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 94-346
Approximate changes in water levels, Chicot aquifer, 1977-94-- SHEET 1 OF 6
Kasmarek, M.C, and others, Approximate changes in water levels in wells completed in the Chicot and Evangeline aquifers, 1977-94 and 1993-94, and measured compaction, 1973-93, in the Houston-Galvestion region, Texas

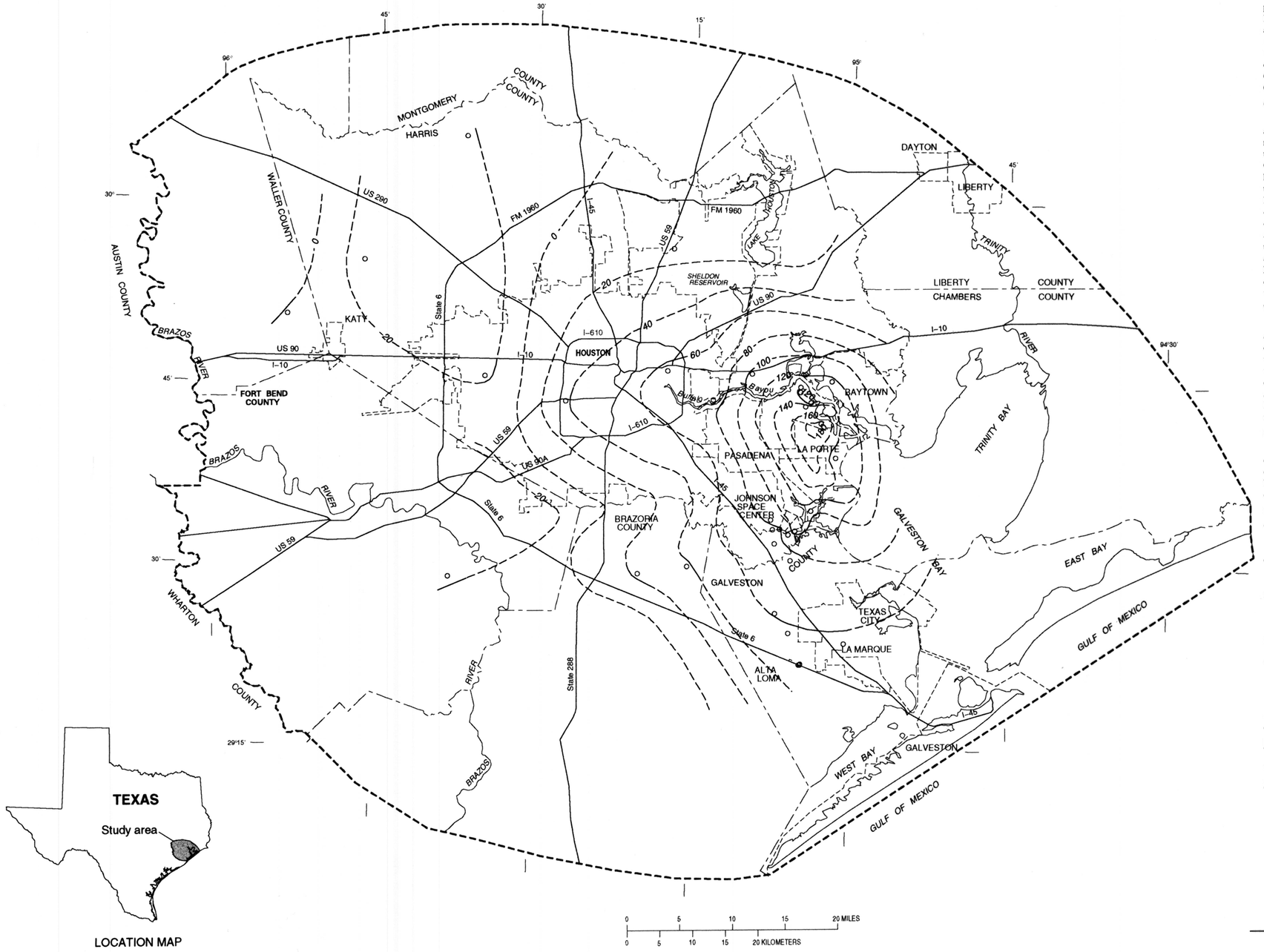

Figure 1. Map showing approximate changes in water levels in wells completed in the Chicot aquifer, 1977–94.

