U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with the
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

OPEN-FILE REPORT 94-34

INTRODUCTION

The intermediate aquifer system within the Southwest Florida Water Management District underlies a 5,000-square-mile area including De Soto, Sarasota, Hardee, Manatee, and parts of Charlotte, Hillsborough, Highlands, and Polk 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 late Tertiary age. The 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 in other areas 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 The volume of water withdrawn from the intermediate aquifer system is considerably less than that withdrawn from the Floridan aquifer system in the study area (Duerr and others, 1988).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 aquifers exist in the system, wells open to individual aquifers 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 Floridan aquifer system 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 available from wells. 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 May 1993. 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 determining 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 dry season when ground-water withdrawals for agricultural use are high. The cumulative rainfall for the study area was 4.84 inches above normal for the period from June 1992 to May 1993 (Southwest Florida Water Management District, 1993).

This report, prepared by the U.S. Geological Survey in cooperation with the Southwest Florida Water Management District, is one of a series of intermediate aquifer system potentiometric-surface map reports made for the study area since September 1985. Water-level data are collected in May and September to depict the annual low and high water-level conditions, respectively. Most of the water-level data for this map were collected by the U.S. Geological Survey during the period of May 17-21, 1993. Supplemental data were collected by other agencies and companies.

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 in wells open exclusively to this aquifer. The hydrographs for selected wells, shown in figure 3, indicate that the annual and seasonal fluctuations of the water levels are generally 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 northern recharge area (hydrographs 4 and 5) where water use is predominantly for public supply. Hydrographs in figure 4 show the maximum daily water-level altitudes in selected wells from May 1992 to May 1993.

Water levels measured in May 1993 for the composite intermediate aquifer potentiometric surface were lower than those measured in September 1992 (Mularoni, 1993). In 132 wells with paired measurements, the May 1993 level ranged from 23.20 feet below to 7.00 feet above the September 1992 level and averaged 4.67 feet below the September 1992 level. In 27 wells with paired measurements in the Tamiami-upper Hawthorn aquifer, the May 1993 level ranged from 15.50 feet below to 0.56 foot above the September 1992 level and averaged 3.33 feet below the September 1992 level.

May 1993 water levels for the composite intermediate aquifer potentiometric surface were lower than those reported for May 1992 (Mularoni, 1992). In 128 wells with paired measurements, the May 1993 level ranged from 7.45 feet below to 15.56 feet above the May 1992 level and averaged 3.66 feet above the May 1992 level. In 29 wells with paired measurements in the Tamiami-upper Hawthorn aquifer, the May 1993 level ranged from 4.78 feet below to 12.19 feet above the May 1992 level and averaged 1.17 feet above the May 1992 level. At Verna well field in northeastern Sarasota County, a 20-foot contour was estimated from measurements in wells that tap both the Upper Floridan aquifer and the intermediate aquifer system (fig. 1). A cone of depression that extends below sea level exists in the potentiometric surface of the Tamiami-upper Hawthorn aquifer in northern Lee County at a well field that supplies Cape Coral (fig. 2). A cone of depression also exists in potentiometric surface for the composite aquifer system and the Tamiami-upper Hawthorn aquifer at Warm Mineral Springs, which is a natural discharge point from the intermediate aquifer system (figs. 1 and 2).

REFERENCES

Duerr, A.D., Hunn, J.D., Lewelling, B.R., and Trommer, J.T., 1988, Geohydrology and 1985 water withdrawals of the aquifer systems in southwest Florida, with emphasis on the intermediate aquifer system: U.S. Geological Survey Water-Resources Investigations Report 87-4259, 115 p.

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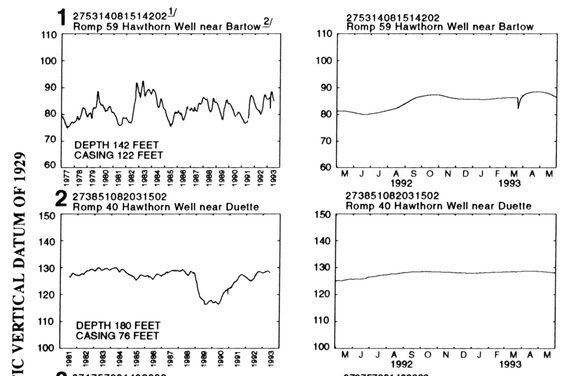

1/ Station number based on the latitude and longitude of the site

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

Figure 3.-- Water levels in selected wells tapping the intermediate aquifer system.

Figure 4.-- Maximum daily water levels in selected wells from May 1992 to May 1993.

