210501-0010300011

BWX Technologies, Inc.
Babcock & Wilcox, a McDermott company

Babcock & Wilcox of Ohio, Inc.
1 Mound Road
P.O. Box 3030
Miamisburg, Ohio 45343-3030
(937) 865-4020

SP-019-98
September 17, 1998

98-TC-09-17

Acting Director, Miamisburg Environmental Management Project
U.S. Department of Energy
P.O. Box 66
Miamisburg, OH 45343-0066

Attention: Arthur Kleinrath

Subject: Contract No. DE-AC24-97OH20044
Implementation of Operable Unit One, Final Report

Dear Mr. Folker:

Mr. Tim Fischer of the U.S. Environmental Protection Agency has requested a final report documenting the implementation of the Operable Unit One Record of Decision. Attached please find the additional copies required for DOE/MEMP distribution.

If you have any questions or need further information, please contact John Price at extension 3954.

Sincerely,

John B. Price

John Price
Project Manager, Soils Project

JP/lkl

cc: DCC
DOE/MEMP (4)
DOE HQ
Admin. Record
MMCIC
ODH
OEPA (2)
US EPA (2)
Public Reading Rm.
J. Price
M. Spivey

210501-0010300011

FINAL REPORT ON THE IMPLEMENTATION OF OPERABLE UNIT 1 RECORD OF DECISION

Mound Plant
Miamisburg, OH

September 1998

Department of Energy
Ohio Field Office

BABCOCK & WILCOX OF OHIO

ATTACHMENTS

A. OU-1 Pump & Treat System Capture Zone Monitoring

A.1 Monitoring for April/May, 1997

A.2 Monitoring for June/July, 1997

A.3 Monitoring for August/September, 1997

B. OU-1 Contaminants of Concern

Operable Unit One Record of Decision Implementation

Operable Unit One (OU-1), or Area B as it was originally called, occupies approximately 4 acres in the southwestern portion of the Mound Plant. It encompasses the historic landfill, the site sanitary landfill, the overflow pond, and the three plant production wells. The Mound Plant began a periodic water-sampling program for VOCs in 1984. Under the Environmental Restoration (ER) Program, a Remedial Investigation (RI) was started in 1987 and focused on groundwater contamination. Since 1986, VOCs have been detected and monitored in the groundwater in Area B. An extended discussion of Area B history, including waste disposal and construction activities, is provided in the OU-1 Remedial Investigation Report, Section 1, March 1994.

As a result of the VOC groundwater contamination found in Operable Unit One, the Mound Plant was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priority List, in 1989. As part of the Mound CERCLA process, a Federal Facility Agreement was signed between the DOE, the U.S. EPA and Ohio EPA. The FFA agreement required DOE to produce an RI/FS report, which is based on remedial investigative fieldwork. As a result of the remedial investigative process, which took approximately 3 years (1992-1995), DOE and the U.S. EPA and Ohio EPA signed a CERCLA Record of Decision (ROD) for a remediation remedy to control groundwater VOC contamination in Operable Unit One, and in the adjacent buried valley aquifer.

The chosen remedial method for containment and removal of VOC contaminants was a pump-and-treat system. A remedial design was developed for the installation of extraction and monitoring wells and construction of an air stripper system. The extraction and monitoring wells for the OU-1 remediation project were installed in 1996, and the installation of the air stripper and associated equipment was completed and started operation on February 18, 1997. The first 180 days of operation was under a Treatability Test. Operation of the facility following the Treatability Test period has been conducted in accordance with the Authorization to Discharge. The effluent from the treatment facility is also known as Outfall 003. The monitoring for VOC contamination in OU-1 is ongoing and part of the Mound Plant Environmental Monitoring Program.

A six-month monitoring program was conducted to assess the hydraulic containment of the groundwater contamination plume within the western and southern compliance boundaries. This was accomplished by collecting water level data from 20 monitoring wells to evaluate the potentiometric surface and local hydraulic gradients in the OU-1 area. Local hydraulic gradients are determined by conducting three point evaluations using monitoring wells that straddle the compliance boundary. Two sets of three monitoring wells are currently being utilized to determine if hydraulic containment is achieved; wells 0417, 0305 and 0410 are used to verify containment at the southern boundary, and wells 0422, 0423 and P003 are used to verify containment at the western boundary. The results of the monitoring show that the system is effectively capturing the contamination. The initial pump-and-treatment capture zone monitoring reports, performed by Terran Corporation, are in Attachment A.

The VOC contaminants of concern (COC) have been monitored monthly on both the influent and effluent. The influent data shows that the pump-and-treatment system is being effective in the removal of the COCs from the groundwater by the rate of which the concentration of contaminants present in the influent is dropping. The effluent data exhibits the effectiveness of the air stripper in removing the COCs from the water being treated and exhibits compliance to the Authorization to Discharge from Outfall 003. A synopsis of the VOC COC data and Water Quality data are in Attachment B.

Based upon the pump-and-treat monitoring results, the system is fulfilling the criterion set forth by the ROD. Due to the aforementioned, the ROD is considered to be fully implemented. Mound will continue to monitor the systems performance until remediation efforts have been determined to be successful and permission is given to cease the treatment system operation.

Attachment A

OU-1 PUMP-AND-TREAT SYSTEM CAPTURE ZONE MONITORING FOR APRIL AND MAY 1997

MOUND PLANT
MIAMISBURG, OHIO

TECHNICAL MEMORANDUM

June 1997

Department Of Energy

EG&G Mound Applied Technologies

TABLE OF CONTENTS

ACKNOWLEDGMENTS 1-1

1.0 INTRODUCTION 1-1

2.0 WEEKLY POTENTIOMETRIC WATER LEVELS AND POTENTIOMETRIC SURFACE MAPPING 2-1

3.0 CONTINUOUS WATER LEVEL MONITORING RESULTS 3-1

4.0 CAPTURE ZONE MEASUREMENT AT COMPLIANCE BOUNDARY 4-1

5.0 REFERENCES 5-1

APPENDIX A HYDROGRAPHS FOR MONITORING WELLS P001, P006, 0374, 0063, 0410, 0412, 0413, 0414, 0415, 0416, 0418, 0419, 0422, 0423

LIST OF FIGURES

Figure 1.1. OU-1 Pump-and-Treat system capture zone monitoring study area. 1-2
Figure 2.1. Groundwater potentiometric surface for April 24, 1997. 2-3
Figure 2.2. Groundwater potentiometric surface for May 1, 1997. 2-4
Figure 2.3. Groundwater potentiometric surface for May 8, 1997. 2-5
Figure 2.4. Groundwater potentiometric surface for May 15, 1997. 2-6
Figure 2.5. Groundwater potentiometric surface for May 22, 1997. 2-7
Figure 2.6. Groundwater potentiometric surface for May 29, 1997. 2-8
Figure 4.1. Original optimization cell locations and node numbers. 4-5
Figure 4.2. Adjusted optimization cell locations to calculate head differences that straddle the southern compliance line. 4-6

LIST OF TABLES

Table II.1 OU-1 Weekly Water Levels for Late April and the Month of May, 1997 2-2
Table IV.1 Head Difference (Manually Measured) and Hydraulic Gradient Between Monitoring Wells that are Outside and Inside the Compliance Boundary. 4-2
Table IV.2 Estimated Head Differences Using Kriging (Figure 4.1). 4-3
Table IV.3 Estimated Head Differences Using Kriging at Adjusted Southern Line of Cells (Figure 4.2) 4-4

ACKNOWLEDGMENTS

This report was prepared by Terran Corporation of Beavercreek, Ohio as report number TB-9728. It was completed under Task Order #16535 with EG&G Mound Applied Technologies. The author was Roger W. McCready and word processing and graphics prepared by Sandra L. Allen. Field work preliminary contouring was conducted by Michael Brady, Chris Ruef and Scott Hora.

1.0 INTRODUCTION

This report has been prepared as part of the Environmental Restoration (ER) Program at the U.S. Department of Energy (DOE) Mound Plant, Miamisburg, Ohio. Operable Unit One (OU-1) addresses possible chemical contamination of the buried valley aquifer which underlies the original southwest corner of the Mound Plant. OU-1 is currently in the remediation phase of the CERCLA process. The remedial method chosen is a pump-and-treat methodology.

Pump-and-treat systems are designed to hydraulically contain and remove the contaminants dissolved in the ground water. Due to the relatively long duration of pump-and-treat remediations the objective of the management problem is to minimize total pumping rate which reduce treatment costs. The OU-1 groundwater contamination plume must be contained within a western and southern compliance boundary. Containment refers to an inward hydraulic gradient at the boundary to prevent the movement of groundwater across the boundary. Therefore, the primary constraint is head differences at the compliance boundary. The design strategy was to have field measurable head-difference limits and the optimal limit of 0.05 feet was chosen during the design phase.

For the first six months of the pump-and-treat system will be monitored to measure the capture zone created by the system. The hydraulic effectiveness of the pump-and-treat system will be measured by collecting water levels from 20 monitoring wells in the area. A combination of hand water level measurements and continuous monitoring instrumentation is used to collect data necessary to quantify the hydraulic containment by the pump-and-treat system. The study area with extraction wells and monitoring well locations is shown in (Figure 1.1). The study began on April 21, 1997 when the dataloggers were installed and will continue until August 31, 1997. This report is a monthly summary of the data collected and the results of the pump-and-treat system hydraulic containment.

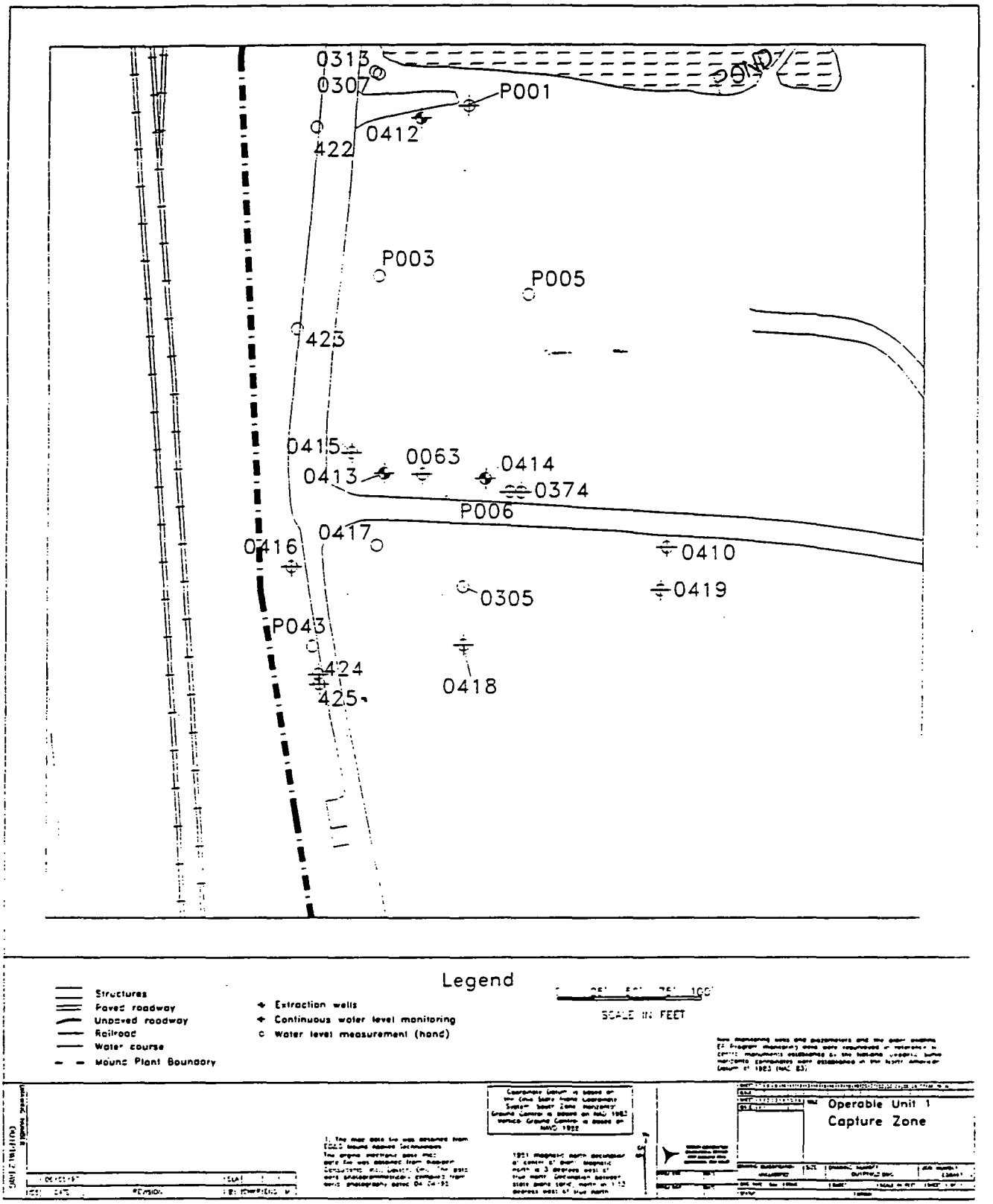


Figure 1.1. OU-1 Pump-and-Treat system capture zone monitoring study area.

2.0 WEEKLY POTENTIOMETRIC WATER LEVELS AND POTENTIOMETRIC SURFACE MAPPING

The ground water levels in twenty monitoring wells and the three pump-and-treat extraction wells are measured manually once a week. The water levels are contoured and an potentiometric map of the water level surface is prepared for each set of weekly water levels. Table II.1 list the depth to water and water level elevation for the twenty monitoring wells and three extraction wells during April and May, 1997.

Water level measurements were completed using standard protocol of the OU-9 QAPP (Revision 4, April 1995) SOP 3.1 Water Level Measurement (Revision 1, March 1992). Water level collection using a electric water level indicator that allows measurement to 0.01 foot. The water levels are recorded on a form and entered into a spreadsheet.

Preparation of the potentiometric water levels maps is conducted in a two step process. Data from each weekly measurement is entered into Golden Software Surfer were it is contoured using Kriging. The contours are then edited by a hydrogeologist before being drawn on the base map.

Only one set of measurements were collected in April and the capture zone is evident on the figure 2.1. During the month of May five sets of water levels were collected and the potentiometric water level surfaces are shown in figures 2.2 through 2.6. All the potentiometric maps have very similar shapes and show a definite cone of depression (capture zone) at the pump-and-treat system. Both the two southern extraction wells (0413 and 0414) are pumping at 43 gallons per minute with extraction well 0412 at 24 gallons per minute. The greatest drawdown is occurring at well 0414. This may indicate that the transvissivity in and around 0414 is lower than at 0413. Since both wells are producing the same amount of water but 0414 has a much greater drawdown. Also, well 0414 may have a lower well efficiency which causes a greater drawdown per yield.

Table II.1 OU-1 Weekly Water Levels for Late April and the Month of May, 1997

Monitoring Well		24-Apr-97 Water Level		01-May-97 Water Level		08-May-97 Water Level		15-May-97 Water Level		22-May-97 Water Level		29-May-97 Water Level	
Number	Elevation TOC	Below TOC	Elevation	Below TOC	Elevation	Below TOC	Elevation	Below TOC	Elevation	Below TOC	Elevation	Below TOC	Elevation
		(Feet)	(MSL)	(Feet)	(MSL)	(Feet)	(MSL)	(Feet)	(MSL)	(Feet)	(MSL)	(Feet)	(MSL)
0063	705.60	25.42	680.18	25.70	679.90	25.00	680.60	25.31	680.29	25.48	680.12	25.90	679.70
0305	709.87	29.50	680.37	29.79	680.08	29.21	680.66	29.55	680.32	29.71	680.16	30.13	679.74
0307	716.10	35.67	680.43	35.98	680.12	35.25	680.85	35.57	680.53	35.47	680.63	36.14	679.96
0313	716.08	35.63	680.45	35.95	680.13	35.27	680.81	35.56	680.52	35.70	680.38	36.17	679.91
0374	706.29	26.08	680.21	26.94	679.35	25.79	680.50	26.06	680.23	26.25	680.04	26.58	679.71
0410	713.84	33.59	680.25	33.90	679.94	33.14	680.70	33.55	680.29	33.94	679.90	34.00	679.84
0412	717.00	36.73	680.27	37.00	680.00	36.21	680.79	36.69	680.31	36.91	680.09	37.13	679.87
0413	704.45	24.71	679.74	35.09	669.36*	24.27	680.18	24.58	679.87	24.76	679.69	25.09	679.36
0414	705.85	27.17	678.68	27.55	678.30	26.79	679.06	27.10	678.75	27.43	678.42	27.79	678.06
0415	706.09	25.74	680.35	26.15	679.94	25.37	680.72	25.72	680.37	25.89	680.20	26.35	679.74
0416	704.30	23.99	680.31	24.30	680.00	23.58	680.72	23.89	680.41	24.10	680.20	24.48	679.82
0417	705.07	24.78	680.29	25.11	679.96	24.39	680.68	24.68	680.39	24.97	680.10	25.28	679.79
0418	709.67	29.41	680.26	29.70	679.97	29.02	680.65	29.34	680.33	29.46	680.21	29.80	679.87
0419	716.41	36.18	680.23	36.50	679.91	35.82	680.59	36.11	680.30	36.36	680.05	36.60	679.81
0422	715.21	34.86	680.35	35.05	680.16	34.28	680.93	34.72	680.49	34.84	680.37	35.15	680.06
0423	709.12	28.63	680.49	29.03	680.09	28.39	680.73	28.69	680.43	28.56	680.56	29.13	679.99
0424	704.49	24.18	680.31	24.49	680.00	23.79	680.70	24.07	680.42	24.25	680.24	24.19	680.30
0425	704.58	24.23	680.35	24.56	680.02	23.90	680.68	24.11	680.47	24.36	680.22	24.54	680.04
P001	717.67	37.23	680.44	37.53	680.14	36.91	680.76	37.18	680.49	37.48	680.19	37.78	679.89
P003	707.46	27.13	680.33	27.43	680.03	26.79	680.67	27.07	680.39	27.33	680.13	27.64	679.82
P005	738.59	58.31	680.28	58.60	679.99	57.92	680.67	58.27	680.32	58.53	680.06	58.85	679.74
P006	705.96	26.10	679.86	26.20	679.76	25.53	680.43	25.79	680.17	25.97	679.99	26.36	679.60
P043	704.80	24.44	680.36	24.80	680.00	24.12	680.68	24.40	680.40	24.69	680.11	25.01	679.79

*Depth to water on May 1, 1997 for well 0413 was in error, the continuous monitoring with the Telog indicated that the water level elevation should be 679.35.

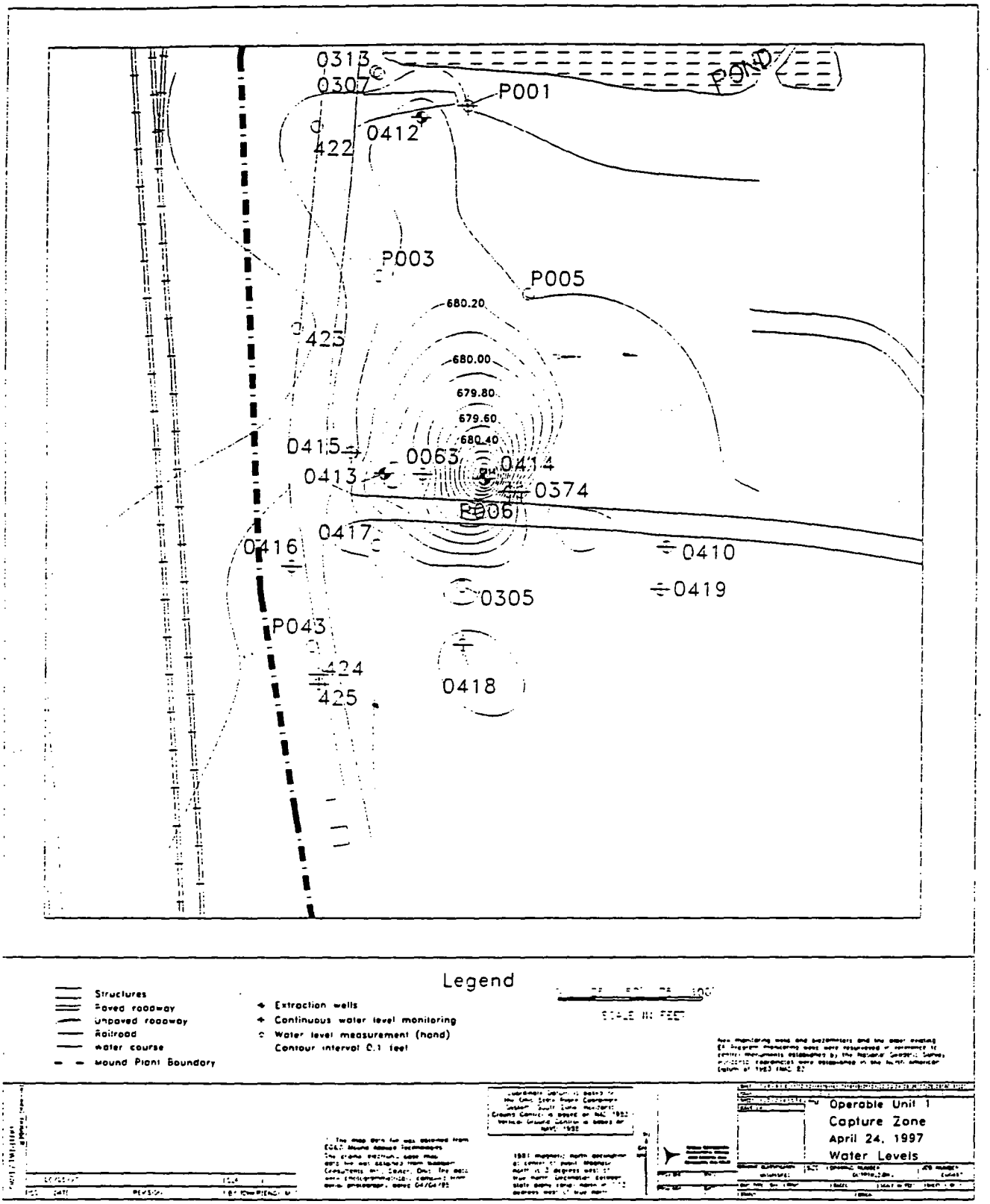


Figure 2.1. Groundwater potentiometric surface for April 24, 1997.

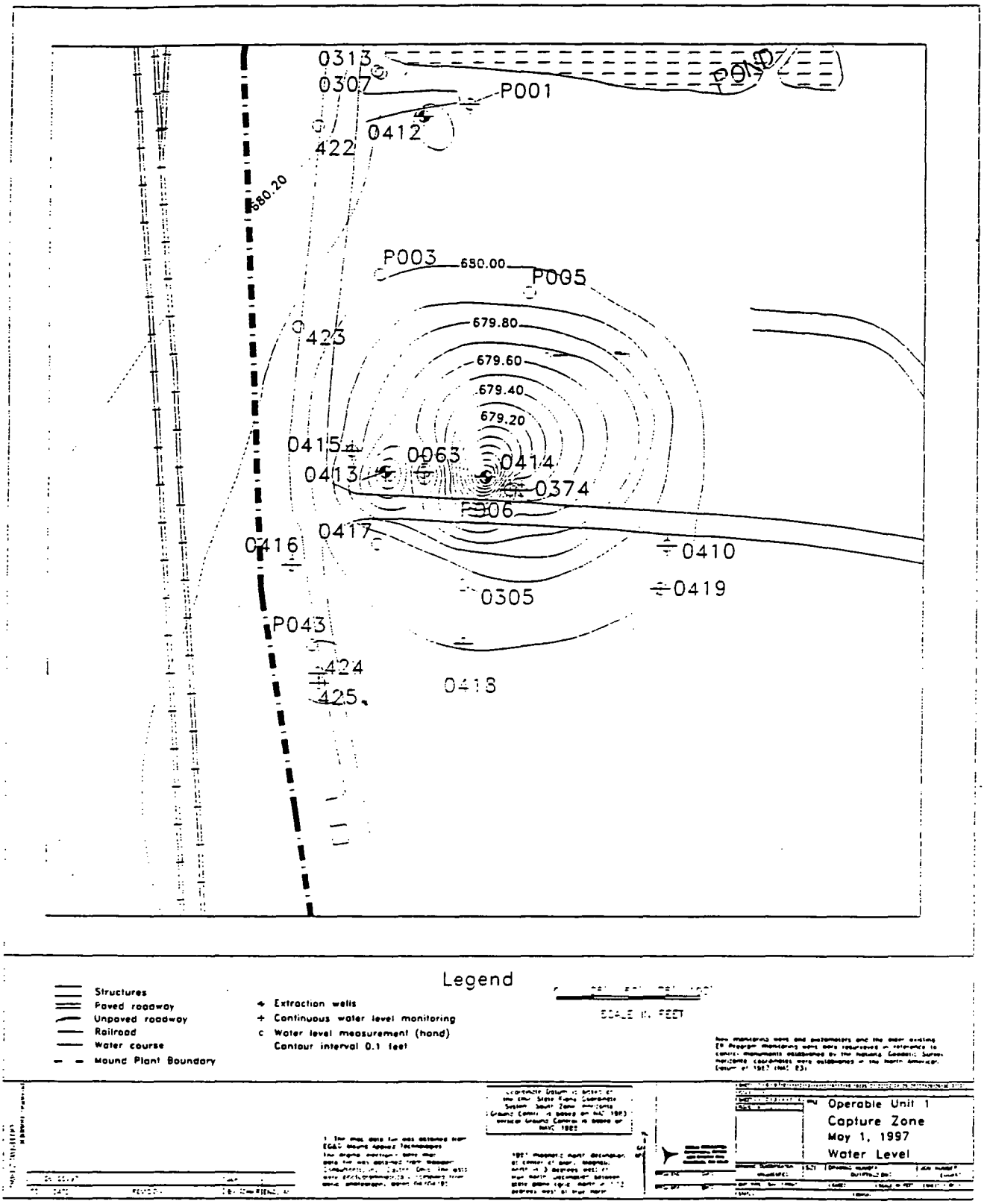


Figure 2.2. Groundwater potentiometric surface for May 1, 1997.

