Prepared in cooperation with the
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

OPEN FILE REPORT 98-099
Metz, P.A. and others, 1998, Potentiometric surfaces of the Intermediate Aquifer System, west-central Florida, September 1997

INTRODUCTION

The intermediate aquifer system underlies a 5,000-square-mile area within the Southwest Florida Water Management District including De Soto, Sarasota, Hardee, Manatee, and parts of Charlotte, Hillsborough, Highlands, Polk, and Lee Counties. It is overlain by the surficial aquifer system and is underlain by the Floridan aquifer system. The intermediate aquifer system consists of layers of sand, shell, clay, calcareous clays, limestone, and dolomite of the Tamiami Formation and Hawthorn Group of Pleistocene to Oligocene age (Wingard and others, 1995). The intermediate aquifer system contains one or more water-bearing units separated by discontinuous confining units. This aquifer system is the principal source of potable water in the southwestern part of the study area and is widely used as a source of water where wells are open to the intermediate aquifer system or to both the intermediate and Floridan aquifer systems. Yields of individual wells open to the intermediate aquifer system vary from a few gallons to several hundred gallons per minute. The volume of water withdrawn from the intermediate aquifer system is considerably less than that withdrawn from the Floridan aquifer system in the study area (Duerr and others, 1988).

In areas where multiple water-bearing units exist in the system, wells open to individual units were selected for water-level measurements whenever possible. The water levels along the northern boundary of the intermediate aquifer system generally are similar to water levels in the underlying Upper Floridan aquifer because the confining unit that separates the two aquifers is either absent or discontinuous in that area, permitting direct hydraulic connection between the two aquifer systems. In the southwestern and lower coastal region of the study area, the intermediate aquifer system is composed of the Tamiami-upper Hawthorn aquifer and the underlying lower Hawthorn-upper Tampa aquifer and is separated by intervening confining units (Wolansky, 1983). Lateral boundaries for the Tamiami-upper Hawthorn aquifer are undetermined because of limited hydrogeologic data. The potentiometric surface of the Tamiami-upper Hawthorn aquifer is shown separately from the potentiometric surface of the intermediate aquifer system.

The purpose of this report is to show the potentiometric surfaces of the intermediate aquifer system in September 1997 (figs. 1 and 2). The potentiometric surface is an imaginary surface represented by the level to which water will rise in tightly cased wells that tap a confined aquifer system. The surface is mapped by measuring the altitude of water levels in a network of wells and is represented on maps by contours that connect points of equal altitude. This map represents water-level conditions near the end of the wet season when ground-water withdrawals for agricultural use normally are low. The cumulative rainfall for the study area was 6.51 inches below average for the period from October 1996 through September 1997 (Southwest Florida Water Management District, 1997).

This report, prepared by the U.S. Geological Survey in cooperation with the Southwest Florida Water Management District, is one of a series of semi-annual intermediate aquifer system potentiometric-surface map reports prepared for the study area since September 1985. Water-level data are collected in May and September to show the annual low and high water-level conditions, respectively. Most of the water-level data for the two maps were collected by the U.S. Geological Survey during the period of September 8-12, 1997.

SUMMARY OF GROUND-WATER CONDITIONS

The composite potentiometric surface of all water-bearing units within the intermediate aquifer system is shown in figure 1. The potentiometric surface of the Tamiami-upper Hawthorn aquifer is shown in figure 2 and is based on water levels from wells open only to this aquifer. The long-term hydrographs for selected wells, shown in figure 3, indicate that the annual and seasonal fluctuations of the water levels generally are large (greater than 15 feet) in the central interior region where water demand for irrigation is high during fall and spring (hydrographs 1, 2, and 3). Seasonal fluctuations are smaller in the southern area (hydrographs 4 and 5) where water use from the intermediate aquifer system is predominantly for public supply. Hydrographs in figure 4 show the maximum daily water levels in selected wells from September 1996 to September 1997.

