

INTRODUCTION

The U.S. Geological Survey (USGS), in cooperation with the U.S. Environmental Protection Agency (USEPA), conducted a regional ground-water study of the Delaware City industrial area, which is located northwest of Delaware City, Delaware (Figure 1). The USGS, together with the U.S. Army Corps of Engineers (COE), collected water-level data as part of this study. This regional ground-water study is part of a USGS and USEPA cooperative project titled: "Geographic Information System (GIS) Regional Groundwater, Contaminant Transport, and Remediation Modeling for the Multi-Site Assessment at Delaware City, Delaware." The USEPA's Resources and Conservation Recovery Act (RCRA) Corrective Action Program initiated ground-water remediation practices in the Delaware City industrial area in 1994.

Multi-site remediation creates complications in the natural ground-water flow processes. Likewise, effective ground-water remediation requires an understanding of the natural flow processes in a given study area. The ground-water-level data presented in this report will be used to calibrate a ground-water flow model being developed by the USGS. The model will be used to help characterize ground-water flow in the Delaware City industrial area in order to determine the regional effects of various multi-site ground-water remediation scenarios.

Purpose and Scope

This report describes the altitude, in feet above sea level, of the potentiometric surface of the water-table aquifer at the Delaware City industrial area during the Spring and Fall of 1993. Spring synoptic water levels, measured between April 26 and May 3, 1993, are presented in figure 2. Fall synoptic water levels, measured between October 4 and October 13, 1993, are presented in figure 3.

This report also presents continuous-recorder ground-water-level data, in feet above sea level, collected from October 15, 1993 through November 8, 1994. These data, for eight wells within the study area, are presented in figure 4.

Description of the Study Area

Delaware City is located in the Coastal Plain Physiographic Province, on the western shore of the Delaware River, north of the Chesapeake and Delaware (C & D) Canal, in Delaware (figure 1). The Delaware City industrial area is located about 1.5 miles northwest of Delaware City. The industrial area is bounded on the west by U.S. Route 13, which runs north-south. Red Lion Creek lies just north of the industrial area. South of the industrial area lies Dragon Run, which runs parallel to and lies north of the C & D Canal. The Delaware River lies about 0.5 miles to the east of the industrial area. Delaware Route 9 runs north-south through the eastern section of the study area.

Acknowledgments

The authors wish to thank the people and cooperating agencies whose help made this report possible. David Toth represented the U.S. Environmental Protection Agency Region III, RCRA Division, Philadelphia, Pennsylvania. Eric Trinkle, of the Delaware Department of Natural Resources and Environmental Control (DNREC), provided well-identification data. Christopher J. Brown of the Army Corps of Engineers (COE), Philadelphia District, Philadelphia, Pennsylvania, collected and reported synoptic water-level data presented in the potentiometric maps (figs. 2 and 3). Anthony J. Tallman of the USGS, Dover, Delaware collected and reported continuous-recorder ground-water-level data shown in the hydrographs (Figure 4). The authors also wish to thank representatives from the following industrial facilities within the study area that allowed the USGS and the COE access to their wells for this study: American Mirrex chemical plant, Formosa Plastics packaging feedstock plant, property owned by ICI Corporation, Occidental Chemical Corporation bulk chemical plant, Standard Chlorine Corporation chemical plant, and Star Enterprise petroleum refinery.

METHODS OF GROUND-WATER-LEVEL DATA COLLECTION

All ground-water-level data are presented as altitude, in feet above sea level. Synoptic ground-water levels are presented as potentiometric maps in figures 2 and 3. Continuous-recorder ground-water levels are presented as hydrographs in figure 4.

