APPARENT CHANGES IN THE POTENTIOMETRIC SURFACES OF CRETACEOUS AND PALEOZOIC AQUIFERS OF NORTHEASTERN MISSISSIPPI, 1955 - 1988

James H. Hoffmann and Patricia A. Phillips
Mississippi Bureau of Land and Water Resources

INTRODUCTION

A series of potentiometric maps were constructed based upon selected water level data from the Coffee Sand, Eutaw-McShan, Gordo, and Paleozoic aquifers in northeastern Mississippi. These aquifers constitute important sources of fresh water in this region and have been subjected to progressive stress for many years due to an increasing demand for public and industrial water supplies. The response of these aquifer systems to the stresses caused by these withdrawals of water has been a general long-term decline in regional water levels and a more dramatic decline in regional water levels and a more dramatic decline near centers of greater pumpage. This work represents the first element in the development of a layered ground-water flow model of the aquifer systems which underlie this part of Mississippi.

Development of these aquifers by man has been in progress for more than a century. Artesian wells were reportedly drilled in northeastern Mississippi prior to 1850 and wells as deep as 1,000 feet were drilled in Chickasaw and Clay counties by 1860. After 1900, pumpage at some locations became significant. Since about 1945, many more wells have been drilled and ground-water withdrawals in northeastern Mississippi have continually increased.

PREVIOUS STUDIES

In 1954, the U. S. Geological Survey began a comprehensive study of the ground-water resources of northeastern Mississippi. During this study a large number of water level measurements were obtained from wells screened in all of the aquifers which are sources of drinking water in the region. Subsequent studies by the U. S. G. S. and data from their observation well network produced additional water level data. In the years 1978, 1982, and 1987 water levels were measured in all of the Cretaceous aquifers and the Paleozoic aquifer throughout their areas of use. Potentiometric maps have been published for these aquifers covering portions of the region in which they contain fresh water occurrence since 1978. During the recent field work, water levels were measured throughout the area from August of 1987 through August of 1988. In addition to water level measurements, well locations and land surface elevations were field checked and modified as necessary and some errors in identification of the actual screened intervals of a few wells were also noted and corrected. These corrections were also used to modify previously collected data in a few cases.

COMPILATION OF DATA

Published and unpublished water level data was compiled from publications and files of the U. S. Geological Survey. This data was organized and analyzed and selected water level measurements from specific wells were plotted on base maps of the study area. Beginning with the year 1955, water level data was plotted for three year intervals spaced approximately five years apart. Data was plotted for the years 1955-1957, 1960-1962, 1966-1968, 1971-1973, 1977-1979, 1981-1983, and 1986-1988. This data was utilized in constructing the maps which approximate the apparent potentiometric surface for each of these aquifers during each of these time intervals. It was not possible to produce a water level map for the Paleozoic aquifer for the period 1955-1957 due to a lack of data. All of the maps for the years 1977-1979 and 1981-1983 have been modified from the published maps of the U. S. Geological Survey.

APPARENT WATER LEVEL CHANGES

Throughout the period since 1955, water levels in and near the recharge areas of these aquifer systems have shown little or no significant declines. Water levels in the confined areas of the Coffee Sand have declined at an average rate of 1 to 2 feet per year or less during this time. In the confined portions of the Eutaw-McShan aquifer system, water levels have generally declined at an average rate of 1 to 2 feet per year except in the vicinity of the pumping centers at Tupelo and West Point where declines of about 3 to 5 feet per year have occurred since 1955. Since the late 1970's, water levels in the Eutaw-McShan at West Point have been recovering in response to a reduction in pumpage from the aquifer at that location. Water level declines similar to those of the Eutaw-McShan are apparent in the Gordo aquifer system except at West Point where declines appear to be on the order of 2 to 3 feet per year. At Corinth, the Paleozoic aquifer has apparently experienced an average decline of as much as 3 to 4 feet per year at some locations since the early 1960's. At one time, the U. S. Geological Survey noted declines of up to 9 feet per year in one of their observation wells at Corinth. Elsewhere, in the area where the aquifer is confined, water levels

do not appear to be dropping by any more than about 1 to 2 feet per year. Due to limitations of space, copies of six of the maps produced for the Eutaw-McShan aquifer system from 1960-1962 to 1986-1988 are included in this paper.