Most water levels measured in September 1997 for the composite intermediate aquifer potentiometric surface generally were higher than the September 1996 water levels (Metz and others, 1997). In 118 wells with paired measurements, the September 1997 levels ranged from 5 feet below to 17 feet above the September 1996 levels and averaged approximately 1 foot above the September 1996 levels. In 27 wells with paired measurements in the Tamiami-upper Hawthorn aquifer, the September 1997 levels ranged from 4 feet below to 5 feet above the September 1996 levels and averaged 0.28 feet above the September 1996 levels.

September 1997 water levels for the intermediate aquifer system composite potentiometric surface generally were higher than the May 1997 water levels (Metz and others, 1997). In 121 wells with paired measurements, the September 1997 levels ranged from 3 feet below to 18 feet above the May 1997 levels and averaged approximately 4 feet above the May 1997 levels. In 27 wells with paired measurements in the Tamiami-upper Hawthorn aquifer, the September 1997 levels ranged from 3 feet below to 8 feet above the May 1997 levels and averaged approximately 2.5 feet above the May 1997 levels. Pumping from the wellfield in northern Lee County that supplies Fort Myers has resulted in a cone of depression in the potentiometric surface of the Tamiami-upper Hawthorn aquifer (fig. 2). Natural discharge from Warm Mineral Springs in the southern part of Sarasota County affects both the composite intermediate aquifer potentiometric surface and that of the Tamiami-upper Hawthorn aquifer (figs. 1 and 2).

REFERENCES

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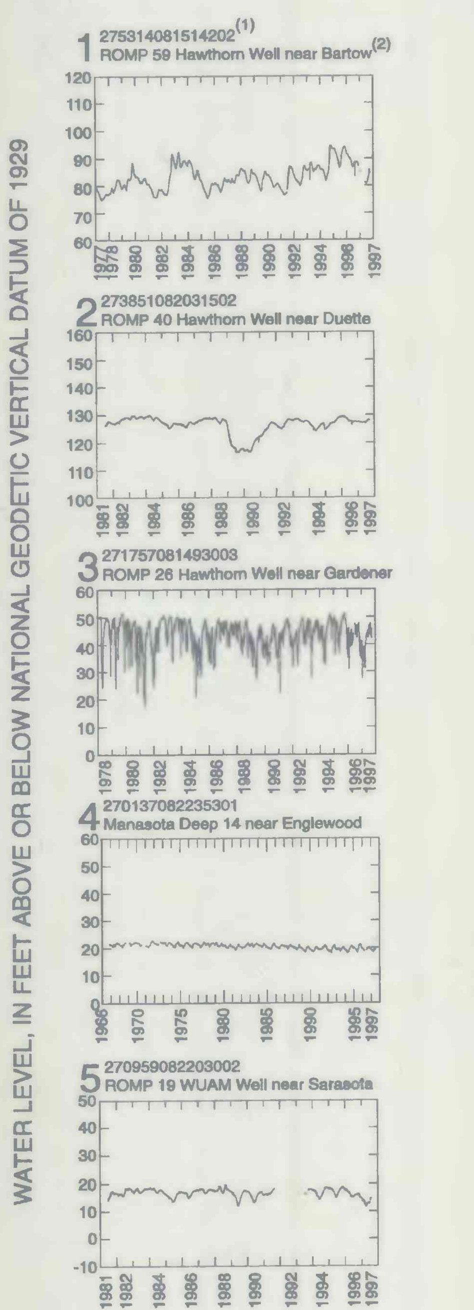
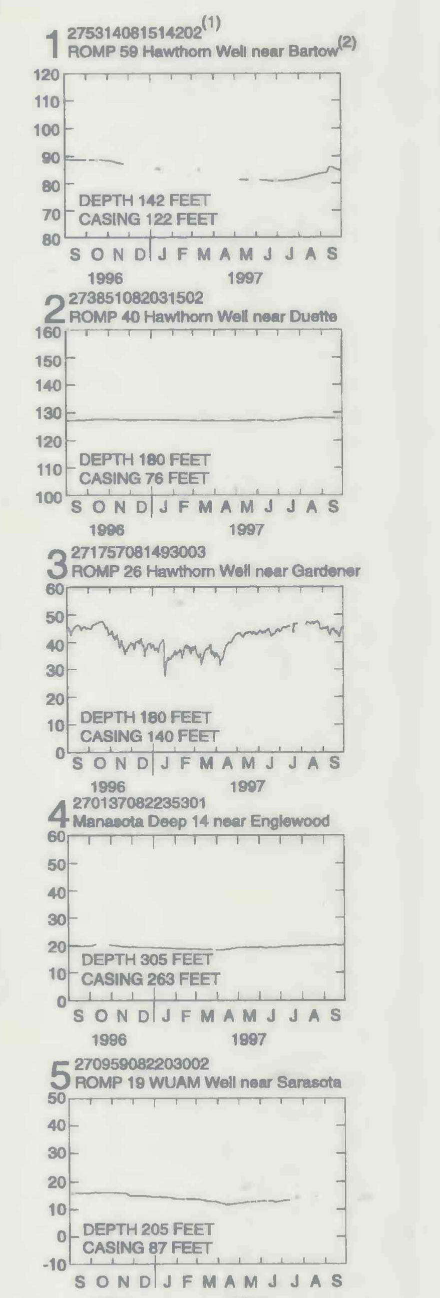