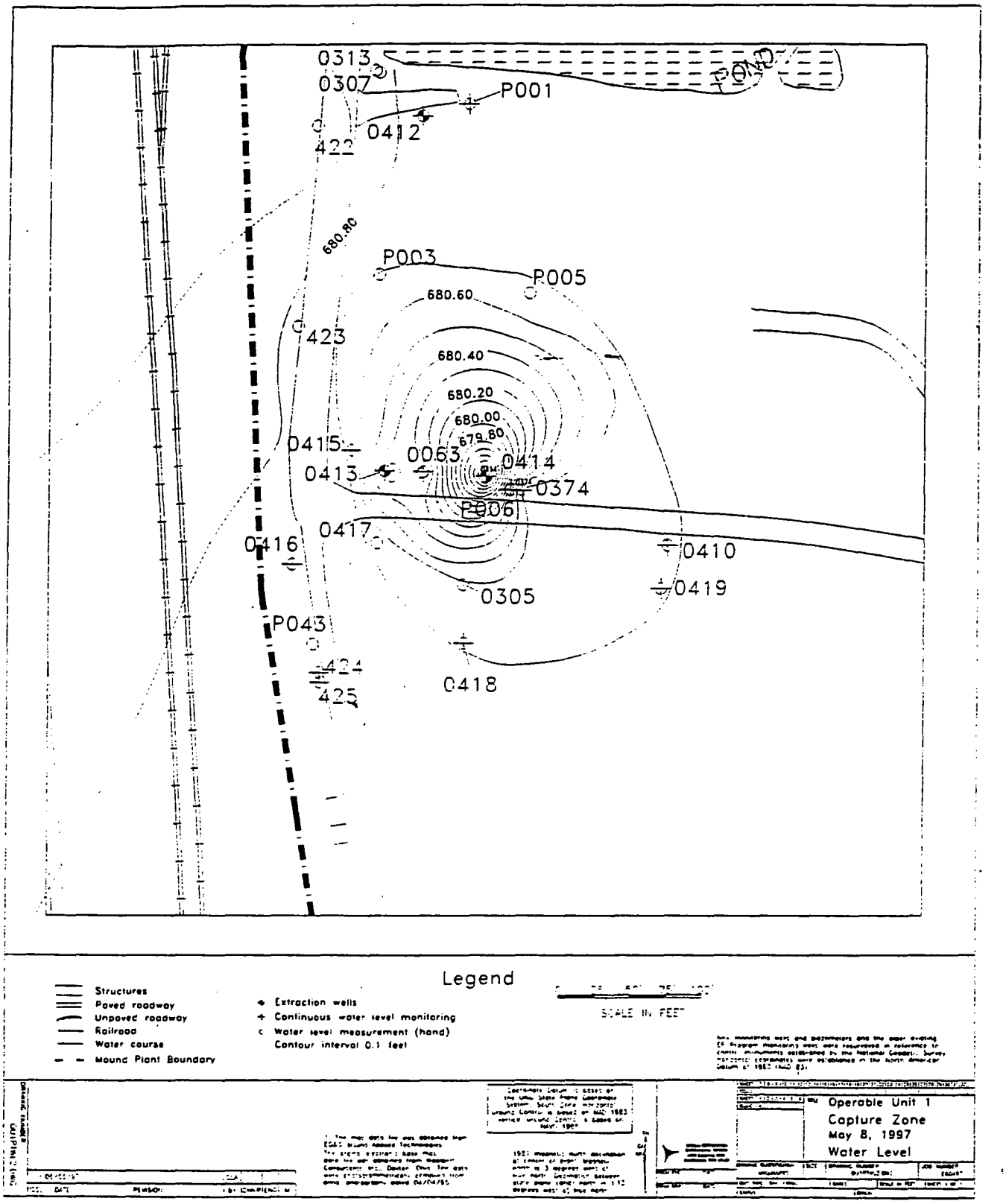


Figure 2.3. Groundwater potentiometric surface for May 8, 1997.

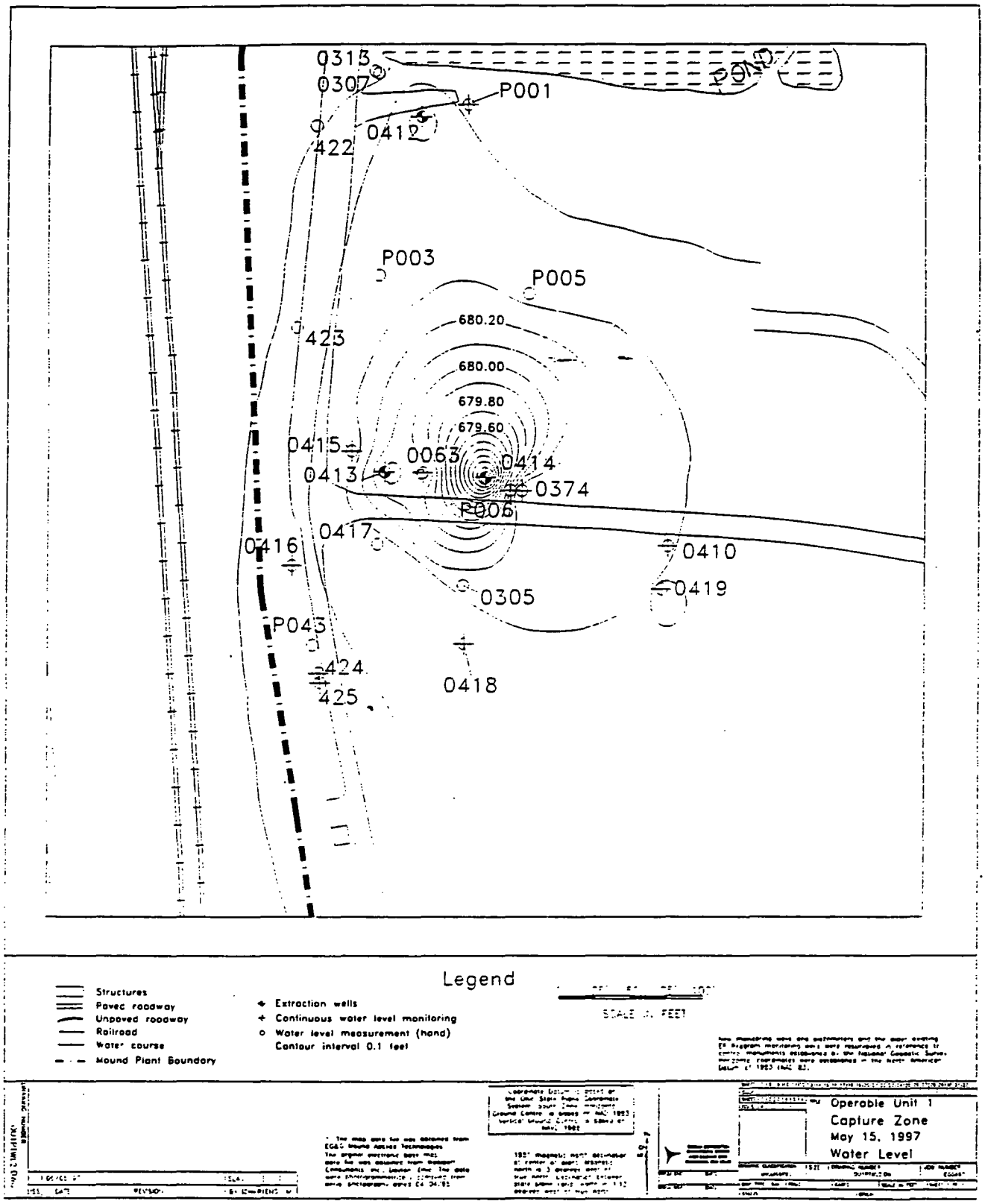


Figure 2.4. Groundwater potentiometric surface for May 15, 1997.

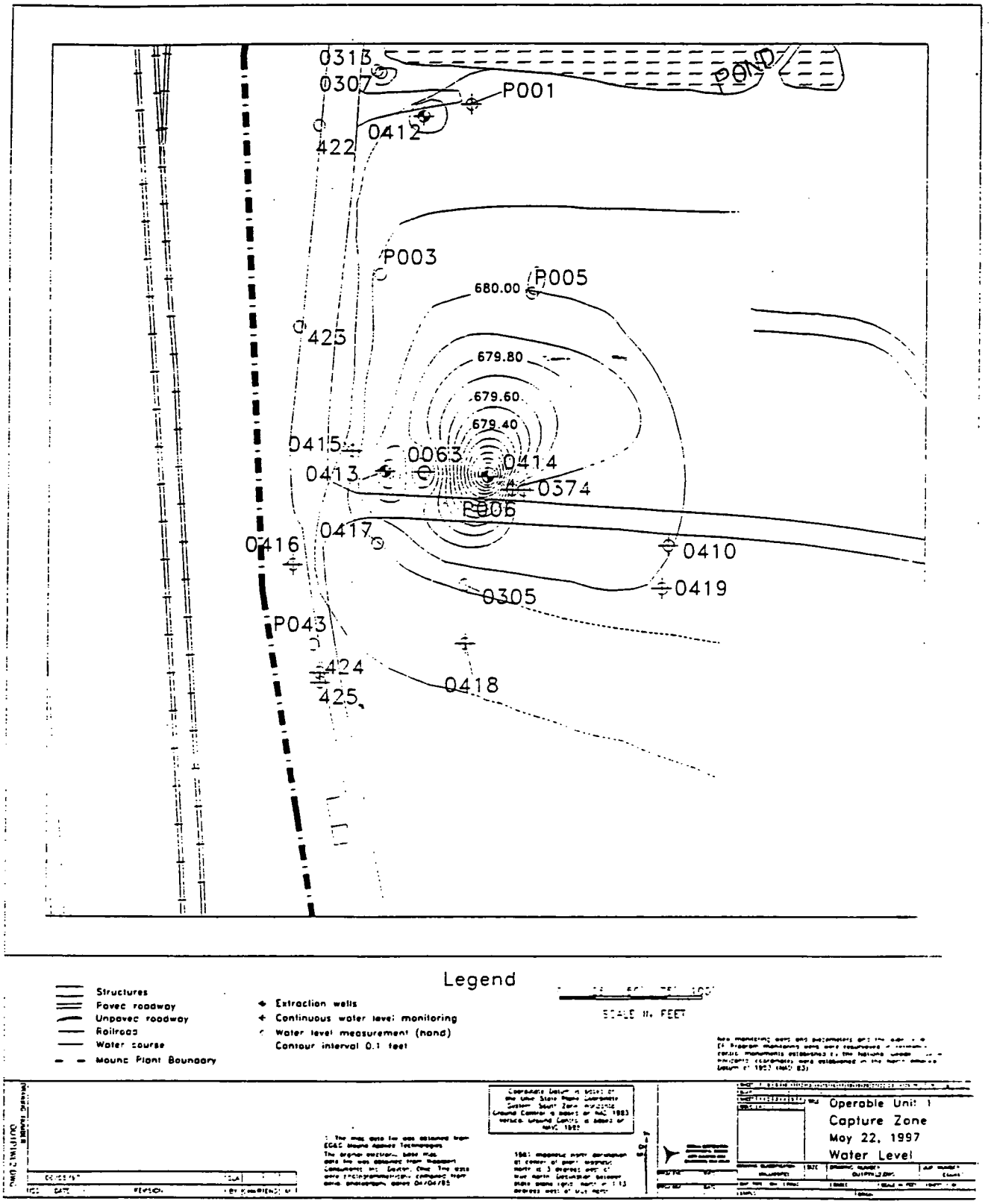


Figure 2.5. Groundwater potentiometric surface for May 22, 1997.

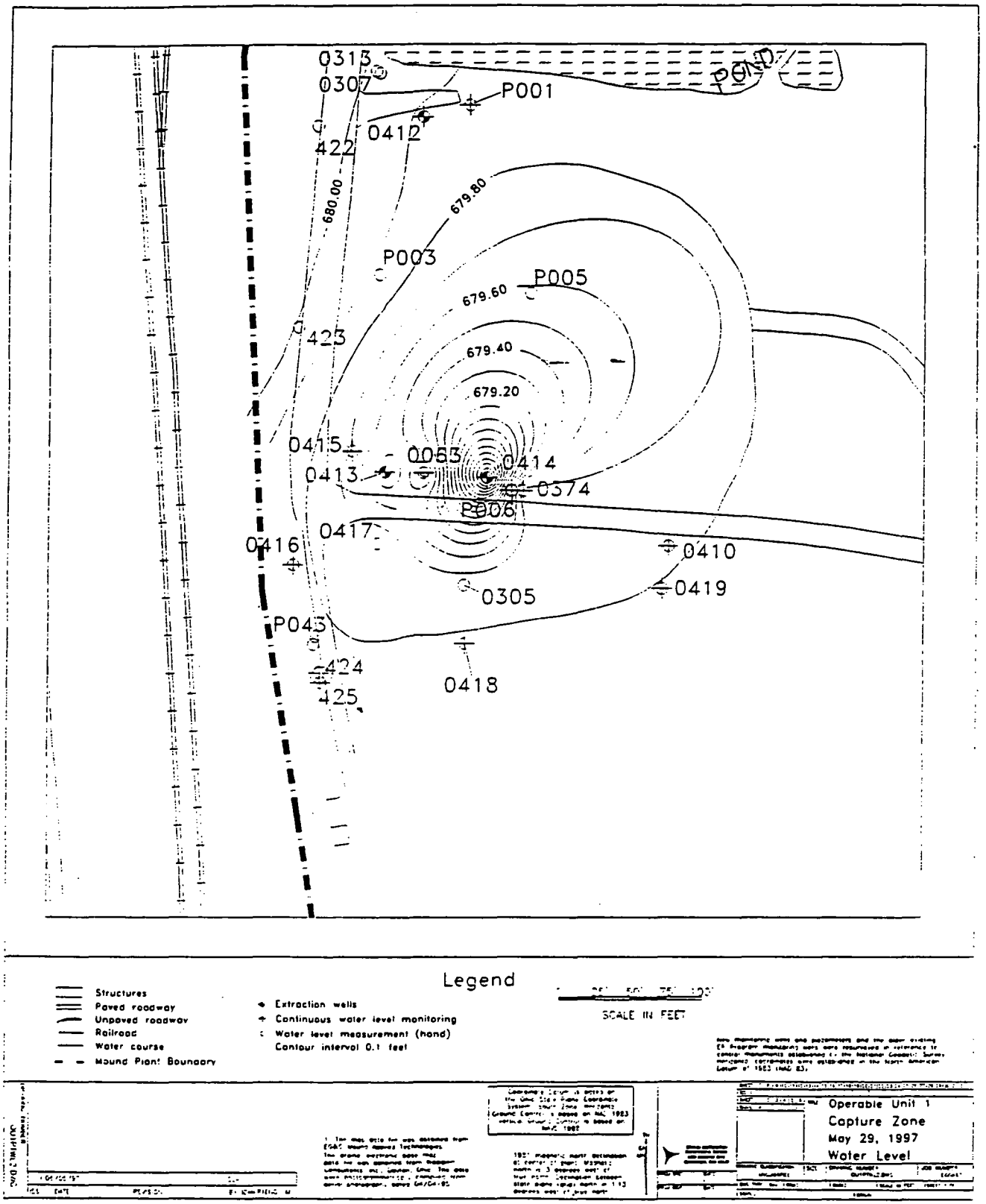


Figure 2.6. Groundwater potentiometric surface for May 29, 1997.

3.0 CONTINUOUS WATER LEVEL MONITORING RESULTS

To assess the potential fluctuations in water levels due to external sources such as the Mound production wells continuous water level monitoring at 13 locations surrounding the pump-and-treat system was initiated. Continuous water level monitoring is provided by individual Telog Level Trackers 2100. The Trackers are dataloggers and pressure transducers instrumentation to provide unattended remote water level recording. The instrumentation was installed in the 13 monitoring wells on April 21, 1997. Figure 1. shows the location of the monitoring wells and extraction wells that have Trackers installed. The dataloggers have been programmed to collect a water level measurement every 15 minutes. Once a week when the hand water level measurements are collected each datalogger is downloaded into a Telog Data Transfer Unit (DTU). The DTU is returned to the office where the data is uploaded into a database that contains records for each well.

Hydrographs of the April and May continuous water level data have been prepared as shown in Appendix A figures A.1 through A.15. The hydrographs reflect the natural water level fluctuations that occur in the Buried Valley Aquifer. Abrupt increase in ground water levels due to rain events and stage increase of the Great Miami River occur frequently through out the year. Increases up to six feet were recorded at P001 from July 1, 1993 to May, 1994 (DOE, 1995). During late April and May a five day ground water level increase occurred that increase water levels by 0.5 to 0.7 feet. The ground water levels are currently declining from the high on May 7, 1997.

The dataloggers were installed during the cleaning of the air stripper on April 21, 1997. The air stripper was turned back on April 22, 1997 at approximately 1300. This is evident by the decrease in water level on the graphs of all wells except 0419. All the wells show a gradual decline in the natural water level. Since the installation of the dataloggers the extraction wells have not been off.

Since the start of this monitoring the plant has been supplied by production well 3 (0076). Many of the hydrographs reveal the daily pumping of the production well. Monitoring well 0419 is most affected by production well 3 producing a daily drawdown of 0.4 feet between 0600 and 1000. Monitoring well 0374 has a 0.1 foot drawdown that occurs in the late afternoon each day. Based on a qualitative review of the other hydrographs the daily peak drawdown at all other monitoring wells used for this study is less 0.05 feet.

4.0 CAPTURE ZONE MEASUREMENT AT COMPLIANCE BOUNDARY

During the design of the pump-and-treat system ground water modeling and optimization was used to determine the number of wells and a field measurable head difference across the compliance boundary. The pump-and-treat system is required to maintain a hydraulic head difference of 0.05 feet at the compliance boundary to ensure capture as approved by regulators (DOE, 1996).

A comparison was made of water level elevations for monitoring wells outside versus inside the compliance boundary. Table IV.1 list eight sets of wells inside and outside of the compliance boundary and the corresponding head difference. The distance between nodes used for head difference calculations during design was 25 feet. Therefore, the design gradient was 0.002 ft/ft. Since the monitoring wells used for the field measurement are usually greater than 25 feet a gradient was also calculated for each location to compare with the design gradient of 0.002 ft/ft. A positive gradient and head difference indicates flow toward the extraction system. Review of table IV.1 indicates that two locations may not have flow toward the system (negative gradient). The set of monitoring wells 0422 and 0307 on the April 24, 1997 and May 22, 1997 have a 0.002 and -0.007 gradient respectively. These wells are not directly across the compliance line and 0307 is actually upgradient from 0422. The set of well 0417 and 0063 on May 22, 1997 had a slight -0.02 feet outward head difference and gradient.

Due to the small number of locations that are directly opposite the compliance line a second method was chosen to calculate the head differences. This method uses the gridding process that the contouring package Surfer performs prior to contouring. Terran Corporation uses Golden Software's program Surfer to produce the first estimate of the contours and then the contours are edited based on hydrogelogic knowledge and professional judgement. The kriging process calculates the water level elevation at the grid locations based on the twenty known water level elevations. Groundwater elevations at the compliance head difference locations are extracted from the grid file for each weekly event (Table IV.2). This allows a larger area to be compared and identify where capture may not be achieved. Figure 4.1 shows the location of the design optimization cells and nodes used in optimization of the head difference. The original head difference cells after surveying are too far north by 12.5 feet. An adjusted line head difference cells that straddle the compliance line is shown in figure 4.2. The design criteria was an head difference of 0.05 feet of cells 25 feet apart with the compliance line in the middle.

A head difference of 0.05 feet or greater is being maintained at the compliance line an estimated 90 percent of that time. During short duration (a few days) of increased water levels due to rain events the western compliance boundary may not maintain a 0.05 feet head difference. However, the site wide flow of the Buried Valley Aquifer during these short events has a easterly component due to flood wave affects which would reduce flow away from the area (DOE, 1994).

Table IV.1 Head Difference (Manually Measured) and Hydraulic Gradient Between Monitoring Wells that are Outside and Inside the Compliance Boundary.

Monitoring Well		24-Apr-97 Gradient / Head Difference		01-May-97 Gradient / Head Difference		08-May-97 Gradient / Head Difference		15-May-97 Gradient / Head Difference		22-May-97 Gradient / Head Difference		29-May-97 Gradient / Head difference	
#	Distance	(ft/ft)	(Feet)	(ft/ft)	(Feet)	(ft/ft)	(Feet)	(ft/ft)	(Feet)	(ft/ft)	(Feet)	(ft/ft)	(Feet)
0422-0412	36.27	0.002	0.086	0.005	0.166	0.004	0.146	0.005	0.186	0.008	0.286	0.005	0.196
0422-0307	36.62	-0.002	-0.079	0.001	0.041	0.002	0.081	-0.001	-0.039	-0.007	-0.259	0.003	0.101
0423-P003	36.07	0.005	0.163	0.002	0.063	0.002	0.063	0.001	0.043	0.012	0.433	0.005	0.173
0416-0415	78.33	-0.001	-0.040	0.001	0.060	-0.000	-0.000	0.001	0.040	-0.000	-0.000	0.001	0.080
0417-0413	49.45	0.011	0.551	0.214	10.601	0.010	0.501	0.011	0.521	0.008	0.411	0.009	0.431
0417-0063	49.06	0.002	0.110	0.001	0.060	0.002	0.080	0.002	0.100	-0.000	-0.020	0.002	0.090
0305-0414	74.17	0.023	1.695	0.024	1.785	0.022	1.605	0.021	1.575	0.024	1.745	0.023	1.685
0305-0374	65	0.002	0.160	0.011	0.730	0.002	0.160	0.001	0.090	0.002	0.120	0.000	0.030

Table IV.2 Estimated Head Differences Using Kriging (Figure 4.1).

