

WATER-LEVEL DATA FOR THE INDUSTRIAL AREA NORTHWEST OF DELAWARE CITY, DELAWARE, 1993-94

By Colleen A. Donnelly and Kurt C. Hinaman

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CONVERSION FACTORS AND VERTICAL DATUM

<u>Multiply</u>	<u>By</u>	<u>To obtain</u>
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
inch (in.)	25.4	millimeter

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.

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ABSTRACT

A regional ground-water study was conducted in the Delaware City industrial area, Delaware, to study the effects that remediation practices have had on ground-water-flow directions. This report presents water-level data collected as part of the regional study from 171 wells and one surface-water site at Red Lion Creek in the Delaware City industrial area during 1993-94. Eight sets of synoptic ground-water-level measurements collected between April 1993 and September 1994, and site information for the 171 wells are presented. Hydrographs of continuous-record water-level data for eight wells and one surface-water site at Red Lion Creek are presented.

The U.S. Geological Survey and the U.S. Army Corps of Engineers collected water-level data in 1993 and 1994 for the study and the Delaware Department of Natural Resources and Environmental Control provided well information. The U.S. Army Corps of Engineers collected synoptic ground-water-level data from wells within the Delaware City industrial area approximately once every 2 months during April 1993 through September 1994. Data from eight sets of synoptic ground-water-level surveys were collected. The U.S. Geological Survey installed digital recorders at eight wells and one surface-water site at Red Lion Creek within the Delaware City industrial area. The digital recorders at the eight wells recorded the continuous ground-water-level data at 1-hour intervals from October 15, 1993 through November 8, 1994. At the Red Lion Creek site, the U.S. Geological Survey collected continuously recorded surface-water levels at 1-hour intervals from December 10, 1993 through November 8, 1994.

INTRODUCTION

As part of the implementation of the Superfund program and the Resource Conservation and Recovery Act (RCRA), the U.S. Environmental Protection Agency (USEPA) initiated ground-water remediation practices at several facilities in the Delaware City industrial area beginning in 1982. This industrial area is northwest of Delaware City, Delaware (fig. 1). The U.S. Geological Survey (USGS), in cooperation with the USEPA, conducted a regional ground-water study of this area in 1993 and 1994. The study involved the use of a model to characterize ground-water flow and to simulate regional effects of multi-site, ground-water-quality remediation scenarios. This regional ground-water study is part of a multi-agency cooperative USEPA project, titled "Geographic Information System (GIS) Regional Groundwater, Contaminant Transport, and Remediation Modeling for the Multi-Site Assessment at Delaware City, Delaware."

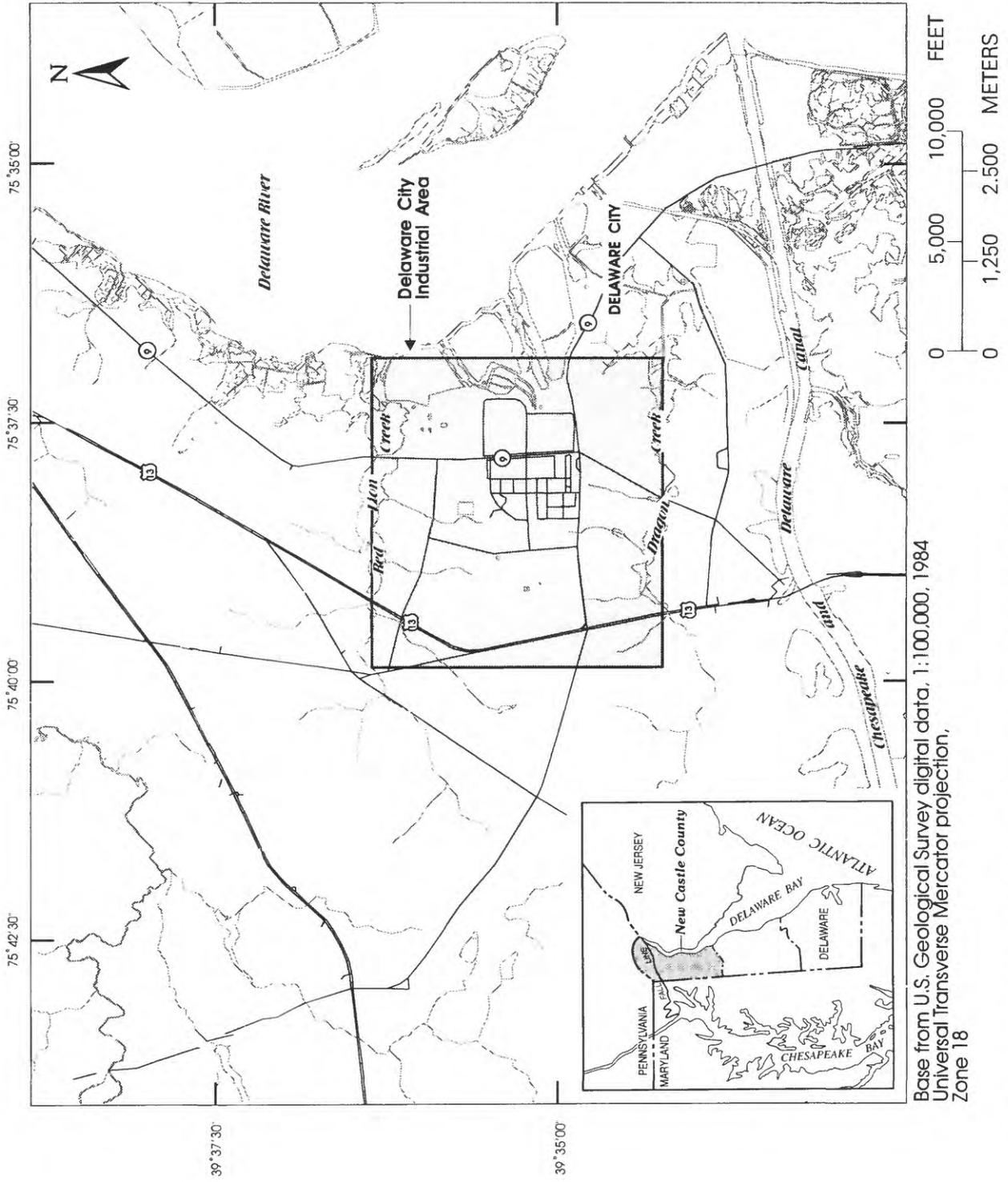


Figure 1. Location of the Delaware City industrial area.

The water-level data presented in this report have been used to calibrate the model. Both the USGS and the U.S. Army Corps of Engineers (COE) collected water-level data for this study. The Delaware Department of Natural Resources and Environmental Control (DNREC) provided well information.

Purpose and Scope

This report presents eight sets of synoptic ground-water-level measurements for 171 wells screened in the water-table aquifer in the Delaware City industrial area. The COE collected the data approximately once every 2 months during April 1993 through September 1994.

The report also presents continuous-record water-level data from the Delaware City industrial area. USGS personnel collected the ground-water-level data from October 15, 1993 through November 8, 1994. Surface-water-level measurements at Red Lion Creek were collected from December 10, 1993 through November 8, 1994.

Description of 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 (fig. 1.) The Delaware City industrial area is located approximately 1.5 mi northwest of Delaware City. The industrial area is bounded on the west by U.S. Route 13, which trends approximately north-south. Red Lion Creek is just north of the industrial area. Dragon Creek, which runs parallel to and north of the C & D Canal, is south of the industrial area. The Delaware River is approximately 0.5 mi east of the industrial area. Delaware Route 9 trends approximately 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 supervised the study for the U.S. Environmental Protection Agency Region III, RCRA Division, Philadelphia, Pa. Eric Trinkle, of the Delaware Department of Natural Resources and Environmental Control, provided well-identification data. Christopher J. Brown of the U.S. Army Corps of Engineers, Philadelphia District, Philadelphia, Pa., directed the collection and reporting of synoptic water-level data and discharge rates for the pumped wells. Anthony J. Tallman of the U.S. Geological Survey at Dover, Del., collected and reported continuous-recorder water-level data. The authors also wish to thank the following industrial facilities within the study area for allowing the U.S. Geological Survey and the U.S. Army Corps of Engineers to use their wells for this study: American Mirrex, Formosa Plastics, ICI Corporation, Occidental Chemical Corporation, Standard Chlorine Corporation, and Star Enterprise.

WATER-LEVEL DATA

All water-level data are presented as altitude, in feet above sea level. Synoptic ground-water-level data are presented in table 1. Hydrographs of continuous-record ground-water-level data are presented in figures 3a through 3h. A hydrograph of continuous-record surface-water-level data from Red Lion Creek is presented in figure 4.

Maps showing the potentiometric surface of the water-table aquifer for the spring 1993 and fall 1993 synoptics are on file in the Towson District office (C.A. Donnelly and K.C. Hinaman, unpub. data 1995). The continuous-record data are also presented in the annual State data report of the U.S. Geological Survey (1994).

Synoptic Ground-Water-Level Data

The COE collected synoptic ground-water-level data from 171 wells within the Delaware City industrial area approximately once every 2 months during April 1993 through September 1994. A total of eight sets of synoptic measurements were collected. Ground-water-level data for these synoptic measurements are presented in table 1 (at end of report).