It must be acknowledged that there are uncertainties, particularly in the case of the older maps, due to possible data errors and a lack of data in some areas. However, on balance the authors believe that these maps represent a reasonable approximation of the general potentiometric surfaces of these aquifer systems during the time periods represented and illustrate the changes which have occurred over a period of more than 30 years.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the assistance of Ms. Pat Curtis of MARIS in the preparation of the base maps used in this study and plotting well locations and water level data. We also wish to thank Mr. W. T. Oakley of the U. S. Geological Survey for his assistance in allowing us to obtain copies of historic water level data from northeastern Mississippi.

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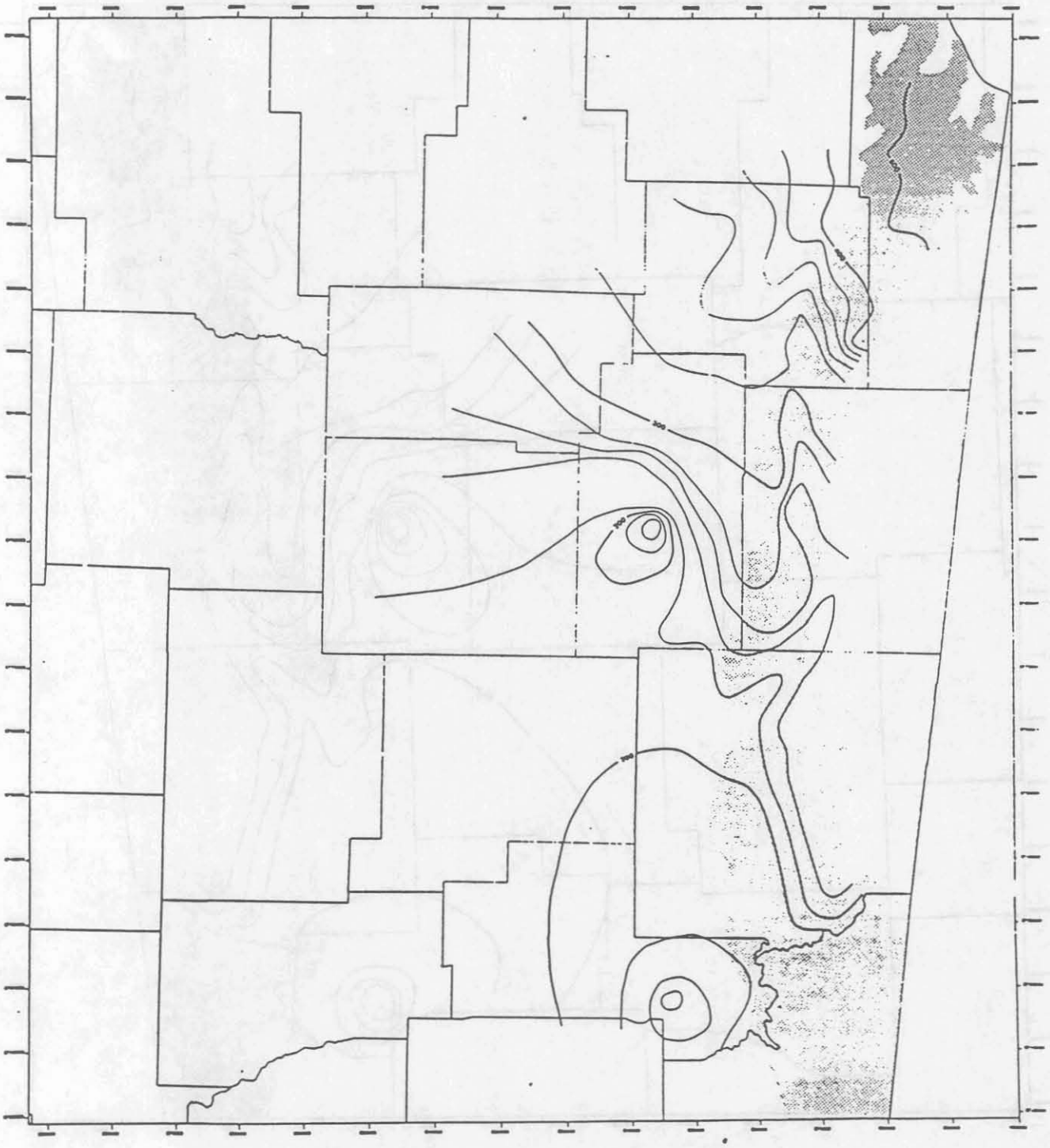
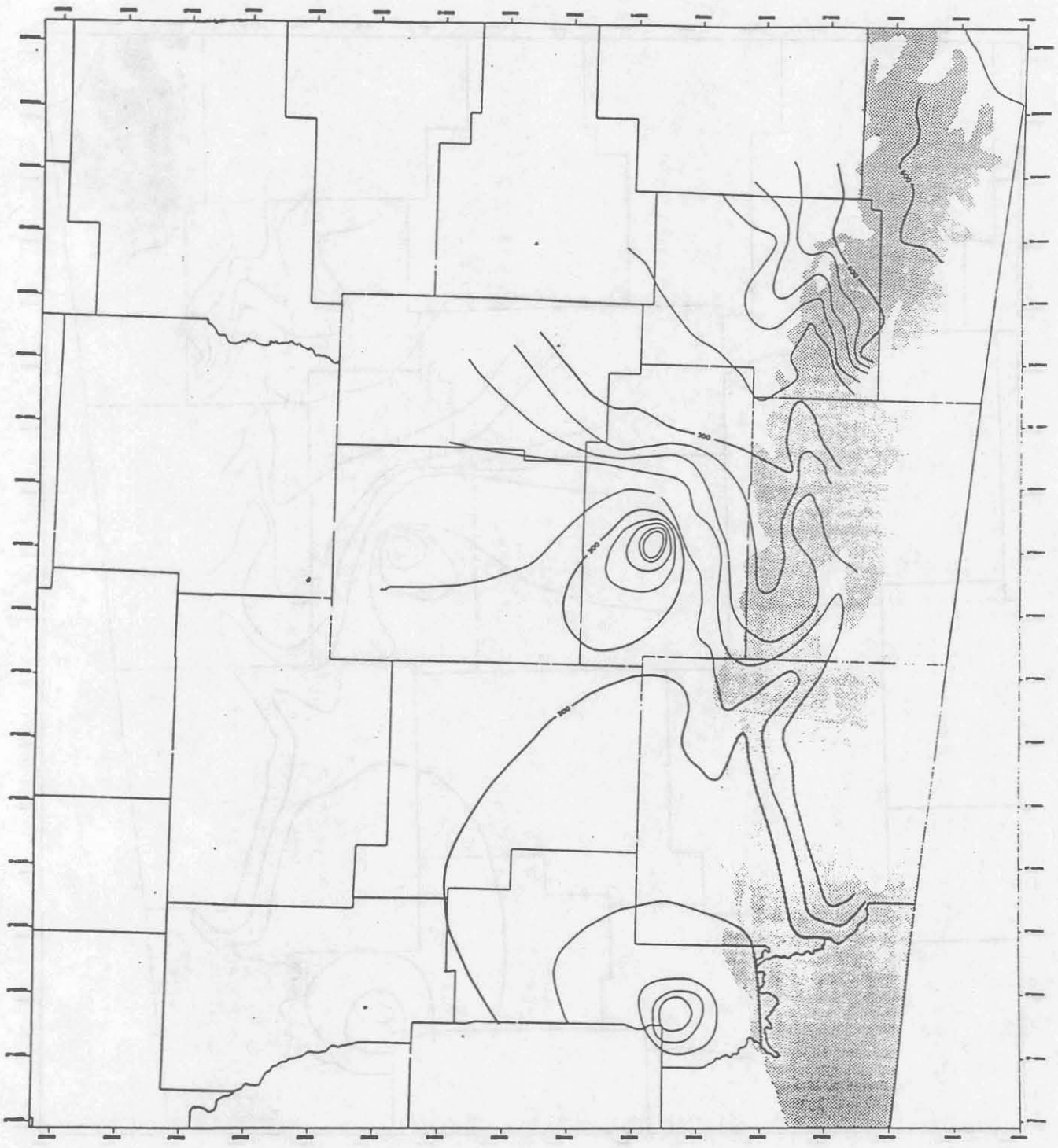