Node #		April 24, 1997			May 1, 1997			May 8, 1997		
				Diff.			Diff.			Diff.
1	2									
3	4	680.401	680.400	0.001	680.401	680.400	0.001	680.934	680.870	0.064
5	6	680.343	680.323	0.02	680.343	680.323	0.02	680.973	680.885	0.088
7	8	680.346	680.308	0.038	680.346	680.308	0.038	680.920	680.864	0.056
9	10	680.368	680.325	0.043	680.368	680.325	0.043	680.872	680.825	0.047
11	12	680.397	680.344	0.053	680.397	680.344	0.053	680.827	680.779	0.048
13	14	680.429	680.326	0.073	680.429	680.356	0.073	680.786	680.730	0.056
15	16	680.459	680.355	0.104	680.459	680.355	0.104	680.755	680.689	0.066
17	18	680.459	680.331	0.128	680.459	680.331	0.128	680.736	680.657	0.079
19	20	680.431	680.293	0.138	680.431	680.293	0.138	680.736	680.639	0.097
21	22	680.419	680.269	0.150	680.419	680.269	0.150	680.754	680.652	0.102
23	24	680.403	680.252	0.151	680.403	680.252	0.151	680.762	680.710	0.052
27	26	679.917	679.939	-0.022	679.917	679.939	-0.022	679.342	679.375	-0.033
29	28	679.820	679.765	0.055	679.820	679.765	0.055	679.315	679.256	0.059
31	30	679.196	679.245	-0.049	679.196	679.245	-0.049	679.718	679.735	-0.017
33	32	679.648	679.405	0.243	679.648	679.403	0.243	679.803	679.685	0.118
35	34	680.248	679.943	0.305	680.248	679.943	0.305	680.624	680.265	0.359
Node #		May 15, 1997			May 22, 1997			May 29, 1997		
				Diff.			Diff.			Diff.
1	2									
3	4	680.924	680.855	0.0690	682.440	682.073	0.367	680.039	678.995	0.044
5	6	680.956	680.869	0.087	682.065	682.128	-0.063	680.055	680.000	0.055
7	8	680.911	680.852	0.059	682.092	682.139	-0.047	680.039	679.991	0.048
9	10	680.863	680.815	0.048	682.093	682.129	-0.036	680.025	679.976	0.049
11	12	680.817	680.769	0.048	682.077	682.097	-0.02	680.012	679.961	0.051
13	14	680.776	680.718	0.058	682.049	682.064	-0.015	679.998	679.939	0.059
15	16	680.742	680.676	0.066	682.012	682.016	-0.004	679.98	679.894	0.086
17	18	680.722	680.639	0.083	681.981	681.974	0.007	679.938	679.832	0.106
19	20	680.720	680.615	0.105	681.967	681.947	0.02	679.875	679.768	0.107
21	22	680.741	680.618	0.123	681.959	681.936	0.023	679.830	679.722	0.108
23	24	680.755	680.629	0.126	681.954	681.936	0.018	679.801	679.703	0.098
27	26	680.339	680.352	-0.013	681.886	681.885	0.001	679.509	679.506	0.003
29	28	680.232	680.178	0.054	681.865	681.826	0.039	679.563	679.470	0.093
31	30	679.591	679.641	-0.05	681.358	681.384	-0.026	678.843	678.841	0.002
33	32	680.107	679.806	0.301	681.713	681.450	0.263	678.880	678.716	0.164
35	34	680.630	680.340	0.29	681.900	681.738	0.162	679.734	679.309	0.425

Table IV.3 Estimated Head Differences Using Kriging at Adjusted Southern Line of Cells (Figure 4.2)

Node #		April 24, 1997			May 1, 1997			May 8, 1997		
				Diff.			Diff.			Diff.
25	24	680.129	680.252	-0.123	680.129	680.252	-0.123	680.578	680.710	-0.132
27	26	680.034	679.852	0.182	—	—	—	680.436	680.282	0.154
29	28	679.863	679.855	0.008	—	—	—	680.254	680.275	0.021
31	30	679.581	679.068	0.513	—	—	—	679.968	679.460	0.508
33	32	679.908	679.404	0.504	—	—	—	680.324	679.825	0.499
35	34	680.293	680.117	0.176	—	—	—	680.676	680.506	0.17
Node #		May 15, 1997			May 22, 1997			May 29, 1997		
				Diff.			Diff.			Diff.
25	24	680.529	680.629	0.1	681.924	681.936	0.012	679.643	679.703	0.06
27	26	680.436	680.282	0.154	679.957	679.814	0.143	679.603	679.476	0.127
29	28	680.254	680.275	0.021	679.838	679.919	0.081	679.444	679.538	0.094
31	30	679.968	679.460	0.508	679.527	678.930	0.597	679.096	678.539	0.557
33	32	680.324	679.825	0.499	679.879	679.276	0.603	679.456	678.881	0.575
35	34	680.676	680.506	0.17	680.078	679.833	0.245	679.808	679.586	0.222

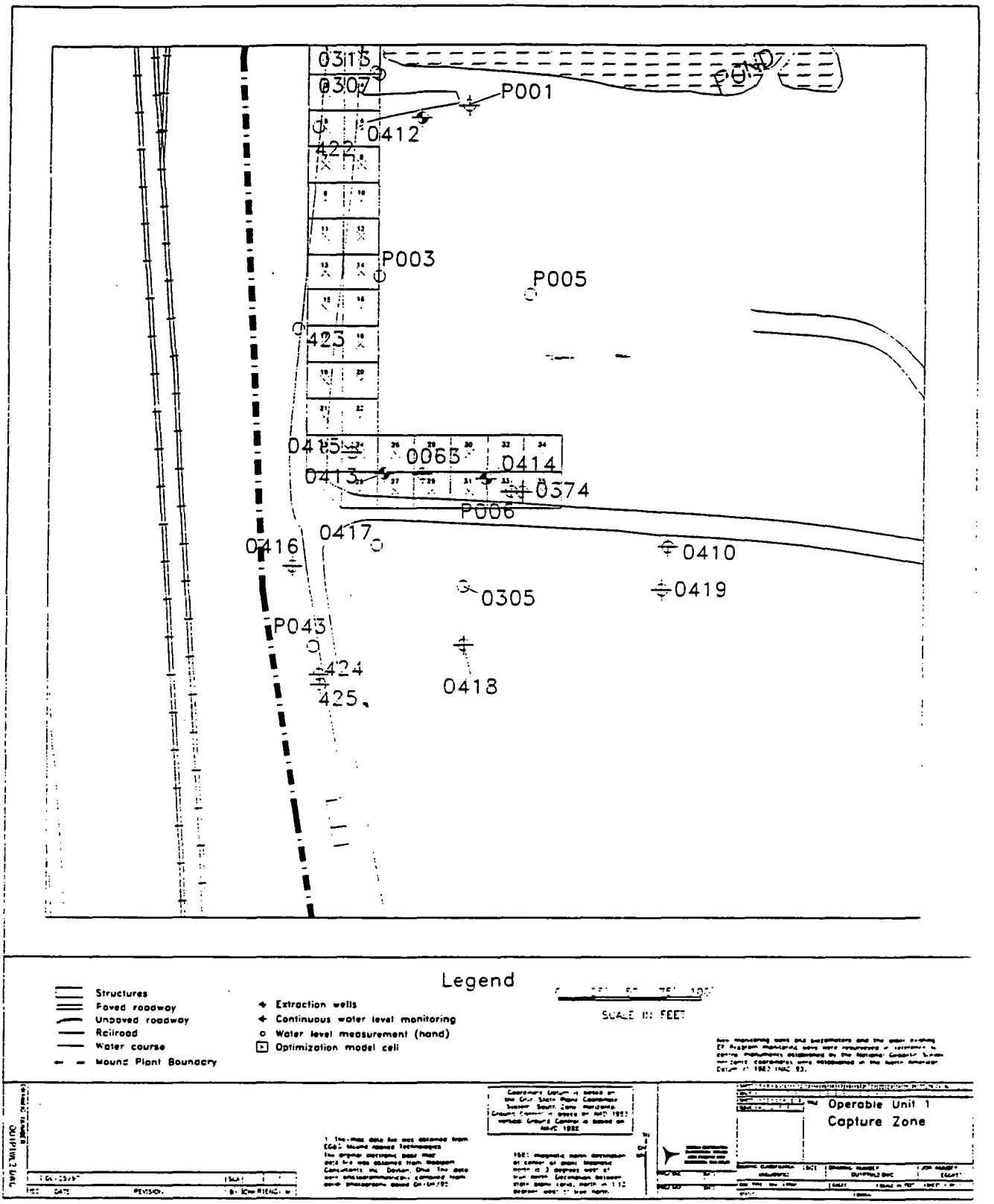


Figure 4.1. Original optimization cell locations and node numbers.

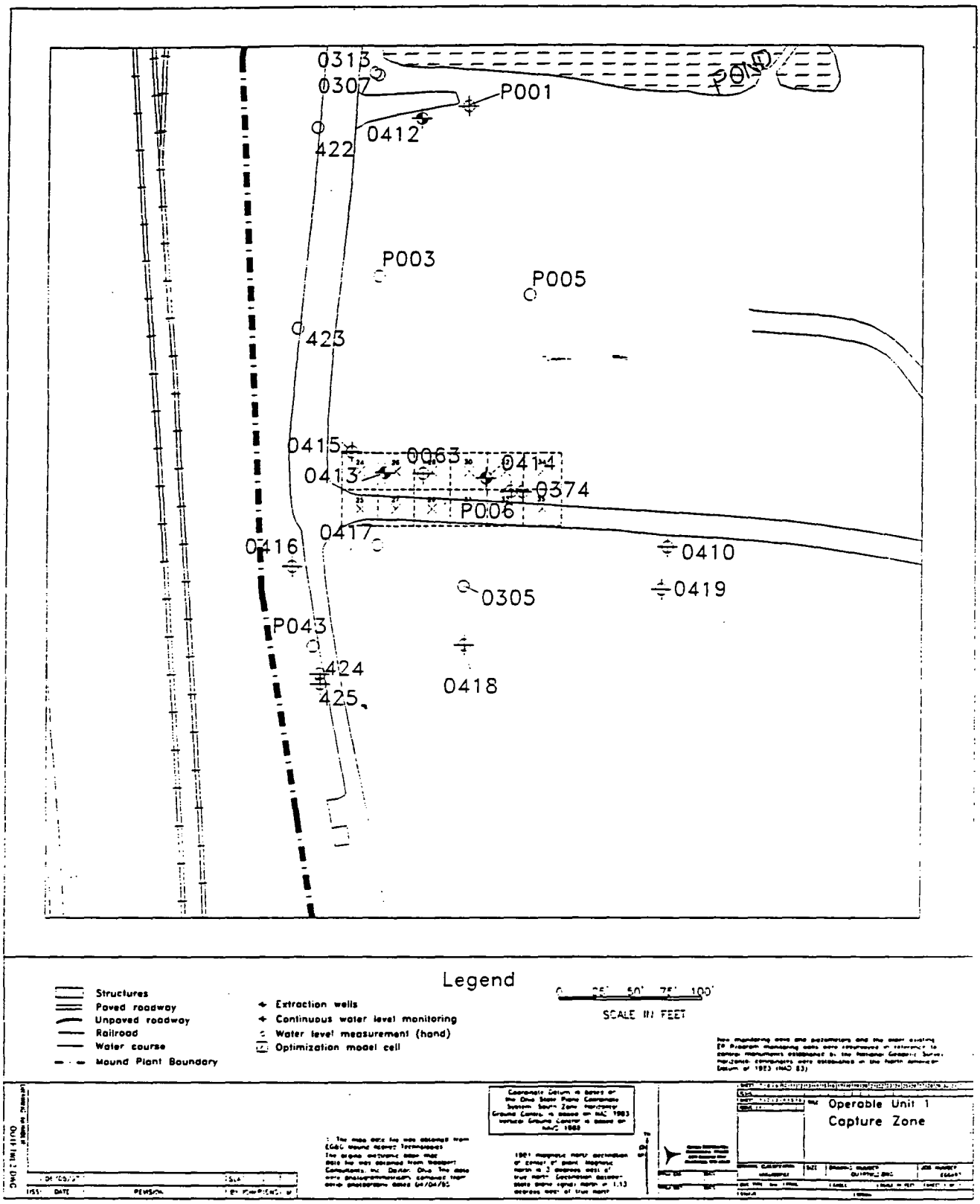


Figure 4.2. Adjusted optimization cell locations to calculate head differences that straddle the southern compliance line.

5.0 REFERENCES

DOE. 1994. "Determination of Aquifer Diffusivity from River Level Flucuations near the U.S. DOE Mound Facility in Miamisburg, Ohio". Environmental Restoration Program, U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE. 1995. "Operable Unit 9 Continuous Water Level Monitoring Results for the Buried Valley Aquifer May, 1993 through May, 1994." Environmental Restoration Program, U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE. 1996. "OU-1 Pump-and-Treat System Design"

APPENDIX A

HYDROGRAPHS FOR MONITORING WELLS P001, P006, 0374, 0063, 0410, 0412, 0413, 0415, 0415, 0416,0418, 0419, 0422, 0423

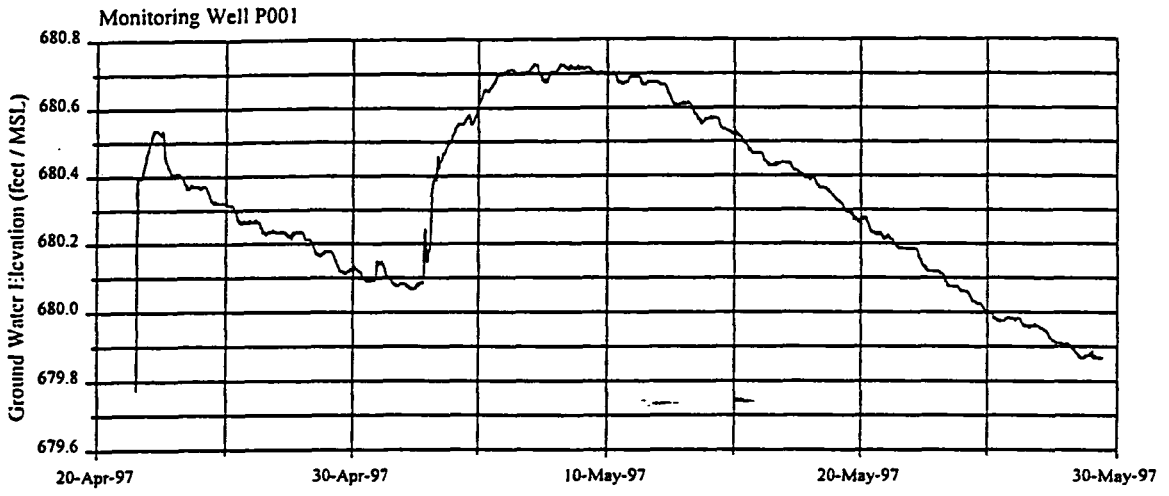


Figure A.1. Hydrograph of monitoring well P001.

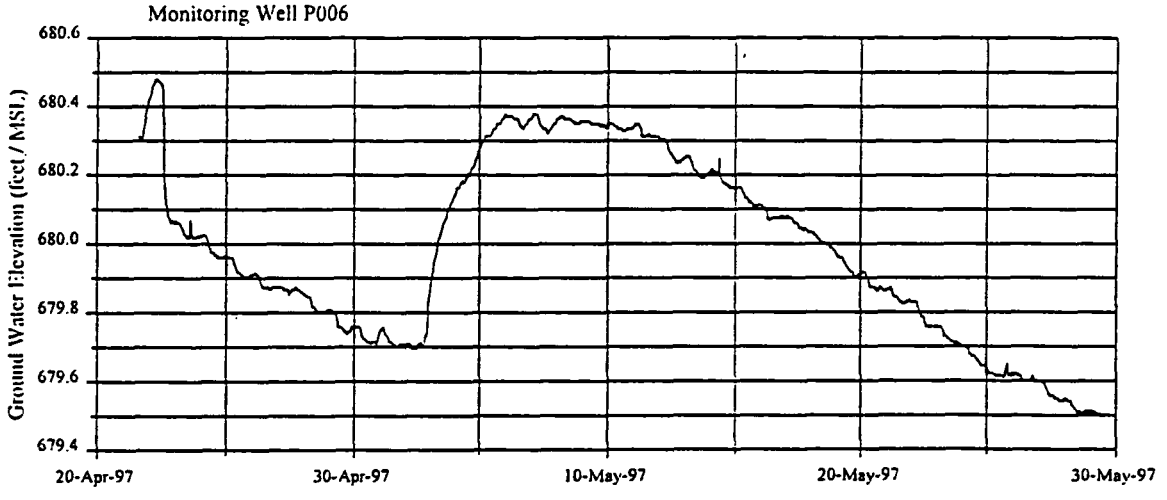


Figure A.2. Hydrograph of monitoring well P006.

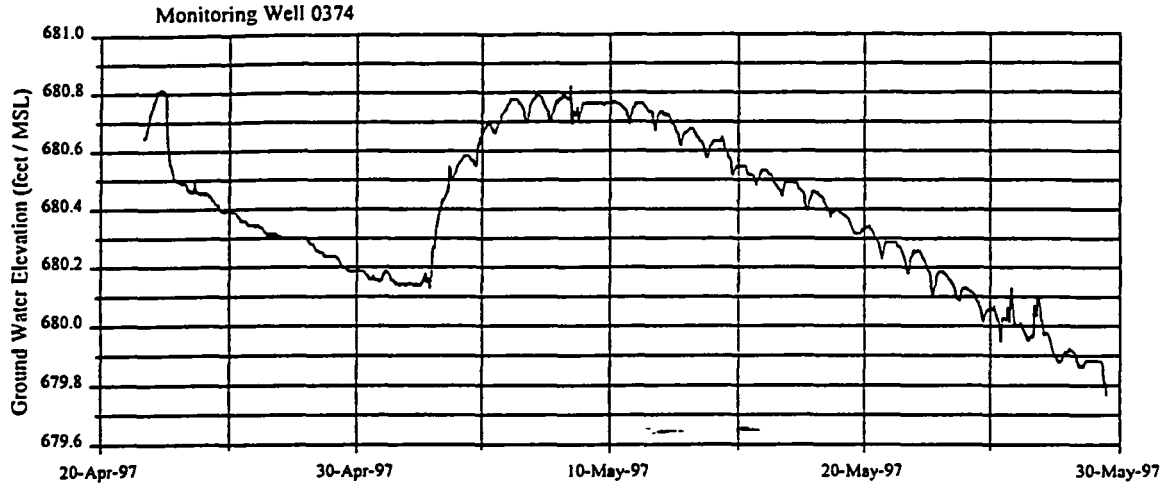


Figure A.3. Hydrograph of monitoring well 0374.

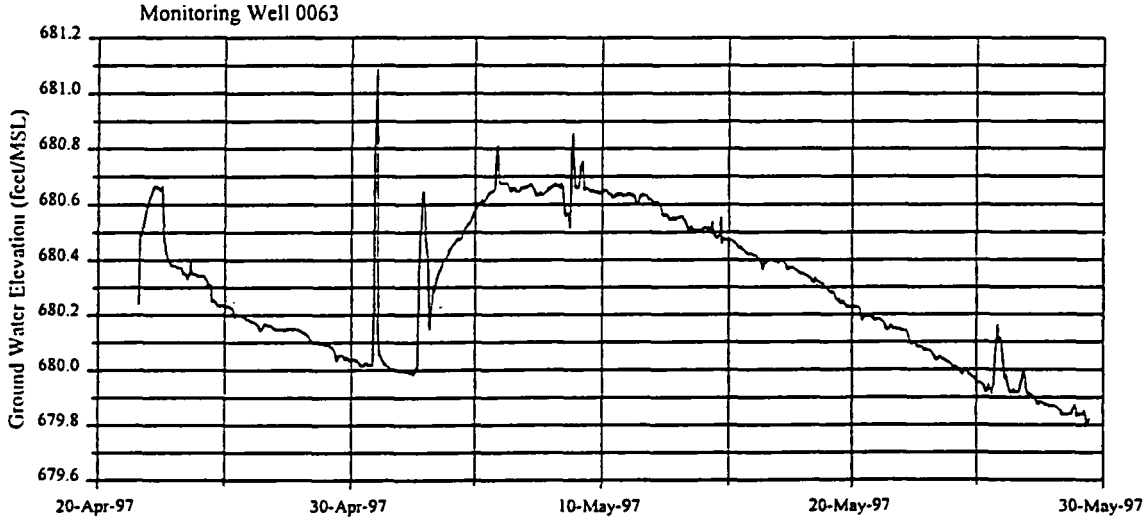


Figure A.4. Hydrograph of monitoring well 0063.

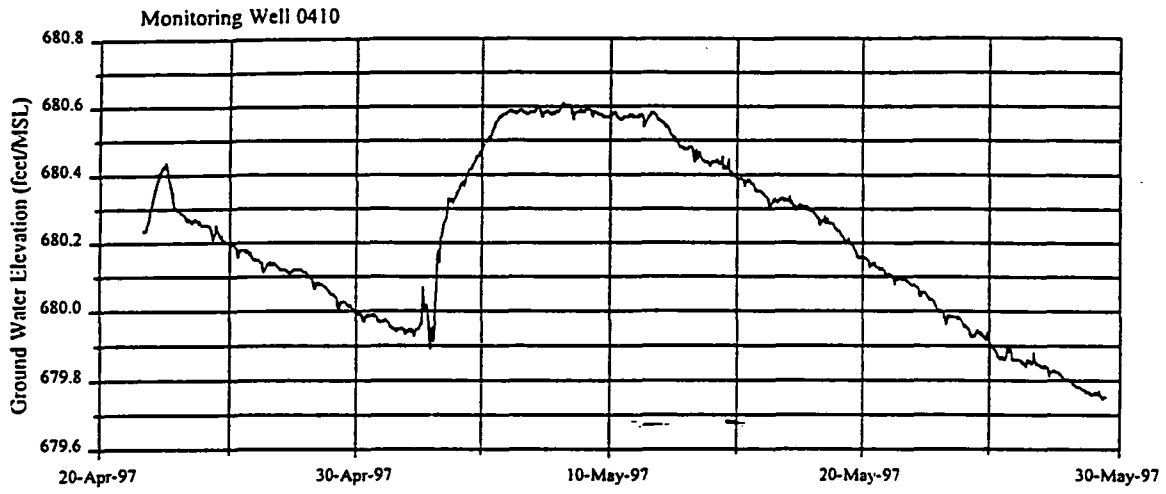


Figure A.5. Hydrograph of monitoring well 0410.

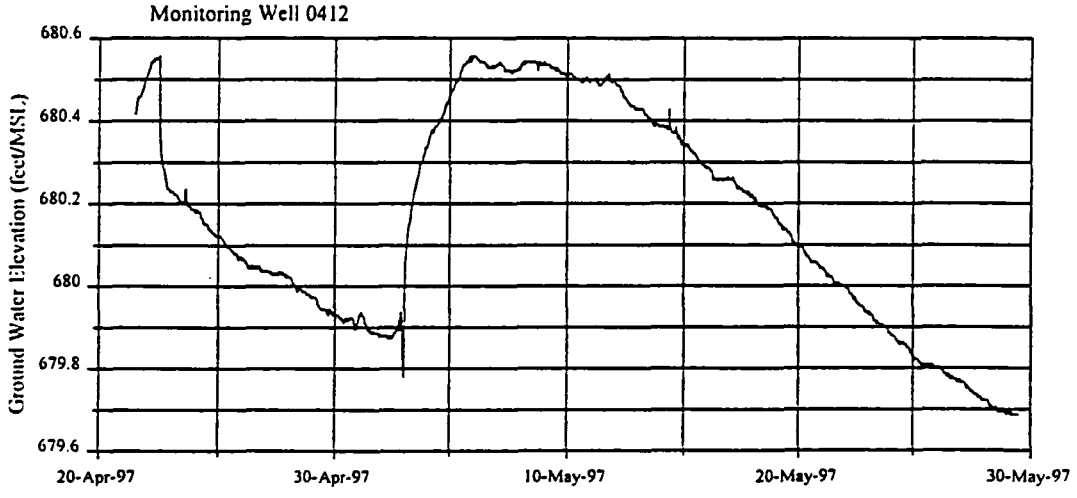


Figure A.6. Hydrograph of monitoring well 0412.

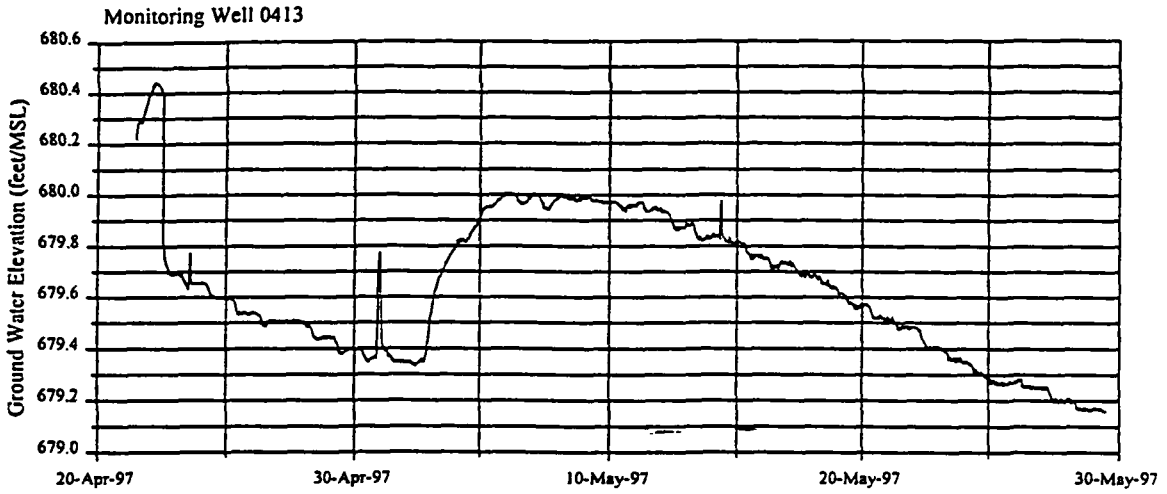


Figure A.7. Hydrograph of monitoring well 0413.