Well identification numbers, latitude and longitude, top-of-casing elevation, and notes for each of the wells investigated by the COE are presented in table 2 (at end of report). With the exception of a few older wells that stand alone as 2-in.-inside-diameter iron casings, there are protective outside casings around most of the 2- or 4-in.-inside-diameter polyvinyl chloride (PVC) wells in the study area.

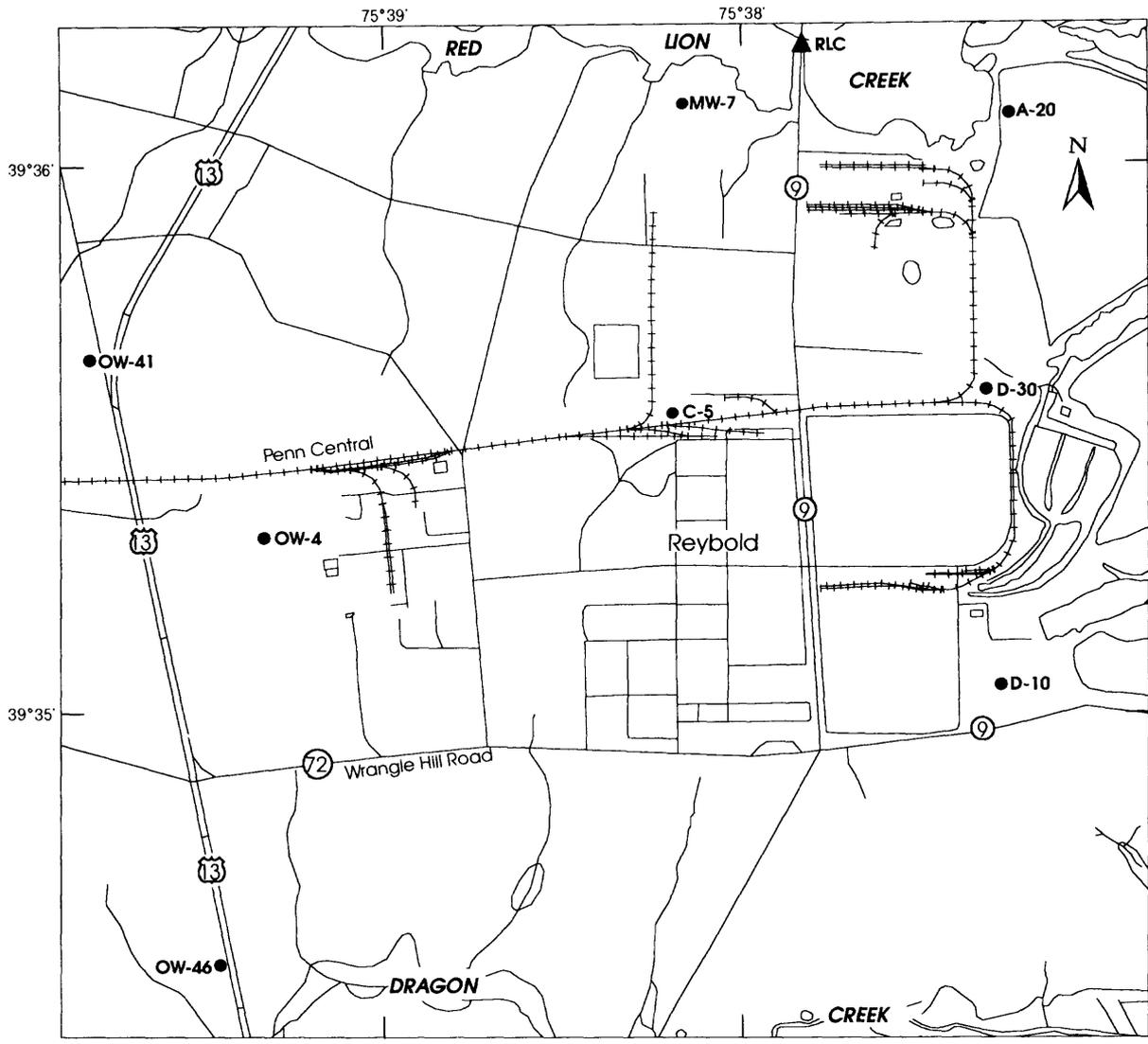
Ground-water-level measurements were taken by industrial facilities in the study area and by the COE. The COE used temporary, differential global-positioning system benchmarks to determine the altitudes of the tops of the well casings above sea level and then adjusted measurements of depth to water level below the top of the well casings to altitude. These measurements were then provided to the USGS.

Continuously Recorded Water-level Data

The USGS installed digital recorders at eight wells and one surface-water site at Red Lion Creek within the Delaware City industrial area. The data were collected in feet below land surface and then converted to altitude, in feet above sea level. The location of each continuous-record site is shown in figure 2.

Ground-Water-Level Data

The USGS collected continuous-record ground-water-level data from eight wells within the Delaware City industrial area (figs. 3a- 3h). The digital recorders at the eight wells collected ground-water-level data at 1-hour intervals from October 15, 1993 through November 8, 1994. The wells were chosen from among the existing wells in the Delaware City industrial area on the basis of their distribution within the study area. Ownership of each continuous-record site is shown in table 3.



Base from USGS digital data, 1:100,000, 1984
 Universal Transverse Mercator Projection
 Zone 18

0 1,000 2,000 FEET
 0 250 500 METERS

EXPLANATION

- OW-41 Ground-water well equipped with continuous digital recorder, and identification number
- ▲ RLC Surface-water site on Red Lion Creek equipped with continuous digital recorder.

Figure 2. Location of ground- and surface-water sites with continuous recorders within the Delaware City industrial area.

Surface-Water-Level Data

The USGS collected continuous-record surface-water-level data at the Red Lion Creek site (fig. 4) at 1-hour intervals from December 10, 1993 through November 8, 1994. This surface-water site was chosen to assess tidal influences on ground-water levels, and the data were used to calibrate the model that was developed as part of the USGS regional ground-water system study.

REFERENCES CITED

U.S. Geological Survey, 1994, Water resources data for Maryland and Delaware, water year 1994--
Volume 1. Surface-water data: U.S. Geological Survey Water-Data Report MD-DE-94-1 (published
annually).

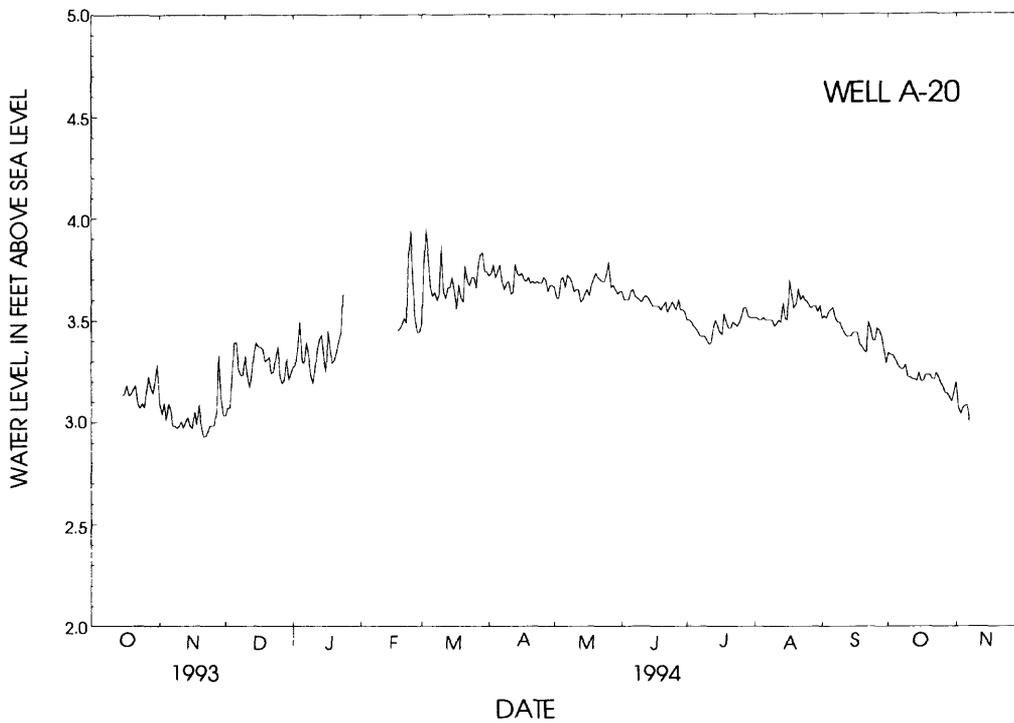


Figure 3a. Ground-water-level measurements for well A-20 in the water-table aquifer in the Delaware City industrial area, October 15, 1993 through November 8, 1994. (Missing data due to recorder malfunction.)