(1) Station number based on latitude and longitude of the site.

(2) ROMP 59 (Regional Observation and Monitor Well Program) is a Southwest Florida Water Management District monitor well and identification number.

Figure 3. Annual and seasonal fluctuations of water levels for selected wells. (Gaps indicate missing data.)



(1) Station number based on latitude and longitude of the site.

(2) ROMP 59 (Regional Observation and Monitor Well Program) is a Southwest Florida Water Management District monitor well and identification number.

Figure 4. Maximum daily water levels for selected wells from September 1996 to September 1997. (Gaps indicate missing data.)

EXPLANATION

- VERNA — MUNICIPAL WELL FIELD
- —20— — POTENTIOMETRIC CONTOUR - - Shows altitude at which water would have stood in tightly cased wells. Contour intervals are 5 and 10 feet. National Geodetic Vertical Datum of 1929. Hachures indicate depressions. Dashed where approximately located.
- BOUNDARY OF SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
- APPROXIMATE NORTHERN BOUNDARY OF THE INTERMEDIATE AQUIFER SYSTEM
- APPROXIMATE EASTERN BOUNDARY OF THE TAMIAMI-UPPER HAWTHORN AQUIFER
- 5 16, 13 — OBSERVATION WELLS - - Large number identifies hydrograph (figs. 1,2). Small number is altitude of water level in feet above or below National Geodetic Vertical Datum of 1929.
- 5 — SPRING - - Number (if shown) is the measured spring-pool altitude, in feet. The altitudes do not necessarily reflect the potentiometric surface at the spring pool.
- CITY OR TOWN

NOTE: The potentiometric contours are generalized to synoptically portray the head in a dynamic hydrologic system, taking due account of the variations in hydrogeologic conditions, such as differing depths of wells, nonsimultaneous measurements of water levels, variable effects of pumping, and changing climatic influence. The potentiometric contours may not conform exactly with the individual measurements of water level.