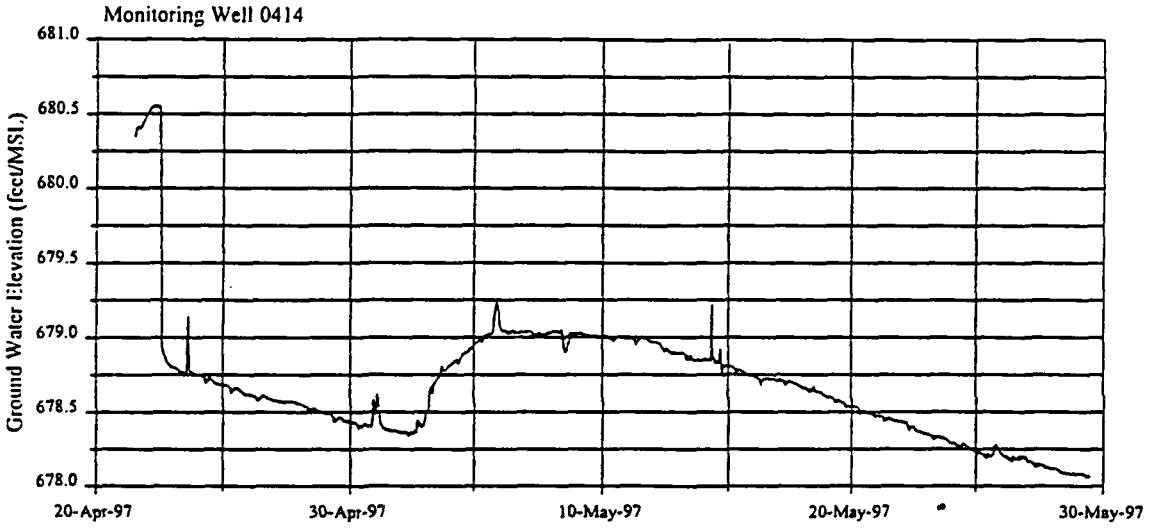


Figure A.8. Hydrograph of monitoring well 0414.

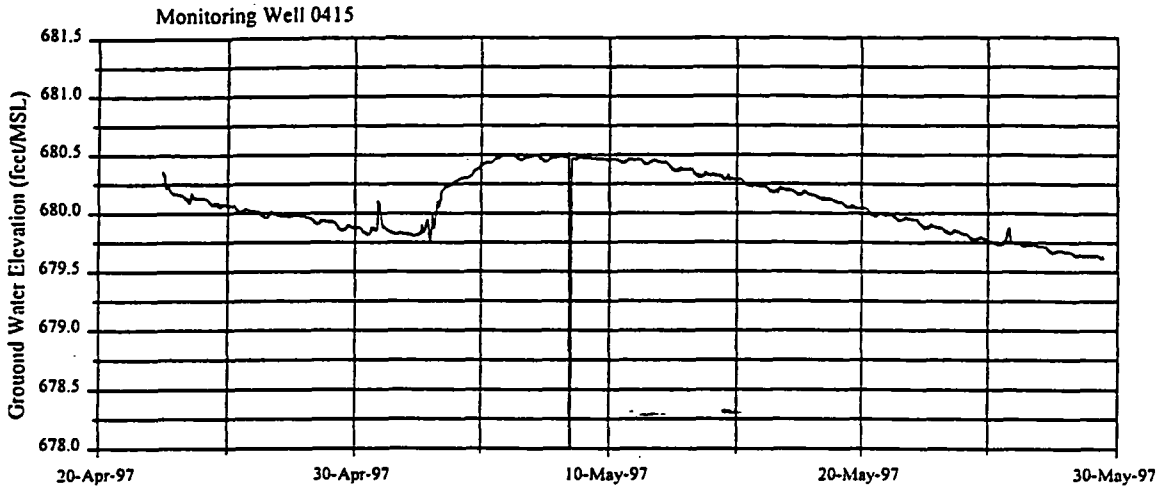


Figure A.9. Hydrograph of monitoring well 0415.

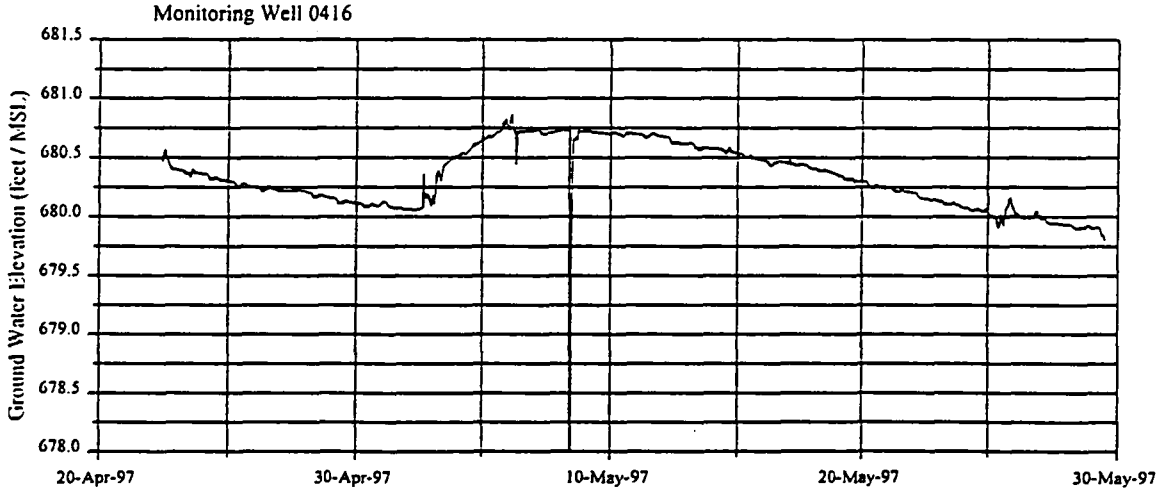


Figure A.10. Hydrograph of monitoring well 0416.

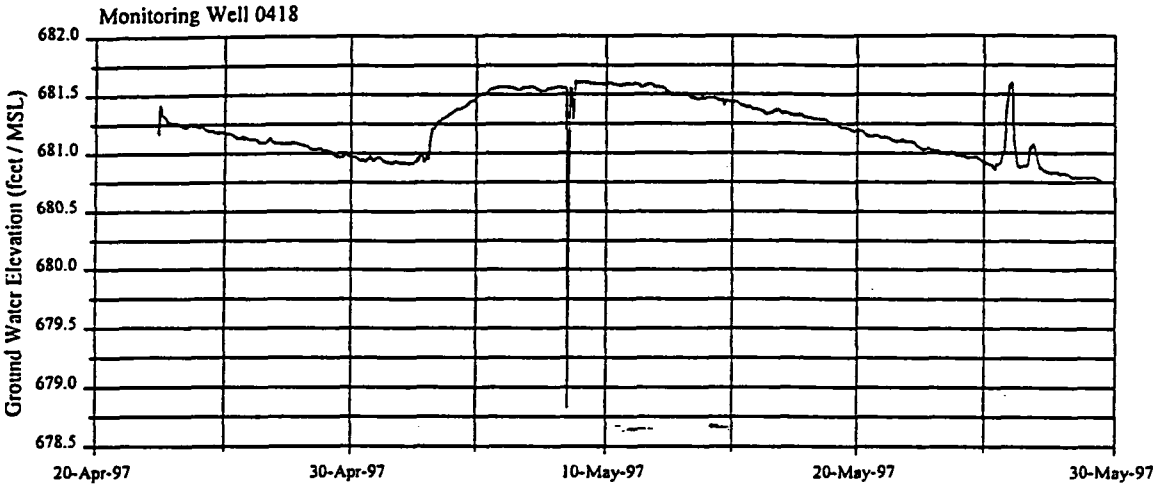


Figure A.11. Hydrograph of monitoring well 0418.

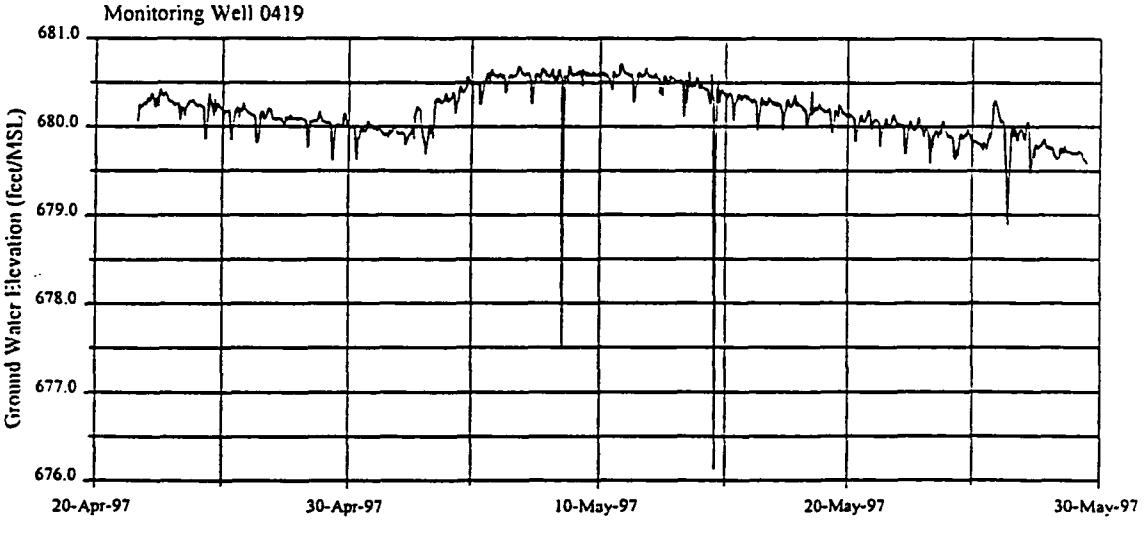


Figure A.12. Hydrograph of monitoring well 0419.

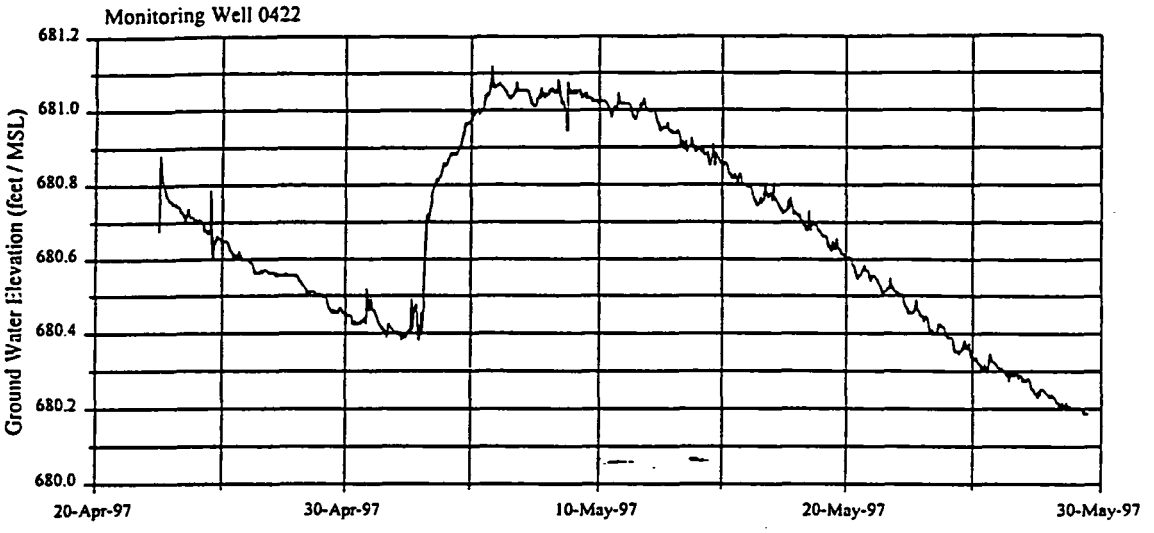


Figure A.13. Hydrograph of monitoring well 0422.

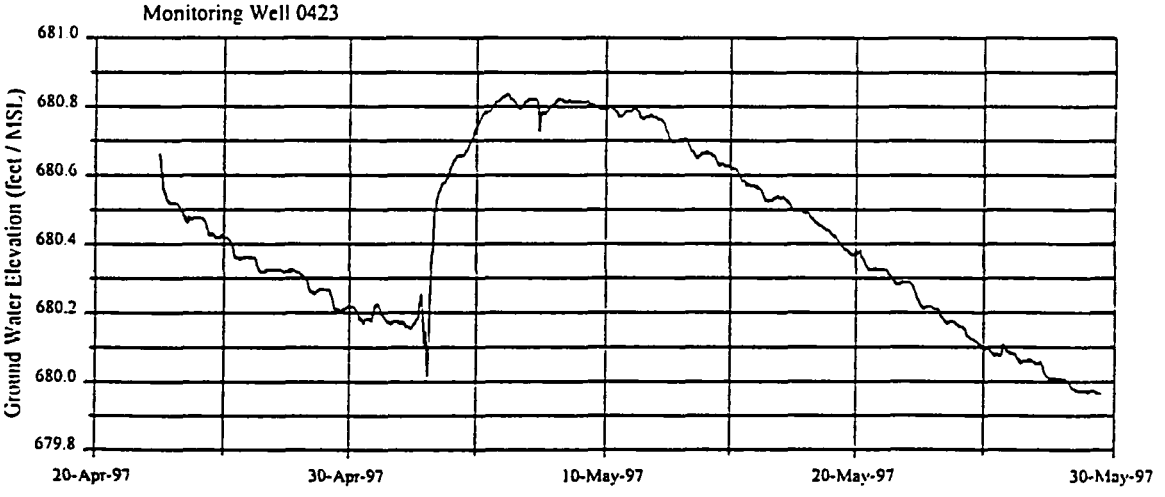


Figure A.14. Hydrograph of monitoring well 0423.

OU-1 PUMP-AND-TREAT SYSTEM CAPTURE ZONE MONITORING FOR JUNE AND JULY 1997

MOUND PLANT
MIAMISBURG, OHIO

TECHNICAL MEMORANDUM

August 1997

Department Of Energy

EG&G Mound Applied Technologies

TABLE OF CONTENTS

ACKNOWLEDGMENTS ACK1-1

1.0 INTRODUCTION 1-1

2.0 WEEKLY WATER LEVELS AND CORRESPONDING POTENTIOMETRIC MAPS IN OU-1 AREA 2-1

3.0 CONTINUOUS WATER LEVEL MONITORING RESULTS FOR JUNE AND JULY, 1997 . . . 3-1

4.0 REFERENCES 4-1

APPENDIX A HYDROGRAPHS FOR MONITORING WELLS P001, P006, 0374, 0063, 0410, 0412, 0413, 0414, 0415, 0416, 0418, 0419, 0422, 0423

LIST OF FIGURES

Figure 1.1. OU-1 Pump-and-Treat system capture zone monitoring study area. 1-2
Figure 2.1. Groundwater potentiometric surface for June 5, 1997. 2-4
Figure 2.2. Groundwater potentiometric surface for June 12, 1997. 2-5
Figure 2.3. Groundwater potentiometric surface for June 19, 1997. 2-6
Figure 2.4. Groundwater potentiometric surface for June 27, 1997. 2-7
Figure 2.5. Groundwater potentiometric surface for July 3, 1997. 2-8
Figure 2.6. Groundwater potentiometric surface for July 10, 1997. 2-9
Figure 2.7. Groundwater potentiometric surface for July 17, 1997. 2-10
Figure 2.8. Groundwater potentiometric surface for July 24, 1997. 2-11
Figure 2.9. Groundwater potentiometric surface for July 31, 1997. 2-12

LIST OF TABLES

Table II.1 OU-1 Weekly Water Levels for June through July, 1997 2-2

ACKNOWLEDGMENTS

This report was prepared by Terran Corporation of Beavercreek, Ohio as report number TB-9734. It was completed under Task Order #16535 with EG&G Mound Applied Technologies. The authors were Roger W. McCready and Scott Hora. Word processing and graphics were prepared by Sandra L. Allen. Field work and preliminary contouring were conducted by Michael Brady, Chris Ruef and Scott Hora.

1.0 INTRODUCTION

This report has been prepared as part of the Environmental Restoration (ER) Program at the U.S. Department of Energy (DOE) Mound Plant, Miamisburg, Ohio. Operable Unit One (OU-1) addresses possible chemical contamination of the buried valley aquifer which underlies the original southwest corner of the Mound Plant. OU-1 is in the remediation phase of the CERCLA. The remedial method chosen to remediate the OU-1 area is the pump-and-treat system.

Pump-and-treat systems are designed to contain and remove the contaminants dissolved in the ground water. Due to the relatively long duration of pump-and-treat process the objective is to minimize the total pumping rate to reduce treatment costs. The OU-1 groundwater contamination plume must be contained within the western and southern compliance boundaries. Containment is defined as an inward hydraulic gradient at a defined compliance boundary to prevent the movement of groundwater across this boundary. Therefore, the primary constraint is difference in head at the compliance boundary. The design strategy states that the optimal head difference to be 0.05 feet which is calculated from water level measurements taken manually.

The pump-and-treat system will be monitored for the first six months to define the capture zone created by the system. The hydraulic effectiveness of the pump-and-treat system will be determined by water level data from 20 monitoring wells in the area. Water level data will be collected via manual measurements and continuous monitoring instrumentation. The study area with extraction wells and monitoring well locations are shown in (Figure 1.1). This study began on April 21, 1997 when the dataloggers were installed and will continue until August 31, 1997. This report is a monthly summary of the data collected and the results of hydraulic containment due to the pump-and-treat system.

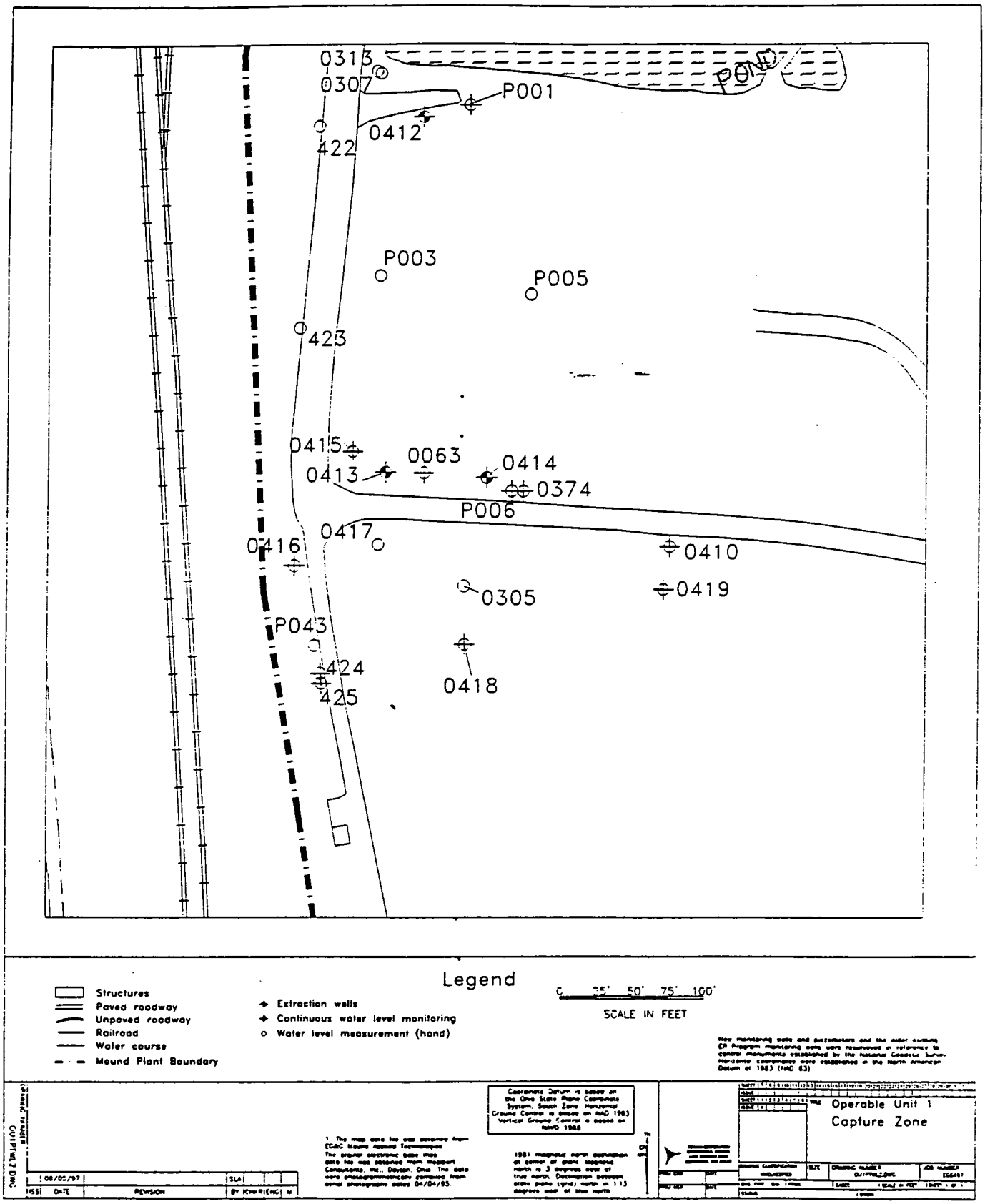


Figure 1.1. OU-1 Pump-and-Treat system capture zone monitoring study area.

2.0 WEEKLY WATER LEVELS AND CORRESPONDING POTENTIOMETRIC MAPS IN OU-1 AREA

The ground water levels in twenty monitoring wells and the three pump-and-treat extraction wells were measured manually once a week. Each set of weekly water level measurements were contoured to produce a potentiometric map of the water level surface for the Upper BVA. When wells were not accessible for manual measurements, data was acquired via dataloggers. Table II.1 list the depth to water and water level elevation for the twenty monitoring wells and three extraction wells for June and July.

Water level measurements were completed using standard protocol of the OU-9 QAPP (Revision 4, April 1995) SOP 3.1 Water Level Measurement (Revision 1, March 1992). Water level collection utilized an electric water level indicator that allows measurement to within 0.01 foot. The water levels are recorded and entered into a spreadsheet.

Preparation of the potentiometric water level maps is conducted in a three step process: (1) Data from each weekly measurement is entered into Golden Software Surfer were it is contoured; (2) The contours are edited by a hydrogeologist; (3) The map is digitized onto a base map.

Four sets of water level measurements were taken in June and another five sets in July 1997. The potentiometric maps for each data set are displayed in figures 2.1 through 2.9. For both months, the potentiometric maps clearly show a cone of depression or capture zone which are all similar in shape. The only exception is figure 2.5 which is a potentiometric map with no cone of depression. The water levels taken for that particular map represent a period when the pump and treat system was shut down for maintenance.