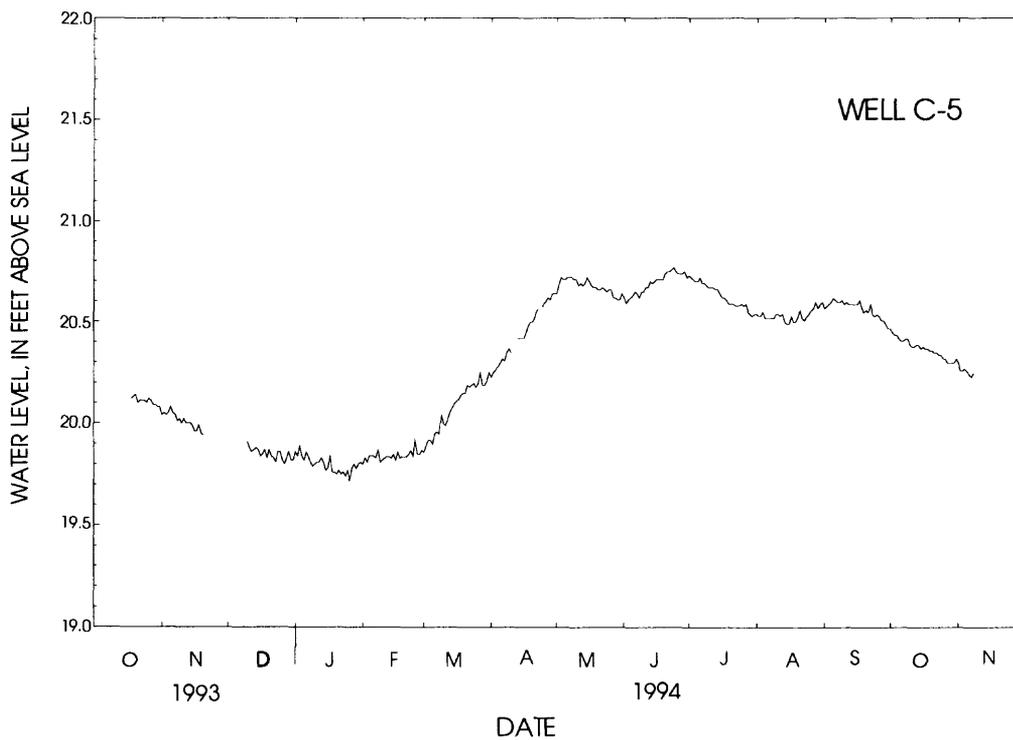


Figure 3b. Ground-water-level measurements for well C-5 in the water-table aquifer in the Delaware City industrial area, October 15, 1993 through November 8, 1994. (Missing data due to recorder malfunction.)

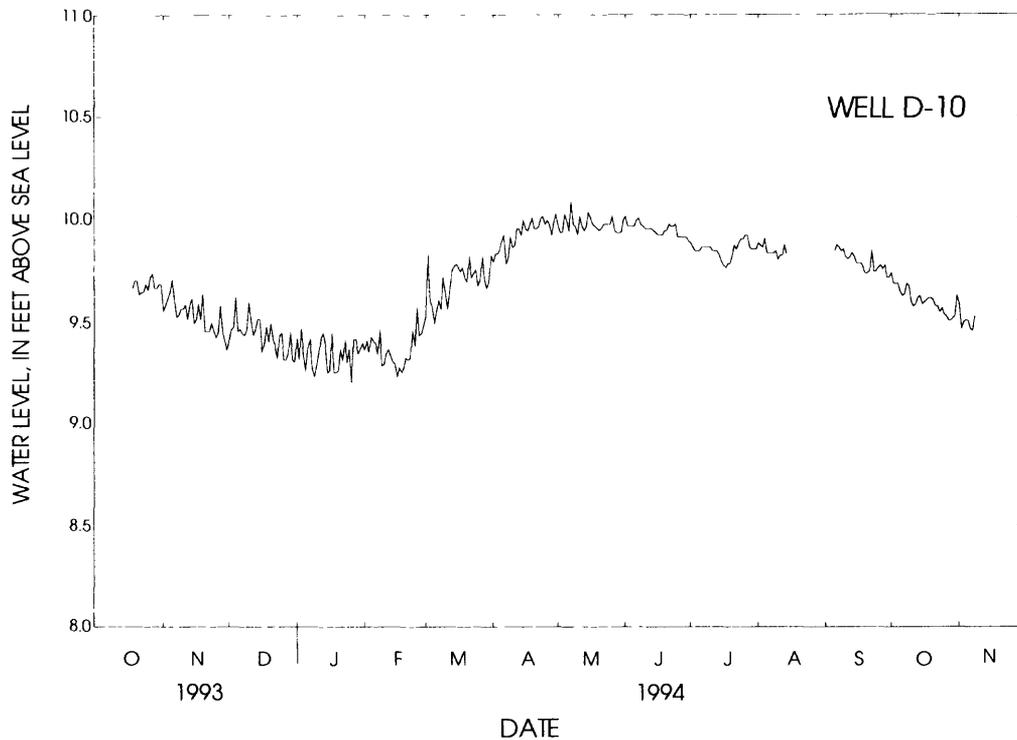


Figure 3c. Ground-water-level measurements for well D-10 in the water-table aquifer in the Delaware City industrial area, October 15, 1993 through November 8, 1994. (Missing data due to recorder malfunction.)

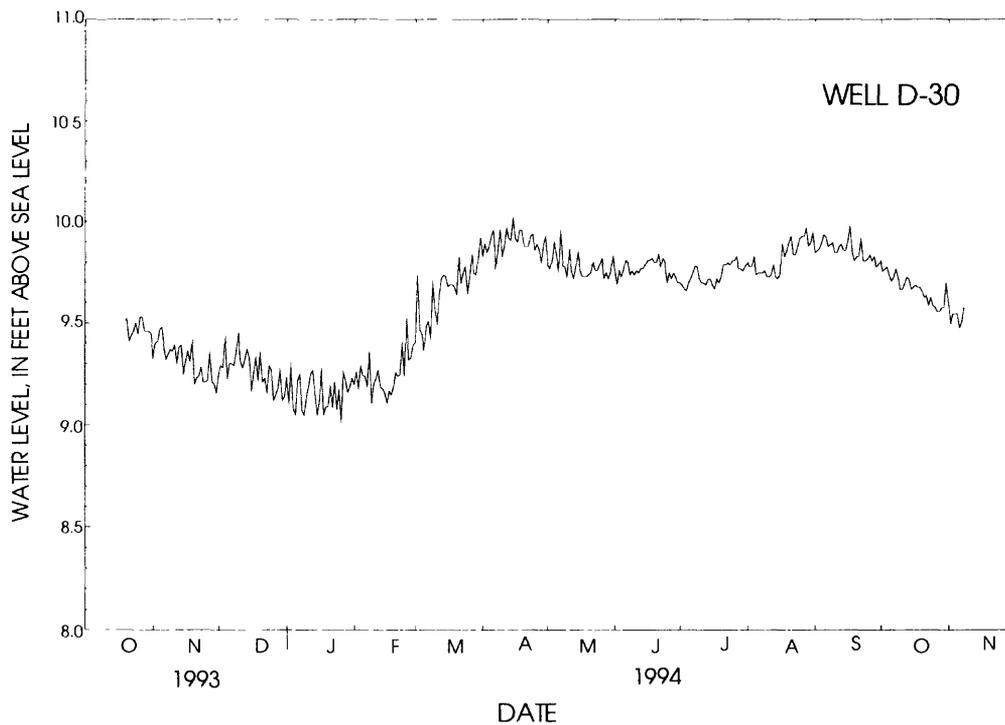


Figure 3d. Ground-water-level measurements for well D-30 in the water-table aquifer in the Delaware City industrial area, October 15, 1993 through November 8, 1994.

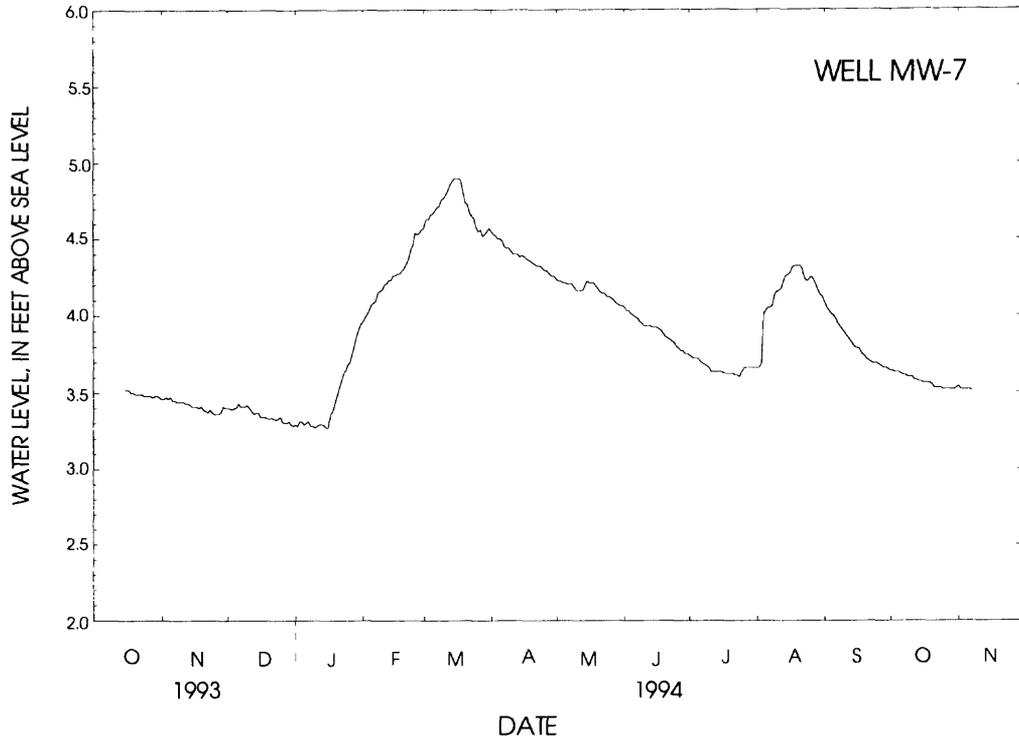


Figure 3e. Ground-water-level measurements for well MW-7 in the water-table aquifer in the Delaware City industrial area, October 15, 1993 through November 8, 1994.

