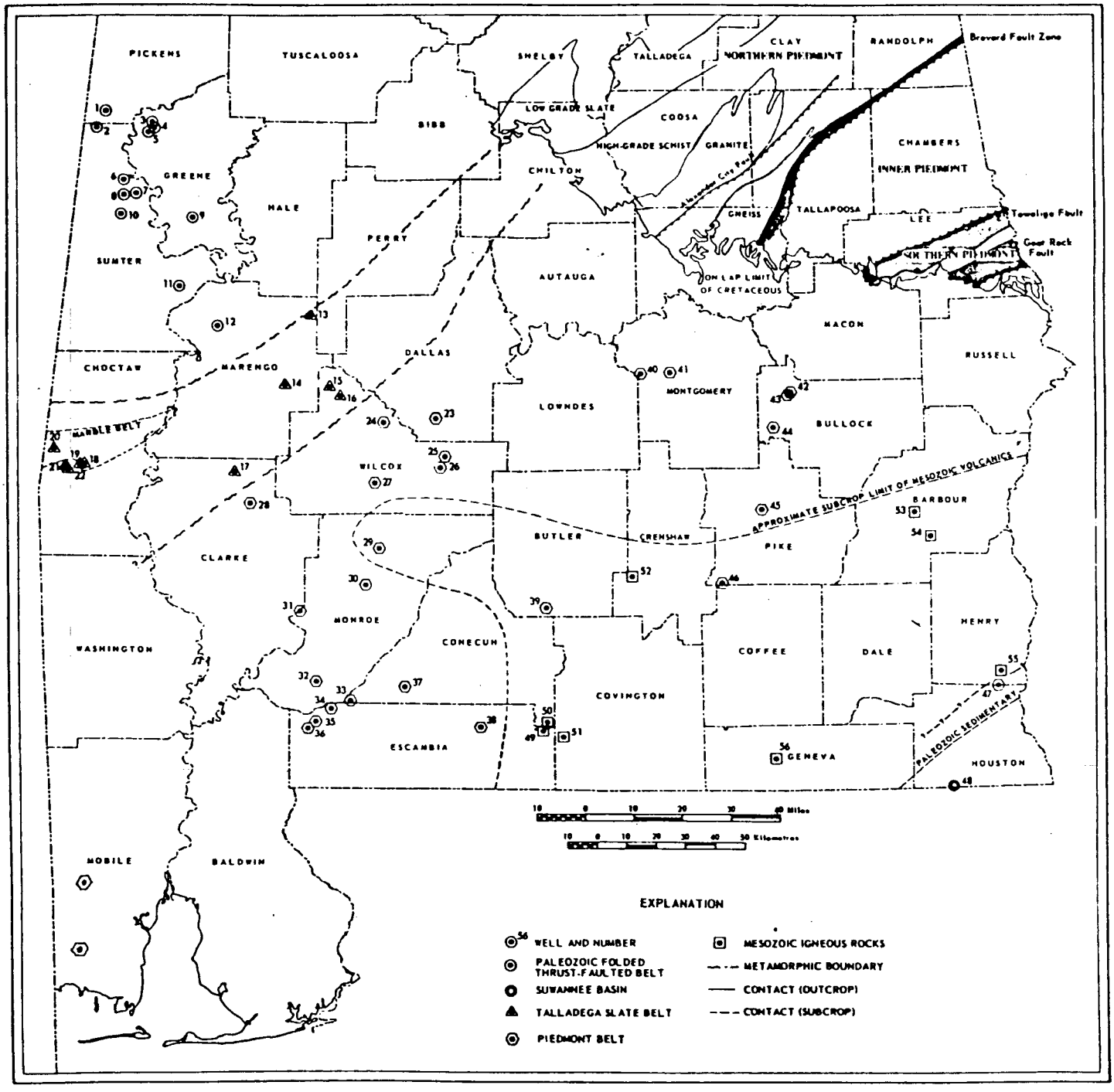


FIGURE 8. Index map to wells penetrating Pre-Mesozoic basement and Mesozoic volcanic rock under the Coastal Plain of Alabama (from Neathery and Thomas, 1975)

the crest of a large regional gravity maximum. These gravity features are also discussed later in this report in the geophysical data section. Most other basement rock types known from drilling cannot be correlated with regional gravity features.

In southwest Alabama the basement surface ranges in depth from less than 4,000 feet in Dallas and Marengo Counties to possibly as much as 25,000 feet in Washington County. Near the coast the basement probably lies deeper than 22,000 feet (figure 9).

Deep test-well information indicates that the two most prominent irregularities in the configuration of the basement surface are related to the easternmost extensions of the Wiggins Uplift and the Mississippi Interior Salt Basin. A broad, conspicuous basement high or ridge associated with the Wiggins Uplift extends from central Mobile County northeastward through north Baldwin and west Escambia Counties, and into southwest and central Conecuh County. A prominent depression in the basement surface, associated with the interior salt basin, is located in Washington County. The actual depth of the basement here is not known with certainty and can only be estimated from existing deep well control and stratigraphic evidence. The deepest well in Washington County is Damson Oil Corporation, #1 Tyler Odum (sec. 13, T. 3 N., R. 4 W.), which bottomed in the Upper Jurassic Norphlet Formation at a depth of slightly more than 20,000 feet.

It is not known if the major faults of the area extend into and offset basement rocks. Sediment thicknesses and basement depths do increase rapidly in a basinward direction from these faults, and it is

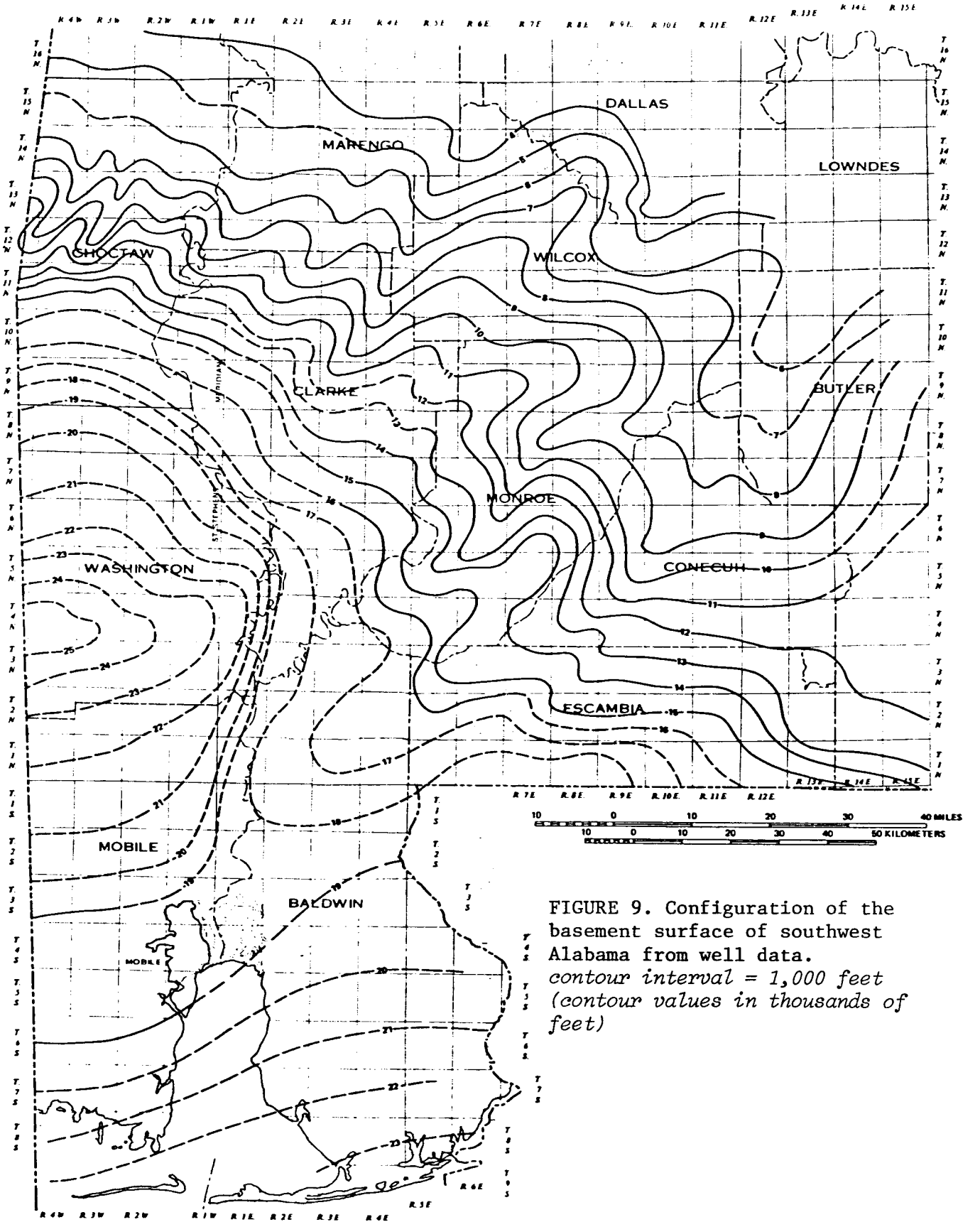


FIGURE 9. Configuration of the basement surface of southwest Alabama from well data. *contour interval = 1,000 feet (contour values in thousands of feet)*

believed that either the basement surface is faulted or that sharp flexures of the basement surface occur along these fault lines.

Southeast Alabama Coastal Plain sediments are underlain predominantly by a metamorphic and igneous basement complex that slopes gently to the south and southwest, except where broken by Triassic grabens (figure 10). In Houston County this basement surface may be composed of Paleozoic sedimentary rocks of the Suwannee basin, but elsewhere it is a metamorphic-igneous rock complex. Excluding areas underlain by Triassic grabens, the greatest known depths to the basement surface in southeast Alabama occur along the Alabama-Florida line and range from about 7,000 feet in Houston County to 13,000 feet in Covington County.

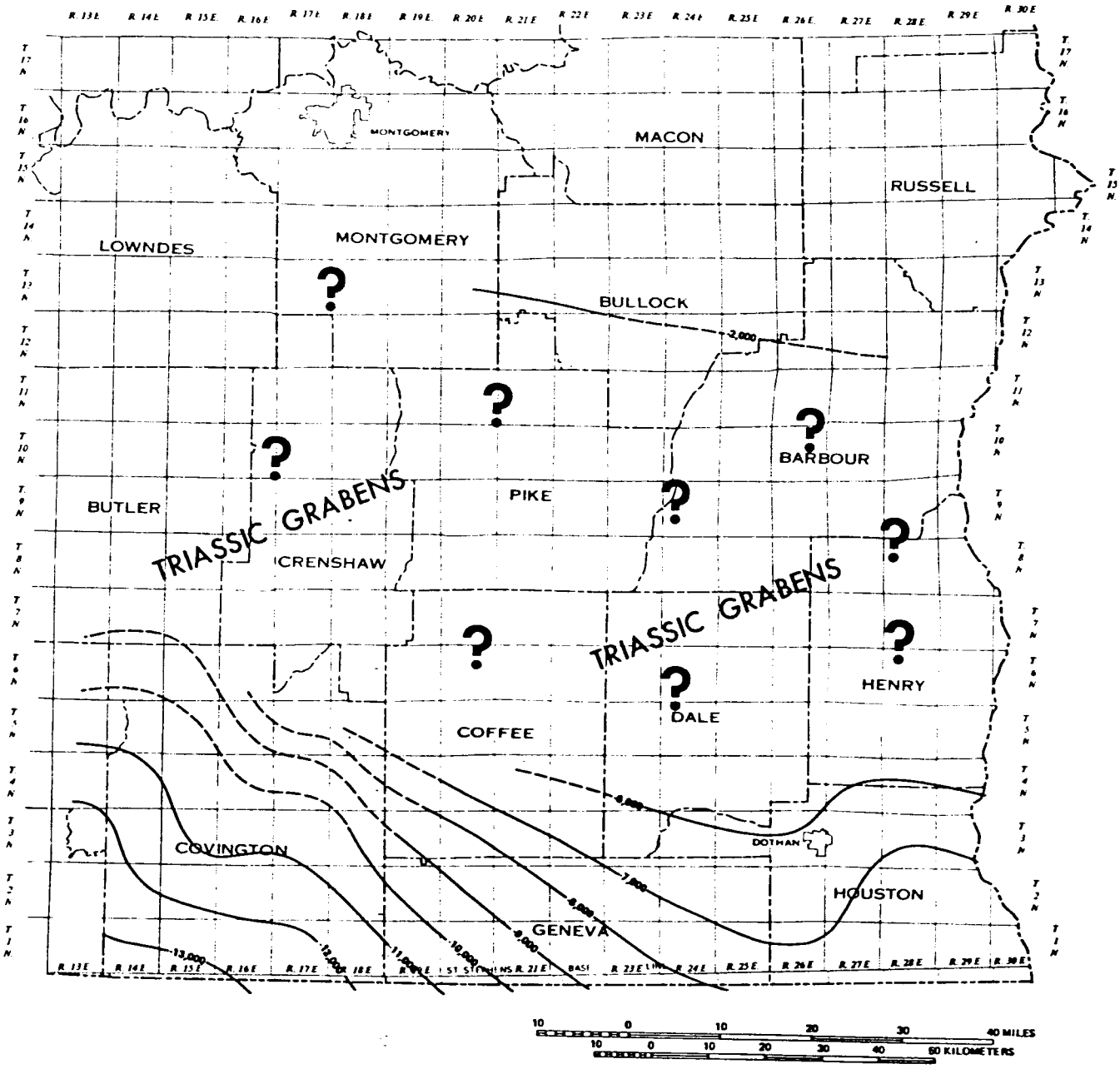


FIGURE 10. Configuration of the basement surface of southeast Alabama from well data.
contour interval = 1,000 feet

REGIONAL STRATIGRAPHY OF UPPER JURASSIC SMACKOVER CARBONATES OF SOUTHWEST ALABAMA

Introduction

In the Gulf Coastal Plain of Alabama, geopressure and geothermal studies should center around the older Jurassic formations, especially the Smackover Formation (figure 11), in association with possible igneous intrusions in the basin area. The geothermal gradient in this area is known to be erratic, with local hot spots occurring throughout. The origin of these hot spots has been correlated with the occurrence of igneous intrusions. Commonly associated with the intrusion of an igneous body into a sedimentary section of carbonate rocks is the liberation of carbon dioxide gas. Any hydrocarbons contained in these sedimentary rock reservoirs would be subjected to elevated temperatures. Such conditions result in additional hydrocarbon cracking and the generation of eometamorphic gases, principally methane and hydrogen sulfide. The proliferation of carbon dioxide, methane, and hydrogen sulfide gases and their invasion into the reservoirs would result in inflated pressures. Such inflated pressure is probably the primary source of geopressure in the Gulf Coastal Plain of Alabama.

The geopressure in the reservoirs, which is either a result of load pressure or phase pressure, is stored efficiently because overlying the Smackover is an excellent impervious anhydrite seal. The maintenance, enhancement, and degradation of the geopressure within the reservoir is controlled by the initial porosity and permeability of that sedimentary

PERIOD	GROUP OR FORMATION
JURASSIC	COTTON VALLEY GROUP
	HAYNESVILLE FORMATION
	SMACKOVER FORMATION
	NORPHLET FORMATION
	LOUANN SALT
	WERNER ANHYDRITE
TRIASSIC	EAGLE MILLS FORMATION

FIGURE 11. Jurassic subsurface stratigraphy in southwest Alabama

rock and the mode of diagenesis it has undergone. During deposition of the reservoir rocks, high-energy zones provide areas where porous and permeable sediments accumulate. After burial, diagenetic processes either increase or decrease the reservoir potential of these sediments through dissolution, cementation, compaction, and/or dolomitization.

In order to identify potential Smackover reservoirs, regional stratigraphic relationships must be understood. These stratigraphic relationships include the geologic setting, and carbonate stratigraphy and lithofacies. Once the reservoirs which have primary porosity have been identified, the secondary diagenetic processes modifying the original porosity within these reservoirs can be delineated. The organic kerogen present in the mudstones interbedded with the reservoirs can be used as an index for determining the maximum temperatures to which these rocks have been subjected during geologic time.

Geologic Setting

Carbonate deposition commonly takes place on either a "shallow shelf" or a "ramp" depositional framework. The "shallow shelf" model involves a nearly flat platform and a clearly defined shelf-slope break. Lithofacies are governed by topography, with grainstones and boundstones occurring on shoal areas and mudstones and wackestones occurring in lagoons. Generally, a continuous reef occurs at the shelf edge. Modern examples of the "shallow shelf" framework include south Florida and the Bahama Bank. Ancient analogs are the Cretaceous Edwards of Texas, Cretaceous El Abra of northern Mexico, and the Permian Capitan of West Texas and New Mexico (Ahr, 1973).

The "ramp" model is an inclined platform that extends basinward without a pronounced break in slope. Carbonate lithofacies are not influenced by a shelf-margin barrier and tend to be distributed in bands which parallel the coastline and reflect the greater wave-and-current activity near the shore. Patch reefs may grow on local topographic paleo-highs. Recent examples of the "ramp" framework are the Campeche Bank (Yucatan Peninsula) and the Trucial Coast of the Persian Gulf. Ancient analogs are the Jurassic Cotton Valley Formation of the northwestern Gulf of Mexico and the Jurassic Smackover Formation from south Texas to Florida (Ahr, 1973).

The lithofacies distribution associated with the "ramp" model is affected by topographic highs which develop on the platform. These topographic highs may be a result of paleo-highs or contemporary salt movement. In the Persian Gulf, Purser (1973) found that lithofacies patterns are controlled primarily by the distance between a topographic high and the shoreline. The highest wave-and-current activity occurs on the crest of the high, with a progressive decrease of energy off the feature. Highs located basinward tend to have higher-energy carbonate lithofacies concentrated at their crests and lower-energy lithofacies distributed in concentric bands around the features as a function of depth and decreasing energy.

In the area of study, one basin, the Mississippi Interior Salt Basin, and two probable embayments, the Manila and Conecuh Embayments, are recognizable (figure 12). These features have been delineated on the basis of the thickness of the Smackover Formation (figure 3) and the depth to basement or basement configuration as indicated by data from

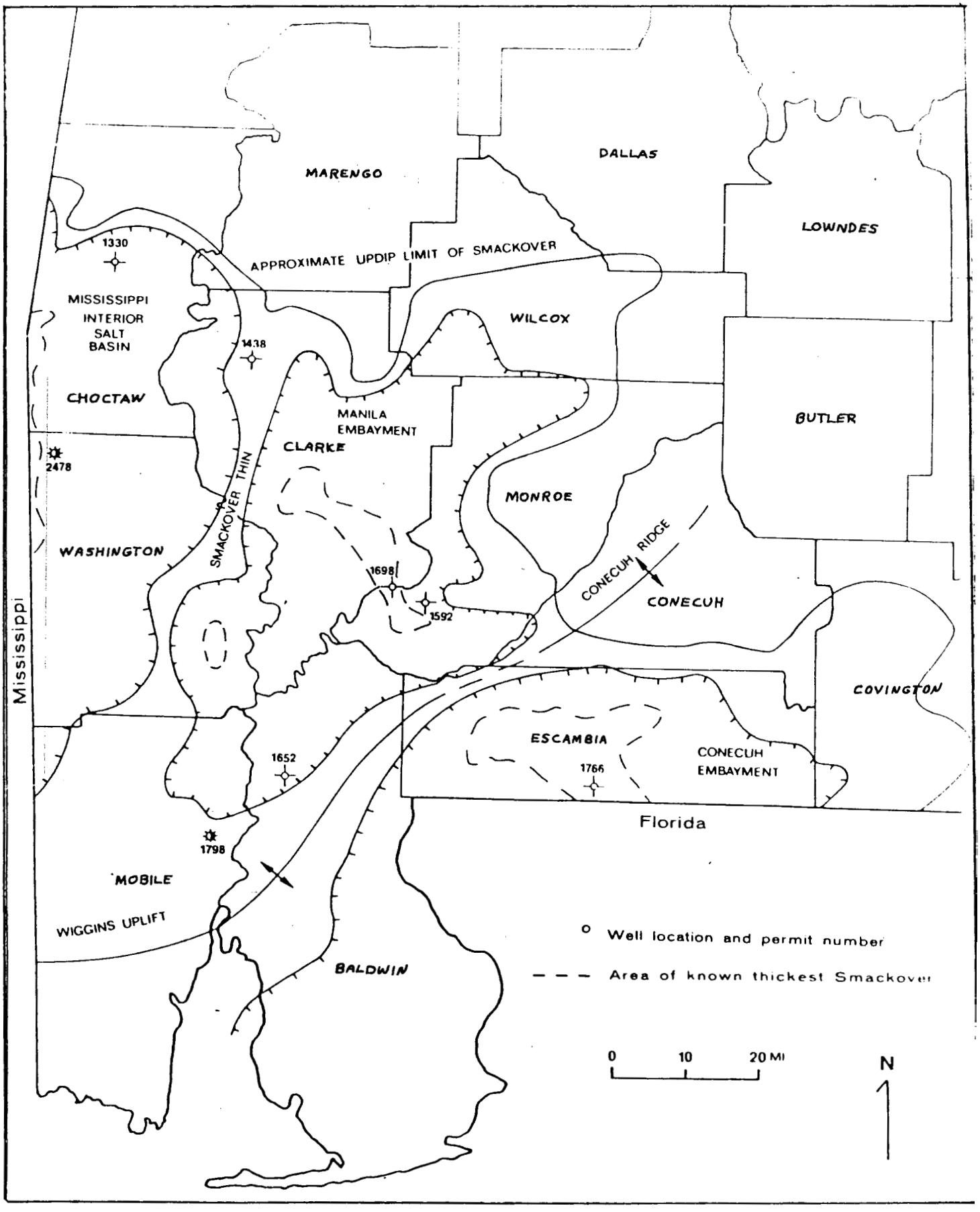


FIGURE 12. Paleogeographic map of southwest Alabama during Smackover time and locations of wells from which cores were studied.

deep test wells (Wilson, figure 9, this report). The Mississippi Interior Salt Basin, as it occurs primarily in Washington and southern Choctaw Counties, is an extension of the Mississippi Interior Salt Basin of eastern Mississippi. The Manila Embayment, as defined by Mancini (in press), is located in eastern Clarke, southeastern Washington, western and southern Monroe, and northern Mobile and Baldwin Counties. The most easterly embayment, the Conecuh, as defined by Sigsby (1976), occurs in Escambia and southwestern Baldwin Counties and extends into northern Florida.

The Smackover trend is locally interrupted by extensional faults, such as the Pickens-Gilbertown, Foshee-Pollard, and Jackson-Mobile, and salt anticlines, such as Chatom, McIntosh and Klepac (figures 6 and 13). Early salt movement resulted in local variations in carbonate sediment distribution. Also, pre-Jurassic paleo-highs, such as the Wiggins Uplift and Conecuh Arch, modified carbonate sedimentation.

The Wiggins Uplift-Conecuh Ridge separates the Conecuh and Manila Embayments (figure 12) and is characterized by distinctive lithofacies. Smackover carbonates thin to less than 100 feet over this structural trend (figure 3). Seismic refraction and gravity data suggest that the Wiggins-Conecuh Ridge acted as a stable basement high throughout Smackover deposition (Wilson, 1975). This basement complex consists of granitic, basaltic, and volcanic rocks (Neathery and Thomas, 1975; Neathery, 1979, personal communication). The complex is believed to be a continuation of the Alabama Piedmont structural trend (Neathery and Thomas, 1975).

The Manila Embayment appears to be separated from the Mississippi Interior Salt Basin by a basement paleo-high or salt ridge (figure 12).

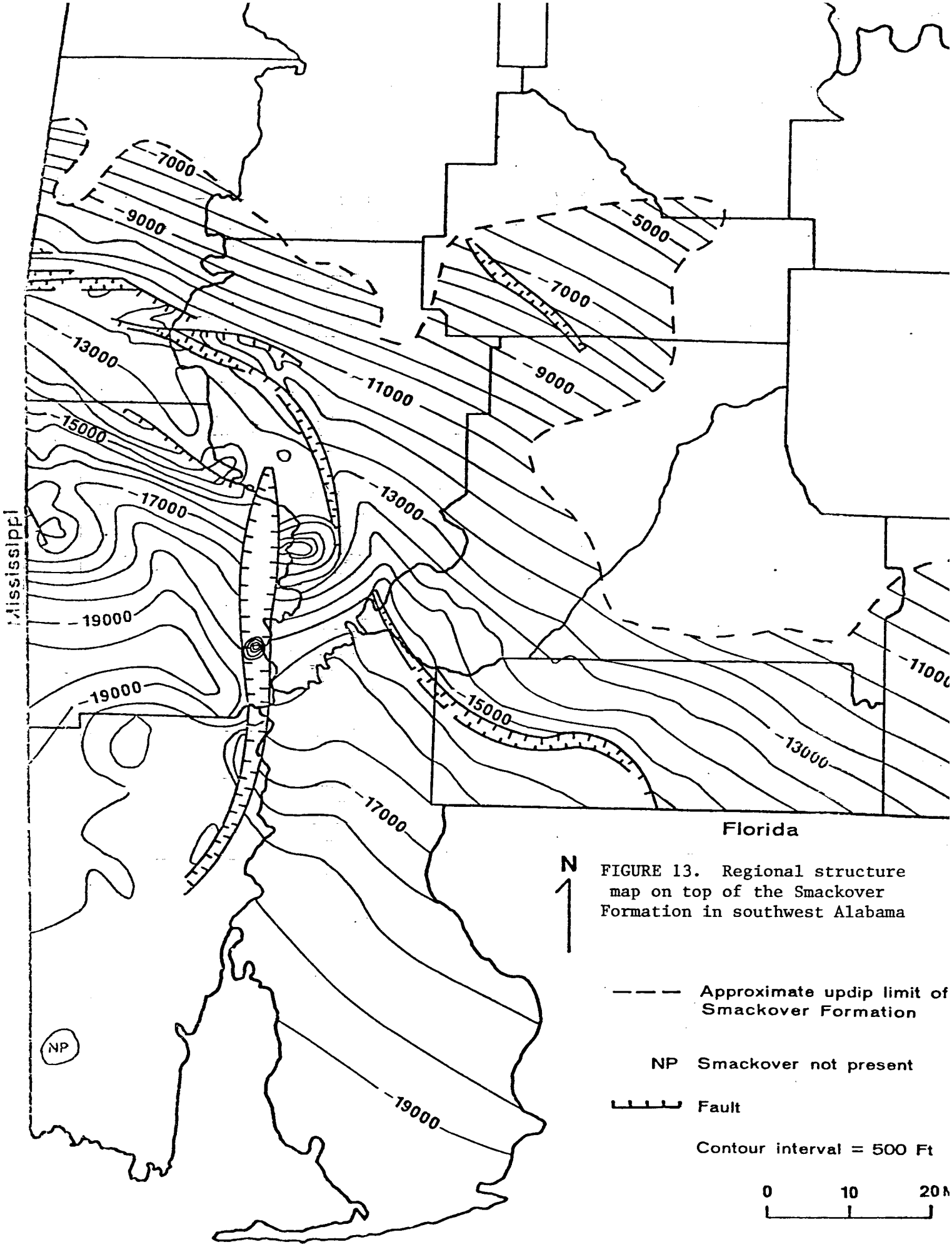


FIGURE 13. Regional structure map on top of the Smackover Formation in southwest Alabama

Smackover carbonates thin to less than 100 feet over this feature located in northern Mobile, eastern Washington, and western Clarke Counties (figures 12 and 3). Higher-energy lithofacies are associated with this apparent high.

Smackover deposition in southwest Alabama closely approximated present-day sedimentation in the Persian Gulf. The Louann Salt was probably responsible for forming the ramp surface. A regional structure map of the Smackover illustrates gentle south to southwest dip (figure 13). Following the "ramp" model as described by Ahr (1973), Smackover lithofacies in southwest Alabama should be distributed in bands which paralleled the ancient Jurassic coastline. High-energy lithofacies (grainstones) should be present in updip areas, and these should grade into pelagic mudstones downdip. This predicted lithofacies distribution has only been observed in parts of the study region, primarily in the area of the Mississippi Interior Salt Basin.

The variations in carbonate deposition associated with the Wiggins-Conecuh Ridge can be explained by using Purser's (1973) findings for the Persian Gulf. For example, the presence of moderate- to high-energy grainstones in Mobile and Baldwin Counties, which would have been off-shore areas during Smackover deposition, is a function of the Wiggins-Conecuh Ridge which acted as a basinward high during Smackover time. Grainstones are concentrated along the crest and flanks of this paleo-high, while expected lower-energy lithofacies are distributed around the feature. This ridge along with the Pensacola Arch to the south also influenced Smackover accumulation in the Conecuh Embayment area. Grain-

supported carbonates are associated with paleo-topographic highs, while low-energy mudstones were deposited between these highs.

Stratigraphy and Lithofacies

The Jurassic section normally present in the subsurface of southwest Alabama is as shown in figure 11. The contact between the Smackover and underlying Norphlet Formation can be gradational or abrupt. In Mobile County the contact is conformable, grading upward from dolomitic sandstone to silty dolomite. The Smackover-Norphlet contact in Escambia County is sharp, with carbonate mudstone overlying quartzose sandstone. The Smackover conformably underlies the Buckner Anhydrite Member of the Haynesville Formation throughout the study area. The contact generally grades from dolomite through interbedded dolomite and anhydrite to anhydrite.

In the study area, the Smackover Formation usually consists of a lower mudstone lithofacies and an upper lithofacies sequence dominated by grain-supported textures. Where present, the lower lithofacies include laminated mudstone and, sometimes, peloidal wackestone, peloidal-oncolitic packstone or dolomite. The upper lithofacies sequence consists of oolitic and/or oncolitic grainstone, peloidal and/or oncolitic wackestone to packstone, and occasionally dolomite or mudstone. The contact between these stratigraphic units is gradational.

Smackover lithofacies are distinctive for the Mississippi Interior Salt Basin and the Manila and Conecuh Embayments, suggesting that depositional conditions varied among them. The lower lithofacies principally represent low-energy, shallow subtidal mudstone that was deposited during a marine transgression which was probably initiated

during late Norphlet time. The upper Smackover lithofacies sequence is dominated by moderate- to high-energy, shallow subtidal packstone to grainstone interbedded with secondary dolomite and intertidal to lagoonal mudstone to wackestone. Although the results of numerous shoreline oscillations during deposition of these upper Smackover lithofacies are evident, the overall trend in most of the study area is regressive. Deposition of the Buckner Anhydrite completed the regressive carbonate phase.

The upper Smackover lithofacies observed in the Placid Oil, Jackson No. 1 (Permit 1330) (281 feet of core), 3 miles east of Toxey, Choctaw County, and in the Inexco, W.J. Britton No. 1 (Permit 2478) (122 feet of core), 12 miles north of Chatom, Washington County, located in the Mississippi Interior Salt Basin (figure 12), are typical of a "ramp" carbonate model. In the Jackson No. 1 core (figure 14), the upper part of the upper Smackover is a dolomitized, oolitic, oncolitic grainstone interbedded with dolomitized packstone. These carbonates are underlain by cross-bedded oolitic, oncolitic, fossiliferous, grainstone which grades downward into a dolomitized oncolitic packstone. These upper Smackover lithologies indicate moderate- to high-energy, shallow subtidal deposition. The next upper Smackover unit is laminated argillaceous, fossiliferous mudstone which accumulated in intertidal mudflats. The middle part of the upper Smackover consists of oolitic, oncolitic grainstone interbedded with oncolitic wackestone and mudstone. These lithologies represent fluctuating low- to high-energy in a shallow intertidal to subtidal system. The lower part of the upper Smackover is primarily laminated mudstone interbedded with peloidal wackestone and

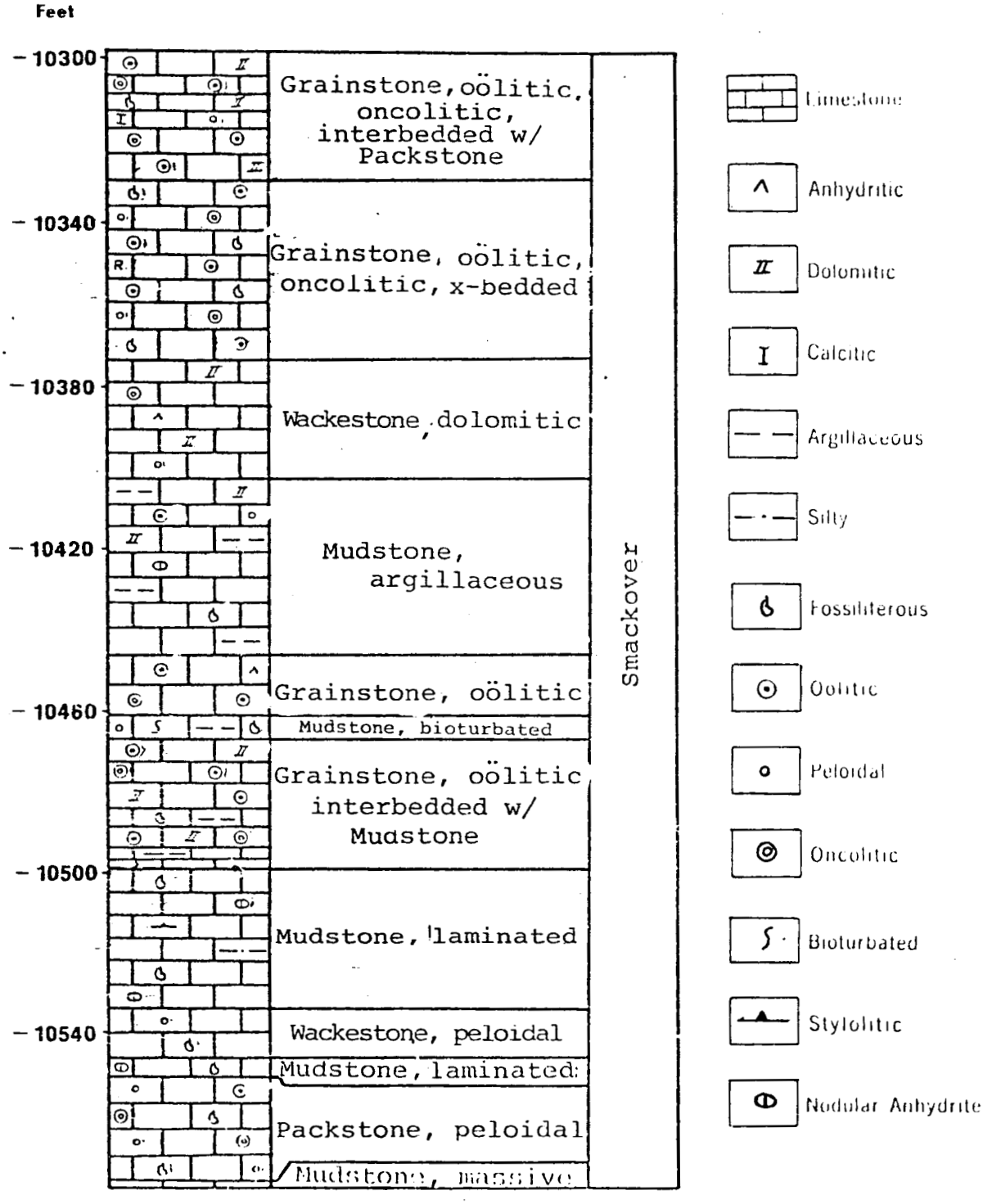


FIGURE 14. Carbonate lithologies identified in the core from Placid, Jackson no.1, 4 miles north of Toxey, Choctaw County, Alabama

peloidal, oncolitic packstone. The laminated mudstone is indicative of intertidal mudflats, while the peloidal wackestone and peloidal, oncolitic packstone are typical of low- to moderate-energy, shallow subtidal deposition. The lower Smackover, as observed from well cuttings (272 feet) from this dry hole, is a laminated, argillaceous mudstone which probably accumulated in a low-energy, shallow subtidal environment.

The upper part of the Britton No. 1 core (figure 15) is a dolomitized peloidal, oolitic packstone that is interbedded with peloidal, oolitic wackestone and dolomitized, oolitic grainstone. These upper Smackover lithologies reflect moderate- to high-energy, shallow subtidal deposition. This unit is underlain by upper Smackover laminated, peloidal mudstone which is in part dolomitized. The mudstone probably was deposited in an intertidal mudflat environment.

The Smackover lithofacies present in Choctaw and Washington Counties are similar to those described by Badon (1974) for Clarke County, Mississippi, and by Wakelyn (1977) for Perry and Stone Counties, Mississippi. In Clarke County, Mississippi, upper Smackover lithofacies consist of peritidal dolomite, moderate- to high-energy, shallow subtidal oosparite and oncolitic oosparite and lower-energy subtidal oomicrite, pelletoidal micrite, and pelmicrite (Badon, 1974). In Perry and Stone Counties, the upper Smackover includes interbedded peloidal grainstones, packstones, and wackestones that were deposited in intertidal and subtidal environments (Wakelyn, 1977). The laminated mudstones of the lower Smackover in these counties represent low-energy, subtidal deposition (Wakelyn, 1977). The Buckner in both of these areas consists of interbedded dolomite and anhydrite that accumulated in a supratidal environment

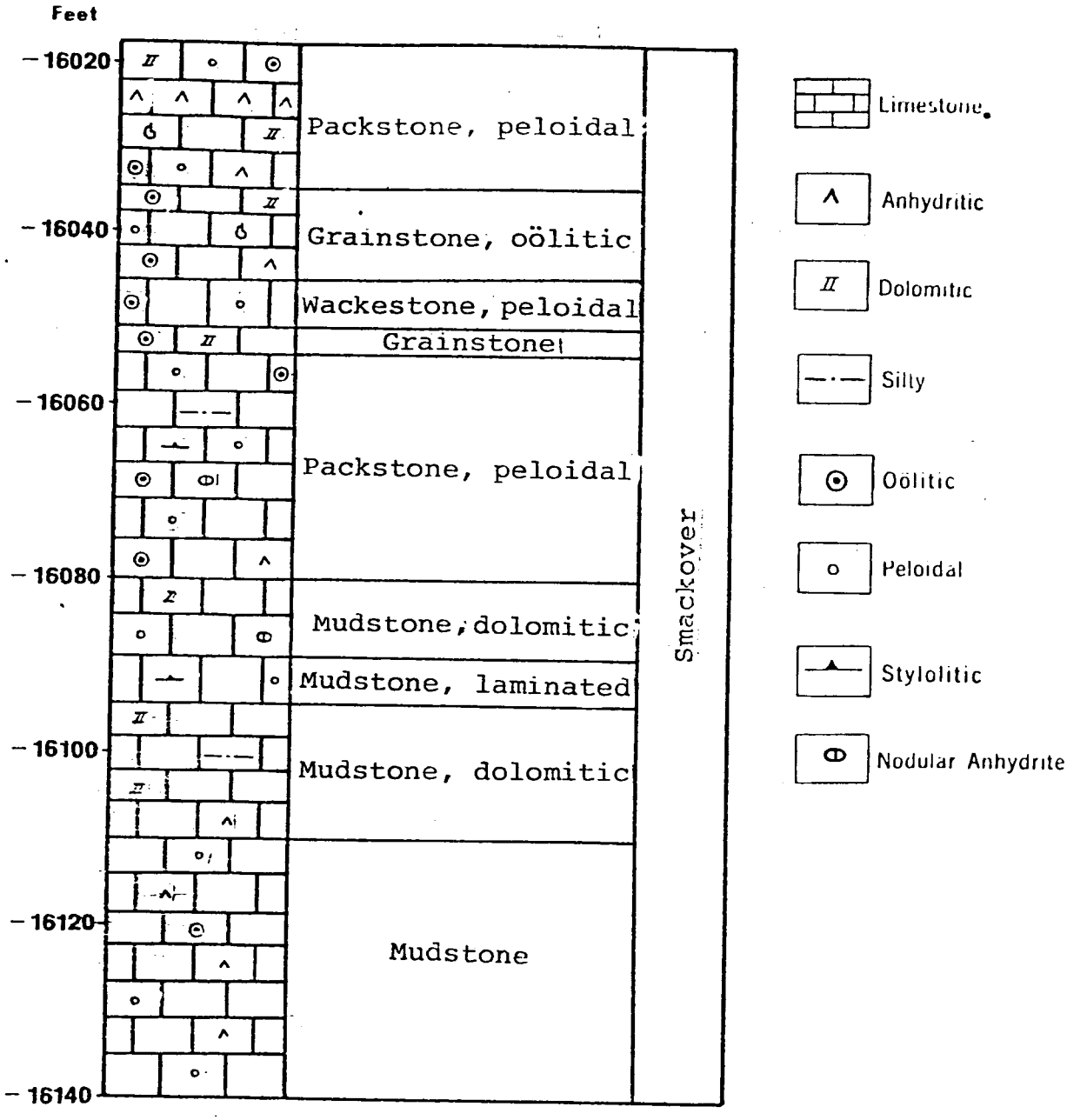


FIGURE 15. Carbonate lithologies identified in the core from Inexco, W.J. Britton no.1, 12 miles northwest of Chatom, Washington County, Alabama

(Badon, 1974; Wakelyn, 1977). The fossil assemblage, which includes algae, brachiopods, gastropods, and echinoderms, found in the Jackson No. 1 core is also like the open marine fauna described by Badon (1974) and Wakelyn (1977) for eastern Mississippi. These lithologic and paleontologic similarities suggest that the carbonate rocks deposited in western Alabama and eastern Mississippi accumulated in the same depositional basin, the Mississippi Interior Salt Basin.

The upper Smackover cored in the Manila Embayment (figure 12) is predominantly a laminated or bioturbated, silty dolomite which has replaced original peritidal deposits. Fossils are very rare to absent in cores from the Getty, C.D. Broughton No. 3 (50 feet of core), 7.5 miles northwest of Uriah, Monroe County (Permit 1698); and Getty, Blacksher Estate No. 1 (60 feet of core), 1 mile northwest of Uriah (Permit 1592) (figures 16 and 17). The scarcity of taxa in this embayment compared to the Mississippi Interior Salt Basin suggests depositional conditions were more hostile. The paleoenvironmental differences between the Manila Embayment and the Mississippi Interior Salt Basin may be due to the Manila Embayment's isolation from the Mississippi Interior Salt Basin during Smackover deposition. Such isolation may have produced restrictive marine conditions in the Manila Embayment area.

The apparent Smackover "thin" located in northern Mobile, eastern Washington, and western Clarke Counties (figure 12) suggests the presence of a paleo-high which may have acted as a barrier in inhibiting ocean circulation in the Manila Embayment area. The thickness of the Smackover over this feature is less than 100 feet (figure 3). In the Humble, W.D. Harrigan No. 1 (34 feet of core), 8 miles northeast of

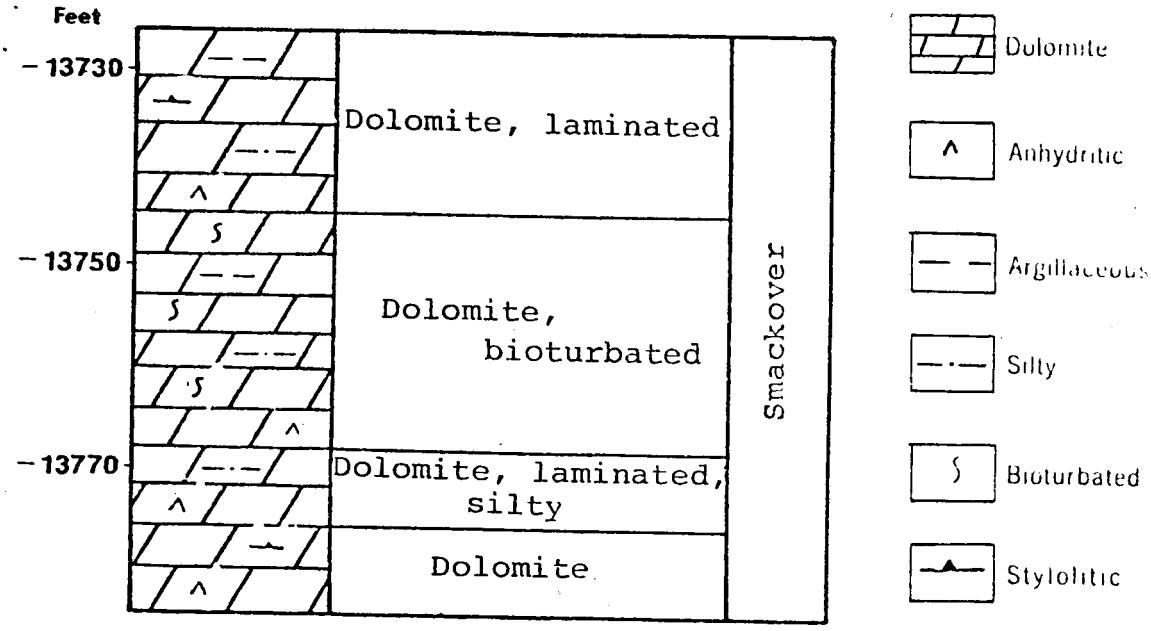


FIGURE 16. Carbonate lithologies identified in the core from Getty, C.D. Broughton no. 3, 7.5 miles northwest of Uriah, Monroe County, Alabama

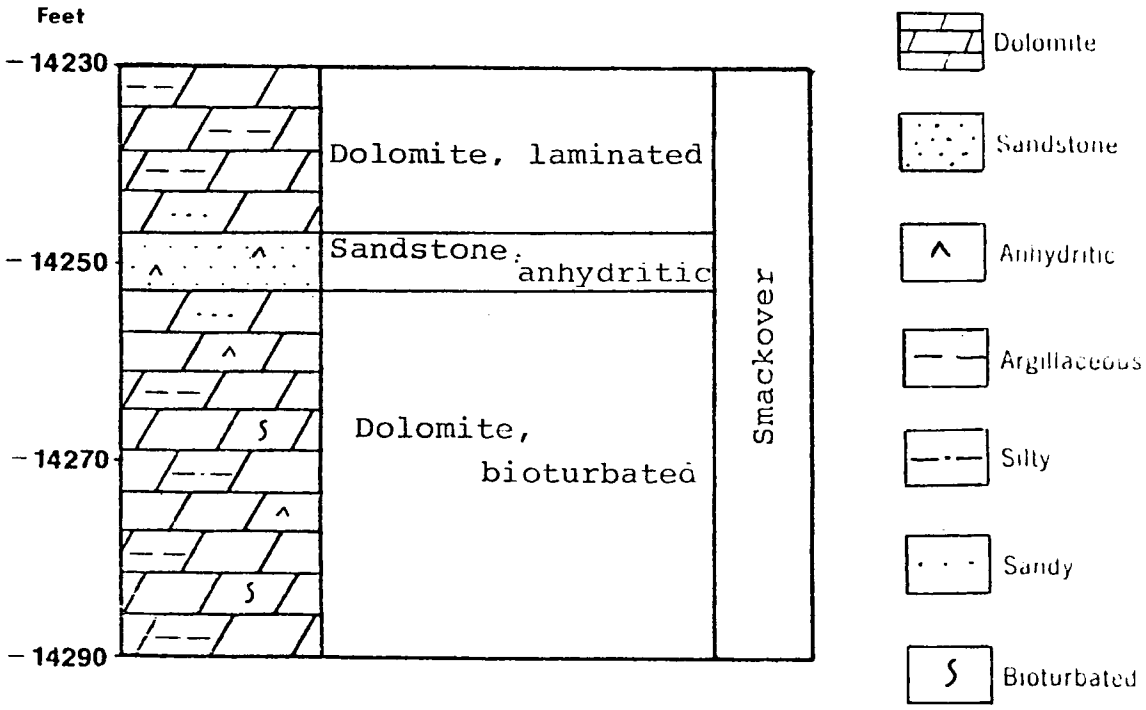


FIGURE 17. Carbonate lithologies identified in the core from Getty, Blacksher Estate no. 1, 1 mile northwest of Uriah, Monroe County, Alabama

Coffeeville, Clarke County (Permit 1438), which is located on this feature, Smackover lithofacies are similar to those observed in Choctaw and Washington Counties. The Smackover is a peloidal, oncolitic packstone interbedded with an occasional oncolitic, peloidal, grainstone (figure 18). The lower 5 feet of the Smackover is an argillaceous mudstone. The packstone and grainstone accumulated in a low- to moderate-energy, shallow subtidal environment, and the mudstone was probably deposited in intertidal mudflats.

The upper Smackover in the Exxon L&N Railroad No. 1 core (287 feet), 1.5 miles west of Pollard, Escambia County (Permit 1766), located in the Conecuh Embayment (figure 12), is characterized by low-energy lithofacies and consists of laminated, argillaceous, bioturbated mudstone which is in part dolomitized (figure 19). These intertidal to lagoonal deposits are underlain by lower Smackover peloidal wackestone which was deposited in a shallow subtidal environment. The wackestone grades downward into dolomitized, peloidal, oncolitic packstone which is interbedded with peloidal mudstone. These lower Smackover lithologies represent fluctuating low- to moderate-energy in intertidal to shallow subtidal environments. The lower Smackover also includes low-energy, shallow subtidal, peloidal wackestone interbedded with low-energy, shallow subtidal, argillaceous, peloidal and laminated mudstone. These lithofacies are similar to those described by Ottmann and others (1973) and Sigsby (1976) for the Jay trend area. Generally, however, the upper Smackover is dominated by grain-supported lithologies. Sigsby (1976) reports that the upper Smackover in this area is represented by pelletal, micritic dolomite and pellet dolomite; and the lower Smackover

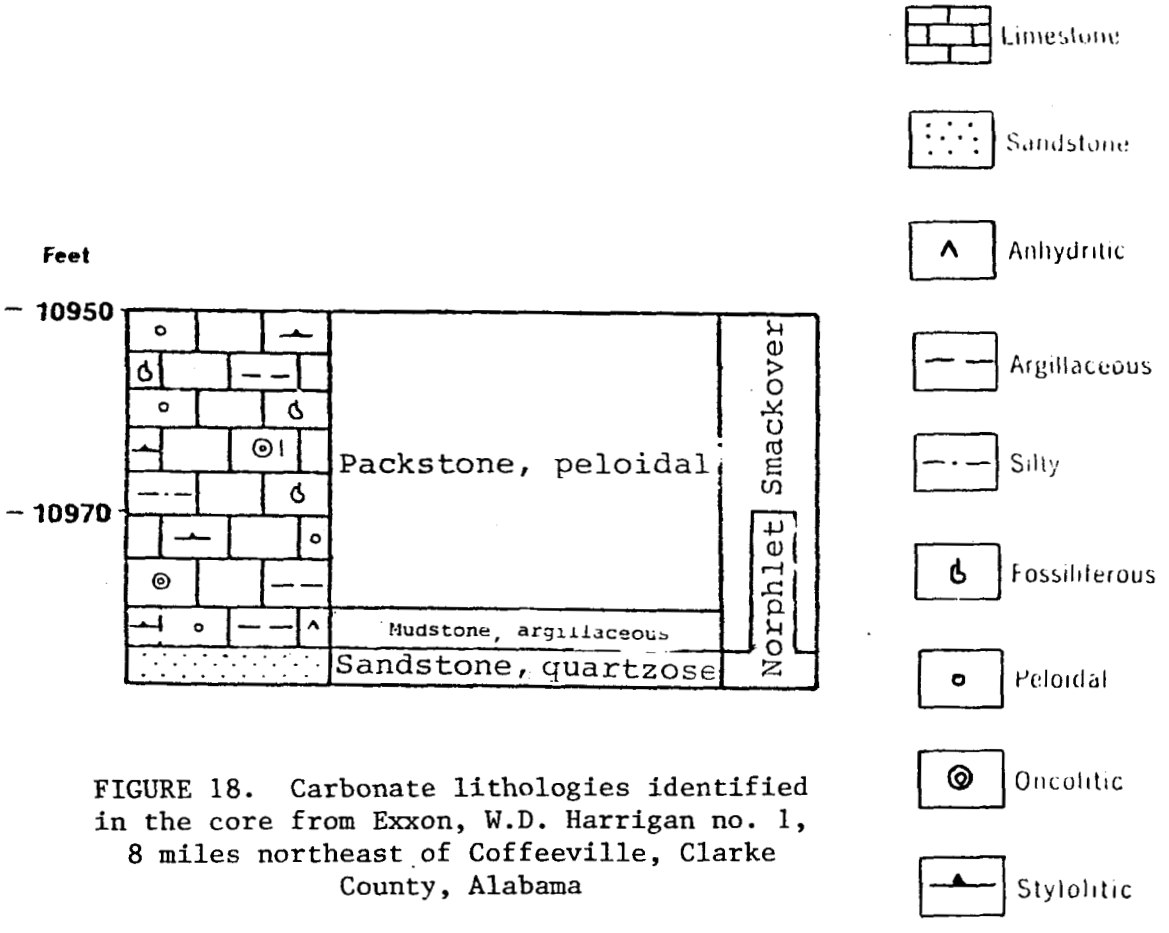


FIGURE 18. Carbonate lithologies identified in the core from Exxon, W.D. Harrigan no. 1, 8 miles northeast of Coffeeville, Clarke County, Alabama

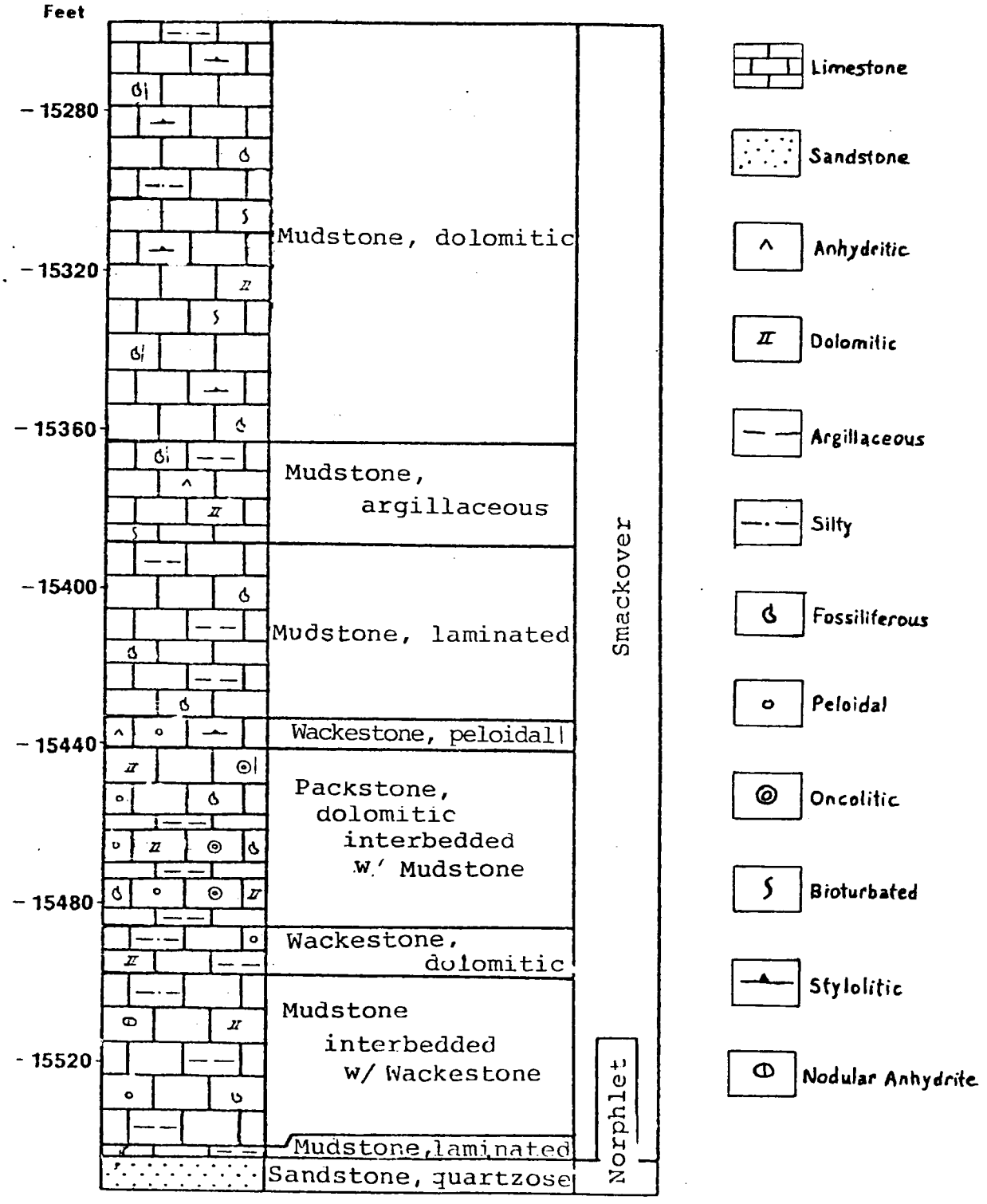


FIGURE 19. Carbonate lithologies identified in the core from Exxon, L & N Railroad no. 1, 1.5 miles west of Pollard, Escambia County, Alabama

includes laminated, micritic limestone and dolomite; micritic, pelletal, oncoidal limestone; micritic, pelletal limestone; and micritic limestone. Fossils, including foraminifers, ostracodes, gastropods and algae, were observed in the L&N Railroad No. 1 core and have been reported also by Sigsby (1976) from other cores in the embayment. Faunal and floral diversity in the Conecuh Embayment is higher than that in the Manila Embayment indicating that paleoenvironmental conditions were more favorable. The Wiggins-Conecuh Ridge probably also contributed to producing restrictive marine conditions in the Manila Embayment area by acting as a barrier to ocean circulation from the south.

Smackover deposition in northern Baldwin, northwestern and southeastern Monroe, southern Conecuh and Mobile Counties was dominated by the Wiggins-Conecuh Ridge (figure 12). The Smackover is absent from the crest of this structure and is much thinner (50 to 150 feet) along its northern flank compared to the typical Smackover thickness in southwest Alabama (figure 3). The mudstone lithofacies characteristic of the lower Smackover was not observed in any of the 16 cores studied from the Chunchula-Hatter's Pond area. The apparent absence of the lower Smackover mudstone and the fact that the Smackover does not attain normal thickness suggest that the Wiggins Uplift was a positive feature during early Smackover time. Northwest of Mobile County, in Stone and Perry Counties, Mississippi, the Smackover is 800 to 900 feet thick, and the laminated mudstone lithofacies of the lower Smackover is well developed (Wakelyn, 1977). The reduced thickness of the Smackover section in the Chunchula-Hatter's Pond area, therefore, may be due to nondeposition of carbonate sediments.

Lithofacies typical of the Chunchula-Hatter's Pond area are found in the Getty, Peter Klein No. 1 (104 feet of core), 12 miles northeast of Mobile, Mobile County (Permit 1978). Although the lithofacies present in this core have been obscured by dolomitization, several distinct lithologies are recognizable. These lithologies include: intertidal, bioturbated secondary dolomite; low- to moderate-energy, subtidal peloidal and oncolitic packstone which is in part dolomitzed; moderate-energy, subtidal, oncolitic/oolitic grainstone; and intertidal, secondary dolomite (figure 20). Fossils other than algal structures are rare in the cores studied from Mobile County. Apparently, the Wiggins-Conecuh Ridge affected distribution of organisms in this area also.

The lithologies present in the Chevron-Shell, J.A. Bryars No. 1 (243 feet of core), 5 miles south of Stockton, northern Baldwin County (Permit 1652) (figure 21), have not been as highly altered as the carbonates that are characteristic of the Chunchula-Hatter's Pond area. This dry hole is located along the southeastern margin of the Manila Embayment. Carbonate deposition in this area most likely was influenced by the Wiggins-Conecuh Ridge, as evidenced by the lithofacies in this core. In the Bryars No. 1 core, the Smackover includes an oncolitic, oolitic grainstone interbedded with peloidal, oncolitic packstone and peloidal wackestone. The grainstone is indicative of moderate- to high-energy, shallow subtidal deposition, with the packstone and wackestone reflecting a periodic reduction in the amount of energy in this subtidal environment. These lithologies are underlain by dolomitized peloidal, oncolitic packstone which reflects low- to moderate-energy.

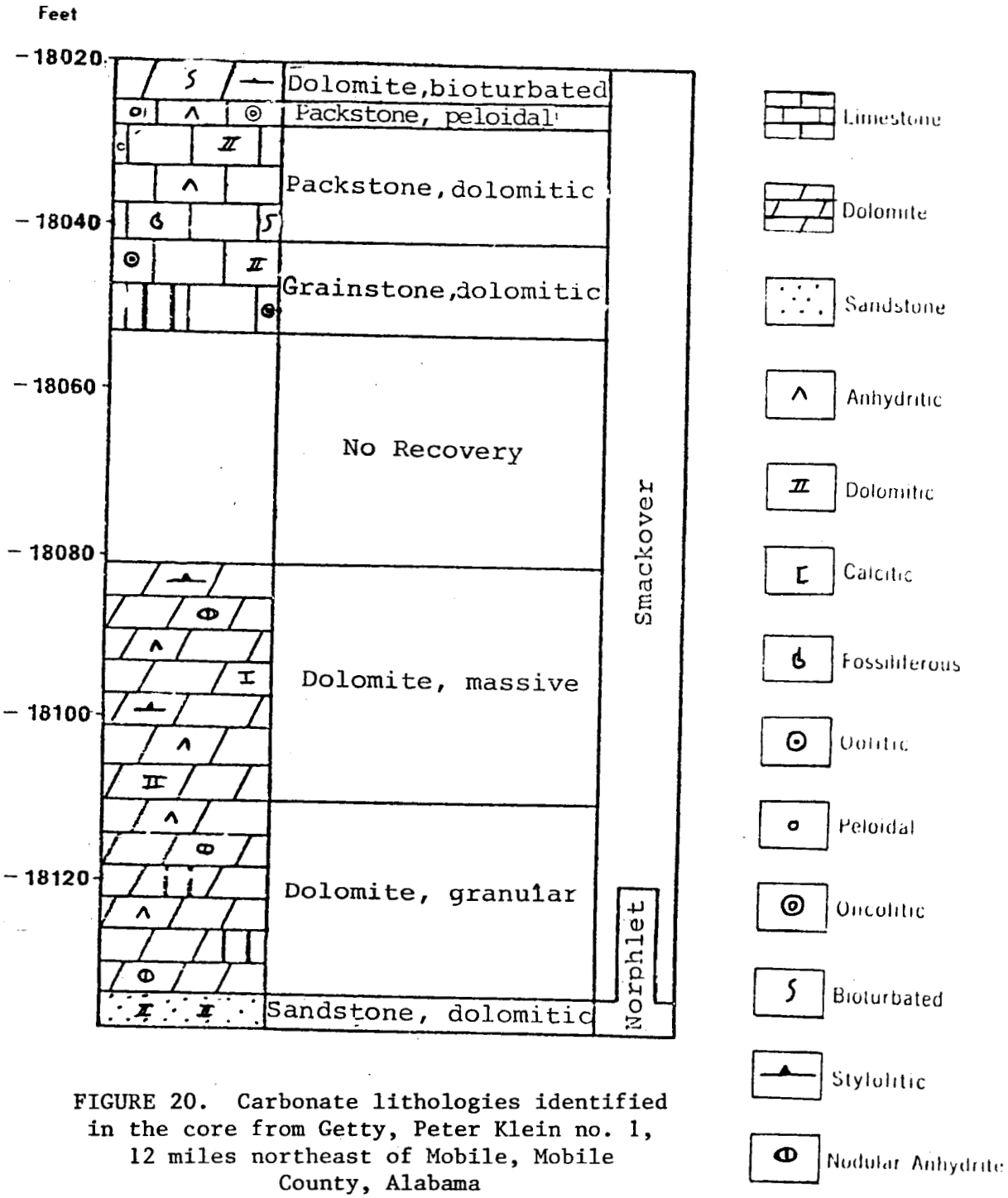


FIGURE 20. Carbonate lithologies identified in the core from Getty, Peter Klein no. 1, 12 miles northeast of Mobile, Mobile County, Alabama

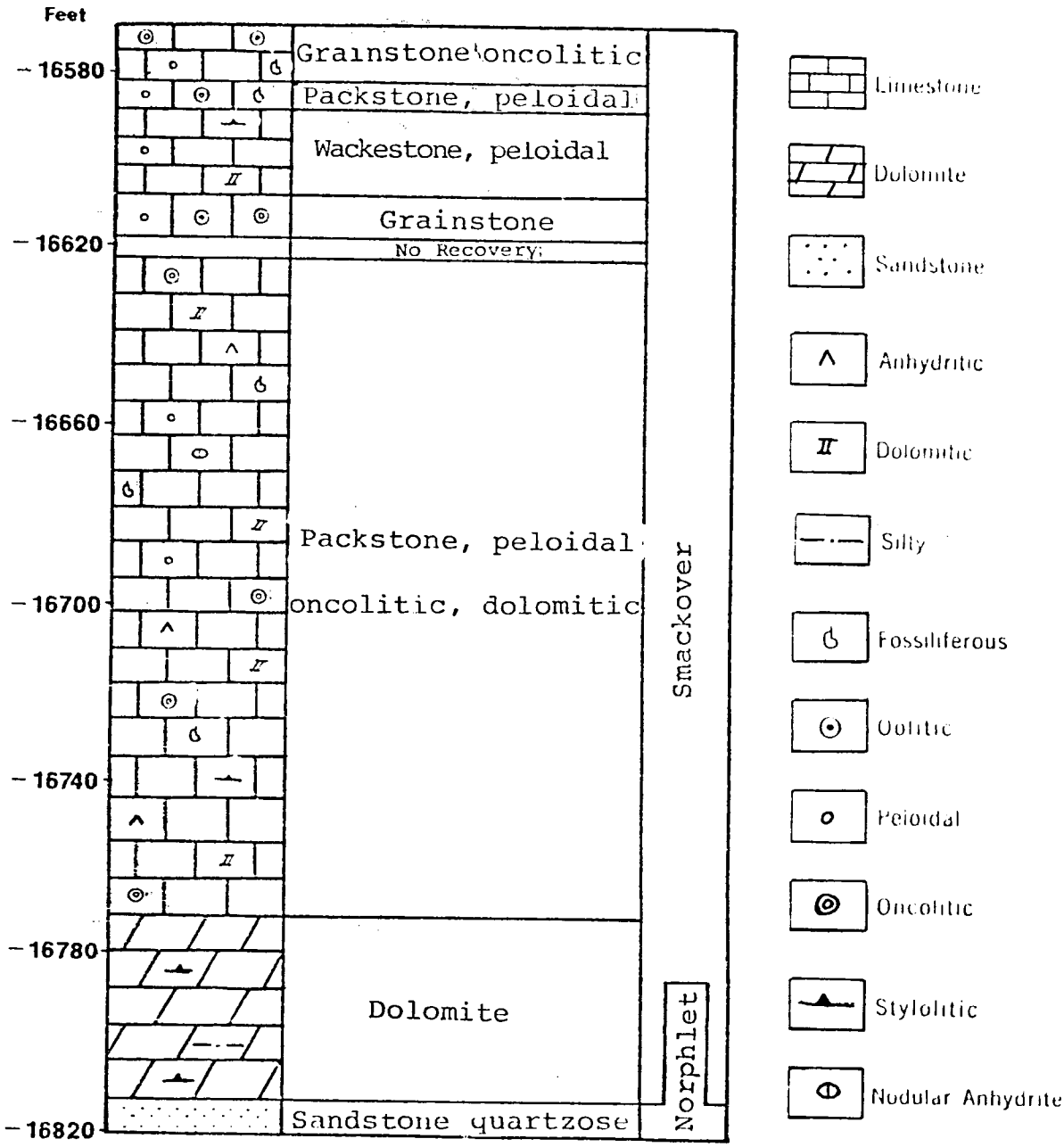


FIGURE 21. Carbonate lithologies identified in the core from Chevron-Shell, J.A. Bryars no. 1, 5 miles south of Stockton, Baldwin County, Alabama

Reservoir Rocks

Carbonate rocks in southwest Alabama include grainstones; leached and dolomitized wackestones, packstones, and grainstones; and dolomite. Porosity is facies-selective and is preserved chiefly in lithofacies of the upper Smackover. Preservation of primary interparticulate porosity and the development of secondary porosity is chiefly controlled by diagenetic alteration. Interparticulate porosity can be reduced by cementation, while dolomitization and leaching are the most critical processes in the formation of secondary porosity. Minor secondary porosity also is produced by solution enhancement (formation of vugs) and fracturing.

As evidenced by the Jackson No. 1 (Choctaw County) and Britton No. 1 (Washington County) cores, reservoir rocks in the Mississippi Interior Salt Basin have both primary and secondary porosity. In the Jackson No. 1 core (figure 14), some primary interparticulate porosite is preserved along with moderate to high amounts of secondary grain-moldic porosity produced by dolomitization and leaching of oolitic and oncolitic grainstones. Intercrystalline dolomite and secondary grain-moldic are the major types of porosity in the Britton No. 1 core (figure 15). Badon (1974) reports that the principal Smackover reservoir rocks in Clarke County, Mississippi, are oolitic grainstones with primary interparticle porosity. The packstones and grainstones present in the Harrigan No. 1 core (Clarke County, Alabama) also have secondary grain-moldic porosity.

In the Manila Embayment, reservoir rocks are primarily dolomites with intercrystalline-dolomite and minor-fracture porosity. Both the Blacksher No. 1 and Broughton No. 3 cores illustrate these types of

porosity. Much of the intercrystalline dolomite porosity in these dry holes has been reduced by later cementation.

Porosity in the L&N Railroad No. 1 core from the Conecuh Embayment area is secondary, including intercrystalline-dolomite and grain-moldic. The porosity is a result of dolomitization and leaching of peloidal, oncolitic packstone and wackestone. Ottmann and others (1973) state that the major porosity types in the Jay trend area are grain-moldic dolomite, intercrystalline-dolomite, and leached-matrix. Grain-moldic dolomite porosity is the leached product of dolomitized peloidal grainstone. Intercrystalline-dolomite is the result of dolomitization and leaching of peloidal wackestone and packstone, and leached-matrix porosity represents dolomitization of algal stromatolites. Sigsby (1976) estimates that 90 percent of the effective porosity in the Jay trend area is a result of leaching and dolomitization of peloidal lithofacies.

Along the Wiggins-Conecuh trend, both primary and secondary porosity is present. Intercrystalline-dolomite porosity, which has been enhanced in places through solution processes (vuggy porosity), is dominant in the Peter Klein No. 1 core. Minor grain-moldic and interparticulate porosity is evident in the grainstones and packstones in this gas-condensate well. Porosity in the Bryars No. 1 core is essentially primary interparticulate which has been reduced through cementation. Minor secondary intercrystalline-dolomite porosity is present, but grain-moldic porosity was not developed.

Thermal Alteration

The mudstones that characterize the lower Smackover and are interbedded with upper Smackover lithologies are locally rich in kerogen. The maturation of the kerogen in these mudstones indicates a moderate thermal history for much of this region (table 1). Only the samples analyzed from cores located near the updip limit of Smackover deposition in Choctaw and Clarke Counties were typified by the presence of immature kerogen. The remainder of the samples analyzed from cores in Washington, Monroe, Mobile, Baldwin, and Escambia Counties contained mature kerogen.

Summary and Conclusions

1. Deposition of the Smackover in southwest Alabama closely approximated present-day carbonate sedimentation in the Persian Gulf. The Louann Salt was probably responsible for forming the ramp surface. Carbonate deposition was affected by early salt movement and paleohighs, such as the Wiggins-Conecuh Ridge.
2. Three probable areas of thick carbonate accumulation are present in southwest Alabama. These include the Mississippi Interior Salt Basin and the Manila and Conecuh Embayments. The Wiggins-Conecuh Ridge separated the Conecuh and Manila Embayments during Smackover deposition. The restrictive marine Manila Embayment appears to have been separated during Smackover time from the Mississippi Interior Salt Basin by an apparent basement paleo-high or salt ridge. Smackover lithofacies and fossil assemblages are distinctive for each of the three areas.

Table 1.--Kerogen analyses[1] (Smackover Formation)

Well	Sample depth (feet)	Organic carbon (percent)	Thermal alteration index (1-5 Scale)	Paleo-temperature °F
Amoco, R. A. Amos No. 2, sec. 32, T7S, R4E, Baldwin Co. Permit 2524	-19860	0.36	3 to 3+	350
Chevron-Shell, J. A. Bryars No. 1, sec. 47, T1N, R2E, Baldwin Co. Permit 1652	-16652	0.19	2 to 2+	200
Woods, Container Corp. No. 1, sec. 28, T2N, R4E, Baldwin Co. Permit 1584	-16225	0.42	2^-	100
Placid, Jackson No. 1, sec. 31, T12N, R3W, Choctaw Co. Permit 1330	-10532	0.34	1+ to 2^-	75
Exxon, W. D. Harrigan No. 1, sec. 16, T10N, R1E, Clarke Co. Permit 1438	-10980	0.19	1+ to 2^-	75
Exxon, L&N Railroad No. 1, sec. 30, T1N, R9E, Escambia Co. Permit 1766	-15326	0.20	2+	225
Jacintoport Corp., Jacintoport, No. 1, sec. 11, T3S, R1W, Mobile Co. Permit 2178	-18309	0.89	3^-	275
Florida Gas-L.L.&E, Ideal Basic Industries, Creola No. 1, sec. 8, T1S, R1E, Mobile Co. Permit 2162	-17306	0.18	3^-	275

[1] Analyses were done by Geochem Laboratories, Houston, Texas.

Table 1.--Continued

Well	Sample depth (feet)	Organic carbon (percent)	Thermal alteration index (1-5 Scale)	Paleo-temperature °F
Getty, B. Travis, sec. 20, T2S, R2W, Mobile Co. Permit 2098	-18584	0.20	2+ to 3⁻	250
Getty, J. R. Sullivan, sec. 9, T1N, R1E, Mobile Co. Permit 2126	-17308	0.81	2 to 2+	200
Getty, Peter Klein No. 1, sec. 3, T2S, R1W, Mobile Co. Permit 1978	-18041	0.25	3⁻ to 3	300
Union, R. J. Newman No. 1, sec. 9, T1S, R1W, Mobile Co. Permit 2461	-18503	0.22	3⁻ to 3	300
Union, J. A. Smith No. 1, sec. 15, T1S, R2W, Mobile Co. Permit 2044	-18490	0.21	3⁻ to 3	300
Getty, Blacksher Co., No. 1, sec. 7, T4N, R6E, Monroe Co. Permit 1592	-14245	0.25	2 to 2+	200
Inexco, W. J. Britton No. 1, sec. 21, T8N, R4W, Washington Co. Permit 2478	-16045	0.21	3⁻ to 3	300
Turner & Hickox, A. W. Foster, sec. 10, T2N, R3W, Washington Co. Permit 2645	-19359	0.35	3⁻ to 3	300

3. The Smackover Formation can be divided into lower and upper lithofacies. Where present, the lower lithofacies includes laminated mudstone; and, on occasion, peloidal wackestone, peloidal-oncolitic packstone or dolomite are present. The upper lithofacies sequence is dominated by grain-supported textures and consists primarily of oolitic and/or oncolitic grainstone, peloidal and/or oncolitic wackestone to packstone, and occasionally dolomite or mudstone.
4. Reservoir rocks include oolitic grainstones; leached and dolomitized wackestones, packstones, and grainstones; and dolomite. Porosity is facies-selective and is preserved chiefly in lithofacies of the upper Smackover. Porosity types include primary interparticulate, secondary grain-moldic, intercrystalline dolomite, vuggy, and fracture.
5. The maturation of the kerogen in Smackover mudstones indicates a moderate thermal history for much of the Coastal Plain of Alabama.

SMACKOVER PETROGRAPHY

Introduction

The principal goals of the petrographic portion of the study were: (1) to identify principal lithofacies present in units of geothermal potential, and (2) to evaluate the reservoir potential of these units. After the Jurassic Smackover Formation was determined to be the unit with the greatest geothermal potential in southwestern Alabama, eight cores were chosen from the Smackover from seven counties (table 2). These cores were described megascopically, and samples were taken of all major lithologies for the preparation of thin sections. In particularly thick and uniform lithologic sections, samples were taken at a minimum of 10-foot intervals. One hundred fifty-eight thin sections were prepared for petrographic analysis. All thin sections were stained with a mixture of alizarin red-S and potassium ferrocyanide to differentiate calcite, dolomite, and ferroan dolomite. Each thin section was then described petrographically (Appendix A), with special emphasis placed on lithofacies determination and porosity development.

In addition, 58 samples from two wells (Humble, W.D. Harrigan, Clarke County and Getty, Peter Klein, Mobile County) were analyzed by x-ray diffraction analysis to determine quantitative carbonate mineralogy (table 3).