Synoptic Ground-Water-Level Data Collection

The COE collected synoptic ground-water-level data approximately once every two months from wells within the Delaware City industrial area from May 1993 through September 1994. These data were used to create the potentiometric maps in figures 2 and 3. With the exception of a few older wells which stand alone as 2-inch diameter iron casings, the protective casings for most of the wells in the study area contain either a 2- or 4-inch diameter circular PVC well. The ground-water-level measurements were submitted as depth to ground water, in feet below the top of the well casing. These measurements were either submitted to the COE by the industrial facilities in the study area, or taken by the COE with the use of a water interface meter. The COE submitted the ground-water-level measurements to the USGS as altitude, in feet above sea level. The measurement of depth to ground water below the top of the well casing is subtracted from the altitude of the top of the well casing to give the altitude of the ground water in the well, in feet above sea level. The COE surveyed the altitudes of the tops of the well casings above sea level through the use of temporary, differential global positioning system benchmarks.

The Spring 1993 synoptic water-level map includes data from 158 wells. The Fall 1993 synoptic water-level map includes data from 70 wells. The exact number of wells sampled for each synoptic varied throughout the study, based on availability of access to the individual wells.

Continuous-Recorder Ground-Water-Level Data Collection

The continuous-recorder ground-water-level data, presented in the hydrographs in figure 4, were collected for eight wells within the Delaware City industrial area by the USGS from October 15, 1993 through November 8, 1994. Digital recorders recorded these ground-water-level data at 1-hour intervals. The data were collected as feet below land surface and then converted to altitude, in feet above sea level. The wells were chosen from among the existing wells in the Delaware City industrial area based on their distribution within the study area. Ownership of each well is indicated in table 1.

Table 1. Owners and identification numbers of wells in the Delaware City industrial area for which continuous-record water-level data are available

Owner	Owner's identification number	USGS identification number
Occidental Chemical Corporation	A-20	393609075371701
Star Enterprise	C-5	393531075381101
Star Enterprise	D-10	393459075373301
Star Enterprise	D-30	393534075371901
Standard Chlorine Corporation	MW-7	393652075380901
ICI Corporation	OW-4	393516075392101
ICI Corporation	OW-41	393538075394501
ICI Corporation	OW-46	393422075392301

Conversion Factors and Vertical Datum

Multiply	By	To Obtain
foot (ft)	0.3048	meter
mile (mi)	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.