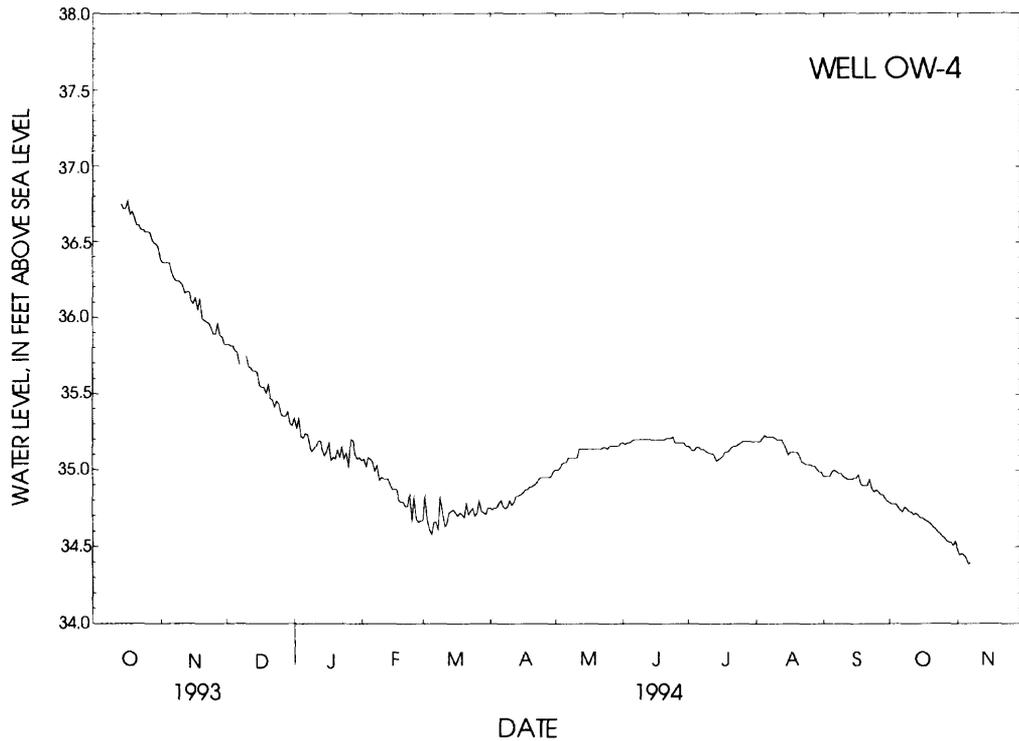


Figure 3f. Ground-water-level measurements for well OW-4 in the water-table aquifer in the Delaware City industrial area, October 15, 1993 through November 8, 1994. (Missing data due to recorder malfunction.)

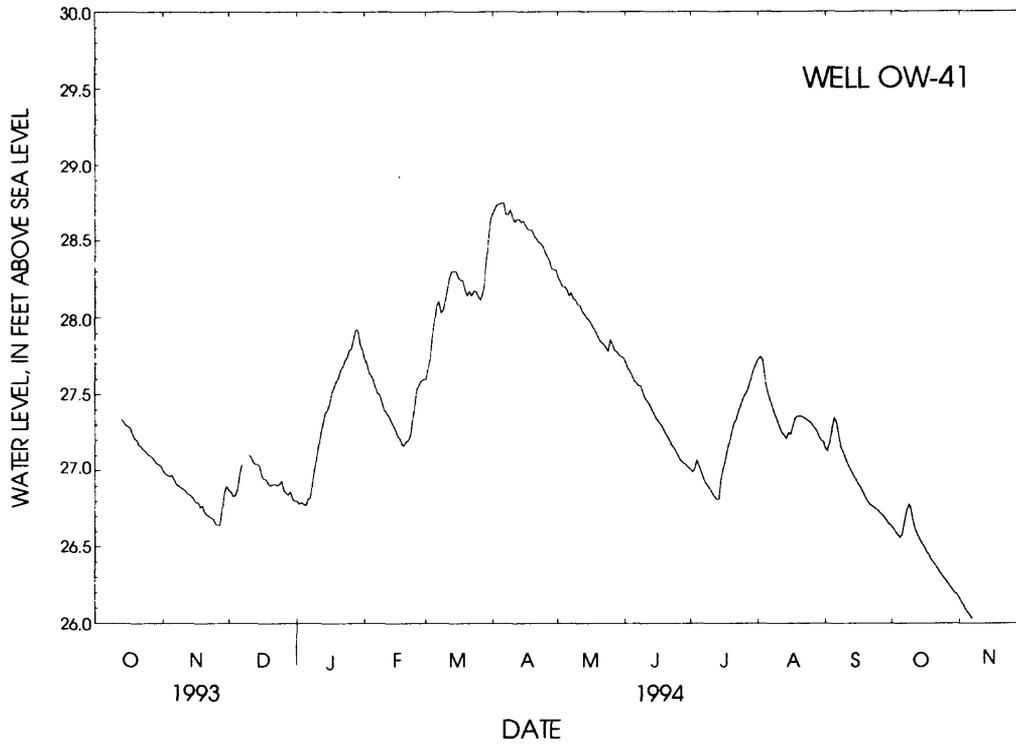


Figure 3g. Ground-water-level measurements for well OW-41 in the water-table aquifer in the Delaware City industrial area, October 15, 1993 through November 8, 1994. (Missing data due to recorder malfunction.)

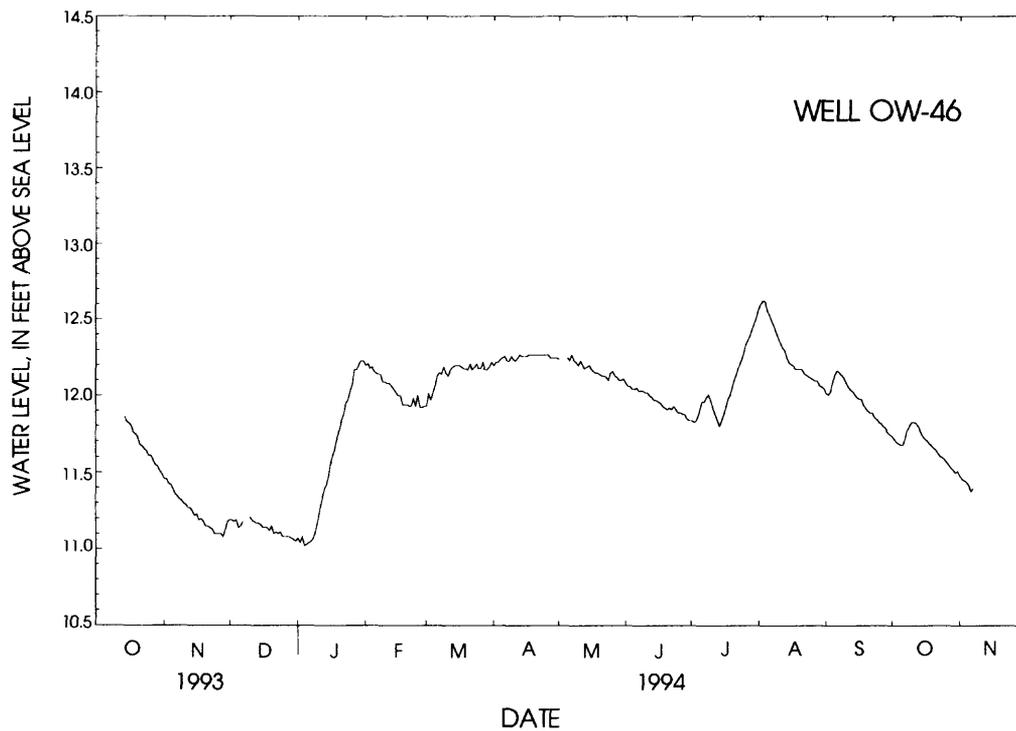


Figure 3h. Ground-water-level measurements for well OW-46 in the water-table aquifer in the Delaware City industrial area, October 15, 1993 through November 8, 1994. (Missing data due to recorder malfunction.)