Lithofacies

Seven lithofacies were identified in the Smackover Formation of southwestern Alabama based on the eight cores studied. These include:

Table 2.--Smackover cores used to determine lithofacies and porosity development

County	Permit No.	Name	Samples
Baldwin	1652	Chevron-Shell et al, J. Arthur Bryars unit No. 1	32
Choctaw	1330	Placid, Jackson No. 1	48
Clarke	1438	Humble, W.D. Harrigan No. 1	8
Escambia	1766	Humble, L&N Railroad 30-3	19
Mobile	1978	Getty, Peter Klein 3-14 No. 1	10
Monroe	1592	Getty, Blacksher Co. 7-12 No. 1	7
Monroe	1698	Getty, Broughton 17-7 No. 3	9
Washington	2478	Inexco, Britton No. 1	25
		Total	158

Table 3.--Carbonate mineralogy as determined by x-ray diffraction analysis

Humble, W.D. Harrigan No. 1; Permit No. 1438

Sample depth (feet)	Dolomite (percent)	Calcite (percent)	Comments
10304		100	Abundant anhydrite
10310	100		
10315	100		
10320	55	45	
10322	75	25	
10330		100	
10337		100	
10344	Tr	100	
10348	100		
10350		100	
10360	35	65	
10369.5	20	85	(Chart off paper, dolo. prob↓)
10380	85	15	
10381	85	15	
10388	100		
10397	100		
10406	85	15	
10417	10	90	
10419	10	90	
10423	15	85	
10440	10	90	
10448	50	50	Abundant anhydrite
10456	30	70	
10461	30	70	
10469	35	65	
10470	40	60	
10483		100	
10491		100	
10494	35	65	
10497	40	60	
10501	10	90	
10509		100	
10511		100	
10512	10	90	
10529.5	0	100	
10530	100		
10532		100	
10535		100	Anhydrite
10536		100	
10537	10	90	
10543	10	90	
10547	10	90	
10556		100	

Table 3.--Continued

Sample depth (feet)	Dolomite (percent)	Calcite (percent)	Comments
10559		100	
10564		100	
10576		100	
10577		100	
18020			
18025	100		Trace quartz
18026	10	90	Trace quartz
18028	100		Trace quartz
18034	65	35	
18041	45	65	
18042	100	Tr	
18081	100	Tr	Trace quartz
18106	100		Abundant anhydrite
18118	100		Trace anhydrite
18125			

(1) oncoloidal grainstone, (2) oolitic grainstone, (3) ooid-oncolite grainstone, (4) peloidal packstone, (5) peloid-ooid-oncolite packstone, (6) mudstone, and (7) dolostone. In general, these lithofacies are very similar to ones described from the Smackover in Arkansas (Becher and Moore, 1976), Mississippi (Badon, 1974) and Florida (Sigsby, 1976; and Ottman and others, 1973).

Peloids, ooids, and algal oncolites along with a smaller number of skeletal grains are the dominant framework constituents. Textures range from grainstones and packstones in lithologies deposited in high- to moderate-energy environments to wackestones and mudstones in sediments deposited in lower-energy environments. Table 4 is a detailed description of the lithology, texture, fossil content, structures, porosity, depositional environment, and distribution of each of the lithofacies.

Porosity

There are five major types of porosity present in the Smackover cores examined: one primary porosity type (interparticulate) and four secondary porosity types (intercrystalline, moldic, vuggy, and fracture). The distribution of these porosity types is highly varied both within and between the lithofacies and geographically within the area of study.

Primary Porosity

Interparticulate porosity is the only type of primary porosity in the samples studied, and it is restricted to those lithofacies with abundant framework constituents (table 5). Interparticulate porosity is the dominant porosity type responsible for the formation of producing

Table 4.--Characteristics of lithofacies

(1.) Oncoloidal Grainstone

Lithology:	Limestone
Texture:	Dominantly grainstone, some packstone; oncolites up to 4 mm in diameter dominant, with lesser amounts of ooids, peloids, and scattered skeletal grains; intergranular areas filled with drusy dentate, granular, and sparry calcite and some sparry dolomite; dolomite replaces outer rims of oncolites or micrite matrix in packstones; anhydrite as nodular replacement or pore filling
Fossils:	Dominantly algae, gastropods, brachiopods, and echinoderms along with oncolites
Structures:	Irregular lamination; vertical to inclined fractures
Porosity:	Minor porosity remains; small amount present is dominantly cement-reduced, interparticulate, with a minor amount intercrystalline in more dolomitic samples
Depositional Environment:	Shallow subtidal; low to moderate energy
Distribution:	Chevron-Shell et al., J.A. Bryars (Baldwin County)

(2.) Oolitic Grainstone

Lithology:	Limestone; occasionally dolomitic
Texture:	Grainstone or packstone; ooids dominant framework constituent; smaller amounts of peloids, oncolites and skeletal grains; poorly sorted with ooids up to .5 mm; cement granular or sparry calcite with traces of late-stage sparry dolomite; some apparent pseudospar of neomorphic origin; trace of quartz silt; trace of replacement or pore-filling anhydrite
Fossils:	Rare brachiopods, gastropods, or echinoderms
Structures:	Stylolitic to microstylolitic
Porosity:	Minor; dominantly cement-reduced, interparticulate

Table 4.--Continued

Depositional Environment:	Shallow subtidal, high-energy
Distribution:	Inexco, W.J. Britton (Washington County); Chevron-Shell et al., J.A. Bryars (Baldwin)

(3.) Ooid-Oncolite Grainstone

Lithology:	Limestone; commonly dolomitic
Texture:	Grainstone, occasionally packstone; ooids and oncolites dominant framework constituents with minor amounts of peloids, skeletal grains and intraclasts; framework grains commonly replaced by hypidiotopic to xenotopic dolomite or leached; framework grains cemented by drusy calcite, granular calcite, or sparry dolomite; anhydrite common as nodular replacement or pore filling
Fossils:	Primarily algal material with occasional gastropods or brachiopods
Structures:	Parallel to inclined laminae; moderately to poorly sorted; indication in some samples of significant compaction
Porosity:	Moderate to high; mixture of grain-moldic, interparticulate; and intercrystalline; moldic porosity most significant, exceeding 25% in places; interparticulate porosity cement-reduced, represents only a fraction of depositional porosity; some solution-enlarged, interparticulate; intercrystalline porosity developed in dolomitized sample
Depositional Environment:	Shallow subtidal, moderate to high energy
Distribution:	Placid, Jackson (Choctaw County)

(4.) Peloidal Packstone

Lithology:	Limestone, silty and micaceous; occasionally dolomitic

Table 4.--Continued

Texture:	Packstone, locally wackestone or grainstone; dominated by spherical to ovoid peloids including *Favreina*; smaller amounts of oncolites, ooids, and skeletal grains; scattered and patchy euhedral dolomite rhombs; mica and quartz silt common minor constituents; some granular calcite cement; micrite commonly neomorphosed to pseudospar or microspar; anhydrite/gypsum nodules common; some leaching of framework grains
Fossils:	Mixture of minor pelecypods, algae, ostracods, and oncolites
Structures:	Occasionally stylolitic to microstylolitic; some spherical vugs; patchy areas of dolomite give clotted texture, perhaps related to bioturbation; scattered dark organic material
Porosity:	Minor; mixture of small amounts intercrystalline, and local vuggy to moldic
Depositional Environment:	Shallow subtidal, low to moderate energy
Distribution:	Humble, L&N Railroad (Escambia County); Humble, W.D. Harrigan (Clarke County); Chevron-Shell et al., J.A. Bryars (Baldwin County) Getty, Peter Klein (Mobile County)

(5.) Peloid-ooid-oncolite Packstone

Lithology:	Limestone; occasionally dolomitic
Texture:	Dominantly packstone with some grainstone or wackestone; peloids (including *Favreina*), ooids, and oncolites dominant framework grains; smaller amounts of skeletal material; micrite matrix commonly neomorphosed to microspar or pseudospar; evidence of early compaction in some cases; cement mixture of drusy, granular, and sparry calcite; dolomite as scattered euhedral-subhedral rhombs, replacement of ooid/oncolite rims or replacement of matrix micrite; matrix dolomite commonly argillaceous; scattered quartz silt in matrix; rock heavily leached in places
Fossils:	Forams, algae, gastropods, brachiopods, and echinoderms most common

Table 4.--Continued

Structures:	Stylolitic and microstylolitic; some dark wavy organic lamination; hint of bioturbation
Porosity:	Minor to high porosity depending largely upon the amount of leaching which has occurred; most interparticulate porosity completely occluded by cementation; present porosity dominantly moldic, with smaller amounts interparticulate
Depositional Environment:	Shallow subtidal, low to moderate energy
Distribution:	Humble, L&N Railroad (Escambia County); Placid, Jackson (Choctaw County); Humble, W.D. Harrigan (Clarke County); Inexco, W.J. Britton (Washington County); Chevron-Shell et al., J.A. Bryars (Baldwin County); Getty, Peter Klein (Mobile County)

(6.) Mudstone

Lithology:	Limestone; commonly silty and micaceous; occasionally dolomitic
Texture:	Mudstone, occasionally wackestone; micrite commonly neomorphosed to microspar or pseudospar; scattered peloids or skeletal grains; some leaching of peloids or skeletal grains; scattered to patchy euhedral to subhedral dolomite rhombs; anhydrite/gypsum as replacement nodules or pore fillings; some sparry calcite as pore filling
Fossils:	Rare ostracods, forams, algal grains, brachiopods; occasional small oncolites
Structures:	Stylolitic to microstylolitic; fractures; massive to finely and irregularly laminated; dark wispy to wavy organic lamination common; mudcracked; bioturbated
Porosity:	Minor to moderate; mixture of fracture-, vuggy-, and moldic-, with small amounts intercrystalline associated with patchy dolomite zones
Depositional Environment:	Subtidal lagoon to intertidal flat; low-energy

Table 4.--Continued

Distribution:	Humble, L&N Railroad (Escambia); Placid, Jackson (Choctaw County); Humble, W.D. Harrigan (Clarke County); Inexco, W.J. Britton (Washington County); Chevron-Shell et al., J.A. Bryars (Baldwin County)

(7.) Dolostone

Lithology:	Dolostone, commonly silty, micaceous; occasionally argillaceous
Texture:	Generally mudstone; rare scattered peloids represent only framework constituents; dolomite typically nonferroan and hypidiotopic to zenotopic, rhombs 20-100 microns in diameter; some associated late stage ferroan dolomite as rims on nonferroan cores; anhydrite/gypsum common as replacement nodules or euhedral crystals
Fossils:	None
Structures:	Stylolitic; fractured; often hydrocarbon stained; dark wispy to wavy organic lamination; irregular silty and micaceous lamination; some scattered bioturbation; mudcracked
Porosity:	Minor to high porosity; small amounts of intercrystalline porosity in all samples; many samples show evidence of leaching with higher porosity values (over 20% locally) in heavily leached samples; higher porosity primarily solution-enlarged fracture-, vuggy-, or moldic-
Depositional Environment:	Intertidal to supratidal flat; low energy
Distribution:	Placid, Jackson (Choctaw County); Inexco, W.J. Britton (Washington County); Chevron-Shell et al., J.A. Bryars (Baldwin County); Getty, Broughton (Monroe County); Getty, Blacksher (Monroe County); Getty, Klein (Mobile County)

Table 5.--Porosity types and abundance in lithofacies studied

A--minor
B--moderate
C--high

Lithofacies	Porosity Type[1]				
	Interparticulate	Intercrystalline	Moldic	Vuggy	Fracture
Oncolitic grainstone	A	A[2]			
Oolitic grainstone	A				
Ooid/oncolite grainstone	A/B	A[2]	C		
Peloidal packstone	A			A	
Peloidal, ooid, oncolite packstone	A		C		
Mudstone		A[2]	A/B	A/B	A
Dolostone		A	A	B/C	B

[1]Porosity types after Choquette and Pray (1970)

[2]Present only in dolomitized samples

Smackover petroleum reservoirs in Arkansas (Becher and Moore, 1976), Louisiana (Bishop, 1969) and Mississippi (Badon, 1974); and it is of major significance in Washington, Choctaw, and Clarke Counties, Alabama. The general decline in importance of interparticulate porosity in parts of southwest Alabama is largely the result of early compaction and extensive cementation.

Minus-cement porosity values in the samples examined range from over 30 percent to less than 15 percent. Those samples which show unusually low minus-cement values (less than 20 percent minus-cement porosity) invariably show evidence of early compaction in the form of interpenetrating grain boundaries and/or distorted ooids or oncolites. This early compaction is in part responsible for the reduction of interparticulate porosity.

Interparticulate porosity is further reduced by extensive cementation. In most samples, interparticulate porosity is almost totally or is completely occluded by one or more of the following five cement types: (1) drusy dentate calcite, (2) granular calcite, (3) sparry calcite, (4) sparry dolomite, and (5) anhydrite. Volumetrically, granular and sparry calcite are the principal cement types, with drusy dentate calcite, sparry dolomite, and late-stage anhydrite playing relatively minor roles.

Interparticulate porosity remaining after compaction and cementation is relatively low (less than 10 percent) and, except in the Clarke and Choctaw County areas where higher values occur, provides no reservoir potential.

Secondary Porosity

Secondary porosity (post-depositional) develops after deposition. There are four major types of secondary porosity present in the samples studied.

(1) Intercrystalline Porosity.--Intercrystalline porosity in the units studied is solely present between rhombohedra of replacement dolomite. It is best developed in the dolostone lithofacies, but also occurs in other lithofacies where dolomitization has occurred but has been less extensive. In no case, however, does intercrystalline porosity reach significant levels in the samples studied.

(2) Moldic Porosity.--Secondary moldic porosity is developed where primary framework grains are selectively leached, either in part or totally. It is a very significant porosity type in the samples studied. Early meteoric diagenesis of many of the lithofacies described was accompanied by the leaching of framework peloids, ooids, and/or oncolites. This leaching post-dated an early stage of cementation which stabilized the lithology. The samples studied show a complete spectrum of replacement from completely unleached samples through samples with partially leached framework grains to samples in which micritic rims are all that remain of the original grains.

While this secondary porosity is sometimes occluded by later-stage cementation, it is volumetrically the most important porosity type in the samples studied. Moldic-porosity values exceed 25 percent in some of the samples. Moldic porosity is most common in the ooid-oncolite

grainstone and peloid-ooid-oncolite packstone lithofacies, though some moldic porosity is also present in other lithofacies.

(3) Vuggy Porosity.--Vuggy porosity develops when initial pores are enlarged by solution. The nature of these initial pores can vary. They can be interparticulate or intraparticulate voids, molds, or intercrystalline pores.

A variety of different types of vuggy porosity was recognized in the samples studied. In many instances interparticulate pores or molds have been solution-enlarged forming vuggy porosity. Because the original nature of the porosity could be identified, however, this type of porosity was described as solution-enlarged interparticulate or moldic. The mudstone or dolostone lithofacies occasionally contain irregularly shaped vugs. In many cases these vugs represent solution-enlarged molds of early diagenetic anhydrite or gypsum nodules or crystals, but in other cases the origin is unknown.

Volumetrically, vuggy porosity is relatively insignificant except in the mudstone and dolostone lithofacies. In these lithologies it can result in the development of moderate to high amounts of porosity.

(4) Fracture Porosity.--Fracture porosity is that porosity which develops along fractures in the rock. While fracture porosities are seldom high, they are often significant since they are commonly associated with high permeabilities. In the units under study, fracture porosity was present only in the mudstone and dolostone lithofacies. In these lithologies, it was frequently cement-reduced and seldom exceeded 5 percent.

Porosity Summary

Based on the distribution of the porosity types described, it seems apparent that the Smackover Formation in southwestern Alabama does have reservoir potential. Porosity values in excess of 25 percent are present in several of the cores examined. While it is impossible to define the lateral extent and size of the reservoirs identified because of the small number of wells examined, it seems likely that these reservoirs are of sufficient size to be potential geothermal reservoirs.

GEOPHYSICAL DATA

Southwest Alabama

Because southwest Alabama is an important oil and gas producing region, it has been investigated by numerous reflection seismic surveys carried out by oil companies and geophysical firms. These data are held strictly confidential and were not available for this study. Although deep refraction seismic information is not available in the immediate area of study, Warren and others (1966) reported on the results of deep refraction seismic measurements along a north-south line in Mississippi that crossed the Wiggins Uplift and Mississippi Interior Salt Basin (figure 22). This survey was made in 1963-64 to provide background information on crustal structure near the site of the Salmon nuclear-test explosion in the Tatum salt dome.

The refraction data in Mississippi indicate that there are pronounced differences in the thicknesses and depths of deep crustal layers in the area of the Wiggins Uplift as compared to the area of the Interior Salt Basin. In comparison with the salt basin area, the Wiggins Uplift is underlain by a shallower, thicker upper granitic crust and a deeper, lower basaltic crust and Moho. In the area of the Uplift, the upper crustal layer is approximately 8 miles thick and the Moho is at a depth of about 25 miles. Below the center of the Interior Salt Basin the upper crust is only slightly more than 3 miles thick and the Moho is at a depth of about 20 miles. The Moho is even shallower north of the salt basin.

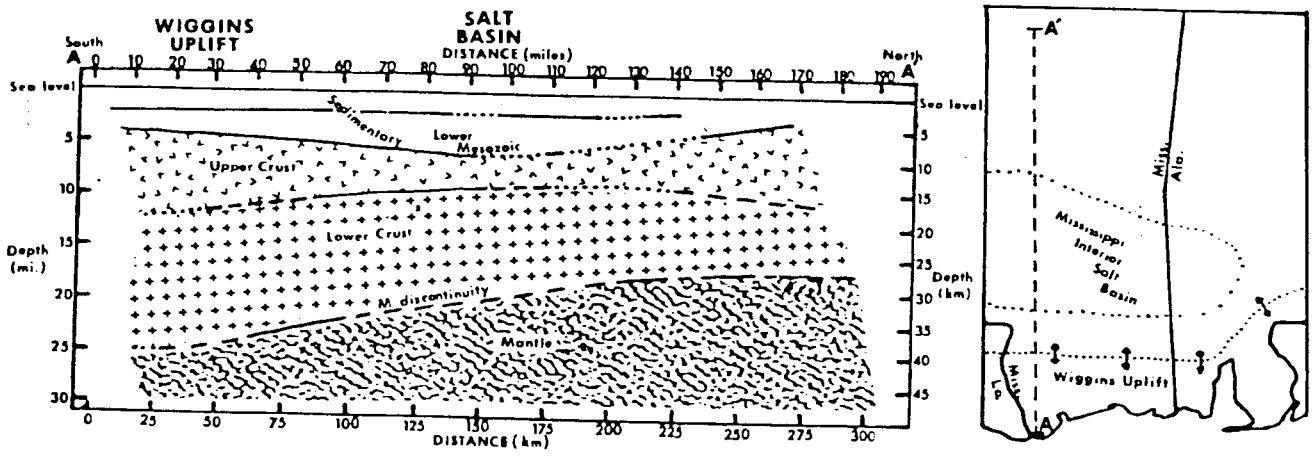


FIGURE 22. Interpretation of crustal structure in southeast Mississippi from refraction seismic data (from Wilson, 1975; modified from Warren and others, 1966)

Data from a number of gravity surveys were compiled and a regional Bouguer gravity map prepared for southwest Alabama (figure 23). As would be expected, regional gravity anomalies reflect the marked variations in crustal thicknesses and depths associated with the Wiggins Uplift and the Interior Salt Basin. As pointed out by Warren and others (1966), however, there must be lateral density changes in the upper mantle in order to account for anomaly intensities.

A regional gravity minimum of less than -36 milligals in Mobile County is associated with the easternmost extension of the Wiggins Uplift. The axis of this feature, which can be traced from central Mobile through north Baldwin, west Escambia and into central Conecuh Counties, closely corresponds to the axis of the basement ridge discussed earlier. A gravity high is indicated in the Interior Salt Basin area of Washington County, although there is no closure here. In Mississippi a closure of more than +20 milligals is present in the central part of this basin (American Geophysical Union, 1964).

Several large gravity maxima in southwest Alabama are believed to be related to dense intracrustal intrusions or perhaps to "swells" in the dense lower crust or upper mantle. In north Clarke and southwest Marengo Counties is the Thomasville anomaly with an intensity of more than +24 milligals. In south Dallas and north Wilcox Counties is the Carlowville anomaly with an intensity of more than +28 milligals. The Fairfield anomaly, which is centered in southwest Covington County, has a closure of more than +16 milligals. These dense intracrustal masses in southwest Alabama bordered the margin of the early Jurassic basin and

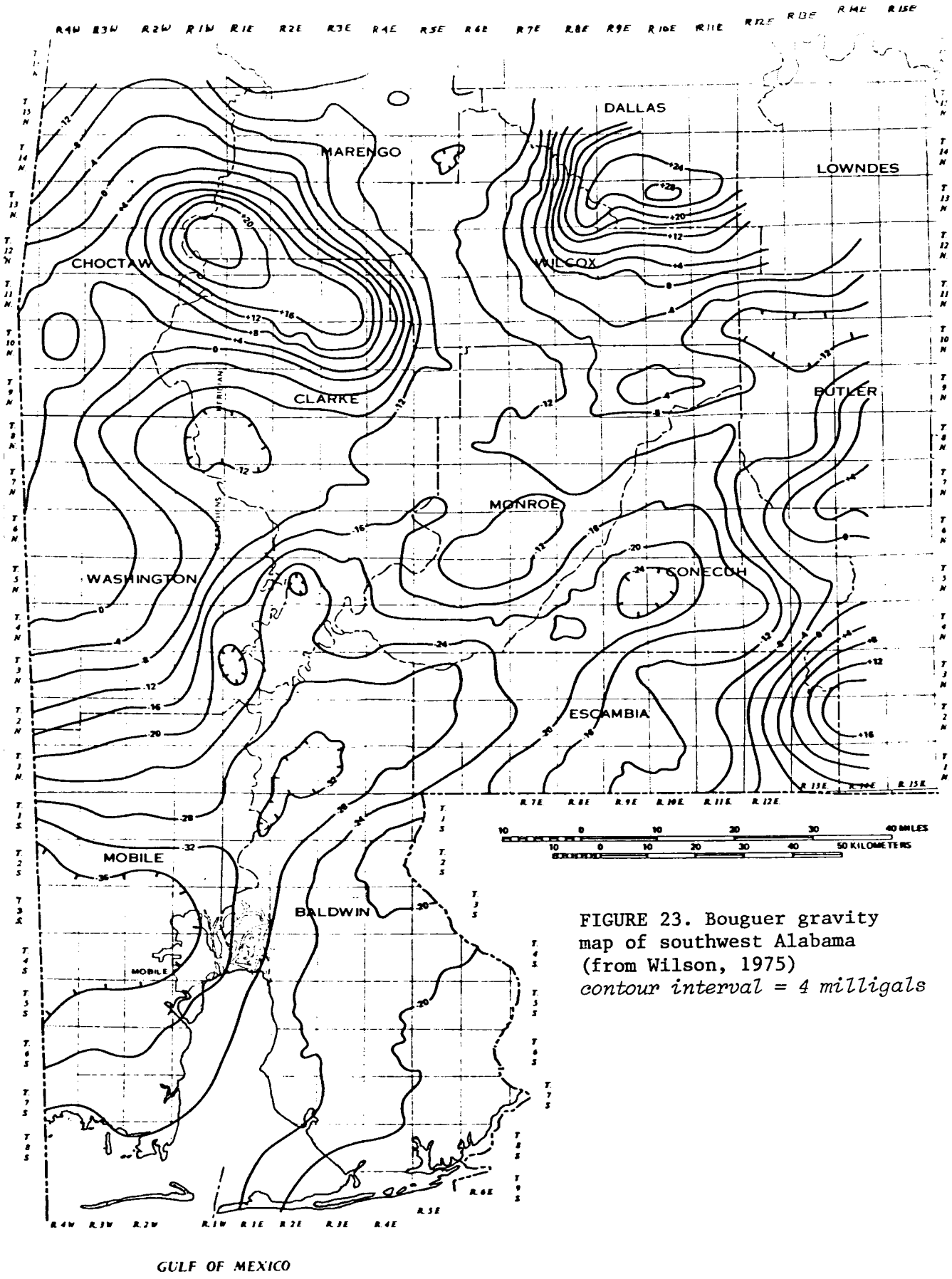


FIGURE 23. Bouguer gravity map of southwest Alabama (from Wilson, 1975) *contour interval = 4 milligals*

probably locate a zone of structural weakness in the crust along which early basin subsidence took place (Wilson, 1975).

A vertical magnetic intensity map is available for part of southwest Alabama (figure 24). The most prominent feature on this map, which corresponds to the Thomasville gravity maximum in Clarke County, has an intensity of more than 1200 gammas. A magnetic high with an intensity of more than 750 gammas is located in east-central Baldwin County, centered in the southwest part of T. 2 S. and R. 4 E., 6 miles southeast of the city of Bay Minette. A small regional gravity high, without closure, occurs in this area (McWilliams and Joiner, 1970a). In southwest Alabama the Wiggins Uplift and Interior Salt Basin both appear to be reflected by regional magnetic lows, although these are not as distinctive as the associated gravity anomalies.

Southeast Alabama

Geophysical data in southeast Alabama are limited to a regional Bouguer gravity anomaly map of the area (figure 25). The dominant feature on this map is a regional maximum, the axis of which extends in a southwest direction from southeast Russell County, through Barbour and into northeast Coffee County. This feature, which reaches a maximum intensity of more than +30 milligals, is similar in intensity to other NE-SW trending maxima located in the area of the Piedmont Province of the eastern United States. The cause of this anomaly is not known and cannot be determined from available data. It is interesting to note, however, that Woollard (1962), in correlating gravity to surface geology, found that positive gravity anomalies of the Piedmont are most

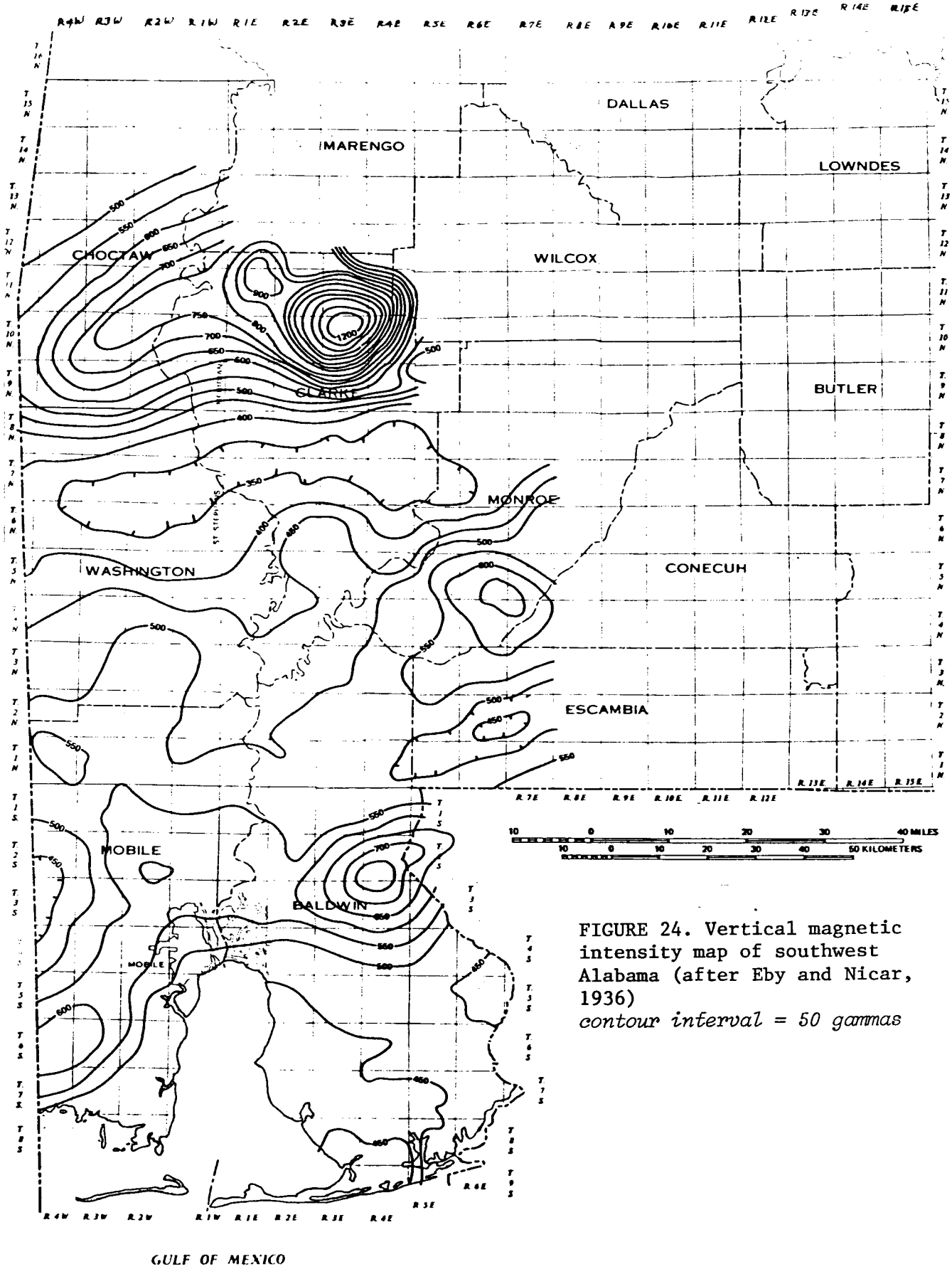


FIGURE 24. Vertical magnetic intensity map of southwest Alabama (after Eby and Nicar, 1936)
contour interval = 50 gammas

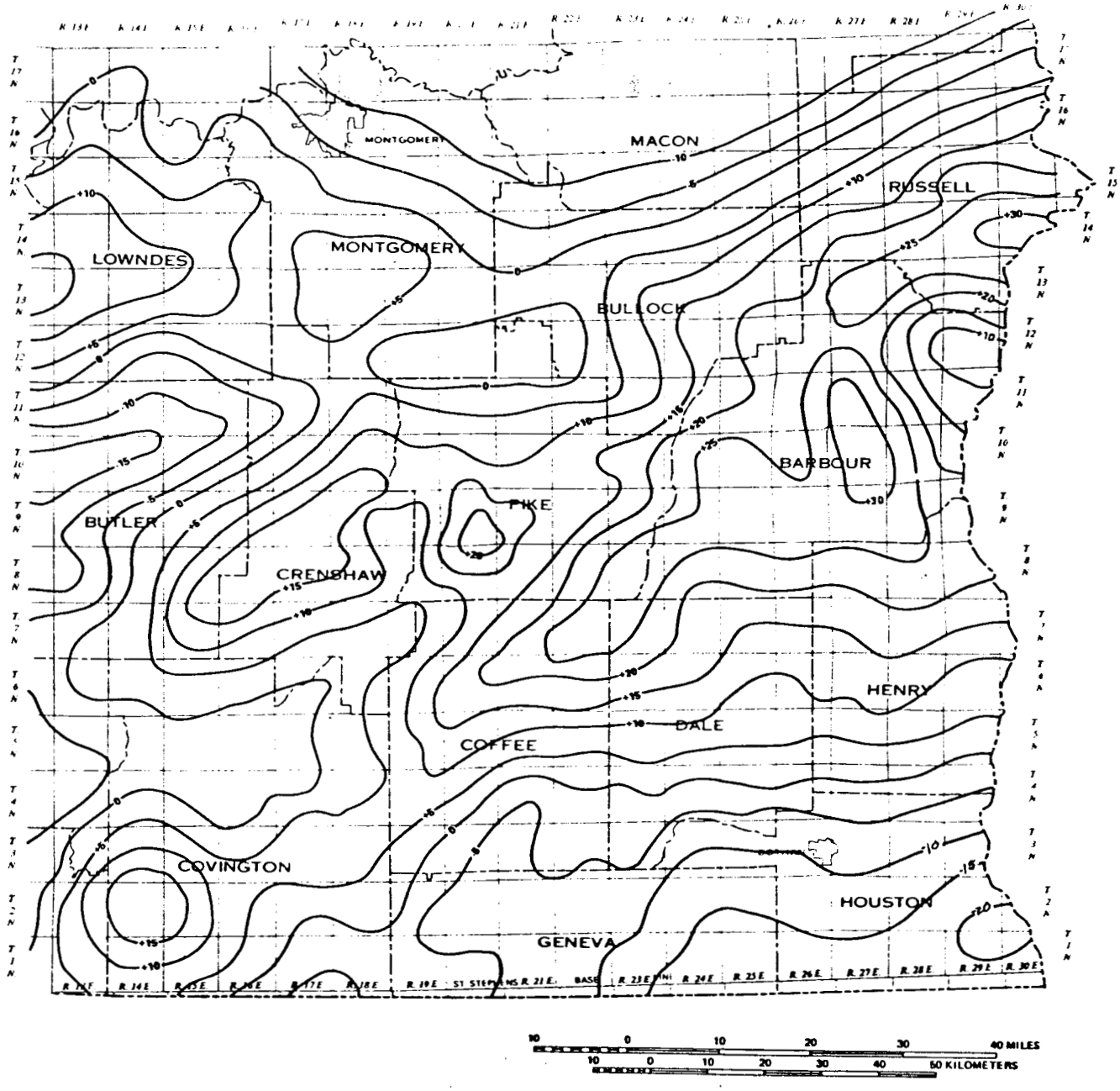


FIGURE 25. Bouguer gravity map of southeast Alabama (modified from a map distributed as a courtesy of Exploration Surveys Incorporated, Dallas, Texas)
contour interval = 5 milligals

often associated with injection gneisses, gabbroic and dioritic intrusives, and volcanics of the eugeosynclinal area.

To the southwest and in alignment with the large regional high is the Fairfield anomaly in southwest Covington County. Other gravity maxima, of unknown origin, are located in Crenshaw and Pike Counties.

LOG ANALYSES FOR THE DETERMINATION OF ABNORMAL FORMATION PRESSURES AND TEMPERATURES IN SOUTH ALABAMA

Introduction

Formations with abnormally high pressures and temperatures have been known to occur in southwest Alabama, although reports are absent concerning the causes or nature of these zones. A review of drilling reports and well logging records reveal that a number of wells in Baldwin County have encountered drilling problems, and heavy muds of 17 to 18 lbs/gal were needed in order to control the wellbore conditions. In addition, abnormally high temperatures have also been found in all overpressured wells. Temperatures up to 330°F were recorded in some wells at a depth of approximately 18,000 feet.

Though there have been scattered reports of abnormal pressures and temperatures in southwest Alabama, there have been no test data of these zones available for a comprehensive study of the geo-energy potential. As a result of this restriction, our study has relied heavily upon well-log analyses.

Well-logging Methods for Detecting and Evaluating Abnormal Formation Pressures

Regardless of the causes of abnormal pressure, all overpressured formations are characterized by the presence of high porosity, low density, and high water saturation. Accordingly, the well-logging techniques for detecting high-pressure zones are based upon physical property measurements of rocks using appropriate logging tools.

Resistivity logs have been used effectively in Tertiary sections of the Texas-Louisiana Gulf Coast area. The method requires resistivity data for several thousand feet in each well in order to establish a normal resistivity trend. Overpressured zones then can be identified at the position at which resistivity breaks off from normal trend to a lower resistivity. This method has been used reasonably well in the older Jurassic formations in southwest Alabama.

Quantitative determination of formation pressures from resistivity data was discussed by Hottman and Johnson (1965). The method requires an empirical correlation curve of formation-pressure gradient and determination of the ratio of normally pressured shale to observed shale resistivity. This curve is available for Miocene/Oligocene Formations along the U.S. Gulf Coast area. We have tested this relationship and found it is not applicable to wells in Alabama.

"Equivalent Depth Method" suggested by Fertl (1976) was tested with satisfactory results. This method utilizes the shale resistivity-versus-depth plot to determine the equivalent depth. The formation pressure is calculated based on the mathematical relation:

$$P_f = G_o - D_A - D_E (G_o - G_H)$$

where P_f = formation pore pressure, psi

D_A = depth of abnormal pressure zone, feet

D_E = normal equivalent depth in feet corresponding to D_A

G_H = hydrostatic pressure gradient, psi/ft

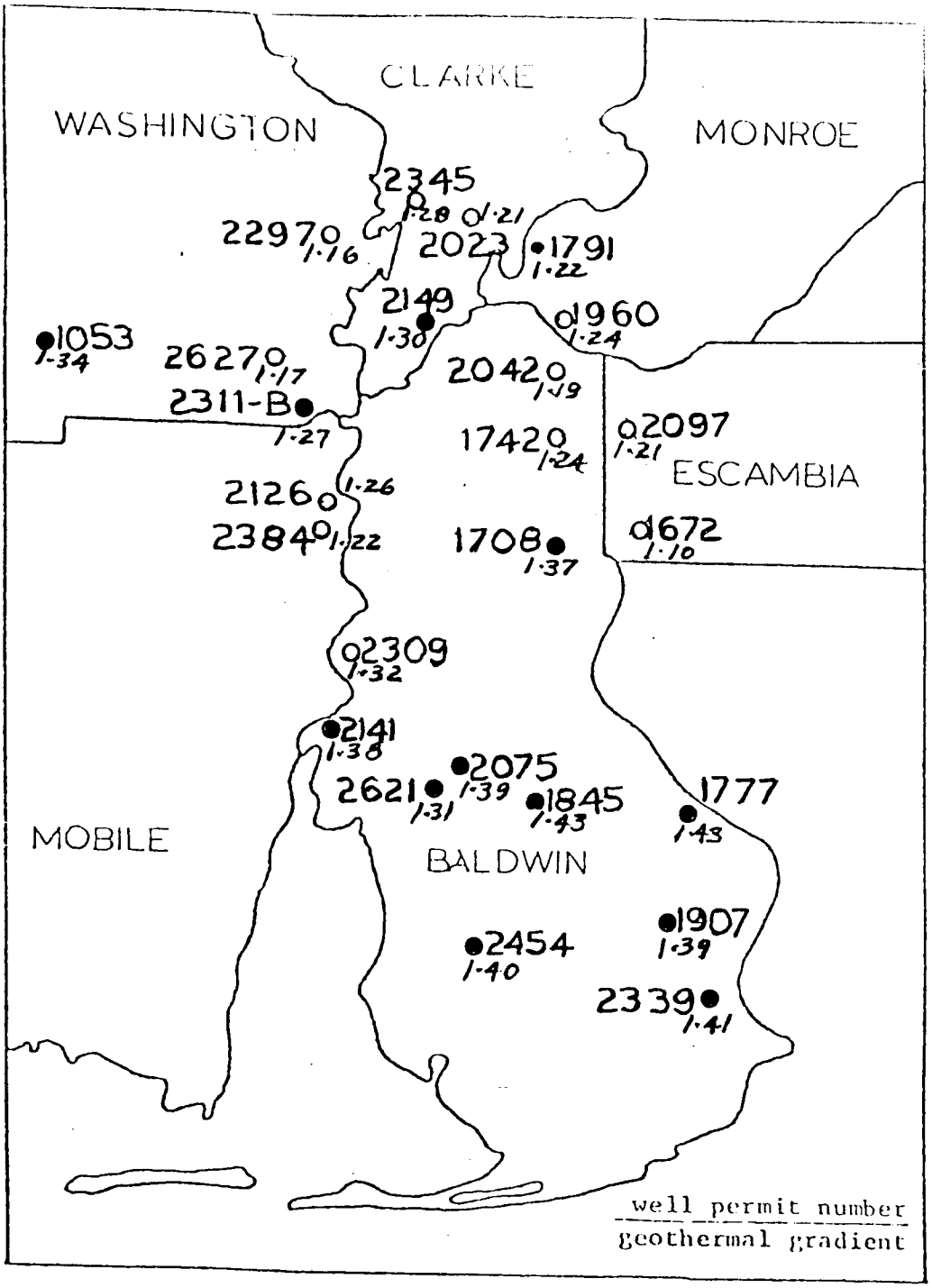
G_o = overburden pressure gradient, psi/ft

The equivalent depth method is convenient to use and does not require an empirical correlation curve as in the Hottman-Johnson method.

The use of acoustic logs, neutron logs, and density logs for detecting overpressured zones as proposed by Ham (1966) are inapplicable in this study area because the logged intervals are often too short to establish normal trends to use for abnormal pressure calculations.

Increased geothermal gradients have also been found in overpressured zones (figure 26). The coexistence of overpressures and high formation temperatures may be explained in terms of heat-flow capacity. Clay has a thermal conductivity of approximately 2.4 mcal/cm-°C-sec compared with 1.4 mcal/cm-°C-sec for water. Therefore, overpressured waters act as "thermal barriers," thereby locally increasing the geothermal gradient.

The geothermal gradient can be determined by actual measurement of static temperature in the wellbore. Bottomhole temperatures (BHT) are normally shown on the well log heading. It should be mentioned that the BHT measured by logging devices may not necessarily be the "bottom" hole temperature. The maximum thermometer contained in the logging device simply records the hottest point within the logging interval. It should also be pointed out that the temperature obtained from a well log is usually less than the true formation temperature because the stabilized formation temperature is rarely reached by the time the well logs are run. However, the observed temperatures are likely to be within 5% of the true formation temperature and are useful for regional temperature studies.



● *overpressured well*

○ *non-overpressured well*

FIGURE 26. Geopressured wells in southwest Alabama and geothermal gradients

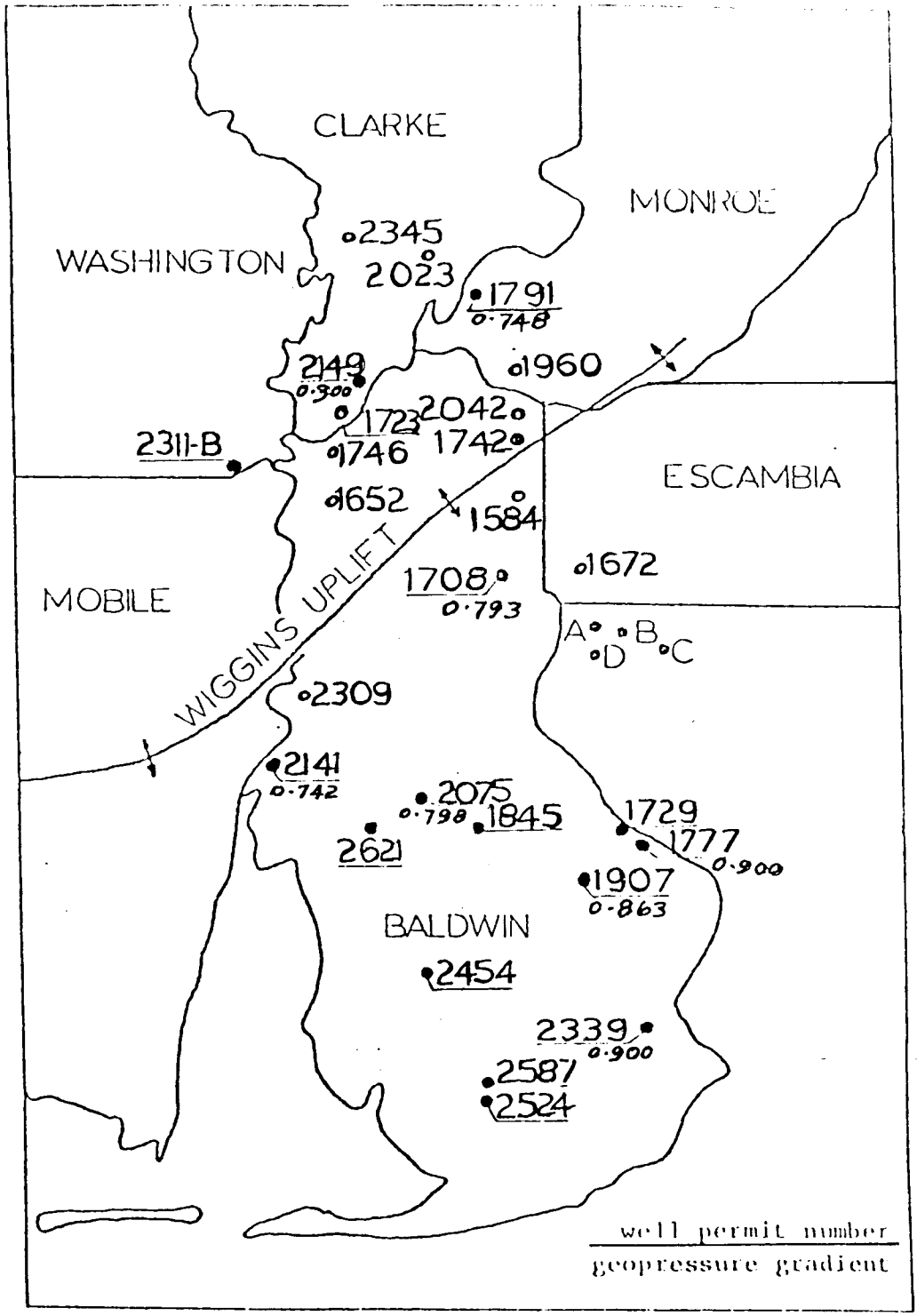
Geopressured Wells in Southwest Alabama

A review of well files at the Alabama Oil and Gas Board indicates that there has been no sign of abnormal pressure in the shallower Cretaceous formations. Heavy mud associated with wellbore problems, however, was reported for a number of deep Jurassic exploratory wells in southwest Alabama.

Abnormally high-pressure wells can be readily recognized from the history of mud systems employed in their drilling operations. Normally, a 9.5 lbs/gal water-base mud is initially used to a depth of approximately 17,000 feet, to the top of geopressured zones. The drilling fluid is then switched to heavy mud, weighted up to approximately 18 lbs/gal. After the high-pressure interval is penetrated, a casing string is set and the mud weight returned to normal.

A total of 235 Jurassic wells were inspected for possible abnormal pressure zones. Wells with a mud record of 12 lbs/gal or higher were selected for further investigation. Of the 235 wells inspected, 27 wells are located in Washington County, 97 wells in Escambia County, 19 wells in Baldwin County, 85 wells in Mobile County and 7 wells in Clarke County.

As a result of the above described investigation, 12 wells located in Baldwin County were found to have abnormally high pressures. These wells, designated by their Drilling Permit Number, are shown in figure 27. In addition, wells 2149 and 1723 in southernmost Clarke County, 2311-B in the southeast corner of Washington County, and 1791 in southern Monroe County were also found to be overpressured.



● *overpressured well*

o *non-overpressured well*

FIGURE 27. Geopressured wells in southwest Alabama and geopressure gradients

Four wells located in the northwestern corner of Escambia County, Florida, showed evidence of overpressure. These wells were numbered A, B, C, and D in figure 27. Unfortunately, the well logs of these wells are too poor to permit study in detail.

Determination of Abnormally Pressured Zones

Log analyses for the determination of depth and lithology of the overpressured zones were performed for eight wells drilled with heavy mud. The method applied was the semi-log plot of depth-versus-resistivity of shale streaks as shown in figures 28 through 35. The resistivities were read from dual induction logs. Other logs, including density, neutron, sonic, gamma ray, and caliper, were also used to determine rock types, porosities, and wellbore conditions for the purpose of making well-to-well correlations.

The results of plots clearly indicate that there is a drastic resistivity break-off from the normal trend line in the lower Haynesville Formation. As outlined previously, the break-off point represents the transition zone from normal to abnormal pressures. The Late Jurassic Haynesville Formation generally dips toward the Gulf of Mexico, and the depths to overpressured zones are found to vary from 14,000 feet in Clarke and Monroe Counties to 18,000 feet in the southern part of Baldwin County. Table 6 shows the approximate top and bottom limits of the overpressured zones as determined from logs.

From log analyses and limited drilling reports, the lithology of overpressured zones in Baldwin County is believed to be chiefly anhydrite interbedded with gypsum, limestone, shale and possibly some thin layers of sandstone. Further, the results of log analyses reveal that

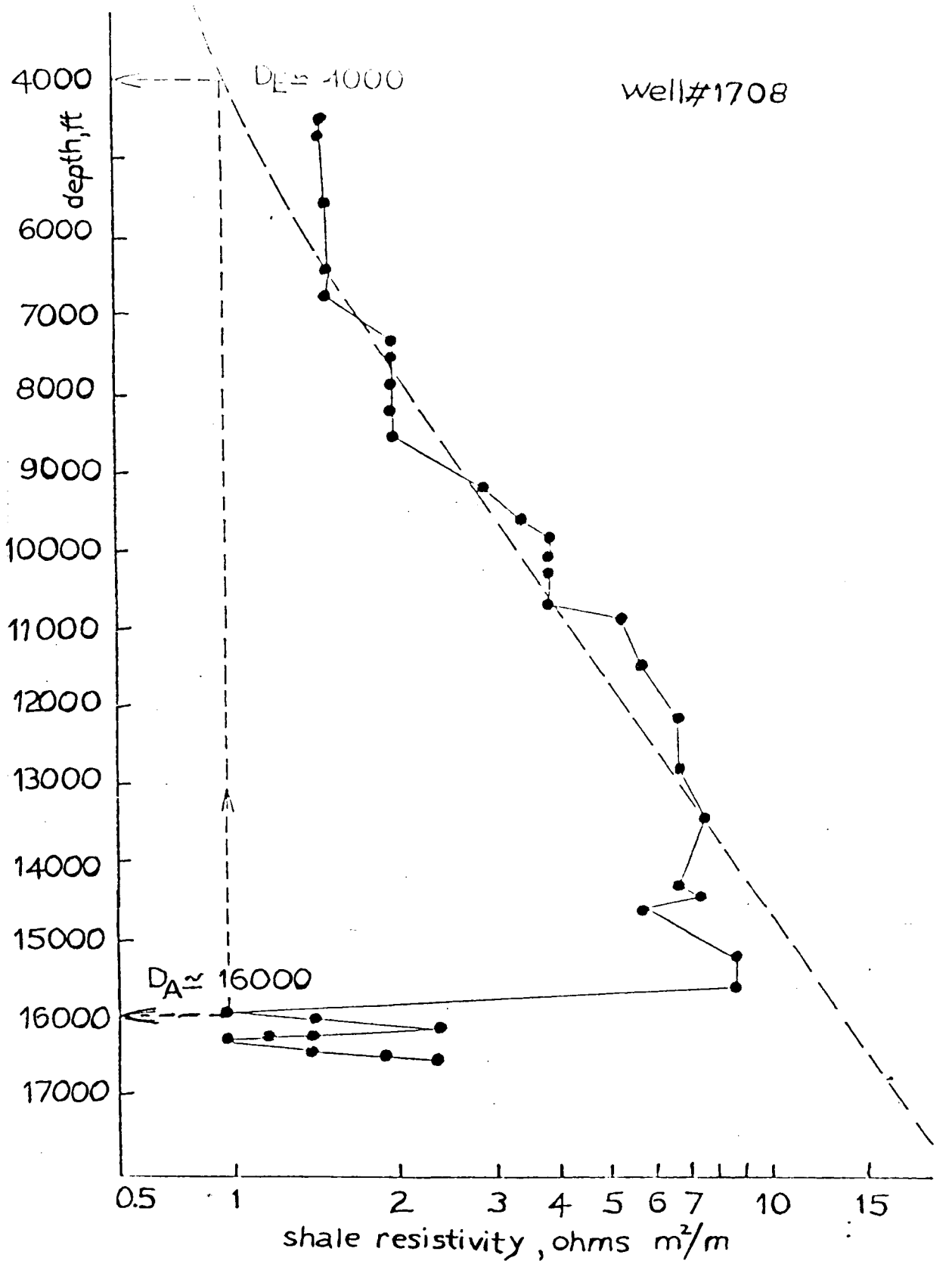


FIGURE 28. Well no. 1708, shale resistivity versus depth

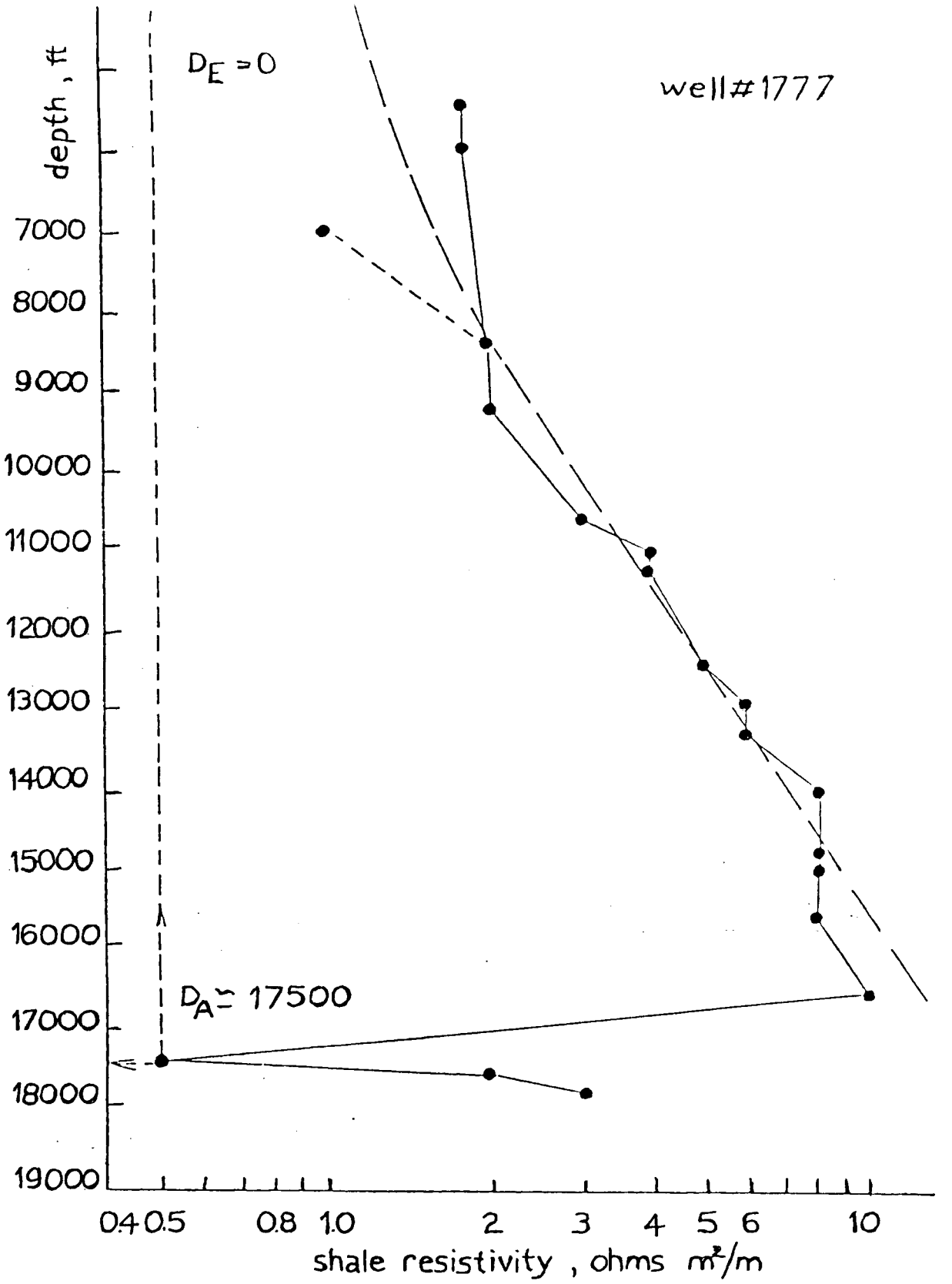


FIGURE 29. Well no.1777, shale resistivity versus depth

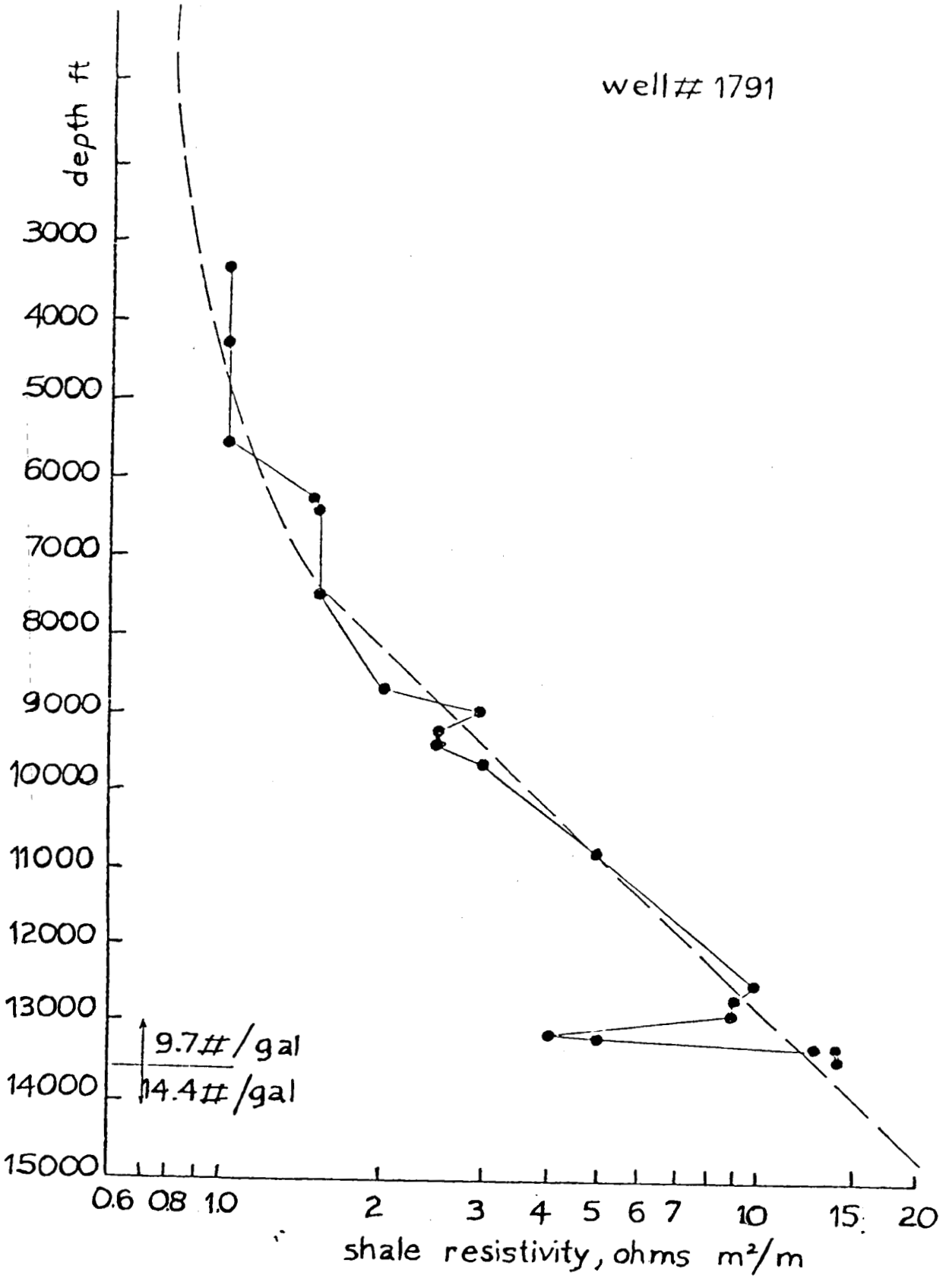


FIGURE 30. Well no. 1791, shale resistivity versus depth

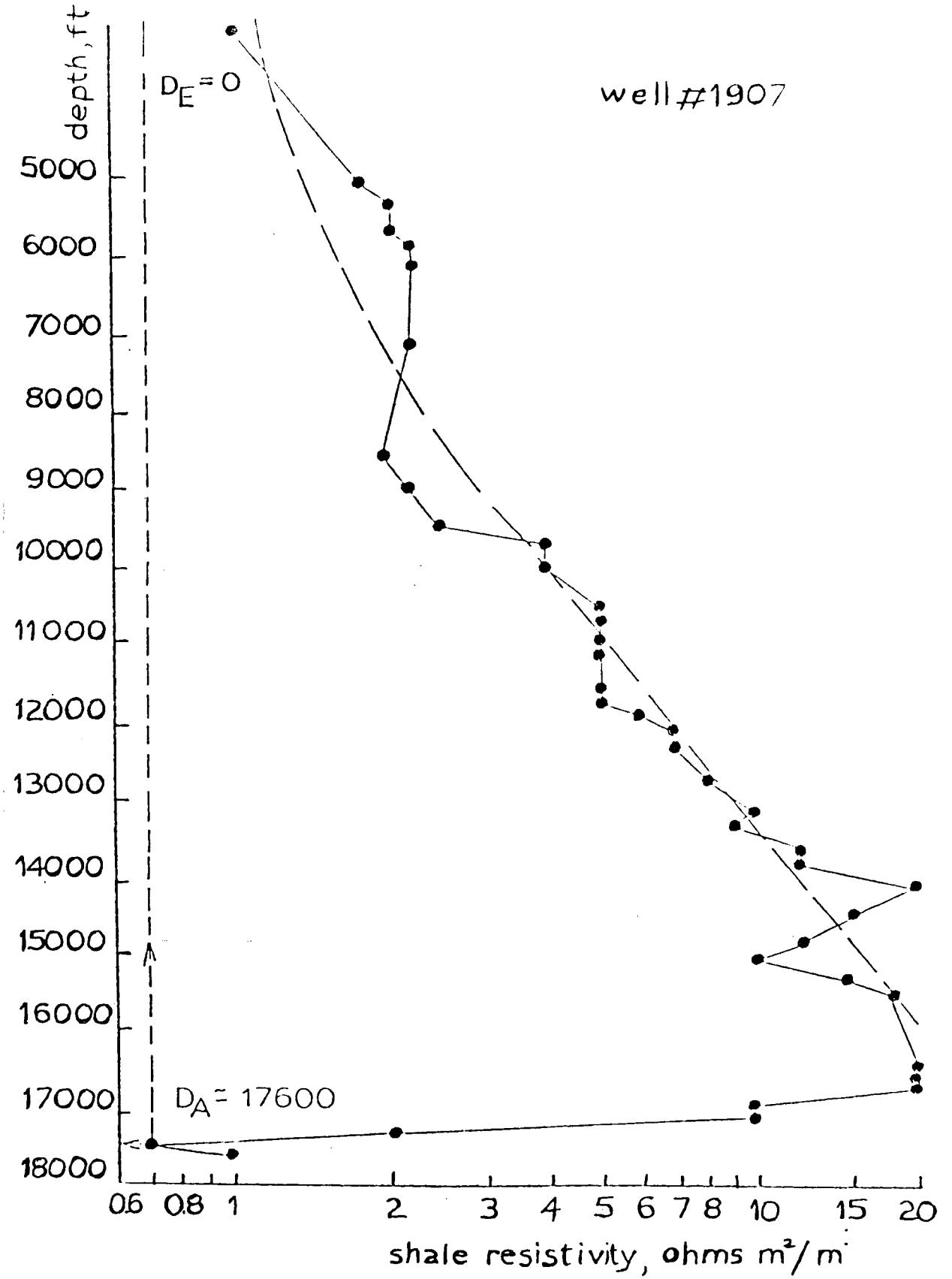


FIGURE 31. Well no. 1907, shale resistivity versus depth

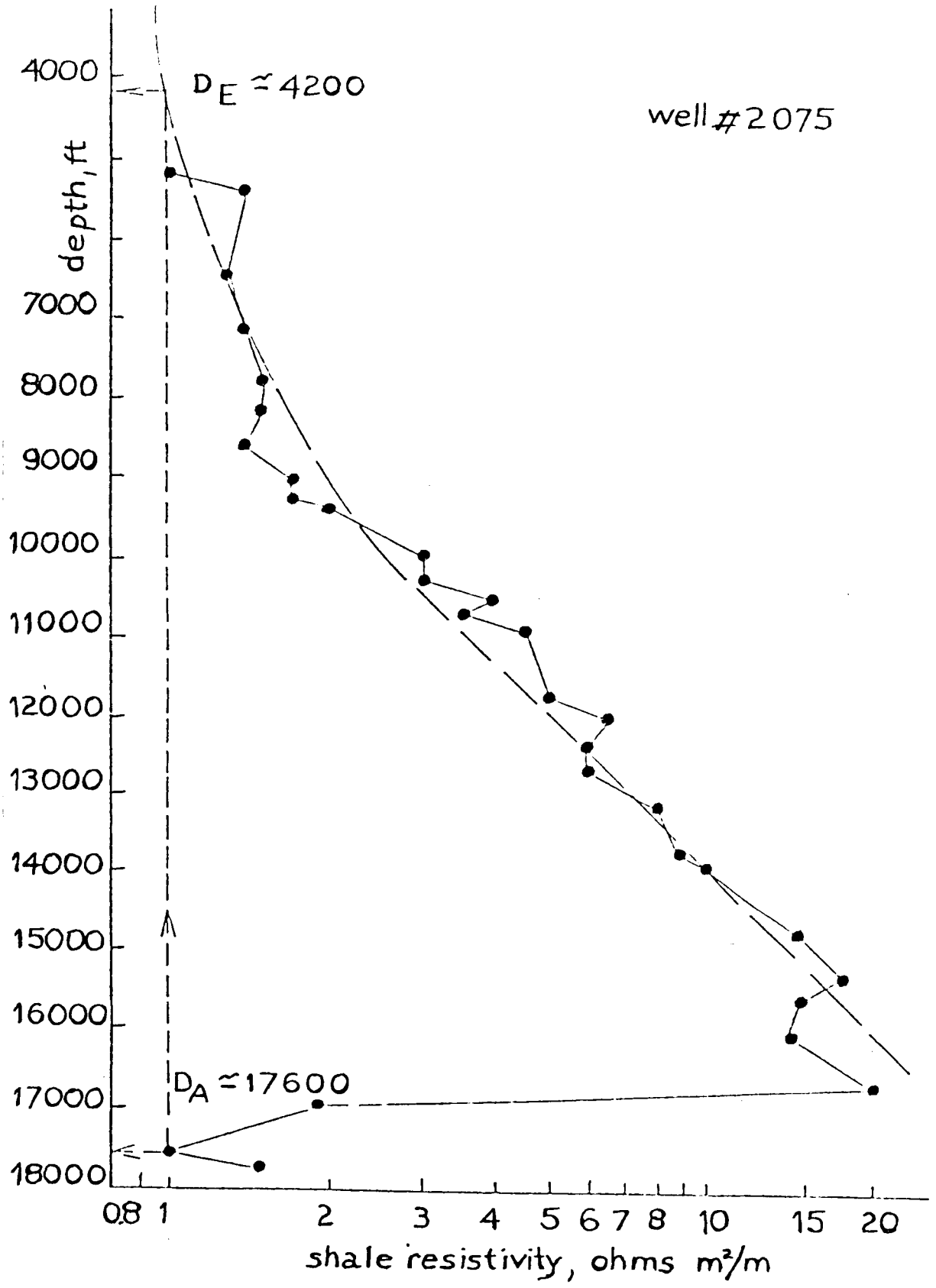


FIGURE 32. Well no. 2075, shale resistivity versus depth

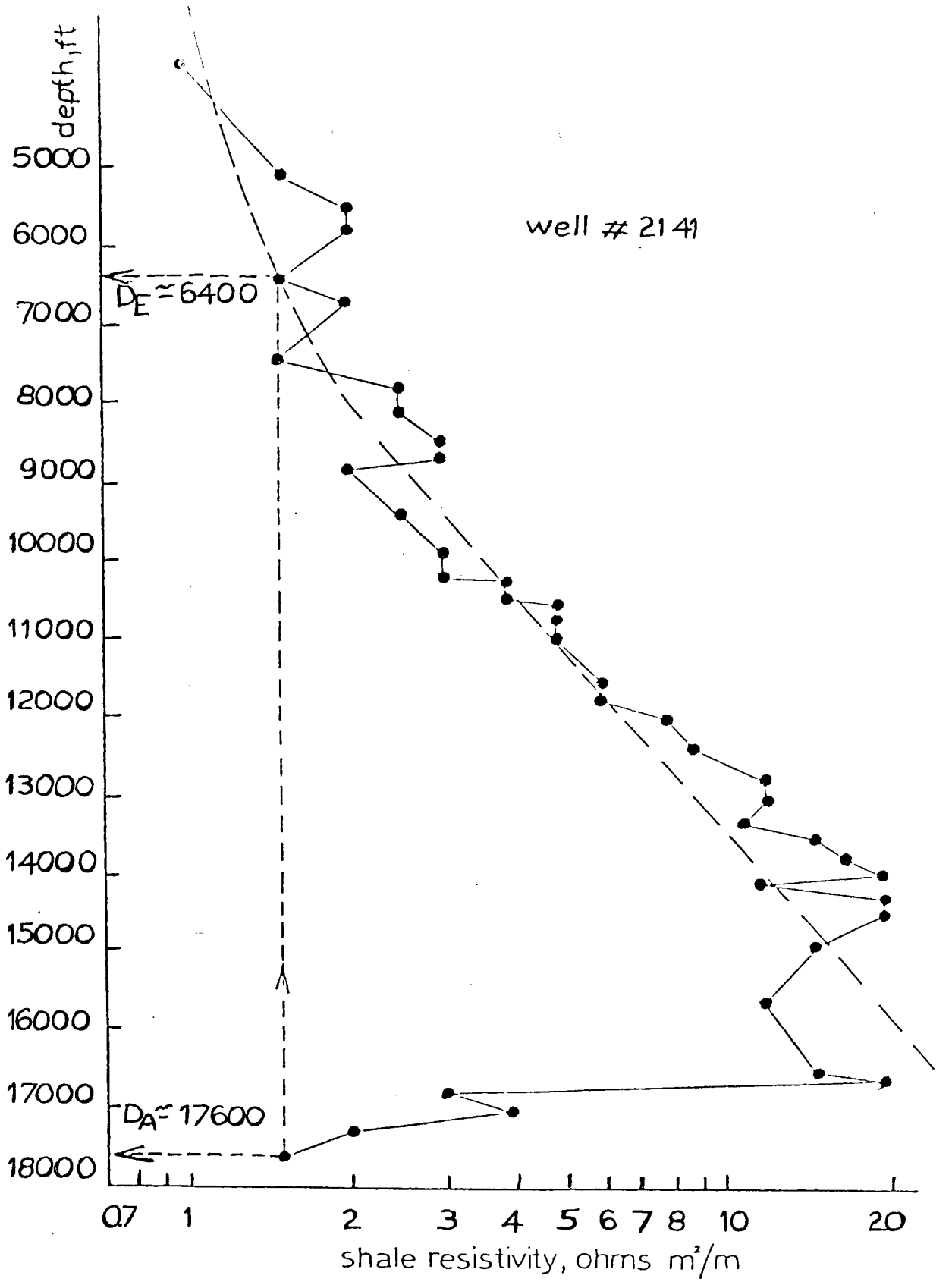


FIGURE 33. Well no. 2141, shale resistivity versus depth

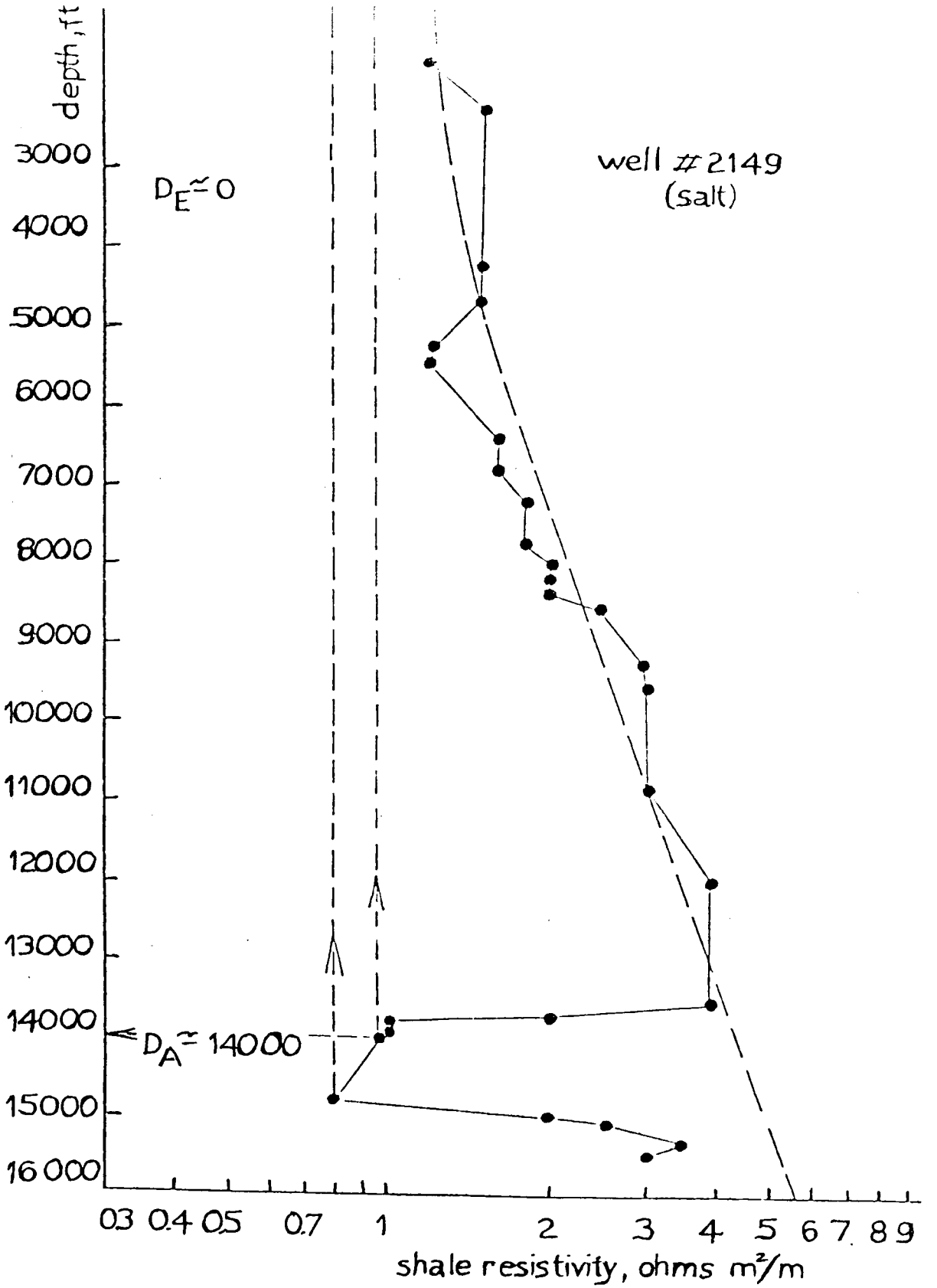


FIGURE 34. Well no. 2149, shale resistivity versus depth

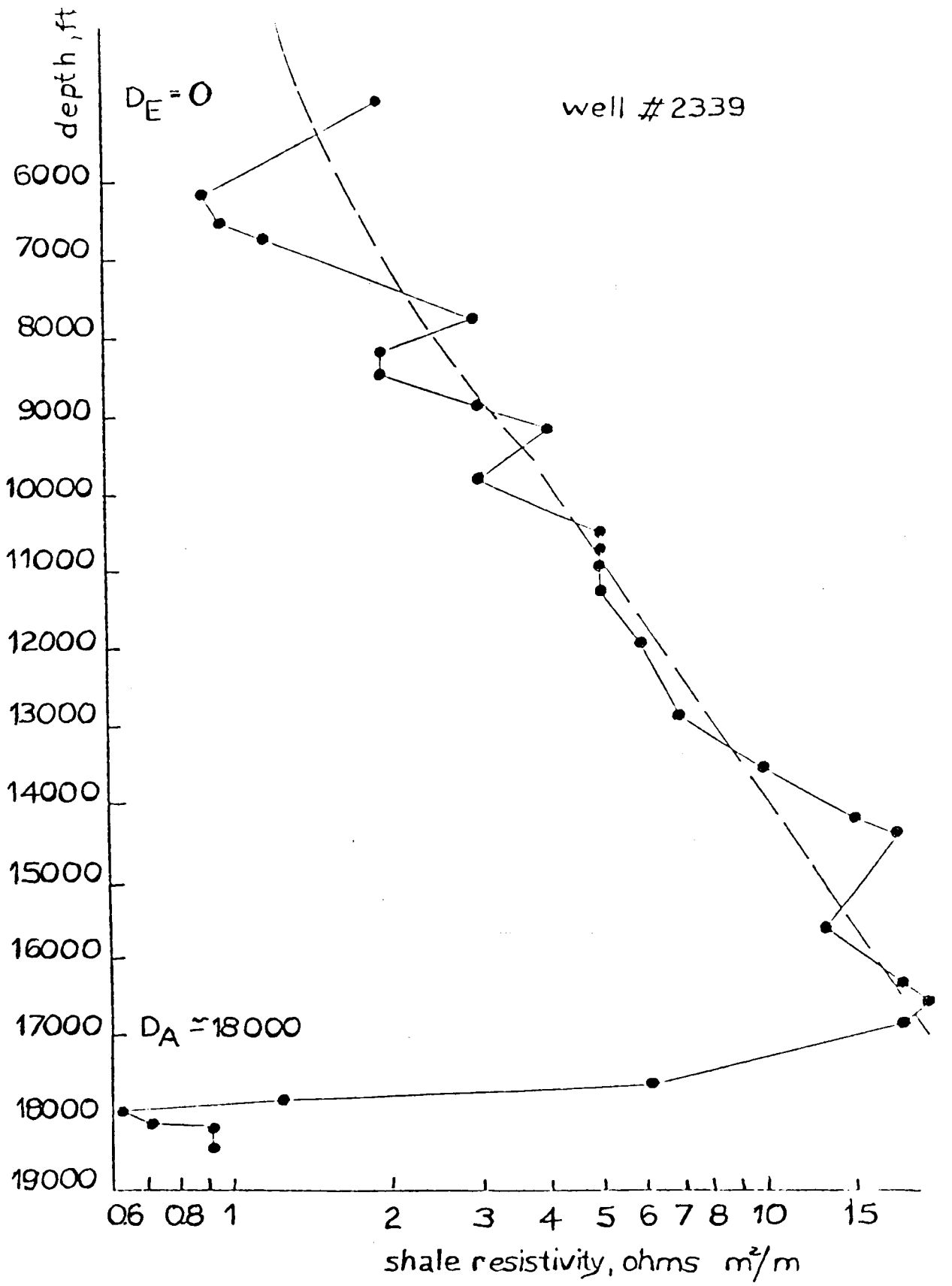


FIGURE 35. Well no.2339, shale resistivity versus depth

Table 6.--Overpressured wells in southwest Alabama

Well no.	Top of Haynesville	Overpressured interval	Top of Smackover	Mud weight (lbs/gal)
1708	15,200	15,720 - 16,400	16,700	15.6
1729	no log available			
1777	--	16,300 - 17,400	17,830	12.0
1791	13,050	13,700 - 14,680	14,920	14.4
1845	16,550	17,380 - 18,200	18,300	18.6
1907	16,750	17,360 - 18,090	18,200	18.6
2075	16,800	17,580 - 17,890	18,307	18.5
2141	17,050	17,400 - 17,820	18,150	13.1
2149	14,050	14,690 - 15,840	15,950	18.5
2339	17,000	17,670 - 18,750	18,855	17.1
2454	17,200	17,850 - 18,750	19,068	17.8
2524	no log available			
2587	no log available			
2621	16,850	17,146 - 18,040	18,420	18.5

four wells located in the southern parts of Clarke, Monroe, and Washington Counties also encountered thick sections of salt. The salt section, which lacks rigid structure, must support the entire load of overlying sediments and therefore becomes overpressured. Thin shale beds directly below the salt are overpressured and cause severe heaving problems when penetrated by the drill bit. Heavy muds with densities higher than 18 lbs/gal were used for the control of wellbore conditions.