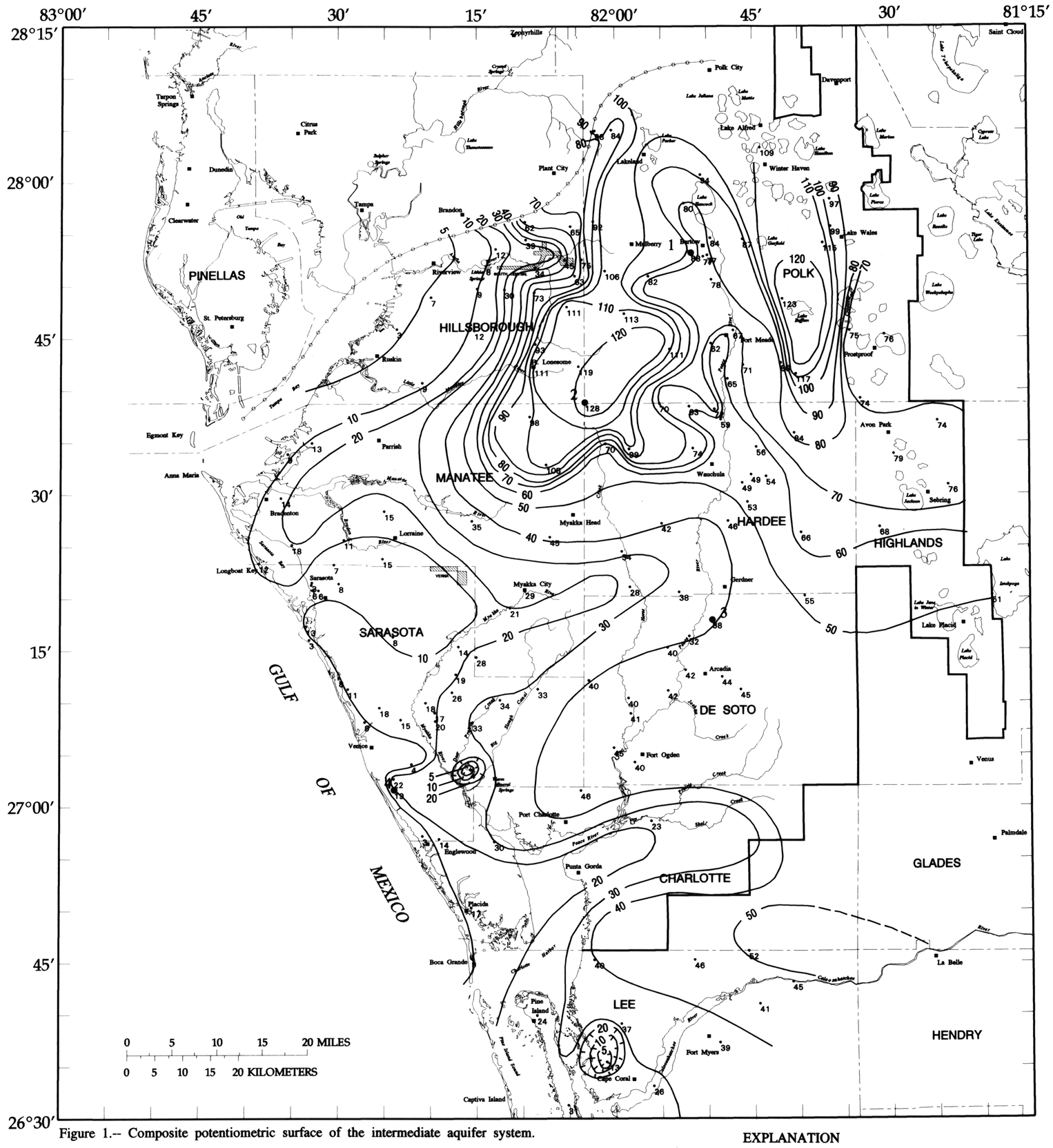

Figure 1.-- Composite potentiometric surface of the intermediate aquifer system.

EXPLANATION

MUNICIPAL WELL FIELD PRODUCING 500,000 GALLONS PER DAY OR MORE

POTENTIOMETRIC CONTOUR -- Shows altitude at which water would have stood in tightly cased wells. Contour interval 5 and 10 feet. National Geodetic Vertical Datum of 1929. Hatchures indicate depressions. Dashed where approximately located.