Table II.1 OU-1 Weekly Water Levels for June through July, 1997

Monitoring Well		05-Jun-97 Water Level		12-Jun-97 Water Level		19-Jun-97 Water Level		27-Jun-97 Water Level	
Number	Elevation TOC	Below TOC	Elevation	Below TOC	Elevation	Below TOC	Elevation	Below TOC	Elevation
		(Feet)	(MSL)	(Feet)	(MSL)	(Feet)	(MSL)	(Feet)	(MSL)
0063	705.60	20.35	685.25	22.18	683.42	---	685.39*	24.55	681.05
0305	709.87	24.63	685.24	26.52	683.35	---	---	28.50	681.37
0307	716.10	30.53	685.57	32.74	683.36	---	---	31.83	684.27
0313	716.08	30.54	685.54	32.42	683.66	---	---	34.80	681.28
0374	706.29	21.12	685.17	22.9	683.39	---	---	24.26	682.03
0410	713.84	28.75	685.09	30.28	683.56	---	685.17*	32.14	681.70
0412	717.00	31.56	685.44	33.5	683.50	---	685.33*	---	681.03*
0413	704.45	19.63	684.82	21.57	682.88	---	684.65*	---	680.44*
0414	705.85	22.12	683.73	23.97	681.88	---	683.70*	---	679.51*
0415	706.09	20.55	685.54	22.62	683.47	---	685.19*	24.90	681.19
416	704.30	18.81	685.49	20.78	683.52	---	685.45*	23.25	681.05
0417	705.07	19.73	685.34	21.62	683.45	---	---	24.01	681.06
0418	709.67	24.53	685.14	26.3	683.37	---	686.26*	28.60	681.07
0419	716.41	31.20	685.21	32.88	683.53	---	685.16*	35.35	681.06
0422	715.21	29.60	685.61	31.42	683.79	---	685.82*	33.80	681.41
0423	709.12	23.52	685.60	25.52	683.60	---	685.57*	27.50	681.62
0424	704.49	19.18	685.31	20.95	683.54	---	---	23.40	681.09
0425	704.58	19.26	685.32	21.05	683.53	---	---	22.65	681.93
P001	717.67	32.25	685.42	34.04	683.63	---	685.40*	36.45	681.22
P003	707.46	22.04	685.42	23.9	683.56	---	---	26.35	681.11
P005	738.59	53.30	685.29	54.99	683.60	---	---	57.32	681.27
P006	705.96	20.86	685.10	22.6	683.36	---	685.07*	24.95	681.01
P043	704.80	19.47	685.33	21.3	683.50	---	---	23.80	681.00

*Indicates data that were recorded by dataloggers.

**Depth to water on May 1, 1997 for well 0413 was in error, the continuous monitoring with the Telog indicated that the water level elevation should be 679.35.

--- No data available

Table II.1 OU-1 Weekly Water Levels for June through July, 1997 (cont.)

Monitoring Well		03-Jul-97 Water Level		10-Jul-97 Water Level		17-Jul-97 Water Level		24-Jul-97 Water Level		31-Jul-97 Water Level	
Number	Elevation TOC	Below TOC	Elevation	Below TOC	Elevation	Below TOC	Elevation	Below TOC	Elevation	Below TOC	Elevation
		(Feet)	(MSL)	(Feet)	(MSL)	(Feet)	(MSL)	(Feet)	(MSL)	(Feet)	(MSL)
0063	705.60	24.75	680.85	25.87	679.73	26.15	679.45	26.67	678.93	27.07	678.53
0305	709.87	29.09	680.78	30.12	679.75	30.43	679.44	30.91	678.96	31.37	678.50
0307	716.10	35.17	680.93	36.10	680.00	36.38	679.72	36.86	679.24	37.38	678.72
0313	716.08	35.16	680.92	36.06	680.02	36.32	679.76	36.91	679.17	37.41	678.67
0374	706.29	25.52	680.77	26.07	680.22	26.88	679.41	27.25	679.04	27.82	678.47
0410	713.84	33.18	680.66	34.10	679.74	34.37	679.47	34.86	678.98	35.45	678.39
0412	717.00	36.06	680.94	37.14	679.86	37.43	679.57	---	678.93*	38.45	678.55
0413	704.45	23.57	680.88	25.18	679.27	25.39	679.06	---	678.38*	---	676.43*
0414	705.85	24.99	680.86	27.79	678.06	28.11	677.74	---	677.09*	---	677.86*
0415	706.09	25.24	680.85	26.18	679.91	26.61	679.48	26.33	679.76	27.47	678.62
416	704.30	23.44	680.86	24.46	679.84	24.74	679.56	25.3	679.00	25.72	678.58
0417	705.07	24.22	680.85	25.27	679.80	25.54	679.53	26.04	679.03	26.50	678.57
0418	709.67	28.93	680.74	29.98	679.69	30.20	679.47	30.59	679.08	36.20	673.47
0419	716.41	35.77	680.64	36.68	679.73	36.88	679.53	37.33	679.08	37.91	678.50
0422	715.21	34.27	680.94	35.21	680.00	35.13	680.08	35.85	679.36	36.42	678.79
0423	709.12	28.25	680.87	26.91	682.21	29.54	679.58	29.88	679.24	30.37	678.75
0424	704.49	23.65	680.84	24.62	679.87	24.86	679.63	25.33	679.16	25.85	678.64
0425	704.58	23.73	680.85	24.67	679.91	24.95	679.63	25.13	679.45	26.08	678.50
P001	717.67	36.80	680.87	37.75	679.92	38.06	679.61	38.52	679.15	39.04	678.63
P003	707.46	26.57	680.89	27.58	679.88	27.88	679.58	28.35	679.11	28.87	678.59
P005	738.59	57.78	680.81	58.76	679.83	59.06	679.53	59.47	679.12	59.97	678.62
P006	705.96	25.15	680.81	26.29	679.67	26.64	679.32	27.1	678.86	27.69	678.27
P043	704.80	24.00	680.80	25.03	679.77	25.24	679.56	25.76	679.04	26.31	678.49

*Indicates data that were recorded by dataloggers.
--- No data available

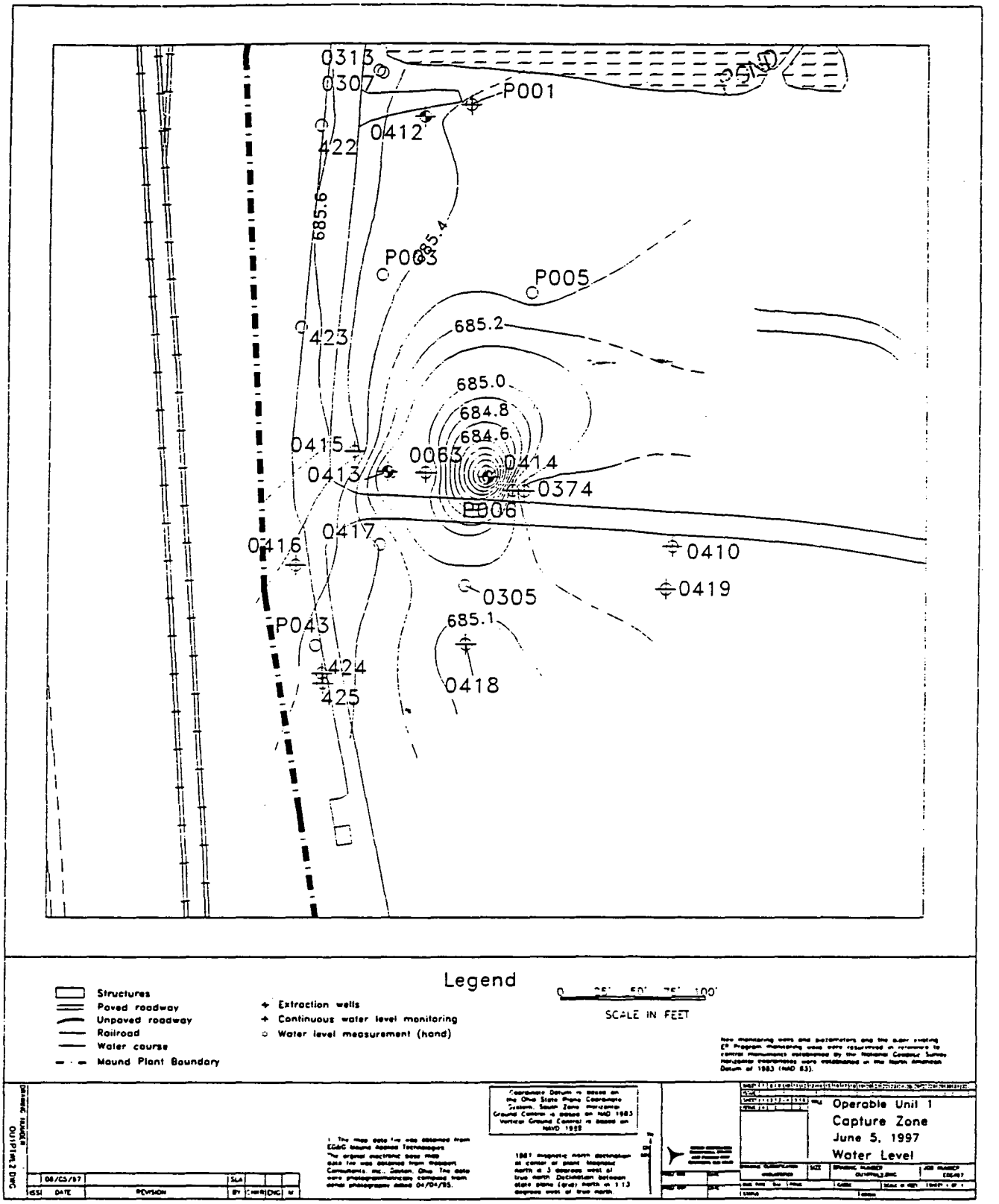


Figure 2.1. Groundwater potentiometric surface for June 5, 1997.

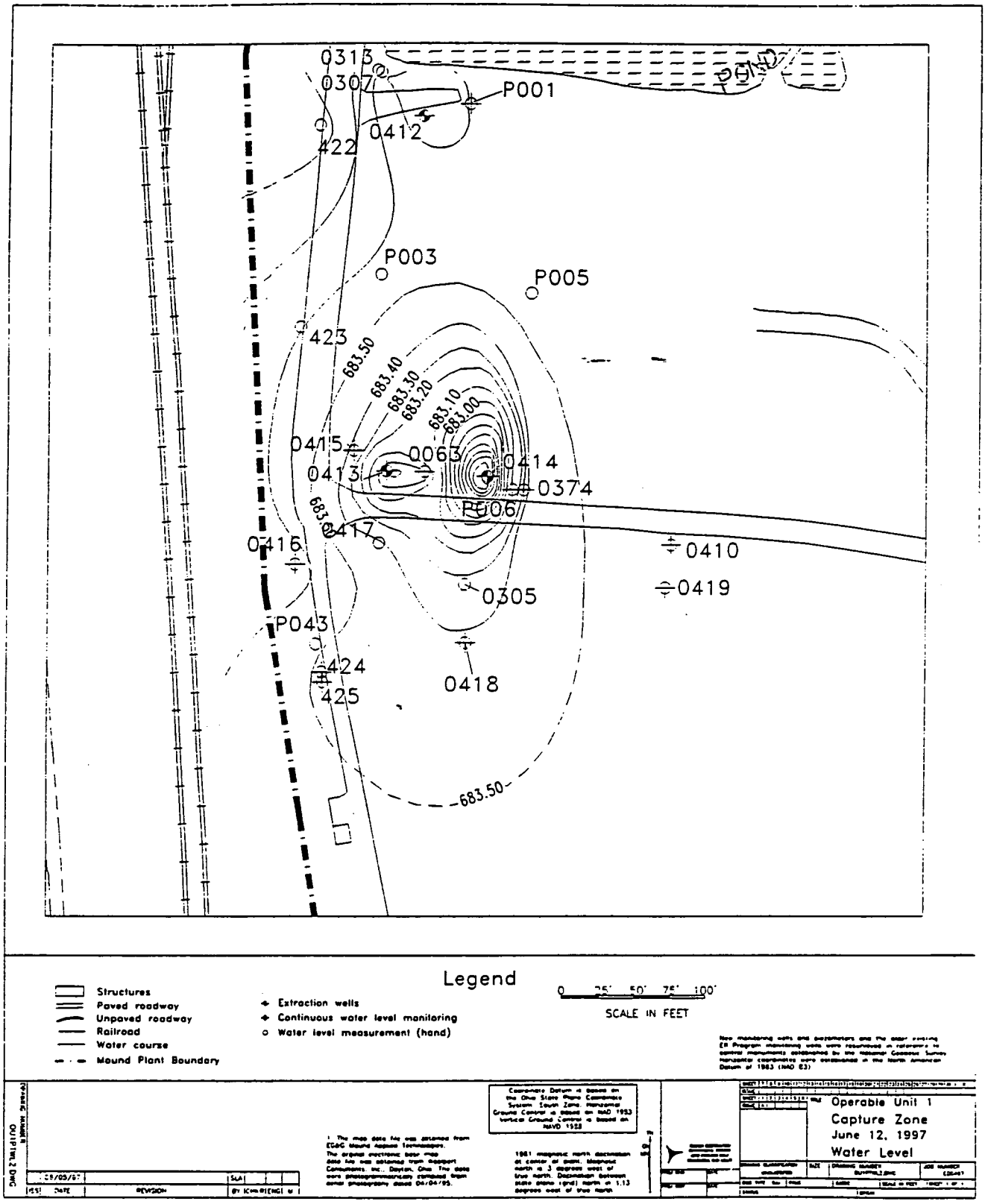


Figure 2.2. Groundwater potentiometric surface for June 12, 1997.

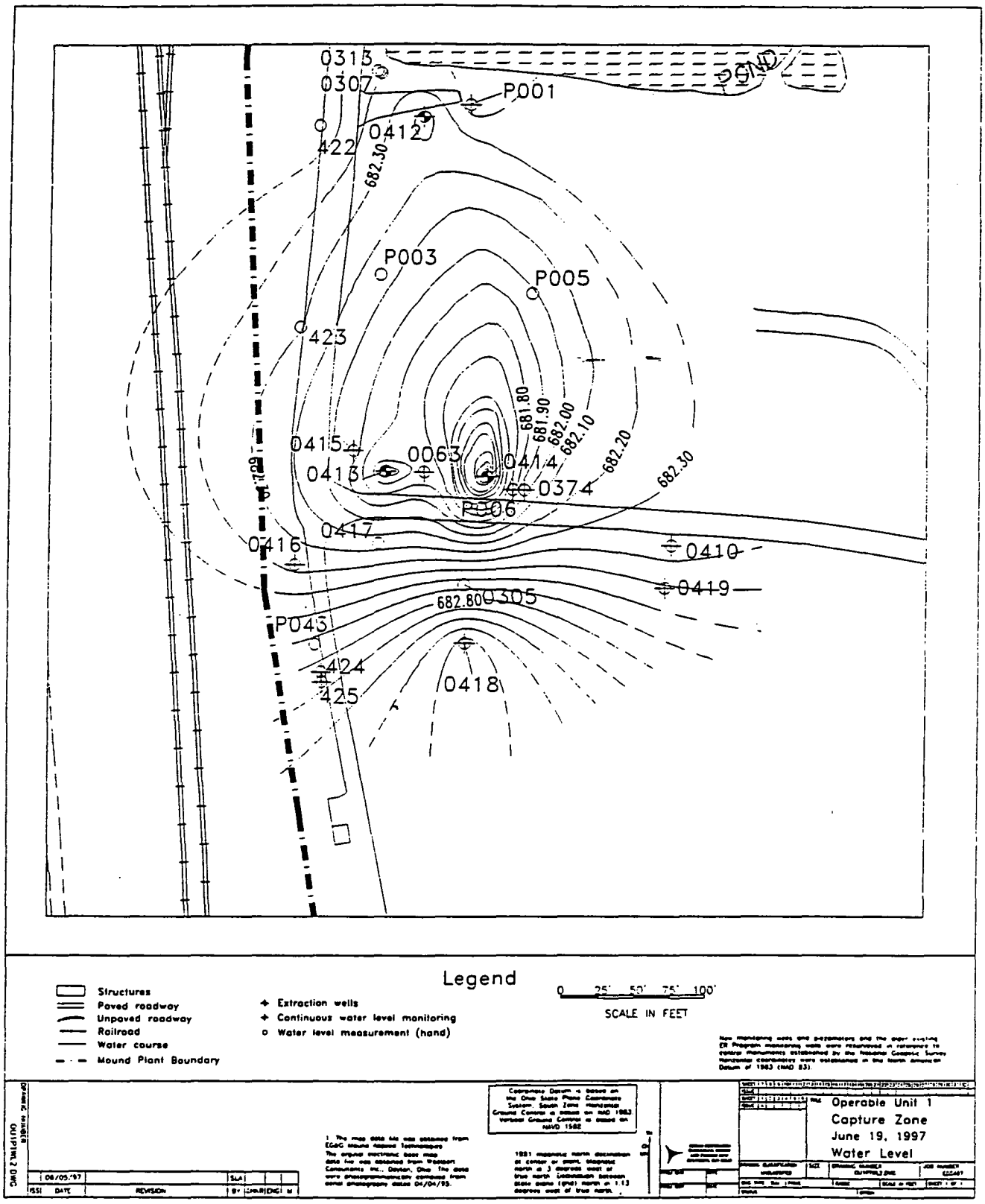


Figure 2.3. Groundwater potentiometric surface for June 19, 1997.

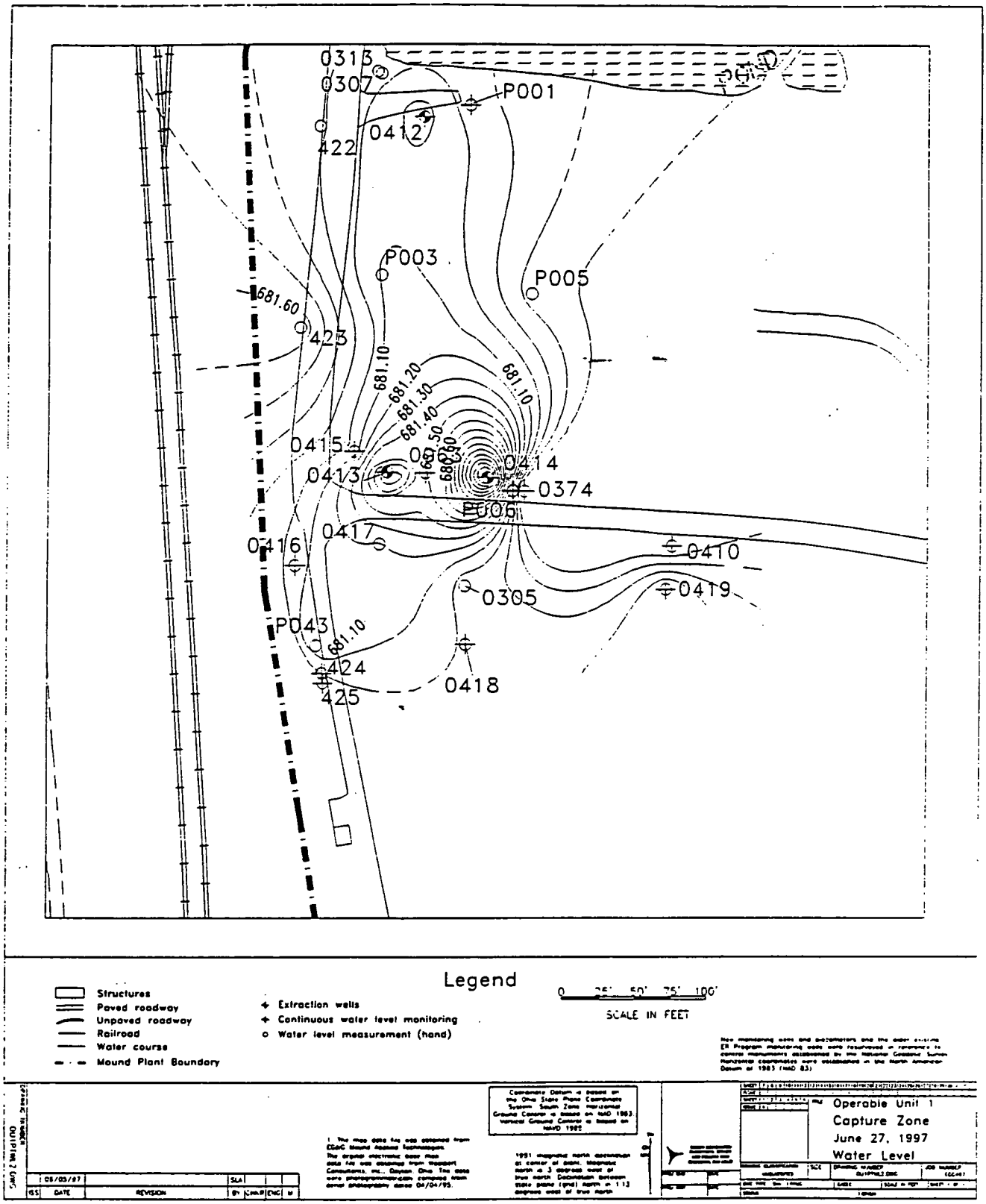


Figure 2.4. Groundwater potentiometric surface for June 27, 1997.

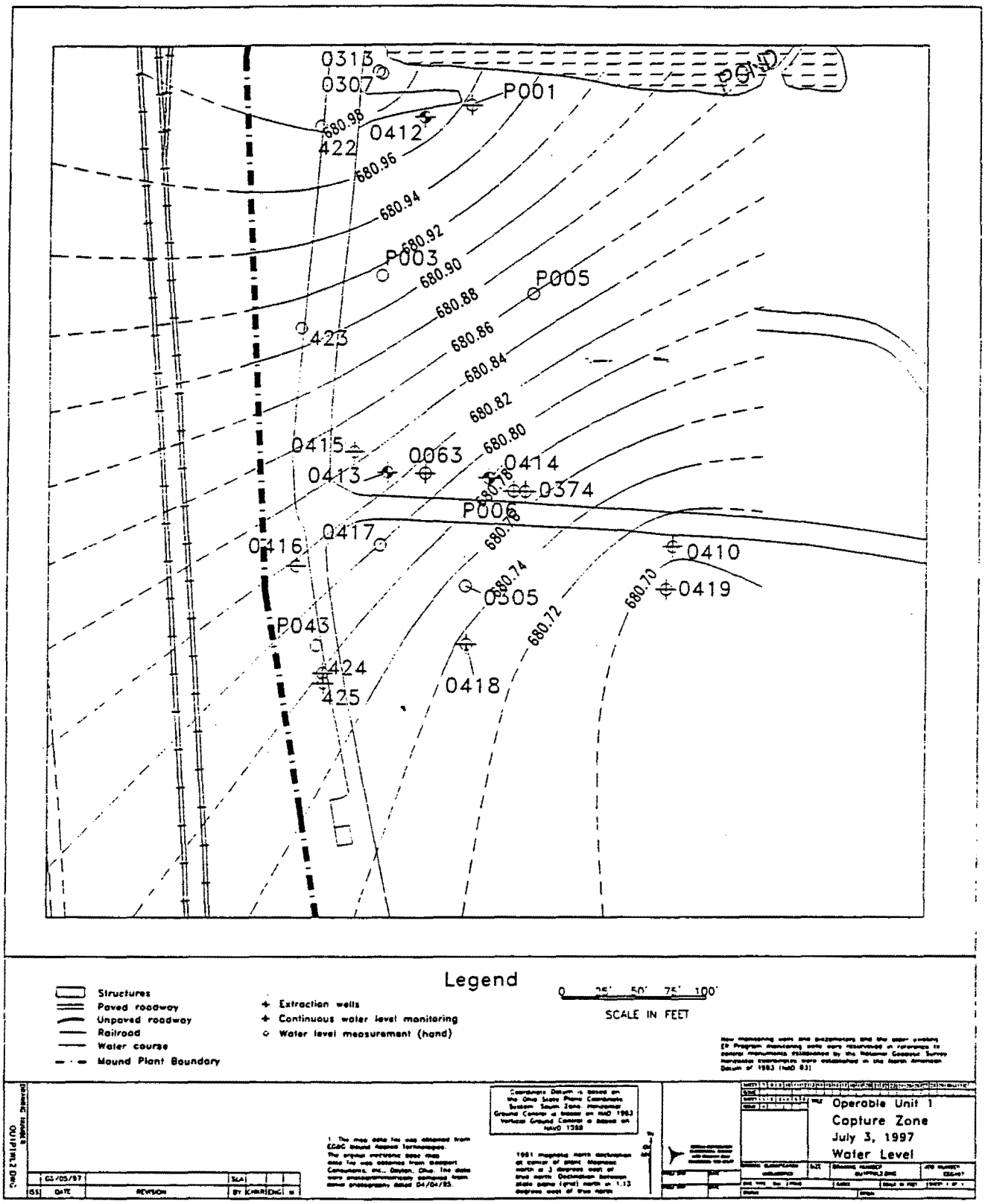


Figure 2.5. Groundwater potentiometric surface for July 3, 1997.