In the above mentioned four wells, a porous zone was found in the salt section of the Haynesville Formation (figure 36). Based on cutting samples, this zone appears to be composed of fine to medium grained sand. An equivalent to this zone is present in Well 2311-B, Washington County; however, the porosity and permeability here is too low for this area to have potential for geothermal-geopressure energy. The same porous zone was also found in the unpressured Wells 2023 and 1960 as shown in figure 27. Figure 37 is a Compensated Neutron Density log through the porous zone in Well 1791, Monroe County. Here, the thickness of the zone is about 95 feet, 50 feet of which has good permeability as indicated by a mud-cake buildup on the wall of the borehole (see caliper curve).

Overpressure in Wells 2149 and 1723 was evidenced by the use of heavy muds weighing up to 19 lbs/gal, which were used in order to control the infiltration of formation water into the wellbore. The high-pressure problem in conjunction with mechanical drilling troubles in Well 1723 had resulted in its abandonment before completion. Signs of abnormal pressures were not found to the north in Well 2023 and to the east in Well 1960. The drilling fluid used in these wells was salt mud

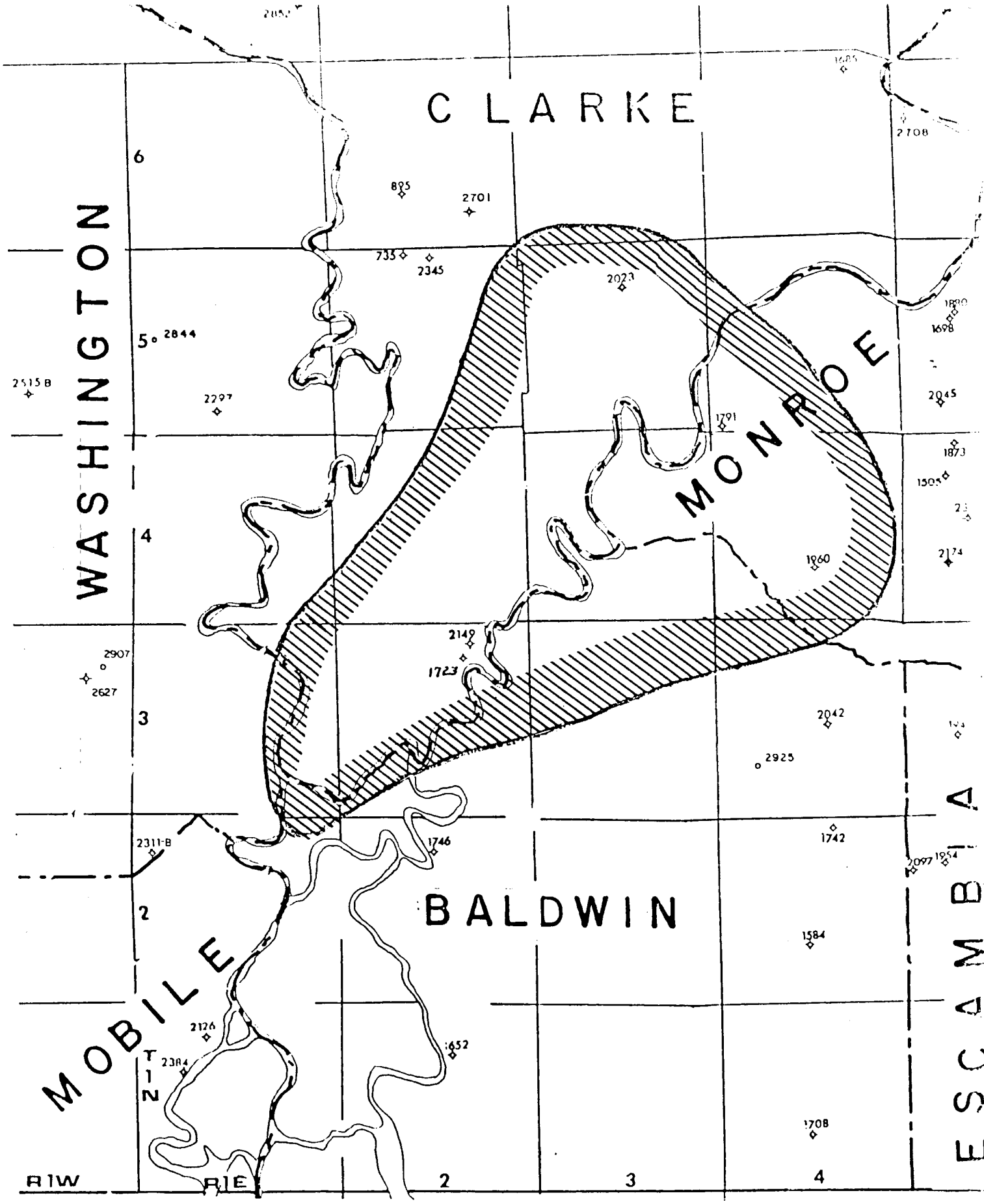


FIGURE 36. Areal extent of porous and permeable sand within lower Haynesville Formation of southwest Alabama *(only deep wells penetrating the Jurassic section are shown with State Permit Numbers)*

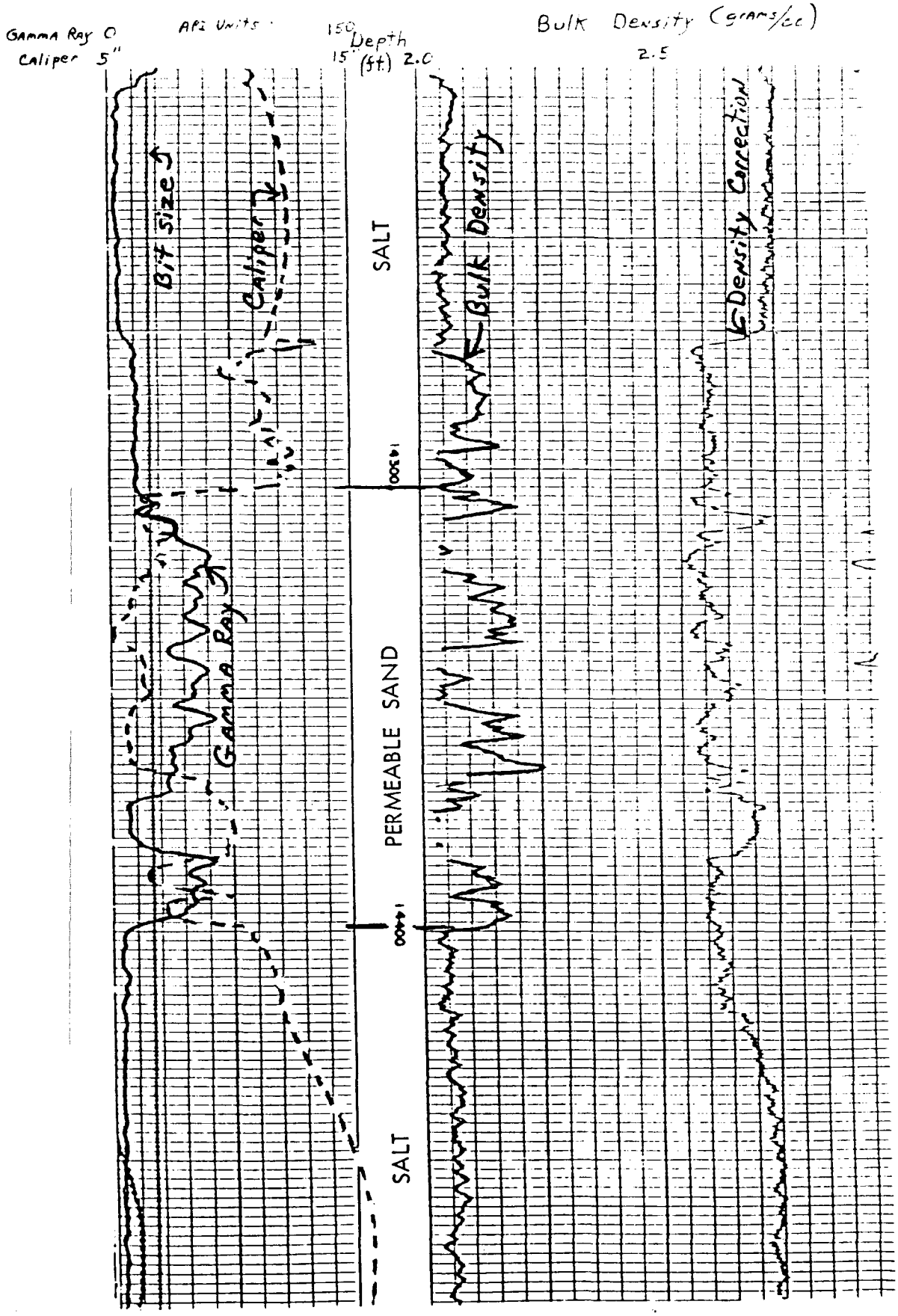


FIGURE 37. Compensated Neutron Formation Density Log through porous and permeable sand within lower Haynesville Formation in Southeastern Exploration, Shomo Land Unit 31-11 (Permit no.1791), Monroe County, Alabama

with a density of 12 lbs/gal. The discontinuity of pressure distribution in the area suggests the existence of pressure barriers in the form of faults or permeability- porosity pinchouts.

Based on neutron and density logs, the porous zone has a porosity of about 30%. The zone appears to be permeable as evidenced by the mud-cake buildup against some of the permeable layers, as shown by caliper logs. The areal coverage of the permeable sand is approximately 200 square miles or 2.3 cubic miles based on a net thickness of 60 feet. Less than half of the reservoir volume, however, is likely to be over-pressured.

The discovery of the porous zone is an encouraging sign for geothermal-geopressure energy exploration in the state; however, the reservoir size may be too small for practical utilization. According to Bebout and others (1978) a minimum volume of 3 cubic miles, permeability of 20 md and fluid temperature of 300°F are required for commercial production of geothermal-geopressure energy.

Quantitative Pressure Evaluation

Quantitative determinations of geopressure gradients were performed for eight wells in the study area. Several methods described in the literature were tested, and it was found that the Equivalent Depth Method is more applicable than others. The mathematical relations of this method have been discussed earlier in this report.

The overburden pressure gradient (G_o) varies depending upon geographical areas. We found that a value of 0.9 psi/ft would be satisfactory for most wells in southwest Alabama. The computed pressure gradients are summarized in table 7 and posted on figure 27.

Table 7.--Abnormal pressures and pressure gradients

Well no.	Depth (ft)	Mud weight used (lbs/gal)	Computed equilibrium mud weight (lbs/gal)	Computed Formation pressure (psi)	Pressure gradient (psi/ft)
1708	16,200	15.6	15.25	12,840	0.793
1777	17,500	18.2	17.32	15,750	0.900
1791	14,000	14.4	--	10,478	0.748
1907	17,600	18.6	16.60	15,188	0.863
2075	17,600	18.5	15.32	14,013	0.796
2141	17,600	13.0	14.27	13,056	0.742
2149	14,000	18.5	17.32	12,600	0.900
2339	18,000	17.1	17.32	16,200	0.900
				Average	= 0.830

NOTE: Computation based upon:

Hydrostatic pressure gradient (G_H) = 0.465 psi/ft

Overburden pressure gradient (G_O) = 0.90 psi/ft

The average pressure gradient is 0.830 psi/ft compared to 0.745 psi/ft in overpressured Miocene/Oligocene Formations in the U.S. Gulf Coast area. It was also found that pressure gradients increase with depth, a finding that is consistent with the Mississippi Interior Salt Basin's trend of the abnormally pressured Smackover Formation as reported by Parker (1973).

Origin of Abnormal High Pressures

It has been generally agreed upon that the generation of abnormally high pressures in Tertiary formations of the Gulf Coast area are considered to be the result primarily of rapid sedimentation followed by gravitational compaction in a pressure-seal or permeability restrictive environment. The mechanism responsible for the abnormal pressures in southwest Alabama, however, does not seem to be due to compaction, because of the lack of thick shale sections. The presence of anhydrite, gypsum, and interbedded thin shale streaks suggest the possibility of a chemical source for the geopressure.

Chemical diagenesis processes, which have been discussed by a number of authors (Hanshaw and others, 1968), includes (1) formation of new minerals, (2) redistribution of recrystallization, and (3) lithification. The phase changes from gypsum ($CaSO_4 \cdot 2H_2O$) to anhydrite ($CaSO_4$) plus water could create high pore pressure if permeability barriers are present.

A reverse process, the rehydration of anhydrite and water to gypsum could also be a source of overpressures. In the completely hydrated state, the volumetric expansion of gypsum could be as high as 30 to 50%.

Should this process be taking place at depth in a sealed system, tremendous pressures can result. Louden (1972) reported that the overpressures encountered in the Buckner Anhydrite section of the lower Haynesville Formation in Mississippi is a typical example of this type of process.

Massive rock-salt could be the major source of abnormal pressure in south Clarke, Monroe, and Washington Counties. Salt is known to behave plastically and is totally impermeable. As a result, rock-salt would expand laterally and transmit the overburden load in all directions. Drilling records indicate that numerous well bore problems were encountered in southwest Alabama when penetrating the salt sections.

In view of the high temperatures (250° to 350°F) in the abnormal pressure zones, it is suspected that dewatering of montmorillonite to illite could also contribute partly to the development of high pressure. The dehydration of clay will begin at a temperature of approximately 220°F and the amount of water discharged may amount to 10-15% of the compacted bulk volume. High pressures may be generated if the water cannot be drained off as fast as it is released.

Geothermal Investigation

During the course of this geopressure study, the geothermal regime of the geopressured zone was also investigated. Bottom-hole temperature measurements recorded on electrical log headings for 25 wells in Baldwin County and adjacent areas were used in preparation of a geothermal gradient map. These wells included all the geopressured wells and additional wells in the surrounding areas. Figure 26 shows the areal coverage and locations of these wells.

In most cases, at least two temperature readings--one above and one below the geopressured zone--are available from log records. This is because a special liner is required to isolate the high-pressure zone; hence, well logging must be conducted before and after the overpressured formation is penetrated. The temperature measurements were used for the determination of geothermal gradients above the geopressured zone as well as the temperature changes within the geopressured zone.

Using a mean surface temperature of 66°F, the geothermal gradient is calculated as follows:

$$G.G. = \frac{BHT-66}{depth/100}$$

where G.G. = geothermal gradient, °F/100 ft

BHT = maximum temperature recorded in the logged interval, °F

Depth = bottom depth adjusted to sea level (in feet)

An examination of temperature-versus-depth plots reveals that all abnormally high-pressure zones were accompanied by abnormally high temperatures. The maximum temperatures in over-pressured wells results in an average calculated gradient of 1.36°F/100 ft for the total depths of the wells. This geothermal gradient is not surprisingly high compared to the more than 2°F/100 ft found in some areas of the U.S. Gulf Coast. Nevertheless, temperatures as high as 325°F have been recorded in a number of wells at a depth of approximately 18,000 feet. The calculated geothermal gradients are shown in table 8 and marked on figure 26.

The average geothermal gradient for those wells having normal pressure gradients is 1.22°F/100 ft. It is interesting to note that temperatures increase at an average of 4.76°F/100 ft within the

Table 8.--Summary of geothermal gradient calculations

Well no.	Geothermal Gradient (°F/100 ft) Above hot formation	For the whole well	Within the hot formation
Overpressured Wells			
1053		1.34	
1708	1.08	1.37	4.90
1777	1.18	1.43	6.77
1791	1.11	1.22	
1845	1.07	1.43	
1907	1.10	1.39	7.60
2075	1.04	1.39	5.46
2141	1.15	1.38	3.92
2149	0.97	1.30	4.41
2311-B	1.01	1.27	5.13
2339	1.20	1.41	3.62
2454	1.13	1.40	3.80
2621	1.26	1.31	1.97
Average	1.11	1.36	4.76
Unpressured Wells			
1672	1.07	1.10	
1742	1.14	1.24	
1960	0.71	1.24	4.52
2042	1.09	1.19	
2023	1.02	1.21	2.60
2097		1.21	
2126	1.04	1.26	1.93
2297	1.05	1.16	
2309	1.19	1.32	2.43
2345	1.10	1.28	2.33
2384		1.22	
2627	0.74	1.17	
Average	1.02	1.22	2.76

geopressured zones of the lower Haynesville Formation, whereas the average geothermal gradients above these hot zones is only 1.02°oF/100 ft. In more than half of the normal-pressure wells, temperature records within the lower Haynesville Formation are not available and thus the calculations of geothermal gradients are greatly curtailed. The absence of multiple temperature measurements within unpressured wells results from the fact that since no abnormal pressures are encountered during drilling operations, there is no need for selective logging of the intervals that in other areas may be overpressured.

Geopressure Summary

The abnormal geopressure system in southwest Alabama has been identified qualitatively using log-analysis techniques. The overpressured zones were found to occur in the lower Haynesville Formation at a depth of approximately 17,000 feet. The average pressure gradient is 0.830 psi/ft with an accompanying average geothermal gradient of 1.36°F/100 ft. The abnormal pressure zone is found mainly in Baldwin County south of the Wiggins Uplift. For the majority of the study area, the origin of abnormal pressure may be diagenesis of sulfates. Phase change of clayey sediments may also contribute in part to overpressure. The overpressured zones, ranging from 400 to 900 feet in thickness, are composed primarily of anhydrite, limestone, shale and salt. The abnormal pressure in the permeable sand zone encased in lower Haynesville salt is probably due to the intrusion of salt and/or or faulting in the area.

THERMAL VARIATIONS AND ANOMALIES IN THE SUBSURFACE OF THE ALABAMA COASTAL PLAIN

Data Compilation, Reliability and Presentation

The geothermal and geopressure data base for this study was constructed from information provided by the electric logs of more than 1,300 oil and gas test wells which have been drilled over the past 35 years in the Alabama Coastal Plain area. Data available from each of these logs and considered pertinent to this study are (1) the bottom-hole or maximum recorded temperature; (2) the elapsed time of temperature measurement following the cessation of drilling fluid circulation; (3) the probable depth and rock type or formation in which the temperature was recorded; and (4) the drilling-mud weight. A number of wells were logged more than once during drilling operations; therefore, multiple temperature measurements are available on these.

Appendix B presents all of the above-mentioned information and, in addition, contains geothermal gradients (in column 1) calculated from the down-hole temperature measurements by the following formula:

$$G.G. = \frac{\text{BHT in } °F \ -66°F}{\text{depth}/100}$$

where G.G. = geothermal gradient (°F/100 feet)

BHT = bottom-hole temperature (Maximum recorded temperatures were assumed to be at bottom-hole depths.)

66°F = assumed mean annual temperature (considered to be at sea level)

depth = assumed depth of temperature measurement below sea level (bottom-hole depth in feet)

The gradient values given in column 1 were calculated for each temperature from sea level to the bottom-hole depth, thus assuming a uniform gradient to this depth. Column 2 presents gradients calculated for intervals between multiple down-hole temperature measurements. Appendix B is arranged alphabetically by county name, and the data for each county are preceded by a base map showing well locations (figures 46 through 71 in Appendix B).

By necessity, this study was restricted to data not completely reliable in terms of providing information for a complete and thorough evaluation of the geothermal potential for the area. Temperatures presented in this report should not be considered to be true formation temperatures, since measurements are most often taken within a few hours following the circulation of drilling fluids. The time required for thermal equilibrium to be established in a well will likely vary from one or two days to perhaps as long as several weeks. Therefore, most temperatures presented in Appendix B are likely to be lower than actual formation temperatures, especially in the deeper wells. Also, in deep wells it is possible that some temperature measurements may be erroneously low due to thermometer "shakedown" caused by severe vibrations. Additional complications concerning data reliability are produced by the cementing of casing in wells and most importantly in shallow wells where logs are run very soon after circulation and the setting of casing cement is not complete. In cemented wells, heat is given off in the first few hours as energy is released into the borehole fluids as cement

bonds are formed (heat of hydration). Few studies have been made in this field. Dashevsky (1978) found that the cooling of fluids in a borehole following cementation may have both a linear and an exponential component.

Temperatures taken in oil-well logging operations are made by "maximum" recording instruments. In some instances the maximum recorded temperature may not occur at the bottom of the well and some "reversals" of geothermal gradients may exist in the well bore (Fowler, 1980). Where this occurs, calculated geothermal gradients will be in error since these calculations are based on the assumption that the maximum recorded temperature is at the bottom of the well. In some parts of southwest Alabama, where multiple temperatures are available, reversals in gradients have been noted (figure 38). Most reversals appear to occur in the Haynesville Formation; however, it should be noted that this is the formation in which most multiple temperature measurements are made.

Maximum recorded temperatures within a well are related to the net effects of several natural causes, the two primary ones being the amount of heat-flow from within the earth and the variations in the thermal conductivities of the rocks in which the temperatures are recorded. Geothermal gradients are directly proportional to heat flow and inversely proportional to rock conductivities. Heat-flow data are available at only three locations in the south Alabama Coastal Plain area, and these few are considered to be insufficient for a thorough evaluation of geothermal potential. In addition, data on in situ rock conductivities are not available.

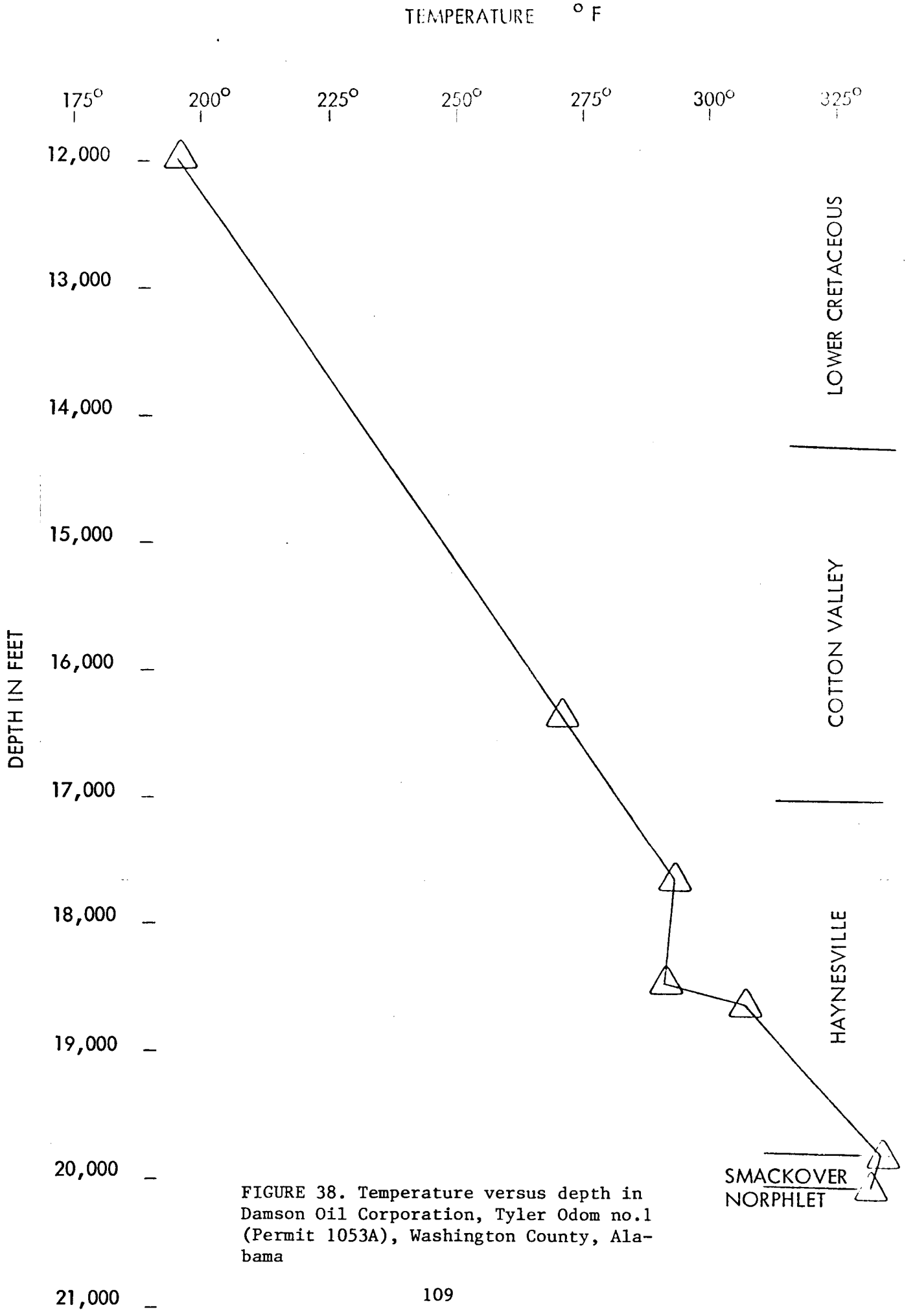


FIGURE 38. Temperature versus depth in Damson Oil Corporation, Tyler Odom no.1 (Permit 1053A), Washington County, Alabama

Oil and gas test wells are quite numerous in a few areas of southwest Alabama; however, in many areas, wells are either sparsely distributed or absent. Because of other data restrictions, any one well "anomaly" must be considered with skepticism. The locations of areas with poor control are obvious on the base maps included in this report (figures 46 through 71 in Appendix B).

Appendix B contains basic temperature data that are raw and uncorrected for depth. Depth correction curves and calculations vary from one area to another (Kehle, 1973) and have not been established for the Alabama Coastal Plain. Gradient corrections related to depth are small (generally less than 0.2°F/100 ft) and, if known and applied, would have little influence on the overall appearance of the gradient maps presented herein. Geothermal gradients presented in this appendix and displayed on the following maps are influenced by the temperature measurements recorded during well-logging procedures, heat-flow values, rock thermal conductivities, and local geologic structure. These factors all influence calculated geothermal gradients. However, because available data do not allow a good evaluation of their effects, gradient values given here are not absolute. This fact should be taken into consideration when viewing the various geothermal maps presented. These maps should be used primarily to locate anomalies and, if well-control permits, define their areal extent. Geothermal gradient values should be used only in a comparative manner with values calculated from temperatures in wells within the same general region and within the same geologic formation or unit. For comparative purposes, a separate column in Appendix B gives the name of the formation or age of rock unit

in which the well was bottomed at the time of temperature measurement. From these basic data, three types of "geothermal" maps were prepared for this study: (1) geothermal gradient maps; (2) isothermal maps; and (3) a temperature map of the Norphlet Formation. Orginally, these maps were prepared on oil and gas well base maps with a scale of 1:64,000. Contours were then transferred to other base maps showing only county boundaries and township and range lines and these, in turn, were photo-reduced to the final products. The original work copies for these maps are on file at the Geological Survey of Alabama.

Geothermal Gradient Maps of Southwest Alabama

Geothermal gradient calculations for southwest Alabama indicate that, in a number of locations, gradients are significantly higher in wells which bottom in rocks of Cretaceous age than in the deeper wells which bottom in rocks of pre-Cretaceous age. This difference was noted even where shallow and deep wells are located in close proximity. The abnormally high gradients in wells that bottom in rocks of Cretaceous age occur most commonly in the updip areas of the basin (i.e., Choctaw, northern Clarke, Marengo, Wilcox, Conecuh, and eastern Escambia Counties). They are often found to occur within major fault zones of the area. These high gradients may be related to the upward movement of warm waters along some faults and fractures. Also, a greater amount of heat flow upward into Cretaceous rocks may occur along the updip limits of thick, insulating rocks of Jurassic age. In marginal areas of interior basins, the effects of updip movement of fluids and heat may be most pronounced (Renner, 1979).

Two separate geothermal gradient maps were prepared for southwest Alabama. One map is based on bottom-hole temperatures in rocks of Cretaceous age (figure 39), and the other is based on bottom-hole temperatures in rocks of pre-Cretaceous age (figure 40). The former is contoured on a 0.20°F/100 ft interval and the latter on a 0.10°F/100 ft interval.

Figure 39 displays gradients in Cretaceous age rocks that range from slightly less than 1.20 to slightly more than 2.00°F/100 ft. The highest gradients occur in northwest, central, and southwest Clarke County, southwest Wilcox, south-central Conecuh, east Escambia, and east-central Baldwin Counties. Almost all of these apparently high gradients occur either in areas of major faulting or in areas along the margin and updip limits of Jurassic basin deposits. (See figures 3 and 4). A notable exception is the east-central Baldwin County anomaly, located 6 miles southeast of the city of Bay Minette and hereafter referred to as the "Bay Minette anomaly."

The Bay Minette anomaly is not located in or near a fault zone, nor is it near the Jurassic basin limits. However, it is important to note that this is a "one-well anomaly," and should, therefore, be considered with skepticism until confirmation is made by additional drilling. The well in question is Sun Oil Company's #1 International Paper Company test well which was completed in March 1957 and is located in section 4, T. 2 S., R. 4 E. (P#759). The log for this well has a recorded temperature of 218°F at a subsea depth of 7,336 feet in Lower Cretaceous, interbedded sands and shales. The calculated gradient from this temperature is 2.07°F/100 ft.

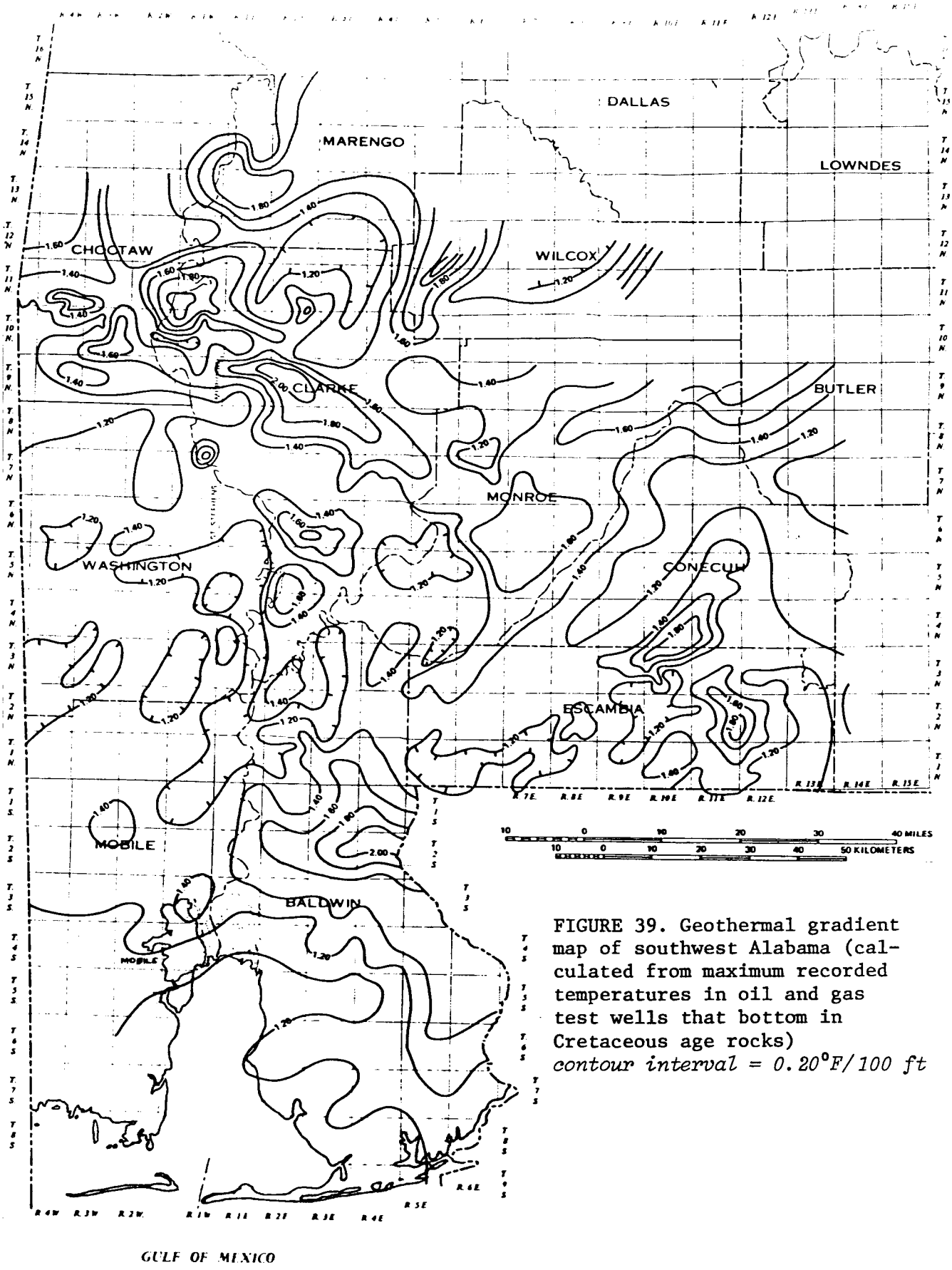


FIGURE 39. Geothermal gradient map of southwest Alabama (calculated from maximum recorded temperatures in oil and gas test wells that bottom in Cretaceous age rocks)
contour interval = 0.20°F/100 ft

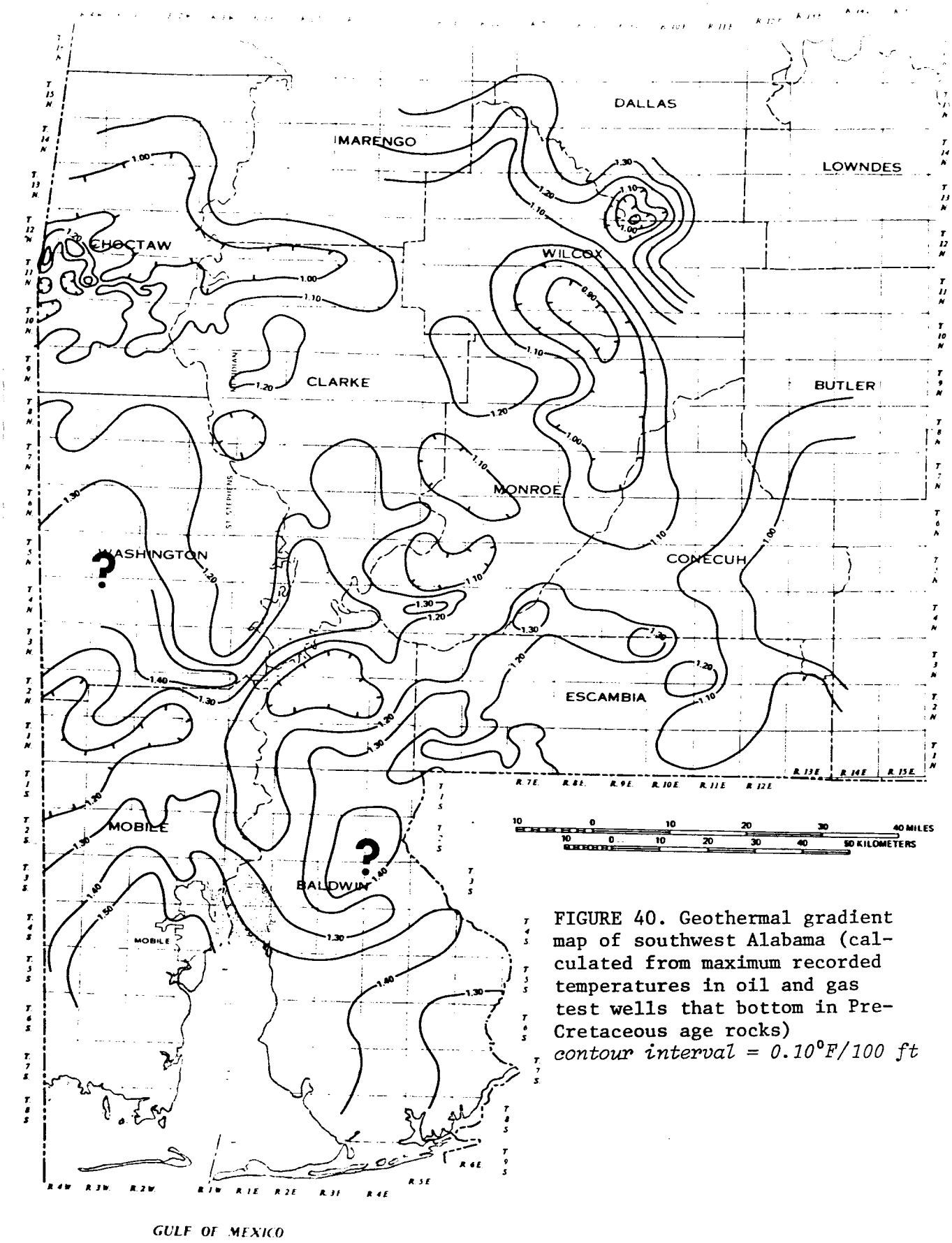


FIGURE 40. Geothermal gradient map of southwest Alabama (calculated from maximum recorded temperatures in oil and gas test wells that bottom in Pre-Cretaceous age rocks) *contour interval = 0.10°F/100 ft*

Figure 40 displays geothermal gradients from test wells penetrating pre-Cretaceous rocks (Jurassic, Triassic or Paleozoic rocks). This map reflects a much more subdued variation in gradient values calculated from temperatures in these deeper horizons. Gradients range from slightly less than 0.90 to slightly more than 1.50°F/100 ft. The high gradient values calculated from temperature measurements within Cretaceous age rocks have mostly "disappeared"; however, a question mark (?) is needed in the area of the Bay Minette anomaly since here deep-well control is absent. The highest gradients are found in the Interior Salt Basin area of southern Washington County (greater than 1.40°F/100 ft) and in southern Baldwin and Mobile Counties (greater than 1.40 and 1.50, respectively).

Isothermal Maps of Southwest Alabama

Depth-to-isotherm or isothermal maps display the depth variations to a surface of constant temperature. For southwest Alabama isothermal maps were prepared for three isotherms: (1) 158°F or 70°C (figure 41); (2) 212°F or 100°C (figure 42); and (3) 302°F or 150°C (figure 43). Based on geothermal gradients, these maps show the approximate depths (in thousands of feet) to these temperature surfaces. The thermal conductivity of crystalline or basement rocks is much higher than that of the overlying sedimentary rocks, and geothermal gradients within the basement are therefore lower. The results of any attempt to project isotherms below the basement surface would be very questionable. In addition, the geothermal potential of these basement rocks is considered to be extremely poor. For these reasons, no attempt was made to project

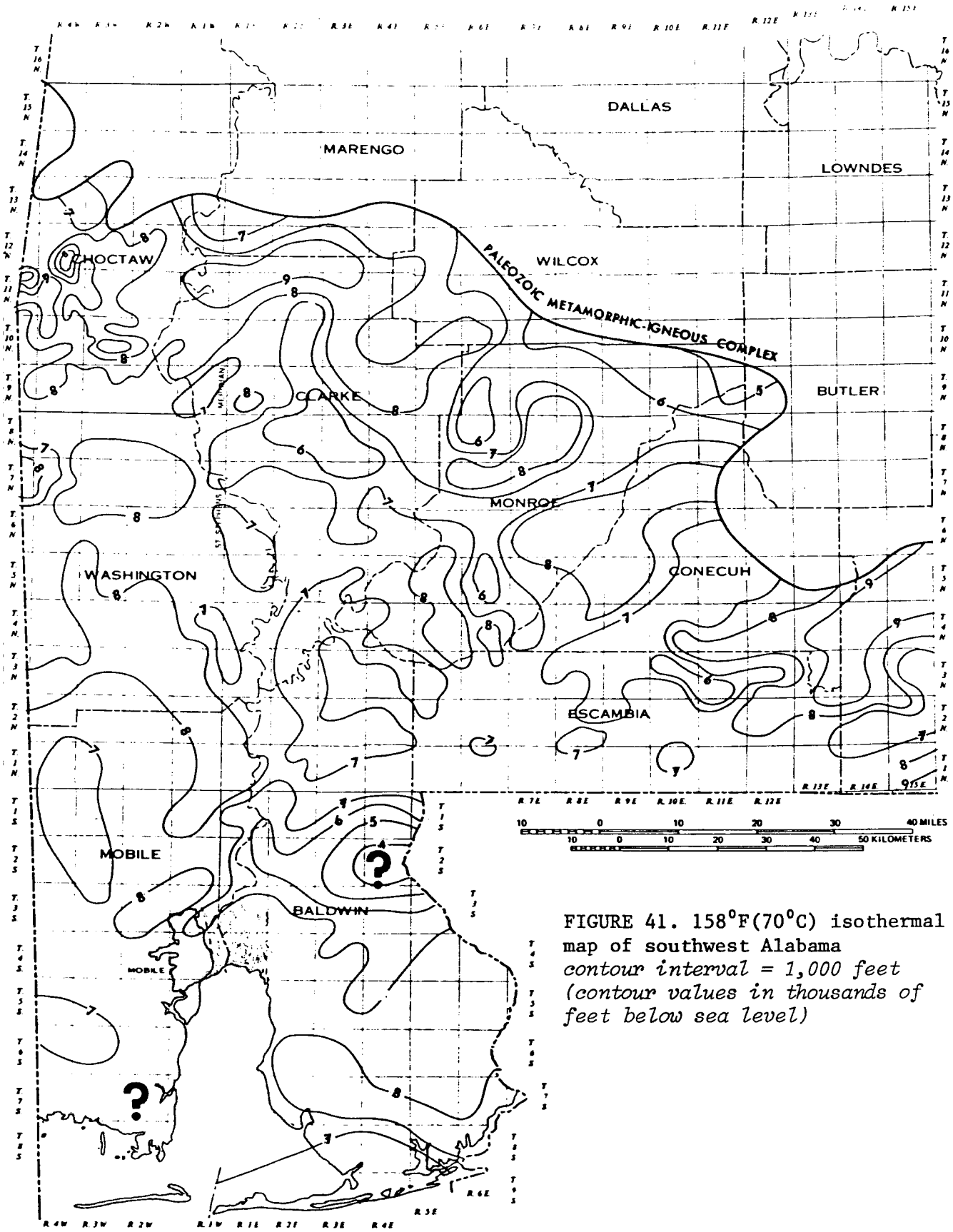


FIGURE 41. 158°F(70°C) isothermal map of southwest Alabama
contour interval = 1,000 feet (contour values in thousands of feet below sea level)

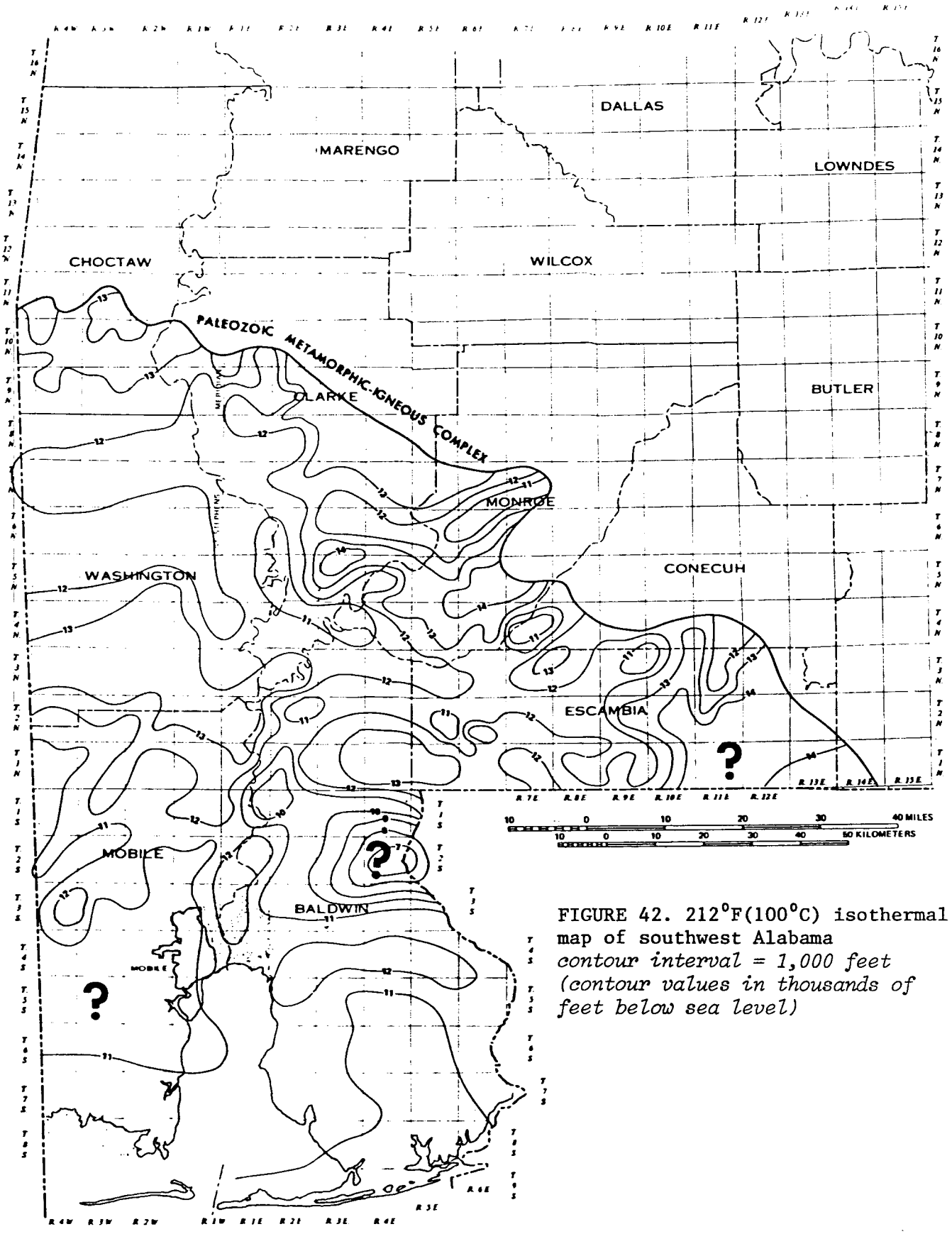


FIGURE 42. 212°F(100°C) isothermal map of southwest Alabama
contour interval = 1,000 feet (contour values in thousands of feet below sea level)

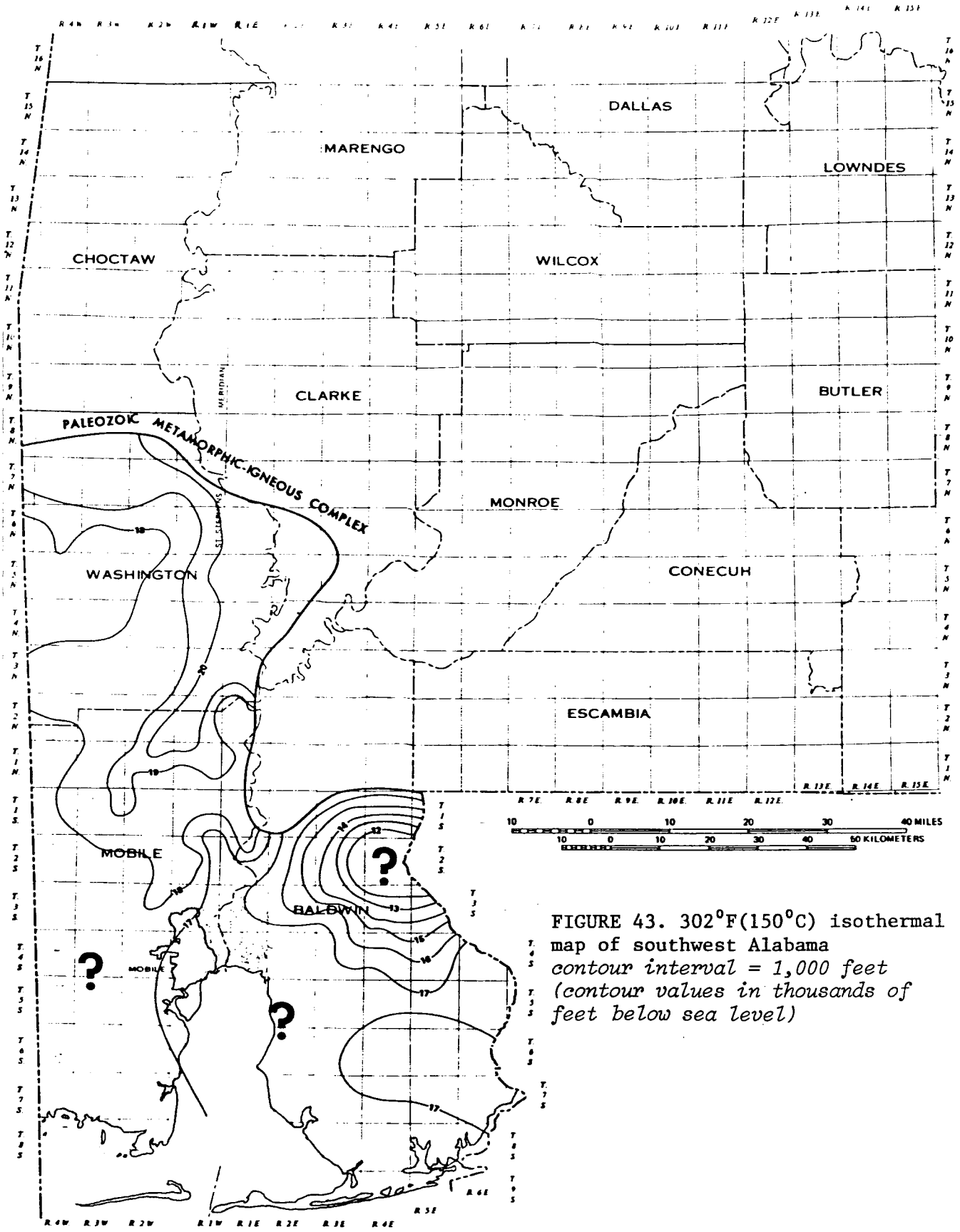


FIGURE 43. 302°F(150°C) isothermal map of southwest Alabama
contour interval = 1,000 feet (contour values in thousands of feet below sea level)

isotherms below the basement surface, and contours are shown only where isotherms occur above the basement complex.

Because the Haynesville Formation was found to be a zone of significant changes in both geothermal and geopressure gradients in large areas of southwest Alabama, the depths to this formation were considered in the determination of which gradient values to use in constructing the isothermal maps. Geothermal gradients in Cretaceous rocks were used to project the depths to isotherms. However, in areas where projected depths exceeded the depths to the top of the Haynesville, the temperatures and calculated gradients in pre-Cretaceous rocks were then used to project isothermal surface depths. In addition, a higher degree of reliability was assumed for those wells in which down-hole temperatures were very near the isothermal values contoured. These isothermal maps are, therefore, a compilation of data based on both of the geothermal gradient maps presented here and all down-hole temperature measurements, including multiple readings. They were also constructed with additional considerations being given to the effects of regional stratigraphy and structure.

Depths to the 158°F isotherm range from less than 4,000 feet to more than 9,000 feet. The 212°F isotherm occurs at depths of less than 7,000 feet to more than 14,000 feet, and the 302°F isotherm occurs from depths of slightly less than 12,000 to more than 20,000 feet below the surface. The shallowest depth to all three isotherms is assumed to occur at the Bay Minette anomaly; however, since this is a one-well anomaly, this depth should be considered questionable until additional drilling confirms its existence.

Temperature Map of the Norphlet Formation

The Norphlet Formation of Jurassic age is considered by oil and gas exploration companies to be the deepest potential Mesozoic aged petroleum reservoir rock in the northern Gulf Coast Basin. Therefore, many deep test wells bottom in the Norphlet and a large number of assumed bottom-hole temperatures are available in this formation.

Figure 44 is a temperature map of the Norphlet Formation contoured with a 10°F interval. Temperatures range from 140°F to more than 340°F and essentially reflect formation depths. (See Norphlet structure map, figure 7.) The highest temperatures in the Norphlet are found in the deep Interior Salt Basin area of Washington County and in south Mobile and Baldwin Counties, areas in which the Norphlet lies more than 19,000 feet below the surface.

Geothermal Gradient Map of Southeast Alabama

Available subsurface temperature data from oil and gas test wells in southeast Alabama are sparsely distributed throughout most of the area and completely lacking in some areas (Barbour, Bullock, and Henry Counties). Furthermore, multiple down-hole temperature records are very few in number.

Thick Jurassic evaporites and carbonates are not present in southeast Alabama and, except where possibly broken by sediment-filled Triassic grabens, basement rocks are overlain by coarse clastics of Jurassic (?) and Cretaceous age. Geopressured zones and rocks with high pressure and thermal insulating characteristics are not known to be present in southeast Alabama. For these reasons only one type of geothermal gradient map was prepared for this area.

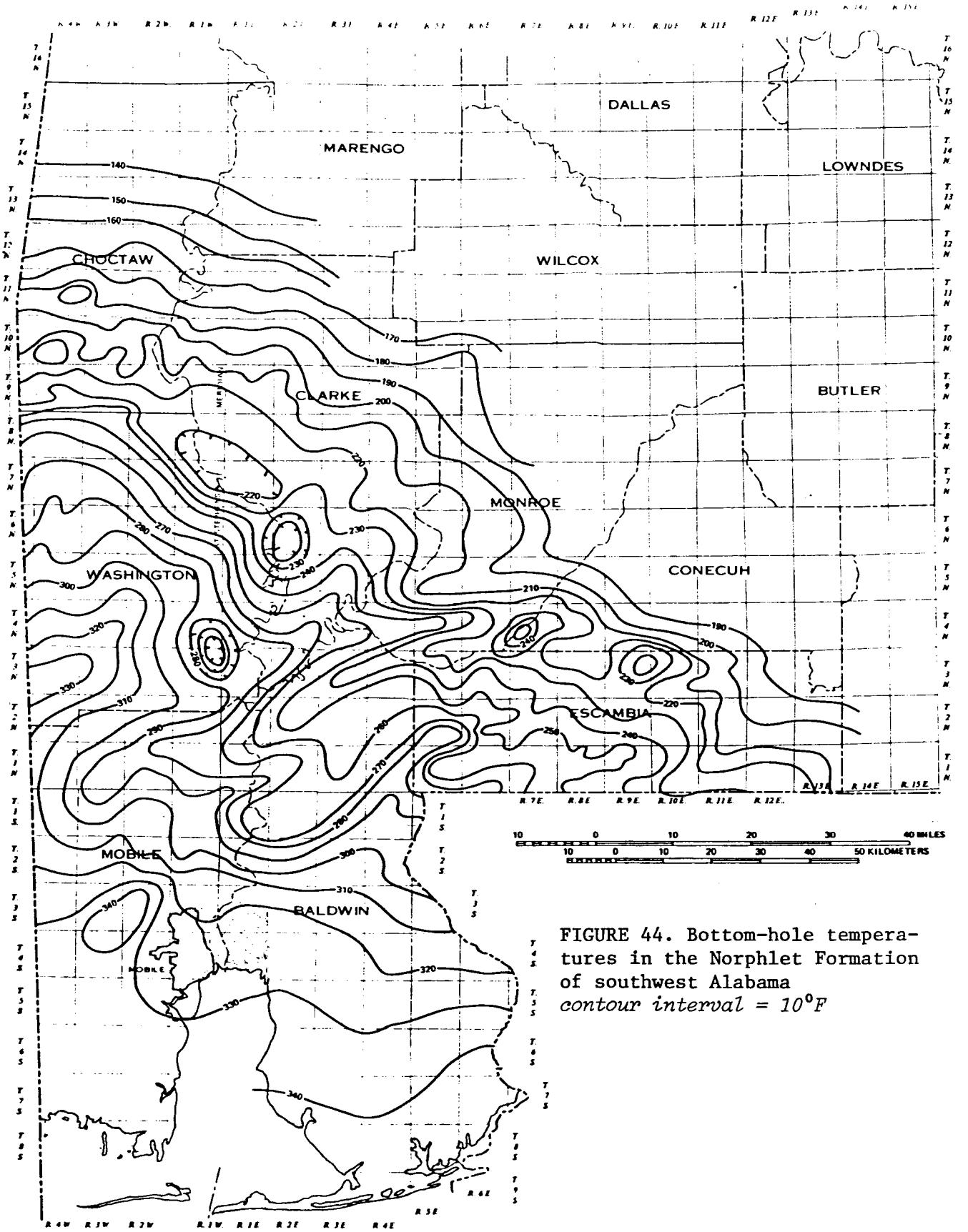


FIGURE 44. Bottom-hole temperatures in the Norphlet Formation of southwest Alabama
contour interval = 10°F

Figure 45 is a geothermal gradient map of southeast Alabama. This map displays gradients ranging from slightly less than 1.00°F/100 ft near the Alabama-Florida line to more than 1.80°F/100 ft. The highest gradient for the area is located in northeast Coffee County (well #489). A calculated gradient of 1.63°F/100 ft is located in southeast Houston County (well #238).

Correlation of Thermal, Geological, and Geophysical Data

A few correlations of thermal variations with geology have been mentioned earlier in this report. Geothermal gradients calculated from temperatures of wells that bottomed in Cretaceous rocks indicate some areas of abnormally high gradients within major fault zones and along the Jurassic basin margin of southwest Alabama.

The two major crustal structures in southwest Alabama, the Wiggins Uplift and Mississippi Interior Salt Basin, do not appear to be associated with any major changes or anomalies in geothermal gradients, although minor changes are apparent. The salt basin area of Washington County is associated with slightly higher gradients calculated from bottom-hole temperatures in pre-Cretaceous rocks. This may be due to a small increase in heat flow related to the shallower lower crust and mantle underlying this interior basin (figure 22).

Geothermal effects of the Interior Salt Basin, the Wiggins Uplift, and other major structures can be seen on the temperature map of the Norphlet Formation. As would be expected, higher temperatures are present in this formation in the deeper salt basin area. Lower Norphlet temperatures and gradients found along the axial trace of the

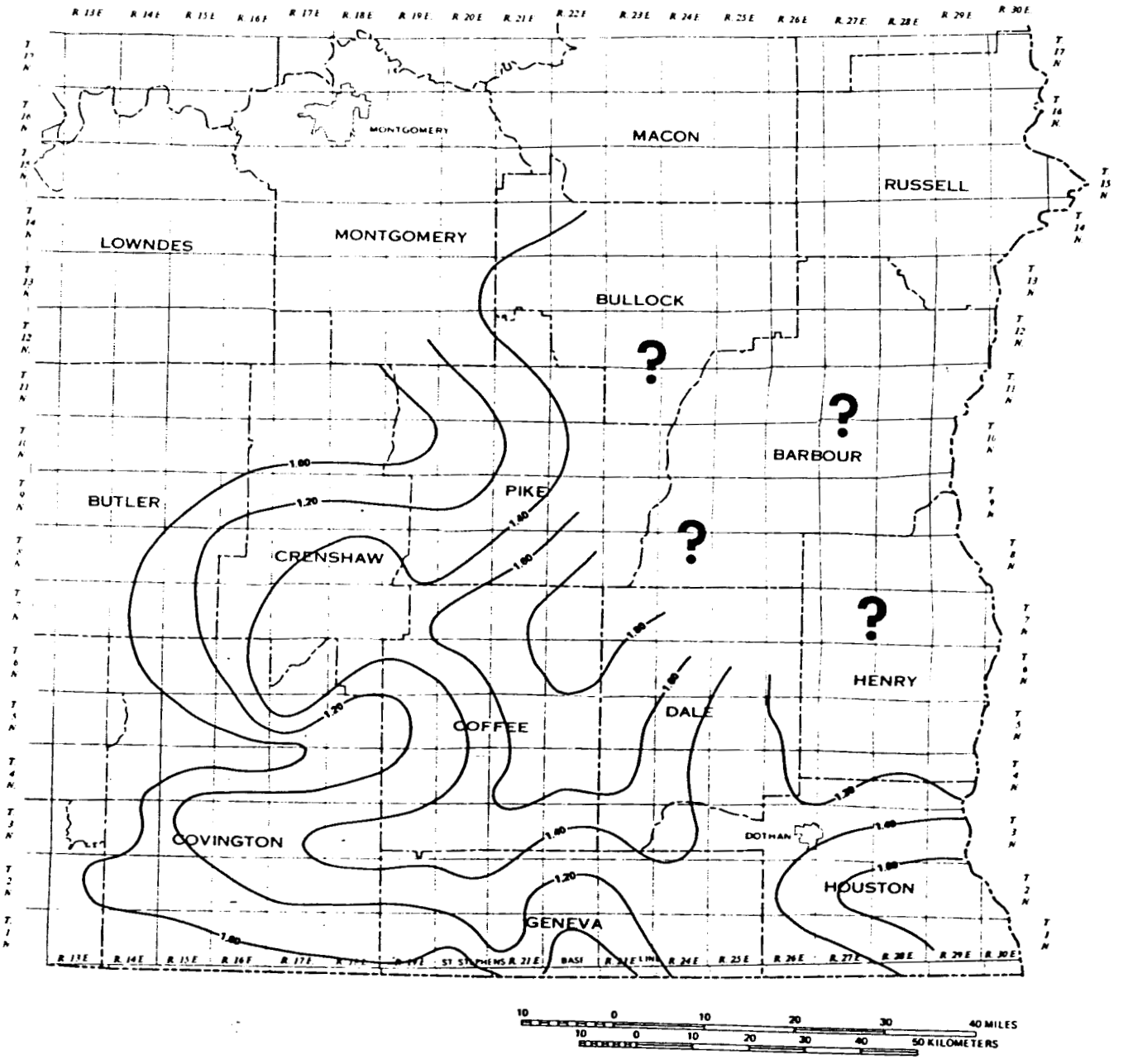


FIGURE 45. Geothermal gradient map of southeast Alabama
contour interval = 0.20°F/100 ft

Wiggins Uplift through northern Baldwin County may be related to lower heat flow. The Hatchetigbee Anticline and the McIntosh and Klepac salt dome areas display abnormally low temperature values in the Norphlet, thus reflecting the higher structural positions at these locations. The higher heat conductivity of these salt masses is apparently obscured by the effects of structural uplift and the lower temperatures of these shallower depths. Well control is poor in the areas of the McIntosh and Klepac piercement salt domes; therefore, these salt intrusions should not be completely condemned as potential conductors of heat from great depths.

In southwest Alabama the three large gravity maxima (Thomasville, Carlowville and Fairfield anomalies) do not appear to be associated with significant geothermal anomalies. In southwest Marengo County and at the northeast end of the Thomasville gravity feature, apparent gradients in the Cretaceous exceed 1.80°F/100 ft. These gradients, however, are not reflected in nearby deep wells and pre-Cretaceous rocks. It is believed that heat flow is normal here and that the indicated higher gradient in shallow wells is related to factors other than the Thomasville basement feature. In the vicinity of the Fairfield gravity maximum in southwest Covington and eastern Escambia Counties, possibly related Mesozoic igneous rocks are present locally; however, geothermal gradients here are not abnormally high.

The Bay Minette geothermal gradient anomaly, with its one-well control point, is located on a large magnetic maximum with more than 150 gammas closure. (See figure 24.) This possible correlation makes this

area look even more interesting, and it is hoped that new test-wells will soon be drilled in the area for confirmation.

In the southeastern part of the Alabama Coastal Plain, the highest calculated geothermal gradient was in a well located in northeast Coffee County (P#489) and on the southeast end of a large, regional gravity maximum (figure 25). The meager test well and temperature control in this area indicate a possible relationship between geothermal gradients and deep crustal thickness or lithology changes which are reflected by regional gravity anomalies. Abnormally high heat flows and geothermal gradients may correspond to deep crustal rocks that produce gravity highs. Additional studies are needed to confirm this relationship. Also in southeast Alabama, the gradient of more than 1.60°F/100 ft in southeast Houston County may be related to the Suwannee Basin margin that extends through this area.

A Warm "Spring" in Houston County

Geothermal energy is now being utilized near the town of Cottonwood in southeast Alabama's Houston County. Warm water from "Sealy Springs" has been used for mineral baths and recreation for many years. This "spring" is actually a deep, flowing well that was originally drilled in the late 1920's as an oil and gas test and is located in section 23, T. 1 N., R. 27 E. The casing for this well was perforated at a depth of about 4,280 feet, and the well began flowing warm water to the surface. Water temperature has been reported at 112°F and the flow rate is about 180 gpm. Chemical analysis of this water is as follows: 9,400 ppm

chlorides; 795 ppm $CaCO_3$; 269 ppm HCO_3; 1 ppm SO_4; 1 ppm NO_3; 0.3 ppm F (verbal communication with the Water Resources Division, U.S. Geological Survey, Tuscaloosa, Alabama).

An investigation revealed that "natural" springs of the area flow cool water, and no additional warm water surface flows are known to be present.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The primary data base for this study consisted of data derived from electric logs of oil and gas test wells. These data are very limited in scope and should be used with caution in estimating the geothermal potential of south Alabama. Calculated high geothermal gradients in relatively shallow test wells may not indicate true thermal conditions at greater depths, and a linear extrapolation of these gradients to deeper rocks may produce erroneously high temperature estimates. Decreasing porosity and changes in lithology with depth combine to increase bulk rock conductivity and decrease the gradient. In southwest Alabama, gradients observed in rocks of Cretaceous age cannot be reliably projected downward into Jurassic age rocks below the Cotton Valley Group because significant conductivity changes occur in the Haynesville Formation. Furthermore, the upward movement of fluids and heat along faults, fractures and the Interior Salt Basin margin, or the heating effects of casing cement may cause the temperature of borehole fluids in shallower wells to be elevated above normal and the result will be abnormally high calculated gradients that do not reflect the true prospects for high-temperature geothermal resources at greater depths.

The Alabama Coastal Plain area is underlain by a conduction-dominated, deep sedimentary basin, a type of geothermal regime that comprises the largest part of the world's geothermal energy resource

base. As in most tectonically "quiet" regions, this area is characterized by a relatively constant geothermal flux, and geothermal gradients are most commonly low to moderate. However, because these sediments reach great thicknesses in some areas, temperatures in excess of 300°F have been encountered in deep wells (below 17,000 feet). Even without regard to the extremely high costs of drilling to these depths, the low thermal conductivity of these deep rocks, and in most areas their low porosities and permeabilities, severely restrict the potential effective recovery of geothermal fluids. In this report the geothermal waters lying deep below the surface have been referred to as a "potential resource." Some authors feel that the geothermal energy associated with deep sedimentary basins cannot be classified as a "resource" due to the technical and economic restraints on its development (Renner, 1979). This report has been restricted to an evaluation of the area without regard to the technical and economic factors that change with time.

The results of this study indicate that any future development of the geothermal resources in south Alabama will be restricted to low and moderate temperature, non-electric applications. Such resources have been defined as geothermal fluids between the temperatures of 50° and 160°C (122° to 320°F) (Howard, 1975). The lower limit of this temperature range is the minimum temperature for greenhouse heating and the upper limit represents the temperature above which geothermal waters may be used for the generation of electricity by binary cycle systems.

Low- and moderate-temperature waters constitute a significant potential energy source for possible applications in space heating, industry, agriculture and aquaculture (Howard, 1975; Energy Res. and

Dev. Adm., 1975; Wahl, 1977; and Lienau, 1980). Experiments are presently being conducted by the Tennessee Valley Authority (TVA) on the raising of crops in soils heated by warm water (120°F) in underground pipes. Although the growing seasons are somewhat longer in the south Alabama area, a lengthening of these seasons may be desirable in some instances. Also, experiments are being conducted with the growing of catfish in warm discharge water from a TVA steam plant. Lund (1979) discusses the possibility of using geothermal energy sources for the production of alcohol fuel. If feasible, the use of geothermal energy in alcohol fuel distillation plants would be well suited to much of southwest Alabama, an area of vast grain-growing farm lands with access to shipping through the port at Mobile.

In southwest Alabama, temperatures and pressures elevated above "normal" have been found in the deeper parts of the basin and within the Haynesville Formation. Abnormally high temperature zones are found in association with abnormally high interstitial fluid pressures. These geopressured zones occur in rocks where confined connate waters have been combined with waters produced through chemical diagenetic processes and trapped between impermeable strata. They are most commonly found to occur as an abrupt rather than a gradual transition from overlying rocks of normal pressures and temperatures. Jones (1969, p. 304) discusses the relationship between geotemperature and geopressure and states:

> "That the geotemperature regime is related to the occurrence of geopressure is not surprising, because the movement of water is the most important factor in terrestrial heat flow in sedimentary basins. Checking the upward flow of water greatly reduces the rate of upward flow of heat, and geopressured reservoirs become overheated."

The overpressured zones of the Haynesville, along with their high temperatures, range in thickness from 400 to 900 feet and occur in sections of interbedded anhydrite, gypsum and shale. They are found in Baldwin County and the southern parts of Washington, Clarke, and Monroe Counties. Deep test wells in some areas of southwest Alabama, especially within Baldwin County, often encounter geopressured Haynesville shales confined above and below by impermeable anhydrite beds. These shales tend to flow into the boreholes, thus producing drilling problems; however, pressures within them generally "bleed off" with time and high-density muds used to drill through these zones can be decreased in weight. Of course, these shales have no potential for geothermal utilization since they are not capable of releasing large volumes of water or steam at high rates over long periods of time.

Although abnormally high pressures and elevated temperatures have been encountered in the Haynesville Formation, rocks of very poor reservoir quality generally characterize these zones. An exceptional area is located in the vicinity of the South Carlton oil field in southernmost Clarke County (figure 36). Here, a geopressured sand zone is encased within massive salt deposits of the lower part of the Haynesville Formation below a depth of 15,500 feet, where temperatures exceed 260°F. This zone occurs below more than 300 feet of salt deposits (the lower 170 feet of which is massive salt), and above more than 200 feet of massive salt. Serious drilling problems were encountered on the South Carlton domal structure when large volumes of hot saline water flowed from the geopressured interval into the borehole and upward to

land surface. A water-quality analysis for this zone is not available and bore-hole conditions in the South Carlton area do not allow an electric log determination of dissolved solids. Because of its depth and stratigraphic position within thick salt deposits, it is believed that these connate waters are very highly saline. Although it has been found to be highly geopressured only in the South Carlton Dome area, this potential geothermal reservoir underlies an estimated 200 square mile area of south Clarke, north Baldwin, and southwest Monroe Counties. It is bounded on the south by the Wiggins Uplift, on the northeast by the Gilbertown-West Bend-Pollard fault zone, and on the west and northwest by the Jackson fault and the Klepac piercement salt dome. The Wiggins Uplift may have served as a source area for this sand.

Another promising area is located southeast of the city of Bay Minette. Logs from a test well located on a magnetic high have a recorded abnormally high temperature of 218°F at a subsea depth of 7,336 feet and within Lower Cretaceous sediments. The calculated gradient from this temperature is 2.07°F/100 ft, a value significantly higher than the average gradient for the area. If this gradient is "true," then temperatures higher than 300°F may be possible within sands of the Cotton Valley Group. However, this is a one-well anomaly and no other wells are located over this magnetic feature. Also, it is important to note that a temperature of only 130°F was reported at a depth of about 6,500 feet in this well. There is no apparent geologic reason for such a discrepancy or rapid change in temperature over this relatively short vertical distance of slightly more than 800 feet. Judgment on the

potential of this area must be withheld until additional drilling is conducted in the area and new temperature measurements taken.

The Mississippi Interior Salt Basin is one of three geopressured basins in the southern states, the other two being the North Louisiana Salt Basin and the Northern Gulf of Mexico Basin along and near the Texas and Louisiana coast lines. Highly pressured and potential geothermal reservoirs in the Smackover Formation have been found in parts of the Interior Salt Basin in neighboring Mississippi. The probable geopressuring mechanisms here are diagenesis, internal forces, vertical compression, and resistance to fluid expulsion (U.S. Geol. Surv., 1978). The Interior Salt Basin extends into and occupies all of Washington County, Alabama, and parts of adjacent counties. Here, however, highly overpressured Smackover reservoir rocks have not been found to date, although large areas remain to be explored by the drill. Because of regional primary porosity trends in the upper Smackover, any future discoveries of extensive geopressured reservoirs in this formation will likely occur in western Washington County or southern Baldwin County. The geopressured zones in Miocene and Pliocene sediments that occur near the Texas and Louisiana coastlines and described by Jones (1969 and 1970), do not extend into the near-shore areas of Alabama. Rapid deposition of Miocene and Pliocene clays and sands contemporaneously with rapid subsidence and faulting did not take place in the study area, nor is there an equivalent counterpart.

The geothermal potential of the southeast Alabama Coastal Plain area is considered to be similar to much of the Atlantic Coastal Plain. Costain and others (1976-79) and Renner (1979) believe that the optimum

sites for geothermal development in the Atlantic Coastal Plain area will be associated with granitic intrusions into the underlying basement complex. Concentrations of heat-producing radiogenic elements in these intrusions are the source of abnormal heat flows, and the most favorable areas occur where these plutons are overlain by thick, insulating sediments of low thermal conductivity. Available geophysical data in southeast Alabama are insufficient to locate basement intrusions. Detailed geophysical surveys followed by a test-drilling program will be needed in order to evaluate the geothermal potential for sediments in the vicinity of basement plutons in the area of study.

Available subsurface temperature control in southeast Alabama indicates subnormal to slightly above normal geothermal gradients. This control, however, is sparsely distributed or nonexistent throughout much of the area. Gradients range from less than 1.00°F/100 ft near the Alabama-Florida line to more than 1.80°F/100 ft in northeast Coffee County. Higher gradients, which are possibly related to basement rocks that produce gravity highs, may increase northeast of Coffee County; however, this is uncertain since data are absent in this direction. In northeast Coffee County temperatures may reach 150°F within the sedimentary rock sequence (estimated thickness 5,000 feet) and can only be expected to reach higher temperatures if deep Triassic basins are present here. Although thermal anomalies are not known to be associated with the Triassic basins of the Atlantic coastal region, the thick sediments that they contain may provide some opportunity for the geothermal development of low and moderate temperature fluids, even in areas of near-normal geothermal gradient and heat flow. A gradient of

slightly more than 1.60°F/100 ft is indicated for southeast Houston County, an area underlain by the Suwannee Basin. Here, temperatures in Mesozoic sediments here may reach 180°F above Paleozoic rocks that are estimated to be 7,000 feet deep.

