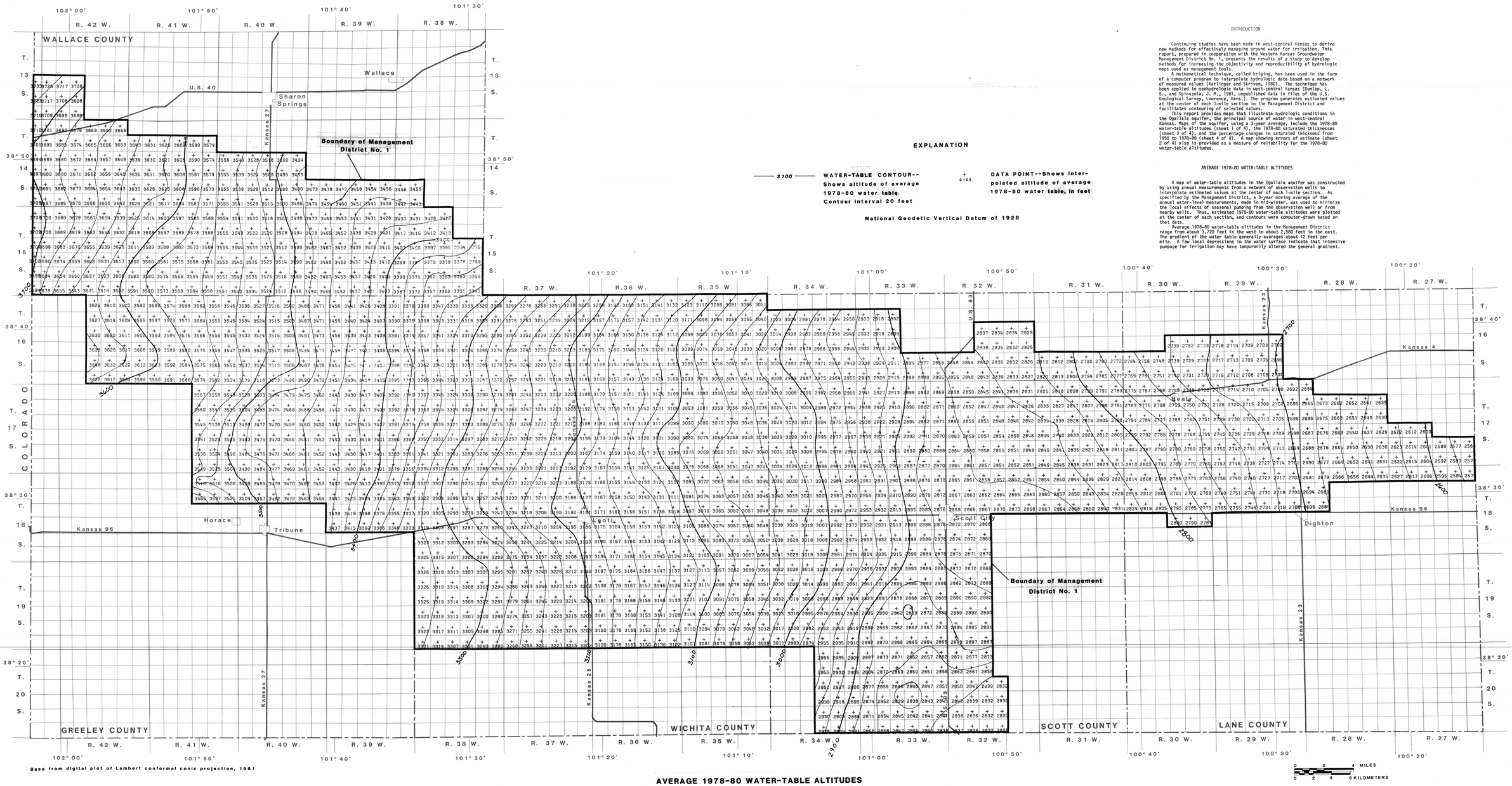
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

Prepared in cooperation with the
WESTERN KANSAS GROUNDWATER MANAGEMENT DISTRICT NO. 1

OPEN-FILE REPORT 81-908
SHEET 1 of 4



Base from digital plot of Lambert conformal conic projection, 1981

EXPLANATION

—— 3100 —— WATER-TABLE CONTOUR--Shows altitude of average 1978-80 water table. Contour interval 20 feet

+ 3105 DATA POINT--Shows interpolated altitude of average 1978-80 water table, in feet

National Geodetic Vertical Datum of 1929

INTRODUCTION

Continuing studies have been made in west-central Kansas to derive new methods for effectively managing ground water for irrigation. This report, prepared in cooperation with the Western Kansas Groundwater Management District No. 1, presents the results of a study to develop methods for increasing the objectivity and reproducibility of hydrologic maps used as management tools.

A mathematical technique, called kriging, has been used in the form of a computer program to interpolate hydrologic data based on a network of measured values (Karlinger and Skrivan, 1980). The technique has been applied to geohydrologic data in west-central Kansas (Dunlap, L. E., and Spinazola, J. M., 1981, unpublished data in files of the U.S. Geological Survey, Lawrence, Kans.). The program generates estimated values at the center of each 1-mile section in the Management District and facilitates contouring of selected values.

This report provides maps that illustrate hydrologic conditions in the Ogallala aquifer, the principal source of water in west-central Kansas. Maps of the aquifer, using a 3-year average, include the 1978-80 water-table altitudes (sheet 1 of 4), the 1978-80 saturated thicknesses (sheet 3 of 4), and the percentage changes in saturated thickness from 1950 to 1978-80 (sheet 4 of 4). A map showing errors of estimate (sheet 2 of 4) also is provided as a measure of reliability for the 1978-80 water-table altitudes.

AVERAGE 1978-80 WATER-TABLE ALTITUDES

A map of water-table altitudes in the Ogallala aquifer was constructed by using annual measurements from a network of observation wells to interpolate estimated values at the center of each 1-mile section. As specified by the Management District, a 3-year moving average of the annual water-level measurements, made in mid-winter, was used to minimize the local effects of seasonal pumping from the observation well or from nearby wells. Thus, estimated 1978-80 water-table altitudes were plotted at the center of each section, and contoured by computer-drawn based on that data.

Average 1978-80 water-table altitudes in the Management District range from about 3,720 feet in the west to about 2,580 feet in the east. The gradient of the water table generally averages about 12 feet per mile. A few local depressions in the water surface indicate that intensive pumpage for irrigation may have temporarily altered the general gradient.

AVERAGE 1978-80 WATER-TABLE ALTITUDES

HYDROLOGIC MAPS OF OGALLALA AQUIFER, WEST-CENTRAL KANSAS

By
Lloyd E. Dunlap and Joseph M. Spinazola

1981