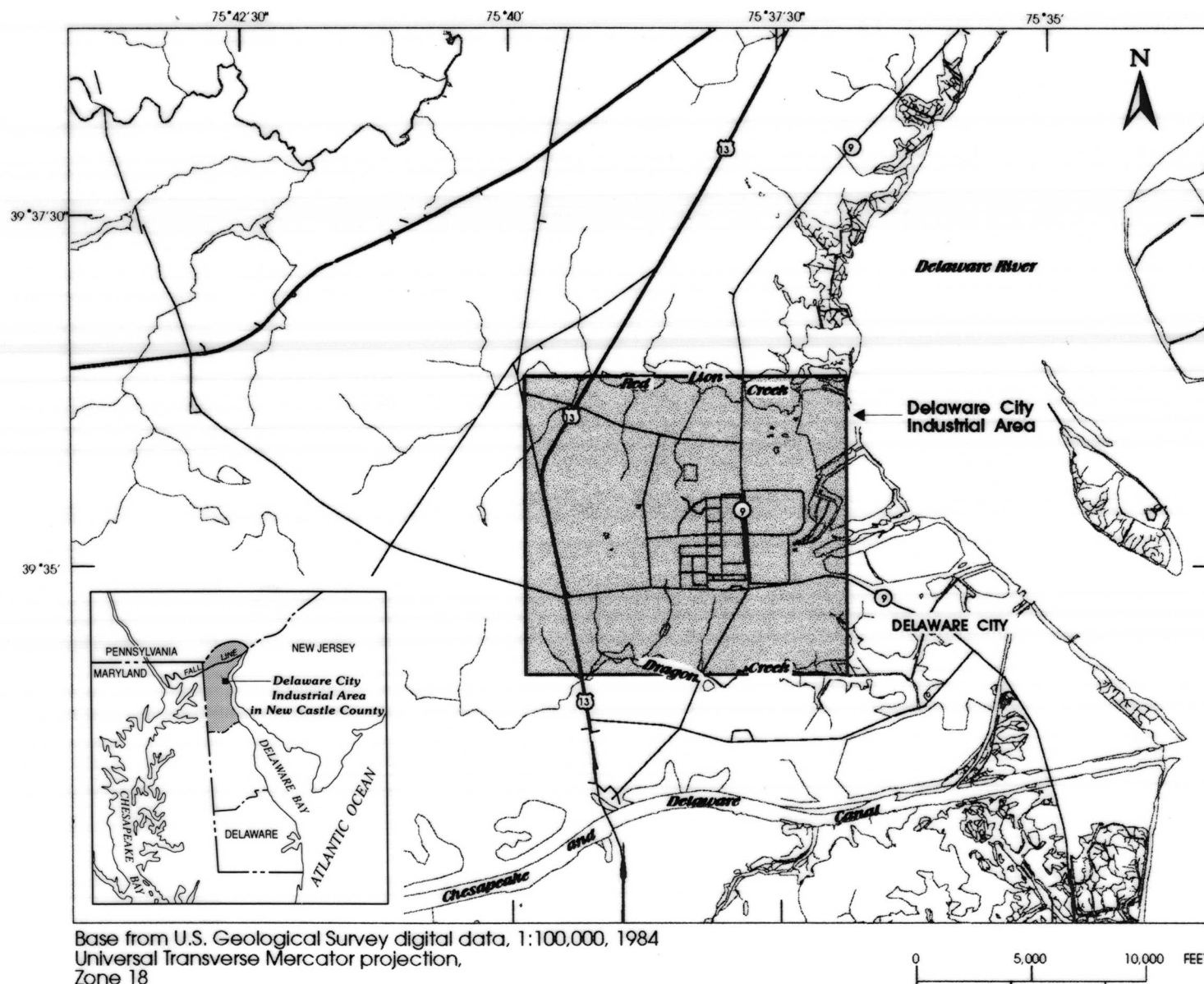


Figure 1. Location of the Delaware City industrial area.