This study did not include a consideration of the economic and technological feasibilities for the commercial utilization of geothermal resources in south Alabama. These will be dependent upon the minimum required water temperature and volume for a given operation or need, recharge and circulation to the system, water salinities and related production and disposal problems, and the required depths along with drilling and well completion costs. The amount of heat that can be utilized from geothermal waters will be dependent upon several factors, including not only rock permeability and thermal conductivity but also overdraft relative to natural heat flow. The thickness, areal extent, and recharge of any given thermal-water reservoir in the area will be of much importance since production at depletable rates will, of course, decrease the life expectancy of the system and may cause problems with land subsidence. Deep geothermal reservoirs with high temperature potential, especially in southwest Alabama, occur only in the subcrop and their sources of recharge may be very limited or nonexistent. The areal extent of these deep and highly saline water aquifers is of prime importance, as are their porosities and permeabilities which tend to decrease with depth.

A thorough evaluation of the above-mentioned factors was beyond the scope of this present study and the available data. An appraisal of any particular thermal aquifer and its in situ thermal and yield characteristics and life expectancy can be made only during a carefully designed

drilling, testing, and development program. Before such a program is instigated, however, other studies should be made and additional data collected.

In southwest Alabama it is recommended that a monitoring program be conducted on future oil and gas test wells to be drilled in the areas of interest outlined earlier in this report. These areas include Baldwin County (especially in the vicinity of the Bay Minette anomaly), Washington, south Clarke, and southwest Monroe Counties. Plans should be formulated for the possible conversion of dry and abandoned oil and gas test wells to research geothermal wells. Such wells could be used to perform tests needed to provide data for a better evaluation of the area, including rock conductivities, heat-flow studies, and equilibrium temperatures. Furthermore, these wells could be used to provide information on the behavioral characteristics of potential reservoirs, including porosities, permeabilities, pressures and production capabilities, and also information on the geochemical nature of reservoir fluids. All of these data are needed in order to determine whether potential geothermal source rocks are economically attractive relative to present-day technology.

It is further recommended that a shallow drill-hole program and heat-flow study be conducted across and in the vicinity of the Bay Minette magnetic and "apparent" geothermal anomaly. The deepest reported down-hole temperature from the test well located on this feature indicates a higher-than-normal heat flow, even above the insulating rocks of the Haynesville Formation. Such a study is needed to either confirm or condemn this one-well anomaly.

Future studies of the geothermal potential of the southeast Alabama Coastal Plain should incorporate the following methods of research:

1. Gravimetric and aeromagnetic surveys should be conducted in order to locate and define igneous intrusions in the basement complex.
2. Seismic surveys are needed in order to delineate Triassic basins underlying the area.
3. Heat-flow studies in shallow drill holes should be performed to supplement the meager amount of thermal data available from oil and gas test wells.
4. Consideration should be given for the conversion of dry and abandoned oil and gas test wells to geothermal research wells.

Although the southeast Alabama Coastal Plain area is not presently being actively explored for oil and gas, it is anticipated that additional test drilling will take place in the future, especially in Covington and Houston Counties.

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APPENDIX A

Petrographic Descriptions of Selected Smackover Cores

Chevron-Shell et al., J.A. Bryars unit No. 1,
Baldwin County, Alabama; Permit No. 1652

Sample depth (feet)	Description
16,572	Oncolitic grainstone; slightly dolomitic; framework consists of oncolites of various sizes (up to 4 mm), ooids, peloids, and scattered bioclasts including algae, gastropods, brachiopods, and echinoderms; grains show some evidence of fracturing due to compaction; trace of quartz silt; some anhydrite as a late cement or replacement; most grains have rims of drusy dentate cement with intergranular areas filled with granular and coarse sparry calcite; dolomite present as 20-50 micron subhedral rhombs replacing outer rims of oncolites; minor porosity, primarily cement-reduced interparticulate.
16,576	Oolitic grainstone; framework consists of ooids up to .5 mm in diameter, oncolites, peloids intraclasts, and scattered bioclasts including brachiopods, gastropods, and echinoderms; some minor signs of compaction but grains almost float; trace of quartz silt; minor amounts of drusy dentate cement, majority of cement granular or sparry calcite with some late stage dolomite cement; trace of anhydrite as late cement or replacement; 20-100 micron subhedral to euhedral dolomite rhombs concentrated along fractures or scattered throughout slide; minor porosity, primarily cement-reduced interparticulate.
16,583	Peloidal packstone-grainstone; dense mixture of peloids with scattered small ooids, oncolites or skeletal grains; much finer grained than above; heavily compacted with grain outlines difficult to discern; cement primarily granular calcite; gypsum and anhydrite nodules common; scattered euhedral dolomite rhombs 20-100 microns in diameter; minor porosity, primarily cement-reduced interparticulate.
16,590	Mudstone, dolomitic; dense; micrite has a somewhat clotted texture suggestive of altered peloids; trace of scattered algal grains; dolomite as euhedral rhombs (20-50 microns) concentrated along fractures or scattered throughout slide; very little porosity.
16,596	Wackestone to packstone; dolomitic; dense clotted texture makes delineation of grains difficult; framework grains include small peloids and algal material; dolomite as scattered 20-150 micron euhedral rhombs; some patchy zones of granular calcite, very little porosity.
16,601	Mudstone; dolomitic; similar to 16,590'; dolomite more common and slightly finer grained (20-100 microns); some patchy fenestral porosity.

16,607	Peloidal packstone-grainstone; similar to 16,583'; cement fine granular calcite; abundant gypsum/anhydrite nodules; dolomite as 20-100 micron euhedral to subhedral rhombs scattered throughout slide or clustered in irregular small patches; minor porosity, primarily cement-reduced interparticulate.
16,609	Mudstone; dolomitic; similar to 16,601'.
16,614	Oncolitic grainstone; slightly dolomitic; framework dominantly oncolites with small numbers of ooids and peloids; dense packing; cement fine granular calcite; anhydrite present as small nodules and laths; dolomite as scattered euhedral rhombs of replacement origin; minor porosity; mixture of cement-reduced interparticulate.
16,616	Peloidal packstone-grainstone; similar to 16,607; less gypsum/anhydrite; large stylolite concentrating dolomite; minor porosity, primarily cement-reduced interparticulate.
16,618	Oncolitic grainstone; similar to 16,614', less dense; minor porosity.
16,625	Peloidal packstone-grainstone; similar to 16,607'; denser with texture clotted in places; large stylolite concentrating dolomite; several large oncolites present; trace of quartz silt; very little porosity.
16,636	Peloidal packstone-grainstone; dolomitic; similar to above (16,625') but much more dolomitic; dolomite as euhedral to subhedral rhombs 15 to 100 microns in diameter; trace of quartz silt and mica; minor porosity.
16,641	Peloidal packstone-grainstone; similar to 16,625'; less dolomitic than above; dense; oncolites and skeletal grains more common than above; excellent anhydrite laths; trace of quartz silt; little porosity.
16,652	Peloidal packstone-grainstone; similar to 16,636'; stylolitic; dolomite concentrated along stylolite, in irregular patches, and scattered throughout slide; some large oncolites present; anhydrite/gypsum common; trace of quartz silt; little porosity.
16,664	Peloidal packstone-grainstone; framework of peloids, oncolites, and skeletal material; abundant algal material; texture clotted in places; nodules and laths of anhydrite/gypsum; cement granular calcite; dolomite present as 15 to 150 micron rhombs scattered throughout slide and concentrated in irregular patches; little porosity.

16,671	Peloidal packstone-grainstone; similar to above; appears bioturbated; zones of extensive dolomitization give mottled appearance; scattered quartz silt; minor porosity, primarily intercrystalline.
16,674	Peloidal packstone-grainstone; similar to above (16,671'); dolomitized zones not as thoroughly altered; anhydrite/gypsum laths and nodules common; scattered quartz silt; granular and sparry calcite cement; little porosity.
16,683	Dolomitized peloidal(?) packstone; severe (75%) dolomitization; dolomite 20 to 100 micron euhadral to subhedral rhombs; quartz silt and mica (muscovite and biotite) common; microstylolites abundant; minor porosity, primarily intercrystalline.
16,695	Peloidal packstone-grainstone; similar to 16,664'; slightly more dolomite in definite but irregular zones; some large algal grains; granular and sparry calcite cements, little porosity.
16,707	Wackestone-mudstone; slightly dolomitic; scattered oncolites skeletal material and peloids; dolomite as scattered 20-50 micron euhedral-subhedral rhombs; some micrite neomorphosed to pseudospar; trace of quartz silt; little porosity.
16,718	Dolomitized peloidal(?) packstone; similar to 16,683'.
16,730	Peloidal packstone-grainstone; similar to 16,664'; anhydrite/gypsum laths and nodules common; some late stage ferroan dolomite present associated with sulfate; little porosity.
16,739	Peloidal packstone-wackestone; similar to above; more dolomitic; dolomite as euhedral-subhedral rhombs concentrated along microstylolites; quartz silt and mica abundant along stylolites; anhydrite/gypsum nodules common; little porosity.
16,745	Peloidal packstone-grainstone; similar to 16,695'; more dolomitic than above.
16,755	Peloidal packstone; similar to above; microstylolitic; quartz silt and mica concentrated along stylolites; little porosity.
16,765	Oncolitic packstone; large oncolites relatively unaltered with intergranular material severely dolomitized; dolomite 80-150 micron hypichotopic rhombs; scattered quartz silt and mica; anhydrite/gypsum common and along with sparry calcite and sparry dolomite occludes porosity; little porosity.

16,774	Dolomitized peloidal(?) packstone; similar to 16,683; more dolomite than above; original texture difficult to ascertain; little porosity.
16,786	Dolostone; dolomite nonferroan, hypidiotopic to xenotopic with rhombs 25 to 100 microns in diameter; quartz silt common; anhydrite/gypsum nodules common; dark wispy organic laminations minor porosity, primarily intercrystalline.
16,797	Dolostone; similar to above.
16,806	Dolostone; similar to 16,786'; dolomite very cloudy.
16,812	Dolostone; similar to 16,786'; dolomite very cloudy; stylolitic; large anhydrite nodule.

Inexco, W.J. Britton No. 1
Washington County, Alabama, Permit No. 2478

Sample depth (feet)	Description
16,019	Peloidal oolitic packstone-grainstone; framework a mixture of peloids, skeletal grains (primarily algae) and badly deformed ooids or oncolites; intergranular material fine granular cement or neomorphic pseudospar(?); 20-100 micron euhedral to subhedral dolomite rhombs scattered throughout slide; numerous well-defined anhydrite/gypsum laths present; stylolitic with dolomite concentrated along stylolite; little porosity.
16,021	Peloidal oolitic packstone; dolomitic, anhydritic; framework grains badly altered peloids, oncolites, ooids(?), and algal grains; dolomite 20-100 micron hypidiotopic rhombs; anhydrite and gypsum as replacement nodules or lath-spaced crystals; porosity low, primarily intercrystalline.
16,023	Peloidal oolitic packstone; dolomitic; similar to 16,019'; bioturbated with dolomite concentrated in zone of bioturbation; microstylolitic; minor porosity; primarily intercrystalline.
16,024	Peloidal oolitic packstone; dolomite; heavily leached; rock contains a mass of leached spherical forms (peloids, ooids, oncolites?) 50 to 200 microns in diameter; outer boundaries of voids irregular because of intrusion by surrounding material; matrix a mosaic of hypidiotopic-xenotopic nonferroan dolomite; anhydrite/gypsum present as nodules and void filling; oil-stained margin to many voids; dolomitization predated hydrocarbon migration which was followed by sulfate implacement; considerable porosity, primarily moldic with lesser amounts of intercrystallization.
16,032	Algal packstone; dolomitic; total rock dolomitized by very fine-grained dolomite; some fine-grained sulfate occurs in patches associated with fine dolomite rhombs; slide heavily oil stained; little porosity.
16,035	Mixture of oolitic grainstone-packstone and dolomitic wackestone-packstone; upper 1/4 of slide composed of slightly to moderately altered pseudooids or oncolites(?); only single outer lamination visible; core of framework grains mixture of subhedral dolomite rhombs and granular calcite or pseudospar; ooids(?) distorted and compressed yet grain-to-grain contact minimal; some quartz inclusions in ooids; intergranular material granular cement or pseudospar with scattered replacement dolomite rhombs; lower 3/4 of slide mixture of pseudospar

16035 (cont'd) and 20-50 micron idiotopic to hypidiotopic dolomite; dolomite segregated into vague ovoid masses 100-300 microns in diameter; some scattered quartz silt; some large ooids from upper 1/4 scattered in lower portion; little porosity.

16,045 Peloidal oolitic packstone-wackestone; similar to 16,019'; sulfate not as abundant; non-stylolitic.

16,047 Peloidal-oolitic packstone-wackestone; similar to 16,019' but contains large (>1mm) highly distorted ooids; non-stylolitic little sulfate; all grains have a fringe of acicular calcite with majority of intergranular material fine-grained granular calcite; little porosity.

16,051 Oolitic grainstone; dolomitic; ooids 50 to 900 microns in diameter; deformed with evidence of compaction; cores of almost all ooids replaced by 20-50 micron euhedral to subhedral dolomite rhombs which are also found scattered throughout matrix; matrix fine granular calcite cement; stylolitic to microstylolitic; slide grades into a slightly dolomitic peloidal packstone-wackestone; little porosity, primarily intercrystalline.

16,053 Peloidal oolitic packstone-wackestone; mixture of scattered peloids and badly deformed ooids in a matrix of fine-grained granular calcite and very fine hypidiotopic to xenotopic dolomite; framework grains very difficult to distinguish and of variable concentration throughout the slide; dolomite concentrated in irregular, vague zones; little porosity.

16,064 Peloidal oolitic packstone-grainstone; similar to 16,019 except little or no dolomite present; scattered quartz silt; some scattered sulfate nodules; little porosity.

16,067 Peloidal oolitic packstone-grainstone(?); very anhydritic; dominated by large anhydrite nodules; nonreplaced portions of thin-section granular calcite with vague grain outlines; anhydrite contains vague spherical remnants of calcite which represent hues of original ooids(?); traces of quartz silt; stylolitic; little porosity.

16,070 Peloidal, oolitic packstone-grainstone; similar to 16,019'; nondolomitic; sulfate (anhydrite and gypsum) common; scattered quartz silt; stylolitic; minor porosity, primarily moldic.

16,080	Wackestone to mudstone; mass of 10-20 micron pseudospar grains with scattered 10-50 micron euhedral-subhedral nonferroan dolomite rhombs; traces of possible grain (peloid or ooid) outlines but not as well-defined or common as above; sulfate nodules and laths; little porosity.
16,096	Wackestone to mudstone; very dolomitic in part; mixture of microspar and pseudospar (5 to 50 microns); euhedral-subhedral dolomite rhombs concentrated in discrete irregular wavy lamination; dolomitic zones argillaceous; wispy to wavy organic laminations; stylolitic; scattered peloids; alternating dolomitic and nondolomitic zones give nodular appearance; trace of quartz silt; no sulfate; minor porosity, primarily intercrystalline.
16,100(T)	Dolostone; mass of 20-75 micron hypidiotopic rhombs; abundant included organic material; scattered quartz silt; vague traces of original calcite material; stylolitic; trace of sulfate; minor porosity, primarily intercrystalline.
16,100(B)	Dolostone; similar to above but heavily oil-stained; well-defined zones without oil stain contain sparry calcite cement suggesting early cementation, perhaps associated with original skeletal(?) grains; minor to moderate porosity, primarily intercrystalline.
16,101	Wackestone to mudstone; dolomitic; similar to 16,080', traces of possible peloids more common than above; dark, wispy, organic lamination; little porosity.
16,109	Wackestone; similar to 16,080 and above but less dolomitic; peloids and distended ooids more common than above; scattered quartz silt; little porosity.
16,112	Wackestone to mudstone; similar to above; little porosity.
16,121	Mudstone, similar to above but very few framework grains; dark wispy organic laminations scattered throughout; little porosity.
16,132	Mudstone; similar to above.
16,140	Mudstone; similar to above.

Humble, L&N Railroad No. 30-3,
Escambia County, Alabama; Permit No. 1766

Sample depth (feet)	Description
15,259	Mudstone; silty and micaceous; quartz silt 5 to 75 microns in diameter; abundant dark organic matter along laminations and concentrated along stylolites; micrite neomorphosed to 5-10μ microspar; scattered ostracods and forams; almost 1/2 slide coarse granular calcite which is replacing micrite (or replacing earlier sulfate); no trace of anhydrite or gypsum; some scattered 10-50 micron dolomite rhombs; minor porosity, small amount of vuggy porosity present within granular calcite zones.
15,284	Mudstone; slightly silty and micaceous (less so than above); quartz silt 20-100 microns in diameter, angular to subangular; small amount of scattered organic material; widely scattered ostracods; microstylolitic; micrite neomorphosed to 5 to 25 micron microspar; suggestion of bioturbation; several sinuous fractures cutting section; minor porosity, dominantly fracture.
15,310	Mudstone; similar to above; stylolitic; small gypsum nodules scattered throughout slide; minor porosity, primarily fracture.
15,326	Mudstone; similar to 15,248'; patchy zones of pseudospar possibly associated with bioturbation; scattered brachiopod fragments; bioturbated with burrows filled with dolomitic mudstone; dolomite as 25-100 micron, nonferroan euhedral rhombs included in microspar-pseudospar matrix; little porosity.
15,358	Mudstone; similar to 15,284; scattered quartz silt; scattered brachiopods and forams; 50-75 micron euhedral-subhedral dolomite rhombs scattered throughout and clustered around burrows; little porosity.
15,383	Mudstone; slightly dolomitic; barren except for a single foram; dolomite as mosaic of coarse (200-300 micron) xenotopic to hypidiotopic rhombs in clusters associated with burrows; micrite neomorphosed to microspar; trace of quartz silt; some small gypsum nodules, little porosity.
15,419	Mudstone; barren except for a few scattered forams; trace of quartz silt; non-dolomitic; abundant dark wavy organic lamination throughout thin-section; micrite neomorphosed to microspar and some pseudospar; little porosity.

15,445	Peloidal, oncolitic packstone; slightly dolomitic; scattered skeletal grains including forams and gastropods; micrite neomorphosed to microspar and pseudospar; dark argillaceous zones in matrix associated with fine-grained xenotopic dolomite; small amounts of replacement sulfate; scattered quartz silt; some sparry calcite filling voids; minor porosity, primarily intercrystalline.
15,449	Peloidal, oncolitic packstone; similar to above but almost completely replaced by 5-20 micron anhedral to subhedral dolomite rhombs; highly argillaceous; heavily leached; some anhydrite/gypsum was replacement or cement; trace of quartz silt; moderate to high porosity, mixture of moldic and intercrystalline.
15,451	Peloidal, oncolitic packstone; similar to above but less completely dolomitized; dolomite as very fine (<20 microns) xenotopic-hypidiotopic rhombs; microstylolitic; less leaching than in 15,449'; minor porosity, primarily intercrystalline.
15,454	Peloidal, oncolitic packstone; similar to 15,449'; complete dolomitization; considerable leaching; high porosity, mixture of moldic and intercrystalline.
15,481	Peloidal, oncolitic packstone; similar to above but little evidence of leaching; stylolitic; large anhydrite nodules; minor porosity; primarily intercrystalline.
15,494	Peloidal, oncolitic packstone/wackestone; similar to above but more matrix material; completely dolomitized; scattered anhydrite nodules; dark wavy organic lamination; minor porosity, primarily intercrystalline.
15,503	Peloidal wackestone; silty, micaceous, and argillaceous; dark argillaceous peloids(?); very silty, abundant 10-50 micron quartz silt and muscovite flakes scattered throughout sample and concentrated along irregular wavy laminations; argillaceous material concentrated in irregular laminae; microstylolitic; some neomorphism; minor porosity, primarily vuggy.
15,515	Mudstone/wackestone; similar to above but less peloidal material and less argillaceous; dolomitic with dolomite as scattered euhedral-subhedral rhombs; anhydrite nodules common; extensive neomorphism of micrite to microspar and pseudospar; minor porosity, principally vuggy.

15,523	Peloidal wackestone; silty, micaceous, argillaceous; quartz silt and mica scattered throughout and concentrated in irregular wavy laminae; scattered small anhydrite nodules; micrite neomorphosed to microspar; scattered single euhedral dolomite rhombs; some sparry dolomite cement; little porosity.
15,529	Peloidal wackestone; silty, micaceous, argillaceous; dolomitic; scattered forams mixed with peloids; quartz silt and mica scattered throughout slide with no lamination; more argillaceous than above and slightly more dolomitic; dolomite as scattered euhedral to subhedral rhombs; little porosity.
15,535	Mudstone; silty and micaceous; dolomitic; stylolitic; quartz silt 10-50 microns in diameter scattered throughout and concentrated along stylolites; dolomite as scattered 10-50 micron subhedral rhombs; small anhydrite nodules; some dark organic material; little porosity.
15,539	Peloidal wackestone; similar to 15,529' but less argillaceous and more dolomitic; dolomite fine-grained (<20 micron), xenotopic to hypidiotopic; some patchy ferroan calcite; little porosity.

Getty, Blacksher Co. 7-12 No. 1,
Monroe County, Alabama; Permit No. 1592

Sample depth (feet)	Description
14,231	Dolostone, light to medium gray; silty and micaceous; dolomite nonferroan, hypidiotopic with rhombs 10-30 microns in diameter; noncarbonate fraction includes quartz/feldspar, muscovite, and biotite and common dark wispy organic lamination; quartz grains 50-200 microns in diameter and subangular to subrounded; porosity minor, primarily intercrystalline.
14,245	Dolostone, light to medium gray; silty and micaceous; similar to above; dolomite nonferroan, hypidiotopic with rhombs 10-30 microns in diameter; noncarbonate fraction includes quartz, feldspar, muscovite, and biotite along with dark wispy organic laminations; noncarbonate material concentrated along indistinct, wavy laminations; quartz grains 50-300 microns in diameter and subangular to subrounded; porosity minor, primarily intercrystalline.
14,248	Sandstone (subarkose), fine-medium grained, moderately well sorted; quartz subangular to subrounded, primarily monocrystalline with slightly undulose extinction; feldspar dominantly plagioclase; porosity high (20-25%), mixture of primary and secondary; minor amount of anhydrite cement.
14,253	Dolomitic siltstone to silty dolostone; grades from a dolomitic siltstone or fine sandstone to a silty dolostone; siltstone angular to subangular, feldspathic, very micaceous; dolomite very fine grained (<20 micron) hypidiotopic rhombs; nonferroan; dark organic material scattered throughout and concentrated along distinct wavy laminae also rich in mica; porosity minor, mixture of intercrystalline- and fracture-.
14,262	Dolostone, slightly silty; contains scattered subrounded quartz grains of coarse silt to medium sand size; dolomite nonferroan, hypidiotopic with rhombs ranging from 20-60 microns in diameter; scattered gypsum nodules; some large fractures filled with sparry calcite; porosity minor, primarily intercrystalline, with minor amounts of fracture porosity.
14,274	Dolostone, silty, micaceous; scattered quartz silt grains and mica flakes; quartz 50-300 microns in diameter and subrounded to subangular; noncarbonate fraction concentrated along irregular wavy laminations; dolomite nonferroan, hypidiotopic with rhombs 20-60 microns in diameter; irregular wavy to wispy dark organic lamination; moderate porosity, dominantly intercrystalline or solution-enlarged intercrystalline.

14,290 Dolostone, nonferroan, grading from hypidiotopic dolomite to granular or sparry dolomite; irregular patchy areas of dark organic material; anhydrite/gypsum common; spherical patches of dolomite included within the sulfate; porosity variable, ranging from minor intercrystalline porosity in areas of fine dolomite to moderate-high solution enlarged intercrystalline porosity in areas of coarser dolomite and sulfate.

Getty, Broughton 17-7 No. 3,
Monroe County, Alabama; Permit No. 1698

Sample depth (feet)	Description
13,726	Dolostone, trace of scattered quartz silt grains (30-200 microns in diameter) and mica (muscovite) flakes; dolomite nonferroan, hypidiotopic to idiotopic, rhombs 20 to 150 microns in diameter; trace of scattered wispy organic laminations; porosity low to moderate, primarily intercrystalline.
13,741	Dolostone, trace of scattered quartz silt grains (30-200 microns in diameter) and mica (muscovite) flakes; trace of scattered wispy dark organic laminations; dolomite nonferroan, hypidiotopic to idiotopic rhombs 20-50 microns in diameter; minor amounts of anhydrite/gypsum; porosity low, primarily intercrystalline.
13,749	Dolostone, silty, slightly micaceous; quartz grains 20-100 microns, subangular to subrounded; dolomite nonferroan, very cloudy, as hypidiotopic rhombs 20-50 microns; some later clear dolomite rhombs associated with pores; minor amounts of gypsum/anhydrite as cement; some calcite cement filling intergranular areas; porosity minor, primarily intercrystalline.
13,755	Dolostone, silty, slightly micaceous quartz grains 20-100 microns, subangular to subrounded; dolomite, nonferroan, very cloudy, as hypidiotopic rhombs 20-50 microns in diameter; minor amounts of gypsum/anhydrite cement; minor to moderate porosity, primarily intercrystalline.
13,762	Dolostone, slightly silty and micaceous, dolomite nonferroan, very cloudy, as 20-50 micron hypidiotopic rhombs; scattered gypsum/anhydrite cement; mottled appearance in thin section suggesting bioturbation; trace of irregular dark organic material; minor porosity, primarily intercrystalline.
13,768	Dolostone, silty and micaceous (including biotite) quartz grains 40 to 200 microns in diameter; quartz and mica much more abundant than above, concentrated along microstyolites; dolomite nonferroan, cloudy, as 20-40 micron hypidiotopic to idiotopic rhombs; trace of gypsum/anhydrite cement; several small fractures present; minor porosity, mixture of fracture and intercrystalline.
13,775	Dolostone, silty and micaceous, quartz grains 40 to 200 microns in diameter; less quartz and mica than above; dolomite nonferroan, cloudy, as 20-40 micron hypidiotopic rhombs; minor amounts of calcite cement; microstyolites and wispy dark organic laminations common; minor porosity, primarily intercrystalline.

13,777	Dolostone, slightly silty and micaceous, quartz grains 40 to 150 microns in diameter; dolomite nonferroan, cloudy, as 20-40 micron hypidiotopic rhombs; patches of anhydrite/gypsum as replacement nodules; wavy to wispy dark organic lamination; minor porosity, primarily intercrystalline.
13,785	Dolostone, slightly silty and micaceous, dolomite nonferroan, very cloudy, as 20-50 micron hypidiotopic rhombs; scattered gypsum/anhydrite cement; minor porosity, primarily intercrystalline.

Placid, Jackson No. 1
Choctaw County, Alabama; Permit No. 1330

Sample depth (feet)	Description
10,298	Ooid-oncolite grainstone; dolomitic; framework mixture of ooids, oncolites and skeletal grains; framework grains heavily altered to 25-150 micron hypidiotopic to xenotopic dolomite; intergranular areas filled with granular to sparry calcite; some framework grains mixed with dark, very fine-grained dolomite of possible hardground origin; anhydrite common as late replacement; moderate porosity, mixture of solution-enlarged interparticulate and intercrystalline.
10,304	Ooid-oncolite grainstone; similar to above except almost all framework material completely leached; intergranular material mass of granular calcite some of which invades leached pores; dolomite present in some incompletely leached ooids; small amounts of later sparry dolomite cement; anhydrite common as late-stage replacement; high porosity, dominantly oomoldic.
10,310	Mixture of dolomitized ooid-oncolite grainstone/packstone and dolostone; ooid-oncolite grainstone similar to above except intergranular areas filled with 20-100 micron hypidiotopic dolomite; less leaching of framework grains; evidence of late-stage compaction; some anhydrite cement; lower portion of thin section dolostone comprised of 20-100 micron hypidiotopic dolomite; moderate to high moldic or interparticulate porosity in grainstone, moderate intercrystalline porosity in dolostone.
10,313	Ooid-oncolite grainstone; similar to above; framework grains cemented by sparry dolomite and replaced by 20-100 micron hypidiotopic dolomite; some anhydrite as late cement; moderate to high porosity, mixture of interparticulate and moldic.
10,320	Ooid-oncolite grainstone; similar to 10,298; grains almost completely replaced by 25-150 micron hypidiotopic to xenotopic dolomite; intergranular material dominantly granular calcite; moderate porosity, mixture of moldic and intercrystalline.
10,322	Mixture of dolomitized ooid-oncolite grainstone/packstone and dolostone; similar to 10,310; almost complete dolomitization; dolomite 20-100 micron hypidiotopic rhombs; moderate porosity as oomoldic or intercrystalline.
10,330	Ooid-oncolite grainstone; nondolomitic; framework grains are a mixture of ooids, oncolites peloids, intraclasts and skeletal grains, some large detrital rock fragments; intergranular material mixture of granular and sparry calcite; many pores oil coated indicating hydrocarbon-migration, interrupted cementation; moderate porosity, interparticulate or solution-enlarged interparticulate.

10,337	Ooid-oncolite grainstone; similar to above; grains somewhat smaller and better sorted than above; moderate to high porosity, primarily solution-enlarged interparticulate.
10,344	Ooid-oncolite grainstone, nondolomitic, similar to 10,330; coarser than above and less well sorted; anhydrite and gypsum cement common; moderate porosity, completely interparticulate.
10,348	Ooid-oncolite grainstone, similar to 10,330; evidence of strong compaction; slightly more skeletal material present (gastropods, brachiopods, algae); trace of sulfate cement; moderate porosity, primarily interparticulate.
10,350	Ooid-oncolite grainstone, similar to 10,300; several large detrital grains present; wide range in size of framework grains, sorting poor; less compaction than above; intergranular cement both granular and sparry calcite; low to moderate porosity, primarily cement-reduced interparticulate.
10,360	Ooid-oncolite grainstone; very fine-grained, framework grains mixture of ooids, oncolites, and peloids; intergranular material mixture of granular calcite and scattered dolomite rhombs; well-sorted; packing tight; low porosity, primarily cement-reduced intergranular.
10,369.5	Ooid-oncolite grainstone; similar to above but lacking intergranular dolomite; porosity higher than above because of leaching; moderate porosity; solution-enlarged interparticulate.
10,380	Dolomitized ooid-oncolite packstone/wackestone; 75% dolomite as very fine (<20 micron) rhombs with considerable dark organic material; dolomite replaces ovoid grains and intergranular material; nondolomite primarily sparry calcite suggesting replacement of molds of leached grains; many molds unfilled leaving moderate moldic porosity.
10,381	Dolomitized ooid-oncolite packstone; 80-90% dolomite as dense very fine (<20 micron) rhombs with considerable dark organic material; outlines of several large oncolites visible; large replace anhydrite nodules present; porosity moderate, mixture of moldic and intercrystalline.
10,388	Dolostone, very fine-grained (<20 microns) mass of xenotopic dolomite; considerable organic material; no trace of grains; euhedral gypsum crystals; minor porosity, primarily intercrystalline.

10,397	Dolostone to dolowackestone, similar to above, some traces of grain (peloid) outlines; minor amount of unaltered calcite; less sulfate than above; minor porosity, primarily intercrystalline.
10,406	Dolostone to dolowackestone, similar to above; some coarser (up to 50 micron) dolomite rhombs; vague traces of grains (probably peloids); no replacement sulfate; trace of quartz silt; minor porosity; primarily intercrystalline.
10,417	Mudstone; similar to above but nondolomitic; single brachiopod fragment; trace of sulfate and quartz silt; dark wispy organic laminations; micrite altered to microspar in part; stylolitic; fractured; minor porosity, primarily fracture.
10,419	Ooid-peloid(?) packstone/wackestone; framework grains almost completely leached leaving ovoid moldic pores; matrix argillaceous microspar; abundant sulfate as laths and nodules; trace of dolomite as scattered fine-grained rhombs; moderate moldic porosity.
10,423	Mudstone; similar to 10,417; scattered bioclasts; nondolomitic; little porosity.
10,440	Mudstone; similar to 10,417; little porosity.
10,448	Ooid-oncolitic grainstone; ooids and oncolite grains severely leached; intergranular areas filled with drusy and granular calcite; some scattered clear dolomite rhombs in leached pores suggesting dolomitization and then leaching; abundant large anhydrite nodules and laths of replacement origin; high porosity (25%), dominantly moldic with smaller amounts of cement-reduced interparticulate.
10,456	Ooid-oncolitic grainstone; similar to above; slightly finer grained; less leaching with more dolomite remaining; moderate to high porosity (29%), primarily moldic.
10,461	Wackestone; similar to 10,417; scattered framework grains (probably peloids) which are altered to dolomite; little porosity.
10469(B)	Ooid-oncolite grainstone; similar to 10,448; less leaching, most ooids replaced by 20-75 micron hypidiotopic dolomite; moderate to high porosity, dominantly moldic.
10,470	Ooid-oncolite grainstone; similar to 10,448 but more skeletal grains and less leaching; moderate porosity, dominantly moldic.

10,483	Ooid-oncolite grainstone; similar to 10,448; almost complete leaching of ooids; little dolomite; trace of sulfate; high porosity (18%); dominantly moldic.
10,491	Ooid-oncolite grainstone; similar to above; grains somewhat flattened indicating early compaction; high porosity, dominantly moldic.
10,494	Ooid-oncolite grainstone; similar to above but little or no leaching; grains completely replaced by 10-50 micron xenotopic dolomite; minor to moderate porosity, mixture of interparticulate and moldic.
10,497	Ooid-oncolite grainstone; similar to above; grains slightly smaller; very dense packing; grains separated by drusy calcite; almost all ooids replaced by 20-80 micron xenotopic dolomite; minor porosity, mixture of interparticulate and moldic.
10,501	Mudstone; non-dolomitic; scattered bioclasts (brachiopods) and peloids; micrite altered to microspar; trace of sulfate; little porosity.
10,509	Mudstone; non-dolomitic; no trace of framework grains; micrite altered to microspar; gypsum nodules very common; little porosity.
10,511	Mudstone; non-dolomitic; similar to above; some sulfate-filled fractures; little porosity.
10,512	Mudstone; laminated; non-dolomitic; scattered framework grains; laminae of micaceous silt; traces of sulfate; little porosity.
10,529.5	Mudstone; laminated; non-dolomitic; laminae a mixture of fine 10-30 micron laminae within the carbonate (stromatolitic laminae?) alternating with laminae of micaceous silt; detrital laminae microstylolitic; little porosity.
10,530	Mudstone; massive; non-dolomitic; no trace of framework grains; fractured with fractures filled with sparry calcite; cut by irregular wedge-shaped laminae of micaceous quartz silt; quartz grains coarser than above; thin section may cut mudcracked surface; little porosity.
10,532	Mudstone; similar to 10,501; vague silty laminae along with some irregular wavy lamination within the carbonate; scattered fine dolomite rhombs; little porosity.

10,535	Mudstone; similar to above; large anhydrite nodules common; brecciated appearance; stylolitic with organic concentrations along stylolites.
10,536	Mudstone(?); similar to 10,532; anhydrite less common than above; numerous oval pores suggesting leached grains but no hint of original material; moderate porosity, primarily moldic.
10,537	Mudstone; similar to 10,532; scattered quartz silt grains scattered dolomite rhombs; little porosity.
10,543	Mudstone/wackestone; some large algal grains; scattered quartz silt; significant leaching of algal grains, some oval pores present similar to those at 10,536; stylolitic; moderate porosity, primarily moldic.
10,547	Mudstone/wackestone; similar to above; moderate porosity, principally moldic.
10,556	Mudstone; similar to 10,536; minor to moderate moldic porosity.
10,559	Oncolitic peloidal packstone; non-dolomitic; framework grains mixtures of peloids, oncolites, and scattered skeletal grains; matrix slightly neomorphosed micrite; rare sulfate nodules and laths; oval pores common; moderate porosity, dominantly moldic.
10,564	Oncolitic peloidal packstone; similar to above; more framework grains than above; large anhydrite nodules present; moderate to high porosity, dominantly moldic.
10,576	Mudstone; similar to 10,532; leached oval pores very common; if pores represent leached grains the original rock was possibly a packstone; no trace of original grains; non-dolomitic; moderate to high porosity, primarily moldic.
10,577	Mudstone; silty; non-dolomitic; widely scattered skeletal material; small gypsum geodes; microstylolitic; no oval pores as seen above; some small fractures; little porosity, primarily fracture.

Humble, H.D. Harrigan No. 1
Clarke County, Alabama; Permit No. 1438

Sample depth (feet)	Description
10,950	Peloidal packstone; peloids very vague and poorly delineated; trace of quartz silt; some scattered bioclasts (ostracods and algae); intergranular micrite neomorphosed to microspar and pseudospar; little porosity.
10,954	Oncoloidal, peloidal grainstone; dominated by leached and compressed oncolites; also contains peloids, scattered forams and possible blue-green algae; cores of oncolites leached and oncolites compressed; grains cemented primarily by 10-25 micron equant granular calcite; some sparry calcite as late stage cement; trace of subhedral dolomite rhombs; microstylolites present; moderate porosity, primarily moldic.
10,956	Peloidal packstone-wackestone; similar to 10,950'; less framework material; stylolitic with concentration of organic material and quartz silt along stylolites; extensive neomorphism of micrite to microspar or pseudospar; little porosity.
10,960	Peloidal packstone-grainstone; similar to 10,950; numerous spherical vugs which could represent leached oncolites; matrix extensively neomorphosed to pseudospar; moderate porosity, primarily moldic; minor amount of replacement anhydrite as small nodules.
10,966	Mudstone to wackestone; dominantly a mass of 20-50 micron granular calcite of neomorphic origin (pseudospar); scattered zones of ostracods, peloids, and possible algal material; small amounts of replacement anhydrite; stylolitic; numerous vague circular voids 50-250 microns in diameter which may represent leached grains; moderate porosity, dominantly solution-enlarged moldic or vuggy.
10,974	Peloidal packstone; peloids vague and poorly defined; also minor amounts of skeletal material including ostracods and algae; matrix is granular calcite (20-50 microns) of probable neomorphic origin; minor anhydrite/gypsum filling pores; numerous vague circular pores similar to those found at 10,966'; dark organic material (hydrocarbons) fills some pores but predates final cementation(?); moderate porosity, dominantly solution-enlarged moldic or vuggy.
10,980	Mudstone; silty; dark vague wispy lamination; some scattered peloids; minor amounts of skeletal material (primarily ostracods); matrix 5-25 micron microspar to pseudospar; some coarse sparry calcite filling voids and fractures; macro and microstylolites common; little porosity.
10,982	Mudstone; similar to 10,980'; less stylolitic; pseudospar 10-40 microns in diameter; some later anhydrite/gypsum; little porosity.

Getty, Klein 3-14 No. 1,
Mobile County, Alabama; Permit No. 1978

Sample depth (feet)	Description
18,020	Dolostone, hypidiotopic-idiotopic, 25 to 75 micron rhombs, primarily nonferroan dolomite though some rhombs have ferroan rims and ferroan dolomite fills some of the smaller pore spaces; somewhat silty (<5%), qtz. grains 20-100 microns, angular to subangular, scattered throughout slide; patchy zones of very fine-grained (<10 micron) nonferroan dolomite probably representing bioturbation; some very irregular, patchy zones of calcite, difficult to determine whether these are remnants of bioclastic material or later-stage pore filling; scattered wispy organic lamination; minor porosity, primarily intercrystalline.
18,025	Dolostone, xenotopic-idiotopic, 20 to 50 micron rhombs, primarily nonferroan dolomite; somewhat silty (<5%) qtz. grains 20-75 microns, angular to subangular, scattered throughout slide; irregular dark "organic" zones of finer grained dolomite forming "wispy" laminations (possible bioturbation); x-ray diffraction shows 100% dolomite; porosity minor, primarily intercrystalline.
18,026	Pelletal, oncoloidal packstone-grainstone; spherical to ovoid pellets 50-300 microns in diameter along with oncolites comprise most of section; scattered subangular-angular quartz silt ranging from 10-150 microns in diameter comprises less than 5% of section; evidence of severe solution and reprecipitation of sparry calcite; pores rimmed by thin 50 to 150 micron fringe of dolomite and then completely filled with coarse prismatic calcite and minor amounts of anhydrite and gypsum; dolomite which comprises about 10 percent of the rock according to x-ray diffraction occurs as a fringe to these filled pores and as idiotopic to hypidiotopic rhombs "included" within the sparry calcite; porosity moderate, appears to represent solution-enlarged intercrystalline porosity within the calcite-filled voids (this possibly may represent an intertidal deposit where dolomite and anhydrite were emplaced by reflux, subsequently almost completely leached and later replaced by calcite with minor remaining void space later enlarged by solution).
18,034	Pelloidal packstone; dolomitic (x-ray shows 65% dolo), dolomite occurs as hypidiotopic to idiotopic nonferroan rhombs 25-175 microns in diameter; rhombs are slightly clouded by inclusions; dolomite replaces much of original material making identification difficult; peloids, pelecypods, and algal grains definable; dark organic(?) material scattered throughout; minor porosity, primarily intercrystalline.

18,041 Packstone/grainstone(?) dolomitic (x-ray shows 45% dolo) dolomite occurs as hypidiotopic, nonferroan dolomite with rhombs 25 to 100 microns in diameter, rhombs occur singly or in aggregated masses; most of the nondolomitic portion of the sample is comprised of a mosaic of fine (<10 micron) granular calcite, scattered peloids; organic material [and minor amounts of detrital muscovite] concentrated along wavy, poorly defined styolites; minor porosity, primarily intercrystalline.

18,042 Dolomitized ooid-oncolite grainstone, original ooids or oncoids (.25-1 mm in diameter) have been completed leached; intergranular material is primarily nonferroan dolomite and occurs as 25 micron rhombs up to sparry dolomite; finer rhombs very cloudy while large rhombs and sparry dolomite much clearer; abundant dark organic material associated with cloudy dolomite; it appears the finer cloudy dolomite may be replacing the original material while the coarser, clear dolomite is a contemporaneous or later stage pore filling; minor amounts of ferroan dolomite as late-stage rim on rhombs adjacent to pore space; trace of sparry calcite as pore filling; minor amount of pore filling, isotropic fluorite; thin-section porosity is 20% and consists primarily of cement-reduced moldic, intergranular, and intercrystalline porosity.

18,081 Dolostone, mosaic of hypidiotopic rombs 15 to 100 microns in diameter, primarily nonferroan, cloudy; ferroan dolomite occurs as a rim on nonferroan rhombs and as a later-stage pore filling; trace amounts of sparry calcite; patchy zones (nodules?) of gypsum and anhydrite; organic material scattered throughout and concentrated along styolites; trace of angular quartz silt (<25μ); some silicification (chert) along styolites; porosity minor, mixture of intercrystalline, fracture, and channel associated with stylolites.

18,106 Dolostone, xenotopic to hypidiotopic rhombs ranging from 25 to 150 microns combined with a sparry dolomite pore filling; rhombs nonferroan and very cloudy, sparry dolomite nonferroan and clear; minor ferroan dolomite (<5%) as euhedral rhombs and rims on nonferroan rhombs; pore-filling anhydrite and gypsum (7%); scattered dark organic matter included in cloudy dolomite; vague circular pore zones suggests this slide may represent a dolomitized oolite(?) similar to 18,042; porosity combination of intergranular, cement-reduced moldic and solution-enlarged vuggy to channel; thin section porosity 27%.

18,118 Dolostone, mosaic of xenotopic to hypidiotopic rhombs ranging from 25-250 microns; mixture of cloudy and noncloudy dolomite, clear dolomite appears to post-date cloudy; majority of dolomite nonferroan; Fe dolomite as late rims on clear or cloudy rhombs; organic material (hydrocarbons) scattered throughout slide, appears to postdate Fe-dolo rims; anhydrite and gypsum as scattered pore filling; some styolitization present with organic material concentrated along styolites; porosity primarily intercrystalline with some solution enlargement; thin section porosity 9%.

18,125 Sandy dolostone, dolomite (58%) xenotopic-hypidiotopic with rhombs 25-250 microns in diameter; dolomite nonferroan, minor amount of Fe-dolomite as late stage rims; sand-sized fraction mixture of mino (23%) and poly qtz. (7%), K-spar (6%), and plagioclase (2%), feldspars show common overgrowths; common interpenetration of clastic grains by dolomite; thin-section porosity (4%), dominantly solution-enlarged intercrystalline.

APPENDIX B

Geothermal Data for South Alabama

(See Figure 1, Page 3, for Index Map)

County	Pages
Baldwin	171-175
Barbour	No data
Bullock	176-177
Butler	178-179
Choctaw	180-195
Clarke	196-206
Coffee	207-208
Conecuh	209-211
Covington	212-213
Crenshaw	214-215
Dale	No data
Dallas	216-217
Escambia	218-231
Geneva	232-233
Henry	234-235
Houston	236-237
Lowndes	238-239
Macon	No data
Marengo	240-241
Mobile	242-250
Monroe	251-254
Montgomery	No data
Pike	255-256
Russell	No data
Washington	257-262
Wilcox	263-264

NOTE:

In Appendix B and under "Calculated Gradients," values in column 1 were calculated from sea level to assumed depth of temperature measurement (temperature at sea level, 66°F). Gradients in column 2 were calculated from previous upper temperature and depth.

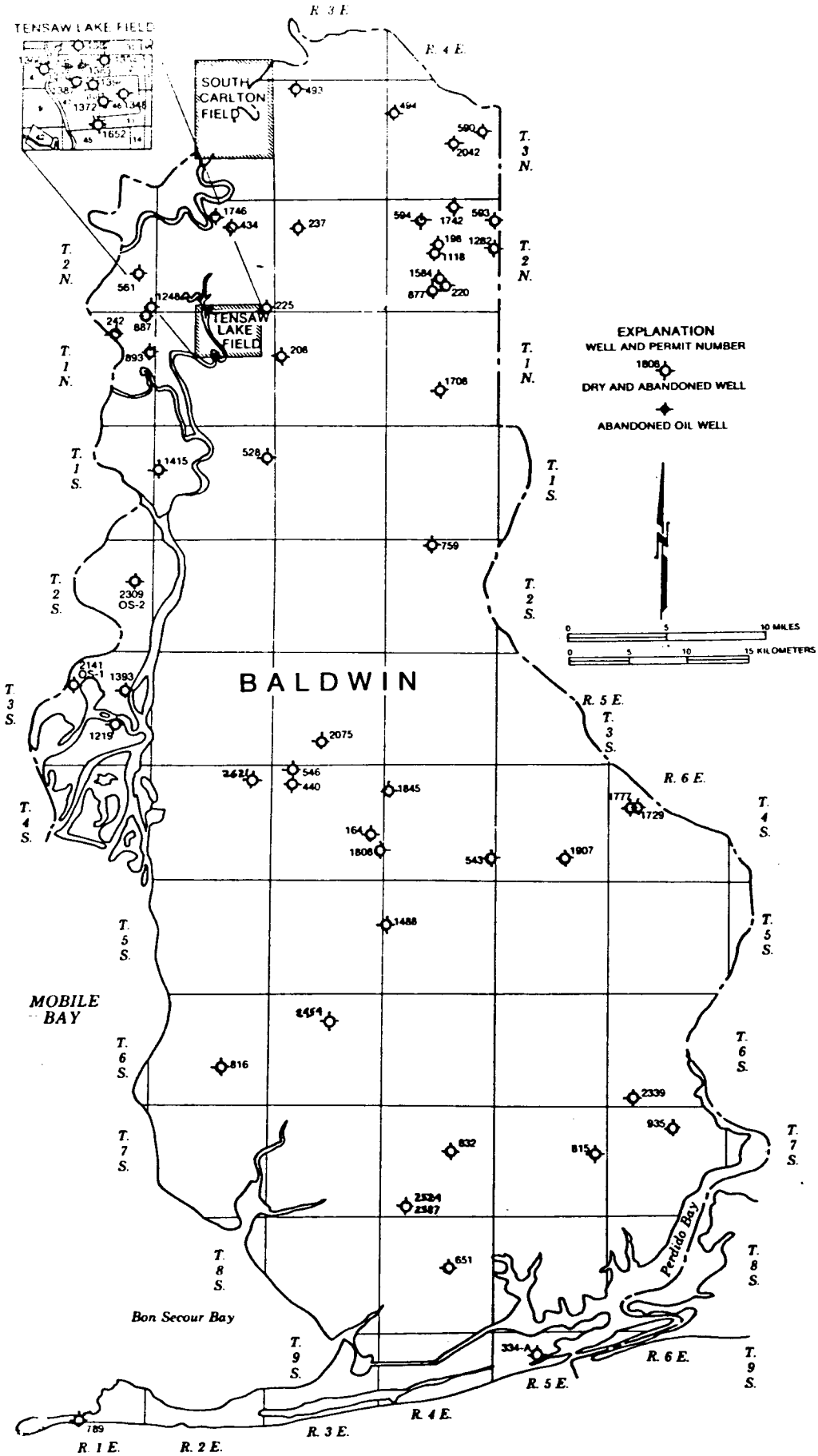


FIGURE 46. Baldwin County map showing locations of wells for which geothermal data are listed in Appendix B.

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION Sec	T.	R.	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth subsea (ft)	Time after circulation (hrs.)	Mud density (lbs/gal)	Formation or Age	Calculated Gradient (°F/100 ft) 1	2
164	Sohio Petroleum Corp.										
7-21-48	T.C.I.R.R. Co.	NE/SW	24	4S	3E	138	5,422	2½	10.0	Tertiary	1.33
						154	7,836	4	10.4	(Lower) Tuscaloosa	1.12	0.66
						158	8,021	2	10.5	Early Cretaceous	1.15	2.16
198	Gulf Refining Co.										
1-9-50	W.M. Carney Mill Co.	SE/NE	16	2N	4E	142	6,424	2½	10.7	(Lower) Tuscaloosa	1.18	
208	Lazarow & Robilo Oil										
5-12-50	Ben May	SW/NW	18	1N	3E	165	6,986	3	10.0	Early Cretaceous	1.42	
220	S. P. Borden & Crow										
7-20-50	W.M. Carney Mill Co.	NW/SW	27	2N	4E	150	6,230	2	10.1	(Lower) Tuscaloosa	1.35	
225	Neilson & Walker										
9-13-50	C.H. Bryars	SW/SE	36	2N	2E	166	6,788	2	10.2	Early Cretaceous	1.47	
237	S.P. Borden & Crow Drlg.										
10-6-50	W.M. Carney Mill Co.	NW/SW	8	2N	3E	146	6,408	2	10.4	Early Cretaceous	1.25	
242	Gulf Oil Co.										
1-12-51	B.D. Simison et al	SE/SE	43	1N	1E	144	5,995	2	10.2	Selma	1.30	
						158	7,249	1½	10.3	Eutaw	1.27	1.12
						180	9,979	2	10.5	Early Cretaceous	1.14	0.81
265	Clarkwin Oil Corp.										
5-7-51	C.O. Oswell et al	SE/NW	15	3N	2E	139	5,443	2	9.9	(Lower) Tuscaloosa	1.34	
287	Humble Oil & Ref. Co.										
7-18-51	Paul Danner	SE/SE	14	3N	2E	164	6,490	2	9.8	Early Cretaceous	1.51	
334	South Baldwin Oil										
12-3-52	Dr. Amos Garrett	NE/NW	9	9S	5E	164	7,992	2	9.2	Early Cretaceous	1.23	
434	I.P. & Fred LaRue										
5-7-53	T.T. Tunstall	SW/SE	49	2N	2E	139	6,094	2½	9.4	(Lower) Tuscaloosa	1.20	
440	Stanolind Oil & Gas										
6-13-53	U.S. Steel	SW/SW	5	4S	3E	168	7,753	2	9.8	Early Cretaceous	1.32	
493	Sunnyland Cont. Co.										
11-2-53	Frank F. Earle et al	SW/NW	5	3N	3E	136	5,927	2	9.9	Early Cretaceous	1.18	
494	Sunnyland Cont. Co.										
12-1-53	Frank F. Earle et al	NE/SW	7	3N	4E	142	6,191	2	9.3	Early Cretaceous	1.23	
528	Union Producing Co.										
3-21-54	Ben May et al	SW/SE	12	1S	2E	121	4,283	2	9.5	Selma	1.28	
						157	7,366	2½	9.8	Early Cretaceous	1.24	1.17
543	Stanolind Oil & Gas										
5-28-54	U.S. Steel	SE/SE	25	4S	4E	162	7,713	2½	10.4	Early Cretaceous	1.24	
546	Stanolind Oil & Gas										
6-10-54	U.S. Steel A-2	NW/NW	5	4S	3E	158	7,723	3	9.7	Early Cretaceous	1.19	
561	Placid Oil Co.										
10-1-54	Bacon-MacMillan	NW/SE	32	2N	1E	164	8,209	2	10.1	Early Cretaceous	1.19	
						172	8,992	2	10.0	Early Cretaceous	1.18	1.03
590	I.P. LaRue										
2-4-55	W.M. Alexander	SW/NW	13	3N	4E	160	6,283	2½	10.2	Early Cretaceous	1.50	
593	Hamilton & Armour et al										
3-24-55	H. H. Patterson et al	NE/NE	12	2N	4E	148	6,526	2	10.2	Early Cretaceous	1.26	
594	Hamilton & Armour et al										
4-15-55	H. H. Patterson et al	NE/NE	8	2N	4E	152	6,479	2	10.2	Early Cretaceous	1.33	
651	A.R. Temple										
4-15-56	G.E. Walsh & N.G. Ehle	NE/SE	15	8S	4E	176	8,177	3	10.1	Early Cretaceous	1.35	
673	Clarkwin Oil Corp.										
6-10-56	W.H. & C.O. Oswell	SE/SE	10	3N	2E	130	5,464	2½	9.7	(Lower) Tuscaloosa	1.17	
674	Clarkwin Oil Corp.										
7-5-56	W.H. & C.O. Oswell no.2	SW/SE	10	3N	2E	134	5,456	2	10.0	(Lower) Tuscaloosa	1.25	

STATE PERMIT Compl. Date	OPERATOR FEE	LOCATION Sec	T.	R	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal.)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
759 3-18-57	Sun Oil Co. International Paper	NE/NW	4	2S	4E	130	6,496	3	9.9	(Marine) Tuscaloosa	0.99	
					218	7,336	1½	10.3	Early Cretaceous	2.07	10.48
779 9-16-58	Clarkwin Oil Corp. W.H. & C.O. Oswell "C"	NE/SE	10	3N	2E	138	5,411	1½	9.9	(Lower) Tuscaloosa	1.33	
780 10-20-57	Clarkwin Oil Corp. W.H. & C.O. Oswell "B"	NE/NW	15	3N	2E	140	5,450	2	10.4	(Lower) Tuscaloosa	1.36	
789 6-20-57	Seneca Development Co. Gulf Beach L & D	SE/SE	28	9S	1E	178	8,227	2	10.3	(Lower) Tuscaloosa	1.36	
815 12-28-57	A. R. Temple Paul Kyzer	NE/SW	13	7S	5E	163	7,965	3	10.0	Early Cretaceous	1.22	
816 11-28-57	A. R. Temple Fairhope Single Tax	SE/SE	22	6S	2E	157	8,367	2½	10.0	Early Cretaceous	1.09	
832 2-7-58	A. R. Temple F.W. Sherrill et al	SE/NE	15	7S	4E	163	8,440	2½	10.2	Early Cretaceous	1.15	
877 8-31-58	Zach Brooks Drlg. Co. Patterson-Alabama Oil	SE/SW	28	2N	4E	180	10,688	3	10.2	Early Cretaceous	1.07	
887 11-4-58	Placid Oil Co. G.R. Bryant	NE/NW	1	1N	1E	160	7,987	2½	9.4	Early Cretaceous	1.18	
893 12-5-58	Placid Oil Co. P.A. Bryant	NE/NE	13	1N	1E	154	7,613	2	9.5	Early Cretaceous	1.16	
935 2-27-59	A.W. Williams Drlg. T.J. Restor	NE/NW	10	7S	6E	156	7,745	2	9.6	Early Cretaceous	1.16	
1021 10-10-60	Clarkwin Oil Corp. C.O. & W.H. Oswell no.3	NW/NE	15	3N	2E	136	5,516	2	9.5	(Lower) Tuscaloosa	1.27	
1118 11-1-61	G.M. Harrison Patterson-Alabama Oil	SW/SE	16	2N	4E	158	6,567	2	9.8	Early Cretaceous	1.40	
1219 2-12-63	Humble Oil & Ref. R.P. Baer, II, et al	NW/NW	38	3S	1E	172	8,331	2	10.0	Early Cretaceous	1.27	
					242	12,984	2½	10.1	Early Cretaceous	1.36	1.50
1248 8-29-63	Placid Oil Co. Meaher Estate	SE/SE	36	2N	1E	235	13,507	4½	9.81	Early Cretaceous	1.25	
1282 12-8-63	La Grange Petro. Dallas Taylor et al	NE/SE	13	2N	4E	142	6,113	4	9.4	(Lower) Tuscaloosa	1.24	
1334 1-3-65	Chesley Pruet et al Nelson Heirs	NE/NE	43	1N	2E	146	7,453	2½	9.4	Early Cretaceous	1.07	
					198	10,687	4	10.2	Early Cretaceous	1.24	1.61
1348 5-3-65	Chesley Pruet et al Bryars	SW/NE	46	1N	2E	162	8,868	13	9.8	Early Cretaceous	1.08	
1366 9-17-65	Robert A. Lee Bacon-McMillan Veneer	NE/NW	4	1N	2E	186	9,090	4	9.8	Early Cretaceous	1.32	
1370 11-16-65	Robert A. Lee et al Annie B. Smith	NW/NW	3	1N	2E	181	8,691	3	10.1	Early Cretaceous	1.32	
1372 4-17-66	Chevron Oil Co. R. L. Smith	NW/SW	46	1N	2E	170	8,618	4	9.8	Early Cretaceous	1.21	
1382 5-17-66	Robert A. Lee Nelson Heirs et al	SE/SW	34	2N	2E	180	8,677	3	9.6	Early Cretaceous	1.31	
1383 6-9-66	Chevron Oil Co. J.A. Bryars	SW/SW	43	1N	2E	110	1,918	1	9.0	Tertiary	2.29	
					170	7,778	4	9.4	Early Cretaceous	1.34	1.02
					184	8,684	3½	9.4	Early Cretaceous	1.36	1.55
1387 9-29-66	Chevron Oil Co. J.A. Bryars no. 2	NE/NE	47	1N	3E	198	8,729	5	9.6	Early Cretaceous	1.51	
1393 11-19-66	Pruet & Hughes Richard P. Baer, II			3S	2E	200	10,492	4	10.1	Early Cretaceous	1.28	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION	Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
1398 12-19-66	Robert A. Lee Annie B. Smith no. 2	SE/NW	3	1N	2E	180	8,710	3	9.4	Early Cretaceous	1.31	
1415 7-1-67	Robert A. Lee International Paper	SW/NW	18	1S	2E	200	8,991	4	9.8	Early Cretaceous	1.49	
1488 2-23-69	Rush Oil-R.A. Lee Rube Childress	SW/NW	18	5S	4E	208	10,352	4	9.9	Early Cretaceous	1.37	
1513 7-15-69	Clarkwin Oil Co. C.O. Oswell et al no.4	NE/NE	15	3N	2E	140	5,476	6	9.1	(Lower) Tuscaloosa	1.35	
1515 10-17-69	Houston Oil & Minerals Danner	SW/NE	11	3N	2E	138	5,552	7	9.4	(Lower) Tuscaloosa	1.24	
1531 3-20-70	Houston Oil & Minerals Danner no. 5	NW/SW	12	3N	2E	138	5,558	6	9.5	(Lower) Tuscaloosa	1.30	
1537 1-18-70	Houston Oil & Minerals Danner no. 4	SE/NE	11	3N	2E	139	5,543	6	9.2	(Lower) Tuscaloosa	1.32	
1584 2-12-71	Woods Petroleum Patterson-Alabama Oil	NE/NE	28	2N	4E	222	13,728	6	9.2	Cotton Valley	1.14	
						239	15,655	6	9.9	Haynesville	1.11	0.88
						284	16,474	3	11.1	Norphlet	1.32	5.49
1652 1-13-72	Chevron Oil Co. et al J. Arthur Bryars	SE/SE	47	1N	2E	192	10,115	10	9.4	Early Cretaceous	1.23	
						247	15,372	13	10.5	Haynesville	1.16	1.14
						280	17,153	21½	11.0	Norphlet	1.25	1.97
1708 6-14-72	Mellon Creek Operating W.F. Thomas	NE/NE	28	1N	4E	236	15,418	7	10.4	Haynesville	1.10	
						286	16,674	6	15.6	Norphlet	1.32	3.98
1729 8-26-72	Watson Oil Corp. International Paper	NE/NW	17	4S	6E	145	5,266	3	9.2	Selma	1.50	
						268	16,542	7	9.4	Haynesville	1.22	1.09
1742 9-13-72	Shell Oil Co. Wefel Estate	SW/NE	3	2N	4E	110	3,500	3	8.6	Selma	1.26	
						191	9,760	4	9.0	Early Cretaceous	1.28	1.30
						248	14,577	12	9.4	Haynesville	1.25	1.18
						254	15,980	8	10.6	Norphlet	1.18	0.43
1746 12-19-72	Amoco Production Co. Scott Paper Co.	NW/NW	49	2N	2E	203	9,958	7	9.5	Early Cretaceous	1.38	
						220	13,444	4	9.8	Cotton Valley	1.15	0.49
						268	15,332	7½	9.6	Haynesville	1.32	2.54
						248	16,882	9	10.9	Louann Salt	1.08	-
1777 2-20-73	Watson Oil Corp. International Paper	NW/NW	17	4S	6E	272	17,352	13	10.0	Haynesville	1.19	
						306	17,638	12	18.2	Haynesville	1.36	11.89
						322	17,809	8	16.2	Smackover	1.44	9.36
						319	18,058	7	12.0	Norphlet	1.40	-
1808 2-9-73	Watson Oil Corp. W.P. Brown & Sons	SE/NE	25	4S	3E	142	5,224	3½	8.8	Selma	1.45	
						254	16,318	6	9.2	Cotton Valley	1.15	1.01
1845 3-4-74	Exxon Co. U.S.A. U.S. Steel Corp. GU7-6	SE/NW	7	4S	4E	119	4,768	4	9.1	Selma	1.11	
						316	16,917	6½	9.5	Haynesville	1.48	1.62
						323	17,581	11	18.2	Haynesville	1.46	1.05
						290	17,790	9	18.7	Haynesville	1.26	
						308	17,912	16	18.6	Haynesville	1.35	14.75
						328	18,159	14	11.9	Smackover	1.44	8.10
1907 7-18-74	Watson Oil Corp. Internat'l Paper no.3	SW/SE	27	4S	5E	140	5,123	3	9.6	Selma	1.44	
						255	16,812	10	9.5	Haynesville	1.12	0.98
						256	17,158	9	9.6	Haynesville	1.11	0.29
						318	17,940	13	18.6	Haynesville	1.40	7.93
						319	17,990	14	18.6	Buckner	1.41	2.00
						313	18,420	8	13.0	Norphlet	1.34	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs/gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
2042	N.B. Hunt										
2-8-75	St. Regis 22-2	NW/NE	22	3N	4E	110	3,758	4	9.2	Selma	1.17
						251	15,308	6	10.2	Norphlet	1.21	1.22
2075	Texaco, Inc.										
8-18-75	W.P. Brown & Sons	NW/SE	28	3S	3E	242	16,789	8	9.9	Haynesville	1.05
						318	17,902	7	18.5	Haynesville	1.41	6.83
						319	18,198	19	12.1	Haynesville	1.39	0.34
2141	Chevron Oil Co.										
5-24-76	R.P. Baer et al			3S	1E	130	4,920	5	9.8	Selma	1.30
						260	16,840	7½	9.3	Haynesville	1.15	1.09
						318	18,318	23	13.0	Norphlet	1.38	3.92
2309	Amoco Production Co.										
5-24-77	Middle River Unit	SW/NW	13	2S	1E	140	4,707	4½	9.4	Tertiary	1.57
						267	16,716	18½	9.3	Haynesville	1.20	1.06
						310	18,468	12	11.2	Louann	1.32	2.45
2339	Phillips Petroleum										
10-10-77	International Paper	NE/SW	32	6S	6E	246	13,707	15	9.5	Early Cretaceous	1.31
						280	16,975	8	9.5	Cotton Valley	1.26	1.04
						281	17,519	-	9.5	Haynesville	1.23	0.18
						330	18,763	9	17.1	Smackover	1.40	3.94
						338	19,307	10½	12.1	Louann	1.41	1.47
2454	Allied Chemical Corp.										
7-27-78	S. L. Chandler 10-5	SW/NW	10	6S	3E	123	5,244	4	9.2	Selma	1.09
						288	17,110	8½	9.7	Haynesville	1.30	1.39
						268	17,413	9	10.0	Haynesville	1.16	-
						267	17,638	9	10.0	Haynesville	1.14	-
						326	18,837	12	17.8	Haynesville	1.38	4.92
						338	19,259	10½	11.9	Norphlet	1.41	2.84
2524	Amoco Production Co.										
2-26-79	Roy A. Amos 32-12 #2	NW/SW	32	7S	4E	125	5,075	3	9.1	Tertiary	1.16
2587	Amoco Production Co.										
4-1-79	Roy A. Amos 32-12 #1	NW/SW	32	7S	4E	108	2,903	4	8.9	Tertiary	1.45
						307	18,233	7	10.0	Haynesville	1.32	1.30
						337	19,205	9	15.6	Haynesville	1.41	3.09
						348	19,478	8	15.4	Haynesville	1.45	4.03
						340	19,651	7	11.9	Smackover	1.39	-
2621	Highland Resources-Brown										
4-20-79	U.S. Steel Unit 1-11	NE/SW	1	4S	2E	121	4,811	9	9.1	Selma	1.14
						282	16,948	10½	9.5	Haynesville	1.27	1.33
						305	18,114	11	18.5	Haynesville	1.32	1.97
						301	18,360	6	11.9	Norphlet	1.28	-

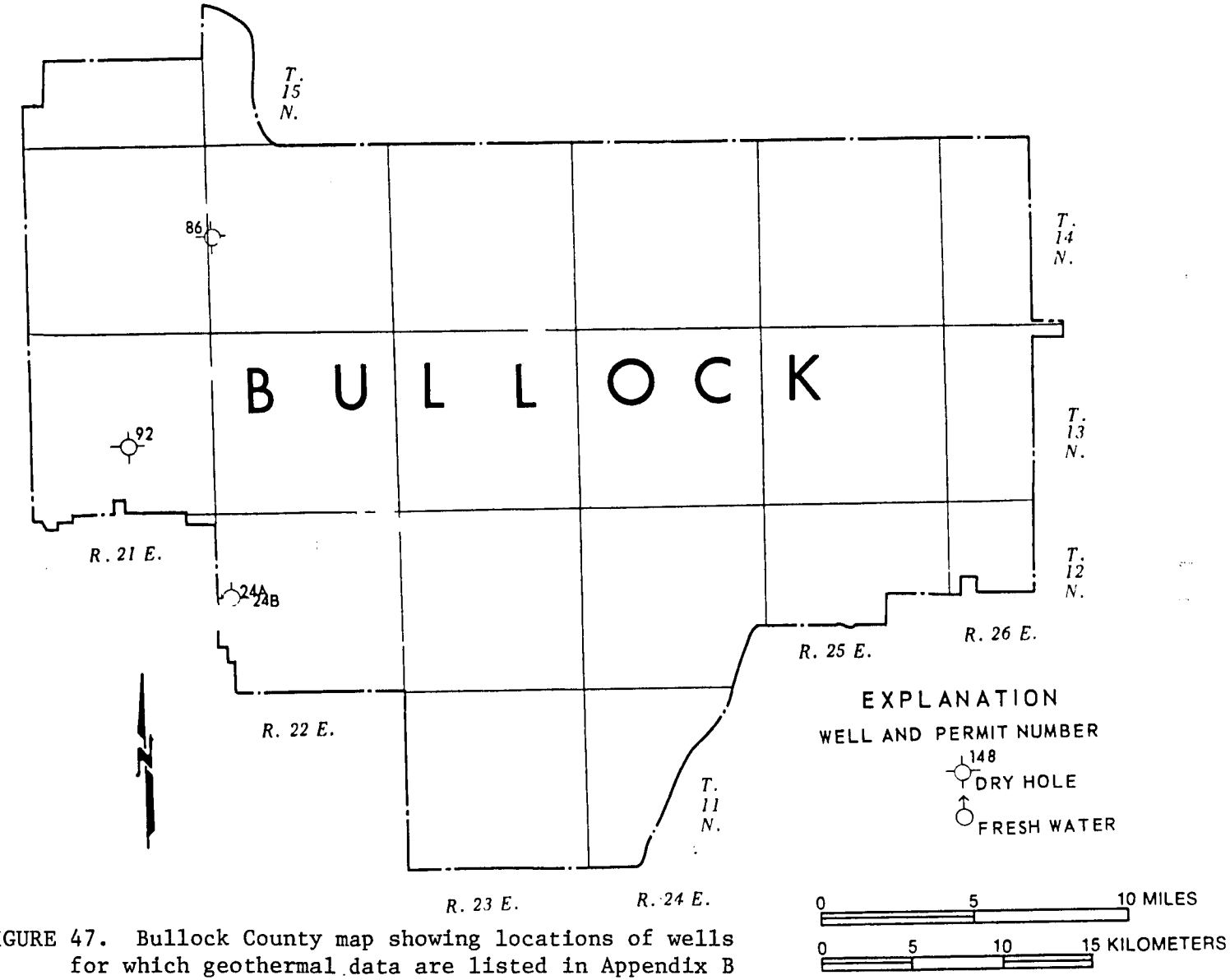


FIGURE 47. Bullock County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
24A 7-28-44	Charles N. Daniel Harris	SE/SW	18	12N	22E	94	1,268	?	10.2	(Lower) Tuscaloosa	2.21	
86 5-20-45	Capital Oil & Gas Co. Ethel B. Cholston et al	SE/SE	18	14N	22E	86	1,425	?	9.5	Paleozoic (Metamorphic)	1.40	
92 6-13-45	Capital Oil & Gas Co. Pickett	SE/NW	22	13N	21E	98	2,093	?	10.1	Paleozoic (Igneous)	1.53	

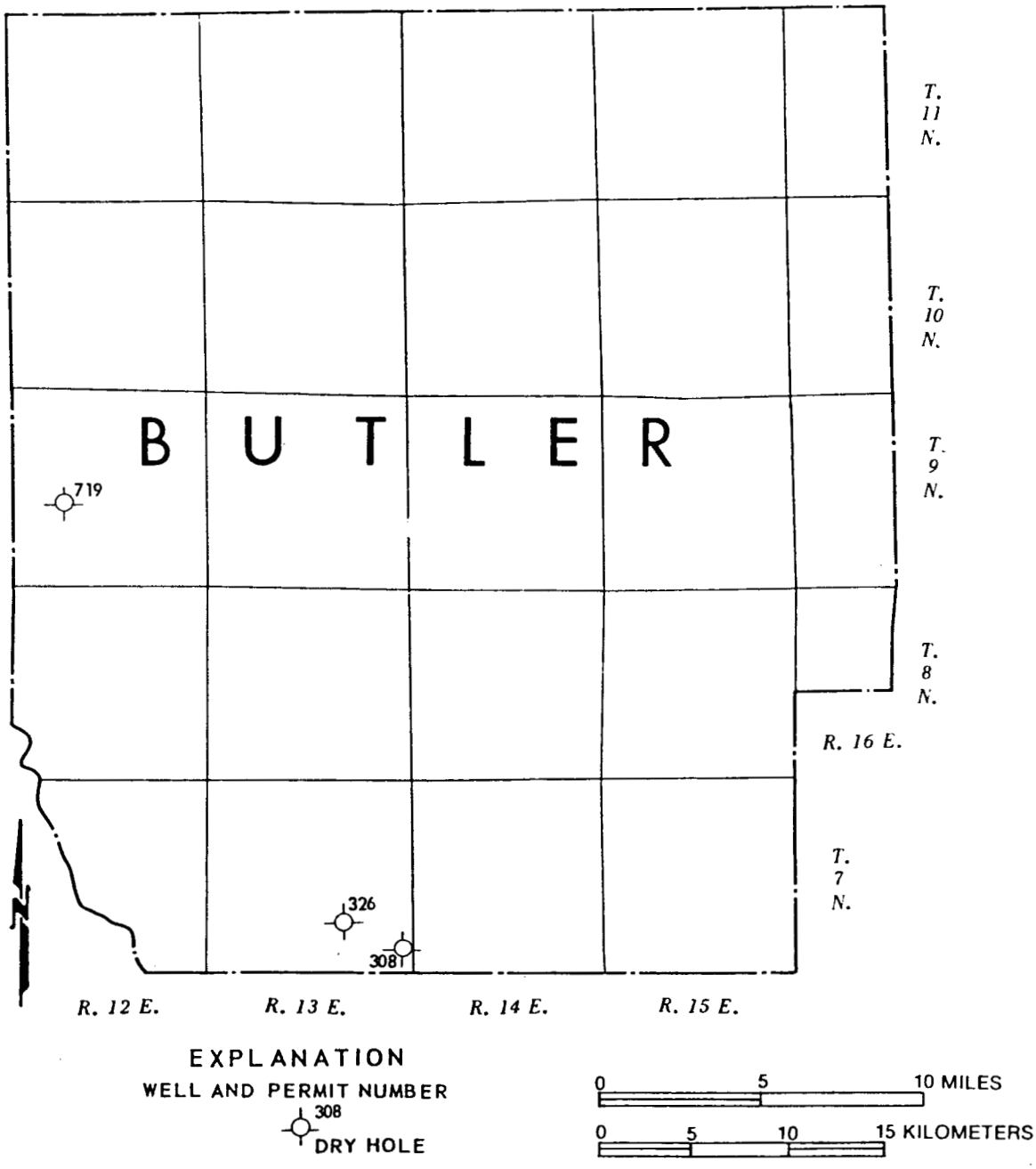


FIGURE 48. Butler County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
308 10-30-51	Gulf Refining Co. K. Hooks	NE/NE	36	7N	13E	138	7,629	4	9.7	Cotton Valley ?	0.94	
326 5-20-52	Gulf Refining Co. D.W. Hendrix	SE/NW	26	7N	13E	124	6,055	3	9.9	Early Cretaceous	0.96	
						152	8,989	2	10.0	Triassic ? igneous	0.96	0.95
719 11-6-56	Cottage Hill Oil Co. E.P. Pitts	SW/NW	20	9N	12E	102	3,600	1½	9.5	(Lower) Tuscaloosa	1.37	