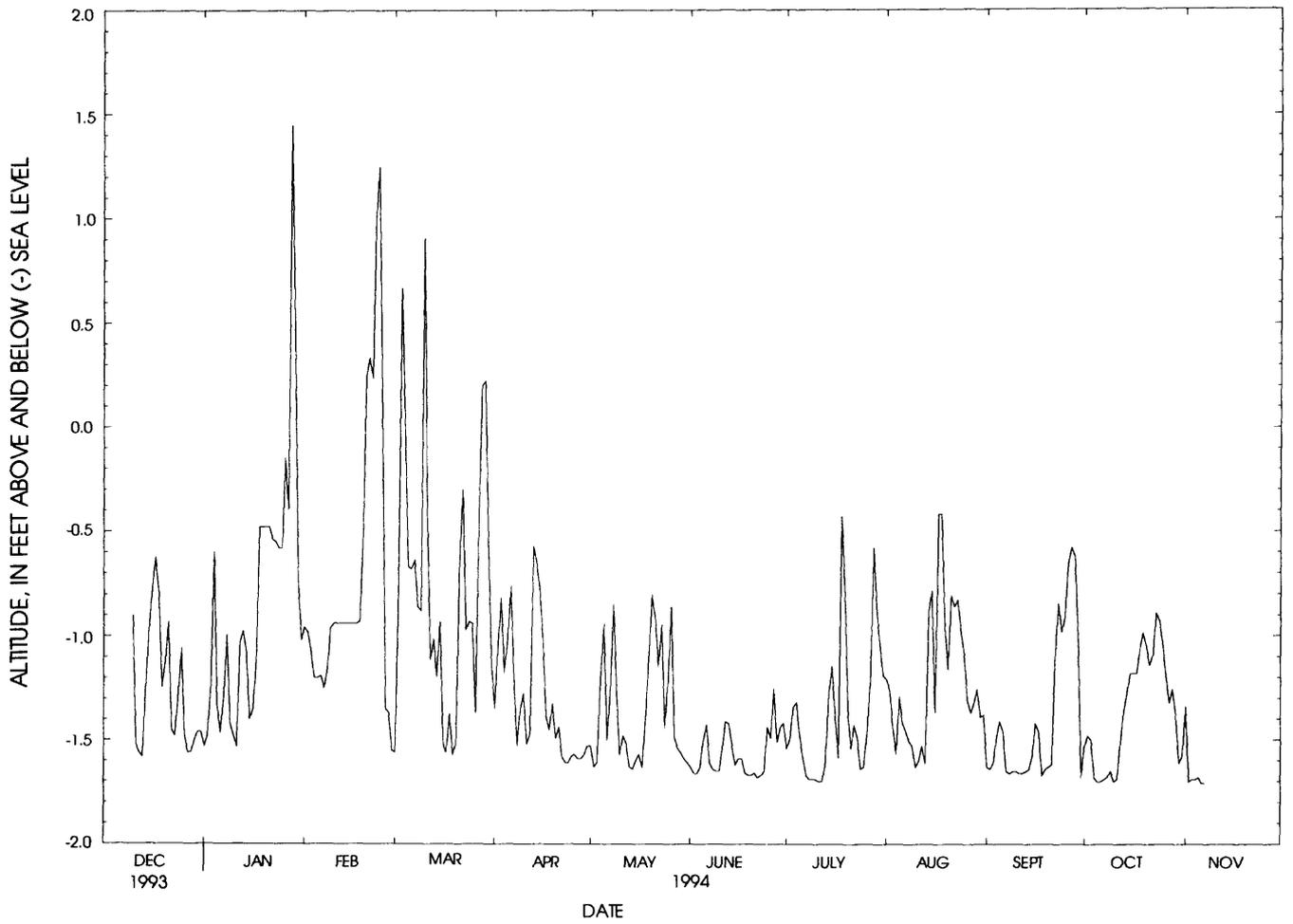


Figure 4. Surface-water-level data for Red Lion Creek in the Delaware City industrial area, December 10, 1993 through November 8, 1994.

Table 1. Synoptic ground-water-level measurements collected from selected wells within the Delaware City industrial area during April 1993 through September 1994

[--, data not collected; am, American Mirrex; ch, Standard Chlorine Corporation; fo, Formosa Plastics; ic, ICI Corporation; ox, Occidental Chemical Corporation; st, Star Enterprise; footnotes at end of table]

Corporate well identification	Synoptic water levels, in feet above sea level							
	1993				1994			
	April ¹	July ²	October ³	December ⁴	February ⁵	April ⁶	June ⁷	September ⁸
amMP-5	33.12	32.88	33.08	33.16	31.14	32.42	32.31	31.98
amMP-6	39.30	39.77	38.82	38.15	37.95	38.82	39.08	38.64
amMP-7	33.92	--	--	--	--	--	--	--
chMW-5	5.41	5.11	4.80	4.58	5.73	6.05	5.53	5.03
chMW-6	4.48	--	--	--	--	--	--	--
chMW-7	4.41	4.02	3.78	3.5	3.76	3.97	4.96	3.37
chMW-13	12.73	13.44	13.30	13.21	13.17	14.06	13.85	13.53
chMW-14	10.25	--	9.75	9.30	9.59	10.79	10.37	10.16
chMW-15	9.64	--	9.42	8.77	9.13	10.22	11.39	9.64
chMW-16	9.58	--	9.30	8.76	9.16	10.21	10.10	9.66
chMW-17	10.87	--	9.29	9.92	10.28	11.25	10.86	10.55
chMW-18	14.34	14.40	13.88	13.49	14.06	14.80	14.58	14.12
chRW-1	-0.08	-0.62	-0.62	-1.58	5.12	-0.36	-1.62	-1.48
chRW-2	-9.47	5.47	5.27	4.67	6.11	5.83	5.47	5.27
chRW-3	-6.78	-2.96	-5.58	-7.74	6.22	-8.48	5.52	-8.36
chRW-4	-2.26	-1.44	-0.10	0.19	6.84	-0.14	-1.76	-0.46
chRW-5	-2.68	12.04	11.82	-1.83	-3.18	-2.92	-3.38	-0.96
chTW-22	10.19	--	9.99	9.54	10.06	10.79	10.67	10.46
chTW-25	11.00	--	--	--	--	--	--	--
chTW-28	8.31	8.52	8.09	7.61	8.47	8.82	8.52	8.28
chTW-30	9.88	10.32	9.92	9.40	9.94	10.74	10.48	10.27
chTW-31	11.35	--	--	--	--	--	--	--
chTW-49	5.21	--	--	--	--	--	--	--
chTW-50	5.25	--	--	--	--	--	--	--
chTW-60	5.77	--	--	--	--	--	--	--
chTW-61	5.43	--	--	--	--	--	--	--
chTW-62	5.19	--	--	--	--	--	--	--
chTW-63	5.31	--	--	--	--	--	--	--
chTW-64	7.14	--	--	--	--	--	--	--
foLEX-MW-1	41.68	--	40.96	40.37	40.37	41.34	41.45	40.67

Table 1. Synoptic ground-water-level measurements collected from selected wells within the Delaware City industrial area during April 1993 through September 1994--Continued

[--, data not collected; am, American Mirrex; ch, Standard Chlorine Corporation; fo, Formosa Plastics; ic, ICI Corporation; ox, Occidental Chemical Corporation; st, Star Enterprise; footnotes at end of table]

Synoptic water levels, in feet above sea level								
Corporate well identification	1993				1994			
	April ¹	July ²	October ³	December ⁴	February ⁵	April ⁶	June ⁷	September ⁸
foLEX-MW-2	40.44	40.73	40.73	38.76	39.47	39.68	38.59	--
foLEX-MW-3	39.59	41.43	41.43	37.82	37.13	37.89	38.27	37.62
foLEX-MW-4	40.12	--	38.55	37.76	37.76	38.1	38.26	37.63
foLEX-MW-5	41.31	--	38.41	38.13	38.13	38.91	38.42	37.78
foLEX-MW-6	44.58	--	40.47	40.37	40.37	43.36	41.60	40.64
foOW-20	36.83	34.34	34.34	32.91	33.03	33.41	33.26	--
foOW-21	35.34	--	34.41	33.92	34.67	34.78	34.25	--
icINTER-A	--	--	--	37.48	38.75	39.42	--	--
icINTER-B	--	--	--	22.54	24.08	15.91	--	--
icINTER-C	--	--	--	30.10	44.33	39.42	--	--
icINTER-D	--	--	--	21.69	23.75	24.08	--	--
icINTER-E	--	--	--	28.19	30.66	29.75	--	--
icINTER-F	--	--	--	30.31	32.58	--	--	--
icINTER-G	--	--	--	32.71	34.85	33.75	--	--
icINTER-H	--	--	--	26.97	19.85	28.17	--	--
icINTER-I	--	--	--	23.31	23.75	24.58	--	--
icINTER-J	--	--	--	25.48	19.66	28.17	--	--
icINTER-K	--	--	--	26.43	26.33	27.67	--	--
icINTER-L	--	--	--	19.91	22.85	19.50	--	--
icETW-4	22.40	--	--	--	--	--	--	--
icETW-5	26.64	--	--	--	--	--	--	--
icETW-6	20.58	25.27	23.70	18.57	19.45	19.75	18.68	18.20
icETW-7	19.76	24.02	22.52	18.18	21.05	19.64	18.42	17.92
icETW-9	21.04	--	--	--	--	--	--	--
icETW-10	24.29	--	--	--	--	--	--	--
icETW-11	30.07	--	--	--	--	--	--	--
icETW-13	21.96	--	--	--	--	--	--	--
icETW-15	21.77	22.68	21.27	20.67	21.25	21.83	20.78	--
icETW-19	25.32	--	--	--	--	--	--	--
icFTW-3	24.52	25.35	24.86	24.43	24.47	24.69	24.58	24.39

Table 1. Synoptic ground-water-level measurements collected from selected wells within the Delaware City industrial area during April 1993 through September 1994--Continued

[--, data not collected; am, American Mirrex; ch, Standard Chlorine Corporation; fo, Formosa Plastics; ic, ICI Corporation; ox, Occidental Chemical Corporation; st, Star Enterprise; footnotes at end of table]