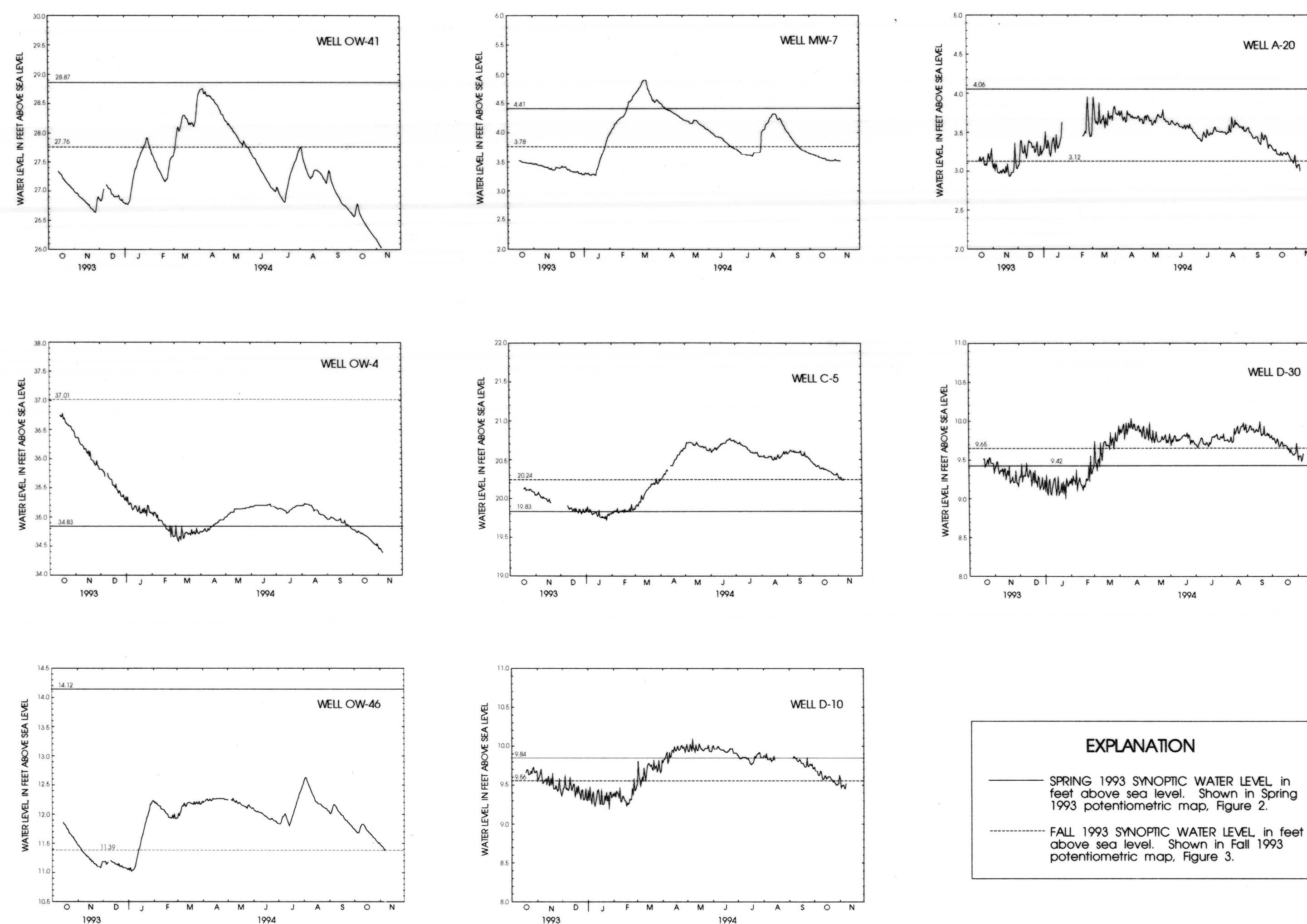
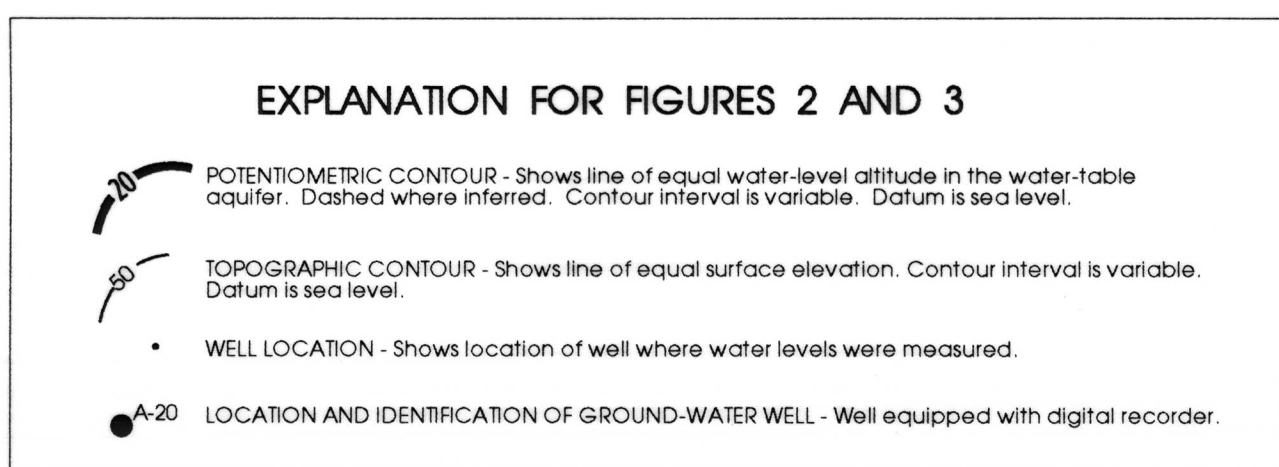


Figure 4. Continuous ground-water-level data, in feet above sea level, in eight wells screened in the water-table aquifer in the Delaware City industrial area. Data collected at 1-hour intervals, October 15, 1993 through November 8, 1994.

