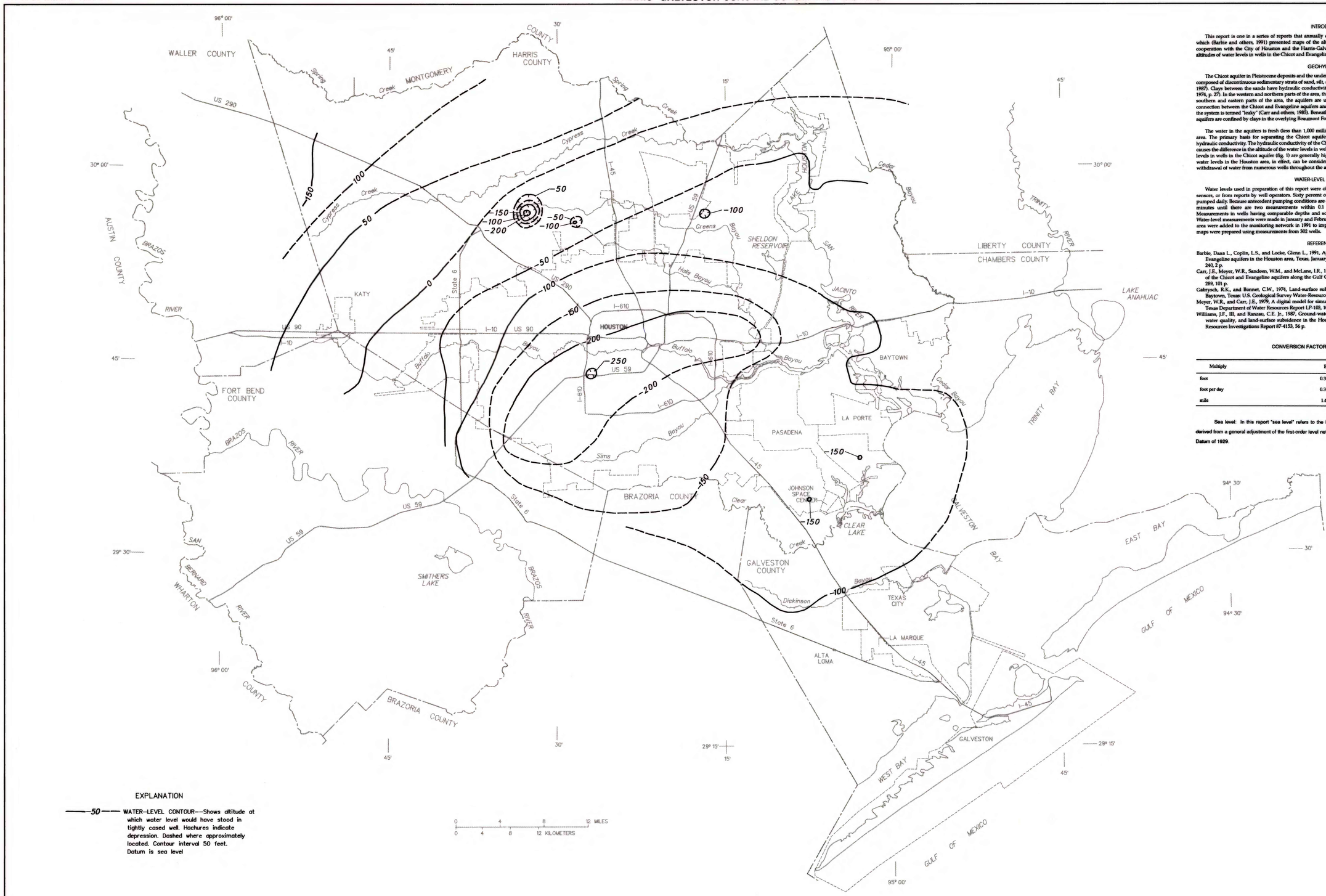
U.S. DEPARTMENT OF THE INTERIOR
U.S GEOLOGICAL SURVEY

Prepared in cooperation with the
CITY OF HOUSTON
and the
HARRIS–GALVESTON COASTAL SUBSIDENCE DISTRICT

OPEN–FILE REPORT 93–75
SHEET 1 OF 2



EXPLANATION

—50— WATER–LEVEL CONTOUR—Shows altitude at which water level would have stood in tightly cased well. Hachures indicate depression. Dashed where approximately located. Contour interval 50 feet. Datum is sea level

0 4 8 12 MILES
0 4 8 12 KILOMETERS

Base modified from Texas Department of Highways and Public Transportation General Highway Maps

Figure 1. Map showing approximate altitude of water levels in wells in the Chicot aquifer, January–February 1991.

INTRODUCTION

This report is one in a series of reports that annually depict altitudes of water levels since 1977, the most recent of which (Barbie and others, 1991) presented maps of the altitudes of water levels for 1990. This report was prepared in cooperation with the City of Houston and the Harris-Galveston Coastal Subsidence District, and presents approximate altitudes of water levels in wells in the Chicot and Evangeline aquifers, in the Houston area, January-February 1991.

GEOHYDROLOGY

The Chicot aquifer in Pleistocene deposits and the underlying Evangeline aquifer in Pliocene and Miocene deposits are composed of discontinuous sedimentary strata of sand, silt, and clay, which thicken to the southeast (Williams and Ranzau, 1987). Clays between the sands have hydraulic conductivities of as little as 4×10^{-4} feet per day (Gabrysch and Bonnet, 1974, p. 27). In the western and northern parts of the area, the aquifers outcrop and are under water-table conditions. In the southern and eastern parts of the area, the aquifers are under artesian conditions. Because there is a slight hydraulic connection between the Chicot and Evangeline aquifers and between the Chicot aquifer and streams on the land surface, the system is termed "leaky" (Carr and others, 1985). Beneath Galveston Bay and Lake Houston, the Chicot and Evangeline aquifers are confined by clays in the overlying Beaumont Formation, and therefore, are not as leaky in that part of the area.

The water in the aquifers is fresh (less than 1,000 milligrams per liter dissolved-solids concentration) in most of the area. The primary basis for separating the Chicot aquifer from the underlying Evangeline aquifer is a difference in hydraulic conductivity. The hydraulic conductivity of the Chicot aquifer is greater than the Evangeline 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). Water levels in wells in the Chicot aquifer (fig. 1) are generally higher than those in wells in the Evangeline aquifer (fig. 2). The water levels in the Houston area, in effect, can be considered a system of coalescing cones of depression caused by the withdrawal of water from numerous wells throughout the area.

WATER-LEVEL MEASUREMENTS

Water levels used in preparation of this report were obtained by steel tape and air-line measurements, by electrical sensors, or from reports by well operators. Sixty percent of the observation wells are pumped frequently, and some are pumped daily. Because antecedent pumping conditions are commonly unknown, multiple measurements are made within minutes until there are two measurements within 0.1 foot, then the highest altitude measurement is recorded. Measurements in wells having comparable depths and screened intervals were selected for construction of the maps. Water-level measurements were made in January and February 1991. Additional wells in the northern part of the Houston area were added to the monitoring network in 1991 to improve definition of water levels in those parts of the area. The maps were prepared using measurements from 302 wells.

REFERENCES CITED

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
foot	0.3048	meter
foot per day	0.3048	meter per day
mile	1.609	kilometer

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum 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.

APPROXIMATE ALTITUDE OF WATER LEVELS IN WELLS COMPLETED IN THE CHICOT AND EVANGELINE AQUIFERS IN THE HOUSTON AREA, TEXAS, JANUARY–FEBRUARY, 1991

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