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

PREPARED IN COOPERATION WITH THE
CITY OF HOUSTON
AND THE
HARRIS-GALVESTON COASTAL SUBSIDENCE DISTRICT

OPEN-FILE REPORT 97–181
Approximate water-level altitudes, Chicot aquifer, January 1997—SHEET 1 OF 8
Kasmarek, M.C., and others, 1997, Water-level altitudes 1997, water-level changes 1977–97 and 1996–97, and compaction 1973–96 in the Chicot and Evangeline aquifers, Houston-Galveston region, Texas

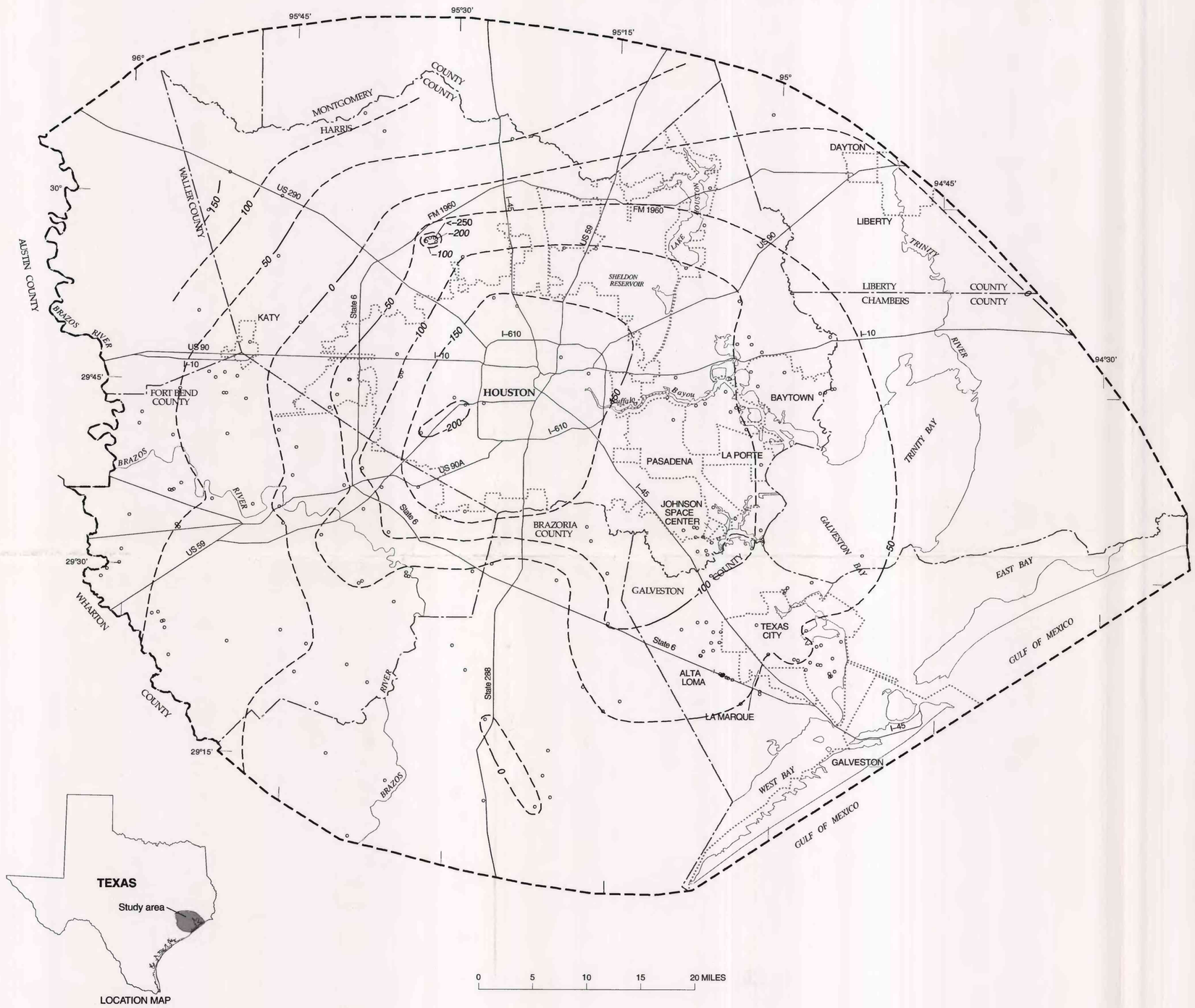

Figure 1. Map showing approximate water-level altitudes in the Chicot aquifer, Houston-Galveston region, Texas, January 1997.