POTENTIOMETRIC MAP OF THE EUTAW–MCSHAN AQUIFER

1960–1962

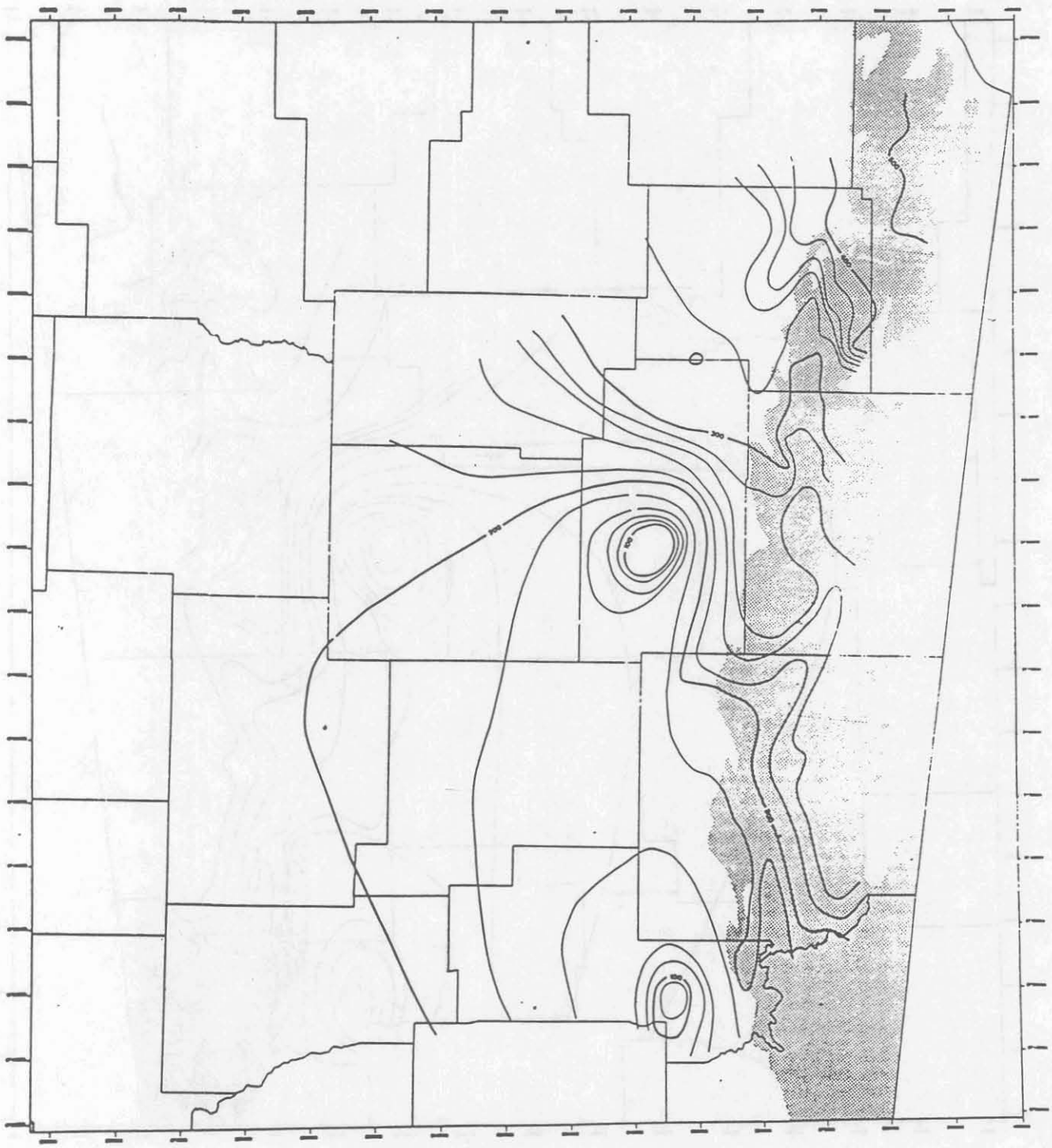
c.i. 20 ft.