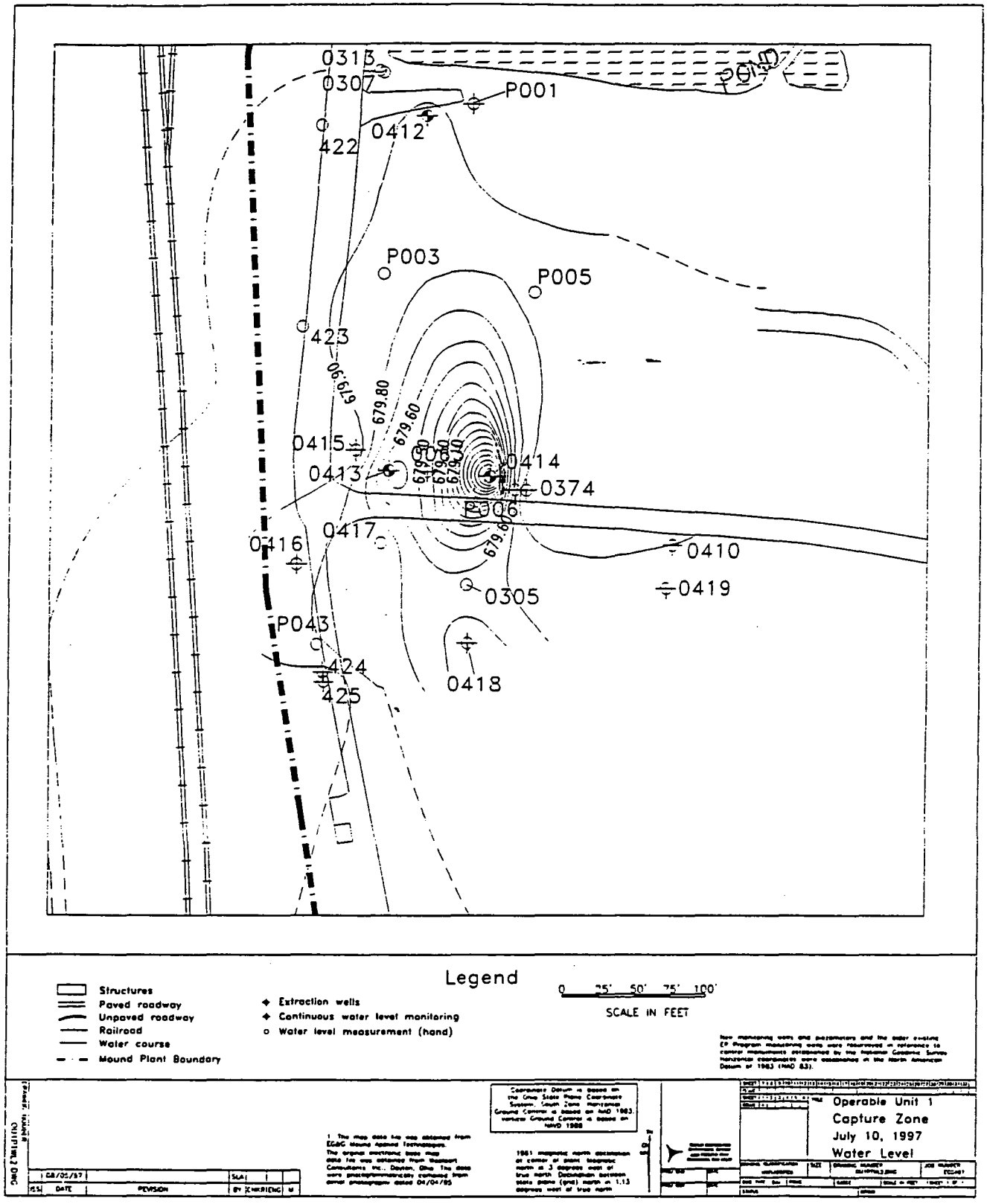


Figure 2.6. Groundwater potentiometric surface for July 10, 1997.

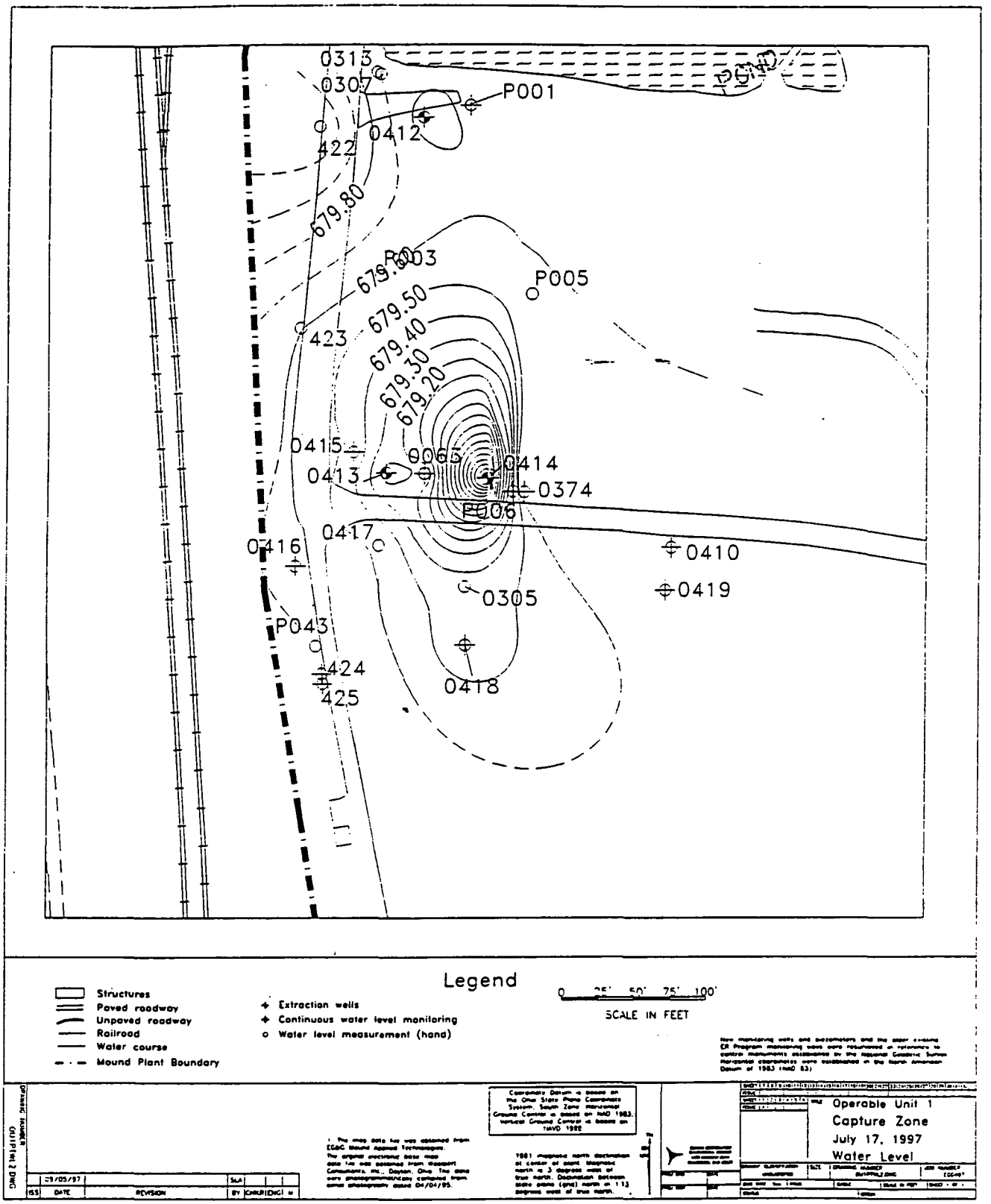


Figure 2.7. Groundwater potentiometric surface for July 17, 1997.

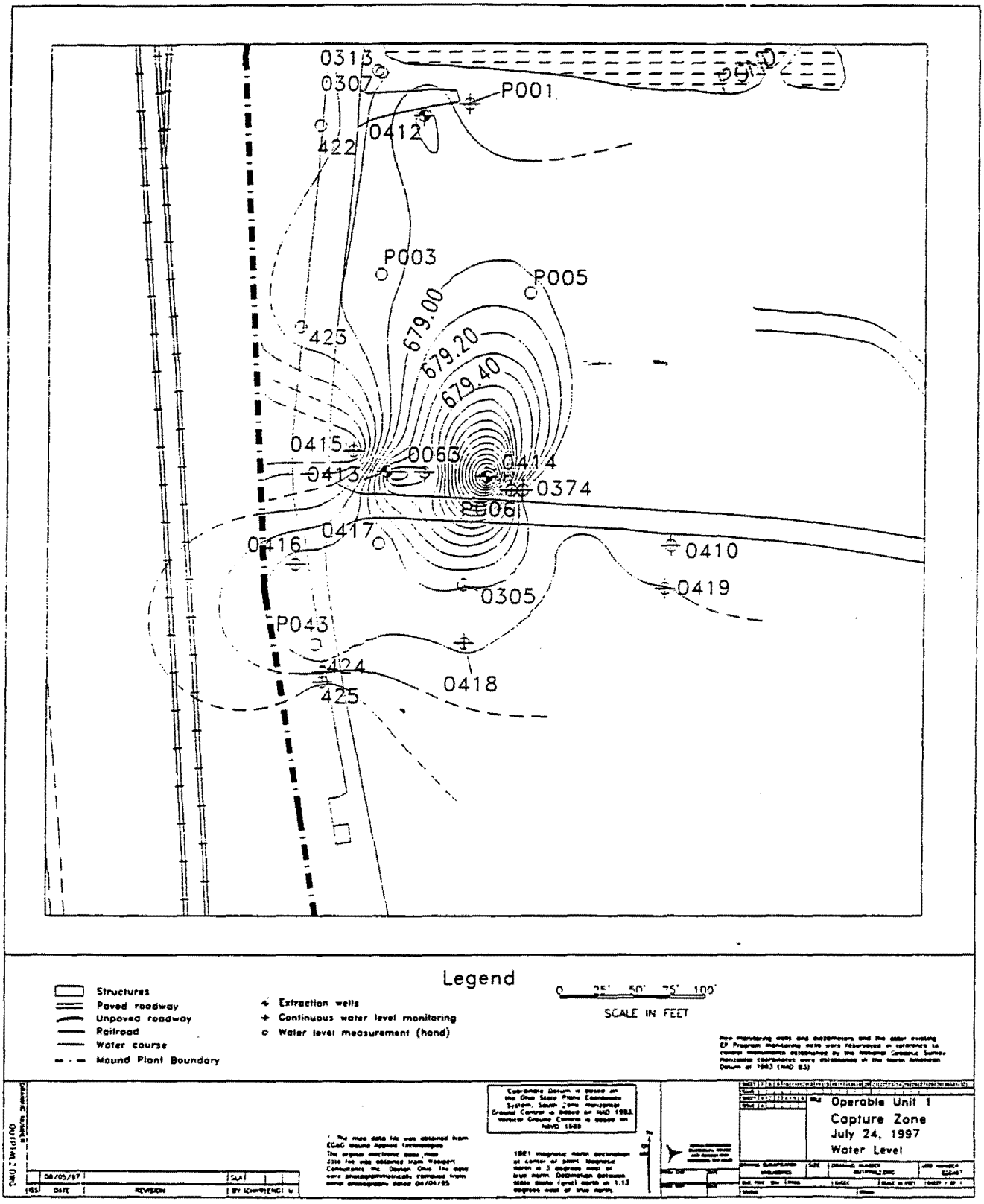


Figure 2.8. Groundwater potentiometric surface for July 24, 1997.

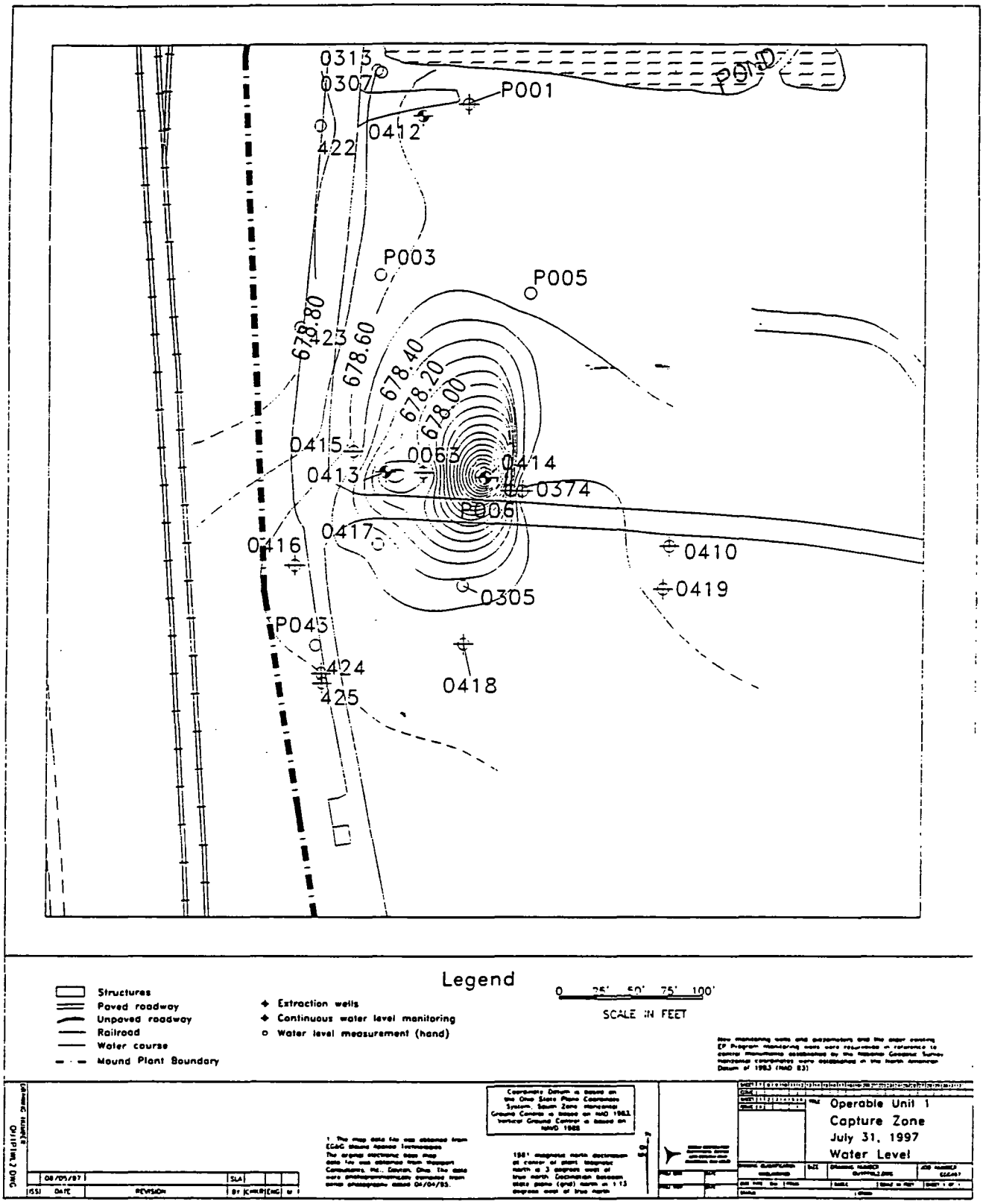


Figure 2.9. Groundwater potentiometric surface for July 31, 1997.

3.0 CONTINUOUS WATER LEVEL MONITORING RESULTS FOR JUNE AND JULY, 1997

To assess the potential fluctuations in water levels due to external sources such as the Mound production wells, water levels were monitored continuously at 13 locations surrounding the pump-and-treat system. This continuous monitoring was provided by individual Telog Level Trackers 2100. These Trackers are dataloggers / pressure transducers automatically record water levels. This instrumentation was installed in 13 monitoring wells on April 21, 1997. Figure 1. shows the location of the monitoring wells and extraction wells that contain Trackers. The dataloggers have been programmed to collect a water level measurement every 15 minutes. Once a week when the hand water level measurements are collected and each datalogger is downloaded into a Telog Data Transfer Unit (DTU). The DTU is returned to the office where the data is uploaded into a database that contains records for each well.

Hydrographs of continuous water level data for late April through July 1997 are shown in Appendix A (figures A.1 through A.15). The hydrographs reflect the natural water level fluctuations that occur in the Upper Buried Valley Aquifer. Abrupt increases in ground water levels due to rain events and stage increase of the Great Miami River occur frequently through out the year. Increases up to six feet were recorded at P001 from July 1, 1993 to May, 1994 (DOE, 1995). In early June 1997, a five day ground water level increase occurred due to precipitation which caused water levels in some wells to rise nearly seven feet (see Appendix A). The ground water levels were declining from the high on May 7, 1997.

Additionally, there were three more peaks seen in most of the hydrographs in June and July 1997 (Appendix A). These peaks range from 0.0 to 2.5 feet and were due to periods where the pump and treatment system was shut off for maintenance purposes. The negative peaks with high amplitude and short span were due to periods where that particular well was sampled.

Since the start of this monitoring the plant has been supplied by production well 3 (0076). Many of the hydrographs reveal the daily pumping of the production well. Monitoring well 0419 is most affected by production well 3 producing a daily drawdown of 0.4 feet between 0600 and 1000. Monitoring well 0374 has a 0.1 foot drawdown that occurs in the late afternoon each day. Based on a qualitative review of the other hydrographs the daily peak drawdown at all other monitoring wells used for this study is less 0.05 feet.

4.0 REFERENCES

DOE. 1994. "Determination of Aquifer Diffusivity from River Level Flucuations near the U.S. DOE Mound Facility in Miamisburg, Ohio". Environmental Restoration Program, U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE. 1995. "Operable Unit 9 Continuous Water Level Monitoring Results for the Buried Valley Aquifer May, 1993 through May, 1994." Environmental Restoration Program, U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE. 1996. "OU-1 Pump-and-Treat System Design"

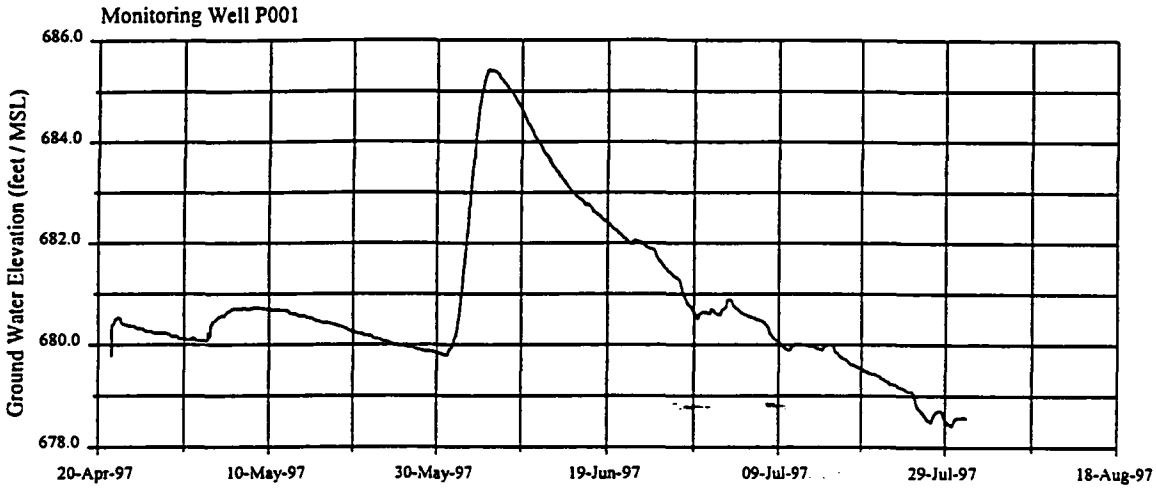


Figure A.1. Hydrograph of monitoring well P001.

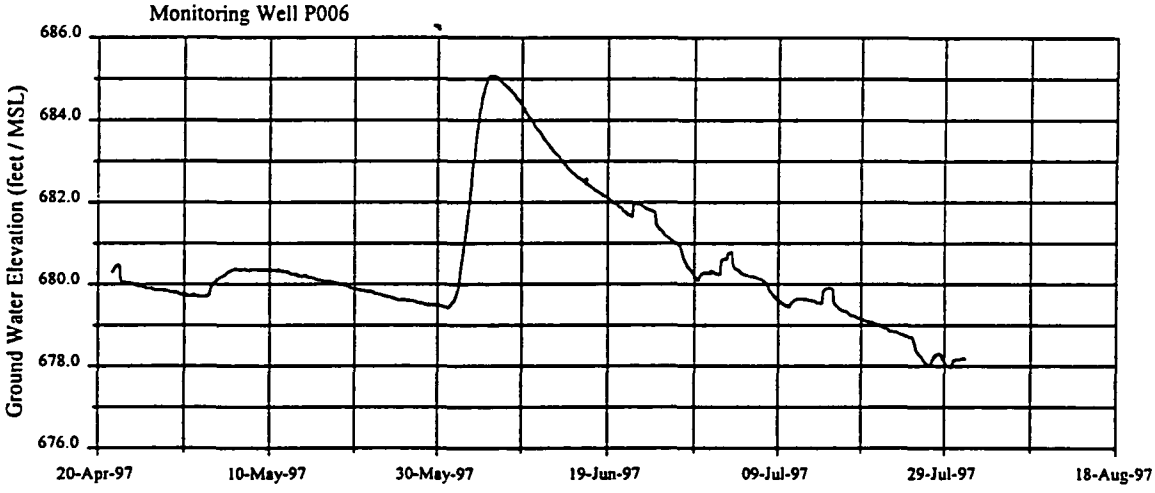


Figure A.2. Hydrograph of monitoring well P006.

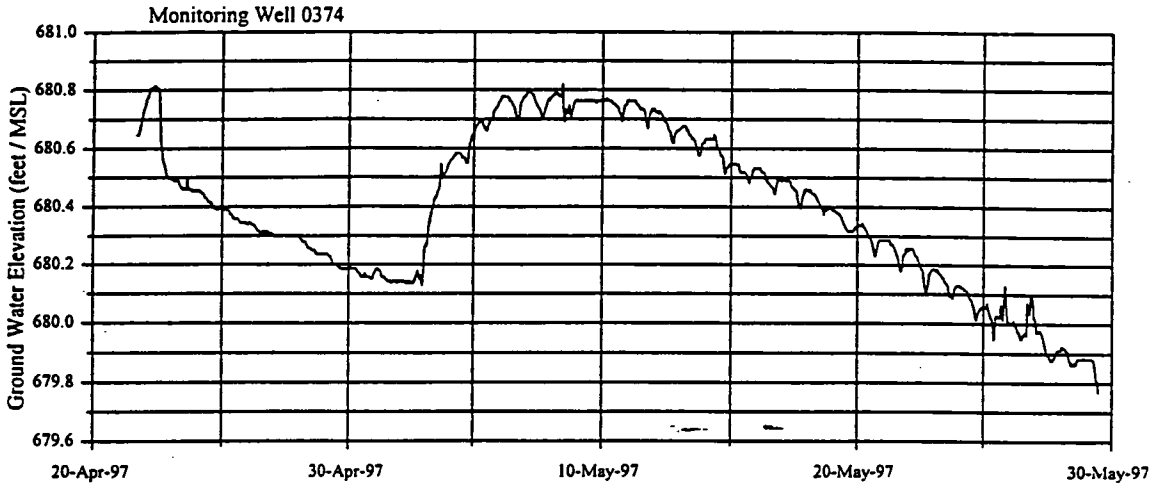


Figure A.3. Hydrograph of monitoring well 0374.

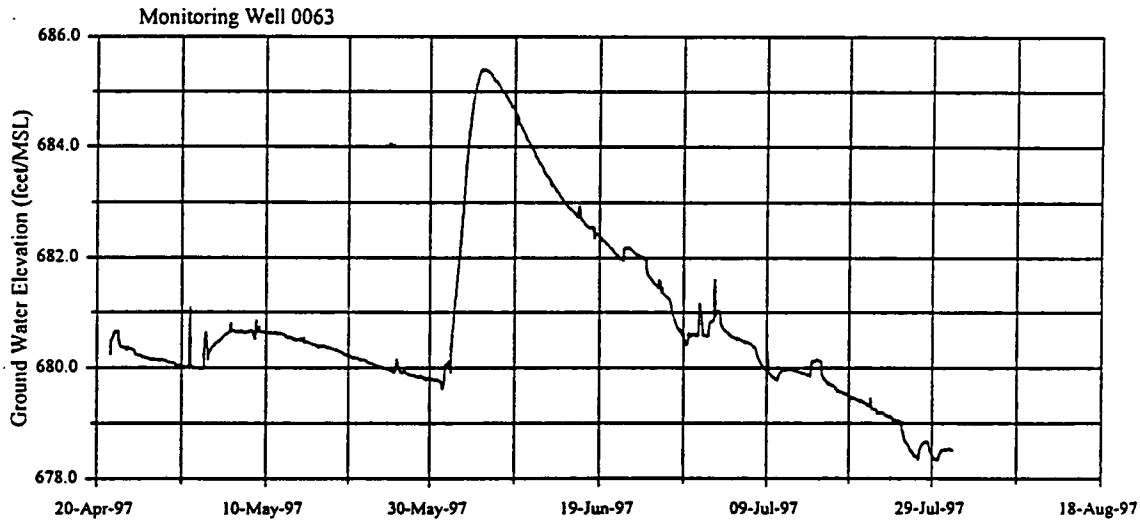


Figure A.4. Hydrograph of monitoring well 0063.