Base from U.S. Geological Survey digital data, 1:100,000
Universal Transverse Mercator projection
Zone 15

INTRODUCTION

This report is one in an annual series of reports that depicts water-level altitudes and water-level changes since 1977 and compaction since 1973 in the Chicot and Evangeline aquifers in the Houston-Galveston region, Texas. The report, prepared in cooperation with the City of Houston and the Harris-Galveston Coastal Subsidence District, presents maps for the Chicot and Evangeline aquifers showing the approximate water-level altitudes in wells in 1997 (figs. 1, 4) and approximate water-level changes in wells from 1977 to 1997 and from 1996 to 1997 (figs. 2, 3, 5, 6), a map showing extensometer site locations (fig. 7), and graphs showing measured compaction of subsurface material at selected sites from 1973 to 1996 (fig. 8). The most recent previously published water-level-altitude maps and water-level-change maps for the two aquifers in the region are by Kasmarek and others (1996). The Houston-Galveston region includes Harris and Galveston Counties and adjacent parts of Brazoria, Fort Bend, Waller, Montgomery, Liberty, and Chambers Counties.

GEOHYDROLOGY

The Chicot aquifer consists of sediments of Holocene and Pleistocene age and the underlying Evangeline aquifer consists of sediments of Pliocene and Miocene age. The sediments are discontinuous layers of sand and clay that thicken to the southeast (Williams and Ranzau, 1987). The Chicot and Evangeline aquifers are confined beneath Galveston Bay and Lake Houston by the Beaumont Clay. The aquifers are unconfined in the western and northern parts of the region where they crop out. The aquifers are confined in the southern and eastern parts of the region. The water in the aquifers is fresh (less than 1,000 milligrams per liter dissolved-solids concentration) in most of the region. The Chicot aquifer is differentiated from the geologically similar Evangeline aquifer on the basis of hydraulic conductivity (Carr and others, 1985, p.10). The hydraulic conductivity of the Evangeline aquifer generally is less than the hydraulic conductivity of the Chicot aquifer (Williams and Ranzau, 1987, p. 10). A weak hydraulic connection between land surface and the Chicot aquifer and between the Chicot and Evangeline aquifers allows vertical movement of water into and between the aquifers; the aquifer system thus is characterized as "leaky" (Gabrysch and Coplin, 1990, p. 2). The water-level surface in the Houston-Galveston region is the result of many coalescing cones of depression caused by water withdrawn from numerous wells throughout the area.

WATER-LEVEL MEASUREMENTS

Water-level measurements used to prepare this report were obtained by steel tape, airline, electronic sensor, and from reports by well operators. Most wells are pumped once daily, but some are pumped more frequently. Multiple measurements were made when wells were not being pumped. However, antecedent pumping conditions were not always known. Water-level measurements were made in January, the month when water levels usually are highest. The wells selected for water-level measurements had comparable depths and screened intervals. Some water-level measurements from wells outside the study area are obtained to increase water-level-contour control.

MEASURED COMPACTION

Compaction of subsurface material is measured continuously by 13 borehole extensometers (wells equipped with compaction monitors) at 11 sites (fig. 7). Compaction measured by the shallower second extensometer at the Clear Lake site is not shown because it is similar to that measured by the deeper extensometer at the site. Graphs of long-term compaction for 12 extensometers are shown in figure 8.

REFERENCES CITED

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Williams, J.F., III, and Ranzau, C.E., Jr., 1987, Ground-water withdrawals and changes in ground-water levels, ground-water quality, and land-surface subsidence in the Houston district, Texas, 1980–84: U.S. Geological Survey Water-Resources Investigations Report 87–4153, 56 p.

VERTICAL DATUM

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929.

EXPLANATION

— — -50 — — **Water-level contour**—Shows altitude at which water level would have stood in tightly cased well. Contour intervals 50 and 100 feet. Datum is sea level

— — — — — **Boundary of study area**

∘ **Data point**—Well in which water-level measurement was made. One point can represent more than one well

< indicates less than

WATER-LEVEL ALTITUDES 1997, WATER-LEVEL CHANGES 1977–97 AND 1996–97, AND COMPACTION 1973–96 IN THE CHICOT AND EVANGELINE AQUIFERS, HOUSTON-GALVESTON REGION, TEXAS

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