POTENTIOMETRIC MAP OF THE EUTAW–MCSHAN AQUIFER

1966–1968

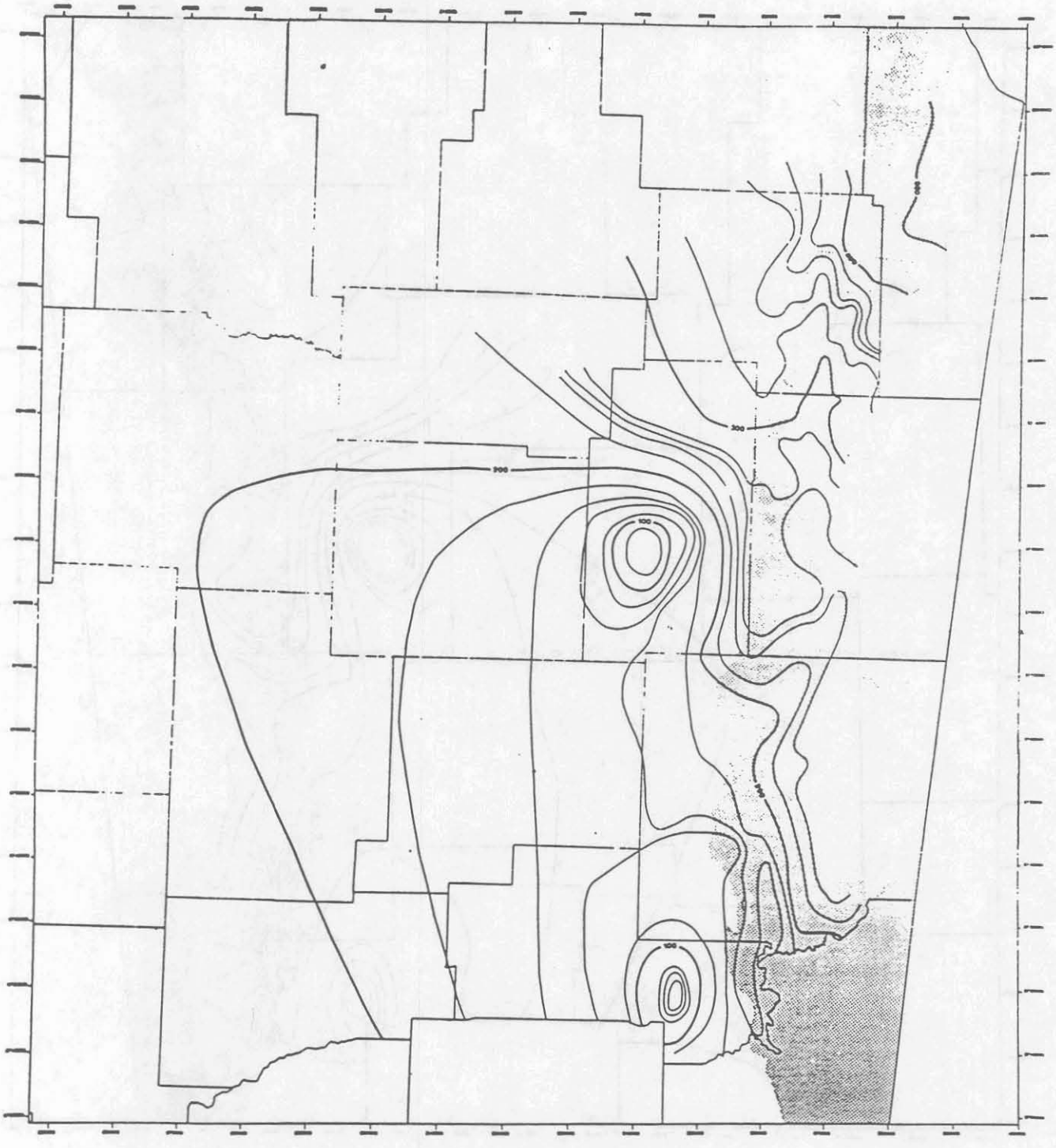
c.i. 20 ft.



POTENTIOMETRIC MAP OF THE EUTAW–MCSHAN AQUIFER

1971–1973

c.i. = 20 ft.