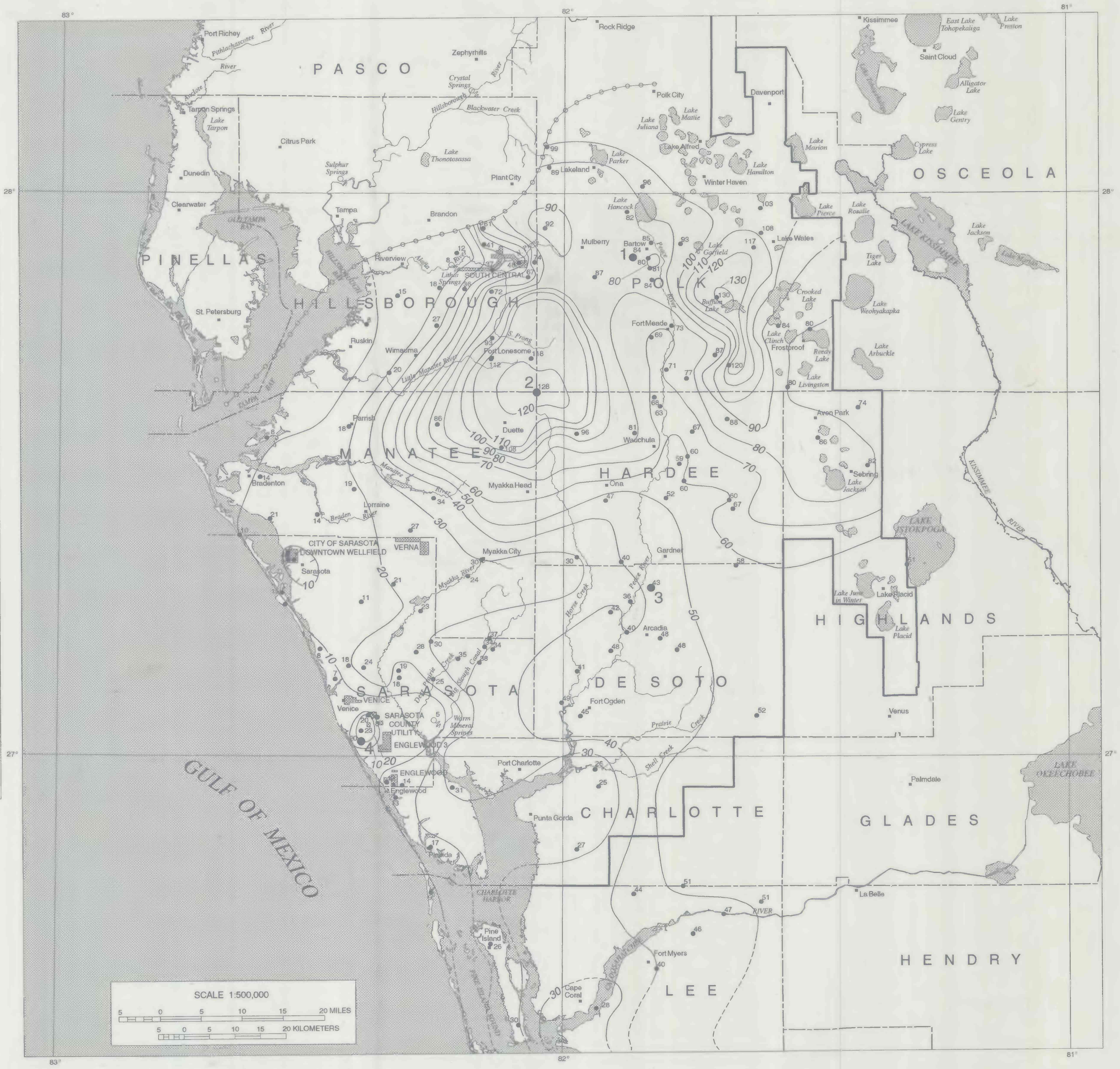


Figure 1. Composite potentiometric surface of the intermediate aquifer system.