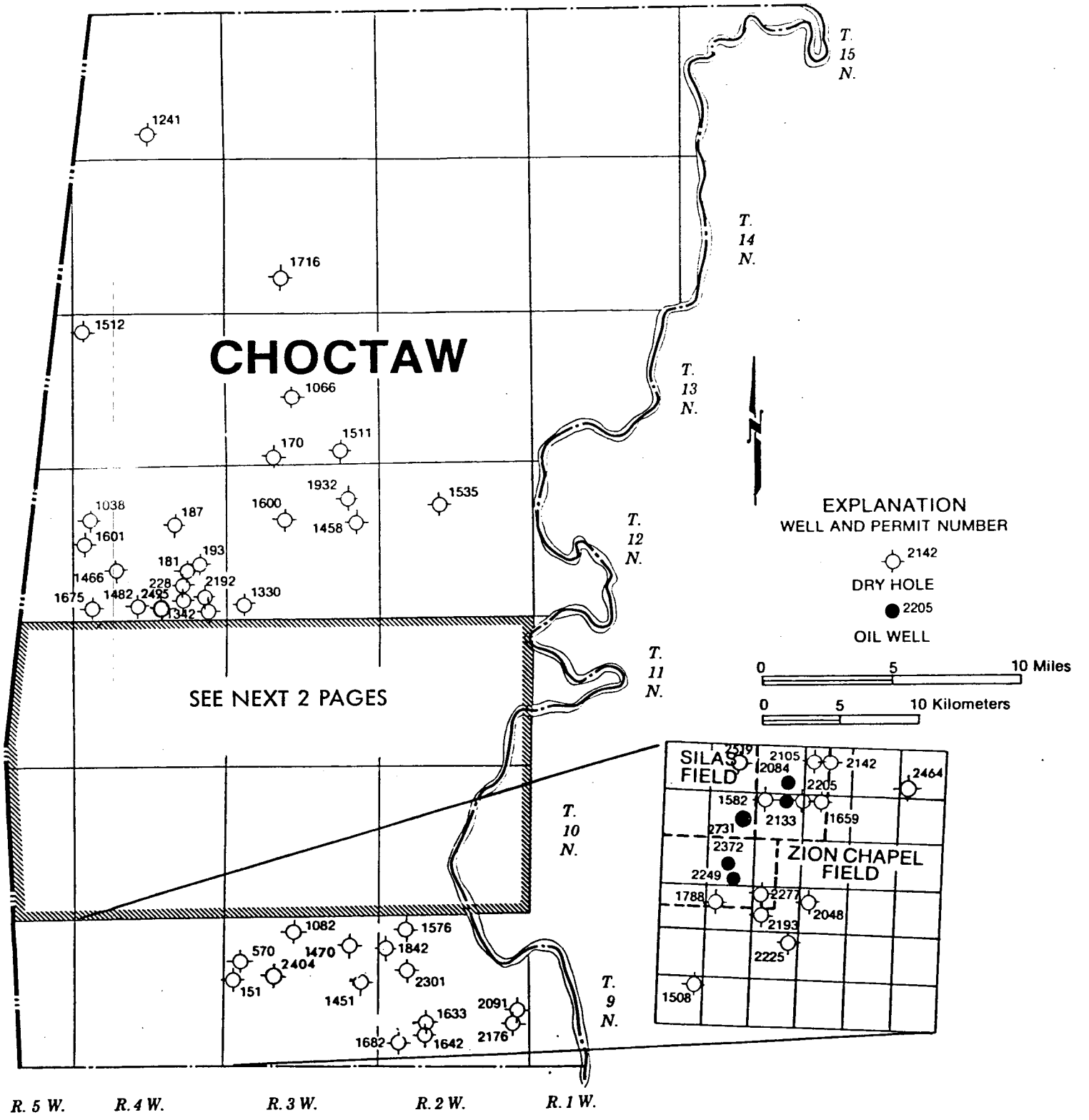
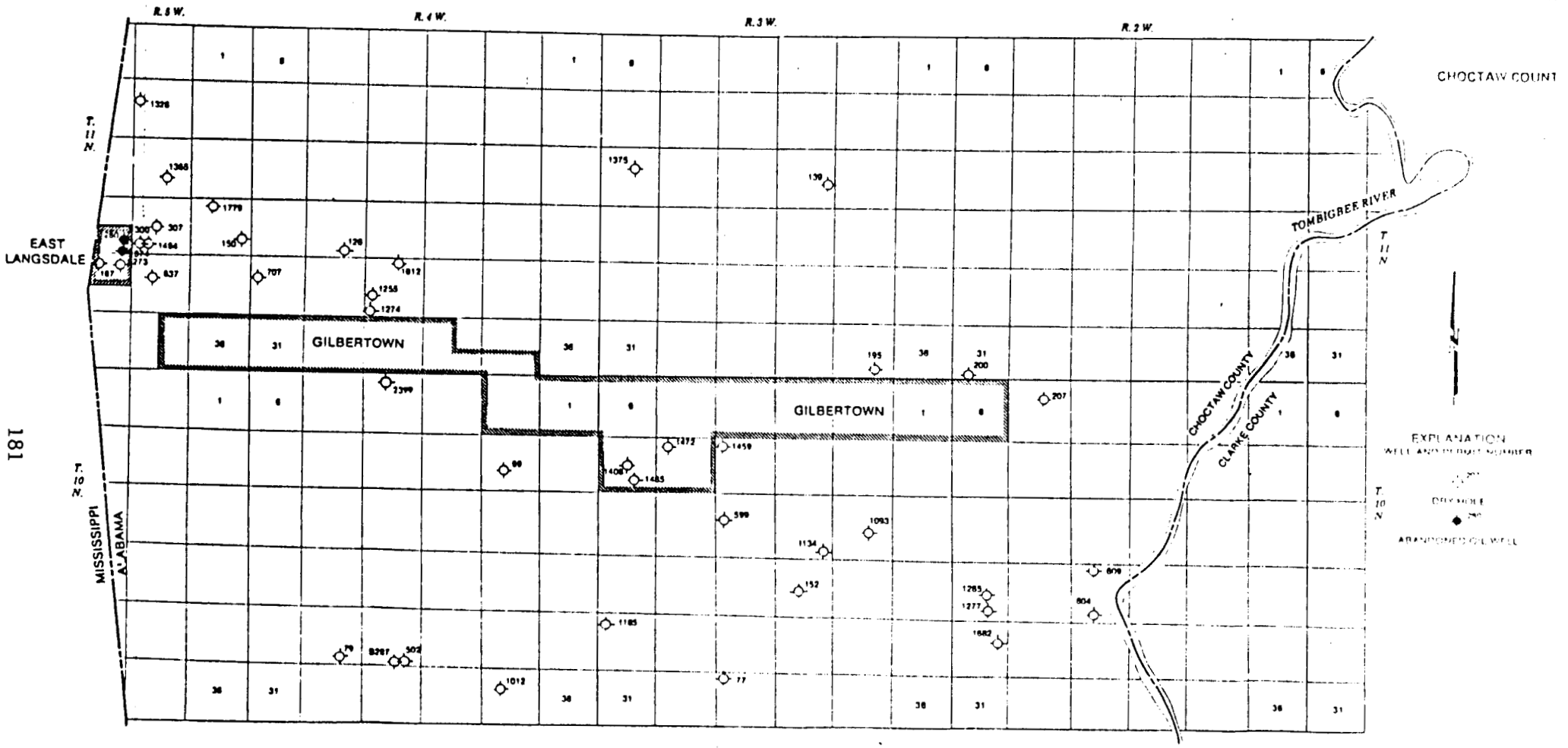


FIGURE 49. Choctaw County map showing locations of wells for which geothermal data are listed in Appendix B



SELMA GROUP & EUTAW FORMATION (CRETACEOUS) TEST WELLS

FIGURE 50. Area within Choctaw County showing locations of wells included in Appendix B that bottom in Cretaceous age rocks

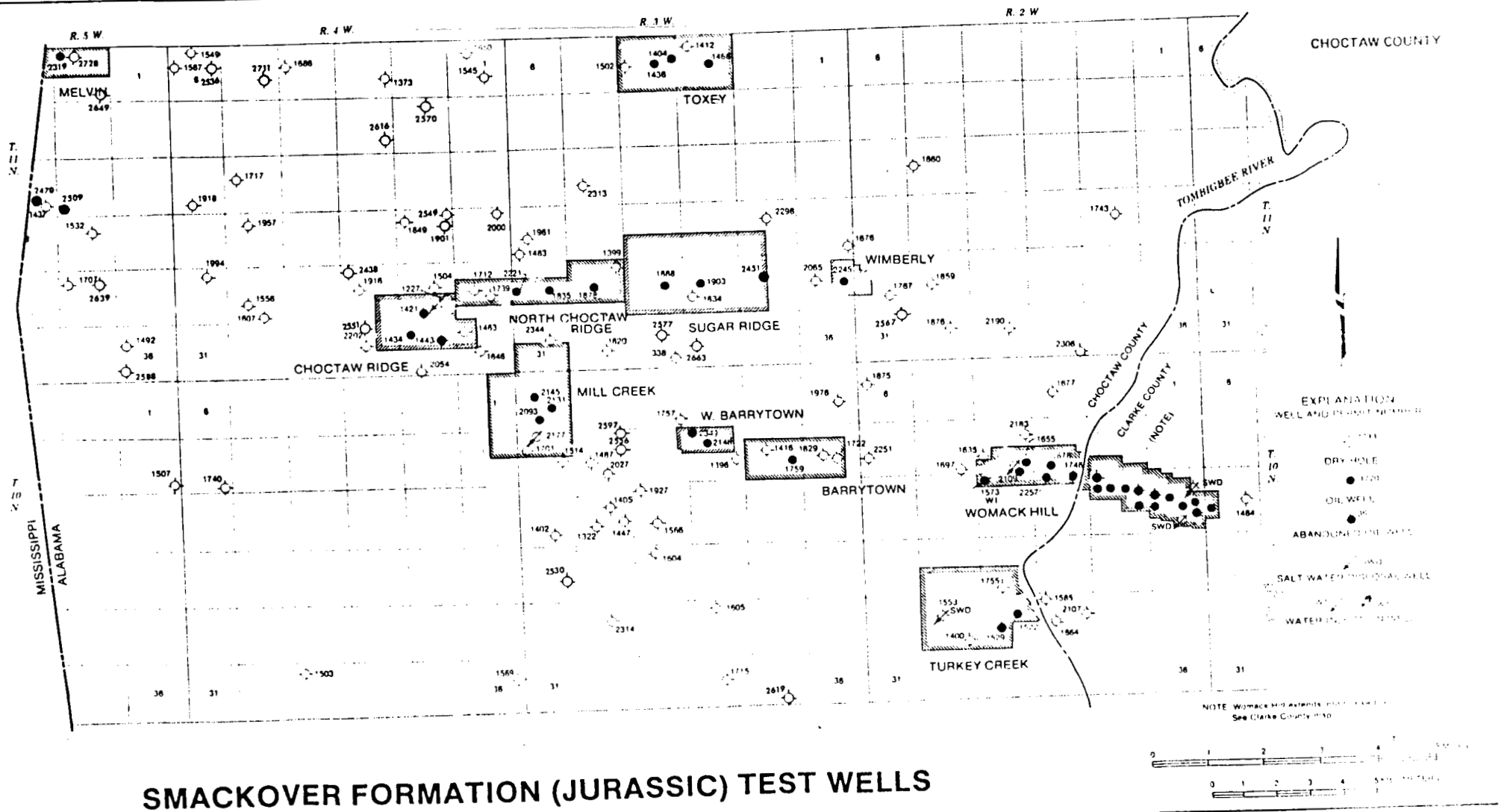


FIGURE 51. Area within Choctaw County showing locations of wells included in Appendix B that bottom in Jurassic age rocks

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
39 3-8-44	Hunt Oil Co. A.R. Jackson no. 2	SE/NE	2	10N	4W	133	3,522	?	9.6	Eutaw	1.90	
41 4-9-44	H.L. Hunt J.T. Doggett no. 2	SE/NW	2	10N	4W	133	3,696	?	9.7	Eutaw	1.81	
47 5-8-44	Choctaw Holdings, Inc. W.J. Trice	SW/SW	35	11N	4W	132	3,403	?	9.5	Eutaw	1.94	
54 7-15-44	Placid Oil Co. W.J. Trice no. 4	SE/SW	35	11N	4W	145	3,933	?	9.8	Eutaw	2.01	
69 11-25-44	Hunt Oil Co. M.W. Smith Lumber Co.	NE/SW	11	10N	4W	140	5,183	?	10.2	(Lower) Tuscaloosa	1.43	
77 12-22-44	Hunt Oil Co. J.C. Bolinger	NW/NW	33	10N	3W	162	4,900	?	10.0	(Lower) Tuscaloosa	1.96	
79 2-19-45	John Green, Jr. Lucile C. Dawsey	SW/SE	29	10N	4W	102 116	3,092 3,927	? ?	9.5 9.6	Selma (Upper) Tuscaloosa	1.16 1.27	 1.67
81 6-17-45	Belden & Blake Corp. Maggie Utsey no. 3	SE/NW	33	11N	4W	120	3,379	?	9.6	Eutaw	1.60	
82 3-17-45	Choctaw Holdings, Inc. H.G. Smith	SW/SE	34	11N	4W	108	2,626	?	9.2	Selma	1.77	
96 8-9-45	Marshall Oglesby Sam Alman	NE/SW	5	10N	3W	126	3,281	?	?	Eutaw	1.83	
109 10-9-45	Carter Oil Co. Alman	SE/NE	5	10N	3W	123	3,241	?	10.2	Eutaw	1.76	
113 12-5-45	Belden & Blake Corp. Johnson	SE/NW	4	10N	3W	132	3,250	?	9.7	Eutaw	2.03	
121 7-23-46	Carter Oil Co. E.A. Rentz	NW/NE	4	10N	3W	115 136	1,484 4,913	? ?	10.2 10.0	Tertiary Early Cretaceous	3.30 1.42	 0.61
126 10-27-46	H.L. Hunt Emma Jones et al	SW/SE	20	11N	4W	130	4,103	?	9.8	Eutaw	1.56	
127 11-17-46	Choctaw Holdings, Inc. Rex Alman no. 2	NE/NE	4	10N	3W	110	3,233	?	10.2	(Upper) Tuscaloosa	1.36	
131 3-5-47	Belden & Blake Corp. E.A. Rentz no. 2	NW/NE	4	10N	3W	125	3,140	?	9.8	Eutaw	1.88	
133 6-9-47	Belden & Blake Corp. Hubert Moseley	SW/NW	3	10N	3W	125	3,221	?	10.4	Eutaw	1.83	
136 9-6-47	Belden & Blake Corp. F.M. Johnson no. 2	SW/NE	4	10N	3W	142	4,137	?	10.2	(Upper) Tuscaloosa	1.84	
139 7-2-47	Daryl Davis S.H. Bolinger	NE/SE	15	11N	3W	118	4,593	?	10.5	(Lower) Tuscaloosa	1.13	
150 10-4-47	H.L. Hunt Robert Land no. 6	NE/SE	24	11N	5W	145	5,405	?	9.9	(Lower) Tuscaloosa	1.46	
151 11-4-47	Hunt Oil Co. M. DuBose	NE/SW	18	9N	3W	142	4,931	?	10.0	(Lower) Tuscaloosa	1.54	
152 10-21-47	Hunt Oil Co. Robert Barnette	NE/SW	22	10N	3W	145	4,898	?	10.0	(Lower) Tuscaloosa	1.61	
167 8-26-48	Russell Maguire L. Pippen	NW/NW	27	11N	5W	112	3,672	1½	9.5	Eutaw	1.25	
178 7-25-49	Belden & Blake Corp. W.C. Abston	SW/NW	3	10N	3W	112	3,215	1½	9.9	Eutaw	1.43	
190 9-21-49	Belden & Blake Corp. A.M. Moseley	SE/NE	3	10N	3W	105	3,216	2	9.9	Eutaw	1.21	

STATE PERMIT Completion	OPERATOR LEASE	LOCATION Sec	T	R	GEOTHERMAL/GEOPRESSURE DATA Maximum Temperature (°F)	Depth Tubing (ft)	Time after Circulation (hrs)	Mud Density (lbs/gal)	Formation or Age	Calculated Gradients (psi/100 ft)	
192 5-15-55	R.G. Houser C.E. Morgan	NE/NW 2	10N	3W	108	3,232	1½	9.3	Eutaw	1.30	
193 10-13-49	A.M. Keisker Rosenbaum-Dee	SE/SE 23	12N	4W	132	3,653	2	9.8	(Upper) Tuscaloosa	1.81	
194 11-14-49	Belden & Blake Corp. Frank Stewart	SW/NW 2	10N	3W	120	3,216	1½	10.0	Eutaw	1.68	
195 12-20-49	R.G. Houser J.M. Boney Estate	SW/SE 35	11N	3W	107	3,546	2	11.0	Selma	1.16	
200 1-28-50	J.B. Evans, Jr. J.W. Rudder et al	SE/SW 31	11N	2W	124	3,935	?	9.9	Eutaw	1.47	
205 4-11-50	Belden & Blake Corp. Edward Robinson	NE/NW 4	10N	3W	112	3,216	4	10.0	Eutaw	1.43	
206 5-1-50	Belden & Blake Corp. Chestnut-Rudder	NW/NE 2	10N	3W	114	3,251	1½	9.8	Eutaw	1.48	
207 4-20-50	H.C. Sloan R.L. Thornton, Sr.	SW/NE 5	10N	2W	144	3,316	2	10.2	Selma	2.35	
212 7-16-50	Choctaw Holdings, Inc. A.M. Moseley no. 2	NE/NE 3	10N	3W	120	3,276	2	10.1	Eutaw	1.65	
213 7-10-50	Belden & Blake Corp. Eula Abston	SE/NW 2	10N	3W	120	3,289	2	10.2	Eutaw	1.64	
214 5-30-50	Carter Oil Co. Mattie Clarke	SW/NE 1	10N	3W	102	3,318	3	10.0	Eutaw	1.08	
215 6-9-50	Robert Locke Ambrose Moseley	NW/NE 3	10N	3W	124	3,218	1½	10.0	Eutaw	1.80	
216 7-8-50	Choctaw Holdings, Inc. Chestnut-Rudder no. 2	NE/NE 2	10N	3W	104	3,256	1½	9.8	Eutaw	1.17	
218 6-17-50	Fortenberry Drlg. Co. R.A. Adams	SE/NE 6	10N	3W	110	3,236	1½	9.3	Eutaw	1.36	
226 8-16-50	R.G. Houser G.O. Swann	SE/NE 1	10N	4W	106	2,655	1	10.0	Selma	1.51	
228 12-29-50	M.P. Bouslog C.J. Manley	NE/SW 26	12N	4W	117	3,606	1½	10.0	(Upper) Tuscaloosa	1.41	
229 8-17-50	Hawkins & Henke Mattie Clarke	NW/NE 1	10N	3W	132	4,441	1½	11.0	Eutaw	1.49	
232 12-9-50	R.G. Houser Albert Long	NE/SE 1	10N	4W	114 121	2,646 3,299	1 1	9.9 10.0	Selma Eutaw	1.81 1.67	1.07
233 10-1-50	Belden & Blake Corp. A.P. Chestnut	SW/NE 2	10N	3W	112	3,266	1½	9.9	Eutaw	1.41	
236 10-5-50	Choctaw Holdings, Inc. Sam Alman no. 2	NW/SE 5	10N	3W	127	3,283	2	10.0	Eutaw	1.86	
239 10-24-50	Hunt Oil Co. Norden-Swann	SW/NE 1	10N	4W	129	3,297	1½	9.5	Eutaw	1.91	
246 12-21-50	Carter Oil Co. Frank Stewart no. 3	NW/SE 3	10N	3W	102	3,267	2	10.0	Eutaw	1.10	
253 1-4-51	Belden & Blake Corp. A.P. Chestnut no. 2	SE/NE 2	10N	3W	116	3,261	2	9.9	Eutaw	1.53	
254 1-21-51	H.L. Hunt Robert Land no. 7	SE/NW 36	11N	5	126	3,506	2	11.0	Selma	1.71	
255 1-4-51	Dan L. Reynolds W.S. Scruggs	NW/NW 6	10N	3W	113	2,905	2	9.0	Selma	1.62	
256 1-13-51	Redstock and Reeves M.P. Bonner	NW/NW 35	11N	5W	120	3,719	2	9.9	Eutaw	1.45	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
267 4-6-51	W.H. Blasingame W.M. Adams	NW/NW	4	10N	3W	110	3,519	1½	10.1	Eutaw	1.25	
271 5-10-51	Belden & Blake Corp. F.A. Adams et al	NW/SE	6	10N	3W	124	3,308	1	10.2	Eutaw	1.75	
273 4-17-51	J.F. Crow Well Serv. A.L. Pippin	NE/NE	27	11	5W	120	3,722	2	9.7	Eutaw	1.45	
277 4-24-51	J.B. Evans, Jr. F.E. Gibson	SE/NW	11	10N	3W	128	3,772	2	9.8	Eutaw	1.64	
280 5-28-51	Arden A. Anderson A.L. Pippin no. 2	SE/SE	22	11N	5W	108	3,657	1½	9.8	Eutaw	1.15	
295 8-13-51	Carter Oil Co. F.M. Johnson no. 3	NE/SW	4	10N	3W	108	3,253	2	9.6	Eutaw	1.29	
300 2-18-52	J.D. Reese et al A.L. Pippen	SW/SW	23	11N	5W	110	3,725	2	10.2	Eutaw	1.18	
307 10-12-51	Lionel Petroleum Corp. A.G. Harrell	SE/NW	23	11N	5W	126	3,764	3	10.0	Eutaw	1.59	
316 12-17-51	Justiss-Mears Oil Co. Mattie Clark no. 2	NW/NE	1	10N	3W	120	3,428	2	10.0	Eutaw	1.58	
338 10-24-52	Carter Oil Co. E. James	SE/SE	33	11N	3W	118	2,660	1	9.8	Selma	1.96	
						160	9,603	3	10.2	Cotton Valley	0.98	0.61
						170	10,934	2	10.0	Cotton Valley	0.95	0.75
						171	11,750	1½	10.0	Haynesville	0.89	0.12
						210	13,203	5	10.3	Louann	1.09	2.68
374 10-22-52	Hunt Oil Co. A.L. Pippin no. 3	SE/SE	22	11N	5W	115	3,597	2	9.9	Eutaw	1.36	
415 2-21-53	Carter Oil Co. A.L. Alman no. 3	NW/NE	5	10N	3W	150	3,691	2	9.6	Eutaw	2.28	
423 4-10-53	Marshall Oglesby Jackson-Doggett	SE/NW	1	10N	4W	125	2,582	1½	9.3	Selma	2.29	
430 4-30-53	S.J. Hollock E.E. Cunningham	NW/NW	2	10N	4W	112	3,381	1½	9.5	Eutaw	1.36	
446A 7-23-53	Choctaw Holdings, Inc. A.L. Jackson	SW/NW	1	10N	4W	130	3,314	2½	9.5	Selma	1.93	
471 8-21-53	Marshall Oglesby Robert Land	SW/NW	36	11N	5W	146	3,538	2	9.5	Eutaw	2.26	
481 10-24-53	Commonwealth Oil Co. P.H. Evans	SW/NE	35	11N	5W	113	3,603	2	9.6	Eutaw	1.30	
498 11-11-53	Commonwealth Oil Co. J.M. Boney	NW/NE	33	11N	4W	115	3,508	2	9.7	Eutaw	1.40	
502 1-7-54	R.C. Pugh J.C. Bolinger	SW/SE	28	10N	4W	130	3,760	1	10.1	Eutaw	1.70	
503 11-23-53	Florida Oil & Gas Robert Land	SE/NE	36	11N	5W	109	3,511	1½	9.6	Eutaw	1.22	
505 12-20-53	Jeffreys & Sunnyland Steve Scruggs	NW/SE	32	11N	4W	112	3,426	1	9.8	Eutaw	1.34	
509 12-17-53	Florida Oil & Gas Co. Maggie Utsey	NW/NW	33	11N	4W	118	3,363	2	9.7	Eutaw	1.55	
515 1-1-54	Jeffreys & Sunnyland Steve Scruggs no. 2	NE/SE	32	11N	4W	110	3,430	2	9.6	Eutaw	1.28	
570 11-4-54	Gulf Ref. Co. et al Mahoney Dubose et al	SW/SE	7	9N	3W	136	5,438	2½	9.9	Early Cretaceous	1.29	
574 11-4-54	Carter Oil Co. C.F. Stewart	SE/NW	6	10N	2W	120	3,750	1	9.5	Eutaw	1.44	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T	R	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs/gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
599 4-20-55	Houston Oil Co.-Texas Hunter-Benn Inv. Co.	SW/NW	16	10N	3W	118	3,879	1½	9.8	(Upper) Tuscaloosa	1.34	
601 2-6-56	F.H. Kelton Estate J. Morgan Heirs no. 4	SW/SE	2	10N	3W	100	3,269	2	10.0	Eutaw	1.04	
603 6-6-55	R. Sigler & W.R. Gunn Marcita Dansby et al	NE/SW	6	10N	2W	112	3,468	1½	9.5	Eutaw	1.33	
604 6-30-55	Magnolia Petroleum Co. S.M. Powe & Alco Land	SE/SW	21	10N	2W	125	3,933	2	10.0	Eutaw	1.50	
609 7-14-55	Magnolia Petroleum Co. Powe & Scruggs	NE/NW	21	10N	2W	125	4,496	1½	9.6	Eutaw	1.31	
626 12-28-55	Carter Oil Co. Davis-Land	SW/NE	34	11N	5W	110	3,702	2	9.8	Eutaw	1.19	
627 12-19-55	Belden & Blake Corp. Rex Alman no. 3	SE/NE	4	10N	3W	100	3,297	1½	9.8	Eutaw	1.03	
637 1-30-56	Dave Gammill Robert Land	SE/NW	26	11N	5W	121	3,745	2½	9.5	Eutaw	1.47	
639 3-5-56	J.E. Brogden, Sr. J. Morgan Heirs no. 5	SE/SE	2	10N	3W	104	3,333	2	10.0	Eutaw	1.14	
705 9-21-56	Humble Oil & Ref. Co. Eula Abston Jones	NE/SW	2	10N	3W	102	3,257	1½	9.8	Eutaw	1.11	
707 9-5-56	Armour & Martin Robert Land	SW/NW	30	11N	4W	118	4,366	1½	9.6	Eutaw	1.19	
830 1-20-58	Petroleum Serv. Con. M.P. Bonner	NE/NE	34	11N	5W	120	3,737	1½	9.9	Eutaw	1.45	
996 12-31-59	R.G. Houser C.B. Morgan no. 2	NE/NW	2	10N	3W	100	3,293	1	9.8	Eutaw	1.03	
1007 1-26-60	Belden & Blake Corp. J.S. Morgan, Jr.	NE/SE	2	10N	3W	110	3,282	2	9.5	Eutaw	1.34	
1012 12-3-59	Atlantic Refining Co. Choctaw Lumber Co.	SE/NW	35	10N	4W	115	3,756	2	10.1	Eutaw	1.30	
1022 3-13-60	R.G. Houser A.A. Mosley no. 3	NW/NE	3	10N	3W	122	3,325	2	9.8	Selma	1.68	
1038 8-30-60	Placid Oil Co. Land et al	NW/NE	18	12N	4W	188	12,235	3	9.6	Paleozoic (Cambrian ?)	1.00	
1052 12-20-60	Belden & Blake Corp. Leo Stewart	NW/SW	2	10N	3W	120	3,351	1	9.1	Eutaw	1.61	
1066 12-21-60	Southern Television H. Ruffin & V. Ruffin	SW/NE	21	13N	3W	118	4,290	1½	9.2	(Lower) Tuscaloosa	1.21	
1082 4-6-61	Martin Reagan Scott Paper Co.	NE/SE	4	9N	3W	130	5,036	1½	9.9	(Lower) Tuscaloosa	1.27	
1093 5-18-61	Womack and Wilson Albert Hamrick Estate	NW/SE	14	10N	3W	128	3,971	2	9.8	Eutaw	1.56	
1102 12-12-61	Belden & Blake Corp. C.B. Morgan	SW/SW	1	10N	3W	112	3,337	1½	9.6	Eutaw	1.38	
1134 2-3-62	Viking Oil & Sou. States John Hambrick	SE/SE	15	10N	3W	110	3,934	1½	10.2	Eutaw	1.12	
1183 7-8-62	Marshall Oglesby Hulett et al	NE/NE	32	11N	4W	115	3,707	2	9.7	Eutaw	1.32	
1185 7-30-62	Brooks & Kirby Hunter-Benn	NW/NW	30	10N	3W	111	3,619	2	9.7	Eutaw	1.24	

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1227 7-3-63	Continental Oil Co. Trice	NE/SE	26	11N	4W	110	2,642	1	9.8	Selma	1.67	
						150	7,115	3	9.6	Early Cretaceous	1.18	0.89
						196	12,238	6	9.8	Norphlet	1.06	0.90
1236 12-1-63	Gillmore & Anderson C.B. Morgan	NE/NW	2	10N	3W	112	3,254	2	9.9	Eutaw	1.41	
1241 6-6-63	Rush Oil Co., Inc. J.B. Phillips, Jr.	SE/SE	28	15N	4W	140	5,734	4	9.5	Early Cretaceous	1.29	
1255 8-9-63	Placid Oil Co. J.M. Boney no. 5	NW/SW	28	11N	4W	125	4,185	3½	9.9	Eutaw	1.41	
1258 9-22-63	Belden & Blake Corp. W.S. Scruggs	SE/NE	32	11N	4W	100	3,700	4	9.2	Eutaw	0.92	
1274 10-1-63	M. Oglesby & G.H. Jett Sely Boney	SW/SW	28	11N	4W	121	3,907	3½	9.4	Eutaw	1.41	
1276 10-21-63	Marshall Oglesby W.T. Trice Heirs	NW/SE	35	11N	4W	120	3,865	3	9.1	Eutaw	1.40	
1277 11-9-63	Citmoco Services, Inc. Dora C. Powe et al	SW/SE	19	10N	2W	140	5,878	3	10.0	Early Cretaceous	1.26	
1279 11-1-63	Belden & Blake Corp. W.J. Trice no. 6	NE/SW	34	11N	4W	118	3,492	4	9.1	Eutaw	1.49	
1280 11-7-64	Arden A. Anderson Mattie E. Clarke	NW/SE	1	10N	3W	120	3,318	3	9.3	Eutaw	1.63	
1285 12-3-63	Citmoco Services, Inc. Dora C. Powe et al no. 2	NW/SE	19	10N	2W	142	5,439	7	9.7	Early Cretaceous	1.40	
1287 12-30-63	Belden & Blake Corp Clara Dabbs	SW/NE	33	11N	4W	103	3,624	4	9.8	Eutaw	1.02	
1288 5-22-64	Frank H. Kelton Estate Eula Jones	NE/SW	2	10N	3W	130	3,236	4½	8.2	Eutaw	1.98	
1289 8-31-64	Marshall Oglesby W.J. Trice no. 8	SE/NW	34	11N	4W	112	3,610	5	9.0	Eutaw	1.27	
1290 5-12-65	Choctaw Holdings, Inc. Maggie Utsey no. 4	SW/NW	33	11N	4W	120	3,593	3	9.7	Eutaw	1.50	
1291 4-2-64	Marshall Oglesby W.J. Trice no. 7	SE/SE	35	11N	4W	112	3,650	6	9.4	Eutaw	1.26	
1293 2-27-64	Arden A. Anderson C.F. Stewart	NE/SW	1	10N	3W	114	3,296	4	9.6	Eutaw	1.46	
1298 7-27-64	Arden A. Anderson C.F. Stewart no. 2	SW/SE	1	10N	3W	118	3,294	3	9.4	Eutaw	1.58	
1315 7-27-64	Arden A. Anderson Mattie E. Clarke no. 2	SE/SE	1	10N	3W	118	3,286	3	9.3	Eutaw	1.58	
1317 10-8-65	Newkirk-Anderson A.M. Mosley	NE/SW	3	10N	3W	105	3,264	5	9.4	Eutaw	1.19	
1322 10-14-64	Pan American Petro. Hunter-Benn et al	NE/SW	17	10N	3W	200	12,698	4	9.5	Norphlet	1.06	
1328 10-16-64	Placid Oil Co. Land	SW/NW	11	11N	5W	115	3,874	4½	9.2	Eutaw	1.26	
1330 12-6-64	Placid Oil Co. Jackson	NW/SE	31	12N	3W	180	11,010	3½	10.0	Paleozoic (Metamorphics)	1.04	
1339 3-9-65	Belden & Blake Corp. Unit 2-2	NW/NE	2	10N	3W	116	3,273	4	9.2	Eutaw	1.53	
1342 3-22-65	Placid Oil Co. Bolinger	NW/SE	36	12N	4W	178	10,338	3	9.6	Paleozoic (Metamorphics)	1.08	

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1349 7-27-65	Johnson & Williams Marvin L. Utsey et al	NW/NW	33	11N	4W	100	3,430	2	9.2	Eutaw	0.99	
1354 6-19-65	Anderson Oil Explo. Co. Unit 2-1	NE/NE	2	10N	3W	116	3,239	4	?	Eutaw	1.54	
1355 7-25-65	Anderson Oil Explo. Co. Unit 1-15	SW/SE	1	10N	3W	112	3,308	3	9.4	Eutaw	1.39	
1358 11-29-65	Choctaw Holdings Inc. John Green	SE/NW	31	11N	4W	105	3,504	3	9.7	Eutaw	1.11	
1360 8-14-65	Marshall Oglesby Boney-Scruggs	SW/NE	32	11N	4W	120	3,652	3	9.5	Eutaw	1.48	
1361 2-16-66	Marshall Oglesby Land Brothers	SW/NW	36	11N	5W	115	3,601	5	9.4	Eutaw	1.36	
1365 3-30-65	James W. Proctor Land-Johnson	NW/SE	14	11N	5W	110	3,228	5	9.4	Selma	1.36	
1367 3-20-65	Belden & Blake Corp. Rex Alman	NE/NE	4	10N	3W	113	3,826	3	9.4	(Upper) Tuscaloosa	1.23	
1369 10-11-67	Arden A. Anderson Mattie E. Clarke no. 4	NW/NW	6	10N	2W	110	3,316	3	9.6	Eutaw	1.33	
1373 3-23-66	Placid Oil Co. Land 3-9	NE/SE	3	11N	4W	200	11,347	5½	10.0	Norphlet	1.18	
1374 6-18-66	Belden & Blake Corp. W.S. Scruggs	NE/SW	33	11N	4W	127	3,741	3	9.6	Eutaw	1.63	
1375 6-8-66	Marshall Oglesby Rudder-Land	SW/NE	18	11N	3W	120	3,356	2½	9.5	Eutaw	1.61	
1384 8-11-66	Otis Ainsworth J.P. Utsey et al 33-10	NW/SE	33	11N	4W	118	3,413	3	9.5	Eutaw	1.52	
1386 8-30-66	Woods Petro. Corp. Trice	SW/NW	35	11N	4W	174	12,416	4	9.6	Norphlet	0.87	
1396 1-6-67	Larco Drlg. & Smith Cooper-Gibson	NE/SE	10	10N	3W	205	12,647	4	9.7	Norphlet	1.10	
1399 12-15-66	Guardian Oil & Oglesby C.J. Oates	NE/NE	29	11N	3W	116	3,420	3	9.6	Eutaw	1.46	
1400 2-13-67	Chesley Pruet Drlg. Pruet-Alco Ld. & Tmb.	SE/SE	29	10N	2W	210	12,689	5	10.0	Smackover	1.13	
1402 2-14-67	Larco Drlg. & Smith Hunter-Benn	SW/SE	18	10N	3W	200	12,590	4	9.7	Smackover	1.06	
1404 5-11-67	E.L. Erickson Scott Paper-Bolinger	SE/NE	4	11N	3W	188	10,773	4	9.7	Norphlet	1.13	
1405 3-28-67	Larco Drlg. & Smith Hunter-Benn no. 2	SW/NE	17	10N	3W	196	12,509	4	9.8	Smackover	1.04	
1408 4-17-67	Southwest Gas Prod. Scruggs-Hutchinson	SE/NW	7	10N	3W	136	6,216	4	9.6	Early Cretaceous	1.13	
1412 5-10-67	Placid Oil Co. Bolinger 3-4	NW/NW	3	11N	3W	175	10,602	?	9.9	Smackover	1.03	
1421 7-9-76	Pruet & Hughes Co. Trice no. 2	SE/SW	26	11N	4W	188	11,963	6	9.4	Smackover	1.02	
1431 11-17-67	Marshall Oglesby J.W. Hutchinson, Jr.	NW/NE	7	10N	3W	112	3,552	4	9.8	Eutaw	1.29	
1434 12-23-67	Pruet & Hughes Trice Unit 35-4	NW/NW	35	11N	4W	194	12,287	5	9.5	Norphlet	1.04	
1436 2-12-68	E.L. Erickson J. Jimmerson 4-7	SW/NE	4	11N	3W	188	10,760	4½	9.5	Norphlet	1.13	

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1437 1-17-68	Chesley Pruet et al Harrell Unit	SE/SE	15	11N	5W	192	11,949	12	9.3	Smackover	1.05	
1439 1-7-68	Marshall Oglesby Velma Coody et al	NE/NW	7	10N	3W	120	3,538	4	9.8	Eutaw	1.53	
1441 3-8-68	Belden & Blake Corp. U.M. Adams	SE/NE	5	10N	3W	125	3,296	?	?	Eutaw	1.79	
1443 2-15-68	Pruet & Hughes Co. Trice Unit 35-7	SW/NE	35	11N	4W	188	11,917	4	9.4	Smackover	1.02	
1445 3-1-68	Marshall Oglesby J.W. Hutchinson, Jr.	NE/NE	7	10N	3W	115	3,441	4	9.5	Eutaw	1.42	
1447 4-12-68	Larco Drlg. & Smith Hunter-Benn no. 3	NE/SE	17	10N	3W	206	12,515	6	9.6	Smackover	1.12	
1451 6-4-68	G.E. Kadane & Sons Choctaw Lumber Co.	SE/SW	13	9N	3W	220	13,410	5	9.6	Norhplet	1.15	
1458 7-4-68	Placid Oil Co. Bolinger 13-3	NE/NW	13	12N	3W	190	10,821	5	10.1	Paleozoic (Metamorphics)	1.15	
1459 5-15-68	Pan American Petro. Abston	NW/NW	9	10N	3W	118	3,619	3	9.7	Eutaw	1.44	
1463 6-28-68	Chesley Pruet Rentz Unit 36-4	SW/NW	36	11N	4W	190	11,957	4	9.5	Smackover	1.04	
1466 9-21-68	Placid Oil Co. Land 29-1	NE/NE	29	12N	4W	178	10,904	6	9.6	Paleozoic (Metamorphics)	1.03	
146[illegible] 12-[illegible]-68	E.L. Erickson L.C. Boney, Sr. et al	SW/NE	3	11N	3W	170	10,413	6	9.7	Smackover	1.00	
1470 2-18-69	Dee Jay Co. et al Choctaw Lumber Co.	SW/NW	12	9N	3W	205	13,387	4	9.4	Norphlet	1.04	
1472 4-30-71	Solatex Petro. Co. Clarke	NW/NW	8	10N	3W	114	3,403	6	9.0	Eutaw	1.41	
1482 2-2-69	Phillips Petro. Co. Jackson-Harrell	SE/SW	33	12N	4W	215	11,042	6	9.4	Paleozoic (Metamorphics)	1.35	
1483 1-30-69	F.H. Kelton, Sr. Skinner 19-13	SW/SW	19	11N	3W	189	12,554	4	9.5	Smackover	0.98	
1485 1-14-69	Marshall Oglesby et al Mrs. V.C. McPhail et al	SW/SE	7	10N	3W	108	3,614	3	9.9	Eutaw	1.16	
1487 3-21-69	Southwest Gas Prod. Hunter-Benn et al 8-11	NE/SW	8	10N	3W	214	13,013	4	9.7	Louann	1.14	
1492 4-30-69	Marshall Oglesby Land 36-5	SW/NW	36	11N	5W	194	13,255	7	9.7	Norphlet	0.97	
1494 3-21-69	Womack, Jr. & Oglesby A.L. Pippen Estate	SE/SW	23	11N	5W	120	3,841	5	9.4	Eutaw	1.41	
1502 8-4-69	E.L. Erickson Scott-Bolinger 4-5	SW/NW	4	11N	3W	180	10,757	5	9.3	Norphlet	1.06	
1503 6-16-69	Placid Oil Co. Long-Bell Petro.	NW/NW	33	10N	4W	230	13,913	6	9.6	Norphlet	1.18	
1504 7-3-69	Chesley Pruet Drlg. Trice-Bonner 26-7	SW/NE	26	11N	4W	195	11,953	9	9.3	Smackover	1.08	
1507 8-6-69	Louisiana Land & Expl. John Green Estate	SE/SE	12	10N	5W	200	13,557	8	9.4	Louann	0.99	
1508 8-11-69	Chesley Pruet Drlg. Barber 31-1	NE/NE	31	9N	4W	230	14,952	8	9.4	Norphlet	1.10	

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1511 8-7-69	Sohio et al J.H. Chapman	SE/SE	35	13N	3W	158	9,547	3	9.0	Paleozoic (Metamorphics)	0.96	
1512 7-30-69	Central Oil Co. Charles M. Land et al	SE/SW	6	13N	4W	155	8,650	6	9.4	Paleozoic (Metamorphics)	1.03	
1514 9-23-69	Southwest Gas Prod. Co. V.C. McPhail 7-10	NW/SE	7	10N	3W	215	12,976	12	9.7	Norphlet	1.15	
1522 11-6-69	Pruet & Hughes et al Powe Unit 28-7	SW/NE	28	10N	2W	200	12,747	7	9.7	Norphlet	1.05	
1529 12-15-69	Pruet & Hughes et al Powe Unit 28-11	NE/SW	28	10N	2W	208	12,757	3½	9.6	Norphlet	1.11	
1532 12-21-69	Larco Drlg. & Expl. C. M. Land et al	SW/NE	23	11N	5W	191	12,286	7	9.4	Smackover	1.02	
1535 12-20-69	Placid Oil Co. Tyson 9-14	SE/SW	9	12N	2W	181	9,710	6	9.2	Paleozoic (Metamorphics)	1.18	
1545 3-3-70	Louisiana Land & Expl. E.E. Jackson Lumber	NW/SE	1	11N	4W	182	11,513	5	9.5	Norphlet	1.01	
1549 4-18-70	Justiss-Mears Oil Co. Land Brothers 6-3	NE/NW	6	11N	4W	177	10,914	6	9.2	Paleozoic (Metamorphics)	1.02	
1553 5-31-70	Pruet & Hughes Turkey Creek Fld. SWD	SE/NW	29	10N	2W	198	12,894	5	9.5	Norphlet	1.02	
1556 8-15-70	Justiss-Mears Oil et al Boney 29-11	NE/SW	29	11N	4W	196	12,871	6	9.6	Norphlet	1.01	
1566 8-31-70	Pruet & Hughes Co. Hunter Benn 16-11	NE/SW	16	10N	3W	196	12,781	6	9.3	Norphlet	1.02	
1567 9-11-70	Justiss Mears et al Land Brothers 6-5	SW/NW	6	11N	4W	175	10,911	6	9.4	Paleozoic (Metamorhpics)	1.00	
1569 10-11-70	Pruet & Hughes-Pelto J.D. Norton 36-8	SE/NE	36	10N	4W	206	13,400	4	9.3	Norphlet	1.05	
1573 12-1-70	Placid Oil Co. WHFU, Carlisle 16-4	NW/NW	16	10N	2W	190	11,809	3	9.4	Norphlet	1.05	
1576 12-17-70	California Time Petro. Altmayer	SW/NW	5	9N	2W	205	13,285	6	9.5	Norphlet	1.05	
1582 2-19-71	Exchange Oil & Gas Long Bell Petro. Co.	NW/NW	9	9N	4W	212	14,119	6½	11.9	Norphlet	1.03	
1600 4-2-71	Justiss-Mears Oil Co. C.G. Bryan 16-4	NW/NW	16	12N	3W	160	8,571	5	9.2	Paleozoic (Metamorphics)	1.10	
1601 5-3-71	Justiss-Mears Oil Co. Land Brothers 18-14	SE/SW	18	12N	4W	160	9,039	6	9.2	Paleozoic (Metamorphics)	1.04	
1604 4-8-71	Pruet & Hughes-Pelto Norton, Taylor et al	NE/NW	21	10N	3W	198	12,903	8	9.4	Norphlet	1.02	
1605 4-17-71	Pruet & Hughes Co. Gibson 27-3	NE/NW	27	10N	3W	212	13,010	15	9.3	Norphlet	1.12	
1607 4-17-71	J. Mears-Pruet & Hughes Boney 29-15	SW/SE	29	11N	4W	188	12,942	4	9.5	Norphlet	0.94	
1633 6-13-71	Occidental Petro. Corp. Willie Holcombe Estate	SE/NE	29	9N	2W	223	13,487	6	9.8	Norphlet	1.16	
1635 6-21-71	Pruet & Hughes-Pelto Martin et al	NW/SW	9	10N	2W	198	11,863	5	9.4	Norphlet	1.11	

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1642 7-30-71	Occidental Petro. Corp. J.M. Pelham, Jr., et al	SE/SE	29	9N	2W	120	2,924	2	9.1	Eutaw	1.85	
1646 11-1-71	V. Monta Currie, Jr. Doggett Estate	NE/SW	36	11N	4W	244	12,023	5	9.4	Smackover	1.48	
1650 9-27-71	E.L. Cox et al Land et al	NE/NW	1	11N	4W	189	11,084	10	9.5	Paleozoic (Metamorphics)	1.11	
1655 10-19-71	Placid Oil Co. WHFU; Parker Locke 9-16	SE/SE	9	10N	2W	197	11,676	5	9.4	Norphlet	1.11	
1659 11-19-71	Exchange Oil & Gas-Marr White Smith Land Co.	NE/NW	10	9N	4W	219	14,044	7	9.6	Louann	1.09	
1675 1-31-72	Clement & Stover et al S.H. Bolinger & Co.	SW/SW	31	12N	4W	187	11,109	14	9.2	Smackover	1.09	
1676 2-26-72	Tideway-Patrick Petro. Chappell	SE/SE	24	11N	3W	185	11,878	7	9.3	Norphlet	1.00	
[illegible] [illegible]-72	Pelto Oil Co. Rob LeNoir	NE/SW	3	10N	2W	196	12,415	6	9.3	Norphlet	1.05	
1678 4-1-72	Placid Oil Co. WHFU; Locke 10-14	SE/SW	10	10N	2W	187	11,668	5	9.3	Norphlet	1.04	
1682 1-8-72	Amoco Production Co. Mary Twomey	SE/NE	30	9N	2W	102	2,998	3	9.6	Eutaw	1.20	
1686 9-3-72	Arden A. Anderson Jackson Land 4-5	SW/NW	4	11N	4W	166	8,681	8	9.5	Cotton Valley	1.15	
1697 3-15-72	Pruet & Hughes-Pelto McPhearson 8-15	SW/SE	8	10N	2W	190	11,848	3½	9.3	Norphlet	1.05	
1701 4-3-72	Pruet & Hughes Co. Choctaw Lumber Co. 7-5	SW/NW	7	10N	3W	202	12,690	5½	9.6	Norphlet	1.07	
1707 4-15-72	Lone Star - Central Land Brothers 26-5	NW/NW	26	11N	5W	196	13,010	5½	9.3	Norphlet	1.00	
1712 [illegible]-72	Kelton-Pruet & Hughes Casey Estate 25-6	SE/NW	25	11N	4W	195	12,017	7	9.4	Smackover	1.07	
[illegible] [illegible]-72	Mellon Creek Oper. Co. Choctaw Lumber Co.	SW/NE	34	10N	3W	211	13,123	5½	9.3	Norphlet	1.10	
1716 4-18-72	Freedom Oil Co., Inc. H.H. & J.C. Hutchinson	NW/SW	28	14N	3W	140	7,122	4	9.6	Norphlet	1.04	
1717 6-29-72	Gammill-Tideway-Haynie & Mayer Boney-Banks	SW/NW	17	11N	4W	186	12,164	5	9.3	Norphlet	0.99	
1722 7-1-72	Pruet & Hughes-Pelto Chestnut 12-10	NW/SW	12	10N	3W	206	12,225	10	9.1	Norphlet	1.15	
1739 8-23-72	Pruet & Hughes Co. Doggett Unit 25-10	NW/SE	25	11N	4W	190	11,971	6	9.6	Smackover	1.04	
1740 [illegible]-12-72	Walter, Williams, Harrell & Mortimer John Green, Jr.	SE/SE	7	10N	4W	205	13,471	7	9.4	Louann	1.03	
43 [illegible]-72	Pelto Oil Co. William Dansby	SW/NE	23	11N	2W	181	11,006	4	9.2	Norphlet	1.05	
1755 10-13-72	Universal Resources Hilton Powe et al	SE/SW	21	10N	2W	226	12,772	12	9.4	Norphlet	1.25	
1757 10-5-72	Pruet & Hughes-Pelto Lewis 4-16	SE/SE	4	10N	3W	198	12,546	7	9.4	Norphlet	1.05	
1759 11-21-72	Pruet & Hughes Co. S.H. Bolinger 30-15	SW/SE	30	11N	2W	191	11,762	5	9.4	Norphlet	1.06	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION	Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA: Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
1767 10-19-72	Pruet & Hughes Co. S.H. Bolinger Co. 30-15	SW/SE	30	11N	2W	191	11,762	5	9.4	Norphlet	1.06	
1779 2-16-73	Placid Oil Co. Land 24-3	NE/NW	24	11N	5W	153	7,686	6	9.2	Early Cretaceous	1.13	
1788 12-29-72	Inexco Oil Co. Toomey 20-5	SW/NW	20	9N	4W	164 234	9,331 14,686	4½ 6½	9.3 10.5	Early Cretaceous Norphlet	1.05 1.14	1.31
1812 2-27-73	Placid Oil Co. Boney 28-2	NW/NE	28	11N	4W	155	7,824	4½	9.1	Early Cretaceous	1.14	
1820 2-6-73	Charles D. Champlin Alman	NW/SE	32	11N	3W	190	12,578	5	9.3	Norphlet	0.99	
1829 4-10-73	Pruet & Hughes-Sun Oil Lewis 12-11	NE/SW	12	10N	3W	203	12,022	5	9.3	Smackover	1.14	
1834 3-16-73	Pruet & Hughes Co. Stewart 27-12	NW/SW	27	11N	3W	210	12,249	8	9.4	Norphlet	1.18	
1835 3-30-73	Pruet & Hughes Oper. Skinner Unit 30-10	NW/SE	30	11N	3W	192	12,123	5	9.1	Norphlet	1.04	
1842 4-21-73	Hunt Industries Watters 7-7	SW/NE	7	9N	2W	212	13,149	5	9.3	Norphlet	1.11	
1849 5-29-73	Williams & Mortimer, Jr. John P. Utsey 23-4	NW/NW	23	11N	4W	220	11,901	4	9.5	Norphlet	1.29	
1853 7-21-73	Belden & Blake Corp. A.M. Mosley no. 3	NE/NE	3	10N	3W	120	3,340	3	10.6	Eutaw	1.62	
1854 6-30-73	Belden & Blake Corp. Frank Stewart no. 3	NW/NW	2	10N	3W	122	3,364	3	9.4	Eutaw	1.66	
1855 6-8-73	Belden & Blake Corp. F.M. Johnson no. 3	SW/NE	4	10N	3W	122	3,345	2½	9.5	Eutaw	1.67	
1859 6-9-73	Placid Oil Co. et al McPhearson 29-11	NE/SW	29	11N	2W	196	11,733	11	9.3	Norphlet	1.11	
1860 6-19-73	Universal Resources Newton 17-5	SW/NW	17	11N	2W	188	11,313	5	9.2	Norphlet	1.08	
1875 7-25-73	Pruet & Hughes Co. Stewart 6-5	SW/NW	6	10N	2W	205	12,678	5	9.3	Norphlet	1.10	
1876 8-16-73	Placid Oil Co. McPhearson 32-7	SW/NE	32	11N	2W	189	11,772	4	9.4	Norphlet	1.05	
1878 9-11-73	Placid Oil Co. Oates 29-6	SE/NW	29	11N	3W	188	11,812	5	9.2	Smackover	1.03	
1888 9-29-73	Placid Oil Co. Alman 28-7	SW/NE	28	11N	3W	194	11,575	4	9.2	Smackover	1.11	
1901 10-24-73	Don S. Williams et al John P. Utsey 23-8	SE/NE	23	11N	4W	217	11,795	5	9.5	Norphlet	1.28	
1916 12-4-73	James B. Furrh et al Boney et al 27-6	SE/NW	27	11N	4W	189	12,400	6	9.3	Smackover	0.99	
1918 12-11-73	C.W. Williams, Jr. Urban McKenzie 18-15	SE/SW	18	11N	4W	190	12,247	7	9.3	Norphlet	1.01	
1927 1-9-74	Larco Drlg.-Patrick Choctaw Land Co. 16-4	NW/NW	16	10N	3W	204	12,643	4	9.5	Smackover	1.09	
1932 5-21-74	Tideway Oil Co., Inc. Bolinger Lumber 13-8	SE/NE	13	12N	3W	170	9,524	1	9.4	Norphlet	1.09	
1957 4-1-74	Pruet & Hughes Co. Boney 20-3	NE/NW	20	11N	4W	190	12,148	5	9.0	Norphlet	1.02	
1961 4-19-74	Midroc-Watkins, Jr. C.W. Skinner 19-11	NE/SW	19	11N	3W	180	11,562	6	9.5	Cotton Valley	0.99	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION	Sec	T.	R.	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
1976 6-26-74	Arden A. Anderson Mattie E. Clark 1-10	NW/SE	1	10N	3W	214	12,472	10	9.3	Norphlet	1.19	
1994 11-25-74	WIL-KEN, Inc. J.W. Thompson II 30-2	NW/NE	30	11N	4W	198	12,755	5	9.5	Cotton Valley	1.04	
2000 11-10-74	Midroc Oil & Watkins J.W. Graham 24-1	NE/NE	24	11N	4W	200	11,920	4	9.3	Norphlet	1.12	
2027 12-29-74	Robert Mosbacker Choctaw Land Co. 8-15	SW/SE	8	10N	3W	192	12,440	6	9.6	Smackover	1.01	
2048 3-1-75	Robert Mosbacker Fred May 22-5	SW/NW	22	9N	4W	237	14,472	5	10.0	Norphlet	1.18	
2054 2-22-75	Tesaro Petro. Corp. Trice 35-14	SE/SW	35	11N	4W	188	12,660	4	9.5	Norphlet	0.96	
2065 4-19-75	Placid Oil Co. M.T. Robinson 25-6	SE/NW	25	11N	3W	194	11,821	4	9.3	Norphlet	1.08	
2084 5-22-74	Pruet & Hughes Chestnut 4-15	SW/SE	4	9N	4W	204 214	13,335 13,820	5 6	10.1 10.1	Smackover Norphlet	1.04 1.07	 2.06
2091 5-28-75	J.C. Franklin et al Abbie Stanford et al	SE/SE	24	9N	2W	100	3,286	3½	9.3	Eutaw	1.03	
2105 7-28-75	Pruet & Hughes Choctaw Lumber Co. 3-5	SW/NW	3	9N	4W	225	14,203	5	10.1	Louann	1.12	
2133 8-22-77	Pruet & Hughes Chesnut 9-2	NW/NE	9	9N	4W	215	13,902	5½	10.0	Norphlet	1.07	
2138 11-13-75	Pruet & Hughes Sparrow 6-14	SE/SW	6	10N	3W	105 110	3,349 3,550	5 6	9.1 9.2	Eutaw Eutaw	1.16 1.24	 2.49
2142 9-26-75	Pruet & Hughes-Aquitaine Choctaw Lumber 3-6	SE/NW	3	9N	4W	110	3,440	6	9.2	Eutaw	1.28	
2145 11-17-75	Pruet & Hughes Trice 6-6	SE/NW	6	10N	3W	200	12,714	6	9.3	Norphlet	1.05	
2148 12-16-75	Harkins & Co. Abston 10-6	SE/NW	10	10N	3W	196	12,394	6	9.2	Norphlet	1.05	
2176 12-16-75	PCSI C.H. Roberts	NW/NE	25	9N	2W	110	3,350	4	9.2	Eutaw	1.31	
2183 3-6-76	North American Royal. Louise Locke	SE/NE	9	10N	2W	194 210	11,619 12,124	8 72	9.2 9.2	Buckner Norphlet	1.10 1.19	 3.17
2190 3-21-76	Wil-Ken, Inc. et al McPhearson-Belcher 33-7	SW/NE	33	11N	2W	181 191	11,173 11,667	5 5	9.0 9.2	Smackover Norphlet	1.03 1.07	 2.02
2192 3-5-76	Pelto Oil Co. J.W. Rudder 36-5	SW/NW	36	12N	4W	155 160	10,162 10,319	3½ 6	8.6 8.9	Haynesville Paleozoic (Metamorphics)	0.89 0.91	 3.18
2193 3-4-76	Robert Mosbacher H.O. Smith 21-12	NW/SW	21	9N	4W	231	14,617	6	10.2	Norphlet	1.13	
2195 2-18-76	Pruet & Hughes-Aquitaine Dowling 3-9	NE/SE	3	9N	4W	214	13,940	5	9.8	Louann	1.06	
2202 4-23-76	Wil-Ken, Inc. et al Trice Estate 34-6	SE/NW	34	11N	4W	216	12,451	8½	9.3	Norphlet	1.21	
2205 4-5-76	Pruet & Hughes-Aquitaine Chesnut 9-1	NE/NE	9	9N	4W	219	14,236	5	9.9	Louann	1.08	
2221 6-2-76	Pruet & Hughes North Choctaw Ridge SWDW	NW/SW	30	11N	3W	190	11,782	5½	9.6	Smackover	1.05	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
2225 6-7-76	Pruet & Hughes-Aquitaine Smith 28-1	NE/NE	28	9N	4W	230	14,453	5½	10.2	Norphlet	1.14	
2245 9-1-76	Midroc & H.V. Watkins Bolinger 25-9	NE/SE	25	11N	3W	196	11,630	6	9.0	Norphlet	1.12	
2249 8-19-76	Pruet & Hughes Smith 17-15	SW/SE	17	9N	4W	228	14,227	5	9.9	Norphlet	1.14	
2251 10-5-76	Energy Reserves Group Lively 7-12	NW/SW	7	10N	2W	204	12,153	9	9.3	Smackover	1.14	
2277 11-23-76	Pruet & Hughes Co. Chesnut Unit 21-4	NW/NW	21	9N	4W	234	13,923	8	10.1	Smackover	1.21	
2298 12-2-76	Midrock-Watkins, Jr. Bryan 23-7	SW/NE	23	11N	3W	174	11,533	8	9.2	Norphlet	0.94	
2301 2-10-77	Forest Oil Corp. Intern'l Paper "A"	NW/NW	17	9N	2W	219	13,251	8	9.6	Norphlet	1.15	
2306 12-31-76	Texas Crude, Inc. Elliott 34-16	SE/SE	34	11N	2W	188	11,704	9½	9.2	Norphlet	1.04	
2313 1-12-77	Midroc-Watkins, Jr. Goree 17-11	NE/SW	17	11N	3W	184	11,542	?	9.2	Norphlet	1.02	
2314 4-23-77	Wil-Ken, Inc. McIlwain 29-7	SW/NE	29	10N	3W	198	12,982	6	9.4	Norphlet	1.02	
2319 3-30-77	Tesoro Petro. Corp. C.M. Land 2-4	NW/NW	2	11N	5W	180	11,274	6	9.2	Paleozoic (Metamorphics)	1.01	
2344 5-10-77	Pruett & Hughes Gilbert 31-7	SW/NE	31	11N	3W	211	12,522	10	9.2	Louann	1.16	
2349 6-11-77	Harkins & Co. Abston 10-4	NW/NW	10	10N	3W	210	12,016	5	9.2	Smackover	1.19	
2372 10-9-77	Pruet & Hughes Federal Land Bnk. 17-11	NE/SW	17	9N	4W	221	13,739	8	9.9	Smackover	1.13	
2399 8-19-77	Alcorn Production Co. Boney-Utsey 4-3	NE/NW	4	10N	4W	118	3,799	6	9.3	Eutaw	1.37	
2404 11-3-77	G S Oil & Gas Co. School Land 16-1A	NE/NE	16	9N	3W	220	13,295	5½	9.5	Smackover	1.16	
2438 3-6-78	Midroc-Watkins, Jr. Boney 27-4	NW/NW	27	11N	4W	180	12,602	8	9.0	Smackover	0.91	
2451 2-13-78	Midroc & Watkins, Jr. Roberts 26-6	SE/NW	26	11N	3W	188	11,687	6	9.3	Norphlet	1.04	
2464 3-30-78	Midroc-Watkins, Jr. Gatlin 1-4	NW/NW	1	9N	4W	220	13,459	14	9.8	Norphlet	1.14	
2470 3-15-78	Sandefer & Andress, Inc. A.G. Harrell	SW/SW	15	11N	5W	180	11,849	7½	9.1	Smackover	0.96	
2495 8-29-78	Midroc-Watkins, Jr. Jackson 34-11	NE/SW	34	12N	4W	212	10,751	5	9.2	Paleozoic (Metamorphics)	1.36	
2509 6-19-78	Sandefer & Andress, Inc. E.H. Land et al	SW/SW	14	11N	5W	186	11,862	6	9.2	Smackover	1.01	
2519 6-27-78	Pruet & Hughes M.W. Smith	SW/NE	5	9N	4W	212	13,350	8	9.9	Smackover	1.09	
2530 8-17-78	Carolina Gas Expl. R.E. Fagan et al	NE/SE	19	10N	3W	209	12,893	13	9.4	Norphlet	1.11	
2536 6-24-78	J.E. Stack, Jr. Land Brothers 6-8	SE/NE	6	11N	4W	187	10,744	9	9.1	Paleozoic (Metamorphics)	1.13	
2549 8-17-78	Midroc-Watkins, Jr. Utsey 23-1	NE/NE	23	11N	4W	185	11,450	6	9.4	Smackover	1.04	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs/gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
2551 8-21-78	Midroc-Watkins, Jr. Trice 34-3	NE/NW	34	11N	4W	190	12,129	10	9.4	Smackover	1.02	
2556 8-30-78	Midroc-Watkins Anderson 8-8	SE/NE	8	10N	3W	208	12,715	7	9.4	Norphlet	1.12	
2567 9-12-78	American Quasar Petro. Dansby 31-1	NE/NE	31	11N	2W	197	11,449	6	9.2	Smackover	1.14	
2570 8-29-78	Midroc-Watkins, Jr. Jackson 11-2	NW/NE	11	11N	4W	218	12,533	8	9.3	Smackover	1.21	
2577 10-6-78	Rosewood Corp. Maten 33-7	SW/NE	33	11N	3W	205 211	12,041 12,335	5 8½	9.4 9.4	Louann Louann	1.15 1.18	 2.04
2588 11-17-78	J.M. Huber Corp. Robert Land	SW/SW	36	11N	5W	210	13,187	6½	9.3	Norphlet	1.09	
2597 1-17-79	Midroc-Watkins, Jr. Tims 8-1	NE/NE	8	10N	3W	202	12,283	5	9.4	Smackover	1.11	
2616 1-26-79	REB Petroleum Co. S.H. Bolinger Co.-Land	SE/SE	10	11N	4W	192	11,813	5	9.3	Norphlet	1.07	
2619 1-30-79	Pruet & Hughes Powe 35-15	SW/SE	35	10N	3W	212	13,257	10	9.6	Norphlet	1.10	
2639 3-12-79	Oil Dev. Co. of Utah Land Estate	NE/NE	26	11N	5W	194	12,728	8½	9.2	Smackover	1.01	
2649 8-3-79	Marshall Oglesby Clyde Mahaffey	SE/SE	2	11N	5W	222	11,379	11½	9.1	Smackover	1.37	
2663 2-16-79	Midroc-Watkins, Jr. J.W. Jenkins 34-12	NW/SW	34	11N	3W	236	12,180	5	9.3	Louann	1.40	
2711 5-16-79	Texas City Ref., Inc. James A. Bell	NE/SE	5	11N	4W	176	10,797	4½	9.2	Paleozoic (Metamorphics)	1.02	
2728 6-6-79	Marshall Oglesby Harry Haney et al 2-3	NE/NW	2	11N	5W	182	11,020	6	9.1	Smackover	1.05	
2731 8-8-79	Pruet Production Co. Pinkerton 8-9	NE/SE	8	9N	4W	221	13,472	6	9.9	Smackover	1.15	

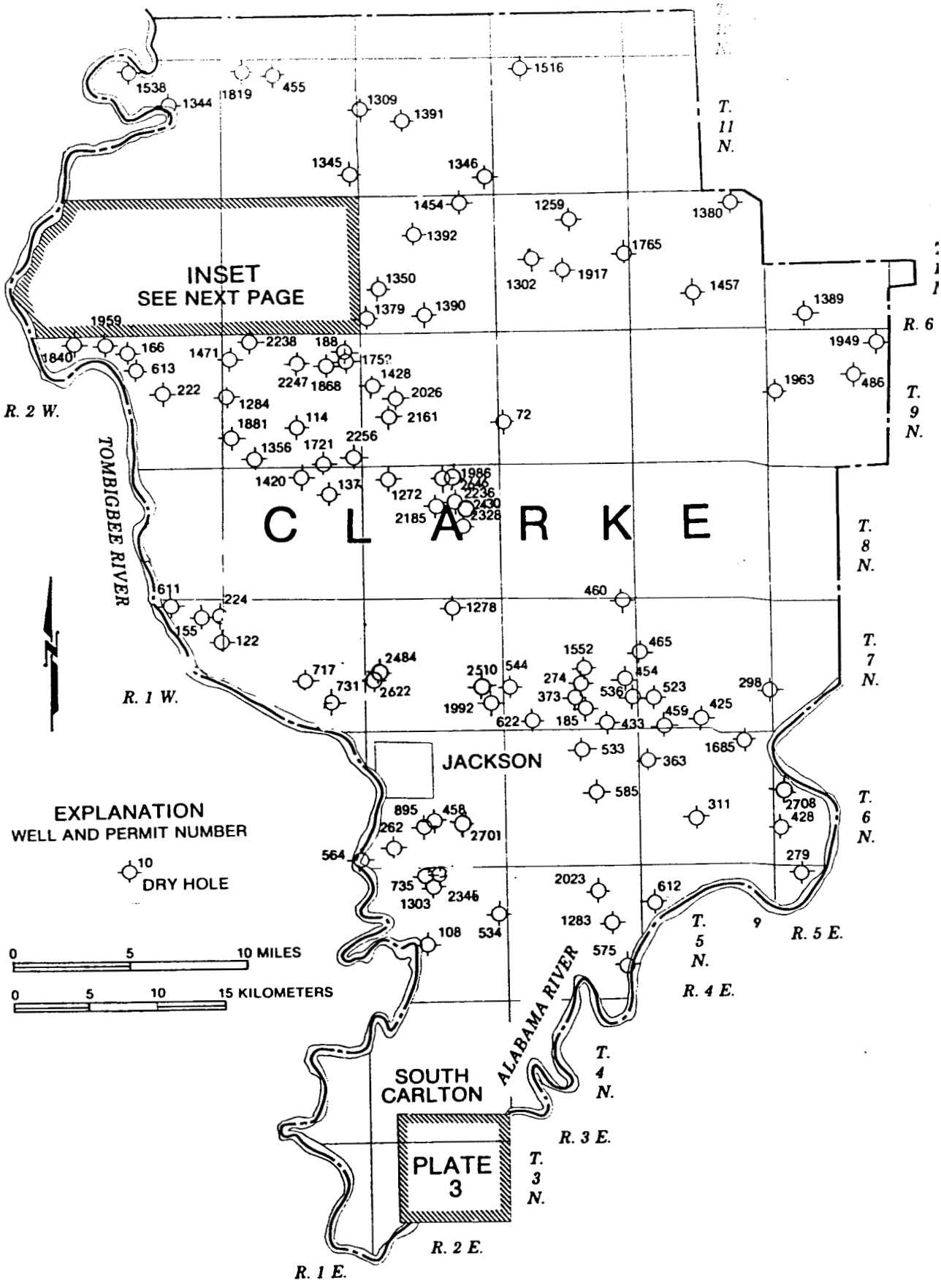

FIGURE 52. Clarke County map showing locations of wells for which geothermal data are listed in Appendix B

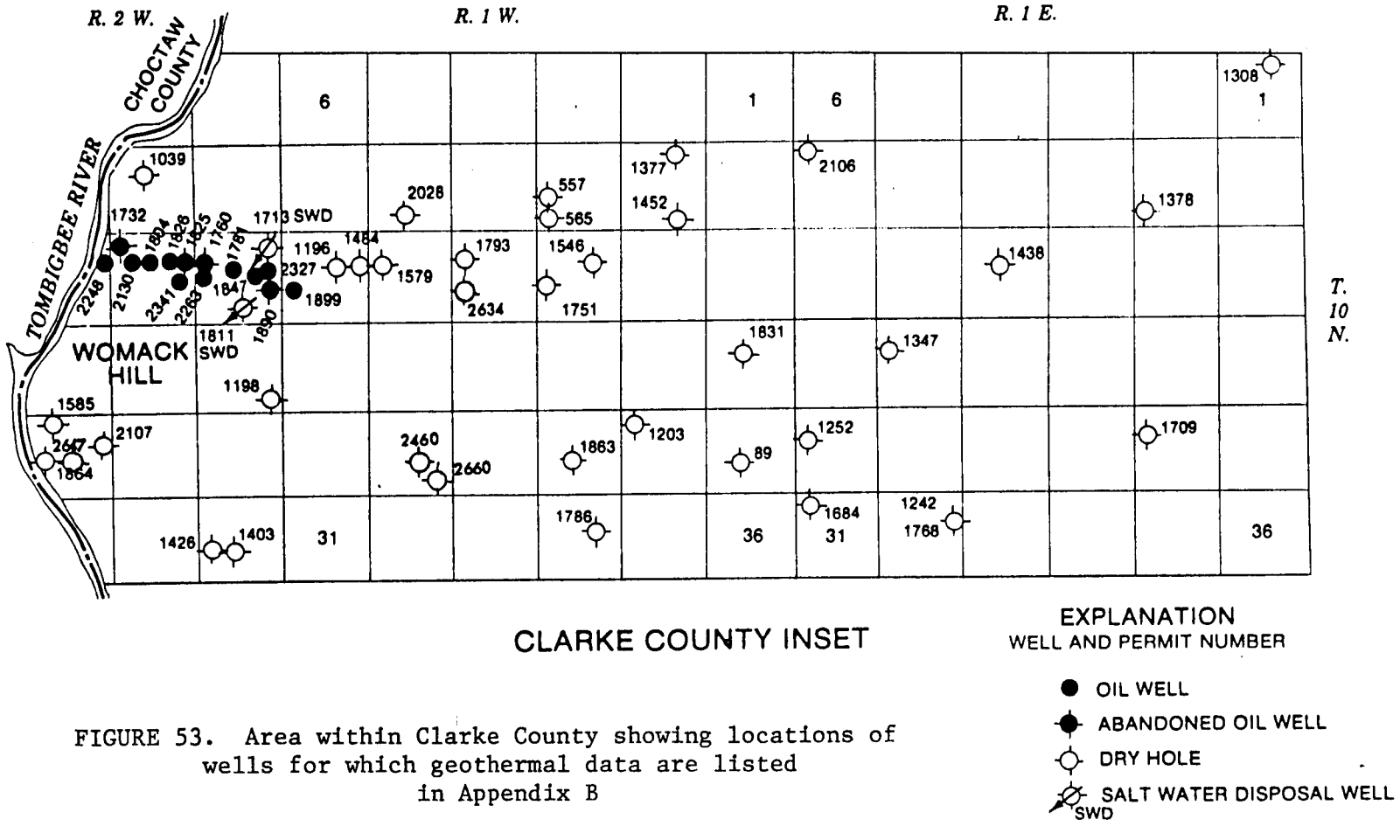

FIGURE 53. Area within Clarke County showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION	Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA: Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
72 12-30-44	Plains Oil Prod. Co. James S. Chapman	NE/NW	30	9N	3E	174	5,636	?	9.7	Early Cretaceous	1.92	
89 7-10-45	California Co. Scotch Lumber Co.	NE/SW	25	10N	1W	130	4,866	?	9.8	(Lower) Tuscaloosa	1.32	
108 11-20-45	Danciger Oil & Ref. State of Alabama	SE/NW	21	5N	2E	135	4,395	?	11.0	Early Cretaceous	1.57	
114 1-14-46	Nu Enamel Corp. A.W. Hill	NW/NW	27	9N	1E	120	5,216	?	9.8	(Lower) Tuscaloosa	1.04	
122 7-24-46	California Co. White City Plantation	NE/SW	12	7N	1W	134	3,790	?	10.2	(Lower) Tuscaloosa	1.79	
137 7-9-47	Shell Oil Co. C.C. Brooks	NW/NE	11	8N	1E	102	1,920	?	9.4	Early Tertiary	1.88	
						115	3,338	?	9.4	Selma	1.47	0.92
						140	4,826	?	9.8	(Lower) Tuscaloosa	1.53	1.68
155 11-17-47	California Co. M.H. Keoughan	NW/SE	1	7N	1W	136	3,859	?	10.2	(Lower) Tuscaloosa	1.81	
166 6-29-48	Hunt Oil Co. F.G. Hicks	SE/SW	4	9N	1W	128	4,871	2	10.0	(Upper) Tuscaloosa	1.27	
185 7-7-49	Humble Oil & Ref. E.H. Bixler, et al	NW/SE	27	7N	3E	118	3,391	2	9.8	Selma	1.53	
						126	4,777	2	10.1	(Marine) Tuscaloosa	1.26	0.58
						140	5,296	1½	10.1	(Lower) Tuscaloosa	1.40	2.70
188 7-30-49	A.R. Temple Scotch Lumber Co.	SE/SW	1	9N	1E	170	4,845	2	10.0	Early Cretaceous	2.15	
222 7-12-50	J.L. Duffy G.W. Clanton	NW/SE	15	9N	1W	118	3,754	1½	10.8	Eutaw	1.39	
224 11-3-50	Danciger Oil & Ref. John F. York	NE/SE	22	3N	2E	120	4,174	2	10.3	Early Cretaceous	1.29	
						176	9,449	2	10.4	Cotton Valley	1.16	1.06
						185	11,167	2½	10.4	Cotton Valley	1.07	0.52
						192	12,117	2	10.3	Haynesville	1.04	0.74
234 11-20-50	Clarkwin Oil Corp. J.H. Wall Estate no. 2	NE/NW	22	3N	2E	132	5,276	1½	10.3	(Marine) Tuscaloosa	1.25	
						148	6,599	1½	10.3	Early Cretaceous	1.24	1.21
						156	7,987	1½	10.2	Early Cretaceous	1.13	0.58
243 3-2-51	Clarkwin Oil Corp. J.H. Wall et al "D"	SE/NW	10	3N	2E	141	5,436	3	9.9	(Lower) Tuscaloosa	1.38	
245 1-5-51	Clarkwin Oil Corp. J.H. Wall Estate no. 4	SW/NW	11	3N	2E	139	6,473	2	10.0	Early Cretaceous	1.13	
						148	7,956	2	10.0	Early Cretaceous	1.03	0.61
257 2-10-51	Humble Oil & Ref. Co. J.H. Wall Estate no. 5	SE/SW	15	3N	2E	134	5,446	2	10.0	(Lower) Tuscaloosa	1.25	
262 4-3-51	Neilson & Walker Tensaw Land & Timber	NW/NW	32	6N	2E	144	6,878	2	10.2	Eutaw	1.13	
						152	7,353	1½	10.2	Tuscaloosa	1.17	1.68
272 5-8-51	Clarkwin Oil Corp. Ed. L. Robinson et al	NE/SW	10	3N	2E	131	5,445	1½	9.9	(Lower) Tuscaloosa	1.19	
274 4-25-51	Neilson & Walker White Smith Lumber Co.	NW/SE	22	7N	3E	148	5,334	2	9.9	(Lower) Tuscaloosa	1.54	
275 6-2-51	Humble Oil & Ref. Co. J.H. Wall no. 6	NW/NE	3	3N	2E	138	6,465	2½	9.8	Early Cretaceous	1.11	
276 6-25-51	Humble Oil & Ref. J.H. Wall Est. no. 7	NE/NW	16	3N	2E	118	4,497	2	9.8	Eutaw	1.16	
279 5-15-51	Duffy & Harrington R.H. Oswell	NW/NW	5	5N	5E	131	5,567	2	10.3	Early Cretaceous	1.17	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
285 9-8-51	Clarkwin Oil Co. J.H. Wall Est. "C"	SW/NE	10	3N	2E	134	5,429	2	9.8	(Lower) Tuscaloosa	1.25	
286 8-4-51	Humble Oil & Ref. J.H. Wall Est. no. 9	NW/SE	3	3N	2E	135	5,729	3	9.8	Early Cretaceous	1.20	
298 10-20-51	James L. Duffy Scotch Lumber Co.	SE/SE	24	7N	4E	140	5,221	2	10.0	Early Cretaceous	1.42	
303 9-8-51	Humble Oil & Ref. J.H. Wall Est. no. 10	NW/NE	10	3N	2E	136	5,432	3	9.5	(Lower) Tuscaloosa	1.29	
311 11-22-51	Duffy & Justiss-Mears C.D. Syphrit et al	SW/SE	21	6N	4E	135	5,318	2	10.0	(Lower) Tuscaloosa	1.30	
314 11-1-52	Humble Oil & Ref. Co. Emma Williams et al	SW/SW	10	3N	2E	140	7,993	2½	9.8	Early Cretaceous	0.93	
						170	10,251	2	10.0	Early Cretaceous	1.01	1.33
						189	12,005	2½	9.9	Cotton Valley	1.02	1.08
						205	13,092	3	9.6	Cotton Valley	1.06	1.47
						218	13,632	2	9.6	Cotton Valley	1.12	2.41
						227	14,759	3	10.5	Haynesville	1.09	0.80
323 9-4-59	Clarkwin Oil Co. Emma Williams B-1	NW/SW	10	3N	2E	140	5,462	2	9.7	(Lower) Tuscaloosa	1.35	
363 8-29-52	Humble Oil & Ref. Co. A.S. Johnson	NE/NW	7	6N	4E	131	4,440	2	9.6	Eutaw	1.46	
						135	5,484	2	9.2	Early Cretaceous	1.26	0.38
373 10-18-52	Humble Oil & Ref. Co. R.E. Gwin et al	SE/NW	27	7N	3E	140	5,151	7½	9.3	(Lower) Tuscaloosa	1.44	
425 3-22-53	Humble Oil & Ref. Co. J.C. Gillmore et al	SE/NE	33	7N	4E	130	4,876	2	9.4	(Lower) Tuscaloosa	1.31	
428 4-11-53	I.P. & Fred LaRue G.B. Sellers	NW/NW	30	6N	5E	132	5,281	1½	9.5	(Lower) Tuscaloosa	1.25	
433 4-12-53	Humble Oil & Ref. Co. Garfield Wright et ux	NE/SE	35	7N	3E	132	4,997	2½	9.5	(Lower) Tuscaloosa	1.32	
454 6-29-53	Sunnyland Contracting Co. Dr. R. D. Neal	NE/SE	24	7N	3E	138	5,365	2	9.1	(Lower) Tuscaloosa	1.34	
455 7-6-53	I.P. & Fred LaRue Tom Dial	NE/SW	4	11N	1E	122	3,466	1½	9.8	(Lower) Tuscaloosa	1.62	
458 7-11-53	Sunnyland Contracting W.M. Robertson	SE/SE	21	6N	2E	132	3,900	2	8.9	Early Cretaceous	1.69	
459 7-20-53	I.P. & Fred LaRue K.R. Cammack	SW/SW	32	7N	4E	130	5,040	2	9.8	(Lower) Tuscaloosa	1.27	
460 7-22-53	Sunnyland Contracting D.V. Cammack	NE/NW	1	7N	3E	150	5,061	2	9.1	(Lower) Tuscaloosa	1.66	
465 8-6-53	Sunnyland Contracting E.C. Cammack	SW/NW	18	7N	4E	132	5,015	2½	9.1	(Lower) Tuscaloosa	1.32	
486 10-27-53	Pure Oil Co. Scotch Lumber Co.	SW/SW	11	9N	5E	126	4,198	2	10.1	Early Cretaceous	1.43	
523 2-21-54	Gulf Refining Co. R.D. Neal et al	SW/NE	30	7N	4E	142	5,913	3	10.0	Early Cretaceous	1.29	
533 4-4-54	Sunnyland Contracting B.A. Cogle	NW/SE	3	6N	3E	134	4,937	3	9.6	(Lower) Tuscaloosa	1.38	
534 4-19-54	Gulf Refining Co. International Paper	SW/SE	12	5N	2E	147	6,519	3	9.4	Early Cretaceous	1.24	
536 5-4-54	Gulf Refining Co. R.D. Neal et al	NE/SE	25	7N	3E	138	5,591	2½	9.7	Early Cretaceous	1.29	
544 5-28-54	Sunnyland Contracting S.M. Lammon et ex	SW/SW	19	7N	3E	134	5,388	2	9.5	Early Cretaceous	1.26	