POTENTIOMETRIC MAP OF THE EUTAW–MCSHAN AQUIFER

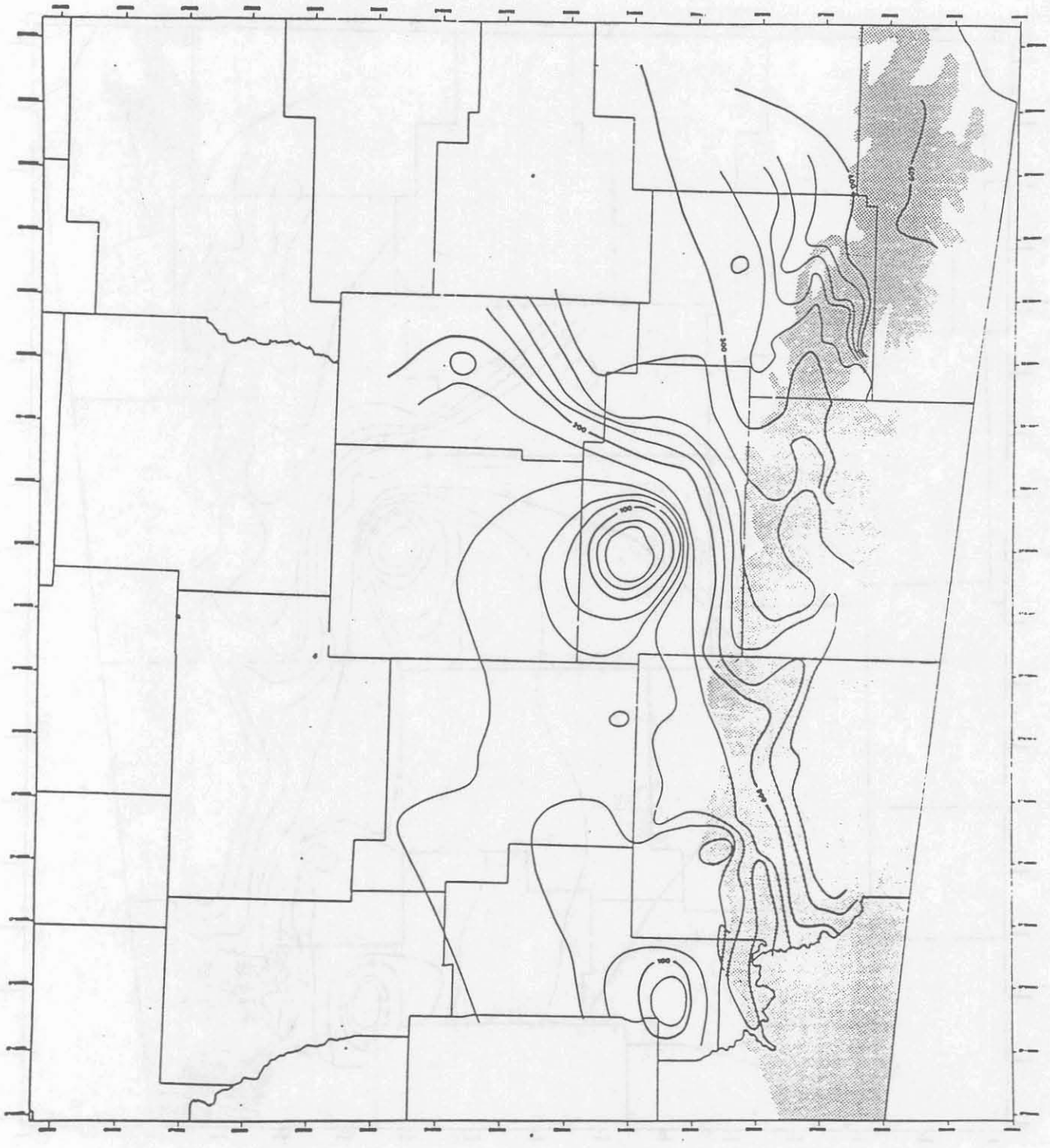
1977–1979

c.i.= 20 ft.

POTENTIOMETRIC MAP OF THE EUTAW–MCSHAN AQUIFER

1981–1983

c.i. 20 ft.



POTENTIOMETRIC MAP OF THE EUTAW–MCSHAN AQUIFER

1986–1988

c.i.= 20 ft.