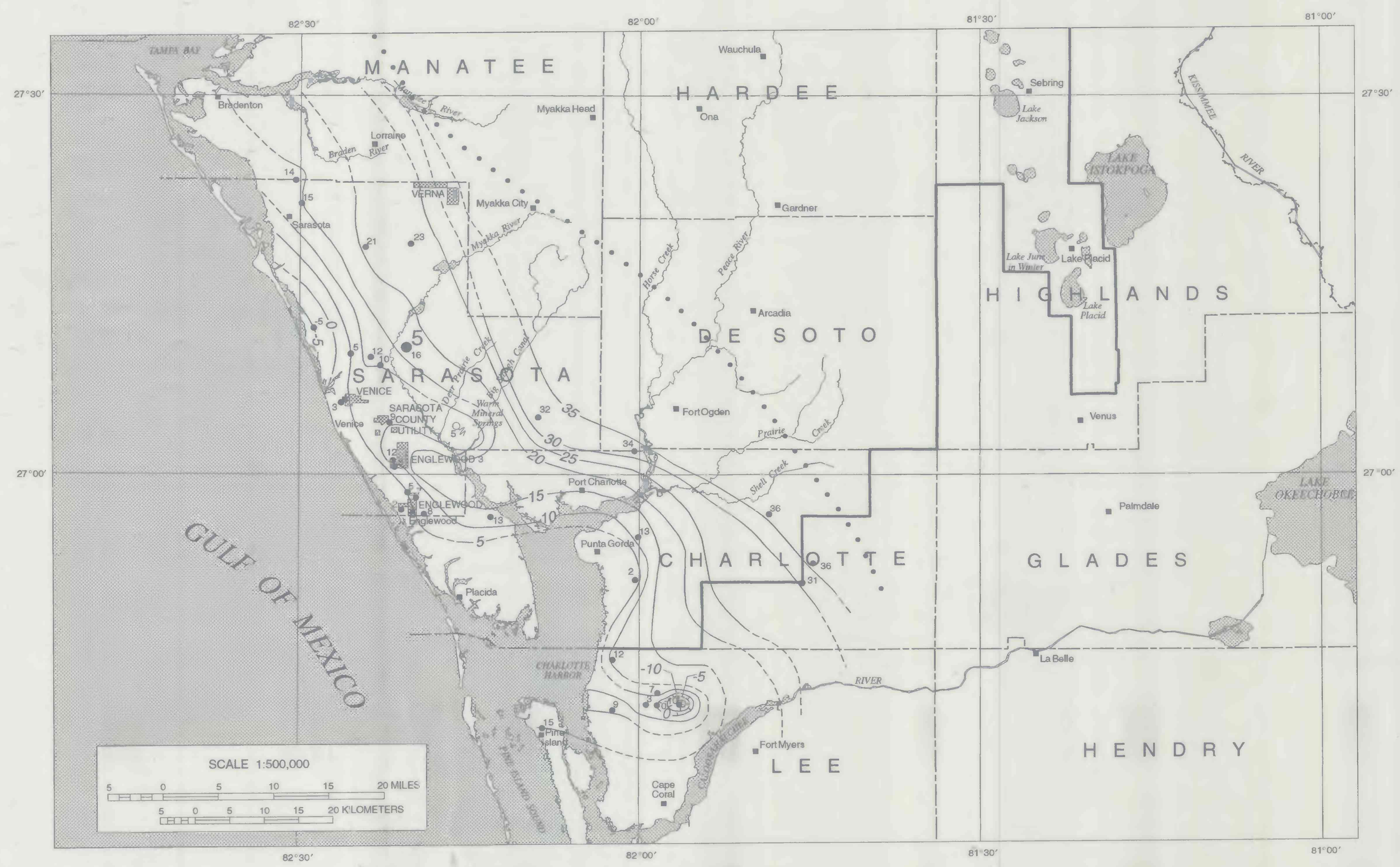


Figure 2. Potentiometric surface of the Tamiami-upper Hawthorn aquifer.

Base from Southwest Florida Water Management District digital data, 1992
Universal Transverse Mercator projection, Zone 17

Copies of this map can be purchased from:
U.S. Geological Survey
Branch of Information Services
Box 25286
Denver, Colorado 80225-0286

POTENTIOMETRIC SURFACES OF THE INTERMEDIATE AQUIFER SYSTEM, WEST-CENTRAL FLORIDA, SEPTEMBER 1997

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