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557 8-21-54	Carter Oil Co. Scotch Lumber Co.	NW/SW	10	10N	1W	130	4,593	2½	10.3	Early Cretaceous	1.40	
564 9-24-54	I.P. & F. LaRue Tensaw Land & Timber	NE/NE	36	6N	1E	168	7,468	3	10.2	(Lower) Tuscaloosa	1.37	
565 9-22-54	Carter Oil Co. Scotch Lumber Co. no. 2	SW/SW	10	10N	1W	131	4,112	1	10.4	Eutaw	1.58	
575 11-5-54	Sun Oil Co. Minnie Perine	SW/SW	25	5N	3E	134	5,548	3	10.3	(Lower) Tuscaloosa	1.23	
585 1-7-55	Ralph Stanley Edward & L.W. Anderson	NW/SW	14	6N	3E	136	4,976	5	10.3	(Lower) Tuscaloosa	1.41	
611 8-25-55	J.R. Butler et al McCorquodale & Wilson	SE/NW	3	7N	1W	132	4,968	2	9.8	Early Cretaceous	1.33	
612 9-1-55	Survey Drilling Co. S.B. Adams Lumber Co.	SE/SE	7	5N	4E	140	5,930	2½	9.7	Early Cretaceous	1.25	
613 9-6-55	Southern States Oil Co. Mrs. A. R. Auther	NW/SE	9	9N	1W	120	3,870	2	9.2	Eutaw	1.40	
622 11-16-55	Justiss-Mears & Armour Johnson & Griffin	SE/NW	32	7N	3E	132	5,194	2	10.1	(Lower) Tuscaloosa	1.27	
672A 9-4-59	Clarkwin Oil Corp. J.H. Wall no. 12	NW/NW	15	3N	2E	132	5,488	1½	9.4	(Lower) Tuscaloosa	1.20	
717 11-13-56	Shell Oil Co. Alabama State Lease	NE/SW	22	7N	1E	128	4,901	2	9.6	Early Cretaceous	1.27	
731 12-1-56	Shell Oil Co. Clolinger et al	NE/SW	26	7N	1E	134	5,373	2	9.5	Early Cretaceous	1.27	
735 7-26-57	Humble Oil & Ref. Champion-Klepac et al	NE/NW	4	5N	2E	100	2,319	2	9.4	Early Tertiary	1.47	
						150	7,364	2	9.2	Cotton Valley	1.14	0.99
						162	9,473	2	9.3	Haynesville	1.01	0.57
						200	10,770	2	11.4	Smackover	1.24	2.93
						248	14,598	2½	15.0	Louann Salt	1.25	1.25
859 6-1-58	Gulf Coast Drlg. & Exp. J.H. Wall	NW/NE	3	3N	2E	142	5,481	1½	9.8	(Lower) Tuscaloosa	1.39	
895 11-27-58	Marshall R. Young C.E. Gilmore	NE/NW	28	6N	2E	210	11,432	2½	11.0	Louann Salt	1.26	
920 12-7-58	Williams & Armour J.H. Wall Est. no. 1	NE/SW	3	3N	2E	125	4,444	2	9.7	Eutaw	1.33	
975 11-3-59	Clarkwin Oil Corp. J.H. Wall E-1	SW/NW	10	3N	2E	140	5,544	2	9.4	(Lower) Tuscaloosa	1.33	
1005 11-19-59	Clarkwin Oil Corp. Robinson-Oswell	SE/SW	10	3N	2E	139	5,534	2	10.1	(Lower) Tuscaloosa	1.32	
1023 6-20-60	Clarkwin Oil Corp. State of Alabama	NW/SE	10	3N	2E	132	5,496	4	10.2	(Lower) Tuscaloosa	1.20	
1039 6-24-60	American Petrofina Co. General Supply	SE/NW	11	10N	2W	125	3,875	1	9.7	(Marine) Tuscaloosa	1.52	
1196 9-18-62	American Petrofina Co. M. Anderson	SW/NE	18	10N	1W	147	3,939	1½	9.4	Eutaw	2.06	
1198 9-25-62	Buzz Morgan et al H.N. Knight et al	SE/SE	24	10N	2W	120	4,486	1½	10.5	Eutaw	1.20	
1203 10-10-62	R. Merrill Harris Henley Webb	NW/NW	26	10N	1W	110	3,389	2	9.21	Eutaw	1.30	
1242 5-23-63	R. Merrill Harris O.C. Bare	SE/NE	32	10N	1E	110	3,377	3	9.8	Eutaw	1.30	

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1252 8-15-63	R. Merrill Harris L.E. Bedwell	SW/NW	30	10N	1E	105	3,276	3	9.2	Eutaw	1.19	
1259 9-28-63	American Petrofina Co. W.D. Harrigan et al	NE/NW	10	10N	3E	178	10,053	4	9.8	Paleozoic	1.11	
1272 10-25-63	LaGrange Petroleum Co. C.B. Gilmore et al	NE/SW	5	8N	2E	136 169	5,289 5,982	2 1	9.2 9.3	Eutaw (Lower) Tuscaloosa	1.32 1.72	 4.76
1278 11-4-63	LaGrange Petroleum Co. Mrs. Tellie T. McVey	SE/NE	3	7N	2E	140	5,526	3	9.3	(Lower) Tuscaloosa	1.34	
1283 11-13-63	La Grange Petroleum Co. Grief Brothers Co.	NW/SE	14	5N	3E	147	5,714	2	9.2	(Lower) Tuscaloosa	1.42	
1284 11-21-63	Citmoco Services Co. Grief Brothers Co.	SE/SW	18	9N	1E	149	5,758	3	9.5	Early Cretaceous	1.44	
1302 3-30-64	American Petrofina Co. W.D. Harrigan no. 2	SW/NE	17	10N	3E	103	2,938	2	9.1	Eutaw	1.26	
1303 3-21-64	J.W. King & E. Williams Slayton-McCrary	NE/SE	4	5N	2E	112	3,395	3	9.6	Early Cretaceous	1.36	
1308 4-8-64	American Petrofina Co. W.D. Harrigan no. 3	NW/NE	1	10N	1E	104	3,081	5	9.3	Eutaw	1.23	
1309 4-17-64	American Petrofina Co. W.D. Harrigan no. 4	NW/NW	18	11N	2E	102	3,078	3	9.2	Eutaw	1.17	
1344 3-23-65	Oglesby & Diamond & Son Diversified Oper. Co.	SE/SE	10	11N	1W	115	2,780	3	?	Eutaw	1.76	
1345 3-27-65	American Petrofina Co. W.D. Harrigan et al no.1	NE/NE	36	11N	1E	108	3,245	5	9.6	Eutaw	1.29	
1346 4-8-65	American Petrofina Co. W.D. Harrigan et al no.2	NE/NE	36	11N	2E	110	3,027	4	9.5	Eutaw	1.45	
1347 4-16-65	American Petrofina Co. W.D. Harrigan et al no.4	SW/NW	20	10N	1E	110	3,400	3	9.7	Eutaw	1.29	
1350 4-23-65	American Petrofina Co. W.D. Harrigan et al no.3	NW/NW	29	10N	2E	118	3,296	3	9.6	Eutaw	1.58	
1356 8-10-65	Sinclair Oil & Gas Co. Gillmore et al	NW/SE	32	9N	1E	187 211 220	10,168 12,771 13,290	7 5½ 7	9.5 10.1 10.2	Cotton Valley Haynesville Norphlet	1.19 1.14 1.16	 0.92 2.59
1377 4-21-66	Smith & Williams V.H. O'Melia no. 2	NW/NE	11	10N	1W	120	3,163	2	10.0	Eutaw	1.17	
1378 4-16-66	Smith & Williams V.H. O'Melia no. 1	SW/SW	11	10N	1E	120	3,051	2	9.6	Eutaw	1.77	
1379 4/9/66	Smith & Williams W.D. Harrigan no. 1	NE/SE	31	10N	2E	118	3,263	2½	9.5	Eutaw	1.60	
1380 5-1-66	Smith & Williams W.D. Harrigan no. 2	SE/SW	2	10N	4E	115	2,657	2	9.6	Eutaw	1.84	
1389 10-3-66	C.C. Murray, Jr. W.D. Harrigan no. 1	SE/NE	32	10N	5E	105	2,593	3	9.6	Eutaw	1.50	
1390 10-12-66	C.C. Murray, Jr. W.D. Harrigan no. 2	SE/NE	33	10N	2E	112	3,229	3	9.8	Eutaw	1.42	
1391 10-28-66	C.C. Murray, Jr. V.H. O'Melia no. 1	SW/NE	16	11N	2E	104	2,865	4	9.6	Eutaw	1.33	
1392 10-21-66	C.C. Murray, Jr. V.H. O'Melia no. 2	NE/SE	9	10N	2E	110	2,989	3	9.5	Eutaw	1.47	
1403 1-29-67	Colt Petro. & Kern G.E. White Estate	NE/SW	36	10N	2W	126	3,984	1	9.7	Eutaw	1.51	
1420 11-11-67	Coral Drilling, Inc. Charles P. Finch	SE/SW	3	8N	1E	222	13,802	24	10.3	Norphlet	1.13	

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1426 10-24-67	J.W. Harris & Oglesby F.G. Hawk	NW/SW	36	10N	2W	126	3,962	4	9.3	Eutaw	1.51	
1428 11-12-67	Humble Oil & Ref. Louie C. Wilson et al	NW/NW	18	9N	2E	219	12,038	4	9.4	Norphlet	1.27	
1438 2-7-68	Humble Oil & Ref. W.D. Harrigan et al	SE/NW	16	10N	1E	198	11,834	5	9.6	Norphlet	1.12	
1452 4-12-68	Marshall Oglesby O'Melia no. 1	SW/SE	11	10N	1W	100	3,071	2	9.2	Eutaw	1.11	
1454 4-20-68	Marshall Oglesby Harrigan	SE/NW	2	10N	2E	118	2,890	3	9.6	Eutaw	1.80	
1457 4-28-68	Marshall Oglesby O'Melia no. 2	NE/NE	28	10N	4E	105	2,612	3	9.5	Eutaw	1.50	
1471 2-23-69	Skelly Oil Co. L.C. Deas	SW/NE	7	9N	1E	116	4,253	6	9.3	Selma	1.18	
						214	13,460	14	9.4	Haynesville	1.10	1.07
						218	14,089	6	9.4	Haynesville	1.08	0.64
1479 12-28-68	Patrick Petroleum Corp. M.W. Davies	NE/SE	16	3N	2E	135	5,484	5	9.7	(Lower) Tuscaloosa	1.26	
1484 2-1-69	Brooks Hall Oil Corp. Rea Starks	SE/NE	18	10N	1W	198	11,971	4	9.5	Eagle Mills	1.10	
1490 2-27-69	Patrick Petroleum Corp. M.W. Davies no. 4	NE/NE	16	3N	2E	135	5,485	4	9.3	(Lower) Tuscaloosa	1.26	
1491 12-27-69	Patrick Petroleum Corp. M.W. Davies no. 5	SE/NE	16	3N	2E	135	5,488	4	9.5	(Lower) Tuscaloosa	1.26	
1516 10-3-69	Murphy Oil Corp. A.S. Johnson	NE/NE	5	11N	3E	150	8,335	4	9.3	Paleozoic	1.01	
1538 1-25-70	Brooks Hall et al Dozier	NW/SW	4	11N	1W	156	9,529	6	9.1	Paleozoic	0.94	
1546 3-26-70	Brooks Hall et al Scotch	SW/NE	15	10N	1W	210	11,469	6	9.4	Norphlet	1.26	
1552 7-14-70	Getty Oil Co. M.W. Smith 22-7	SW/NE	22	7N	3E	200	12,527	10	9.1	Haynesville	1.07	
						218	13,125	4	10.2	Haynesville	1.16	3.01
						242	14,265	16	10.5	Werner	1.23	2.11
1554A 8-24-74	Belden & Blake & Co. M.W. Davies 15-12	NW/SW	15	3N	2E	195	10,950	4	9.7	Early Cretaceous	1.18	
1579 12-21-70	Pruet & Hughes & Pelto Dungan 17-5	SW/NW	17	10N	1W	188	11,826	5	9.4	Norphlet	1.03	
1585 1-25-71	Pruet & Hughes & Davis Turner 27-4	NW/NW	27	10N	2W	190	12,774	4	9.4	Norphlet	0.97	
1684 1-29-72	Pruet & Hughes Co. Scotch Lumber 31-4	NW/NW	31	10N	1E	198	12,230	6	9.2	Norphlet	1.08	
1685 5-13-72	An-Son Corporation C.M. Oswell et al	NW/SE	2	6N	4E	218	13,477	10	9.4	Norphlet	1.13	
1709 4-20-72	Amoco Production Co. Pugh no. 1	SW/NW	26	10N	1E	210	11,813	6	9.4	Norphlet	1.22	
1713 6-1-72	Placid Oil Co. Turner 13-1	NE/NE	13	10N	2W	194	11,586	3½	9.4	Norphlet	1.10	
1721 6-5-72	Southeastern Expl. Co. C.P. Finch	SW/SW	35	9N	1E	172	8,348	3½	9.4	Early Cretaceous	1.27	
1723 12-5-72	Phillips Petro. Corp. Scottie "A"	NW/NW	10	3N	2E	223	14,444	5	9.5	Haynesville	1.09	
1732 9-9-72	Placid Oil Co. Gross Turner 14-4	NW/NW	14	10N	2W	200	11,616	4	9.2	Norphlet	1.15	
1751 9-6-72	Pruet & Hughes & Amoco Parden Unit 15-12A	NW/SW	15	10N	1W	192	11,489	6	9.2	Norphlet	1.10	

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1752 9-22-72	Consolidated Gas Supply Marvin Brunson 12-4	NW/NW	12	9N	1E	218	11,909	8	9.5	Norphlet	1.28	
1760 9-24-72	Pruet & Hughes-Pelto Turner Unit 13-5	SW/NW	13	10N	2W	210	11,528	5	9.1	Norphlet	1.25	
1765 9-28-72	AMAX Petro. Corp. Wirt Davis	SE/SE	13	10N	3E	175	9,320	4	9.3	Paleozoic	1.17	
1768 10-13-72	Consolidated Gas Supply O.C. Hare 32-8	SE/NE	32	10N	1E	202	11,924	13	9.1	Norphlet	1.14	
1781 11-20-72	Placid Oil Co. Turner Unit 13-6	SE/NW	13	10N	2W	190	11,548	6	9.4	Norphlet	1.07	
1786 11-23-72	Victor P. Smith et al Doris Stotts 34-7	SW/NE	34	10N	1W	179	12,294	6½	8.8	Norphlet	0.92	
1793 11-28-72	Pruet & Hughes Co. Dungan Unit 16-5	SW/NW	16	10N	1W	190	11,454	2½	9.3	Norphlet	1.08	
1804 1-10-73	Placid OilCo. Turner Unit 14-6	SE/NW	14	10N	2W	186	11,542	4½	9.3	Norphlet	1.04	
1811 2-22-73	Placid Oil Co. Knight "A" 13-15	SW/SE	13	10N	2W	201	11,543	6	9.6	Smackover	1.17	
1819 2-7-73	AMAX Petroleum Corp. Joe R. Pickens	SW/SE	5	11N	1E	154 160	9,620 9,865	4 2	9.2 9.2	Norphlet Norphlet	0.91 0.95	 2.45
1825 3-15-73	Exxon Company, U.S.A. Gross Turner Unit 14-8	SE/NE	14	10N	2W	181	11,502	8	9.1	Norphlet	1.00	
1826 4-19-73	Exxon Company, U.S.A. Gross Turner Unit 14-7	SW/NE	14	10N	2W	192	11,501	4½	9.3	Norphlet	1.10	
1831 3-16-73	Century Petroleum Ltd. Scotch Lumber Co. 24-6	SE/NW	24	10N	1W	188	11,539	4½	9.3	Smackover	1.06	
1840 5-25-73	Louisiana Land & Expl. G.E. White Estate 1-4	SE/SE	1	9N	2W	215	12,964	8	9.5	Smackover	1.15	
1847 5-30-73	Placid Oil Co. Turner Unit 13-7	NW/SE	13	10N	2W	190	11,781	6½	9.3	Norphlet	1.05	
1863 7-11-73	Pruet & Hughes Co. Scotch Lumber Co. 27-11	NE/SW	27	10N	1W	206	12,374	5	9.5	Norphlet	1.13	
1864 7-11-73	Louisiana Land & Expl. Thomas L. Turner 27-3	NW/SW	27	10N	2W	204	12,757	23	9.6	Norphlet	1.08	
1868 7-18-73	Moncrief & Dallas Expl. M.W. Smith, Jr. 11-5	SW/NW	11	9N	1E	206	11,691	4	9.2	Norphlet	1.20	
1881 7-27-73	Dallas Expl., Inc. J.M. Gillmore 30-5	SW/NW	30	9N	1E	230	13,422	3½	9.7	Norphlet	1.22	
1890 8-22-73	Placid Oil Co. Turner Unit 13-9	NE/SE	13	10N	2W	192	11,449	2½	9.2	Smackover	1.10	
1899 9-26-73	Placid Oil Co. Counselman Unit 18-12	NW/SW	18	10N	1W	192	11,409	3½	9.2	Smackover	1.10	
1911 11-20-73	Belden & Blake Co. M.W. Davies Unit 15-13	SW/SW	15	3N	2E	148	5,486	2½	9.3	(Lower) Tuscaloosa	1.49	
1917 11-25-73	Amerada Hess Corp. B.V. Kelly	NE/NE	21	10N	3E	179	10,127	4	9.2	Norphlet	1.12	
1949 3-9-74	Amerada Hess Corp. Ethel G. Kennedy et al	SW/NW	1	9N	5E	186	9,825	5	9.1	Norphlet	1.22	
1959 4-30-74	Pruet & Hughes Co. McNider Unit 6-14	SE/SW	6	9N	1W	219	13,193	6	9.7	Norphlet	1.16	
1963 4-18-74	Amerada Hess Corp. Scotch	NE/NE	19	9N	5E	190	10,930	5	9.4	Louann	1.13	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
1986 8-3-74	Hassie Hunt Trust Gillmore Unit 3-13	SW/SW	3	8N	2E	214	12,475	5	9.5	Norphlet	1.19	
1992 9-23-74	Placid Oil Co. Stallworth 25-14	SE/SW	25	7N	2E	215	12,748	6	9.4	Haynesville	1.17	
2008 4-8-75	Belden & Blake & Co. B.W. Barbour 16-2	NW/NE	16	3N	2E	144	6,080	4	9.1	(Lower) Tuscaloosa	1.28	
2009 3-26-75	Belden & Blake & Co. B.W. Barbour 16-3	NE/NW	16	3N	2E	143	6,218	5	9.1	(Lower) Tuscaloosa	1.24	
2010 4-8-75	Belden & Blake & Co. B.W. Barbour 16-6	SE/NW	16	3N	2E	144	5,790	7	9.3	(Lower) Tuscaloosa	1.35	
2011 6-12-75	Belden & Blake & Co. B.W. Barbour 16-7	SW/NE	16	3N	2E	137	5,679	7	9.5	(Lower) Tuscaloosa	1.25	
2012 6-11-75	Belden & Blake & Co. B.W. Barbour 16-10	NW/SE	16	3N	2E	133	5,526	4	9.1	(Lower) Tuscaloosa	1.21	
2017 4-8-75	Belden & Blake & Co. J.H. Wall Estate 3-2	NW/NE	3	3N	2E	141	5,468	4	9.1	(Lower) Tuscaloosa	1.37	
2023 2-7-75	Mallard Expl. Inc. International Paper 10-5	SW/NW	10	5N	3E	200 250	13,328 14,991	5 14	9.5 12.2	Haynesville Norphlet	1.01 1.23	 3.01
2025 4-8-75	Belden & Blake & Co. B.W. Barbour 35-9	NE/SE	35	4N	2E	143 156	5,464 7,090	4 5	9.8 9.4	(Lower) Tuscaloosa Early Cretaceous	1.41 1.27	 0.80
2026 1-6-75	Belco Petroleum Corp. C.B. Gillmore et al	NE/NW	20	9N	2E	102 200	2,761 12,238	3 5	8.9 9.5	Selma Norphlet	1.30 1.10	 1.03
2028 4-6-75	Louisiana Land & Expl. Rial Thornton	SE/SW	8	10N	1W	199	11,497	4	9.3	Norphlet	1.16	
2106 7-23-75	Pruet & Hughes & Aqui. Johnson 7-4	NW/NW	7	10N	1E	188	10,927	6	9.2	Norphlet	1.12	
2107 8-30-75	Pruet & Hughes Co. Turner	SE/NE	27	10N	2W	210	12,781	6	9.2	Norphlet	1.13	
2130 12-9-75	Placid Oil Co. Womack Hill 14-4-A	SW/NW	14	10N	2W	182	11,470	3	9.3	Smackover	1.01	
2149 10-12-76	Getty Oil Co. B.W. Barbour 2-12	NW/SW	2	3N	2E	104 208 260 277	3,134 14,639 15,508 16,212	2 7 5½ 13	8.9 9.4 18.5 17.5	Selma Haynesville Haynesville Louann	1.21 0.97 1.25 1.30	 0.90 5.98 2.41
2152 2-25-76	Belden & Blake & Co. B.W. Barbour	NE/NW	10	3W	2E	150	5,776	14	9.4	(Lower) Tuscaloosa	1.45	
2153 2-26-76	Belden & Blake & Co. Wall et al 3-14	SE/SW	3	3N	2E	146	6,025	6	9.5	Early Cretaceous	1.33	
2154 2-19-76	Belden & Blake & Co. B.W. Barbour et al	SE/SE	3	3N	2E	143	5,695	19	9.2	(Lower) Tuscaloosa	1.35	
2155 2-27-76	Belden & Blake & Co. Wall et al 3-15	SW/SE	3	3N	2E	144	5,769	5	9.7	Early Cretaceous	1.35	
2161 12-6-75	Pruet & Hughes Co. Gillmore 20-11	NE/SW	20	9N	2E	210	11,648	7	9.7	Haynesville	1.24	
2165 3-22-76	Belden & Blake & Co. B.W. Barbour et al	NE/NE	10	3N	2E	139	5,797	8	9.1	(Lower) Tuscaloosa	1.26	
2166 3-17-76	Belden & Blake & Co. B.W. Barbour et al	NW/NE	10	3N	2E	146	5,634	10	9.1	(Lower) Tuscaloosa	1.42	
2179 3-29-76	Belden & Blake & Co. Wall et al 3-11	NE/SW	3	3N	2E	140	5,556	5	9.1	(Lower) Tuscaloosa	1.33	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth sensor (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
2180 3-18-76	Belden & Blake & Co. Wall et al 3-6	SE/NW	3	3N	2E	140	5,846	8	9.4	(Lower) Tuscaloosa	1.27	
2181 3-26-76	Belden & Blake & Co. Wall et al 3-7	SW/NE	3	3N	2E	143	5,694	3	9.3	(Lower) Tuscaloosa	1.35	
2182 2-14-77	Belden & Blake Corp. Wall et al 3-9	NE/SE	3	3N	2E	162	6,953	3	9.6	Early Cretaceous	1.38	
2185 2-12-76	Pruet & Hughes Co. Gray Unit 10-14	SE/SW	10	8N	2E	210	12,558	7	9.3	Smackover	1.15	
2236 6-19-76	Pruet & Hughes Co. Coats Unit 10-10	NW/SE	10	8N	2E	212	12,234	8	9.3	Norphlet	1.20	
2238 7-17-76	Placid Oil Co. Pugh 5-4	NW/NW	5	9N	1E	210	12,810	5	9.6	Norphlet	1.12	
2247 9-18-76	Placid Oil Co. Norris 10-5	SW/NW	10	9N	1E	190	12,512	5	9.6	Norphlet	0.99	
2248 12-13-76	Placid Oil Co. Womack Hill 15-8	SW/NW	14	10N	2W	187	11409	7	9.1	Smackover	1.06	
2256 8-16-76	Alcorn Production Co. J.W. Wilson Estate	NW/SE	36	9N	1E	128	4,220	4	9.4	Eutaw	1.47	
2263 11-1-76	Placid Oil Co. Turner 13-21	SW/NW	13	10N	2W	182	11,255	7	9.1	Smackover	1.03	
2286B 4-2-77	Belden & Blake Corp. Wall et al Unit 3-3	SW/NW	3	3N	2E	132	5,532	3	9.4	(Lower) Tuscaloosa	1.19	
2287B 4-2-77	Belden & Blake Corp. Wall et al Unit 3-3A	NE/NW	3	3N	2E	136	5,793	3	9.1	(Lower) Tuscaloosa	1.21	
2288B 2-24-77	Belden & Blake & Co. Wall et al 2-11	NE/SW	2	3N	2E	138	5,677	6	9.2	(Lower) Tuscaloosa	1.27	
2290B 3-29-77	Belden & Blake & Co. Wall et al 2-13	SW/SW	2	3N	2E	138	5,855	2½	9.1	(Lower) Tuscaloosa	1.23	
2327 3-4-77	Placid Oil Co. Turner 13-25	SE/NE	13	10N	2W	190	11,309	4	9.3	Smackover	1.10	
2328 2-20-77	Midroc & Watkins Gray 14-11	NE/SW	14	8N	2E	206	12,283	6	9.1	Smackover	1.14	
2341 5-6-77	Exxon Corp. Gross Turner 14-8A	SE/NE	14	10N	2W	177	11,203	5	9.3	Smackover	0.99	
2345 8-19-77	Shell Oil Co. M.W. Smith et al	SW/NW	3	5N	2E	183 224	10,370 12,037	8¼ 11	9.1 8.5	Haynesville Norphlet	1.13 1.31	 2.46
2430 12-28-77	Midroc & Watkins Gillmore 14-10	NW/SE	14	8N	2E	209	12,215	8	9.3	Haynesville	1.17	
2460 5-26-78	Placid Oil Co. Lawrence 29-10	NW/SE	29	10N	1W	210	13,177	6	9.5	Louann	1.09	
2484 5-27-78	Union Oil Co. of Calif. C.K. Anderson	SE/NW	19	7N	2E	126 201 221	2,660 12,178 13,300	4½ 6½ 8	9.2 7.3 10.0	Selma Haynesville Norphlet	2.26 1.11 1.17	 0.79 1.78
2510 7-21-78	Spooner Petroleum Co. Cholinger	NE/NW	25	7N	2E	220 234	12,668 13,424	5 20	9.4 9.5	Haynesville Norphlet	1.22 1.25	 1.85
2622 3-11-79	Pruet Oil Co. et al Hoven 19-13	SW/SW	19	7N	2E	190 224	11,654 12,930	11½ ?	9.3 9.9	Haynesville Norphlet	1.06 1.22	 2.66
2634 1-26-79	James B. Furrh, Jr. R.H. Dungan	NW/SW	16	10N	1W	198	11,498	8	9.4	Smackover	1.15	
2646 4-9-79	Midroc & Watkins Pugh 3-9	NE/SE	3	8N	2E	200	12,415	10	9.2	Smackover	1.08	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
2647 6-19-79	Midroc & Watkins May 27-10	NW/SE	27	10N	2W	200	12,564	9	9.3	Smackover	1.07	
2660 3-2-79	Pruet & Hughes Oper. Pace Unit 29-16	SE/SE	29	10N	1W	210	12,630	3	9.6	Norphlet	1.14	
2701 5-18-79	Pruet Prod.-Spooner Alco Land & Timber 26-6	SE/NW	26	6N	2E	208	11,811	5½	10.4	Haynesville	1.20	
2708 5-13-79	Florida Gas Expl. J.R. Mattmuller et al	SE/NW	18	6N	5E	228	13,228	6½	9.5	Smackover	1.22	

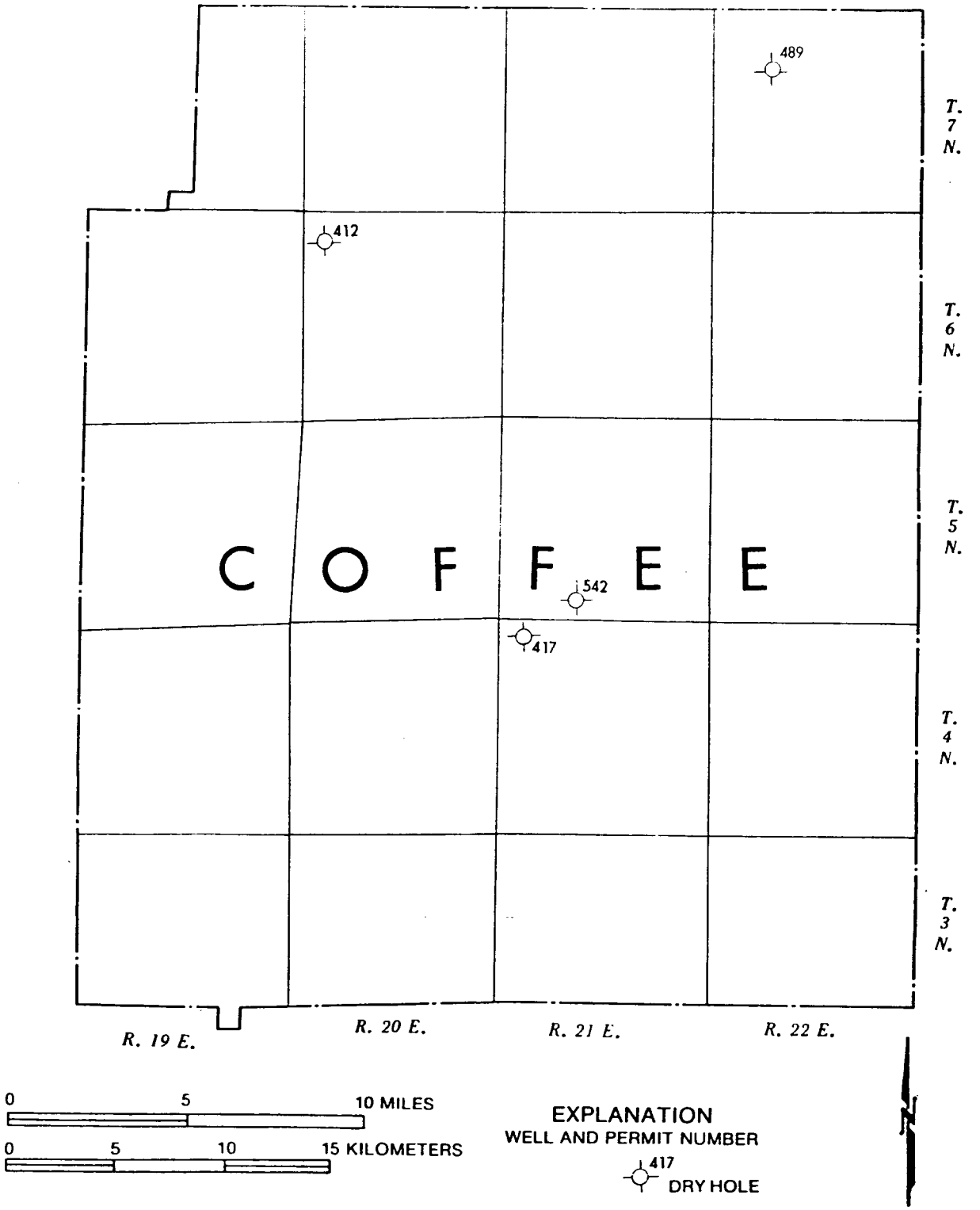

FIGURE 54. Coffee County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
412 1-28-53	E.B. LaRue Andrew J. Page	NW/SE	6	6N 20E	94	3,330	1½	9.4	Early Cretaceous	0.84	
417 2-15-53	Blair Oil & Gas Co. H.C. Thames	SW/NE	6	4N 21E	117	3,435	3½	9.4	Early Cretaceous	1.48	
489 1-7-54	Robert W. Williams Charley Prestwood	NW/SE	8	7N 22E	110	2,405	2	9.8	(Lower) Tuscaloosa	1.83	
542 5-26-54	Seaboard Oil Co. R.S. Strickland	SW/NW	33	5N 21E	115 120	1,963 3,291	1½ 2	9.6 9.9	Selma Early Cretaceous	2.50 1.64	0.40

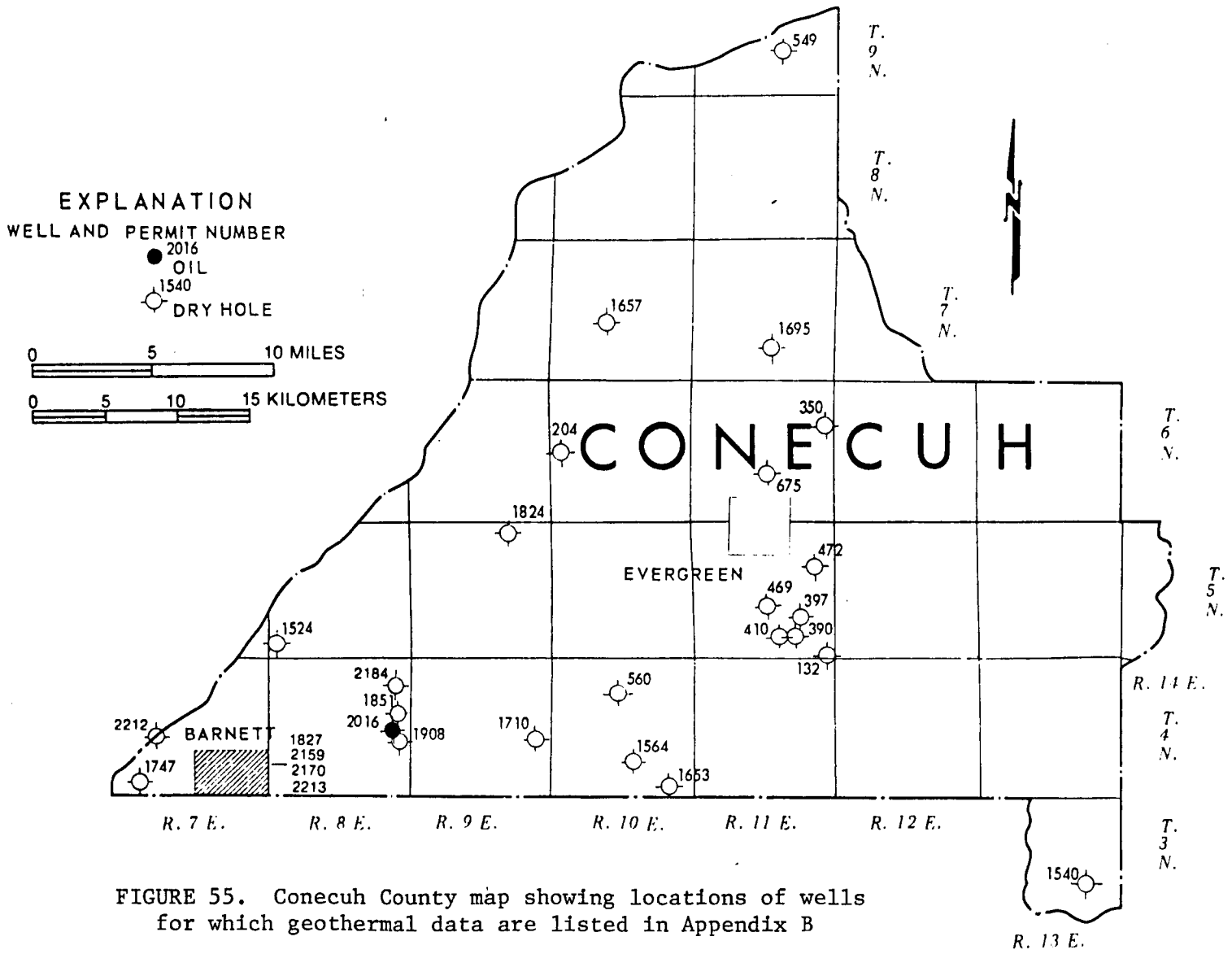

FIGURE 55. Conecuh County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) #1	#2
132 4-7-47	Hunt Oil Co. T.R. Miller Mill no. 5	NW/NE	1	4N	11E	166	8,051	?	10.0	Early Cretaceous	1.24	
204 3-29-50	John S. Neilson W.G. Brantley	NE/NW	19	6N	10E	124	4,658	2	10.3	Early Cretaceous	1.25	
350 6-18-52	Southern Calif. Petro. Evergreen Heading Co.	SW/SE	12	6N	11E	128 132	4,588 5,548	6 2½	9.7 9.5	Early Cretaceous Early Cretaceous	1.35 1.19	 0.42
390 11-13-52	Lyle Cashion Co. W.A. Godwin	NE/NW	35	5N	11E	130	4,686	2	9.6	Early Cretaceous	1.37	
397 12-18-52	Lyle Cashion Co. T.E. McMillan	SW/NE	26	5N	11E	135	4,580	1½	9.6	Early Cretaceous	1.51	
410 1-5-53	Lyle Cashion Co. Grief Bros. Cooperage	NW/SE	34	5N	11E	114	4,676	2	9.3	Early Cretaceous	1.03	
469 8-14-53	Lyle Cashion Co. W.K. Horton, Jr.	SW/SW	22	5N	11E	130	4,557	2	9.7	Early Cretaceous	1.40	
472 8-23-53	Lyle Cashion Co. J.W. Denning et al	SW/SW	12	5N	11E	129	4,322	2	9.8	Early Cretaceous	1.46	
549 6-7-54	Sunnyland Contracting Dock Mixon et ux	NW/NW	27	9N	11E	128	3,363	2	9.4	Early Cretaceous	1.84	
560 9-2-54	George D. Hunt McMillen Day	NE/SE	9	4N	10E	136	5,087	2½	9.5	Early Cretaceous	1.38	
675 6-24-56	A.W. Williams Drlg. D.T. Hyde et al	NW/NW	27	6N	11E	126	4,055	2	9.9	Early Cretaceous	1.48	
1524 11-20-69	E.L. Erickson et al Alger-Sullivan Tenants	NW/NE	31	5N	8E	220	12,903	5	9.6	Smackover	1.19	
1540 2-5-70	Pruet & Hughes Co. T.R. Miller Mill Co.	NW/SE	23	3N	13E	192	12,570	6	9.5	Eagle Mills ?	1.00	
1564 8-16-70	Eason Oil & LL&E D.W. McMillan Trust	SW/NW	27	4N	10E	202	12,083	6	9.5	Eagle Mills ?	1.13	
1653 11-6-71	Louisiana Land & Expl. Ellis et al	NW/SE	35	4N	10E	208 220	12,487 12,899	8 8	9.8 9.9	Eagle Mills ? Eagle Mills ?	1.14 1.19	 2.91
1657 11-20-71	Shenandoah Oil et al Alger-Tenants 21-2	NW/NE	21	7N	10E	180	10,346	6	9.2	Paleozoic	1.10	
1695 3-12-72	Shenandoah Oil et al Alger-Tenants 27-12	NW/SW	27	7N	11E	162	8,541	5	9.0	Paleozoic	1.12	
1710 4-9-72	The Superior Oil Co. D.W. McMillan Trust	NW/SW	24	4N	9E	120 200 204	2,642 11,825 12,192	2 4 5	9.1 10.6 10.8	Selma Haynesville Paleozoic ? (Igneous)	2.04 1.13 1.13	 0.87 1.09
1747 8-20-72	Tenneco Oil Co. Alger Sullivan "A"	NE/SW	31	4N	7E	236	14,048	6	9.6	Paleozoic ? (Igneous)	1.21	
1824 2-27-73	J.M. Huber Corp. Grief Brothers 2-6	SE/NW	2	5N	9E	175 177	9,804 10,094	5 4	9.0 9.0	Cotton Valley Paleozoic	1.11 1.10	 0.69
1827 3-22-74	Tenneco Oil Co. Alger-Sullivan "C"	NW/SE	35	4N	7E	210	13,295	7	9.8	Paleozoic ? (Igneous)	1.08	
1851 6-7-73	Amerada Hess Corp. Woodrow Jackson Heirs	SW/NE	13	4N	8E	208	11,955	6	9.5	Paleozoic	1.19	
1908 11-13-73	Amerada Hess Corp. Ed Leigh-McMillan Tr.	SW/NE	24	4N	8E	214 219	12,577 12,691	7 8	9.9 9.4	Smackover Paleozoic ?	1.18 1.21	 4.39
2016 4-1-77	Jack E. Stack, Jr. O.D. Gilmore Unit 24-2	NW/NE	24	4N	8E	218	12,513	8	9.3	Smackover	1.21	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
2159 12-11-75	Tenneco Oil Co. Alger-Sullivan 34-16	SE/SE 34	4N	7E	226	13,604	5	9.2	Norphlet	1.18	
2170 3-3-76	Wheless Industries D.R. Coley et al	SE/SW 35	4N	7E	240	13,697	9	9.8	Paleozoic ? (Igneous)	1.27	
2184 2-11-76	Jack E. Stack, Jr. H.O. Dyess Unit 11-16	SE/SE 11	4N	8E	212	12,577	5½	9.4	Norphlet	1.16	
2212 4-26-76	Jack Stack Alger Sullivan 29-3	NE/NW 29	4N	7E	254	13,937	6	9.8	Paleozoic ? (Igneous)	1.35	
2213 6-22-76	Jack Stack Alger Sullivan 35-7	SW/NE 35	4N	7E	238	13,665	8	9.5	Paleozoic ? (Igneous)	1.26	

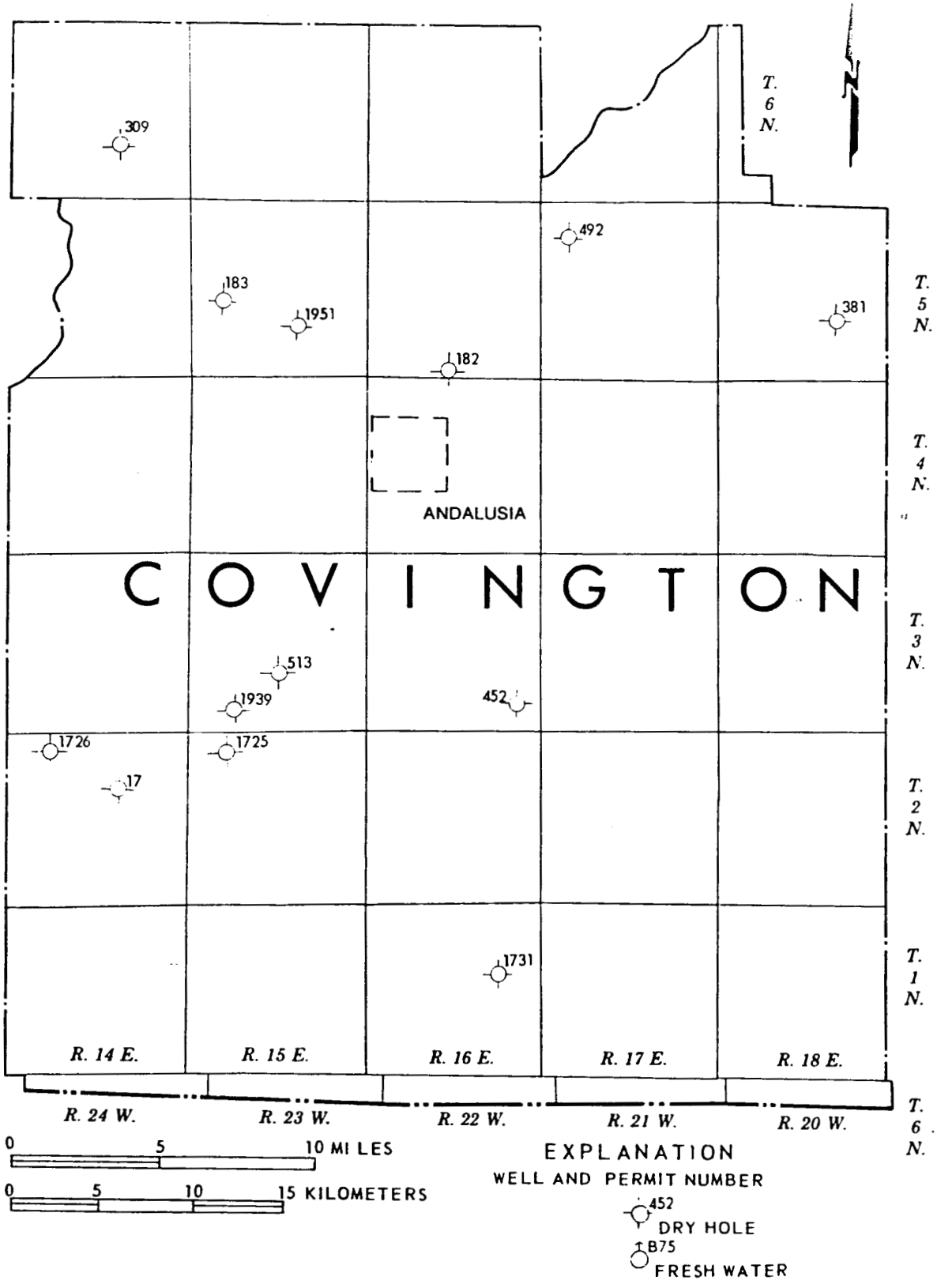

FIGURE 56. Covington County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
17 6-22-42	G.W. Strake A.F. Bullard et al	SW/SE	10	2N	14E	160	6,307	?	10.1	Early Cretaceous	1.49	
182 3-20-49	A.R. Temple Martin-Spicer	NE/SE	33	5N	16E	105	3,945	2	10.1	Early Cretaceous	0.99	
183 4-3-49	A.R. Temple C.S. Williams	SW/NW	20	5N	15E	107	4,208	2	10.0	Early Cretaceous	0.97	
309 11-25-51	Gulf Refining Co. H.R. Mott	NW/NE	27	6N	14E	122	5,692	3	10.3	Early Cretaceous	0.98	
381 11-8-52	J.F. Crow Well Serv. J.B. Ramer	SW/SW	23	5N	18E	105	3,628	2½	10.4	Early Cretaceous	1.08	
452 6-18-53	Lyle Cashion-Daws H.R. Evers	SW/SW	25	3N	16E	122	4,265	2½	9.3	Early Cretaceous	1.31	
492 10-26-53	Edward T. Merry Ed Gantt	NE/NE	7	5N	17E	124	3,861	2½	9.6	Early Cretaceous	1.50	
513 12-25-53	Lyle Cashion-Daws Charles Dixon et al	SW/SW	22	3N	15E	120 121	4,035 4,119	2 2	9.5 9.6	(Lower) Tuscaloosa (Lower) Tuscaloosa	1.34 1.34	
1725 9-2-72	Amoco Production Co. USA-Roy C. Sewell	NW/NW	5	2N	15E	188	11,638	7	9.5	Triassic ? igneous	1.05	
1726 7-4-72	Amoco Production Co. Evelyn Campbell	NE/NE	5	2N	14E	190	12,474	6	9.5	Triassic ? igneous	0.99	
1731 7-24-72	Texas Gas Expl. Corp. Internat'l & Scott 14-8	SE/NE	14	1N	16E	188 195	12,209 12,521	6 3	10.0 10.0	Norphlet Triassic ? igneous	1.00 1.03	 2.24
1939 2-14-74	Maguire Oil Co. Dixon 32-11	NE/SW	32	3N	15E	191	11,847	11	9.0	Paleozoic ?	1.06	
1951 4-16-74	Research Enterprises Foshee	NW/NW	27	5N	15E	160	9,754	5	9.4	Eagle Mills ?	0.96	

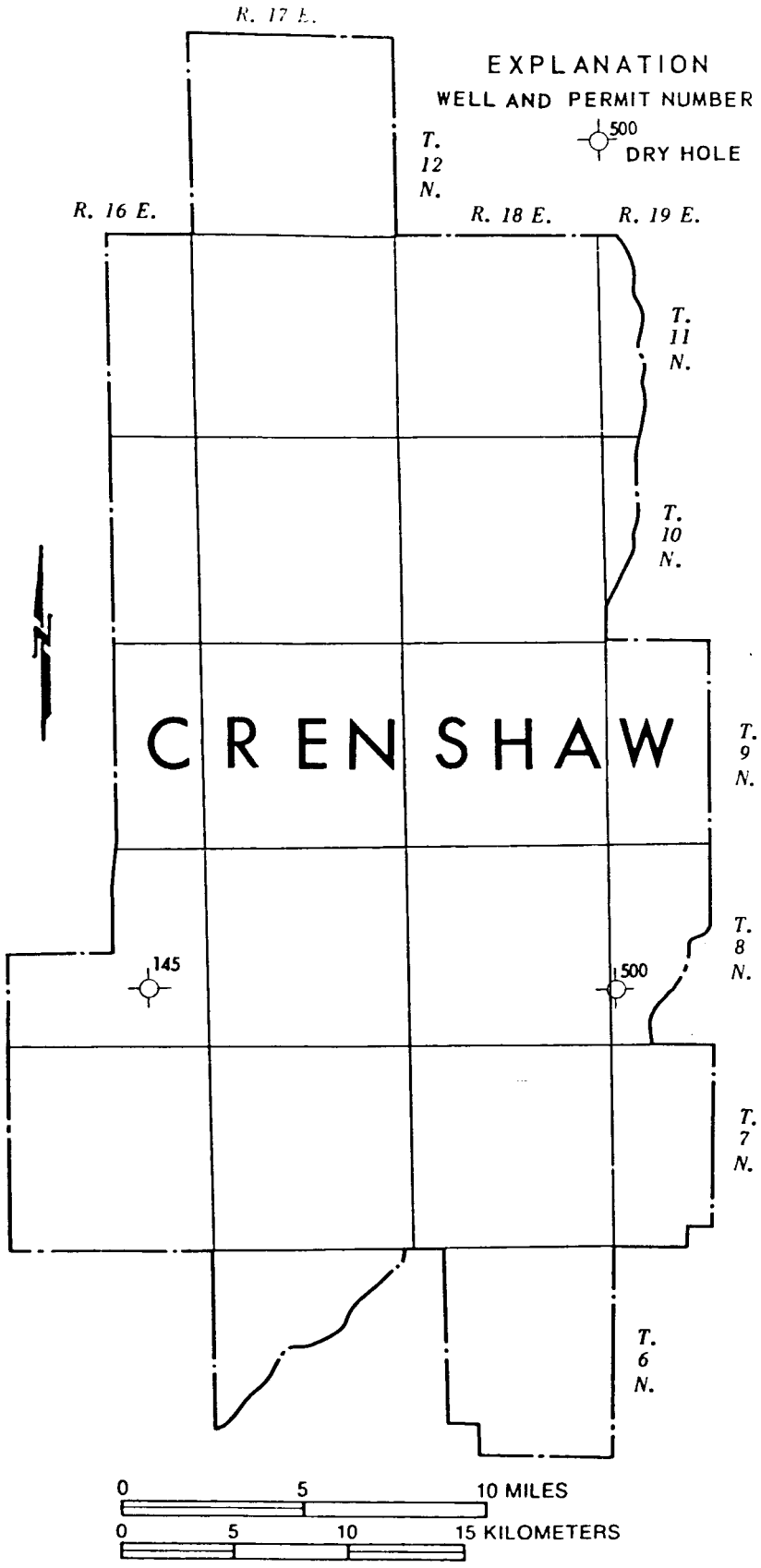

FIGURE 57. Crenshaw County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
145 11-13-47	A.R. Temple W.T. Smith	N½/NW	26	8N	16E	103	3,569	?	9.9	Early Cretaceous	1.04	
						132	7,609	?	9.9	Cotton Valley	0.87	0.72
						184	8,617	?	10.0	Eagle Mills ?	1.37	5.16
						186	9,614	?	10.2	Eagle Mills ?	1.25	0.20
500 11-18-53	J.A. Harper Carrie E. Copeland	SW/NW	30	8N	19E	118	3,500	2½	9.9	Early Cretaceous	1.49	

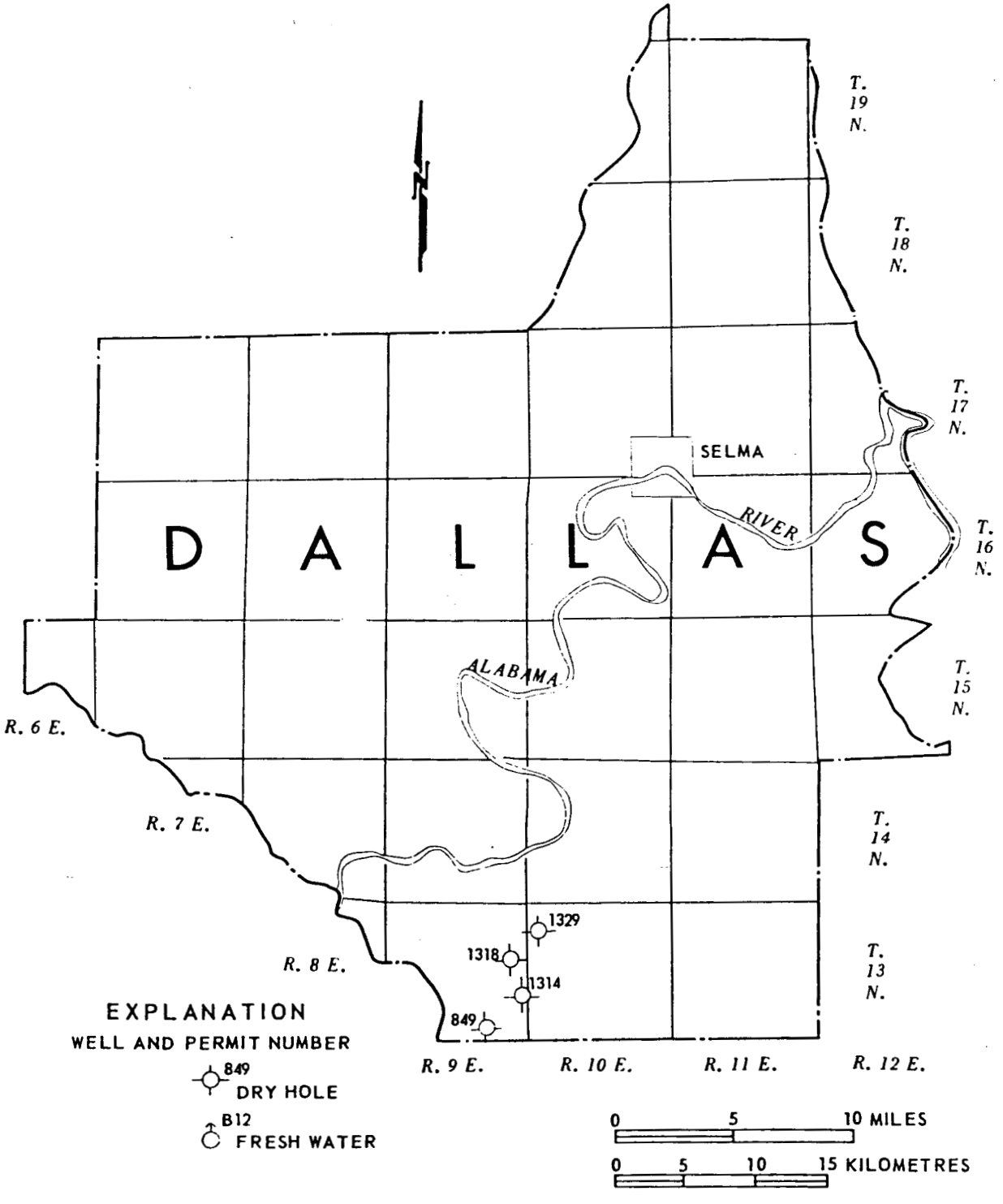

FIGURE 58. Dallas County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
849 4-24-58	Marion Buchanan William G. Hudson	NE/SW	35	13N	9E	110	4,918	2	9.6	Werner	0.89	
1314 5-26-64	Chesley Pruet et al Percy G. Wood	SE/SE	24	13N	9E	110	3,922	4	9.9	Cotton Valley ?	1.21	
1318 6-23-64	Chesley Pruet et al Buchanan & Sons	NE/SE	13	13N	9E	114	4,313	4	10.0	Werner	1.11	
1329 10-17-64	M.B. Rudman-M.H. Marr Buchanan no. 2	NE/NE	7	13N	10E	114	3,703	3	9.8	Paleozoic (Metamorphics)	1.30	

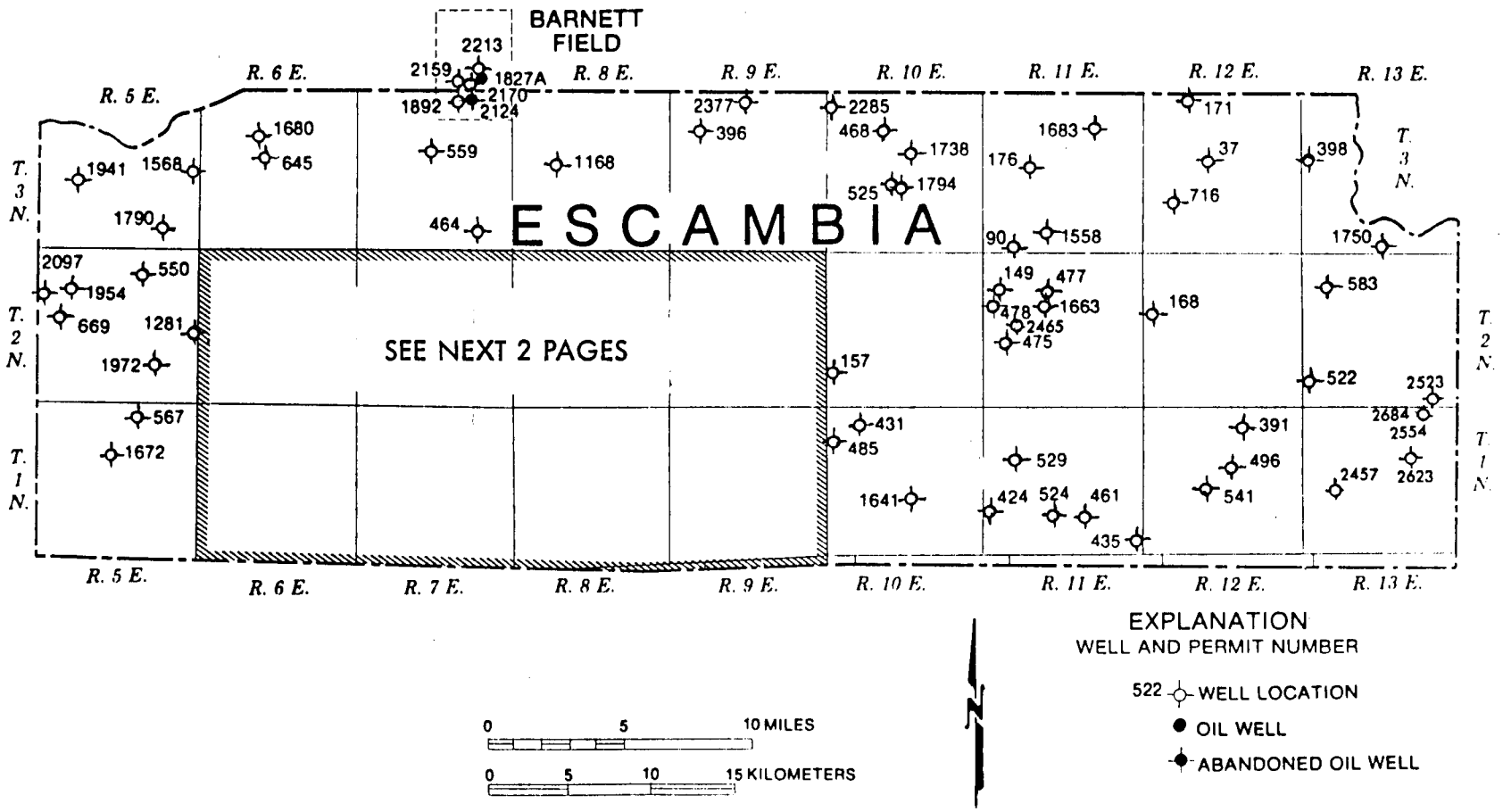

FIGURE 59. Escambia County map showing locations of wells for which geothermal data are listed in Appendix B

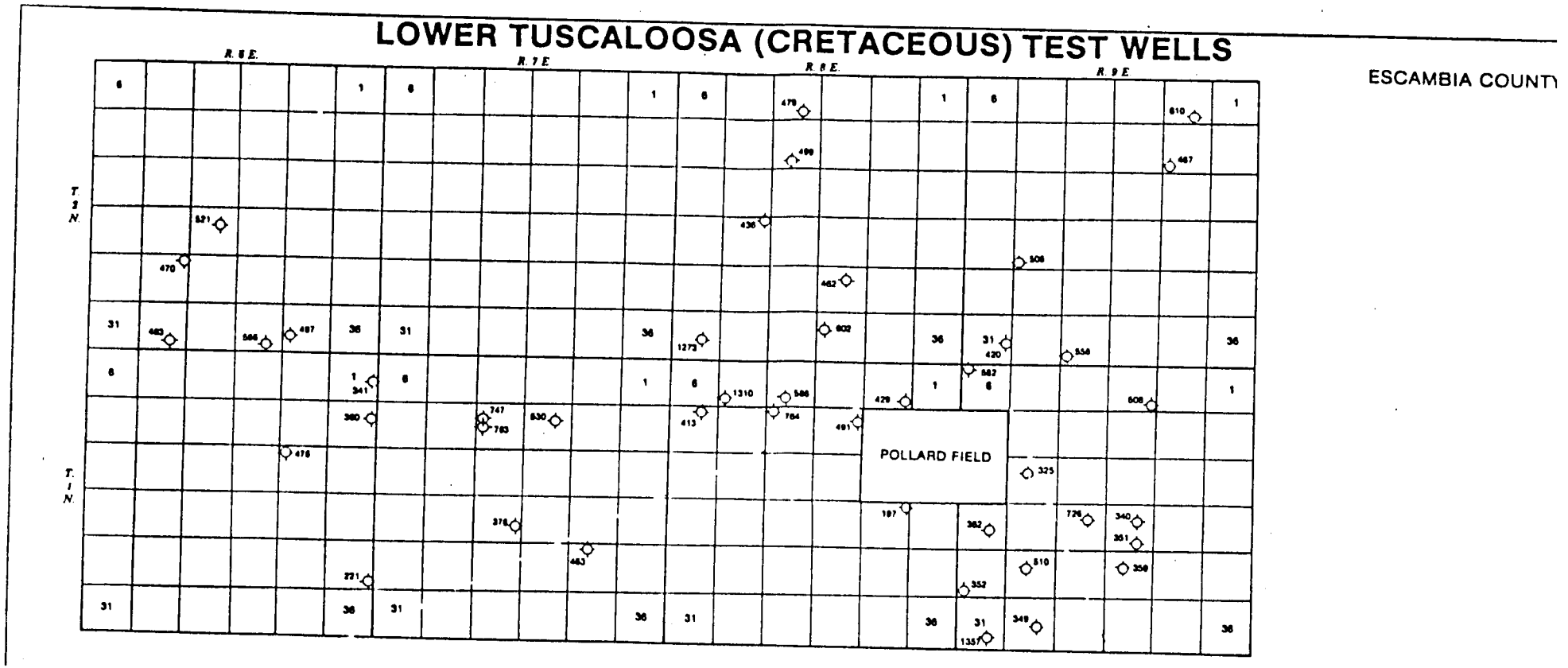

FIGURE 60. Area within Escambia County showing locations of wells included in Appendix B that bottom in Cretaceous Age rocks.