Corporate well identification	Synoptic water levels, in feet above sea level							
	1993				1994			
	April ¹	July ²	October ³	December ⁴	February ⁵	April ⁶	June ⁷	September ⁸
icFTW-4	26.04	--	--	--	--	--	--	--
icFTW-5	27.26	--	--	--	--	--	--	--
icFTW-6	18.12	--	--	--	--	--	--	--
icFTW-10	22.44	--	--	--	--	--	--	--
icFTW-11	23.66	--	--	--	--	--	--	--
icFTW-16	21.52	--	--	--	--	--	--	--
icFTW-17	18.18	--	--	--	--	--	--	--
icFTW-19	15.54	--	--	--	--	--	--	--
icFTW-21	16.41	17.49	16.43	16.11	16.30	17.04	16.60	--
icFTW-22	15.25	--	--	--	--	--	--	--
icFTW-24	14.04	--	--	--	--	--	--	--
icOW-1	33.29	--	--	--	--	--	--	--
icOW-2	30.67	36.89	35.90	34.35	33.54	33.62	33.98	33.70
icOW-3	32.49	--	--	--	--	--	--	--
icOW-4	34.83	38.02	37.01	39.51	34.36	34.25	34.75	34.49
icOW-5	32.16	--	--	--	--	--	--	--
icOW-6	42.66	--	39.36	39.00	38.60	40.03	39.46	--
icOW-7	40.98	--	--	--	--	--	--	--
icOW-8	40.73	--	--	--	--	--	--	--
icOW-9	41.29	--	40.37	39.47	39.05	39.90	40.01	39.32
icOW-10	41.71	--	40.56	39.59	39.15	40.39	40.34	39.51
icOW-15	32.36	34.56	33.84	32.81	32.32	32.36	32.69	32.42
icOW-16	32.03	33.15	32.37	31.91	31.71	32.10	31.85	31.42
icOW-22	33.08	--	--	--	--	--	--	--
icOW-28	28.91	--	--	--	--	--	--	--
icOW-30	27.38	29.64	28.69	27.89	27.59	27.64	27.44	26.93
icOW-31	26.87	30.37	29.45	28.49	28.19	28.19	28.08	27.94
icOW-32	33.55	34.99	33.80	32.65	32.60	33.13	32.07	32.58
icOW-34	32.87	34.88	33.90	32.90	32.46	32.73	32.86	32.48
icOW-37	31.53	--	--	--	--	--	--	--

Table 1. Synoptic ground-water-level measurements collected from selected wells within the Delaware City industrial area during April 1993 through September 1994--Continued

[--, data not collected; am, American Mirrex; ch, Standard Chlorine Corporation; fo, Formosa Plastics; ic, ICI Corporation; ox, Occidental Chemical Corporation; st, Star Enterprise; footnotes at end of table]

Corporate well identification	Synoptic water levels, in feet above sea level							
	1993				1994			
	April ¹	July ²	October ³	December ⁴	February ⁵	April ⁶	June ⁷	September ⁸
icOW-39	27.23	--	27.69	26.37	26.60	26.39	26.50	26.49
icOW-41	28.87	28.87	27.66	27.04	27.07	28.09	27.00	26.50
icOW-42	27.32	--	--	--	--	--	--	--
icOW-44	22.20	23.18	21.98	20.89	21.14	21.31	21.67	21.35
icOW-46	14.12	13.24	11.39	9.79	10.79	10.84	10.67	10.68
icOW-47	11.82	12.82	11.07	10.84	11.53	11.10	10.72	10.86
icOW-48	30.90	--	--	--	--	--	--	--
icOW-49	24.08	--	--	--	--	--	--	--
ox112	4.49	3.83	3.83	3.96	4.03	4.45	23.75	--
oxA-6A	7.97	--	--	--	--	--	--	--
oxA-7A	7.99	--	--	--	--	--	--	--
oxA-8	8.38	--	--	--	--	--	--	--
oxA-12	7.99	--	--	--	--	--	--	--
oxA-13	8.40	--	--	--	--	--	--	--
oxA-14	7.82	--	--	--	--	--	--	--
oxA-15	7.46	6.70	6.67	6.77	6.81	6.91	17.60	--
oxA-16	7.31	--	--	--	--	--	--	--
oxA-20	4.06	3.41	3.12	2.79	2.90	--	7.93	--
oxA-23	6.36	--	--	--	--	--	--	--
oxA-24	6.28	--	--	--	--	--	--	--
oxB-5	6.76	--	--	--	--	--	--	--
st4	7.14	--	--	--	--	--	--	--
st18S	8.14	--	--	--	--	--	--	--
st19S	8.23	--	--	--	--	--	--	--
st24	7.43	6.20	6.05	6.23	6.29	7.36	6.25	6.35
st26	12.63	--	--	--	--	--	--	--
st29	3.45	13.61	13.17	12.71	12.61	13.59	13.79	14.14
st30S	9.42	9.97	9.65	9.41	9.36	10.12	9.86	9.91
st36S	9.68	--	--	--	--	--	--	--
st38A	8.39	7.89	7.48	7.89	7.90	8.68	7.85	7.83

Table 1. Synoptic ground-water-level measurements collected from selected wells within the Delaware City industrial area during April 1993 through September 1994--Continued

[--, data not collected; am, American Mirrex; ch, Standard Chlorine Corporation; fo, Formosa Plastics; ic, ICI Corporation; ox, Occidental Chemical Corporation; st, Star Enterprise; footnotes at end of table]

Corporate well identification	Synoptic water levels, in feet above sea level							
	1993				1994			
	April ¹	July ²	October ³	December ⁴	February ⁵	April ⁶	June ⁷	September ⁸
stC-1	17.59	--	--	--	--	--	--	--
stC-2	17.45	18.4	18.09	17.77	17.85	18.10	18.62	--
stC-3	20.82	21.61	21.35	21.05	20.86	21.26	21.62	21.49
stC-4	21.16	--	--	--	--	--	--	--
stC-5	19.83	20.47	20.24	20.20	18.87	19.43	19.69	19.58
stC-7	16.30	--	--	--	--	--	--	--
stC-8	18.52	--	--	--	--	--	--	--
stC-9	16.49	--	--	--	--	--	--	--
stC-11	16.43	--	--	--	--	--	--	--
stC-12	16.03	--	--	--	--	--	--	--
stC-13	15.37	--	--	--	--	--	--	--
stC-21	23.28	23.53	24.00	23.40	22.99	23.19	23.60	23.40
stC-22	22.67	22.90	22.31	22.10	21.71	22.45	22.24	22.01
stC-23	20.60	--	--	--	--	--	--	--
stC-24	23.08	--	--	--	22.96	23.17	23.48	23.37
stC-26	19.88	--	--	--	--	--	--	--
stC-28	17.26	--	--	--	--	--	--	--
stC-30	16.44	--	--	--	--	--	--	--
stC-31	12.80	--	--	--	--	--	--	--
stC-32	16.00	--	--	--	--	--	--	--
stC-33	15.86	--	--	--	--	--	--	--
stC-34	18.03	--	--	--	--	--	--	--
stCRUDE S	9.39	9.67	9.17	8.85	8.81	9.28	9.30	9.12
stCRUDE W	12.74	13.33	12.90	12.45	12.24	12.71	12.97	12.70
stD-1	18.19	--	--	--	--	--	--	--
stD-2	16.02	--	--	--	--	--	--	--
stD-4	18.36	--	--	--	--	--	--	--
stD-6	17.69	--	--	--	--	--	--	--
stD-7	14.94	--	--	--	--	--	--	--
stD-8	16.66	--	--	--	--	--	--	--

Table 1. Synoptic ground-water-level measurements collected from selected wells within the Delaware City industrial area during April 1993 through September 1994--Continued

[--, data not collected; am, American Mirrex; ch, Standard Chlorine Corporation; fo, Formosa Plastics; ic, ICI Corporation; ox, Occidental Chemical Corporation; st, Star Enterprise; footnotes at end of table]

Corporate well identification	Synoptic water levels, in feet above sea level							
	1993				1994			
	April ¹	July ²	October ³	December ⁴	February ⁵	April ⁶	June ⁷	September ⁸
stD-9	10.56	--	--	--	--	--	--	--
stD-10	9.79	--	--	--	--	--	--	--
stD-12	10.06	10.68	10.25	9.99	9.90	--	10.46	10.41
stD-13	9.84	10.08	9.56	9.37	9.27	10.02	9.76	9.66
stD-14	18.96	19.45	19.50	19.07	18.97	18.77	19.44	19.17
stD-15	19.33	--	--	--	--	--	--	--
stD-16	13.07	--	--	--	--	--	--	--
stD-18	9.32	10.47	10.06	9.76	9.80	10.36	10.30	10.25
stD-19	8.81	11.46	11.05	11.14	7.99	11.23	11.14	11.07
stD-30	9.15	--	--	--	--	--	--	--
stF-2	10.20	--	--	--	--	--	--	--
stF-3	10.14	--	--	--	--	--	--	--
stF-4	10.06	--	--	--	--	--	--	--
stMW-1S	33.66	43.02	--	--	--	--	--	--
stMW-2S	30.17	25.87	25.30	24.83	24.48	24.77	24.92	24.80
stMW-3S	28.46	25.10	25.63	27.93	27.65	27.97	28.11	27.97
stMW-4S	27.18	--	--	--	--	--	--	--
stMW-5S	24.42	--	--	--	--	--	--	--
stMW-6S	28.32	28.89	28.28	27.78	28.26	28.59	28.10	--
stMW-7S	25.94	--	--	--	26.04	26.20	25.79	--
stMW-8S	14.30	24.84	23.78	24.22	24.06	24.53	24.63	24.36

¹Data collected April 26 through May 3, 1993.