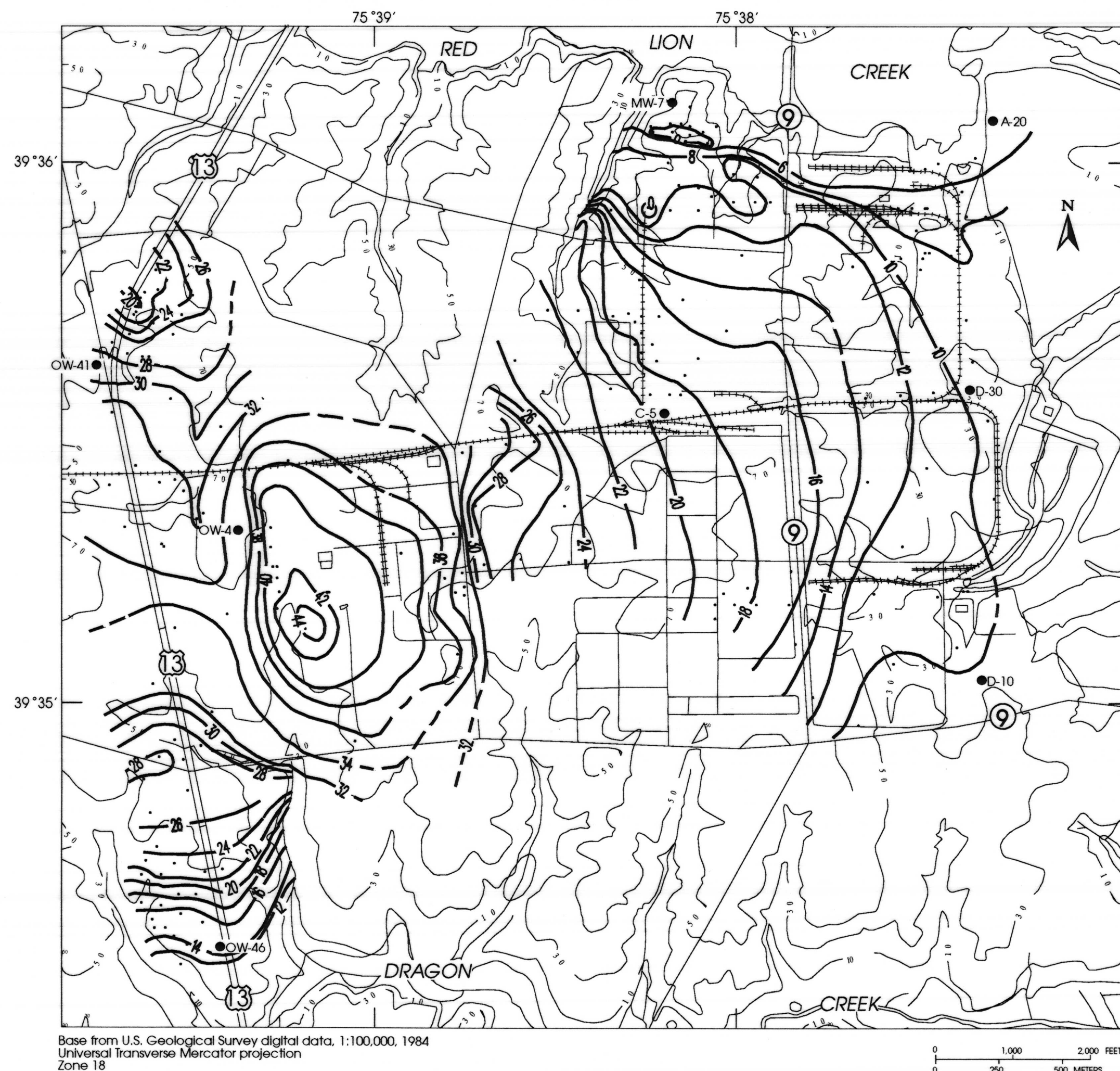


Figure 2. Spring 1993 altitude of the potentiometric surface, in feet above sea level, of the water-table aquifer in the Delaware City industrial area.