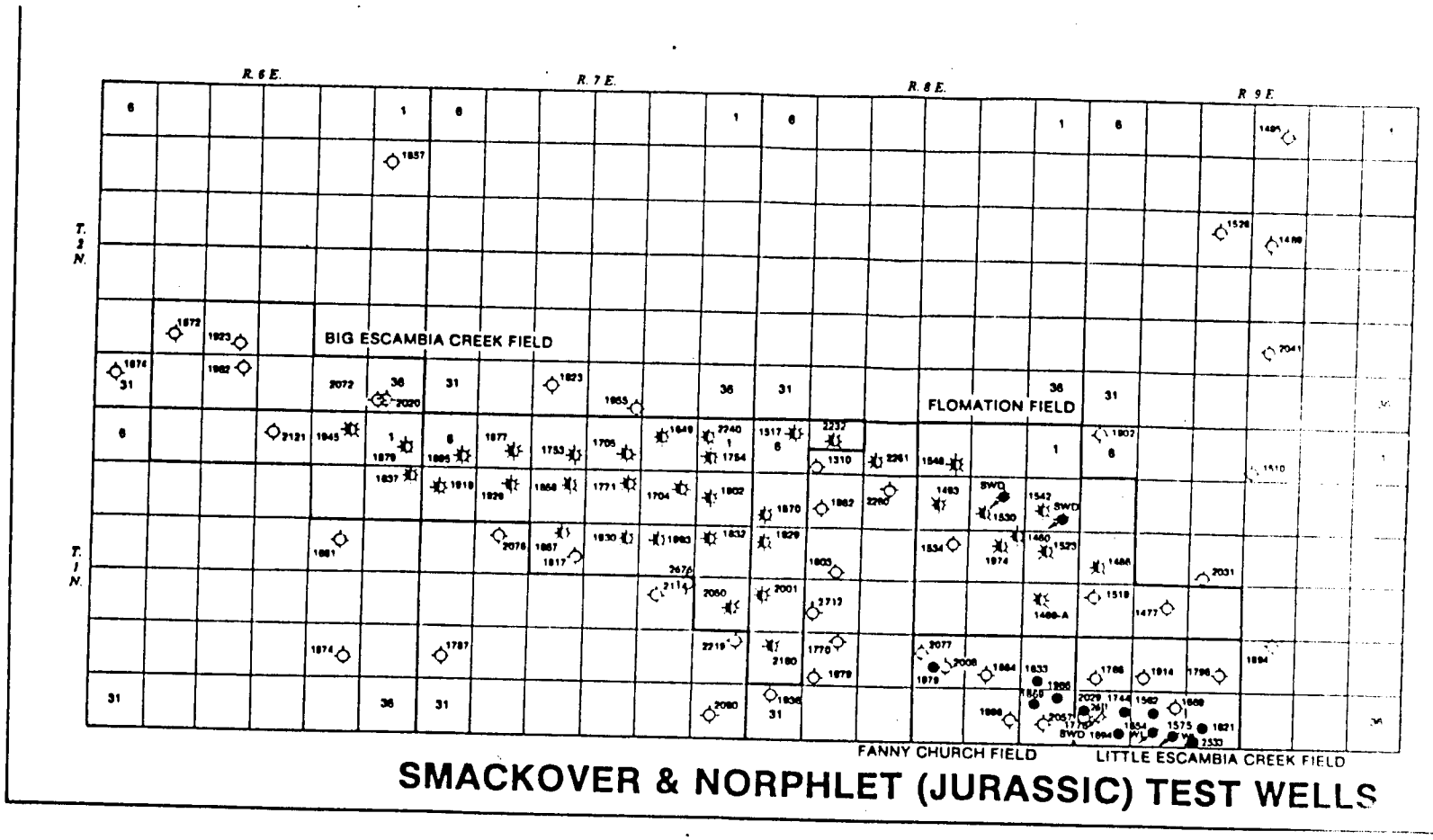

FIGURE 61. Area within Escambia County showing locations of wells included in Appendix B that bottom in Jurassic Age rocks

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) T	V
37 3-2-44	Hunt Oil Co. T.R. Miller Mill No. 2	NE/SW	16	3N	12E	146	5,924	?	10.1	Early Cretaceous	1.35
90 6-15-45	Hunt Oil Co. T.R. Miller Mill No. 3	SW/SW	32	3N	11E	147	5,170	?	10.2	(Upper)Tuscaloosa	1.56
149 10-4-47	Hunt Oil Co. T.R. Miller Mill No. 6	NW/SE	7	2N	11E	151	7,341	?	10.6	Early Cretaceous	1.16
157 12-15-47	The Texas Co. Wiggins (Cobb Unit)	SW/SW	30	2N	10E	136	5,982	?	10.3	Early Cretaceous	1.17
168 7-30-48	Hunt Oil Co. T.R. Miller Mill No. 7	NE/SW	18	2N	12E	128	5,880	3	10.2	Early Cretaceous	1.05
171 10-14-48	Hunt Oil Co. T.R. Miller Mill No. 8	NE/NE	5	3N	12E	131	5,716	2	10.3	Early Cretaceous	1.14
176 11-4-48	Hunt Oil Co. T.R. Miller Mill No. 9	SE/SE	17	3N	11E	140	5,748	2½	10.6	Early Cretaceous	1.29
197 12-17-50	Dan L. Reynolds St. Regis Paper Co.	NE/NE	23	1N	8E	155	6,522	2½	10.4	Early Cretaceous	1.36
221 7-10-50	Neilson & Walker C.E. Bochelor	SE/SE	25	1N	6E	150	6,666	1½	10.3	Early Cretaceous	1.26
293 9-28-51	Stanolind Oil & Gas Co. F.A. Steward	SE/SE	11	1N	8E	150	6,411	3½	10.3	Early Cretaceous	1.31
320 1-25-52	Humble Oil & Ref. Co. A.W. Moye	NE/NW	18	1N	9E	145	5,762	2½	9.7	(Lower)Tuscaloosa	1.37
325 2-19-52	Humble Oil & Ref. Co. Mrs. Lillie Congleton	SE/NW	17	1N	9E	152	5,976	3	9.6	(Marine) Tuscaloosa	1.44
					150	6,332	2	9.6	(Lower)Tuscaloosa	1.33	
327 3-9-52	Humble Oil & Ref. Co. H.D. Finlay	NE/SE	18	1N	9E	124	5,690	2½	9.7	(Marine) Tuscaloosa	1.02
					146	6,334	1½	9.6	Early Cretaceous	1.26	3.42
332 3-31-52	Humble Oil & Ref. Co. A. Lister	SE/NW	18	1N	9E	136	5,774	2	9.4	(Lower)Tuscaloosa	1.21
336A 6-16-52	Humble Oil & Ref. Co. A. Lister	SW/NW	18	1N	9E	144	5,768	2	9.6	(Lower)Tuscaloosa	1.35
337 4-26-52	Humble Oil & Ref. Co. A.W. Moye et ux No. 2	NW/NW	18	1N	9E	142	5,948	2	9.6	(Lower)Tuscaloosa	1.28
340 5-5-52	Humble Oil & Ref. Co. Frances F. Lovelace	SW/NE	22	1N	9E	148	6,506	2	10.0	(Lower)Tuscaloosa	1.26
341 5-20-52	Duffy & Harrington J.S. Nolin	NE/SE	1	1N	6E	150	6,547	4	10.3	(Lower)Tuscaloosa	1.28
342 9-1-52	Humble Oil & Ref. Co. Laura H. Kennedy et al	SE/NE	13	1N	8E	141	5,774	2½	9.2	(Lower)Tuscaloosa	1.30
343 5-16-52	Humble Oil & Ref. Co. L.G. Crosby	NE/NE	13	1N	8E	132	5,980	2	9.5	(Lower)Tuscaloosa	1.10
344 9-22-52	Humble Oil & Ref. Co. L.G. Crosby No. 2	NW/NE	13	1N	8E	123	5,945	1½	9.3	(Lower)Tuscaloosa	0.96
347 6-15-52	Gulf Oil Co. T.R. Miller Mill Co.	SE/SE	12	1N	8E	132	5,936	3	10.1	(Lower)Tuscaloosa	1.11
349 6-11-52	Humble Oil & Ref. Co. Clarence L.G. Kelly	NW/SE	32	1N	9E	144	6,187	2	9.8	(Lower)Tuscaloosa	1.26
351 6-27-52	Humble Oil & Ref. Co. T.R. Miller Mill Co.	SW/SE	22	1N	9E	142	6,528	2	9.7	(Lower)Tuscaloosa	1.16
352 7-9-52	Humble Oil & Ref. Co. Ed Leigh McMillan	SW/SW	30	1N	9E	146	6,223	2	9.6	(Lower)Tuscaloosa	1.28

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) γ_1	γ_2
354 7-17-52	Justiss-Mears Oil Co. T.R. Miller No. 2	SE/SW	12	1N	8E	147	6,243	3	10.1	Early Cretaceous	1.30	
355 8-29-52	Humble Oil & Ref. Co. L.G. Crosby No. 3	SW/SE	12	1N	8E	146	5,951	1½	9.8	(Lower)Tuscaloosa	1.34	
356 10-12-52	Humble Oil & Ref. Co. L.G. Crosby No. 4	NE/NW	13	1N	8E	125	5,767	2	9.5	(Lower)Tuscaloosa	1.02	
357 7-23-52	Humble Oil & Ref. Co. Gurnie A. Carter et ux	NW/NE	18	1N	9E	140	5,980	2½	9.3	(Lower)Tuscaloosa	1.24	
359 7-30-52	Humble Oil & Ref. Co. Ora N. Johnson	SE/NW	27	1N	9E	156	6,688	2	10.8	Early Cretaceous	1.35	
360 7-31-52	Sunnyland Contract. Co. R.L. Goldsmith	SE/NE	12	1N	6E	140	6,398	3	9.5	Early Cretaceous	1.16	
361 8-11-52	Gulf Oil Co. Pollard Waste Water Sys.	SW/SW	12	1N	8E	138	6,175	3	10.1	Early Cretaceous	1.17	
362 7-6-52	Sunnyland Contract. Co. R.L. Carden	NW/SE	19	1N	9E	140	6,089	3	9.0	(Lower)Tuscaloosa	1.21	
364 9-12-52	Humble Oil & Ref. Co. H.D. Finlay et al No. 2	SW/NE	18	1N	9E	138	5,758	2½	9.5	(Lower)Tuscaloosa	1.25	
369 12-4-52	Humble Oil & Ref. Co. A.W. Moye et ux No. 3	NE/NW	18	1N	9E	140	5,906	2½	9.5	(Lower)Tuscaloosa	1.25	
370 11-4-52	Humble Oil & Ref. Co. A.W. Moye et ux No. 4	NW/NW	18	1N	9E	143	5,949	2½	9.2	(Lower)Tuscaloosa	1.30	
371 10-30-52	Humble Oil & Ref. Co. L.G. Crosby et ux No. 5	NE/NE	13	1N	8E	145	5,895	2	9.6	(Lower)Tuscaloosa	1.34	
3[illegible] 9-2[illegible]-52	Arden A. Anderson A.C. Congleton et ux	C/NE	18	1N	9E	140	5,760	2	9.6	(Lower)Tuscaloosa	1.28	
37[illegible] 11-17-52	Humble Oil & Ref. Co. L.G. Crosby No. 6	SW/SE	12	1N	8E	140	5,939	2	9.5	(Lower)Tuscaloosa	1.25	
376 10-23-52	Sunnyland Contract. Co. Hugh M. Caffey et al	NE/SE	21	1N	7E	144	6,714	2½	9.3	Early Cretaceous	1.16	
379 11-11-52	Clinton Oil Co. St.Regis Co."A" No. 3	NW/SE	11	1N	8E	143	6,024	2½	9.8	(Lower)Tuscaloosa	1.23	
382 2-22-53	Gulf Oil Co. T.R. Miller Co. No. 2	SW/SW	12	1N	8E	135	5,932	2	9.8	(Lower)Tuscaloosa	1.16	
383 12-7-52	Gulf Oil Co. T.R. Miller Co. No. 3	SE/SE	12	1N	8E	143	6,213	4	10.3	Early Cretaceous	1.24	
384 1-26-53	Gulf Oil Co. T.R. Miller Co. No. 4	SE/SW	12	1N	8E	140	5,932	3½	9.8	(Lower)Tuscaloosa	1.25	
385 12-4-52	Clinton Oil Co. Gray	NW/SW	12	1N	8E	150	6,228	2	9.6	Early Cretaceous	1.35	
391 12-20-52	The California Co. Ann J. Jones	SE/SE	3	1N	12E	132	4,943	10½	9.8	(Marine) Tuscaloosa	1.34	
						134	5,494	1½	10.0	Early Cretaceous	1.24	0.36
394 12-20-52	Clinton Oil Co. St.Regis Paper Co."A"	NE/SE	11	1N	8E	142	6,013	1½	9.6	(Lower)Tuscaloosa	1.26	
395 12-21-52	Humble Oil & Ref. Co. Pollard Oil Unit No. 5	NW/NW	13	1N	8E	140	6,368	2½	9.5	Early Cretaceous	1.16	
396 1-5-53	Sunnyland Contractg. Co. A.E. Kelly Estate	SW/NW	8	3N	9E	146	5,622	1	9.1	Early Cretaceous	1.42	
398 2-3-53	W.G. Nelson John Allen	NW/SW	18	3N	13E	130	5,019	2½	9.4	Early Cretaceous	1.27	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
400 12-29-52	Humble Oil & Ref. Co. A.W. Moye et ux No. 5	NE/NW	18	1N	9E	138	5,965	3	9.1	(Lower)Tuscaloosa	1.21	
403 1-14-53	Clinton Oil Co. Gray Unit No. 2	NW/SW	12	1N	8E	145	5,964	2	9.2	(Lower)Tuscaloosa	1.32	
404 2-3-53	Clinton Oil Co. St.Regis Co. "A" No. 5	SE/SE	11	1N	8E	142	5,984	3	9.3	(Lower)Tuscaloosa	1.27	
405 2-20-53	Pan Amer. Pet. Corp. St.Regis Co. "A" No. 6	NW/SE	11	1N	8E	134	5,983	2	9.1	(Lower)Tuscaloosa	1.14	
406 4-1-53	Clinton Oil Co. St.Regis Co. "A" No. 7	SW/NE	11	1N	8E	142	5,975	2½	9.3	(Lower)Tuscaloosa	1.27	
407 8-21-53	Pan Am. Pet. Corp. St.Regis Co. "A" No. 8	SE/SE	11	1N	8E	143	5,979	3½	9.4	(Lower)Tuscaloosa	1.29	
409 1-12-53	Humble Oil & Ref. Co. L.G. Crosby No. 7	NW/NE	13	1N	8E	136	5,909	1½	9.6	(Lower)Tuscaloosa	1.18	
413 1-20-53	Sunnyland Contractg. Co. H.L. Lambeth	NW/NE	7	1N	8E	130	6,351	2½	9.0	Early Cretaceous	1.01	
420 3-18-53	Gulf Refining Co. Steward et al	NE/SE	31	2N	9E	140	6,071	3	9.7	Early Cretaceous	1.22	
421 3-15-53	Humble Oil & Ref. Co. Pollard Oil Unit No. 6	SW/NW	13	1N	8E	146	6,420	2½	9.2	Early Cretaceous	1.25	
422 4-5-53	Gulf Oil Co. T.R. Miller Co. No. 5	SE/SE	12	1N	8E	142	5,910	3	9.7	(Lower)Tuscaloosa	1.28	
424 3-22-53	I.P. & LaRue et al Atkinson Oil Trust	NW/NW	30	1N	11E	136	6,047	2	10.3	Early Cretaceous	1.16	
427 4-2-53	Humble Oil & Ref. Co. L.G. Crosby No. 8	NW/SE	12	1N	8E	137 138	5,612 6,236	2½ 2	9.8 9.8	(Upper)Tuscaloosa (Lower)Tuscaloosa	1.26 1.15	 0.16
429 4-18-53	Sunnyland Contractg. Co. T.R. Miller-Citizens Bk.	SE/SE	2	1N	8E	149	6,674	3	9.5	Early Cretaceous	1.24	
431 6-30-53	Sunnyland Contractg. Co. Albert E. Ashton	SW/SW	5	1N	10E	144	5,929	2	10.0	Early Cretaceous	1.31	
435 5-14-53	Sunnyland Contractg. Co. Atkinson Oil No. 2	SE/NE	36	1N	11E	144	6,095	2½	9.4	Early Cretaceous	1.28	
436 5-13-53	Sunnyland Contractg. Co. Kenneth George	NE/NE	20	2N	8E	140	5,956	2	9.7	Early Cretaceous	1.24	
444 7-23-53	Humble Oil & Ref. Co. Pollard Oil Unit No. 7	SW/SW	7	1N	9E	150	5,964	2	9.8	(Lower)Tuscaloosa	1.41	
448 6-2-53	Sunnyland Contractg. Co. H.D. Finlay	NW/SW	7	1N	9E	140	6,426	3½	9.5	(Lower)Tuscaloosa	1.15	
451 8-10-53	Humble Oil & Ref. Co. Mrs. L. Congleton No. 3	SE/NE	18	1N	9E	146	5,969	1½	9.8	(Lower)Tuscaloosa	1.34	
461 8-6-53	The California Co. Atkinson Oil Trust No. 2	SE/NE	27	1N	11E	138	5,871	2	9.5	Early Cretaceous	1.23	
462 8-19-53	Gulf Refining Co. F. Nat'l. Bank of Mobile	SW/NE	27	2N	8E	150 173	5,705 6,651	2½ 2	9.3 9.3	(Upper)Tuscaloosa Early Cretaceous	1.47 1.61	 2.43
463 8-10-53	Clinch Drilling Co. B. Miles Estate	NE/NW	26	1N	7E	147	6,750	3	10.0	Early Cretaceous	1.20	
464 9-10-53	Gulf Refining Co. Alger-Sullivan Lumb. Co.	SW/NE	35	3N	7E	142	5,853	9	9.4	Early Cretaceous	1.30	
467 9-2-53	Durbin Bond & Co., Inc. C.C. Huxford	SW/SW	11	2N	9E	143	5,969	2½	9.7	Early Cretaceous	1.30	
468 8-20-53	Durbin Bond & Co., Inc. MacMillan Trust	SW/NW	9	3N	10E	166	5,462	2½	9.6	Early Cretaceous	1.83	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth subsea (ft)	Time after circulation (hrs.)	Mud density (lbs/gal)	Formation or Age	Calculated Gradients (°F/100 ft) *1	*2
470 8-24-53	Sunnyland Contractg. Co. Alger-Sullivan Lumb. Co.	NE/NE 29	2N	6E	150	6,608	2	9.3	Early Cretaceous	1.27	
475 9-9-53	L. Cashion-D. Gammill Lindsey-Neal	SE/SE 19	2N	11E	138	5,727	2½	9.8	Early Cretaceous	1.26	
476 9-21-53	Durbin Bond & Co., Inc. J.E. Bozeman	NW/NW 14	1N	6E	144	6,517	2	9.9	Early Cretaceous	1.20	
477 10-17-53	Gulf Refining Co. T.R. Miller Co. No. 7	NE/SW 9	2N	11E	138	5,450	3	9.4	Early Cretaceous	1.32	
478 9-27-53	Gulf Refining Co. T.R. Miller Co. No. 6	NE/NW 18	2N	11E	138	5,631	3	9.6	Early Cretaceous	1.28	
479 10-1-53	Gulf Refining Co. F. Nat'l. Bank of Mobile	SW/SW 4	2N	8E	140	5,857	3	9.4	Early Cretaceous	1.26	
483 10-19-53	Stanolind Gas & Oil Co. John Benjamin Owens	SW/SE 32	2N	6E	152	6,368	2	10.0	Early Cretaceous	1.35	
485 11-6-53	Gulf Refining Co. T.R. Miller Co. No. 8	SW/NW 7	1N	10E	140	6,021	3	9.5	Early Cretaceous	1.23	
491 11-17-53	Stanolind Gas & Oil Co. R.W. Strength	SE/NE 10	1N	8E	114	6,050	2	9.8	(Lower)Tuscaloosa	0.79	
495 12-10-53	Humble Oil & Ref. Co. L.G. Crosby et ux No. 9	SW/SE 12	1N	8E	138	5,818	3½	9.8	(Lower)Tuscaloosa	1.24	
496 12-9-53	Lyle Cashion Co. Atkinson Trust	NE/SW 15	1N	12E	126	5,812	2	10.0	Early Cretaceous	1.03	
497 11-14-53	Sunnyland Contractg. Co. J. Merriwether	NW/SW 35	2N	6E	145	6,340	3	9.2	Early Cretaceous	1.25	
499 11-24-53	Gulf Refining Co. F. Nat'l. Bank of Mobile	SE/SW 9	2N	8E	143	5,856	4½	9.5	Early Cretaceous	1.31	
506 12-7-53	Clinch Drilling Co. C.C. Huxford, Sr.	SW/SW 20	2N	9E	144	6,091	3½	9.8	Early Cretaceous	1.28	
507 4-21-54	Humble Oil & Ref. Co. L.G. Crosby No. 10	NE/SW 12	1N	8E	138	5,943	2½	9.5	(Lower)Tuscaloosa	1.21	
508 2-3-54	Gulf Refining Co. Hattie C. Phelps	SE/SE 3	1N	9E	132	6,160	2	9.5	(Lower)Tuscaloosa	1.07	
510 12-19-53	Sunnyland Contractg. Co. Mrs. M. M. Brannan	SE/NW 29	1N	9E	142	6,245	3	9.3	Early Cretaceous	1.22	
511 1-22-54	Humble Oil & Ref. Co. Pollard Oil Unit No. 8	NE/NW 18	1N	9E	140	5,728	2½	9.5	(Lower)Tuscaloosa	1.29	
521 2-23-54	Como Drilling Co. Atmore Prison Farm	SW/NE 21	2N	6E	146	6,506	2½	9.5	(Lower)Tuscaloosa	1.23	
522 2-15-54	Sunnyland Contractg. Co. Atkinson Oil No. 3	NW/NW 31	2N	13E	137	5,465	2	9.5	Early Cretaceous	1.30	
524 3-10-54	Gulf Refining Co. Atkinson Oil Trust	SW/NE 28	1N	11E	142	5,967	2½	9.8	Early Cretaceous	1.27	
525 2-28-54	George Hunt et al E.L. McMillan Trust	NE/SW 21	3N	10E	139	5,731	2	9.6	Early Cretaceous	1.27	
529 3-25-54	Gulf Refining Co. Atkinson Oil No. 2	NW/NW 17	1N	11E	140	5,874	2	9.8	Early Cretaceous	1.26	
530 4-7-54	Sunnyland Contractg. Co. Travis Forte	SW/NE 10	1N	7E	146	6,398	2½	9.2	Early Cretaceous	1.25	
541 7-10-54	Gulf Refining Co. Atkinson Oil No. 3	SE/NW 21	1N	12E	141	5,816	2½	9.6	Early Cretaceous	1.29	
550 7-25-54	Sunnyland Contractg. Co. Alger-Sullivan Lmb.No. 2	NE/NE 10	2N	5E	150	6,437	2½	10.1	Early Cretaceous	1.30	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
556 8-14-54	Gulf Refining Co. Mollie Jackson et al	SW/SW	33	2N	9E	142	5,934	2½	9.7	Early Cretaceous	1.28	
559 8-31-54	Gulf Refining Co. A-S Lmb. "B" No. 2	SE/NE	16	3N	7E	140	5,710	3	9.5	(Lower)Tuscaloosa	1.30	
567 9-29-54	Walter F. Hamilton A.E. Stone et al	NW/SE	3	1N	5E	145	6,512	2	10.0	Early Cretaceous	1.21	
582 1-20-55	Hamilton & Armour Roy Hammac	NW/NW	6	1N	9E	150	6,696	2	10.2	Early Cretaceous	1.25	
583 1-6-55	Hamilton & Armour Atkinson Oil Trust	SE/NE	7	2N	13E	126	5,391	1½	9.7	Early Cretaceous	1.11	
586 1-17-55	Seaboard Oil Co. Alger-Sullivan Lmb. Co.	SW/SE	34	2N	6E	150	6,352	2½	10.2	Early Cretaceous	1.32	
						152	6,850	1½	10.5	Early Cretaceous	1.23	0.40
588 2-4-55	Seaboard Oil Co. S.C. Hammac	SE/SW	4	1N	8E	129	5,346	2	9.9	Eutaw	1.12	
						148	6,392	2	9.6	Early Cretaceous	1.28	1.82
602 5-4-55	Justiss-Mears Oil Co. Alger-Sullivan Lmb. Co.	SW/NW	34	2N	8E	148	6,518	2	10.6	Early Cretaceous	1.26	
610 8-15-55	Ray L. Estabrook C.C. Huxford, Sr.	SW/SE	2	2N	9E	135	5,980	2	9.8	Early Cretaceous	1.15	
645 3-19-56	Ray L. Estabrook Alger-Sullivan Lmb. Co.	NE/SW	16	3N	6E	140	6,043	2½	9.9	Early Cretaceous	1.22	
669 5-25-56	M.B. Rudman et al Alger-Sullivan Lmb. Co.	SE/NE	18	2N	5E	155	6,589	2	10.5	(Lower)Tuscaloosa	1.35	
716 10-24-56	Ray L. Estabrook T.R. Miller Mill Co.	NW/NW	29	3N	12E	122	5,040	2	9.8	(Lower)Tuscaloosa	1.11	
726 11-18-56	Thomas McMillan M.T. Harris	SW/NE	21	1N	9E	144	6,619	2½	9.9	(Lower)Tuscaloosa	1.18	
747 2-21-57	Zach Brooks Drlg. Co. Alger-Sullivan Lmb. Co.	SW/NW	9	1N	7E	195	10,183	3	10.3	Early Cretaceous	1.27	
						194	10,798	2	10.3	Early Cretaceous	1.19	
763 3-15-57	Zach Brooks Drlg. Co. Alger-Sullivan Lmb.No. 2	NW/SW	9	1N	7E	140	6,257	2	9.6	(Lower)Tuscaloosa	1.18	
764 4-1-57	C.D. Armour & Sunnyland Alger-Sullivan Lmb. Co.	NW/NW	9	1N	8E	110	6,225	2	9.6	Early Cretaceous	0.71	
1168 7-7-62	Mobico Oil Co. Alger Tenants in common	SW/SE	17	3N	8E	140	5,654	2	9.7	(Lower)Tuscaloosa	1.31	
1273 11-20-63	California Co. Calco-Alger Tenants	NW/SE	31	2N	8E	181	6,944	2	9.6	Early Cretaceous	1.66	
						198	9,728	3	9.7	Early Cretaceous	1.36	0.61
						198	11,251	4½	10.0	Early Cretaceous	1.17	
						210	11,946	4	10.3	Early Cretaceous	1.21	1.73
1281 11-21-63	LaGrange Pet. Co. Ely McGee	SE/NE	24	2N	5E	143	6,085	4	9.5	(Lower)Tuscaloosa	1.27	
1310 5-24-64	G.H. Jett Drlg. Co. Alger-tenants	SW/SW	5	1N	8E	200	10,315	6	9.7	Early Cretaceous	1.30	
1331 11-10-64	Newkirk-Anderson Agnes Congleton	SE/NE	18	1N	9E	138	5,768	3	9.5	(Lower)Tuscaloosa	1.25	
1357 6-19-65	Dick D. Quin T.R. Miller Mill	SW/SE	31	1N	9E	142	6,246	3	9.2	(Lower)Tuscaloosa	1.22	
1407 9-8-67	Arden A. Anderson A. Lister et al A-1	SE/NW	18	1N	9E	144	5,787	4	10.9	(Lower)Tuscaloosa	1.35	
1460 10-15-68	Humble Oil & Ref. Co. Bernice S. Wessner et al	NE/NE	14	1N	8E	240	13,128	9	9.4	Cotton Valley	1.33	
						250	14,745	7	9.4	Haynesville	1.25	0.62
1469A 1-24-69	Humble Oil & Ref. Co. Ray E. Loper et al	SE/NW	24	1N	8E	256	14,990	6	9.3	Buckner	1.27	
						278	15,366	5	14.2	Norphlet	1.38	5.85

STATE PERMIT Comol. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal.)	Formation or Age	Calculated Gradients (°F/100 ft.) T_1	T_2
77 9-8-69	Humble Oil & Ref. Co. Jernigan, Jr., et al	SW/NE	20	1N	9E	139	6,478	8½	9.3	Early Cretaceous	1.13	
						250	15,557	6	10.2	Norphlet	1.18	1.22
1486 5-23-69	Humble Oil & Ref. Co. E.L. Godwin et al	NE/SW	18	1N	9E	254	15,268	8	10.3	Norphlet	1.23	
1489 3-11-69	Humble Oil & Ref. Co. Huxford et al	NE/SW	15	2N	9E	236	14,573	4	7	Norphlet	1.17	
1493 10-30-69	Humble Oil & Ref. Co. Alger ten. No. 2 et al	NE/SW	10	1N	8E	222	14,690	8	9.6	Buckner	1.06	
						266	15,036	8	14.5	Buckner	1.33	12.72
						285	15,378	5	10.5	Norphlet	1.42	5.56
1495 4-30-69	Humble Oil & Ref. Co. Huxford et al No. 2	NW/SE	3	2N	9E	205	13,831	6	9.9	Haynesville	1.01	
						230	14,228	7	10.2	Smackover	1.15	6.30
						226	14,414	8	10.2	Norphlet	1.11	
1510 8-27-69	Pennzoil United, Inc. Wright et al	SW/SW	3	1N	9E	260	14,327	6	10.4	Buckner	1.35	
						257	14,737	18	10.6	Norphlet	1.30	
1517 4-9-70	Humble Oil & Ref. Co. T.A. Graham Gas Unit 6	SW/NE	6	1N	8E	229	14,456	6	9.4	Haynesville	1.13	
						237	15,283	6	10.4	Norphlet	1.12	0.97
1519 11-1-69	Humble Oil & Ref. Co. M.F. Powell Gas Unit 19	SE/NW	19	1N	9E	238	15,337	6	10.5	Norphlet	1.12	
1523 10-23-69	Humble Oil & Ref. Co. R.E. Loper Gas Unit 13	SE/NW	13	1N	8E	236	15,217	6	10.5	Norphlet	1.12	
1528 2-20-70	Murphy Oil Corp. Huxford	SE/NW	16	2N	9E	230	14,727	7	10.3	Eagle Mills	1.11	
1530 3-9-70	Humble Oil & Ref. Co. Steward Gas Unit 11	NE/SW	11	1N	8E	241	14,801	5	15.0	Buckner	1.18	
						271	15,144	8	10.6	Norphlet	1.35	8.75
1534 1-12-70	Chevron Oil Co. Alger-tenants 2	SW/NE	15	1N	8E	225	12,328	6	9.5	Cotton Valley	1.29	
						222	14,436	6	9.4	Haynesville	1.08	
						265	15,438	14	10.8	Louann	1.29	19.86
1542 5-22-70	Humble Oil & Ref. Co. Loper Gas Unit 12	NE/SW	12	1N	8E	225	12,107	5	10.5	Cotton Valley	1.31	
						238	14,793	5	10.5	Buckner	1.16	0.48
						240	15,248	5	11.3	Norphlet	1.14	0.44
1548 5-20-70	Chevron Oil Co. Alger Tenants Unit 2	NW/SE	3	1N	8E	218	14,334	6½	9.9	Haynesville	1.06	
						252	15,322	5½	11.0	Louann	1.21	3.44
1558 8-4-70	Eason Oil Co. T.R. Miller Mill	SE/NW	33	3N	11E	235	13,860	10	9.8	Palezoic (Crystalline)	1.22	
1562 8-31-70	Humble Oil & Ref. Co. Miller Unit 32 No. 2	SE/NW	32	1N	9E	236	14,239	6	9.6	Haynesville	1.19	
						247	15,520	7	10.5	Norphlet	1.17	0.86
1568 11-11-70	Shell Oil Co. Alger-tenants	NE/NE	24	3N	5E	130	3,217	3	9.8	Selma	1.99	
						229	13,831	6	9.3	Haynesville	1.18	0.93
						232	14,743	6	10.1	Paleozoic	1.13	0.33
1572 1-19-71	Chevron Oil Co. Scott Paper Co. et al	NE/SW	29	2N	6E	224	14,506	7	9.8	Haynesville	1.09	
						262	15,792	9	11.0	Norphlet	1.24	2.95
1575 12-29-70	Humble Oil & Ref. Co. Miller Co.-St.Line Trust	SE/SE	32	1N	9E	260	15,491	8	10.4	Norphlet	1.25	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
1603 5-19-71	Quintana Prod. Co. Alger-tenants	SW/SE	17	1N	8E	240	14,492	8	9.4	Haynesville	1.20	
						256	15,638	7	10.5	Louann	1.21	1.40
1621 9-15-71	Exxon Co.,U.S.A. St. Line Oil Trust	SW/SW	33	1N	9E	248	15,539	6	10.0	Norphlet	1.17	
1641 10-15-71	Superior Oil, L.L.& E. Miller-St. Line Trust	NW/SW	22	1N	10E	116	3,143	2	9.5	Tertiary	1.59	
						118	3,479		9.4	Selma	1.49	0.60
						210	13,735	5	10.1	Haynesville	1.05	0.90
						228	14,805	7	10.8	Norphlet	1.09	1.68
1649 12-17-71	Mallard Explor. Co. Inter. Paper et al	SE/NW	2	1N	7E	225	14,160	7	9.5	Haynesville	1.12	
						263	15,414	6	10.8	Louann	1.28	3.03
1654 5-2-72	Exxon Co., U.S.A. T.R. Miller 32-3	SE/SW	32	1N	9E	252	15,530	8	10.8	Louann	1.20	
1656 10-20-71	Humble Oil & Ref. R.E. Loper No. 11	NE/SW	12	1N	8E	152	6,011	5	9.7	(Lower)Tuscaloosa	1.43	
1663 12-9-71	Superior Oil, L.L. & E. T.R. Miller A-1	NE/NW	16	2N	11E	128	2,879	2	9.4	Selma	2.15	
						198	12,631	6	10.5	Cotton Valley	1.05	0.72
						209	13,879	5	10.8	Paleozoic (Crystalline)	1.03	0.88
1669 6-3-72	Humble Oil & Ref. T.R. Miller 32-1	SE/NE	32	1N	9E	247	15,460	11	10.3	Norphlet	1.17	
1672 3-6-72	Chevron Oil Co. Bayard Ewing et al	NW/NE	16	1N	5E	228	14,859	6 3/4	10.4	Haynesville	1.09	
						250	16,367	?	10.8	Norphlet	1.12	1.46
1674 2-23-72	Placid Oil Co. Digman 31-6	SE/NW	31	2N	6E	257	14,831	6	9.4	Haynesville	1.29	
						283	15,766	6	10.5	Norphlet	1.38	2.78
1679 8-4-72	La. Land & Explor. St. Regis et al	SW/SW	29	1N	8E	246	15,771	6	10.6	Norphlet	1.14	
1680 2-27-72	Getty Oil Co. Scott Paper 9-13	SW/SW	9	3N	6E	248	14,025	3	9.7	Buckner	1.30	
1681 2-29-72	Amoco Prod. Co. Jessie Stanton	SW/NE	14	1N	6E	248	15,350	7	10.7	Buckner	1.19	
1683 2-1-72	Superior Oil, L.L. & E. T.R. Miller B-1	SW/NW	11	3N	11E	204	11,620	13	10.6	Haynesville	1.19	
						202	12,693	6	10.8	Werner	1.07	
1694 7-3-72	Exxon Co., U.S.A. Miller-State Line	SE/SE	31	1N	9E	242	15,562	4	10.3	Norphlet	1.13	
1704 6-2-72	Mallard Explo., Inc. Scott Paper 11-7	SW/NE	11	1N	7E	234	14,325	9	9.2	Haynesville	1.17	
						262	15,561	7	10.5	Norphlet	1.26	2.27
1705 8-21-72	Mallard Explor. Inc. Scott Paper 3-10	NW/SE	3	1N	7E	220	14,298	6	9.1	Haynesville	1.08	
						256	15,438	6	10.6	Norphlet	1.23	3.15
1738 8-22-72	Inexco Oil Co. D.W. McMillan Trust	SW/NW	15	3N	10E	222	13,203	7	9.7	Paleozoic (Crystalline)	1.18	1.18
1744 8-20-72	Humble Oil & Ref. T.R. Miller Mill Co.	SE/NE	31	1N	9E	262	15,481	7	10.4	Norphlet	1.27	
1750 10-28-72	La. Land & Explor. T.R. Miller Mill Co.	SW/SW	34	3N	13E	110	2,273	2	8.8	Selma	1.94	
						212	12,003	6	9.8	Triassic?igneous	1.23	1.05
1753 3-11-73	Mallard Explor. Co. J.J. Miles et al 4-10	NE/SW	4	1N	7E	241	14,289	8	9.0	Haynesville	1.23	
						264	15,437	8	10.4	Norphlet	1.28	2.00

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			S.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal.)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
1754 10-28-72	Mallard Explor. Co. Container Corp. of Amer.	SE/SW	1	1N	7E	238 260	14,292 15,370	8 8	9.1 11.5	Haynesville Norphlet	1.20 1.26	 2.04
1766 11-28-72	Humble Oil & Ref. L & N Railroad 30-3	SE/SW	30	1N	9E	257	14,757	9	10.3	Norphlet	1.29	
1770 12-2-72	La. Land & Explor. O.F. White	SW/NE	29	1N	8E	252	15,667	14	10.7	Norphlet	1.19	
1771 12-28-72	Mallard Explor., Inc. Forte et al 10-7	SW/NE	10	1N	7E	230 262	14,395 15,501	5 8	9.1 10.8	Haynesville Norphlet	1.14 1.26	 2.89
1776 1-28-73	La. Land & Explor. Miller-State Line Trust	SE/NW	31	1N	9E	253	15,584	6	10.5	Norphlet	1.20	
1787 12-26-72	La. Land & Explor. Arthur Hall et al	NW/SE	30	1N	7E	252	15,874	7	10.5	Norphlet	1.17	
1790 12-28-72	Chevron Oil Co. Cecil Neal et al	SW/NE	35	3N	5E	232 229 242	14,182 14,745 15,026	18 6 11	9.8 10.8 10.4	Haynesville Paleozoic (Crystalline) Paleozoic (Crystalline)	1.17 1.11 1.17	 4.63
1794 12-1-72	Inexco Oil Co. McMillan Trust "A"	NW/SE	21	3N	10E	190 216	8,862 13,445	8 10	8.8 9.5	Early Cretaceous Werner	1.40 1.12	 0.57
1796 1-18-73	Serio-Dalco McDavid Lands 28-4	NW/SE	28	1N	9E	242	14,520	7	10.4	Haynesville	1.21	
1802 1-15-73	Humble Oil & Ref. McCurdy Gas Unit 12	SE/NW	12	1N	7E	246	15,467	6	10.3	Norphlet	1.16	
1817 5-11-73	Amoco Produc. Co. O.M. Gordon 16-9	NE/SE	16	1N	7E	238 262	14,898 15,854	6 5	9.5 11.0	Haynesville Norphlet	1.16 1.24	 2.51
1823 3-29-73	Exxon Corp. Scott Paper Unit 33	SE/NW	33	2N	7E	248	15,385	10	10.3	Norphlet	1.18	
1832 6-7-73	Mallard Explor. Inc. Scott Paper Co. et al	SE/NW	13	1N	7E	222 260	14,440 15,510	6 10	9.0 10.3	Haynesville Norphlet	1.08 1.25	 3.55
1833 4-16-73	Exxon Corp. Jimmy L. Bush 25-3	SE/SW	25	1N	8E	243	15,518	7	10.5	Norphlet	1.14	
1837 4-16-73	Exxon Corp. Dinks Farms, Inc. 12-1	NE/NE	12	1N	6E	230 240	14,398 15,736	10 6	8.7 10.3	Haynesville Norphlet	1.14 1.11	 0.75
1857 8-10-73	Exxon Corp. W.H. Ashcraft 12-6	SE/NW	12	2N	6E	252 250	15,244 15,322	20 7	10.3 10.3	Smackover Norphlet	1.22 1.20	
1858 6-22-73	Mallard Explor., Inc. St. Regis Co. 9-7	SW/NE	9	1N	7E	220 262	14,377 15,371	6 9	9.0 10.5	Haynesville Smackover	1.07 1.26	 4.23
1867 9-7-73	Mallard Explor., Inc. O.M. Gordon 16-2	NW/NE	16	1N	7E	244	15,350	16	10.5	Smackover	1.16	
1869 8-15-73	Exxon Corp. Dora J. Steely 36-2	SE/NW	36	1N	8E	252	15,561	9	10.4	Norphlet	1.20	
1870 8-4-73	Mallard Explor., Inc. Lambeth 7-14	SE/SW	7	1N	8E	258	15,510	12	11.1	Norphlet	1.24	
1874 9-8-73	Lamar Hunt Dinks Farm 26-10	NW/SE	26	1N	6E	278	15,952	7	10.9	Norphlet	1.33	
1877 1-4-74	Exxon Corp. Scott Paper Unit 5	NW/SE	5	1N	7E	256	15,385	7	10.2	Norphlet	1.23	

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1879 8-20-73	Exxon Corp. C.W. Helton et al	NW/SE 1	1N	6E	250	15,537	6	10.3	Norphlet	1.18	
1884 9-15-73	Exxon Corp. G.H. Hart 26-3	SE/SW 26	1N	8E	263	15,564	8	10.6	Norphlet	1.27	
1892 9-19-73	Tenneco Oil Co. Alger Sullivan "C"	SE/NE 3	3N	7E	209	13,686	6	9.5	Norphlet	1.05	
1894 11-30-73	La. Land & Explor. T.R. Miller Co. 27-1	NW/NE 27	1N	9E	220	11,334	7	9.5	Early Cretaceous	1.36	
					236	14,358	6	10.4	Haynesville	1.18	0.53
					246	15,311	6	10.6	Norphlet	1.17	1.05
1895 10-15-73	Exxon Corp. M.O. Turner Unit 6	C/SE 6	1N	7E	250	15,462	8	10.2	Norphlet	1.19	
1898 11-5-73	Exxon Corp. W.C. Bell et ux	NE/SE 35	1N	8E	242	15,626	7	10.3	Norphlet	1.13	
1902 11-15-73	Pruet & Hughes Co. St. Regis 6-3	NE/NW 6	1N	9E	248	14,981	16	10.7	Norphlet	1.21	
1914 11-6-73	Exxon Corp. T.R. Miller Mill	C/SW 29	1N	9E	240	15,285	7	10.7	Smackover	1.14	
					237	15,436	6	?	Smackover	1.11	
1919 2-27-74	Exxon Corp. Scott Paper Unit 7	SE/NW 7	1N	7E	272	15,397	8	10.2	Smackover	1.34	
1923 6-1-75	Exxon Corp. Al. St. Lease 338	SW/SE 28	2N	6E	234	15,429	14	10.1	Norphlet	1.09	
					250	15,483	6	10.1	Norphlet	1.19	29.63
1928 6-13-74	La. Land & Explor., Co. Albert Philyaw 8-1	NW/NE 8	1N	7E	260	15,403	4½	10.3	Smackover	1.26	
1929 4-17-74	Mallard Explor. Co. Koppers Gas Unit 18-6	C/NW 18	1N	8E	276	15,343	14	10.8	Smackover	1.37	
1930 9-13-74	Exxon Corp. Scott Paper Unit 15	C/NW 15	1N	7E	248	15,422	6	10.1	Smackover	1.18	
1936 4-5-74	Murphy Oil Corp. Jones Estate 31-2	NE/NW 31	1N	8E	252	15,769	6	10.1	Norphlet	1.18	
1941 4-4-74	Skelly Oil Co. International Paper	NW/SE 20	3N	5E	120	3,510	3	9.0	Tertiary	1.54	
					251	15,646	9	10.1	Paleozoic (Crystalline)	1.18	1.08
1945 4-2-74	Exxon Corp. Scott Paper Co. et al	SW/NE 2	1N	6E	244	15,364	6	10.4	Smackover	1.16	
1954 5-6-74	Tenneco Oil Co. Alger Sullivan "E"	NW/SW 8	2N	5E	266	16,304	8	10.3	Buckner	1.22	
					268	16,452	13	10.7	Smackover	1.23	1.35
1955 5-24-74	Mallard Explor., Inc. Moye Gas Unit 34-16	SE/SE 34	2N	7E	225	16,230	6	10.6	Norphlet	0.98	
1962 10-5-74	Exxon Corp. Mellon Ck. Owens Unit 33	C/NE 33	2N	6E	259	15,541	13	10.2	Norphlet	1.24	
1966 10-8-74	Exxon Corp. Scott Paper et al	NW/NE 36	1N	8E	258	15,481	6	10.0	Norphlet	1.24	
1972 9-25-74	Exxon Corp. Scott Paper 26-11	NE/SW 26	2N	5E	280	15,463	17	13.7	Smackover	1.38	
1974 10-1-74	Exxon Corp. B.S. Wessner Unit 14	SW/NE 14	1N	8E	244	14,543	4	9.3	Haynesville	1.22	
					246	15,247	6½	10.1	Norphlet	1.18	0.28
1979 8-30-74	Tesoro Pet. Corp. Scott Paper Co. 27-11	NE/SW 27	1N	8E	250	15,652	8	10.2	Norphlet	1.18	
1982 7-17-74	Mallard Expl., Inc. Knowles Gas Unit 8-11	NE/SW 8	1N	8E	242	15,403	6	10.7	Norphlet	1.14	

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1993 11-7-74	Pennzoil Produc. Co. Godwin Unit 14-6	SE/NW	14	1N	7E	234	15,275	7	10.2	Smackover	1.10	
2001 11-22-74	Exxon Corp. Scott Paper Unit 19	SE/NW	19	1N	8E	252	15,420	9	10.2	Smackover	1.09	
2006 2-23-75	Tesoro Pet. Corp. Arrington 27-10	NW/SE	27	1N	8E	254	15,625	6	10.0	Norphlet	1.20	
2020 3-14-75	Exxon Corp. Scott Paper Unit 36	C/SW	36	2N	6E	250	15,557	6	10.4	Norphlet	1.18	
2021 10-28-74	La. Land & Explor. T.R. Miller Mill	NW/NW	20	2N	11E	104	1,834	4	9.8	Salt Mountain	2.07	
2029 1-17-75	Murphy Oil Corp. Simmons	SW/NW	31	1N	9E	285	15,537	8	10.5	Norphlet	1.41	
2031 3-16-75	Exxon Corp. O.N. Johnson et al 16-13	SW/SW	16	1N	9E	106	3,231	3	8.8	Tertiary	1.24	
						147	6,441	4	9.1	Early Cretaceous	1.26	1.28
						230	13,917	7½	9.4	Haynesville	1.18	1.11
						240	14,934	6	10.3	Norphlet	1.17	0.98
2041 2-12-75	Tesoro Pet. Corp. Huxford 27-11	NE/SW	27	2N	9E	240	14,665	12	10.2	Norphlet	1.19	
2050 3-7-75	Exxon Corp. Scott Paper Unit 24	NW/SE	24	1N	7E	243	15,448	11	10.3	Smackover	1.15	
2057 4-3-75	Murphy Oil Corp. Johnson 36-3	NE/SW	36	1N	8E	256	15,638	7	10.4	Norphlet	1.21	
2072 7-7-75	First Miss. Corp. Claudia R. Merriwether	C/SW	35	2N	6E	262	15,752	13	10.0	Norphlet	1.24	
2076 6-4-75	Exxon Corp. Scott Paper Unit 17	SE/NW	17	1N	7E	254	15,405	10½	10.2	Smackover	1.22	
2077 6-30-75	Tesoro Petrol. Corp. St. Regis 27-5	SW/NW	27	1N	8E	252	15,681	6	10.4	Norphlet	1.19	
2090 7-11-75	Amoco Produc. Co. John J. Cooper 36-1	NE/SW	36	1N	7E	266	15,864	6½	10.3	Norphlet	1.26	
2097 7-12-75	Jack E. Stack, Jr. Alger-Sullivan Tenants	SW/SW	7	2N	5E	262	15,781	6	10.3	Norphlet	1.24	
2114 11-3-75	Exxon Corp. Scott Paper Unit 23	SE/NW	23	1N	7E	258	15,460	9½	10.2	Smackover	1.24	
2121 10-30-75	Tomlinson Interests, Inc. Merriwether Unit No. 3	SW/NE	3	1N	6E	228	14,005	8	9.3	Haynesville	1.16	
						262	15,728	5	10.0	Norphlet	1.25	1.97
2124 10-23-75	Wheless Indus., Inc. Jessie Fillmore et al	NW/NW	2	3N	7E	221	13,447	6	9.7	Smackover	1.15	
2160 7-14-76	Exxon Corp. Scott Paper Unit No.30	SE/NW	30	1N	8E	254	15,451	8	10.2	Smackover	1.22	
2219 5-28-76	Exxon Corp. Scott Paper Unit No. 25	NW/NE	25	1N	7E	247	15,362	11	10.2	Smackover	1.18	
2232 7-25-76	General Crude Oil Co. Atic Fee	SE/NW	5	1N	8E	248	15,175	8	10.5	Norphlet	1.20	
2240 8-16-76	Mallard Explor., Inc. Container of America	SW/NW	1	1N	7E	225	15,304	15	10.3	Norphlet	1.04	
2261 9-22-76	General Crude Oil Co. Atic Fee No. 2	C/SW	4	1N	8E	253	15,250	6	10.7	Norphlet	1.23	
2280 1-7-77	General Crude Oil Co. Atic Fee No. 3	SE/NW	9	1N	8E	259	15,386	9	10.5	Norphlet	1.25	
2285 12-3-76	Apexco-Amer. Quasar D.W. McMillan Trust	NW/SW	6	3N	10E	240	12,847	18	9.5	Norphlet	1.35	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
2377 11-8-77	Amarillo Oil Co. Hooper Mathews 4-8	SE/NE	4	3N	9E	228	12,993	7½	9.5	Norphlet	1.25	
2457 11-22-78	Amoco-Houston Corp. U.S.A. 20-30	SW/SW	20	1N	13E	216	13,722	10	9.6	Norphlet	1.09	
						221	14,364	7	9.6	Louann	1.08	0.79
2465 5-12-78	Union Oil of Calif. T.R. Miller 17-11	NE/SW	17	2N	11E	100	3,001	5	8.5	Selma	1.13	
						211	13,683	9½	10.0	Norphlet	1.06	1.04
2523 2-18-79	Houston Oil & Min. Mrs. L.W. Henley 36-13	SW/SW	36	2N	13E	240	12,610	21	9.5	Smackover	1.38	
						243	12,765	15	9.5	Smackover	1.39	1.94
2533 8-8-79	Exxon Corp. McDavid Lands 30-1B	SW/SW	33	1N	9E	255	15,700	19	9.6	Smackover	1.20	
2554 3-1-79	Houston Oil & Min. U.S.A.	NE/NE	2	1N	13E	190	12,900	8½	9.2	?(igneous)	0.96	
2611 7-31-79	Exxon Corp. J.L. Jernigan et al	SW/NW	31	1N	9E	251	15,431	11	9.6	Smackover	1.20	
2623 3-23-79	Houston Oil & Min. U.S.A. 15-9	NE/SE	15	1N	13E	212	13,580	9	9.3	Norphlet	1.08	
2676 7-7-79	General Crude Oil Co. Atic Fee 23-1	NE/NE	23	1N	7E	262	15,538	9	10.2	Smackover	1.26	
2684 5-15-79	Houston Oil & Min. U.S.A. 2-7	NE/NE	2	1N	13E	194	13,154	7½	9.3	Smackover	0.97	
2712 7-1-79	Mallard Explor., Inc. St. Regis Co. 20-12	NW/SW	20	1N	8E	281	15,641	12	10.2	Norphlet	1.37	

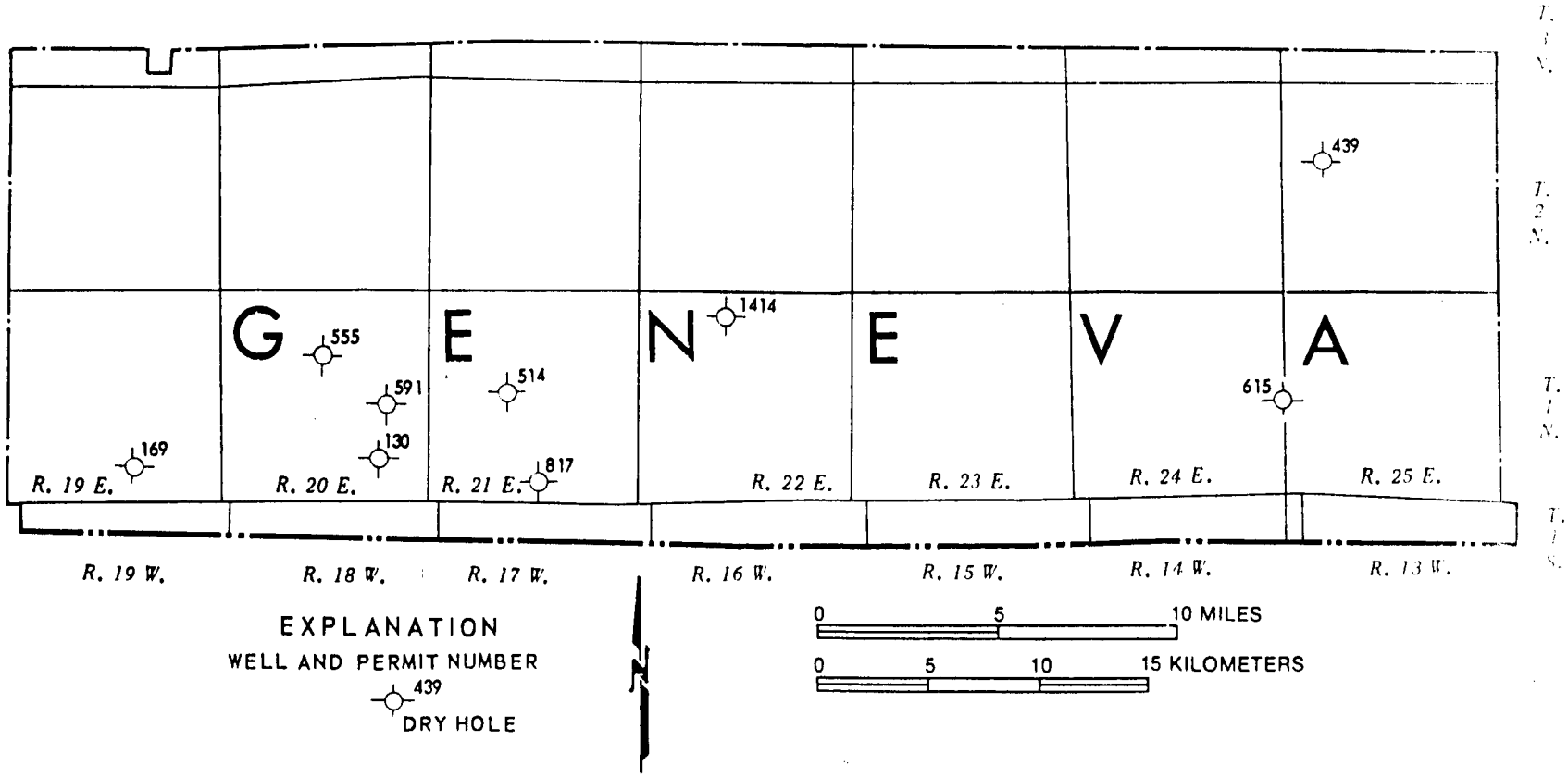

FIGURE 62. Geneva County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
130 1-25-47	Shell Oil Co. T.A. Yawkey	NW/SE	26	1N	20E	105	3,499	?	9.1	(Marine) Tuscaloosa	1.11	
						110	3,779	?	9.4	(Lower) Tuscaloosa	1.16	1.79
						110	4,233	?	9.8	Early Cretaceous	1.04	-
169 9-9-48	A.R. Temple J.P. Faulk	SW/SE	27	1N	19E	112	4,342	1½	10.0	Early Cretaceous	1.06	
439 5-27-53	Harry Harris J.N. Youngblood	NW/NW	17	2N	25E	115	3,621	2	9.8	Early Cretaceous	1.35	
514 1-6-54	Lyle Cashion Co. T.A. Yawkey et al	NW/SW	16	1N	21E	119	4,029	2½	9.6	Early Cretaceous	1.32	
555 7-21-54	Sunnyland Contracting W.A. Wilson et al	NE/SE	9	1N	20E	118	4,417	2	9.1	Early Cretaceous	1.18	
591 2-24-55	Thompson Expl. & Drlg. Thomas A. Yawkey et al	NE/NE	23	1N	20E	108	4,191	2	10.0	Early Cretaceous	1.00	
615 9-25-55	Southeastern Expl. Co. H.S. Battles	SE/SE	13	1N	24E	115	3,621	2	9.6	(Lower) Tuscaloosa	1.35	
817 11-7-57	A.W. Williams Drlg. C.M. Barnes	SE/NW	34	1N	21E	110	3,779	3	9.7	(Lower) Tuscaloosa	1.16	
1414 6-7-67	George S. Engle S.P. Thompson & B.F.	SW/NE	4	1N	22E	156	8,632	6	9.6	Paleozoic (igneous)	1.04	

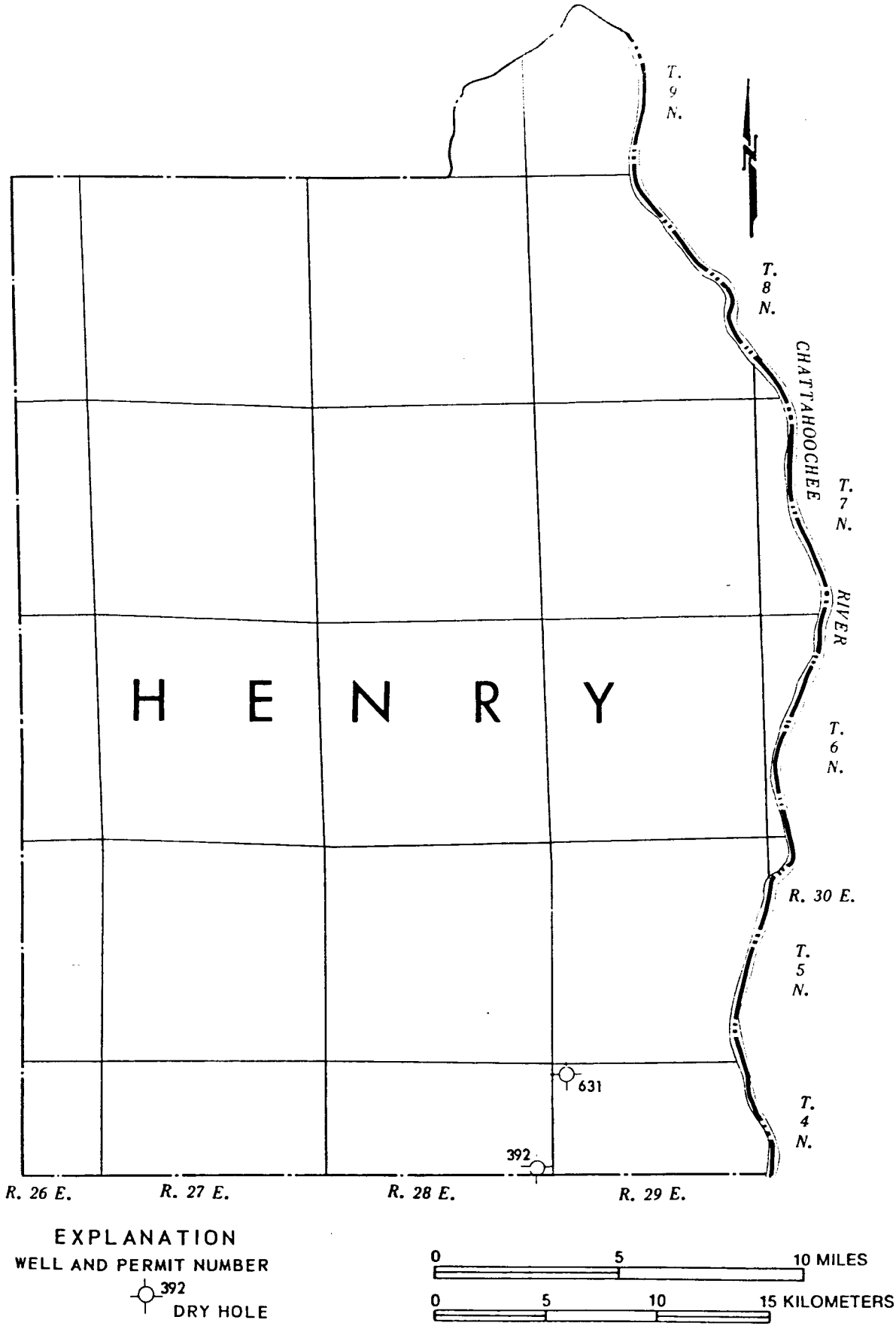

FIGURE 63. Henry County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Comol. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
392 12-3-52	SE Operator's Comm. Beatrice & O.A. Gamble	SW/SE	13	4N	28E	138	6,090	2½	10.0	Paleozoic ? (Igneous)	1.18	
631 3-2-56	Renwar Oil Corp. H.V. Granberry	NE/NW	6	4N	29E	115	4,827	2	9.9	Early Cretaceous	1.02	
						126	6,131	2	9.3	Paleozoic	0.98	0.84
						126	6,416	2	9.6	Paleozoic	0.94	

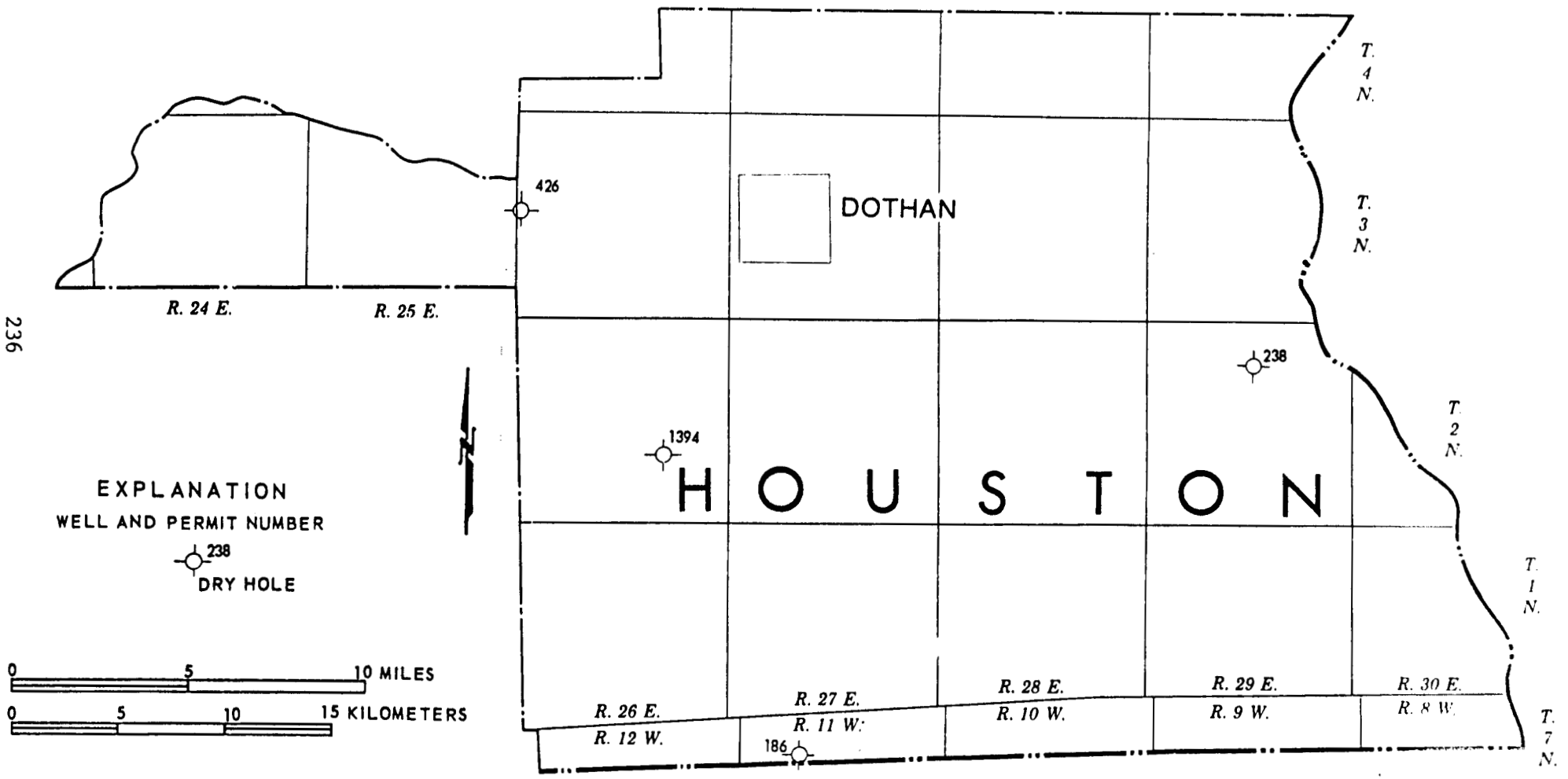

FIGURE 64. Houston County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
186	Union Producing Co.											
7-16-49	E.P. Kirkland	NE/NE	20	7N	11W	100	3,147	2	9.2	(Marine) Tuscaloosa	1.08	
						123	5,436	2	9.8	Early Cretaceous	1.05	1.00
						168	7,053	2	9.8	Early Cretaceous	1.45	2.78
						173	7,959	2	9.8	Paleozoic (Ordovician)	1.34	0.55
238	John S. Neilson											
11-21-50	A.L. Snell	NW/NW	10	2N	29E	128	3,795	1½	1½	Early Cretaceous	1.63	
426	R.W. Williams											
6-4-53	T.H. Whitfield	NW/SW	18	3N	26E	138	5,727	2½	10.0	Early Cretaceous	1.26	
1394	Flowers & Johnston											
12-4-66	P.E. Mixon	SW/NE	26	2N	26E	<100	2,917	5	9.4	(Lower) Tuscaloosa	<1.17	

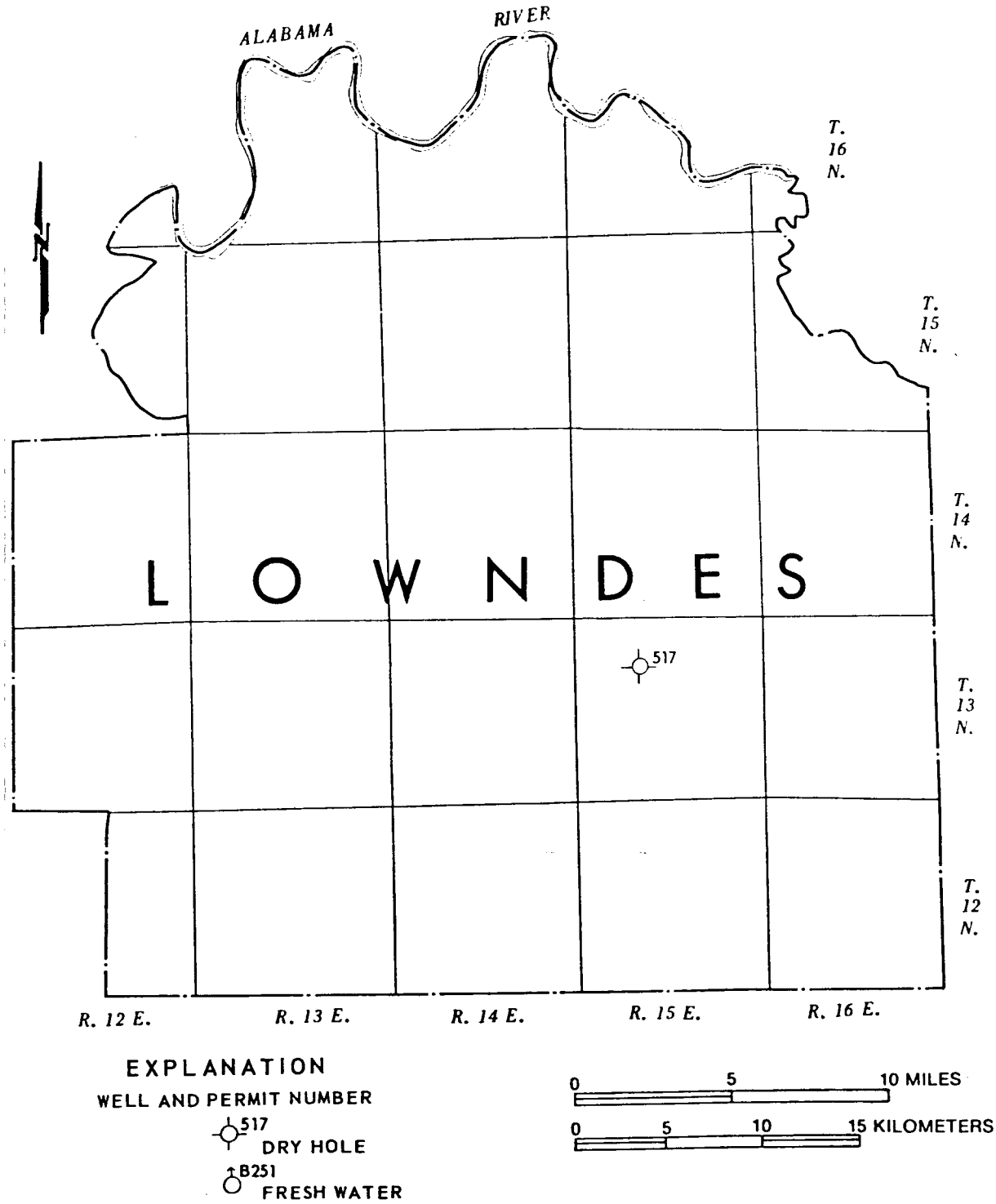

FIGURE 65. Lowndes County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
517 3-12-54	A. Ralph Williams C.S. Wright	NW/SW	9	13N	15E	100 ?	2,078	1½	?	Early Cretaceous	1.64 or less	

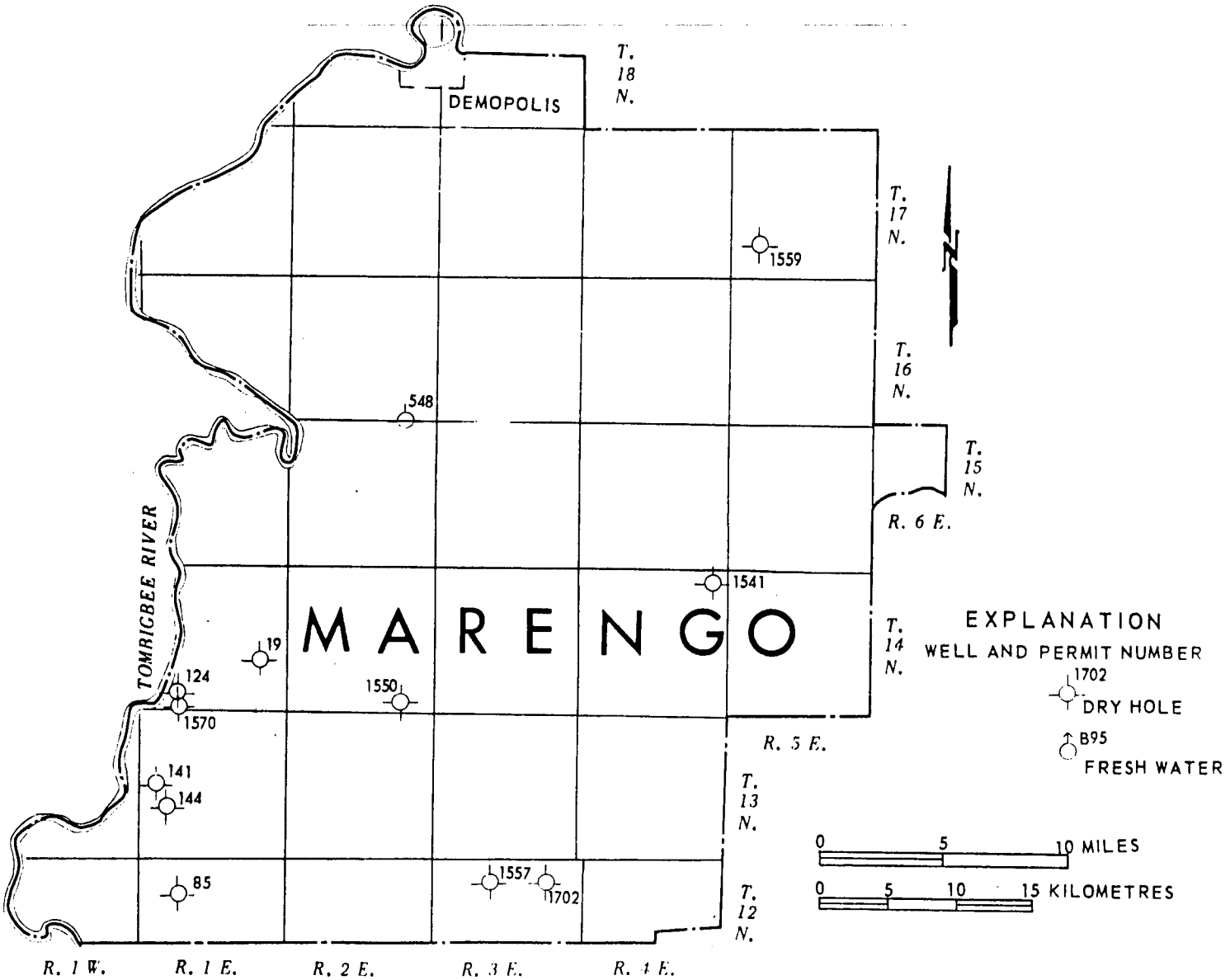

FIGURE 66. Marengo County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
19 4-11-43	Williams and Spier Jordan	SE/SE	23	14N	1E	106	3,412	?	?	Early Cretaceous	1.17	
85 5-28-45	A.W. Hutchings Mary Wadlington et al	SW/NE	8	12N	1E	120	4,049	?	10.5	Early Cretaceous	1.33	
124 9-14-46	Baillio & Trotter Tutt, Baillio & Trotter	NW/NE	32	14N	1E	136	3,788	?	10.2	(Lower) Tuscaloosa	1.85	
141 6-24-47	George Baillio J.L. Bedsole no. 1	SW/SE	18	13N	1E	128	3,200	?	10.1	(Lower) Tuscaloosa	1.94	
144 8-6-47	George Baillio J.L. Bedsole no. 2	SW/SW	20	13N	1E	132	3,323	?	10.2	(Lower) Tuscaloosa	1.99	
548 6-17-54	Ray B. Kelly Dr. O.M. Owensby	SE/NE	35	16N	2E	118	3,390	2	10.5	Early Cretaceous	1.53	
1541 2-23-70	Currey Oil Co. W.M. Glass et al	NE/NE	1	14N	4E	140	5,790	2	9.8	Paleozoic (Metamorphics)	1.28	
1550 3-26-70	Jack Daniel Wallace Tutt et al	SE/NE	35	14N	2E	105	2,208	4	9.7	Eutaw	1.77	
1557 8-7-70	Phillips Petro. Co. Cogle "A"	SW/NW	9	12N	3E	148	7,356	4	9.1	Norphlet	1.11	
1559 8-12-70	Hughes & Oglesby H.D. Alexander	NW/SE	29	17N	5E	103	3,781	6	9.6	Paleozoic	0.98	
1570 10-12-70	Rosen Oil Corp. W.J. Tutt	NE/NE	32	14N	1E	135	5,930	4	9.4	Paleozoic	1.16	
1702 3-12-72	Southeastern Drlg. B.A. Cogle - Johnson	NE/SE	11	12N	3E	150	7,347	6	9.3	Norphlet	1.14	

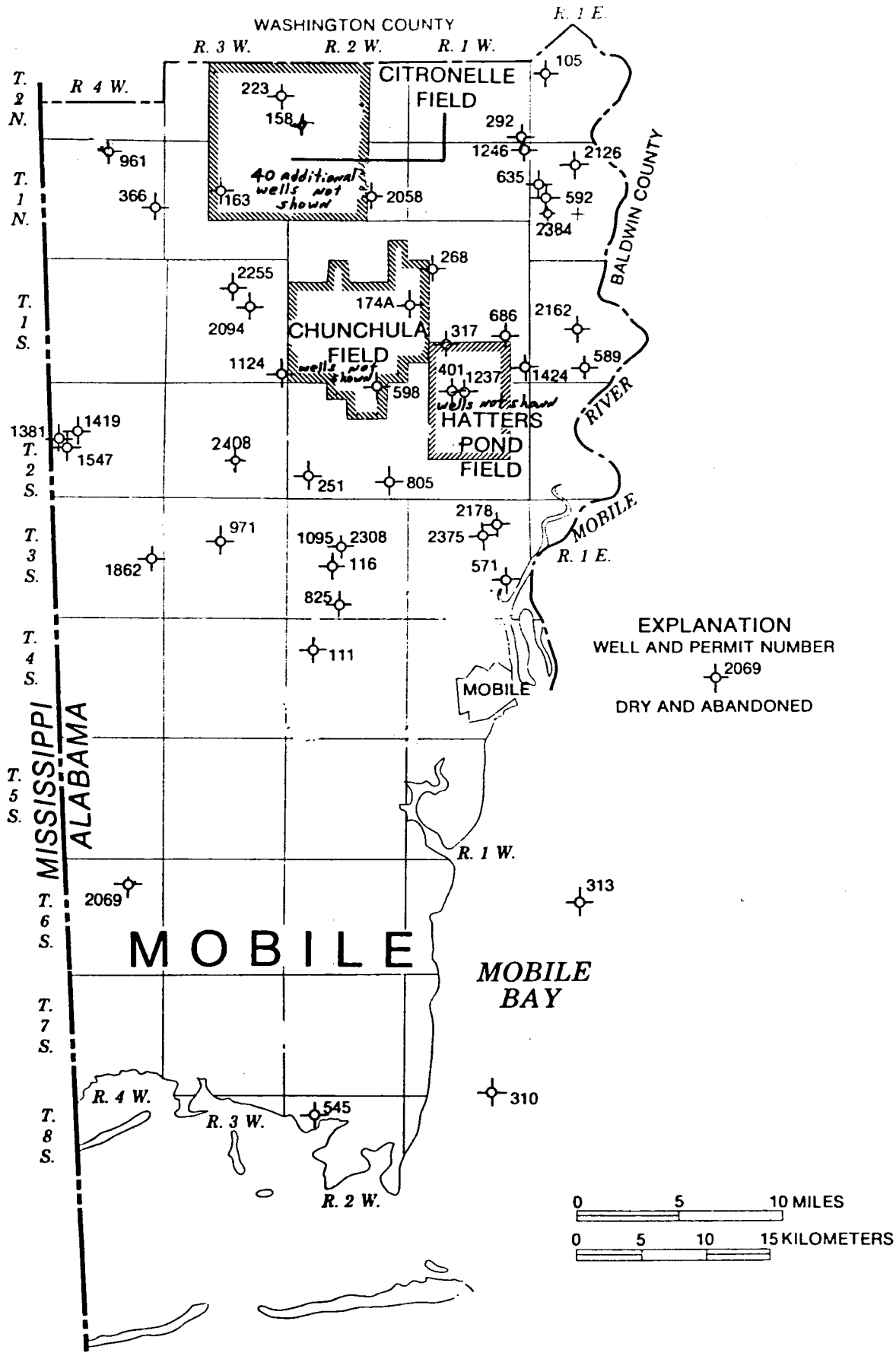

FIGURE 67. Mobile County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Completion	OPERATOR FEE	LOCATION Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth sampled (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
105 11-15-45	True Cauble Frank Boykin	NE/SE 25	2N	1E	145	7,440	?	10.1	Selma	1.06	
111 12-20-45	Danciger Oil & Ref. William R. Giesler	NE/SW 8	4S	2W	128	5,624	?	9.9	Selma	1.10	
					165	8,337	?	10.7	(Lower) Tuscaloosa	1.19	1.36
116 4-16-46	Mikton Oil Co. Mike Vergas	SE/NW 21	3S	2W	130	4,882	?	9.6	Tertiary	1.31	
158 1-26-48	E.B. Sullivan Q.U. Thompson	SE/NE 31	2N	2W	148	6,808	?	10.0	(Lower) Tuscaloosa	1.20	
					168	8,826	?	10.1	Early Cretaceous	1.16	0.99
163A 12-2-55	Humble Oil & Ref. Bd. of School Comm.	NE/SE 16	1N	3W	218	11,759	3	10.6	Early Cretaceous	1.29	
174A 4-26-61	Jett Drilling Co. Vollie E. Mims	NW/NW 18	1S	1W	210	12,055	3	9.8	Early Cretaceous	1.19	
223 7-26-50	Smith Oil Co. Means B. Odom	SE/SE 24	2N	3W	168	7,249	2	10.9	Early Cretaceous	1.41	
251 12-31-50	Morgan & Borden Harriet Kelly Gill	SW/SW 29	2S	2W	168	8,278	2	10.4	Early Cretaceous	1.23	
268 4-9-51	Morgan and Borden R.H. Radcliff et al	SW/NW 5	1S	1W	160	7,946	3	10.6	Early Cretaceous	1.18	
292 9-22-51	Gulf Refining Co. State Hospital "B"	NW/SE 36	2N	1W	182	10,790	3½	10.2	Early Cretaceous	1.08	
310 12-5-51	Gulf Refining Co. State of Alabama "D"	Mobile Bay Lat. 30°22'35.9" Long. 88°02'28.6"			98	2,245	2	10.1	Tertiary	1.43	
					136	5,716	3	10.2	Selma	1.22	1.09
					204	10,002	3½	11.0	Early Cretaceous	1.38	1.59
313 1-31-52	Gulf Refining Co. State of Alabama "D"	Mobile Bay Lat. 30°32.0'N Long. 88°0'W			168	8,104	3	10.8	Early Cretaceous	1.26	
					210	10,993	3	11.1	Early Cretaceous	1.31	1.45
317 12-27-51	Justiss-Mears Oil Co. E.L. Hatter	NE/NE 29	1S	1W	148	7,761	2½	10.5	Early Cretaceous	1.06	
366 10-2-52	I.P. LaRue & Stanford Altmayer-Coggins	SW/NE 24	1N	4W	174	7,788	2½	10.8	Early Cretaceous	1.39	
401 1-27-53	Mobile Drilling Co. E.L. Hatter Estate	NW/SW 4	2S	1W	126	5,072	2½	9.6	Selma	1.18	
					182	7,929	2½	10.4	Early Cretaceous	1.46	1.96
545 7-6-54	Peterson Drilling Co. Sophia A. Smith	NW/NE 8	8S	2W	174	8,991	2	10.5	Early Cretaceous	1.20	
571 10-18-54	Gulf Refining Co. U.S. Steel Corp.	NE/NE 26	3S	1W	182	8,169	3	9.9	(Lower) Tuscaloosa	1.42	
589 2-9-55	The California Co. Ladd Brothers	NE/NW 10	1S	1E	101	1,807	1	9.8	Tertiary	1.94	
					161	5,853	2½	10.0	Eutaw	1.62	1.48
					158	7,121	2	10.2	(Lower) Tuscaloosa	1.29	
592 4-20-55	The California Co. Rev. Sabino Grossi	SE/SW 43	1N	1E	140	6,477	2	10.3	Eutaw	1.14	
					146	6,842	2	10.3	(Marine) Tuscaloosa	1.17	1.64
					151	7,404	1½	10.2	(Lower) Tuscaloosa	1.15	0.89
598 4-7-55	Exeter Oil Co. International Paper	NW/NE 2	2S	2W	161	7,777	2	10.6	(Lower) Tuscaloosa	1.22	
608 9-2-55	Unit Manager Donovan A-25-5	SW/NW 25	2N	3W	155	7,194	2	9.9	Early Cretaceous	1.24	
					190	10,603	2	10.3	Early Cretaceous	1.17	1.03
					206	11,197	2	11.1	Early Cretaceous	1.25	2.69
680 7-26-56	Unit Manager Smithers no. 4	NE/NW 26	2N	3W	192	10,762	2	9.7	Early Cretaceous	1.17	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
686 9-12-56	The California Co. T.J. Rester et al	NE/SE	23	1S	1W	180	8,690	2	10.3	(Lower) Tuscaloosa	1.31	
						190	10,226	1½	10.6	Early Cretaceous	1.21	0.65
						215	11,191	2	10.6	Early Cretaceous	1.33	2.59
						210	12,454	3	10.8	Early Cretaceous	1.16	-
696 9-6-56	Unit Manager Stagg Unit	SE/NW	35	2N	3W	196	10,699	3	9.2	Early Cretaceous	1.22	
713 11-4-56	Unit Manager Citronell Unit 28	SE/NW	1	1N	3W	195	10,391	3	9.8	Early Cretaceous	1.24	
753 3-23-57	Unit Manager Riedemann	SE/NW	12	1N	3W	195	11,132	3	9.6	Early Cretaceous	1.16	
756 4-25-57	Unit Manager Citronelle Unit 37	SE/NW	36	2N	3W	215	11,160	3	9.3	Early Cretaceous	1.34	
791 7-20-57	Unit Manager M.L. Moorer	SE/NW	7	1N	2W	210	11,072	3	9.5	Early Cretaceous	1.30	
800 9-10-57	Unit Manager Tensaw Land & Timber	SE/NW	30	2N	2W	206	11,147	3	9.4	Early Cretaceous	1.26	
805 11-15-57	General American Oil J.W. Pake	NW/NW	36	2S	2W	90	1,793	8½	?	Tertiary	1.34	
						224	10,632	5	10.3	Early Cretaceous	1.49	1.52
						230	13,159	2½	10.2	Early Cretaceous	1.25	0.24
825 1-17-58	Southwestern Oil & Ref. C. Miller-City of Mobile	SE/NE	33	3S	2W	170	9,652	3	9.5	Early Cretaceous	1.08	
838 8-6-58	Lloyd Smith School Land	NW/SE	16	2N	3W	212	11,606	3	9.8	Early Cretaceous	1.26	
841 3-31-58	Unit Manager Coggins-Altmayer no. 2	SE/NW	6	1N	2W	202	11,202	2	9.4	Early Cretaceous	1.21	
857 6-15-58	Jett Drilling Co. M.L. Moorer	SE/SE	15	1N	3W	208	12,738	2	9.5	Early Cretaceous	1.11	
858 6-27-58	Citmoco Services, Inc. Carpenter	SE/NW	2	1N	3W	210	11,197	2½	9.5	Early Cretaceous	1.29	
909 9-8-59	Seneca Development Co. Meszaros	C/NW	22	2N	3W	185	11,519	3	9.7	Early Cretaceous	1.03	
931 2-20-59	Zach Brooks Drlg. Co. School Land no. 2	C/SE	16	1N	3W	224	11,412	2	10.2	Early Cretaceous	1.38	
961 6-30-59	Jett Drilling Co. Prine-Coggins-Altmayer	NW/SW	3	1N	4W	230	12,408	3	9.8	Early Cretaceous	1.32	
962 8-17-59	Unit Manager A.B. Jefferies	SE/NW	11	1N	3W	216	11,274	2½	9.7	Early Cretaceous	1.33	
971 7-27-59	Gulf Coast Drlg. & Expl. Bd. of Supervisors	NE/NE	16	3S	3W	175	8,302	2	10.1	Early Cretaceous	1.31	
						216	11,270	2	10.4	Early Cretaceous	1.33	1.38
981 8-19-59	Unit Manager Helveston-Schneider	SE/NW	17	1N	2W	219	11,391	3	9.5	Early Cretaceous	1.34	
985 9-19-59	Unit Manager Coggins-Altmayer 8-6	SE/NW	8	1N	2W	216	11,230	3	9.8	Early Cretaceous	1.34	
997 11-10-59	Unit Manager Eliza Mason no. 3	SE/NW	5	1N	2W	205	11,238	1 3/4	9.4	Early Cretaceous	1.24	
1067 10-27-61	Ancora Corporation Citronelle Unit B-31-7	SW/NE	31	2N	2W	206	11,308	2½	9.8	Early Cretaceous	1.24	
						256	15,808	3	10.2	Cotton Valley	1.20	1.11
						300	16,800	2½	10.2	Haynesville	1.39	4.44
						276	17,744	4½	12.1	Haynesville	1.18	-
						310	18,985	4½	11.3	Louann	1.29	2.74
1086 6-6-61	Dugger-Holmes & Assoc. Roy W. Johnston	SE/NW	13	1N	3W	210	11,234	4½	9.8	Early Cretaceous	1.28	
1090 9-10-62	Petrovest Corp. Citronelle Unit A-34-6	SE/NW	34	2N	3W	220	11,390	2½	9.6	Early Cretaceous	1.35	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
1092 9-19-61	C.H. Jett Drilling Co. Citronelle Unit A-28-2	NW/NE	28	2N	3W	216	11,275	2	9.6	Early Cretaceous	1.33	
1095 6-27-61	Chesley Pruet et al Indian Springs School	SE/NE	16	3S	2W	238	12,858	3	9.9	Early Cretaceous	1.34	
1108 10-19-61	Unit Manager Plemmons-Krump	SE/NW	23	2N	3W	210	11,267	2½	9.8	Early Cretaceous	1.28	
1124A 3-15-62	Jett Drilling Co. et al Vizard	NE/SE	36	1S	3W	242	12,194	3	9.8	Early Cretaceous	1.44	
1136 3-7-62	H.S. Moss W.H. Williams	SE/NW	14	1N	3W	218 222	11,176 11,326	2½ 1½	9.5 9.7	Early Cretaceous Early Cretaceous	1.36 1.38	 2.67
1137 3-14-62	Ancora Corp. Citronelle	SE/NW	32	2N	2W	210	11,297	2	9.6	Early Cretaceous	1.27	
1144 4-19-62	Serio-Punches Oil Co. George A. Pfaffman	SW/NE	33	2N	3W	215	11,343	2	9.7	Early Cretaceous	1.31	
1172 7-15-62	Sun Oil Co. Coggins-Altmayer no. 6	SE/NW	4	1N	2W	228	11,438	3½	9.8	Early Cretaceous	1.42	
1175 6-16-62	Four States Drlg. Co. Citronelle Unit C-24-2	NW/NE	24	1N	3W	200	11,044	2	9.5	Early Cretaceous	1.21	
1177 7-27-62	Dugger-Holmes & Assoc. Mary J. Miles no. 2	SW/NE	10	1N	3W	200	11,031	2	9.8	Early Cretaceous	1.21	
1191 8-29-62	Petroleum Management, Inc. Citronelle Unit D-9-6	SE/NW	9	1N	2W	214	10,997	2½	9.2	Early Cretaceous	1.35	
1194 10-21-62	G.H. Jett Drilling Co. Citronelle Unit B-33-1	NE/NE	33	2N	2W	232	11,546	2	9.6	Early Cretaceous	1.44	
1214 1-20-63	Petrovest Corp. Citronelle Unit B-19-6	SE/NW	19	2N	2W	214	11,414	2	9.4	Early Cretaceous	1.30	
1220 3-18-63	Sun Oil Co. M.L. Moorer Est. no. 4	SE/NW	10	1N	2W	203	11,193	3	9.8	Early Cretaceous	1.22	
1222 3-18-63	Petrovest Corp. Citronelle Unit A-14-10	NW/SE	14	2N	3W	214	11,337	4	9.7	Early Cretaceous	1.31	
1223 4-4-63	Petrovest Corp. Citronelle Unit C-3-6	SE/NW	3	1N	3W	212	11,247	4	9.8	Early Cretaceous	1.30	
1233 5-13-63	Citmoco Services, Inc. Citronelle Unit A-24-6	SE/NW	24	2N	3W	215	11,214	4	9.6	Early Cretaceous	1.33	
1237 6-19-63	Shell Oil Co. Creola Investment Corp.	NE/SE	4	2S	1W	194 236 232	10,279 11,938 12,652	6 4 4	9.5 10.1 10.1	Early Cretaceous Early Cretaceous Early Cretaceous	1.25 1.42 1.31	 2.53
1246 7-26-63	Citmoco Services, Inc. State of Alabama	SE/NE	1	1N	1W	219 242	11,952 12,434	4½ 24	9.9 9.9	Early Cretaceous Early Cretaceous	1.28 1.42	 4.77
1313 7-27-64	I.N. Hickox Roy B. Meyer	NW/SE	15	2N	3W	220	11,588	3	9.8	Early Cretaceous	1.33	
1319 9-2-64	G.H. Jett Drilling Co. Bd. of School Comm.	SE/NW	16	1N	2W	214	11,434	4	9.7	Early Cretaceous	1.29	
1321 8-2-64	G.H. Jett Drilling Co. Citronelle Unit B-18-10	NW/SE	18	2N	2W	219	11,560	3	9.7	Early Cretaceous	1.32	
1337 1-30-65	I.N. Hickox Citronelle Unit B-20-7	SW/NE	20	2N	2W	205	11,534	5	9.9	Early Cretaceous	1.21	
1381 5-21-66	Citmoco Services, Inc. Roy T. Boteler	NE/NE	19	2S	4W	240	12,728	4	10.1	Early Cretaceous	1.37	
1419 8-15-67	Citmoco Services, Inc. J.F. McGowin et al	SE/SE	17	2S	4W	172	8,266	5	9.8	Early Cretaceous	1.28	