²Data collected July 26 through July 30, 1993.

³Data collected October 4 through October 13, 1993.

⁴Data collected November 30 through December 6, 1993.

⁵Data collected February 16 through February 20, 1994.

⁶Data collected April 11 through April 15, 1994.

⁷Data collected June 12 through June 16, 1994.

⁸Data collected September 12 through September 15, 1994

Table 2. Site information for each of the wells used to collect synoptic ground-water-level data in the Delaware City industrial area

[Top-of-casing elevation in feet above sea level; am, American Mirrex; ch, Standard Chlorine Corporation; fo, Formosa Plastics; ic, ICI; ox, Oxychem; Oxychem, Occidental Chemical Corporation; st, Star Enterprise; footnotes at end of table]

Corporate well identification	Latitude	Longitude	Top-of-casing elevation	Notes ¹
amMP-5	39°35'07"	75°38'43"	57.53	On Schoolhouse Road and gravel road; vented
amMP-6	39°35'13"	75°38'53"	67.97	Inside fence behind parking lot; not vented
amMP-7	39°35'08"	75°38'44"	58.18	On Schoolhouse Road and gravel road; vented
chMW-5	39°36'08"	75°38'02"	25.36	Northeast end of plant on Oxychem property
chMW-6	39°36'10"	75°38'06"	51.43	End of plant
chMW-7	39°36'11"	75°38'09"	48.92	Northwest end of plant on Oxychem property
chMW-13	39°35'57"	75°38'19"	48.44	On Air Products property; silt on bottom
chMW-14	39°35'58"	75°37'53"	48.70	Near Occidental Chemical (Oxychem) parking lot
chMW-15	39°35'58"	75°37'55"	48.10	New well near Oxychem parking lot
chMW-16	39°35'58"	75°37'59"	46.40	New well near Oxychem parking lot
chMW-17	39°36'01"	75°37'55"	54.90	Near Oxychem parking lot and fence
chMW-18	39°36'02"	75°37'59"	37.80	On Oxychem property in ch emergency road
chRW-1	39°36'07"	75°38'12"	53.52	End of plant on Oxychem property
chRW-2	39°36'07"	75°38'09"	51.77	End of plant on Oxychem property
chRW-3	39°36'07"	75°38'06"	44.32	End of plant on Oxychem property
chRW-4	39°36'06"	75°38'03"	46.84	End of plant on Oxychem property
chRW-5	39°35'57"	75°38'13"	47.72	End of plant on Oxychem property
chTW-22	39°35'59"	75°38'02"	51.23	Near plant junkyard, drum storage area
chTW-25	39°35'57"	75°38'04"	48.12	In plant near discharge ditch
chTW-28	39°36'03"	75°38'09"	51.39	Near maintenance area and tall nitrogen tanks
chTW-30	39°36'00"	75°38'08"	50.94	Near liquid nitrogen tank
chTW-31	39°35'57"	75°38'09"	49.28	In plant near instrument shop and tanks
chTW-49	39°36'08"	75°38'09"	54.45	Northwest end of plant on Oxychem property
chTW-50	39°36'08"	75°38'07"	52.87	End of plant on Oxychem property
chTW-60	39°36'06"	75°38'02"	45.17	Northeast end of plant on Oxychem property
chTW-61	39°36'07"	75°38'04"	44.23	End of plant, overgrown area
chTW-62	39°36'08"	75°38'06"	47.64	End of plant on Oxychem property
chTW-63	39°36'08"	75°38'12"	52.55	Northwest end of plant; tilted well; silt at bottom
chTW-64	39°36'05"	75°38'05"	52.21	End of plant- near back gate
foLEX-MW-1	39°35'08"	75°39'05"	61.23	Near VCM ² liquid tank and piping
foLEX-MW-2	39°35'11"	75°39'14"	56.88	Near north corner of aeration basin, vented
foLEX-MW-3	39°35'11"	75°39'14"	58.16	North corner of aeration basin
foLEX-MW-4	39°35'09"	75°39'14"	56.38	Corner of aeration basin and tank area
foLEX-MW-5	39°35'08"	75°39'14"	55.13	Back corner of property
foLEX-MW-6	39°35'03"	75°39'09"	52.46	Next to large tank

Table 2. Site information for each of the wells used to collect synoptic ground-water-level data in the Delaware City industrial area--Continued

[Top-of-casing elevation in feet above sea level; am, American Mirrex; ch, Standard Chlorine Corporation; fo, Formosa Plastics; ic, ICI; ox, Oxychem; Oxychem, Occidental Chemical Corporation; st, Star Enterprise; footnotes at end of table]

Corporate well identification	Latitude	Longitude	Top-of-casing elevation	Notes ¹
foOW-20	39°35'00"	75°38'44"	62.97	On Schoolhouse Road near American Mirrex property
foOW-21	39°35'15"	75°38'45"	68.24	Near Akzo property and Schoolhouse Road; no cap
icINTER-A	39°35'22"	75°39'31"	³ 66	In cornfield on Route 13
icINTER-B	39°34'46"	75°39'29"	³ 60	In cornfield on Route 13
icINTER-C	39°35'14"	75°39'33"	³ 55	In cornfield on Route 13
icINTER-D	39°34'56"	75°39'34"	³ 63	Near ICI computer building in cornfield
icINTER-E	39°35'38"	75°39'36"	³ 53	Near ICI computer building in cornfield
icINTER-F	39°34'32"	75°39'26"	³ 58	On Route 13 on auto auction property
icINTER-G	39°34'32"	75°39'37"	³ 61	In field by auto auction property
icINTER-H	39°35'45"	75°39'37"	³ 61	In field by auto auction property
icINTER-I	39°34'22"	75°39'29"	³ 30	In field by auto auction property
icINTER-J	39°34'23"	75°39'31"	³ 30	In field by auto auction property
icINTER-K	39°34'24"	75°39'32"	³ 35	In middle of field by auto auction property
icINTER-L	39°34'26"	75°39'34"	³ 36	In middle of field by auto auction property
icETW-4	39°35'45"	75°39'34"	48.30	On Route 13 in cornfield
icETW-5	39°35'41"	75°39'31"	58.38	On Route 13 in cornfield
icETW-6	39°35'43"	75°39'38"	49.13	On Route 13 near Route 7, near recovery well
icETW-7	39°35'45"	75°39'37"	44.92	On Route 13 near recovery well
icETW-9	39°35'46"	75°39'36"	46.68	On Route 13
icETW-10	39°35'42"	75°39'34"	56.94	On Route 13 near Route 7
icETW-11	39°35'33"	75°39'32"	60.27	In cornfield, new well
icETW-13	39°35'47"	75°39'34"	46.40	On Route 13 in cornfield
icETW-15	39°35'49"	75°39'34"	36.37	On Route 13
icETW-19	39°35'43"	75°39'30"	47.73	On Route 13 near Route 7
icFTW-3	39°34'35"	75°39'34"	47.74	Auto auction property
icFTW-4	39°34'39"	75°39'35"	59.00	Auto auction property; silted up on bottom
icFTW-5	39°34'44"	75°39'36"	56.91	Auto auction property
icFTW-6	39°34'29"	75°39'30"	41.22	In field near auto auction property; new well
icFTW-10	39°34'31"	75°39'33"	43.44	Auto auction property
icFTW-11	39°34'33"	75°39'36"	41.66	In field near auto auction property - new well
icFTW-16	39°34'31"	75°39'36"	40.40	In field near farmer's shed
icFTW-17	39°34'29"	75°39'27"	47.60	In field near Route 13 and auto auction property
icFTW-19	39°34'26"	75°39'30"	45.04	In middle of field
icFTW-21	39°34'28"	75°39'36"	28.02	In field near creek/wetland area
icFTW-22	39°34'25"	75°39'26"	42.46	In middle of field

Table 2. Site information for each of the wells used to collect synoptic ground-water-level data in the Delaware City industrial area--Continued

[Top-of-casing elevation in feet above sea level; am, American Mirrex; ch, Standard Chlorine Corporation; fo, Formosa Plastics; ic, ICI; ox, Oxychem; Oxychem, Occidental Chemical Corporation; st, Star Enterprise; footnotes at end of table]