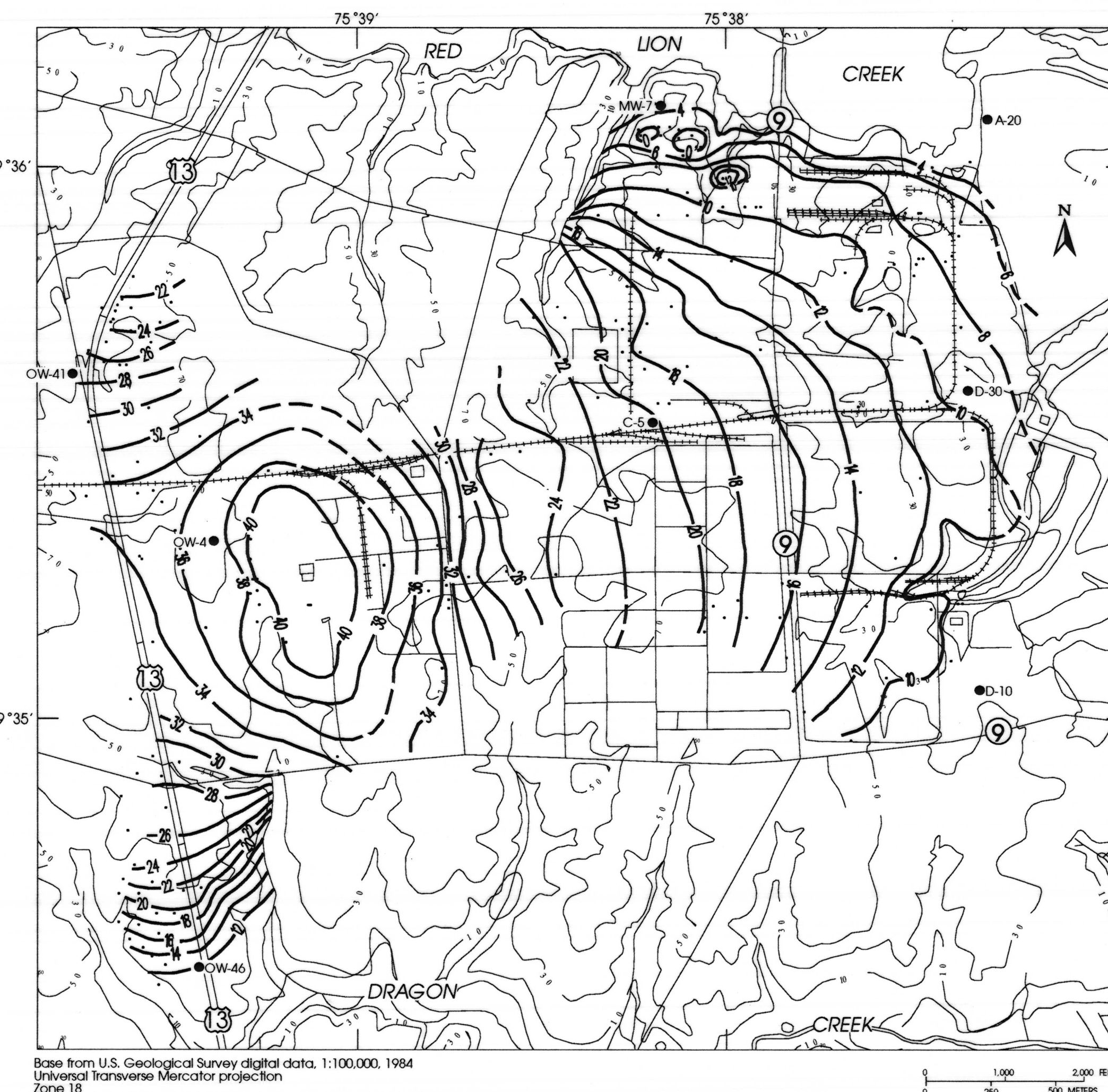


Figure 3. Fall 1993 altitude of the potentiometric surface, in feet above sea level, of the water-table aquifer in the Delaware City industrial area.