BOUNDARY OF SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

APPROXIMATE NORTHERN BOUNDARY OF THE INTERMEDIATE AQUIFER

APPROXIMATE NORTHERN BOUNDARY OF THE TAMIAMI-UPPER HAWTHORN AQUIFER

OBSERVATION WELLS -- Large number identifies hydrograph. Small number is altitude of water level in feet above or below NGVD of 1929.

SPRING

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

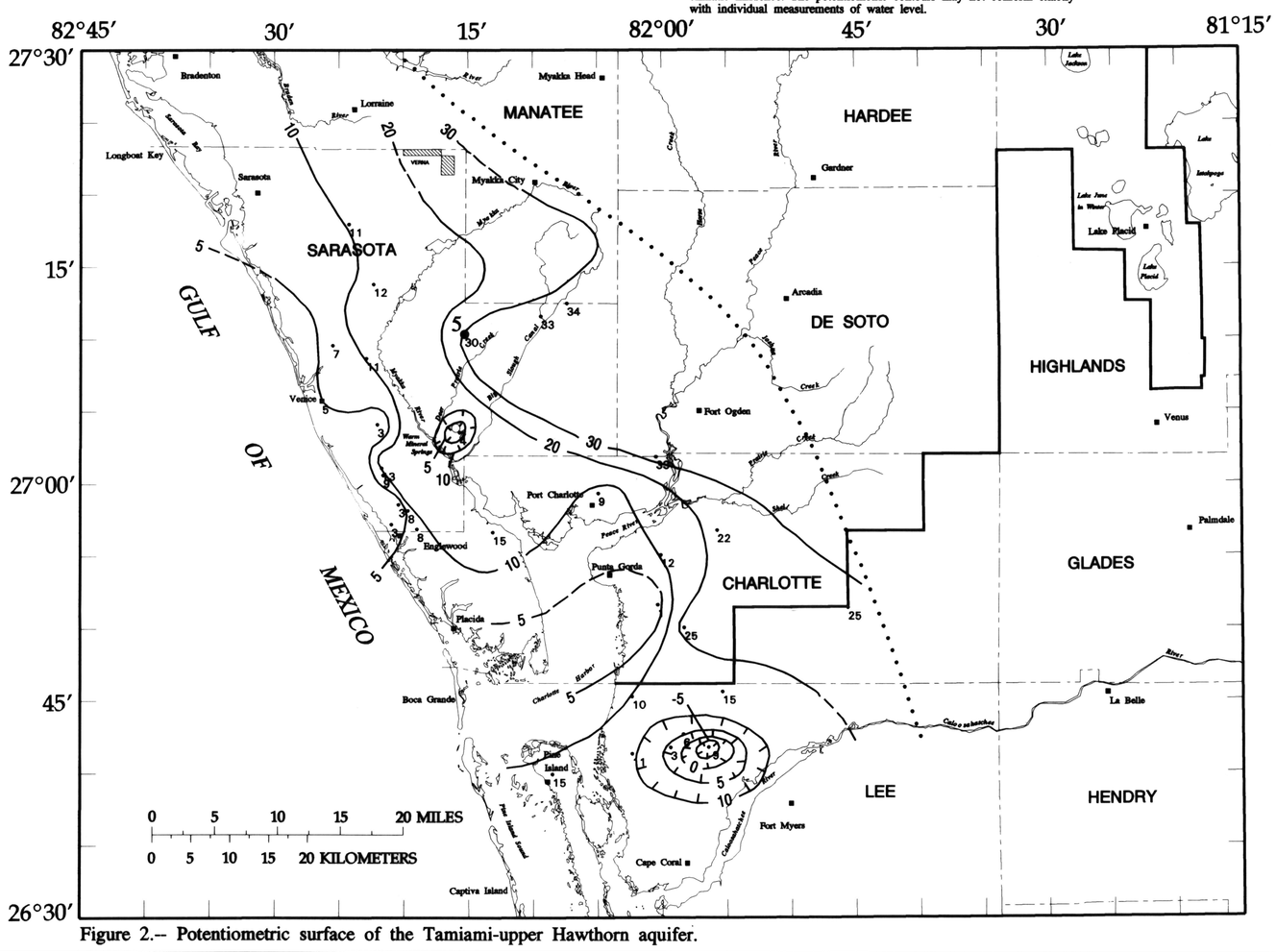

Figure 2.-- Potentiometric surface of the Tamiami-upper Hawthorn aquifer.

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

POTENTIOMETRIC SURFACES OF THE INTERMEDIATE AQUIFER SYSTEM, WEST-CENTRAL FLORIDA, MAY 1993

By R. A. Mularoni

1994

Copies of this map can be purchased from:
U.S. Geological Survey
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