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1424 10-12-67	Chesley Pruet Picard	NE/NE 36	1S	1W	220	11,440	4	9.6	Early Cretaceous	1.35	
1547 3-27-70	Southwest Gas Prod. Lucille K. Van Horn	NW/SW 20	2S	4W	185	10,389	4	9.9	Early Cretaceous	1.15	
1580 2-17-71	Shenandoah Oil Corp. Stallworth A-27-6	SE/NW 27	2N	3W	200	10,950	5½	9.4	Early Cretaceous	1.22	
1862 8-9-73	Forest Oil Corp. Betty Joe Anderson	NE/NW 24	3S	4W	226	13,611	6	9.2	Early Cretaceous	1.18	
					288	17,644	7	13.0	Haynesville	1.26	1.54
					322	19,162	15	12.0	Louann	1.34	2.24
1886 1-4-74	Union Oil of Calif. International Paper	SW/SW 22	1S	2W	218	12,065	5	9.1	Early Cretaceous	1.26	
					281	17,266	6	9.4	Haynesville	1.25	1.21
					305	18,624	10	10.1	Norphlet	1.28	1.77
1950 4-15-74	Union Oil of Calif. H.R. Odom 28-11	NE/SW 28	1S	2W	301	18,566	6	9.9	Norphlet	1.27	
1973 8-6-74	Union Oil of Calif. International Paper 21-11	NE/SW 21	1S	2W	296	18,271	6	10.1	Smackover	1.26	
1975 10-16-74	Union Oil of Calif. R.H. Radcliff, Jr. 31-11	NE/SW 31	1N	1W	220	11,894	13	9.1	Early Cretaceous	1.29	
					292	17,977	?	10.0	Haynesville	1.26	1.18
					292	18,288	7	11.1	Smackover	1.24	–
					308	18,421	8	10.8	Norphlet	1.31	12.03
1978 12-2-74	Getty Oil Co. Peter Klein 3-14	SE/SW 3	2S	1W	202	5,362	10	8.9	Selma	2.54	
					220	11,552	4	9.0	Early Cretaceous	1.33	0.29
					334	18,340	10	10.5	Louann	1.46	1.68
2005 1-18-75	Union Oil of Calif. Mobile Co. Bd. School	NW/SE 16	1S	2W	310	18,308	11	10.7	Smackover	1.33	
2019B 1-15-75	Union Oil of Calif. International Paper 20-7	SW/NE 20	1S	2W	302	18,235	9	10.0	Smackover	1.29	
2043 7-20-75	Getty Oil Co. Creola Minerals 10-11	NE/SW 10	2S	1W	296	16,386	8	11.1	Haynesville	1.40	
2044 3-31-75	Union Oil of Calif. J.A. Smith 15-6	SE/NW 15	1S	2W	293	18,167	8	10.2	Buckner	1.25	
2049 6-12-75	Getty Oil Co. E. Lyles Hatter Estate	NW/SE 4	2S	1W	304	18,397	9½	10.5	Norphlet	1.29	
					310	18,550	7	10.4	Norphlet	1.32	3.92
2055 2-21-75	Bart B. Chamberlain, Jr. B-17-12	NW/SW 17	2N	2W	178	11,164	6	9.5	Early Cretaceous	1.00	
2058 3-11-75	States Oil Co. Lambert Heirs	SW/SW 14	1N	2W	218	11,695	6	9.6	Early Cretaceous	1.30	
2062 5-8-75	Union Oil of Calif. International Paper 17-11	NE/SW 17	1S	2W	290	18,201	10	10.1	Buckner	1.23	
					315	18,322	12	11.5	Smackover	1.36	20.66
2069 7-19-75	Sage Petro. U.S., Inc. Otha O. Dees 11-6	SE/NW 11	6S	4W	129	5,729	6½	9.3	Selma	1.10	
					302	17,562	16½	9.6	Cotton Valley	1.34	1.46
					302	17,989	11	9.8	Haynesville	1.31	–
					343	18,819	?	9.8	Paleozoic	1.47	4.94
2071 4-21-75	R. Mosbacker et al Mobile Co. Bd. School	NW/SW 16	1S	1W	295	18,374	?	10.5	Norphlet	1.25	
2073 12-14-75	Getty Oil Co. Mobile Co. Bd. School	NE/SW 16	2S	1W	156	7,272	4	9.1	Eutaw	1.24	
					294	18,159	8	10.4	Buckner	1.26	1.27
					330	18,387	7½	10.5	Norphlet	1.44	15.79
2078 7-27-75	Getty Oil Co. McAlpine 9-10	NW/SE 9	1S	2W	302	18,237	11	10.1	Smackover	1.29	

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2082	Getty Oil Co.											
12-7-75	Creola Minerals 34-11	NE/SW	34	1S	1W	140	5,376	3	9.1	Selma	1.38	
						312	18,276	21	10.5	Norphlet	1.35	1.33
2085	Union Oil of Calif.											
7-31-75	International Paper 14-6	SE/NW	14	1S	2W	289	18,164	12	10.0	Buckner	1.23	
						320	18,260	18	10.2	Norphlet	1.39	
2094	Union Oil of Calif.											
7-14-75	M.V. Kelly et al 14-6	SE/NW	14	1S	3W	280	18,328	7	10.2	Smackover	1.17	
						292	18,423	8	10.2	Norphlet	1.23	-
2098	Getty Oil Co.											
9-26-75	B. Travis 20-11	NE/SW	20	2S	2W	115	5,154	8	8.9	Selma	0.95	
						322	18,713	8	10.5	Norphlet	1.37	1.53
2101	Getty Oil Co.											
11-4-75	G.W. Radcliff 9-6	SE/NW	9	2S	1W	115	5,210	5	9.3	Selma	0.94	
						305	18,326	14½	10.6	Smackover	1.30	1.45
2119	Union Oil of Calif.											
10-10-75	International Paper 24-11	NE/SW	24	1S	2W	300	18,158	8	10.2	Buckner	1.29	
						320	18,306	12	10.2	Norphlet	1.39	4.75
2120	Union Oil of Calif.											
2-17-77	E.T. Stapleton 27-7	SW/NE	27	1S	2W	125	5,024	5	8.9	Selma	1.17	
						298	18,288	8	10.4	Smackover	1.27	1.30
2126	Getty Oil Co.											
8-4-76	J.R. Sullivan 9-4	NW/NW	9	1N	1E	138	6,187	5	9.1	Tertiary	1.16	
						140	6,309	4½	9.0	Selma	1.17	1.64
						209	13,578	5	9.3	Early Cretaceous	1.05	0.95
						257	16,838	8	10.5	Haynesville	1.13	1.47
						284	17,389	15	10.4	Norphlet	1.25	4.90
						288	17,520	9	10.4	Norphlet	1.27	3.05
2127	Union Oil of Calif.											
11-12-75	M.C. Stallworth 23-11	NE/SW	23	1S	2W	290	18,156	5	9.2	Buckner	1.23	
2134	AMAX Petro. Corp.											
2-2-76	McLeod et al	NE/SW	26	1S	1W	130	5,366	2	9.2	Selma	1.19	
						291	17,506	20	9.4	Haynesville	1.29	1.33
						318	18,646	6	10.3	Norphlet	1.35	2.37
2147B	Union Oil of Calif.											
2-18-76	International Paper 13-10	NW/SE	13	1S	2W	290	18,161	6	10.5	Smackover	1.23	
2150	Getty Oil Co.											
6-8-76	G.E. Loflin 11-6	SE/NW	11	2S	1W	286	16,970	11	10.1	Louann	1.30	
						318	18,561	8	17.8	Louann	1.36	2.01
2156	Getty Oil Co.											
10-22-76	DeWitt C. Baldwin Est.	SW/NE	15	2S	1W	286	16,911	8	9.6	Haynesville	1.30	
						319	18,496	7	17.7	Louann	1.37	2.08
2158	Union Oil of Calif.											
2-12-76	M.V. Kelly 11-10	NW/SE	11	1S	2W	220	11,741	5	9.0	Early Cretaceous	1.31	
						305	18,163	9	10.3	Buckner	1.32	1.32
2162	Florida Gas Expl. et al											
3-10-76	Ideal Basic Ind. et al	SW/NW	8	1S	1E	105	5,227	4	8.9	Tertiary	0.75	
						268	16,778	5	9.7	Haynesville	1.20	1.41
						271	17,495	6	11.0	Smackover	1.17	0.42
2172	Getty Oil Co.											
3-22-76	Creola Minerals 2-11	NE/SW	2	2S	1W	128	5,453	3½	9.0	Selma	1.14	
						292	17,176	10	10.3	Smackover	1.31	1.40
2178	Jacintoport Corp.											
2-24-76	Jacintoport Corp.	SE/NW	11	3S	1W	218	11,949	3	9.3	Early Cretaceous	1.27	
						318	17,796	6	10.0	Haynesville	1.42	1.71
2199	Getty Oil Co.											
7-4-76	S.M. Adams 9-10	NW/SE	9	2S	1W	290	17,771	12	9.8	Haynesville	1.26	
2200	Union Oil of Calif.											
5-21-76	International Paper 12-6	SE/NW	12	1S	2W	203	11,741	8	9.1	Early Cretaceous	1.17	
						282	18,118	8	10.5	Buckner	1.19	1.24

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2207	Getty Oil Co.											
7-11-76	Creola Minerals 33-10	NW/SE	33	1S	1W	130	4,800	4	9.0	Selma	1.33	
						275	17,840	8	10.4	Haynesville	1.17	1.11
						288	18,350	6	10.5	Norphlet	1.21	2.55
2208	Getty Oil Co.											
9-3-76	C.W. Radcliff 17-10	NW/SE	17	2S	1W	118	4,863	1½	9.2	Selma	1.07	
						284	17,909	5	9.8	Haynesville	1.23	1.27
2209	Union Oil of Calif.											
7-13-76	E.L. Maples 18-11	NE/SW	18	1S	1W	306	18,358	10	10.5	Norphlet	1.31	
2218B	Getty Oil Co.											
9-30-77	A.M. Hill et al 10-10	NW/SE	10	1S	2W	295	17,983	22	10.3	Haynesville	1.27	
						312	18,368	6	10.4	Norphlet	1.34	4.42
2222B	Getty Oil Co.											
2-20-77	D.C. Baldwin est. 21-7	SW/NE	21	2S	1W	324	18,616	11	10.5	Norphlet	1.39	
2226	I.N. Hickox											
6-18-76	Stallworth Naval Stores	NW/SW	14	2N	3W	210	11,013	6½	9.3	Early Cretaceous	1.31	
2233B	Union Oil of Calif.											
4-21-77	R.J. Newman 7-7	SW/NE	7	1S	1W	146	6,211	8	8.9	Eutaw	1.29	
						302	18,281	9	10.6	Smackover	1.29	1.29
						303	18,331	8	10.8	Norphlet	1.29	-
2234	Union Oil of Calif.											
10-16-76	International Paper 25-6	SE/NW	25	1S	2W	286	18,317	10	10.4	Smackover	1.20	
2237	I.N. Hickox											
7-3-76	Annie Whatley A-14-14	SE/SW	14	2N	3W	242	10,991	7	9.5	Early Cretaceous	1.60	
2241	Union Oil of Calif.											
9-29-76	Mattie J. Turner 1-7	SW/NE	1	1S	2W	205	12,036	8	9.1	Early Cretaceous	1.15	
						314	18,553	11½	10.2	Norphlet	1.34	1.67
2250B	Getty Oil Co.											
2-17-77	Creola Minerals 5-1	NE/NE	5	2S	1W	302	17,894	14	10.5	Haynesville	1.32	
						304	18,498	9	10.5	Norphlet	1.29	0.33
2252	Exchange Oil & Gas											
5-14-77	Richard W. Rascoe et al	NW/SE	3	2S	2W	288	17,768	8	9.6	Haynesville	1.25	
						305	18,451	10	10.1	Smackover	1.30	2.50
2254	I.N. Hickox											
10-9-76	Stallworth Naval Stores	SW/NW	14	2N	3W	210	11,033	6	9.5	Early Cretaceous	1.31	
2255	Continental Oil Co.											
10-16-76	M.V. Kelly 10-6	SE/NW	10	1S	3W	155	4,825	4	9.0	Selma	1.85	
						285	18,509	6	9.6	Norphlet	1.18	0.95
2258	Getty Oil Co.											
12-2-76	Creola Minerals 35-11	NE/SW	35	1S	1W	295	17,665	10	10.6	Haynesville	1.30	
						306	18,387	13	10.5	Norphlet	1.31	1.52
2270B	Getty Oil Co.											
8-19-77	D.C. Baldwin Estate	SE/NW	15	2S	1W	292	17,471	15	10.1	Haynesville	1.29	
						304	18,397	8	10.1	Norphlet	1.29	1.30
2274	I.N. Hickox											
11-29-76	Bulah M. Luse Estate	NW/NW	23	2N	3W	210	10,947	4	9.3	Early Cretaceous	1.32	
2281	Marion Corp.											
1-15-77	H.S. Cotting 14-6	SE/NW	14	2N	3W	220	11,356	6	9.7	Early Cretaceous	1.36	
2283	I.N. Hickox											
2-24-77	Edith Meyer Est. A-15-9	NE/SE	15	2N	3W	210	11,058	6	9.6	Early Cretaceous	1.30	
2293	Union oil of Calif.											
3-3-77	G.C. Coggin et al 19-7	SW/NE	19	1S	2W	135	5,084	14	9.0	Selma	1.36	
						302	18,362	17	10.8	Smackover	1.29	1.26
2294	Exchange Oil & Gas											
4-29-77	International Paper	SW/NE	4	2S	2W	272	17,852	7	9.7	Haynesville	1.16	
						290	18,423	9	10.0	Smackover	1.22	2.98
						296	18,487	12½	10.1	Norphlet	1.24	9.38
2295	Union Oil of Calif.											
2-10-77	George Radcliff 19-11	NE/SW	19	1S	1W	136	6,260	6	8.9	Selma	1.12	
						298	18,478	12	10.5	Smackover	1.26	1.33

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2296 2-12-77	Pennzoil Producing Co. Ben May Trust 32-6	SE/NW 32	1N	2W	305	18,798	?	10.7	Norphlet	1.27	
2305 7-12-77	I.N. Hickox Edith Meyer Estate	SE/SE 15	2N	3W	212	11,291	4	9.5	Early Cretaceous	1.30	
2308 3-5-77	Exchange Oil & Gas Mobile Co. Bd. School	SW/NE 16	3S	2W	300	17,480	11	9.7	Haynesville	1.31	
					320	18,438	?	10.1	Smackover	1.38	3.34
					345	18,603	9	10.1	Norphlet	1.50	15.15
2310 4-26-77	Union Oil of Calif. E.M. Maddox 26-7	SW/NE 26	1S	2W	124	5,013	3	8.9	Selma	1.16	
					305	18,276	6	10.4	Smackover	1.31	1.36
2316 4-25-77	Marion Corp. M.C. Stallworth Jr.	SW/NE 14	2N	3W	223	11,383	4	9.5	Early Cretaceous	1.38	
2322 4-23-77	Union Oil of Calif. I.L. Wright 28-7	SW/NE 28	1S	2W	307	18,315	9	10.2	Smackover	1.32	
2324 5-1-77	Union Oil of Calif. George Radcliff 30-6	SE/NW 30	1S	1W	309	18,413	14	10.4	Smackover	1.32	
2325 6-7-77	Getty Oil Co. Claire P. Newman 28-10	NW/SE 28	1S	1W	285	17,953	7	10.2	Haynesville	1.22	
					286	18,473	12	10.2	Norphlet	1.19	0.19
2331 4-14-77	Exchange Oil & Gas Corp. International Paper 10-7	SW/NE 10	2S	2W	290	17,668	7	9.6	Haynesville	1.27	
					303	18,452	7½	10.9	Norphlet	1.28	1.66
2334B 7-26-77	Union Oil of Calif. Claire P. Newman et al	SW/NE 29	1S	1W	312	18,425	7	10.5	Smackover	1.34	
2350 10-14-77	Union Oil of Calif. Creola Inv. Corp.	SW/NE 34	1S	2W	304	18,351	7	10.2	Smackover	1.22	
2351 7-8-77	Union Oil of Calif. International Paper 35-7	SW/NE 35	1S	2W	290	18,354	6	10.5	Smackover		
2355B 12-6-77	Union Oil of Calif. Roy J. Smith et al 6-10	NW/SE 6	1S	1W	203	11,777	6½	9.1	Early Cretaceous	1.16	
					278	18,251	10	10.4	Smackover	1.16	1.16
2357 7-11-77	Exchange Oil & Gas Corp. International Paper 2-6	SE/NW 2	2S	2W	282	17,618	6½	9.3	Haynesville	1.23	
					304	18,410	11	10.2	Smackover	1.29	2.78
2360 7-11-77	Union Oil of Calif. R.L. Smith 29-7	SW/NE 29	1S	2W	305	18,297	12	9.8	Smackover	1.31	
2368 9-3-77	Marion Corp. M.C. Stallworth, Jr.	NW/NE 14	2N	3W	227	11,501	4	9.5	Early Cretaceous	1.40	
2375 7-20-77	Louisiana Land & Expl. Jacintoport no. 2	NE/SE 10	3S	1W	156	8,170	4	9.6	Early Cretaceous	1.10	
2380 9-7-77	I.N. Hickox M.L. Moorer Est. A-22-1	NE/NE 22	2N	3W	200	11,271	7½	9.6	Early Cretaceous	1.19	
2381 7-4-78	Getty Oil Co. David L. Boyd 22-4	NW/NW 22	2S	1W	320	18,510	10	10.4	Norphlet	1.37	
2383 11-6-77	Exchange Oil & Gas Janice G. Gatewood	SW/NE 11	2S	2W	285	17,674	8	9.5	Haynesville	1.24	
					296	18,400	7	9.7	Smackover	1.25	1.52
2384 10-14-77	Robert Mosbacher Tensaw Land & Timber	- 43	1N	1E	284	17,909	12	11.2	Smackover	1.22	
2389 4-1-78	Exxon Corp. J.G. Brown Foundation	NW/SE 20	2S	1W	320	18,000	17½	10.3	Haynesville	1.41	
2408 1-5-78	Amerada Hess Corp. et al North Woods Unit 27-16	SE/SE 27	2S	3W	120	4,795	3½	9.6	Selma	1.13	
					321	18,578	7½	10.5	Norphlet	1.32	1.50
2429 1-7-78	Union Oil of Calif. International Paper 36-6	SE/NW 36	1S	2W	310	18,326	6	10.4	Smackover	1.33	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION	Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
2433	Exchange Oil & Gas Corp.											
2-17-78	Annie M. Hill 8-10	NW/SE	8	1S	2W	301	17,806	10½	9.7	Haynesville	1.32	
						304	18,338	6	10.0	Smackover	1.30	0.56
2461	Union Oil of Calif.											
4-18-78	R.J. Newman et al 9-11	NE/SW	9	1S	1W	290	18,263	8	10.4	Smackover	1.23	
2476	Exchange Oil & Gas											
5-15-78	Annie M. Hill 4-10	NW/SE	4	1S	2W	282	17,893	8	9.8	Haynesville	1.21	
						304	18,373	-	10.2	Smackover	1.30	4.58
2499	Union Oil of Calif.											
7-7-78	International Paper 2-10	NW/SE	2	1S	2W	245	11,747	7½	9.1	Early Cretaceous	1.52	
						282	18,280	8	10.2	Smackover	1.18	0.57
2542	Ralph H. Roach Petro.											
10-31-78	Dr. M.L. Moorer Found.	SE/NW	3	1N	2W	210	11,983	7	8.8	Early Cretaceous	1.20	
						281	18,627	7½	10.6	Norphlet	1.15	1.07
2545	Getty Oil Co.											
1-18-79	Mobile Co. Bd. School	SW/NE	16	2S	1W	281	17,674	12	9.6	Haynesville	1.22	
						304	18,038	11	16.5	Buckner	1.32	6.32
						309	18,372	7½	10.2	Norphlet	1.32	
						310	18,426	9	10.4	Norphlet	1.32	
2584	Union Oil of Calif.											
11-27-78	R.E. Davis 1-11	NE/SW	1	1S	2W	292	18,256	9	10.4	Smackover	1.24	
2608	Stone Oil Corp.											
8-3-79	M.L. Smith 36-5	SW/NW	36	1S	1W	280	17,473	2	10.1	Cotton Valley	1.22	
						290	18,136	11	11.5	Haynesville	1.24	1.51
2636	Union Oil of Calif.											
3-14-79	R.J. Newman 9-10	NW/SE	9	1S	1W	302	18,384	14½	10.4	Smackover	1.28	
2673	Clayton W. Williams											
4-19-79	Mattie M. Smith 9-13	NE/SW	9	1S	2W	292	17,565	6	9.5	Haynesville	1.29	
						312	18,327	9	10.2	Smackover	1.34	2.63

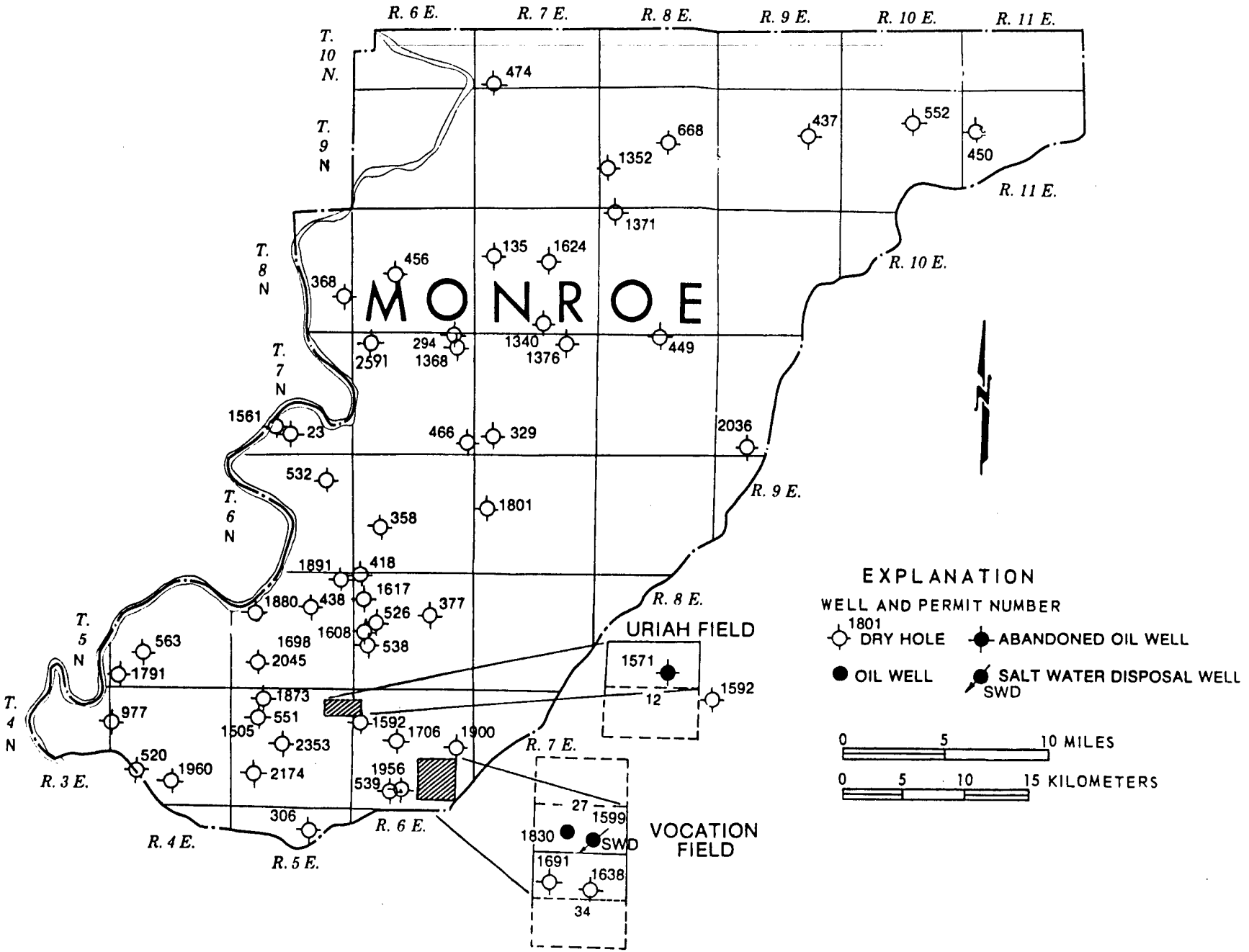

FIGURE 68. Monroe County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) ∇_1	∇_2
23 8-4-43	James L. Duffy et al W.S. Moore Estate	SE/SE	28	7N	5E	130 148	3,734 5,477	? ?	9.8 10.0	Eutaw Early Cretaceous	1.71 1.50	1.03
135 5-30-47	Steinberger, Jr. Swift-Hunter Lumber Co.	SE/NE	18	8N	7E	124	4,330	?	10.5	Early Cretaceous	1.34	
294 8-20-51	Gulf Refining Co. J.H. Hetherington	NE/NE	2	7N	6E	140	6,435	2½	10.2	Early Cretaceous	1.15	
306 9-20-51	Hamilton & Cashion Co. St. Regis & Florida Co.	NE/NE	10	3N	5E	142	6,547	2½	10.0	Early Cretaceous	1.16	
329 4-7-52	Creslenn Oil Co. Swift-Hunter Lumber Co.	NE/SE	31	7N	7E	132 124	3,787 4,839	2½ 1½	9.1 9.2	Eutaw (Lower)Tuscaloosa	1.74 1.19	
358 8-15-52	Humble Oil & Ref. T.W. Moore et al	NE/SW	20	6N	6E	130 136	4,118 5,314	2 1	9.2 9.4	Eutaw Early Cretaceous	1.55 1.32	0.50
368 10-13-52	Mobile Drlg. Co. R.B. Williams	NE/SW	25	8N	5E	122	4,307	2	10.1	(Lower)Tuscaloosa	1.30	
377 10-30-52	Sterrett B. Proctor J.F. Dusenberry	NE/NW	15	5N	6E	148	5,141	2½	10.1	Early Cretaceous	1.60	
418 3-4-53	Sterrett Proctor Cornelia D. Broughton	NE/NW	6	5N	6E	130	5,318	2	9.4	(Lower)Tuscaloosa	1.20	
437 5-10-53	Fred T. Helms Green McCreary	SE/NW	14	9N	9E	131	4,246	2	9.2	Early Cretaceous	1.53	
438 5-21-53	Proctor, I.P. & LaRue Cornelia D. Broughton	SE/SE	10	5N	5E	128	5,351	2½	9.8	Early Cretaceous	1.16	
449 6-4-53	Proctor, I.P. & LaRue J.C. Moseley et al	NW/NW	3	7N	8E	118	3,877	2½	9.4	(Lower)Tuscaloosa	1.34	
450 6-11-53	I.P. & Fred LaRue D.S. Wright	NW/NE	18	9N	11E	116	3,079	1½	9.7	Early Cretaceous	1.62	
456 7-13-53	Temple & Williams C.L. Rutherford	SW/NW	21	8N	6E	130	4,338	2	9.6	Early Cretaceous	1.48	
466 8-5-53	H.N. Crawford et al F.W. Cannon	SW/NE	36	7N	6E	134	4,821	2½	9.4	Early Cretaceous	1.41	
474 9-4-53	Sunnyland Contractg. Co. G.C. Gaillaird	SW/SE	31	10N	7E	130	4,300	2	9.1	Early Cretaceous	1.49	
520 3-5-54	Sunnyland Contractg. Co. C.C. Gantt	NE/NW	29	4N	4E	141	5,996	2½	10.0	Early Cretaceous	1.25	
526 3-13-54	Helms & Southern Oil Brady Belcher	NW/SE	17	5N	6E	125	5,016	2	10.0	(Lower)Tuscaloosa	1.18	
532 4-5-54	Cashion-Daws-Stanley C.D. Broughton	SW/NE	11	6N	5E	128	4,728	2	9.9	(Lower)Tuscaloosa	1.31	
538 4-26-54	Cashion-Daws-Stanley Belcher Lmb. Sales Co.	NW/SE	19	5N	6E	134	5,069	4½	9.6	(Lower)Tuscaloosa	1.34	
539 5-21-54	Gulf Refining Co. "A" Blacksher Co.	NW/SW	28	4N	6E	143	6,101	2½	9.6	Early Cretaceous	1.26	
551 6-26-54	Sunnyland Contractg. Co. Jim English	SE/NW	8	4N	5E	139	5,441	2½	9.3	(Lower)Tuscaloosa	1.34	
552 6-18-54	Sunnyland Contractg. Co. Vredenburgh Saw Mill	NE/SW	10	9N	10E	124	3,547	2	9.7	Early Cretaceous	1.64	
563 9-19-54	Gulf Ref. Co. Berry Upton	NW/NE	29	5N	4E	143	6,031	4½	9.6	Early Cretaceous	1.28	
668 [illegible]0-56	Temple & Williams Drlg. Frances D. Stallworth	SW/SW	15	9N	8E	118	3,846	2	9.8	Early Cretaceous	1.35	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION	Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA: Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
977 7-20-59	Arden A. Anderson Shomo Land Co., Inc.	NW/SW	7	4N	4E	142	5,593	2	10.1	Early Cretaceous	1.36	
1340 2-8-65	Placid Oil Co. #1 International Paper	NE/SW	34	8N	7E	177	9,787	7	9.7	Paleozoic (metamorphics)	1.13	
1352 6-12-65	Placid Oil Co. #2 International Paper	SE/SE	30	9N	8E	179	10,173	3½	9.5	Paleozoic (metamorphics)	1.11	
1368 9-20-65	Placid Oil Co. Scott Paper Co.	SW/NE	1	7N	6E	115	3,100	7	10.1	Eutaw	1.58	
1371 12-29-65	Placid Oil Co. Wilmon Timberlands	SE/SW	6	8N	8E	110	2,806	1	9.8	Eutaw	1.57	
1376 4-1-66	Marshall Oglesby International Paper	NW/SW	2	7N	7E	108	2,814	2	9.5	Eutaw	1.49	
1505 9-18-69	Cherryville Corp. George Williams	SE/NW	8	4N	5E	118 220 245	2,969 13,859 14,820	4 5 4½	9.5 9.8 10.6	Selma Haynesville Norphlet	1.75 1.11 1.21	 0.94 2.60
1561 9-4-70	Skelly Oil Co. Mabel Hall	NW/SE	28	7N	5E	215	13,882	7	9.5	Paleozoic (metamorphics)	1.08	
1571 12-8-70	Getty Oil Co. Rufus Garrett 12-7	SW/NE	12	4N	5E	208 211 242	12,864 13,872 14,066	6 6 7	9.2 9.5 9.8	Cotton Valley Smackover ?(igneous)	1.10 1.05 1.25	 0.30 15.98
1592 4-6-71	Getty Oil Co. The Blacksher Co.	NW/SW	7	4N	6E	222	14,564	6	9.9	Norphlet	1.07	
1599 5-4-71	Getty Oil Co. B.C. Quimby 27-15	SW/SE	27	4N	6E	220	13,828	8	10.0	Smackover	1.11	
1608 4-28-71	Skelly Oil Co. Brady Belcher	NE/NE	19	5N	6E	205	13,293	5	9.4	Norphlet	1.05	
1617 5-10-71	Southwest Gas Prod. Hale 7-1	NE/NE	7	5N	6E	205	12,973	4	9.4	Paleozoic (metamorphics)	1.07	
1624 5-7-71	Phillips Pet. Co. Paper "B"	NE/NE	15	8N	7E	160	9,189	4	9.6	Paleozoic (metamorphics)	1.02	
1638 8-1-71	Getty Oil Co. Container Corp.	SW/NE	34	4N	6E	228	13,734	8	9.9	Smackover	1.18	
1691 6-18-72	Getty Oil Co. Container Corp.	SW/NW	34	4N	6E	110 224 230	2,864 13,976 14,095	2 7 8	? 9.8 9.8	Early Tertiary Smackover Smackover	1.54 1.13 1.16	 1.03 5.04
1698 4-9-72	Getty Oil Co. C.D. Broughton 17-7	SW/NE	17	5N	5E	218	14,316	6	10.0	Norphlet	1.06	
1706 6-2-72	Amoco Prod. Co. Blacksher Trust	SW/SW	16	4N	6E	237	14,689	7	9.8	Jurassic (igneous)	1.16	
1791 3-13-73	Southeastern Explor. Shomo Land Co. 31-11	NE/SW	31	5N	4E	245	15,062	6	14.4	Norphlet	1.19	
1801 1-5-73	Kenmore Oil Co., Inc. Mrs. J.J. Barton	SE/NW	18	6N	7E	204	12,379	7	9.7	Paleozoic (metamorphics)	1.11	
1830 4-25-73	Getty Oil Co. Blacksher Co. 27-14	SE/SW	27	4N	6E	218	13,951	4½	9.5	Jurassic (igneous)	1.09	
1873 9-10-73	Felmont Oil Corp. Blacksher Trust 5-7	SW/NE	5	4N	5E	220 227	13,974 14,852	6½ 9	8.9 9.6	Haynesville Norphlet	1.10 1.08	 0.80

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
1880 12-15-73	Midwest Oil Corp. M.A. Chunn	NE/NE	17	5N	5E	215	13,824	4	9.5	Smackover	1.08	
1891 9-15-73	Eason Oil Co. Curtiss L. Hale et al	NW/SE	1	5N	5E	216	13,079	10	9.2	Paleozoic (metamorphic)	1.15	
1900 11-9-73	Murphy Oil Corp. Bell	SW/SW	13	4N	6E	228	14,252	10	10.0	Norphlet	1.14	
1956 4-24-74	Getty Oil Co. Blacksher 28-9	NE/SE	28	4N	6E	233	14,337	6	9.7	Norphlet	1.17	
1960 11-28-74	Belco Pet. Corp. Blacksher Est. 27-12	NW/SW	27	4N	4E	255	15,067	6	10.6	Smackover	1.25	
2036 2-7-75	Atlantic Richfield Cora Crook et al	NW/SE	32	7N	9E	174	10,298	6	9.2	Paleozoic	1.05	
2045 3-21-75	Amoco Prod. Co. J.G. Brown Foundation	SW/SW	29	5N	5E	210	13,634	6	9.6	Smackover	1.06	
2174 2-3-76	Pelto Oil Co. Wesley B. Coffin et al	SE/NW	29	4N	5E	218 242	13,382 14,981	6 9	9.1 10.6	Haynesville Norphlet	1.14 1.17	 1.50
2353 6-2-77	Hunt Petro. Corp. Blacksher Co.	NW/SW	16	4N	5E	209 260	13,363 14,660	8 3	9.4 9.8	Haynesville Norphlet	1.07 1.32	 3.93
2591 11-13-78	La. Land & Explor. Henry Rogers	NW/NE	6	7N	6E	202	12,187	6	9.6	Paleozoic	1.12	

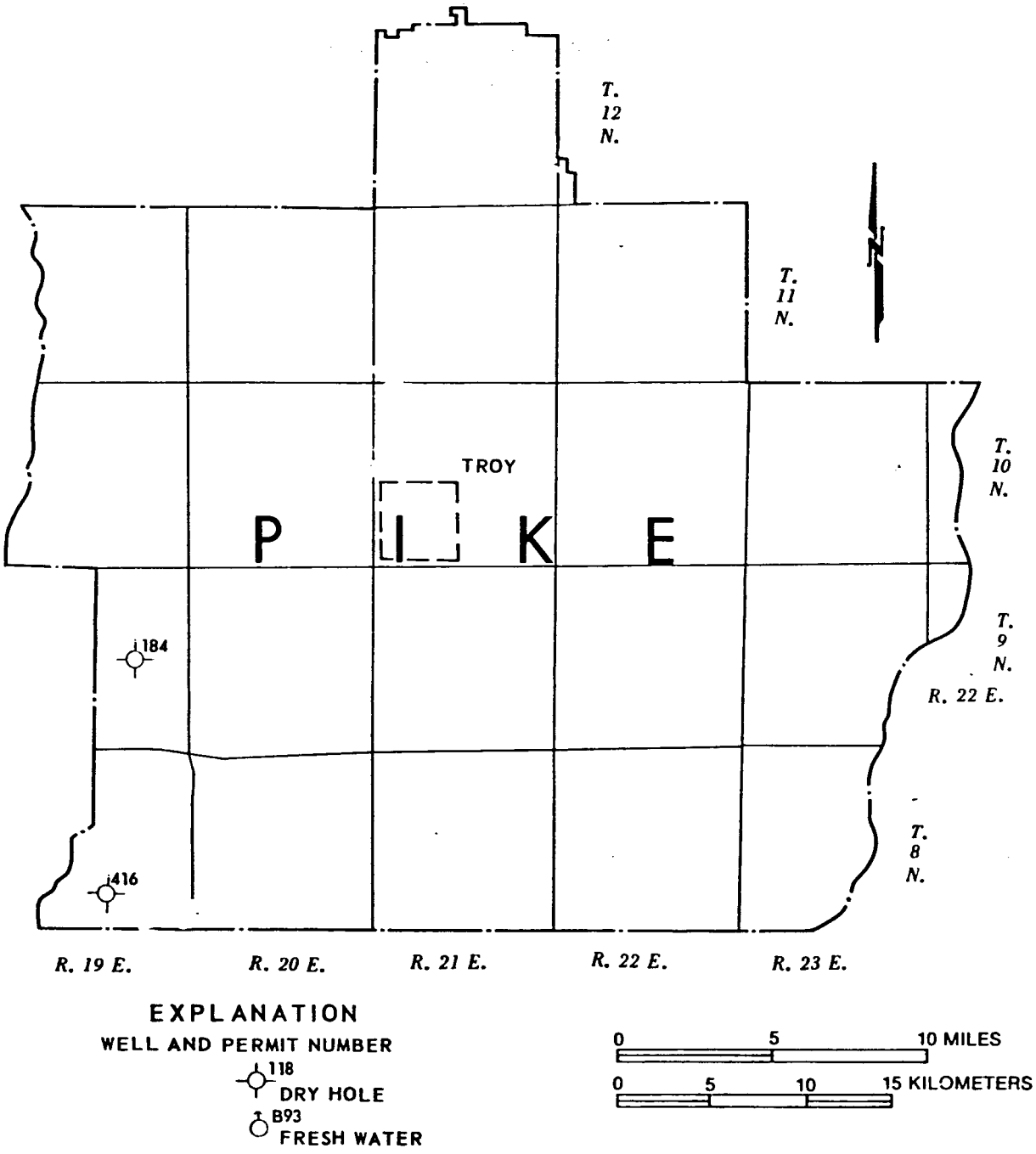

FIGURE 69. Pike County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
184 4-30-49	Foster & Dunnigan Folmar	SE/SW	14	9N	19E	102	3,117	2	10.2	Early Cretaceous	1.15	
416 3-12-53	F.R. Jackson T.E. Jackson	SE/SW	27	8N	19E	110	3,332	2	9.8	(Lower) Tuscaloosa	1.32	
						141	5,658	3	9.8	Early Cretaceous	1.33	1.33
						147	6,426	2½	9.8	Triassic ?	1.26	0.78

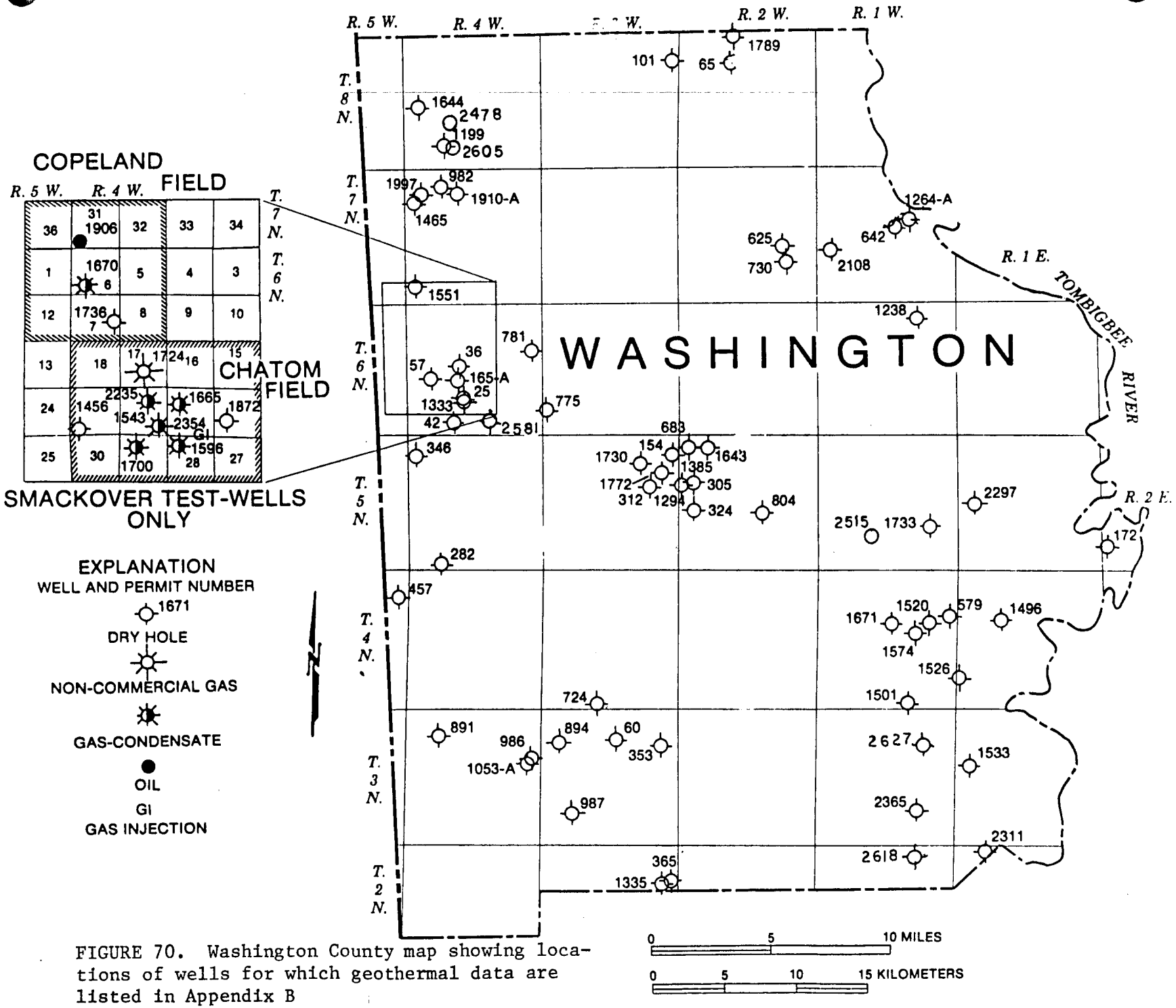

FIGURE 70. Washington County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION	Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA: Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
25	Humble Oil & Ref.											
1-10-44	C.D. Scott no. 1	NW/NE	28	6N	4W	127	5,075	?	9.5	Eutaw	1.20	
						130	5,728	?	9.9	(Marine) Tuscaloosa	1.12	0.46
						147	7,359	?	9.8	Early Cretaceous	1.10	1.04
36	Humble Oil & Ref.											
3-10-44	Jesse R. Williams	SE/SW	36	6N	4W	126	4,108	?	9.4	Selma	1.56	
						132	5,486	?	10.1	(Upper) Tuscaloosa	1.20	0.36
						159	7,239	?	10.2	Early Cretaceous	1.28	1.54
42	Humble Oil & Ref.											
5-1-44	C.D. Scott no. 2	SW/NW	33	6N	4W	134	5,307	?	9.9	Eutaw	1.28	
						168	7,069	?	10.1	Early Cretaceous	1.44	1.93
57	Humble Oil & Ref.											
10-18-44	J.R. Williams B-1	SW/NW	20	6N	4W	210	6,295	?	10.5	(Lower) Tuscaloosa	2.29	
60	The Texas Co.											
11-15-44	Stallworth Naval Stores	SW/NW	10	3N	3W	142	6,028	?	10.0	Eutaw	1.26	
						144	7,035	?	10.2	(Marine) Tuscaloosa	1.11	0.20
						200	7,539	?	10.2	(Lower) Tuscaloosa	1.78	11.11
						208	8,180	?	10.6	Early Cretaceous	1.74	1.27
65	Ray Fisher-J.T. Parks											
10-15-45	S.A. Hobson	SW/NE	9	8N	2W	132	5,368	?	10.1	Early Cretaceous	1.23	
101	Wayne Refining Co.											
8-24-45	Willie Mitchell	NW/NE	12	8N	3W	105	3,273	?	9.5	Eutaw	1.19	
						124	4,181	?	10.2	(Marine) Tuscaloosa	1.39	2.09
154	Humble Oil & Ref.											
12-9-47	U.S. Lumber & Cotton	SE/SE	1	5N	3W	118	3,180	?	10.1	(Lower) Tertiary	1.64	
						140	4,777	?	9.8	Selma	1.55	1.38
						152	6,254	?	10.0	(Marine) Tuscaloosa	1.38	0.81
165	Humble Oil & Ref.											
1-30-49	J.R. Williams no. 2	SE/NW	21	6N	4W	116	1,600	3½	9.2	Tertiary	3.13	
						136	4,582	2	9.2	Selma	1.53	0.67
						138	5,785	2½	9.4	(Marine) Tuscaloosa	1.24	0.17
						168	7,738	3½	10.3	Early Cretaceous	1.32	1.54
						178	8,705	2	10.2	Early Cretaceous	1.29	1.03
						190	9,789	3	10.0	Early Cretaceous	1.27	1.11
						220	10,793	2½	10.0	Early Cretaceous	1.43	2.99
						218	11,951	3	10.2	Cotton Valley	1.27	–
						234	13,396	2½	10.1	Cotton Valley	1.25	1.29
						240	13,709	3	10.0	Cotton Valley	1.27	1.17
						244	13,914	3	10.0	Cotton Valley	1.28	1.95
						242	14,232	3½	9.6	Haynesville	1.24	–
172	Humble Oil & Ref.											
7-31-49	C.E. Harrell	NE/SE	41	5N	2E	112	3,987	2	9.6	Early Tertiary	1.15	
						138	5,731	1½	9.7	Selma	1.26	1.49
						144	6,568	2	9.7	Eutaw	1.19	0.72
						158	7,685	2	10.2	(Lower) Tuscaloosa	1.20	1.25
						168	8,480	2½	10.1	Early Cretaceous	1.20	1.26
282	Justiss-Mears Oil											
6-19-51	Florence Gorham	SE/SW	32	5N	4W	160	7,743	2½	10.3	(Marine) Tuscaloosa	1.21	
305	Justiss-Mears Oil											
9-17-51	McClure-Pine	NW/NE	18	5N	2W	150	6,856	3	10.2	(Lower) Tuscaloosa	1.23	
312	Justiss-Mears Oil											
12-20-51	J.M. Pelham, Jr.	NE/NE	14	5N	3W	154	6,897	3	10.0	Early Cretaceous	1.28	
324	Justiss-Mears Oil											
3-9-52	White Smith Lumber	SW/NE	19	5N	2W	146	6,978	2	10.2	(Lower) Tuscaloosa	1.15	
346	I. Paul Ratliff, Jr.											
6-20-52	C.D. Scott	SE/SW	6	5N	4W	138	5,858	2	9.9	Eutaw	1.23	
						154	7,257	2½	10.1	(Lower) Tuscaloosa	1.21	1.14

STATE PERMIT Comp. date	OPERATOR FEE	LOCATION Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (days)	Mud density (lbs/gal)	Formation or Age	Calculated Gradients (°F/100 ft.) γ_1	γ_2
353 7-15-52	Justiss-Mears Oil J.W. Odom	NW/SW	12	2N	3W	150	7,469	2	10.2	(Lower) Tuscaloosa	1.12
365 9-14-52	S.P. Borden et al Knowlton & Smithers	NE/SE	12	2N	3W	158	6,936	2	10.0	(Lower) Tuscaloosa	1.33
457 7-16-53	Davis & Stanley-Cashion J.H. Loper	NW/NE	12	4N	5W	156	6,676	4	9.7	Eutaw	1.35
579 12-7-54	Gulf Refining Co. Slade et al	NW/NE	13	4N	1W	145	7,839	3	9.7	Midway	1.01
625 11-29-55	Justiss-Mears Oil Co. Hunter-Benn Co.	NW/SE	23	7N	2W	138	6,717	2	10.7	Early Cretaceous	1.07
642 2-17-56	Lyle Cashion Co. Wilson Trust	SW/SW	27	7N	1W	120	4,153	2	9.6	(Lower) Tuscaloosa	1.30
683 7-1-56	Seaboard Oil Co. M.W. Smith, Jr.	NW/SE	6	5N	2W	138	5,096	2½	9.5	Selma	1.41
					156	6,498	2	9.4	(Lower) Tuscaloosa	1.39	1.28
724 2-1-57	Central Oil-Baranet Stallworth Naval Stores	SE/SW	33	4N	3W	198	11,778	2½	9.9	Early Cretaceous	1.12
					204	11,975	1½	9.8	Early Cretaceous	1.15	3.05
730 12-8-56	Plymouth Oil Co. Hunter-Benn Inv.	NE/NE	26	7N	2W	142	6,855	2	9.8	Early Cretaceous	1.11
775 4-25-57	Zach Brooks Drlg. Co. E.L. Jordan	SW/SW	30	6N	3W	140	6,637	2	9.6	(Lower) Tuscaloosa	1.11
781 5-16-57	Zach Brooks Drlg. Co. W.T. Latham	NE/NW	13	6N	4W	189	9,949	3	9.7	Early Cretaceous	1.24
804 9-26-57	L.O. McMillan Turner Pine Co.	NW/SE	22	5N	2W	204	12,215	3	10.3	Early Cretaceous	1.13
891 8-10-59	Seneca Dev. Co. et al Mrs. E.T. Scarbrough	NE/NW	8	3N	4W	148	6,817	2	9.8	Eutaw	1.20
894 11-10-58	Seneca Dev. Co. et al Blake Odom	SE/NE	7	3N	3W	145	6,577	2	9.2	Eutaw	1.20
982 9-14-59	Union Producing Co. Hopkins	SW/SE	5	7N	4W	165	6,472	2½	9.9	(Lower) Tuscaloosa	1.53
					190	10,541	2	10.1	Early Cretaceous	1.18	0.61
					211	11,345	2	10.0	Early Cretaceous	1.28	2.61
					212	11,931	2½	10.1	Early Cretaceous	1.22	0.17
986 8-26-59	Seneca Dev. Co. et al Tyler Turner Odum	NW/NE	13	3N	4W	145	7,514	2	10.2	(Lower) Tuscaloosa	1.05
987 9-12-59	Seneca Dev. Co. et al Kate Turner	NE/SW	29	3N	3W	156	7,048	2½	10.0	(Upper) Tuscaloosa	1.28
1053A 7-7-71	Damson Oil Corp. Tyler Odom	SE/NW	13	3N	4W	196	11,965	2½	10.1	Early Cretaceous	1.09
					270	16,357	2	10.5	Cotton Valley	1.25	1.68
					292	17,675	3	10.9	Haynesville	1.28	1.67
					290	18,501	2½	11.1	Haynesville	1.21	-
					306	18,649	7	12.0	Haynesville	1.29	1.85
					332	19,880	11	16.8	Norphlet	1.34	3.06
					330	20,107	?	11.7	Norphlet	1.31	
1199 10-31-62	Humble Oil & Ref. Hulmer C. Miller et ux	SE/SE	29	8N	4W	194	10,731	2½	10.0	Early Cretaceous	1.19
1238 5-23-63	Natol Corp.-Love Petro. Hunter-Benn	SE/SW	2	6N	1W	146	6,129	2½	9.7	(Lower) Tuscaloosa	1.31
1264A 3-5-64	G.H. Jett Drlg. Co. H.M. Wilson	SE/NE	28	7N	1W	189	10,984	4½	9.3	Haynesville	1.12
					211	12,551	4	10.5	Norphlet	1.16	1.40
1294 2-7-64	Tensaw Petro. Corp. J.C. McClure et al	NW/NW	18	5N	2W	207	10,887	6	9.7	Early Cretaceous	1.30
1333 2-5-65	Brooks & Bianchi Howard & A.N. Scott	NW/NE	28	6N	4W	172	9,733	6	9.9	Early Cretaceous	1.09

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION	Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
1335 1-8-65	Citmoco Services, Inc. P.L. Smithers	NE/SW	12	2N	3W	222	11,516	4½	9.6	Early Cretaceous	1.35	
1385 1-9-67	Pan American Petro. White Smith Land Co.	NE/NW	18	5N	2W	130	3,916	3	9.2	Selma	1.63	
						222	12,756	5	9.6	Cotton Valley	1.22	1.04
						246	15,410	5	9.5	Haynesville	1.17	0.90
						254	16,227	6	9.8	Haynesville	1.16	0.98
						301	17,883	6	13.4	Norphlet	1.31	2.84
1456 8-2-68	Coral Drlg., Inc. D.J. Crager, Jr.	SW/SW	19	6N	4W	248	15,576	6	9.4	Haynesville	1.17	
						265	17,225	16	9.9	Norphlet	1.16	1.03
1465 2-6-69	Coral Drlg., Inc. L.E. Heinmiller	NE/NW	7	7N	4W	226	14,840	6	9.5	Haynesville	1.08	
						270	16,785	10	10.8	Louann Salt	1.22	2.26
1496 4-10-69	Pan American Petro. G.M. Slade	SW/SE	23	4N	1E	119	4,896	4	10.3	Tertiary	1.08	
1501 5-28-69	Pan American Petro. Laura S. Boykin	SE/SE	34	4N	1W	190	10,912	6	9.7	Early Cretaceous	1.14	
1520 10-6-69	Pan American Petro. Tensaw Land & Timber	SE/NE	14	4N	1W	100	1,747	3	9.0	Tertiary	1.95	
						190	8,658	5	9.7	Early Cretaceous	1.43	1.04
						214	11,892	7	9.4	Early Cretaceous	1.24	1.61
1526 11-14-69	Pan American Petro. Laura S. Boykin no. 2	SW/SW	36	4N	1E	150	5,965	6	9.9	Tertiary	1.41	
1533 12-9-69	Pan American Petro. Bilbo Livestock & Land	NW/SE	45	3N	1E	142	5,245	7	9.5	Tertiary	1.45	
1543 9-13-70	Phillips Petro. Co. Williams "AA"	SE/SE	20	6N	4W	112	3,602	3	9.4	Selma	1.28	
						243	14,082	6	9.5	Haynesville	1.25	1.25
						250	14,566	7	12.0	Haynesville	1.26	1.45
						260	14,868	5	9.6	Haynesville	1.30	3.31
						286	16,787	9½	10.6	Louann Salt	1.31	1.36
1551 4-13-70	David K. Brooks J.K. Hartley	NE/NW	31	7N	4W	151	5,131	3½	9.4	Eutaw	1.66	
1574 10-29-70	Gen'l Crude Oil & Marr Tensaw Land & Timber	SW/SW	14	4N	1W	160	7,615	6	9.6	Early Cretaceous	1.23	
1596 10-12-71	Phillips Petro. Co. Scott "C"	SE/NW	28	6N	4W	125	4,852	5	9.2	Eutaw	1.22	
						244	14,792	5	9.3	Haynesville	1.20	1.20
						267	15,722	16	10.6	Haynesville	1.28	2.47
						289	16,398	9	10.6	Norphlet	1.36	3.25
1643 11-15-71	Placid Oil Co. McClure 5-12	NW/SW	5	5N	2W	320	15,843	12	9.3	Haynesville	1.60	
						310	18,866	8	12.4	Louann Salt	1.29	
1644 1-4-72	Continental Oil Co. Alvin Guy	NW/NE	19	8N	4W	122	4,727	2	9.3	Eutaw	1.18	
						257	15,420	6	9.6	Haynesville	1.24	1.26
						260	16,046	7	10.0	Smackover	1.21	0.48
						264	16,194	9	10.0	Norphlet	1.22	2.70
1665 2-12-72	Phillips Petro. Co. Williams "DD"	SE/NW	21	6N	4W	243	14,884	5	9.3	Haynesville	1.19	
						279	16,237	8½	10.8	Smackover	1.31	2.66
1670 3-8-72	Amoco Production Co. J.J. Laurie	SE/SW	6	6N	4W	279	17,041	21	11.3	Louann Salt	1.25	
1671 11-24-71	General Crude Oil Woodyard	SW/NW	15	4N	1W	158	6,982	3	9.5	Eutaw	1.32	

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION Sec.	T.	R.	GEOTHERMAL/GEOPRESSURE DATA Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
1700 6-21-74	Phillips Petro. Co. Scott "D"	SE/NW	29	6N	4W	252	14,950	9	9.3	Haynesville	1.24
						268	15,764	9	10.8	Buckner	1.28	1.97
						288	16,345	22	10.7	Smackover	1.36	3.44
1724 8-16-72	Phillips Petro. Co. Williams "EE"	NE/SE	17	6N	4W	240	14,736	6	9.3	Haynesville	1.18
						244	15,596	7	10.0	Haynesville	1.14	0.47
						280	16,291	6	10.5	Smackover	1.31	5.18
1730 6-21-72	Placid Oil Co. Tensaw 11-3	NW/NW	11	5N	3W	129	3,784	2	9.2	Tertiary	1.67
						182	9,401	6	9.3	Early Cretaceous	1.23	0.94
1733 7-3-72	Claud B. Hamill E.W. Mosley	NE/NE	26	5N	1W	142	7,010	3	9.3	(Lower) Tuscaloosa	1.08
1736 9-13-72	Amoco Prod. Co. et al Glenpool Corp. 7-9	NE/SE	7	6N	4W	249	15,097	6½	9.0	Haynesville	1.21
						278	16,895	7½	10.8	Norphlet	1.25	1.61
1772 10-10-72	Lamar Hunt Joe M. Pelham	NE/SW	12	5N	3W	154	7,356	3	9.3	Early Cretaceous	1.20
1789 12-27-72	AMAX Petro. Corp. Jessie Johnston	SW/NE	4	8N	2W	224	13,434	7	9.6	Norphlet	1.18
1872 9-5-73	Phillips Petro. Co. Scarbrough "A"	NE/SW	22	6N	4W	112	3,606	3	9.4	Selma	1.28
						249	15,162	9½	9.7	Haynesville	1.21	1.18
						265	16,635	5½	10.5	Norphlet	1.20	1.09
1906 4-12-74	Amoco Production Co. W.M. Curlee Estate Unit	SW/SW	31	7N	4W	248	15,109	10	9.5	Haynesville	1.20
						278	16,998	9	10.6	Norphlet	1.25	1.64
1910A 1-7-74	Tenneco Oil Co. et al Jack L. Hopkins	NE/NW	9	7N	4W	270	17,206	9	10.1	Norphlet	1.19
1997 3-17-75	Phillips Petroleum Co. Heinmiller "A" 7-1	NE/NE	7	7N	4W	268	16,669	6	10.0	Norphlet	1.21
2108 9-7-75	Tenneco Oil Co. Cecil T. Loper 39-10	NW/SE	39	7N	1W	248	14,858	5	10.1	Norphlet	1.22
2235 7-24-76	Phillips Petro. Co. Chatom Unit 1-2	SW/NE	20	6N	4W	240	14,564	8	9.5	Haynesville	1.19
						270	16,254	12	10.0	Smackover	1.26	1.78
2297 3-31-77	Murphy Oil Co. Laubenthal	NW/NE	33	5N	1E	124	5,358	14	9.2	Tertiary	1.08
						260	16,743	8½	10.5	Norphlet	1.16	1.19
2311B 11-22-77	Exxon Corp. M.C. Hergersheimer	SE/NW	7	2N	1E	148	6,696		9.1	Selma	1.22
						250	17,508	8	9.7	Haynesville	1.05	0.94
						302	18,476	19	16.2	Haynesville	1.28	5.37
						291	19,708	8½	10.9	Norphlet	1.41	-
2354 10-20-77	Phillips Petroleum Co. Chatom Unit 1-G3	SE/SE	20	6N	4W	266	16,090	7½	9.8	Smackover	1.24
2365 6-25-77	Placid Oil Co. Tensaw Land & Timber	NW/SW	26	3N	1W	157	8,056	6½	9.2	Early Cretaceous	1.13
2478 9-21-78	Inexco Oil Co. W.J. Britton	SW/SW	21	8N	4W	275	16,326	8	10.4	Norphlet	1.28
2515B 4-13-79	Exxon Corp. Gulf Pine Co., Inc.	NW/SZ	28	5N	1W	135	5,241	7	8.9	Selma	1.32
						167	8,219	5¼	8.9	Tuscaloosa	1.23	1.07
						252	17,250	9½	9.8	Haynesville	1.08	0.94
						258	17,510	8	9.8	Haynesville	1.10	2.31
						283	18,003	11½	17.6	Haynesville	1.20	5.07
						293	18,703	9	10.7	Norphlet	1.21	1.43
2581 11-3-78	Amarillo Oil Co. A.L. Miller	SE/NW	34	6N	4W	280	16,970	18	10.8	Norphlet	1.26

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R.	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) *1	*2
2605 12-5-78	Inexco Oil Co. J.M. Kimbrough et al	NE/SW	28	8N	4W	255	16,180	7½	10.5	Smackover	1.17	
2618 12-1-78	Placid Oil Co. Tensaw 2-5	SW/NW	2	2N	1W	160	8,419	7	9.2	(Lower) Tuscaloosa	1.12	
2627 5-15-79	Placid Oil Co. Tensaw 11-10	NW/SE	11	3N	1W	120	7,061	4½	9.4	Early Cretaceous	0.76	
						235	14,278	8	9.3	Haynesville	1.18	1.59
						248	15,402	7½	12.1	Smackover	1.18	1.16
						252	15,786	7	12.1	Smackover	1.18	1.04
						253	15,882	5	12.1	Norphlet	1.18	1.04

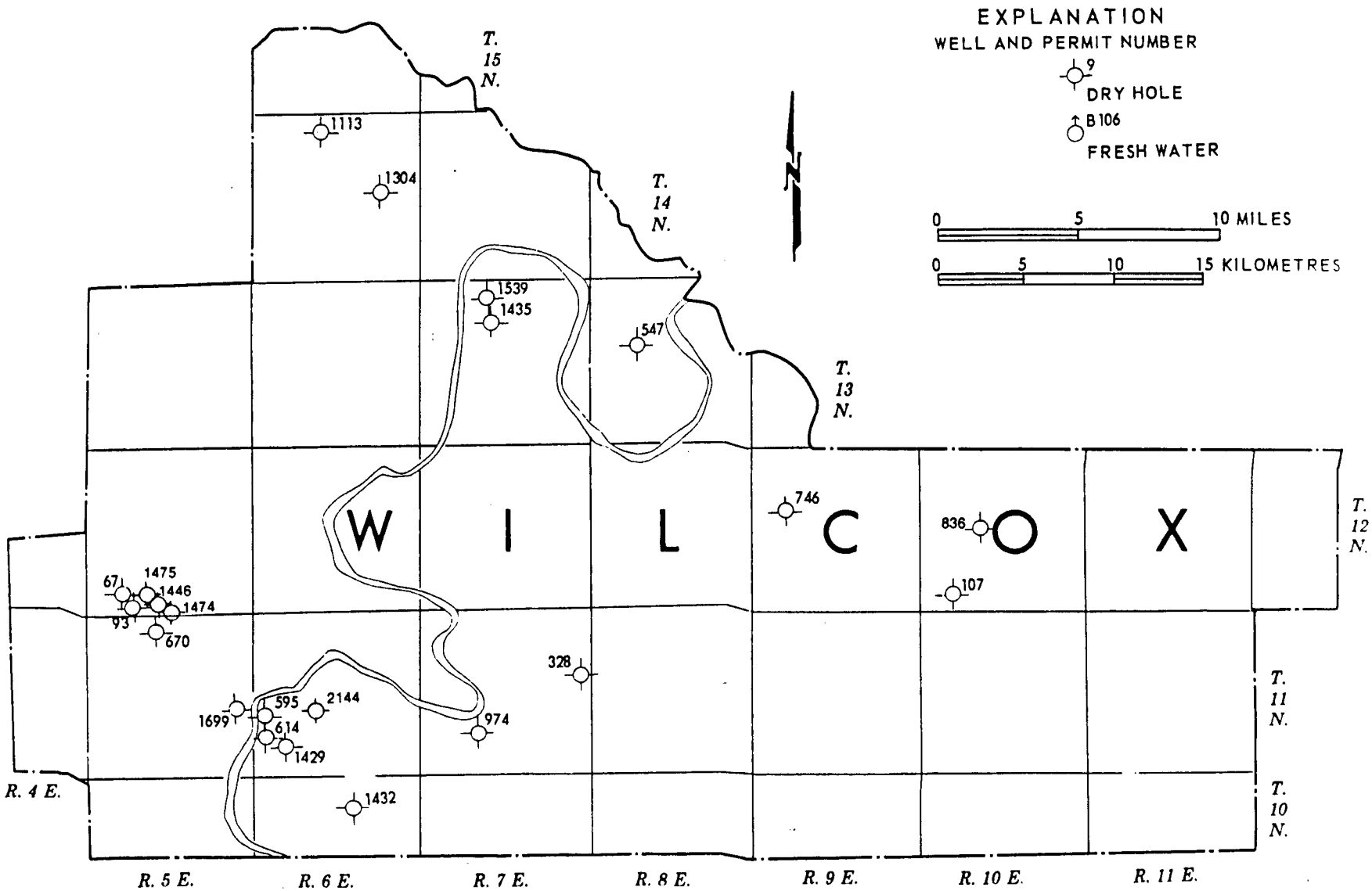

FIGURE 71. Wilcox County map showing locations of wells for which geothermal data are listed in Appendix B

STATE PERMIT Compl. date	OPERATOR FEE	LOCATION				GEOTHERMAL/GEOPRESSURE DATA						
			Sec.	T.	R	Downhole temperature (°F)	Depth subsea (ft.)	Time after circulation (hrs.)	Mud density (lbs./gal)	Formation or Age	Calculated Gradients (°F/100 ft.) $^{\circ}_{1}$	$^{\circ}_{2}$
67	Southern Natural Gas											
1-?-45	Fannie Stokes	SW/NW	32	12N	5E	110	2,015	?	9.5	Selma	2.18	
						132	4,173	?	9.8	Early Cretaceous	1.58	1.02
107	Seaboard Oil Co.											
12-11-45	S.M. McConnico	SW/NW	32	12N	10E	110	2,159	?	9.7	(Upper) Tuscaloosa	2.04	
						115	2,732	?	9.7	(Lower) Tuscaloosa	1.79	0.87
						120	3,858	?	9.9	Early Cretaceous	1.40	0.44
328	Gulf Refining Co.											
3-17-52	C.C. Sellers	SW/NE	13	11N	7E	148	6,833	2	10.0	Norphlet	1.20	
						132	7,331	2	9.6	Paleozoic (Metamorphics)	0.90	
547	Gulf Refining Co.											
6-23-54	H.H. Wilkinson	SW/NE	17	13N	8E	153	6,974	3	9.7	Paleozoic (Metamorphics)	1.25	
595	Gulf Refining Co.											
3-30-55	W.J. Miller et al	SE/SW	19	11N	6E	110	3,692	1	10.1	(Lower) Tuscaloosa	1.19	
614	Southern States Oil											
9-14-55	W.J. Miller et al	NE/SW	30	11N	6E	120	3,687	2	9.2	(Lower) Tuscaloosa	1.46	
670	Southern States Oil											
5-14-56	A.S. Johnson	NE/SW	4	11N	5E	104	1,719	1½	9.5	Eutaw	2.21	
746	Seaboard Oil Co.											
3-19-57	S.J. Albritton	NW/NW	17	12N	9E	115	4,668	1½	9.5	Early Cretaceous	1.05	
						130	5,841	1½	9.5	Triassic ?	1.10	1.28
836	Seaboard Oil Co.											
2-15-58	J.T. Rollins	SW/SW	16	12N	10E	135	5,293	2	9.7	Paleozoic (Metamorphics)	1.30	
974	Barnwell Drlg. Co.											
7-7-59	W.H. Farish	SE/NE	29	11N	7E	120	3,858	1½	9.8	Early Cretaceous	1.40	
						122	4,836	1½	9.8	Early Cretaceous	1.16	0.20
1113	J. Keller Henderson											
10-21-61	Strother Brothers	NE/SW	4	14N	6E	118	4,284	2	9.7	Paleozoic (Metamorphics)	1.21	
1304	Geochemical Surveys											
4-8-64	Strother Brothers	NE/NE	14	14N	6E	109	3,926	2½	9.5	Paleozoic (Metamorphics)	1.10	
1429	Brandon Company											
11-13-67	W.J. Miller et al	SW/SW	29	11N	6E	168	8,824	5	8.8	Paleozoic (Metamorphics)	1.16	
1432	Chesley Pruet et al											
12-9-67	Newell 10-8	NW/SW	10	10N	6E	162	8,773	3	9.3	Norphlet	1.10	
1435	Cameron Oil Properties											
3-11-68	Marjorie Henderson	NW/NW	9	13N	7E	143	4,714	3	10.1	Norphlet	1.63	
1446	Murphy Oil Corp.											
3-1-68	Mitchell	NE/SW	33	12N	5E	106	2,031	2	9.5	Selma	1.97	
						108	2,152	2	9.5	Eutaw	1.95	1.65
1474	Texas Interstate O&G											
12-19-68	Oakley	SE/SE	33	12N	5E	110	2,127	2	9.9	Eutaw	2.07	
1475	Texas Interstate O&G											
1-24-69	Weatherly	NE/NW	33	12N	5E	155	7,730	5	9.3	Norphlet	1.15	
1539	Royal Resources Corp.											
12-10-69	Fred B. Henderson	SW/SW	4	13N	7E	124	4,849	3	9.2	Haynesville	1.19	
						126	5,011	4	9.4	Norphlet	1.20	1.23
1699	Bradco Oil & Gas Co.											
3-6-72	Syd.-Clay Sheffield	NW/SW	24	11N	5E	115	3,368	5	9.5	(Lower) Tuscaloosa	1.45	
2144	John T. Palmer											
10-14-75	Hugh Smiley	SW/SW	21	11N	6E	106	3,492	7	9.7	Early Cretaceous	1.15	