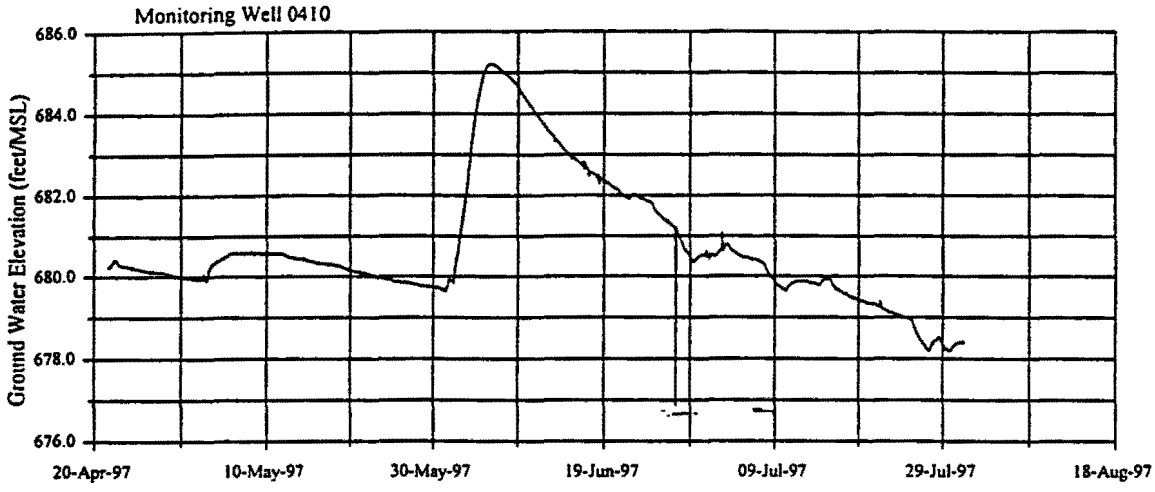


Figure A.5. Hydrograph of monitoring well 0410.

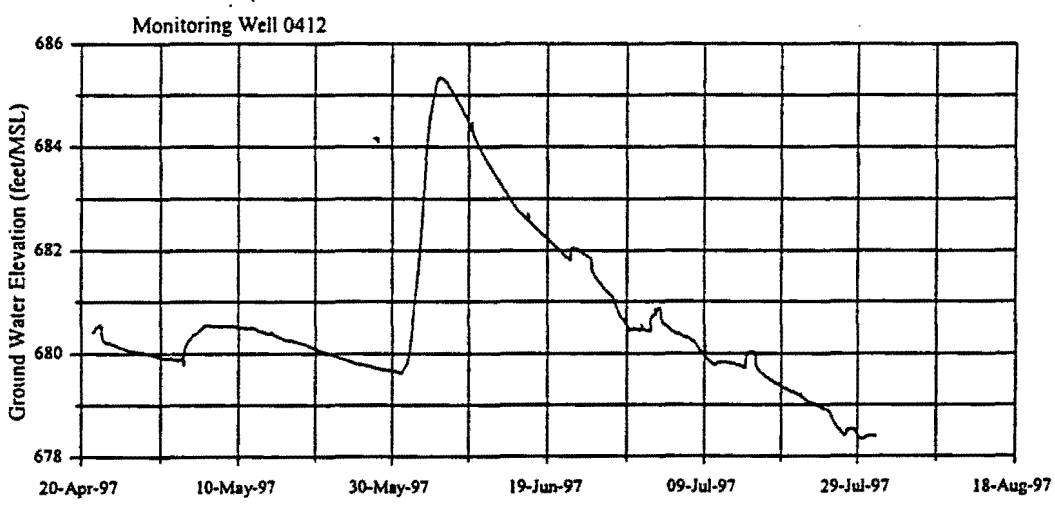


Figure A.6. Hydrograph of monitoring well 0412.

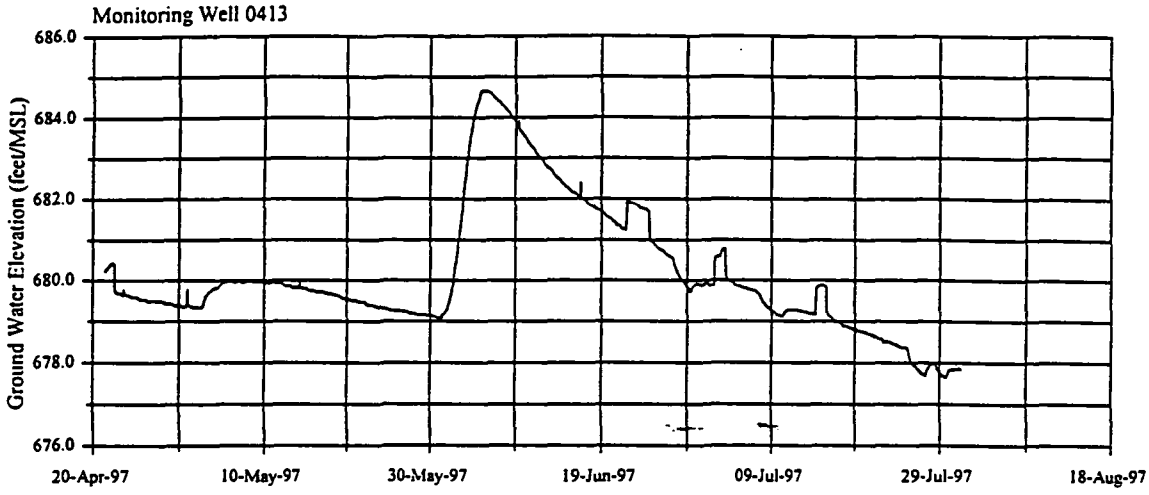


Figure A.7. Hydrograph of monitoring well 0413.

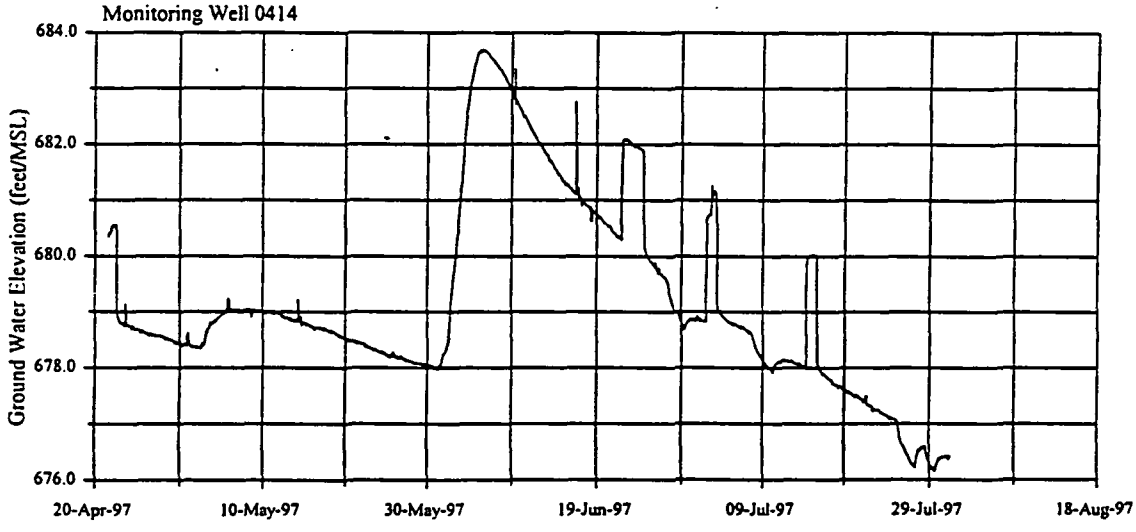


Figure A.8. Hydrograph of monitoring well 0414.

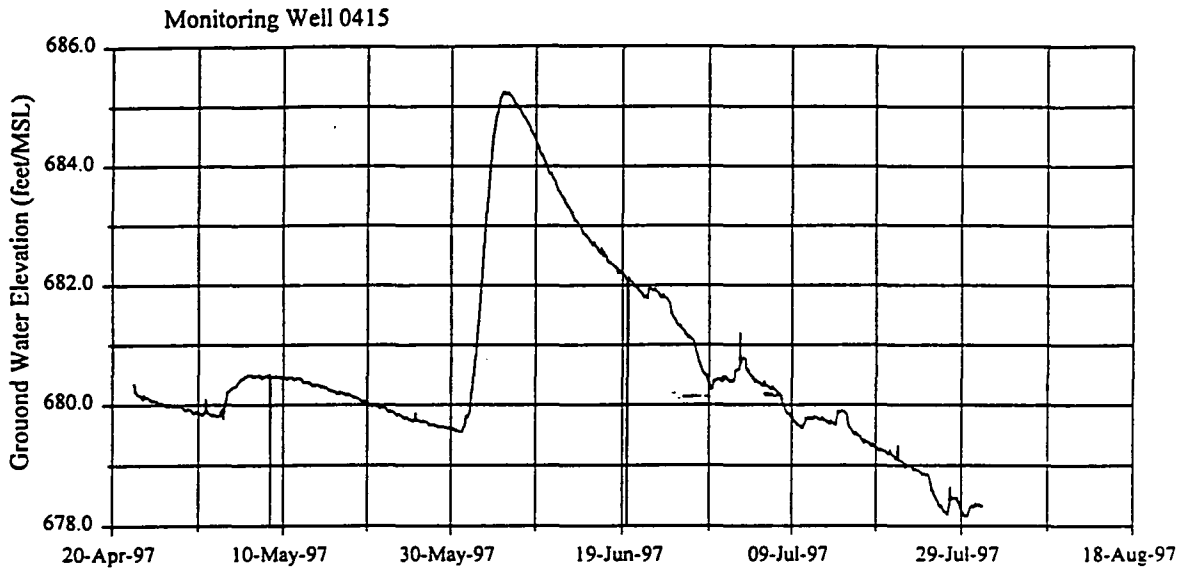
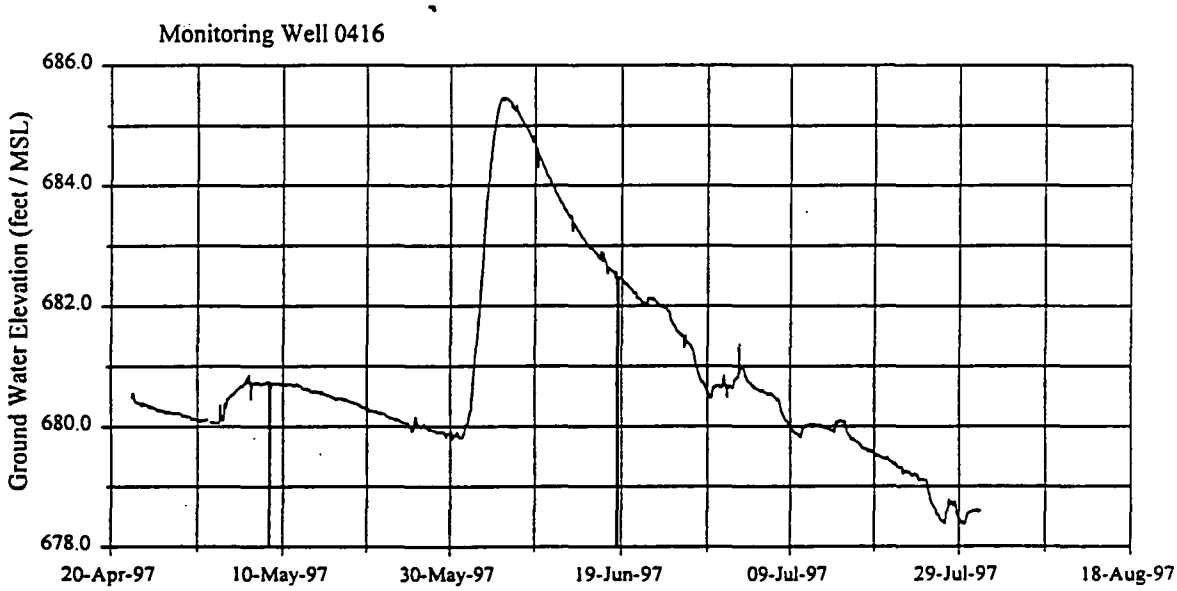


Figure A.9. Hydrograph of monitoring well 0415.



A.10. Hydrograph of monitoring well 0416.

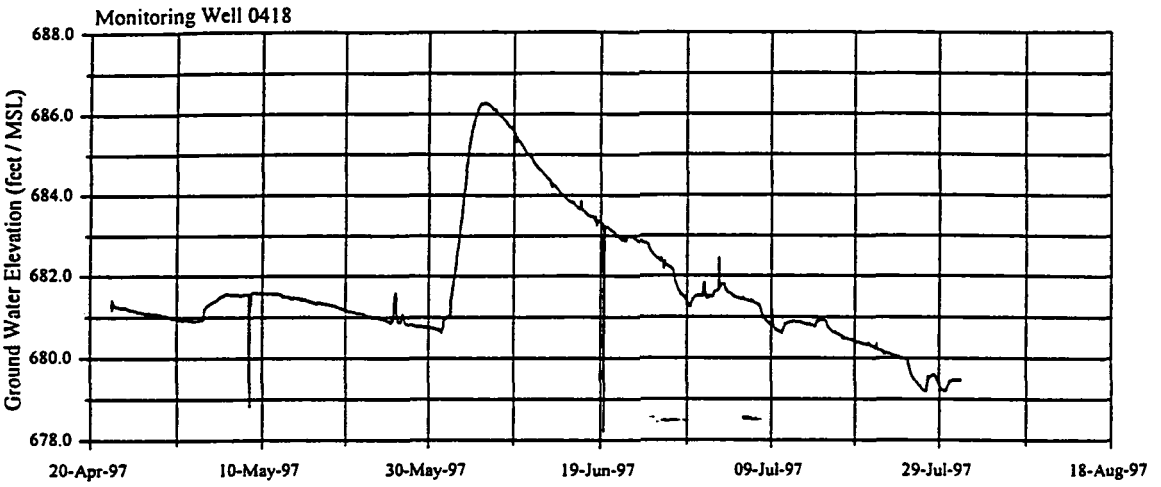


Figure A.11. Hydrograph of monitoring well 0418.

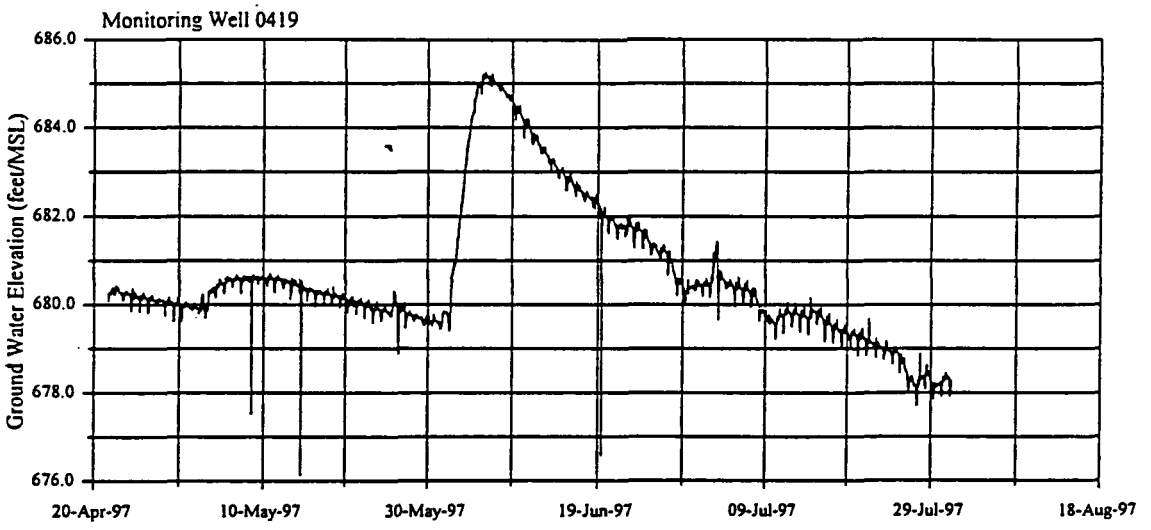


Figure A.12. Hydrograph of monitoring well 0419.

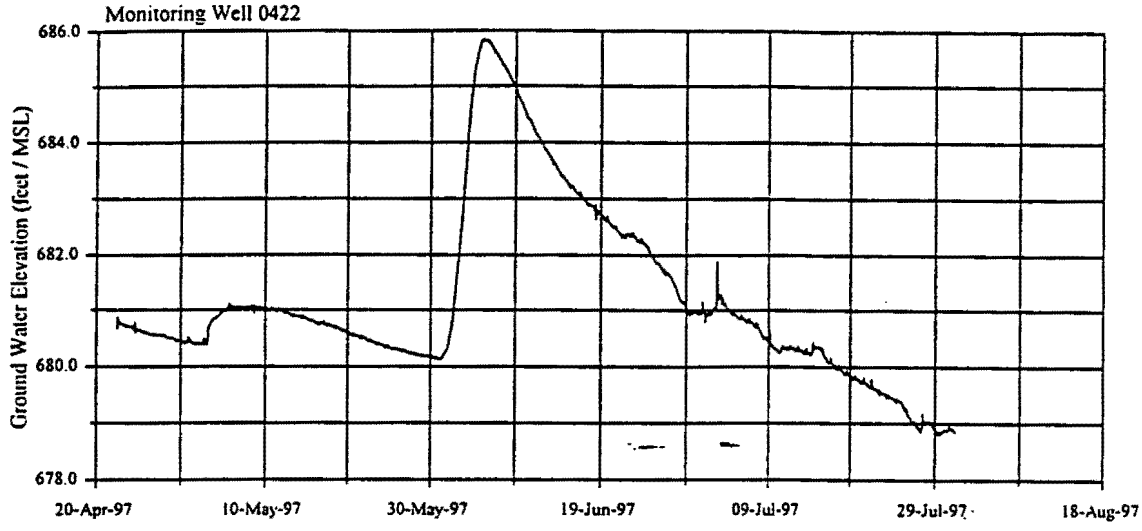


Figure A.13. Hydrograph of monitoring well 0422.

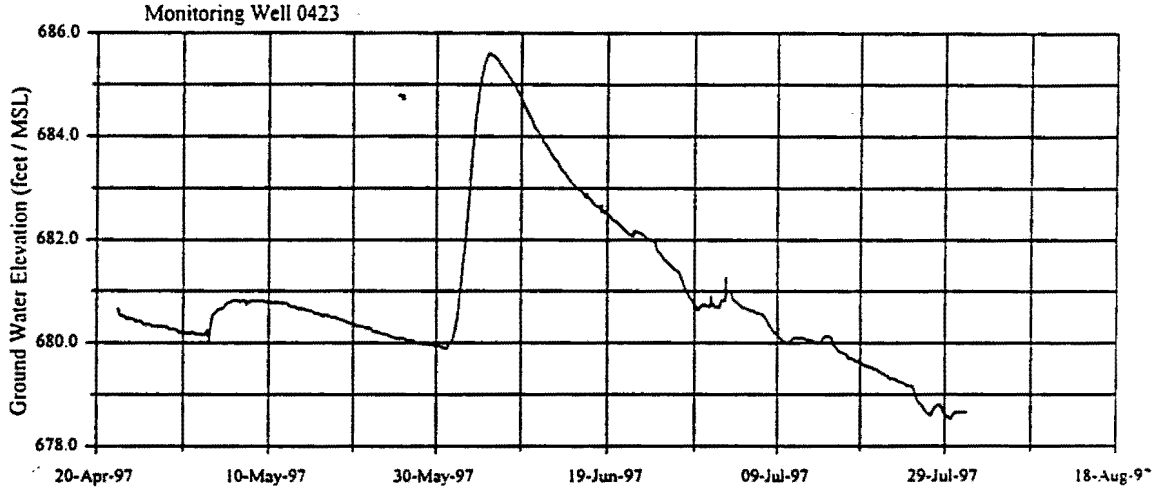


Figure A.14. Hydrograph of monitoring well 0423.

OU-1 PUMP-AND-TREAT SYSTEM CAPTURE ZONE MONITORING FROM AUGUST THROUGH SEPTEMBER 19,1997

MOUND PLANT
MIAMISBURG, OHIO

TECHNICAL MEMORANDUM

October 1997

Department Of Energy

EG&G Mound Applied Technologies

TABLE OF CONTENTS

ACKNOWLEDGMENTS ACK-1

1.0 INTRODUCTION 1-1

2.0 WEEKLY WATER LEVELS AND CORRESPONDING POTENTIOMETRIC MAPS IN OU-1 AREA 2-1

3.0 CONTINUOUS WATER LEVEL MONITORING RESULTS FROM AUGUST THROUGH SEPTEMBER 19, 1997 3-1

4.0 REFERENCES 4-1

APPENDIX A HYDROGRAPHS FOR MONITORING WELLS P001, P006, 0374, 0063, 0410, 0412, 0413, 0414, 0415, 0416, 0418, 0419, 0422, 0423

LIST OF FIGURES

Figure 1.1. OU-1 Pump-and-Treat system capture zone monitoring study area. 1-2
Figure 2.1. Groundwater potentiometric surface for August 7, 1997. 2-4
Figure 2.2. Groundwater potentiometric surface for August 14, 1997. 2-5
Figure 2.3. Groundwater potentiometric surface for August 21, 1997. 2-6
Figure 2.4. Groundwater potentiometric surface for August 28, 1997. 2-7
Figure 2.5. Groundwater potentiometric surface for September 5, 1997. 2-8
Figure 2.6. Groundwater potentiometric surface for September 11, 1997. 2-9
Figure 2.7. Groundwater potentiometric surface for September 19, 1997. 2-10

LIST OF TABLES

Table II.1 OU-1 Weekly Water Levels for August through September 19, 1997 2-2

ACKNOWLEDGMENTS

This report was prepared by Terran Corporation of Beavercreek, Ohio as report number TB-9742. It was completed under Task Order #16535 with EG&G Mound Applied Technologies. The authors were Roger W. McCready and Scott Hora. Word processing and graphics were prepared by Sandra L. Allen. Field work was conducted by Chris Ruef and Scott Hora. Potentiometric water level maps were prepared by Scott Hora.

1.0 INTRODUCTION

This report has been prepared as part of the Environmental Restoration (ER) Program at the U.S. Department of Energy (DOE) Mound Plant, Miamisburg, Ohio. Operable Unit One (OU-1) addresses possible chemical contamination of the buried valley aquifer which underlies the original southwest corner of the Mound Plant. OU-1 is in the remediation phase of the CERCLA. The remedial method chosen to remediate the OU-1 area is the pump-and-treat system.

Pump-and-treat systems are designed to contain and remove the contaminants dissolved in the ground water. Due to the relatively long duration of a pump-and-treat process, the objective is to minimize the total pumping rate to reduce treatment costs. The OU-1 groundwater contamination plume must be contained within the western and southern compliance boundaries. Containment is defined as an inward hydraulic gradient at a defined compliance boundary to prevent the movement of groundwater across this boundary. Therefore, the primary constraint is difference in head at the compliance boundary. The design strategy states that the optimal head difference to be 0.05 feet which is calculated from water level measurements taken manually.

The pump-and-treat system will be monitored for the first six months to define the capture zone created by the system. The hydraulic effectiveness of the pump-and-treat system will be determined by water level data from 20 monitoring wells in the area. Water level data will be collected via manual measurements and continuous monitoring instrumentation. The study area with extraction wells and monitoring well locations are shown in (Figure 1.1). This study began on April 21, 1997 when dataloggers were installed and continued until September 19, 1997. This report is a summary of the data collected and the results of hydraulic containment due to the pump-and-treat system from August through September 19, 1997.