Corporate well identification	Latitude	Longitude	Top-of-casing elevation	Notes ¹
icFTW-24	39°34'24"	75°39'34"	35.00	In field, near recovery well manholes L and K
icOW-1	39°35'18"	75°39'26"	76.31	On ICI access road
icOW-2	39°35'17"	75°39'27"	72.68	On ICI access road
icOW-3	39°35'21"	75°39'29"	77.09	On Route 13 near ICI computer building
icOW-4	39°35'16"	75°39'20"	75.93	On ICI access road
icOW-5	39°35'22"	75°39'33"	67.67	On Route 13 near ICI computer building
icOW-6	39°35'06"	75°39'14"	54.92	In field behind Formosa Plastics
icOW-7	39°35'09"	75°39'15"	61.38	In field behind Formosa Plastics
icOW-8	39°35'11"	75°39'15"	61.33	In field behind Formosa Plastics, silt on bottom
icOW-9	39°35'13"	75°39'15"	60.44	In field behind old Stauffer chemical landfill
icOW-10	39°35'16"	75°39'15"	64.64	On ICI access road near old Stauffer chemical landfill
icOW-15	39°35'03"	75°39'31"	56.96	On ICI access road near Route 13
icOW-16	39°34'52"	75°39'25"	48.00	Near Route 13 in field
icOW-22	39°35'31"	75°39'41"	60.63	Near Route 13, in path of new Route 1 bypass
icOW-28	39°34'46"	75°39'33"	64.57	On Route 72, near Route 13/Route72 intersection
icOW-30	39°34'48"	75°39'27"	34.39	In wetland at Rt 13/Rt 72 intersection
icOW-31	39°34'49"	75°39'31"	44.07	Near wetland at Rt 13/Rt 72 intersection; no cap
icOW-32	39°35'24"	75°39'37"	68.55	On Route 13 in stockpile
icOW-34	39°35'16"	75°39'39"	68.08	In cornfield near Route 13
icOW-37	39°35'26"	75°39'33"	62.13	On Route 13 near railroad
icOW-39	39°34'42"	75°39'29"	67.16	Near Route 72/Route 13 intersection
icOW-41	39°35'36"	75°39'44"	47.52	Near Route 7 and Route 13
icOW-42	39°35'38"	75°39'36"	60.20	On Route 13 in cornfield
icOW-44	39°34'32"	75°39'23"	48.89	On Route 13 across road from auto auction property
icOW-46	39°34'22"	75°39'23"	44.07	On Route 13 by house; silted up on bottom
icOW-47	39°34'20"	75°39'30"	24.07	In field near creek/wetland area
icOW-48	39°35'29"	75°39'23"	74.63	In cornfield near railroad
icOW-49	39°35'46"	75°39'28"	59.52	In back of cornfield
ox112	39°36'03"	75°37'25"	23.75	Near Red Lion Creek near pipeline
oxA-6A	39°35'52"	75°37'22"	21.83	Near landfill and Star sludge disposal area
oxA-7A	39°35'52"	75°37'26"	19.50	Near landfill and Georgia Gulf
oxA-8	39°35'54"	75°37'21"	22.09	Near Star sludge disposal area
oxA-12	39°35'54"	75°37'28"	25.22	On landfill near tank
oxA-13	39°35'52"	75°37'27"	20.64	Near landfill and Georgia Gulf
oxA-14	39°35'55"	75°37'22"	19.80	Near Star Enterprise sludge disposal area and railroad

Table 2. Site information for each of the wells used to collect synoptic ground-water-level data in the Delaware City industrial area--Continued

[Top-of-casing elevation in feet above sea level; am, American Mirrex; ch, Standard Chlorine Corporation; fo, Formosa Plastics; ic, ICI; ox, Oxychem; Oxychem, Occidental Chemical Corporation; st, Star Enterprise; footnotes at end of table]

Corporate well identification	Latitude	Longitude	Top-of-casing elevation	Notes ¹
oxA-15	39°35'56"	75°37'23"	17.60	In empty basin area and railroad and Georgia Gulf
oxA-16	39°35'57"	75°37'27"	25.72	Near Georgia Gulf and railroad
oxA-20	39°36'09"	75°37'16"	7.93	Near old landfill and old settling basin and waste lakes
oxA-23	39°35'56"	75°37'23"	16.42	In empty basin area and railroad and Georgia Gulf
oxA-24	39°35'57"	75°37'27"	25.63	Near Georgia Gulf and railroad
oxB-5	39°36'00"	75°37'21"	19.33	Near back fence and railroad
st4	39°35'56"	75°37'20"	21.49	Near hazardous-waste landfill near Oxychem property
st18S	39°35'51"	75°37'27"	26.52	Near land farm area
st19S	39°35'51"	75°37'31"	23.22	Near land farm area
st24	39°35'56"	75°37'17"	27.35	Near solid waste landfill (soda ash area)
st26	39°35'50"	75°37'39"	26.40	Near land farm area and Oxychem
st29	39°35'33"	75°37'37"	31.01	Near land farm area and railroad
st30S	39°35'34"	75°37'20"	36.72	Behind tank farm near disposal area
st36S	39°35'49"	75°37'28"	28.53	Near land farm area and tanks
st38A	39°35'43"	75°37'10"	23.01	Near solid waste landfill
stC-1	39°35'43"	75°38'18"	52.62	Outside gate for settling pond
stC-2	39°35'39"	75°38'14"	56.90	Near gate and settling pond and railroad
stC-3	39°35'34"	75°38'19"	56.33	Near old settling pond
stC-4	39°35'39"	75°38'24"	44.24	Between two settling ponds
stC-5	39°35'30"	75°38'10"	64.32	Near scrubbers and railroad
stC-7	39°35'43"	75°38'14"	57.92	Near settling pond near pumping well
stC-8	39°35'33"	75°38'07"	61.64	Near conveyor belts
stC-9	39°35'44"	75°38'16"	55.37	Outside gate for settling pond
stC-11	39°35'41"	75°38'14"	57.44	Near settling pond near pumping well
stC-12	39°35'43"	75°38'11"	59.23	Near gate; across from Standard Chlorine
stC-13	39°35'45"	75°38'07"	53.48	Near coke dust pile and Standard Chlorine
stC-21	39°35'38"	75°38'35"	67.99	Near settling pond
stC-22	39°35'44"	75°38'29"	36.82	Near new settling pond
stC-23	39°35'44"	75°38'24"	38.56	Near fence between two settling ponds
stC-24	39°35'34"	75°38'30"	53.64	Near settling pond and pumphouse
stC-26	39°35'33"	75°38'09"	62.93	Near stack gas scrubbers
stC-28	39°35'36"	75°38'07"	62.02	Near production well and coke dust pile
stC-30	39°35'48"	75°38'14"	50.31	Near Standard Chlorine outside Star Enterprise gate
stC-31	39°35'51"	75°37'57"	62.01	Near Standard Chlorine and baseball field
stC-32	39°35'40"	75°37'53"	56.55	On Route 9 near coke dust pile

Table 2. Site information for each of the wells used to collect synoptic ground-water-level data in the Delaware City industrial area--Continued

[Top-of-casing elevation in feet above sea level; am, American Mirrex; ch, Standard Chlorine Corporation; fo, Formosa Plastics; ic, ICI; ox, Oxychem; Oxychem, Occidental Chemical Corporation; st, Star Enterprise; footnotes at end of table]

Corporate well identification	Latitude	Longitude	Top-of-casing elevation	Notes ¹
stC-33	39°35'42"	75°38'00"	61.29	Near coke dust pile
stC-34	39°35'40"	75°38'15"	56.95	Near settling pond
stCRUDE S	39°34'51"	75°37'38"	52.22	Near tank 5
stCRUDE W	39°34'54"	75°37'45"	59.33	Near tank 9
stD-1	39°35'06"	75°37'58"	63.18	Near tank 51 and benzene loading area
stD-2	39°35'06"	75°37'49"	59.75	Near tank 12
stD-4	39°35'08"	75°37'56"	60.57	Near tanks 405, 406, 571-TC-5 (middle of them)
stD-6	39°35'06"	75°37'55"	61.41	Near tank 51 and benzene loading area
stD-7	39°35'01"	75°37'48"	61.15	On Route 9 near tank 11
stD-8	39°35'11"	75°37'49"	59.15	Near tank 403
stD-9	39°35'08"	75°37'35"	41.35	Near tank 8
stD-10	39°34'59"	75°37'32"	47.89	Near tanks 2, 3, 6, and 7 (middle of them)
stD-12	39°35'07"	75°37'25"	32.62	Near effluent sludge stream
stD-13	39°34'57"	75°37'18"	17.68	Near propane storage area/building 327
stD-14	39°35'04"	75°38'02"	63.58	Near tank 50
stD-15	39°35'06"	75°38'02"	64.05	Near tank 51
stD-16	39°35'22"	75°37'36"	42.47	Near tank 245
stD-18	39°35'30"	75°37'17"	27.20	Near tank 139 and shed
stD-19	39°35'20"	75°37'15"	25.56	Near tank 135
stD-30	39°35'32"	75°37'20"	34.03	Near sludge area; sounding not accurate; silted up
stF-2	39°35'01"	75°37'22"	26.99	Near sludge impoundment
stF-3	39°35'08"	75°37'21"	23.16	Near sludge impoundment
stF-4	39°35'08"	75°37'20"	24.01	Near sludge impoundment (large tidal influence)
stMW-1S	39°35'26"	75°38'43"	70.02	New solid waste landfill
stMW-2S	39°35'27"	75°38'36"	64.44	Along piping near railroad
stMW-3S	39°35'27"	75°38'31"	65.11	Along piping near railroad and coke dust pile
stMW-4S	39°35'19"	75°38'41"	74.43	Middle of new landfill; good condition
stMW-5S	39°35'19"	75°38'26"	79.99	New solid waste landfill area; good condition
stMW-6S	39°35'11"	75°38'40"	69.04	On road near equipment yard
stMW-7S	39°35'12"	75°38'34"	68.87	On road near coke dust pile
stMW-8S	39°35'12"	75°38'26"	62.59	Along access road/railroad, good condition

¹Notes are presented as reported by the U.S. Army Corps of Engineers, April 1993.

²VCM: Vinyl Chloride Monomer

³Top-of-casing elevations were estimated from topographic maps.

Table 3. Owners and identification numbers of wells and the surface-water site at Red Lion Creek in the Delaware City industrial area for which continuous-record water-level data are available

[USGS, U.S. Geological Survey]

Owner	Owner's identification number	USGS identification number
	<u>Well</u>	
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
	<u>Surface-water site</u>	
Delaware Department of Transportation	Red Lion Creek	01482320