INTRODUCTION

This report is one in a series of reports that depict water-level changes since 1977 and compaction of subsurface material since 1973. The report was prepared in cooperation with the City of Houston and the Harris-Galveston Coastal Subsidence District, and presents maps showing the approximate changes in water levels in wells completed in the Chicot and Evangeline aquifers, 1977-94 and 1993-94 (figs. 1-4), extensometer site locations (fig. 5), and measured compaction, 1973-93 (fig. 6), in the Houston-Galveston region. Water-level change maps were prepared previously by Kasmarek and others (1993). 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 and the underlying Evangeline aquifer are composed of discontinuous sedimentary deposits of sand, silt, and clay, which thicken to the southeast in the Houston-Galveston region (Williams and Ranzau, 1987). In most of the region, the water in the aquifers is fresh (less than 1,000 milligrams per liter dissolved-solids concentration). The primary basis for separating the Chicot aquifer from the underlying Evangeline aquifer is a difference in hydraulic conductivity. The hydraulic conductivity is larger in the Chicot aquifer and, in part, causes the difference in the altitude of the water levels in wells completed in the two aquifers (Meyer and Carr, 1979). The water levels in wells completed in the Chicot aquifer are at a higher altitude than the water levels in wells completed in the Evangeline aquifer. In the western and northern parts of the region, the aquifers crop out and are under water-table conditions. In the southern and eastern parts of the region, the aquifers are under artesian conditions. Because there is a small hydraulic connection between the two aquifers and between the Chicot aquifer and the land surface, the system is termed "leaky" (Carr and others, 1985). The Chicot and Evangeline aquifers are confined underneath Galveston Bay and Lake Houston by the Beaumont Clay. The water-level surface in the Houston-Galveston region, in effect, may be considered to represent a system of intersecting cones of depression caused by water withdrawn from numerous wells throughout the area.

WATER-LEVEL MEASUREMENTS

Water-level measurements used in preparation of this report were obtained by steel tape, airline measurements, and electronic sensors, and from reports by well operators. About 60 percent of the observation wells are pumped frequently, and some are pumped daily. Multiple measurements were made when wells were not being pumped. However, antecedent pumping conditions often were not known. Water levels in wells were measured in January and February to minimize the effects of pumping. Measurements in wells with comparable depths and screened intervals were selected for construction of the maps. Additional wells in the southern and southwestern parts of the Houston-Galveston region were added to the monitoring network in 1990. Water-level measurements from these wells help to better delineate water-level changes in those parts of the region.

MEASURED COMPACTION

Compaction of subsurface material is being measured by 13 borehole extensometers (wells equipped with compaction monitors) at 11 sites (fig. 5). Historical measurements from 12 extensometers are presented in figure 6. At the Clear Lake site, measurements from a second extensometer of less depth (1,740 feet) are not shown because they duplicate the record of the Clear Lake extensometer presented in figure 6.

SELECTED REFERENCES

Carr, J.E., Meyer, W.R., Sandeen, W.M., and McLane, I.R., 1985, Digital models for simulation of ground-water hydrology of the Chicot and Evangeline aquifers along the Gulf Coast of Texas: Texas Department of Water Resources Report 289, 101 p.

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Kasmarek, M.C., Coplin, L.S., and Campodonico, Al, 1993, Approximate changes in water levels in wells completed in the Chicot and Evangeline aquifers, 1977-93 and 1992-93, and measured compaction, 1973-92, in the Houston-Galveston region, Texas: U.S. Geological Survey Open-File Report 93-86, 7 sheets.

Meyer, W.R., and Carr, J.E., 1979, A digital model for simulation of ground-water hydrology in the Houston area, Texas: Texas Department of Water Resources LP-103, 104 p.

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.

CONVERSION FACTORS

Multiply	By	To obtain
foot	0.3048	meter
mile	1.609	kilometer

EXPLANATION

- 20 — LINE OF EQUAL WATER-LEVEL CHANGE---Dashed where approximately located. Interval 20 feet
- BOUNDARY OF STUDY AREA
- WELL USED FOR CONTROL

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

APPROXIMATE CHANGES IN WATER LEVELS IN WELLS COMPLETED IN THE CHICOT AND EVANGELINE AQUIFERS, 1977-94 AND 1993-94, AND MEASURED COMPACTION, 1973-93, IN THE HOUSTON-GALVESTON REGION, TEXAS

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