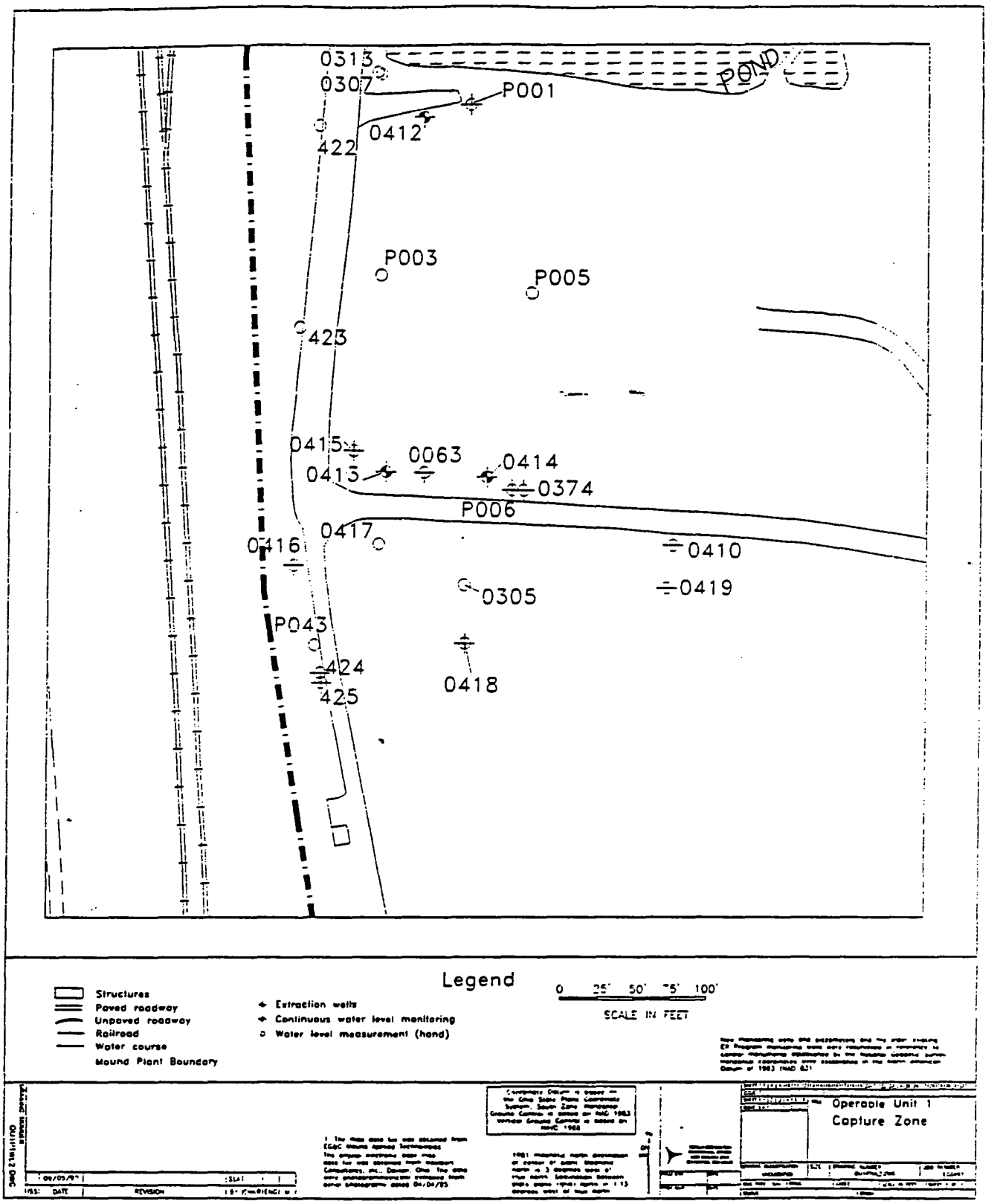


Figure 1.1. OU-1 Pump-and-Treat system capture zone monitoring study area.

2.0 WEEKLY WATER LEVELS AND CORRESPONDING POTENTIOMETRIC MAPS IN OU-1 AREA

The ground water levels in twenty monitoring wells and the three pump-and-treat extraction wells were measured manually once a week. Each set of weekly water level measurements were contoured to produce a potentiometric map of the water level surface for the Upper BVA. Table II.1 list the depth to water and water level elevation for the twenty monitoring wells and three extraction wells from August through September, 19, 1997.

Water level measurements were completed using standard protocol of the OU-9 QAPP (Revision 4, April 1995) SOP 3.1 Water Level Measurement (Revision 1, March 1992). Water level collection utilized an electric water level indicator that allows measurement to within 0.01 foot. The water levels are recorded and entered into a spreadsheet.

Preparation of the potentiometric water level maps is conducted in a three step process: (1) Data from each weekly measurement is entered into Golden Software Surfer were it is contoured; (2) The contours are edited by a hydrogeologist; (3) The map is digitized onto a base map.

Four sets of water level measurements were taken in August and another three sets in September, 1997. The potentiometric maps for each data set are displayed in figures 2.1 through 2.7. For both months, the potentiometric maps clearly show a cone of depression or capture zone which are all similar in shape.

Table II.1 OU-1 Weekly Water Levels for August through September 19, 1997

Monitoring Well		07-Aug-97 Water Level		14-Aug-97 Water Level		21-Aug-97 Water Level		28-Aug-97 Water Level	
Number	Elevation TOC	Below TOC	Elevation	Below TOC	Elevation	Below TOC	Elevation	Below TOC	Elevation
		(Feet)	(MSL)	(Feet)	(MSL)	(Feet)	(MSL)	(Feet)	(MSL)
0063	705.60	27.57	678.03	27.58	678.02	27.30	678.30	27.28	678.32
0305	709.87	31.75	678.12	31.85	678.02	31.33	678.54	31.50	678.37
0307	716.10	37.71	678.39	37.83	678.27	37.32	678.78	37.50	678.60
0313	716.08	37.74	678.34	37.81	678.27	37.52	678.56	37.49	678.59
0374	706.29	28.29	678.00	38.32	667.97	28.15	678.14	27.98	678.31
0410	713.84	35.75	678.09	35.82	678.02	35.56	678.28	35.44	678.40
0412	717.00	38.82	678.18	38.89	678.11	38.60	678.40	38.46	678.54
0413	704.45	26.79	677.66	26.87	677.58	26.56	677.89	26.58	677.87
0414	705.85	29.80	676.05	29.94	675.91	29.60	676.25	29.60	676.25
0415	706.09	27.95	678.14	28.02	678.07	27.72	678.37	27.60	678.49
416	704.30	26.08	678.22	26.04	678.26	25.77	678.53	25.75	678.55
0417	705.07	26.92	678.15	27.01	678.06	26.58	678.49	26.66	678.41
0418	709.67	31.56	678.11	31.65	678.02	31.35	678.32	31.32	678.35
0419	716.41	38.31	678.10	38.35	678.06	38.02	678.39	38.10	678.31
0422	715.21	36.86	678.35	36.92	678.29	36.47	678.74	36.51	678.70
0423	709.12	30.85	678.27	30.89	678.23	30.50	678.62	30.49	678.63
0424	704.49	26.30	678.19	26.33	678.16	25.93	678.56	25.98	678.51
0425	704.58	26.36	678.22	26.42	678.16	25.83	678.75	25.76	678.82
P001	717.67	39.37	678.30	39.43	678.24	39.16	678.51	39.16	678.51
P003	707.46	29.24	678.22	29.29	678.17	28.99	678.47	28.96	678.50
P005	738.59	60.44	678.15	60.49	678.10	60.20	678.39	60.10	678.49
P006	705.96	27.97	677.99	28.07	677.89	27.84	678.12	27.78	678.18
P043	704.80	26.61	678.19	26.70	678.10	26.44	678.36	26.41	678.39

Table II.1 OU-1 Weekly Water Levels for June through August, 1997 (cont.)

Monitoring Well		05-Sept-97 Water Level		11-Sept-97 Water Level		19-Sept-97 Water Level			
Number	Elevation TOC	Below TOC	Elevation	Below TOC	Elevation	Below TOC	Elevation		
		(Feet)	(MSL)	(Feet)	(MSL)	(Feet)	(MSL)		
0063	705.60	27.44	678.16	27.55	678.05	27.75	677.85		
0305	709.87	31.59	678.28	31.32	678.55	32.05	677.82		
0307	716.10	37.68	678.42	37.81	678.29	38.01	678.09		
0313	716.08	37.68	678.40	37.8	678.28	37.99	678.09		
0374	706.29	29.12	677.17	28.35	677.94	28.54	677.75		
0410	713.84	35.67	678.17	35.82	678.02	36.05	677.79		
0412	717.00	38.65	678.35	38.88	678.12	39.07	677.93		
0413	704.45	26.69	677.76	26.85	677.60	27.07	677.38		
0414	705.85	29.84	676.01	30.02	675.83	30.34	675.51		
0415	706.09	27.87	678.22	27.99	678.10	28.2	677.89		
416	704.30	25.92	678.38	26.16	678.14	26.4	677.90		
0417	705.07	26.82	678.25	26.99	678.08	27.2	677.87		
0418	709.67	31.42	678.25	31.61	678.06	31.86	677.81		
0419	716.41	38.24	678.17	38.41	678.00	38.64	677.77		
0422	715.21	36.67	678.54	36.9	678.31	37.1	678.11		
0423	709.12	30.78	678.34	30.91	678.21	31.12	678.00		
0424	704.49	26.13	678.36	26.36	678.13	26.62	677.87		
0425	704.58	26.21	678.37	26.46	678.12	26.7	677.88		
P001	717.67	39.29	678.38	39.44	678.23	39.62	678.05		
P003	707.46	29.11	678.35	29.28	678.18	29.26	678.20		
P005	738.59	60.29	678.30	61.49	677.10	60.67	677.92		
P006	705.96	27.8	678.16	28.06	677.90	28.24	677.72		
P043	704.80	26.56	678.24	26.68	678.12	26.94	677.86		

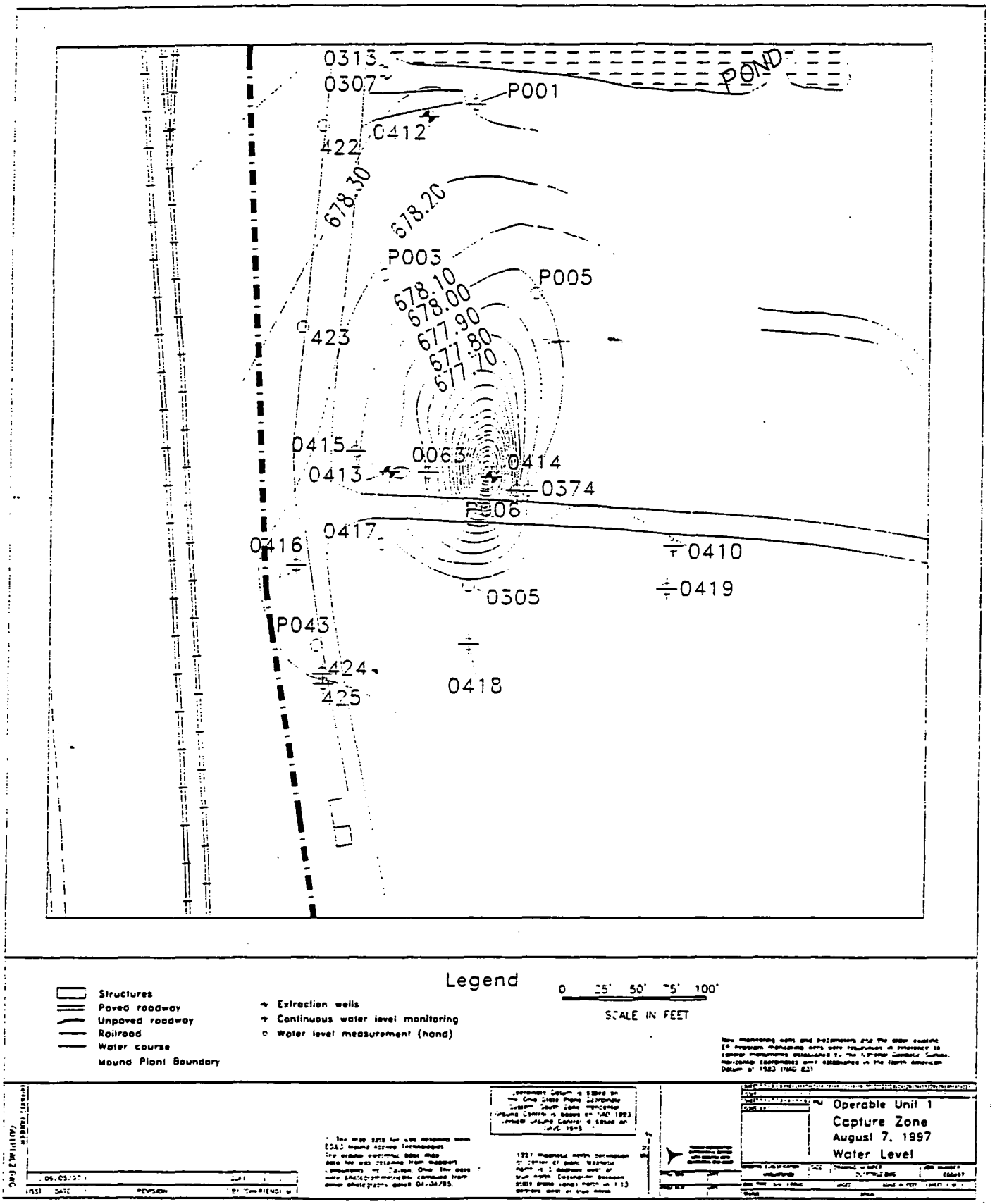


Figure 2.1. Groundwater potentiometric surface for August 7, 1997.

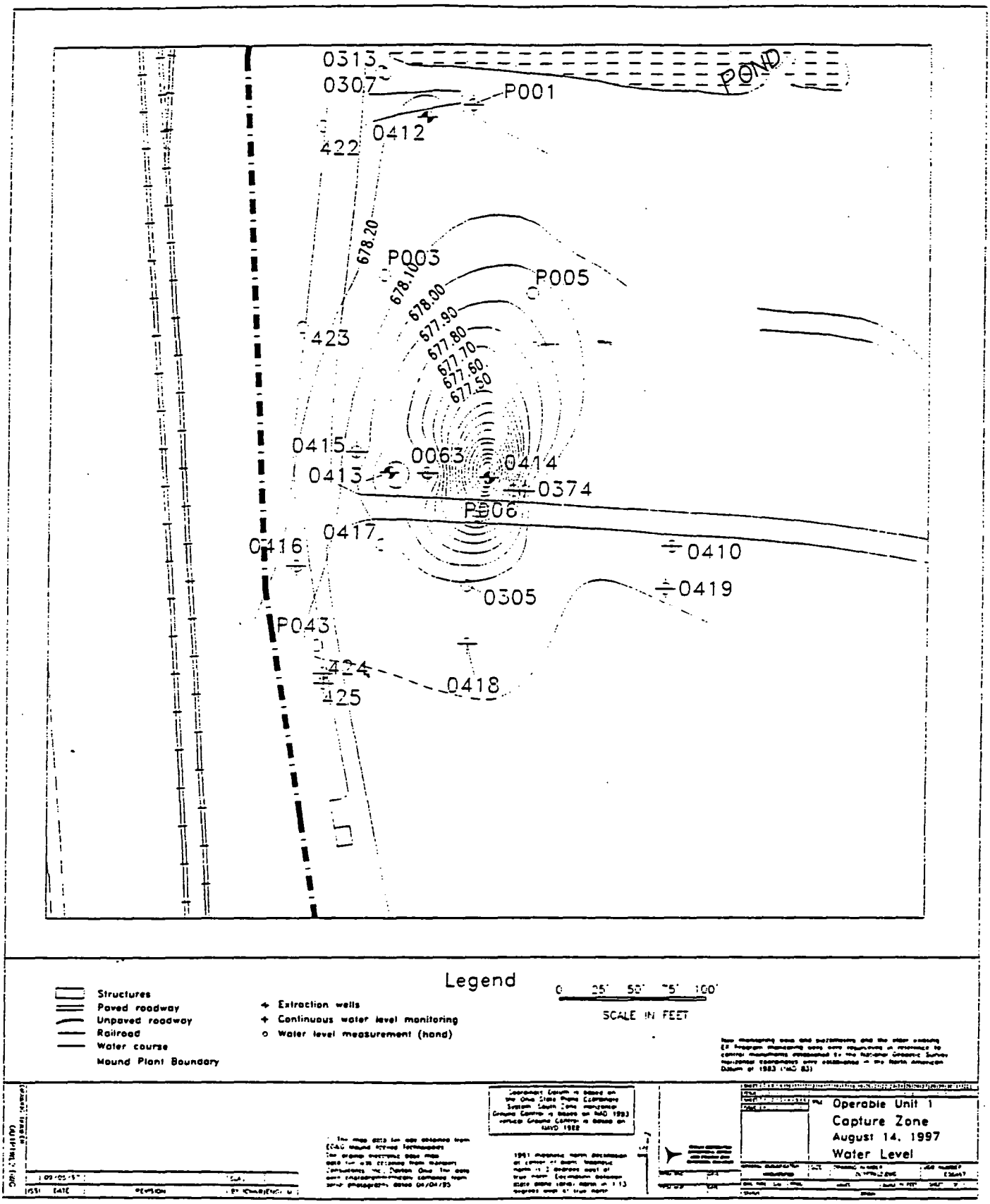


Figure 2.2. Groundwater potentiometric surface for August 14, 1997.

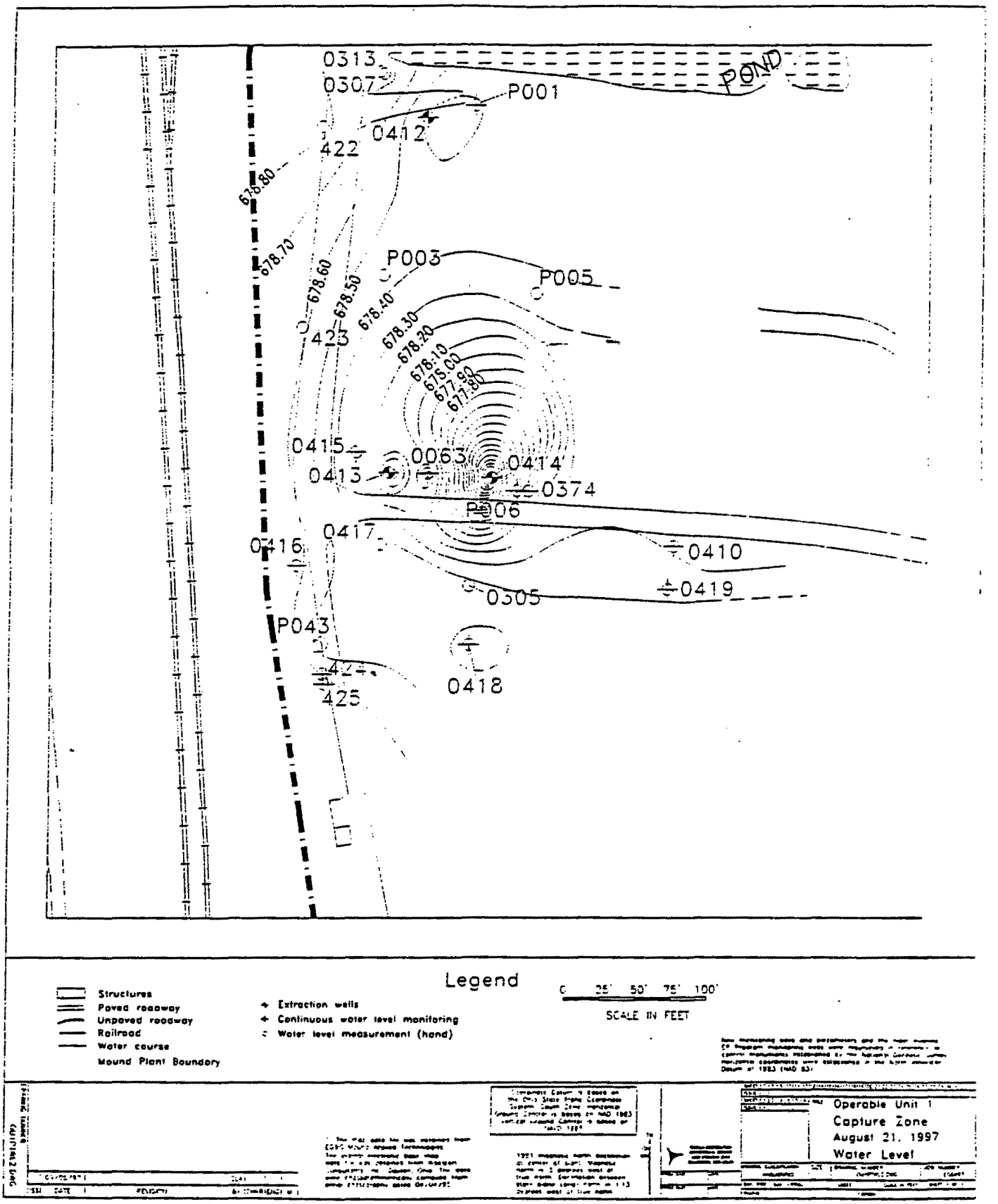


Figure 2.3. Groundwater potentiometric surface for August 21, 1997.

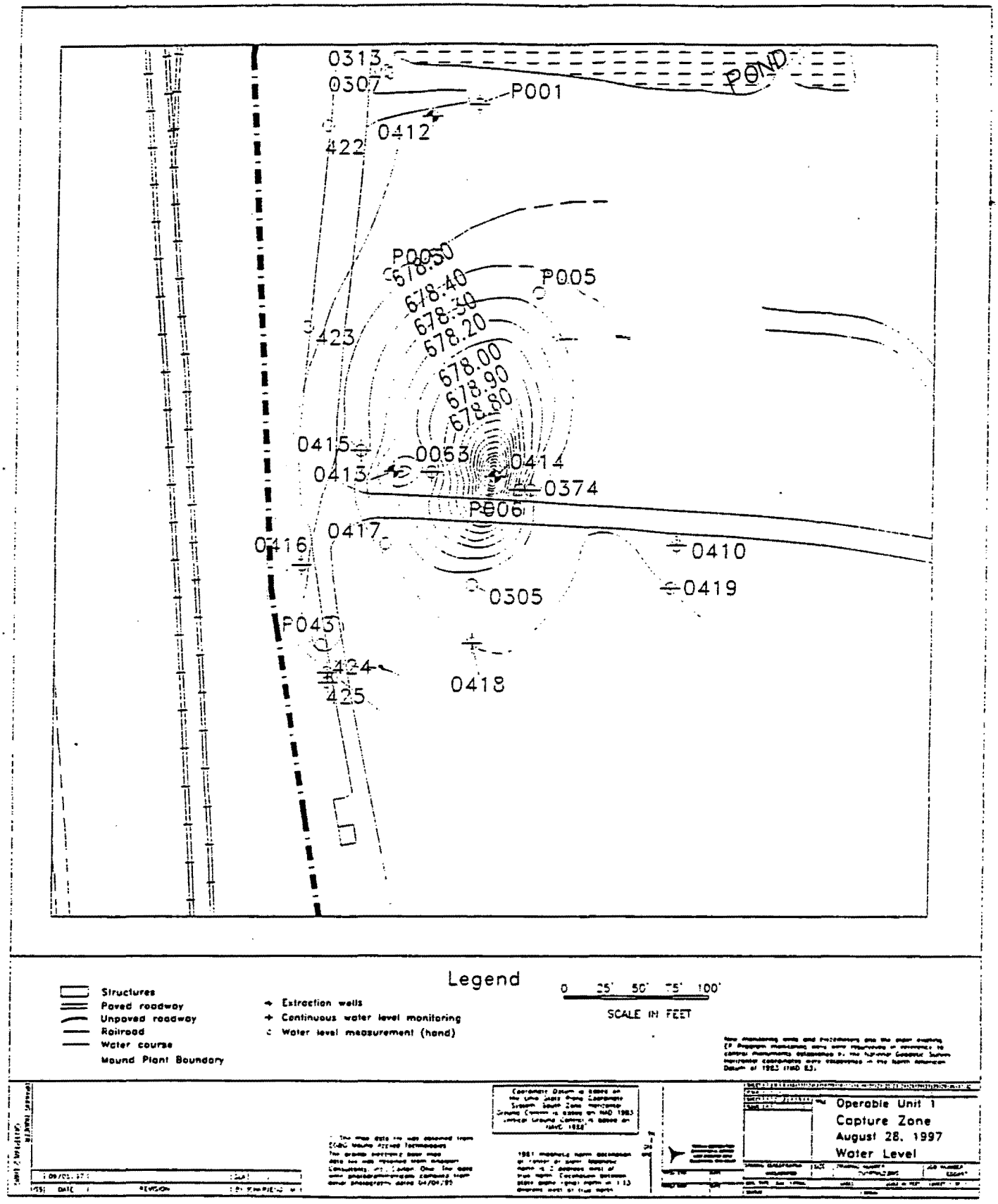


Figure 2.4. Groundwater potentiometric surface for August 28, 1997.

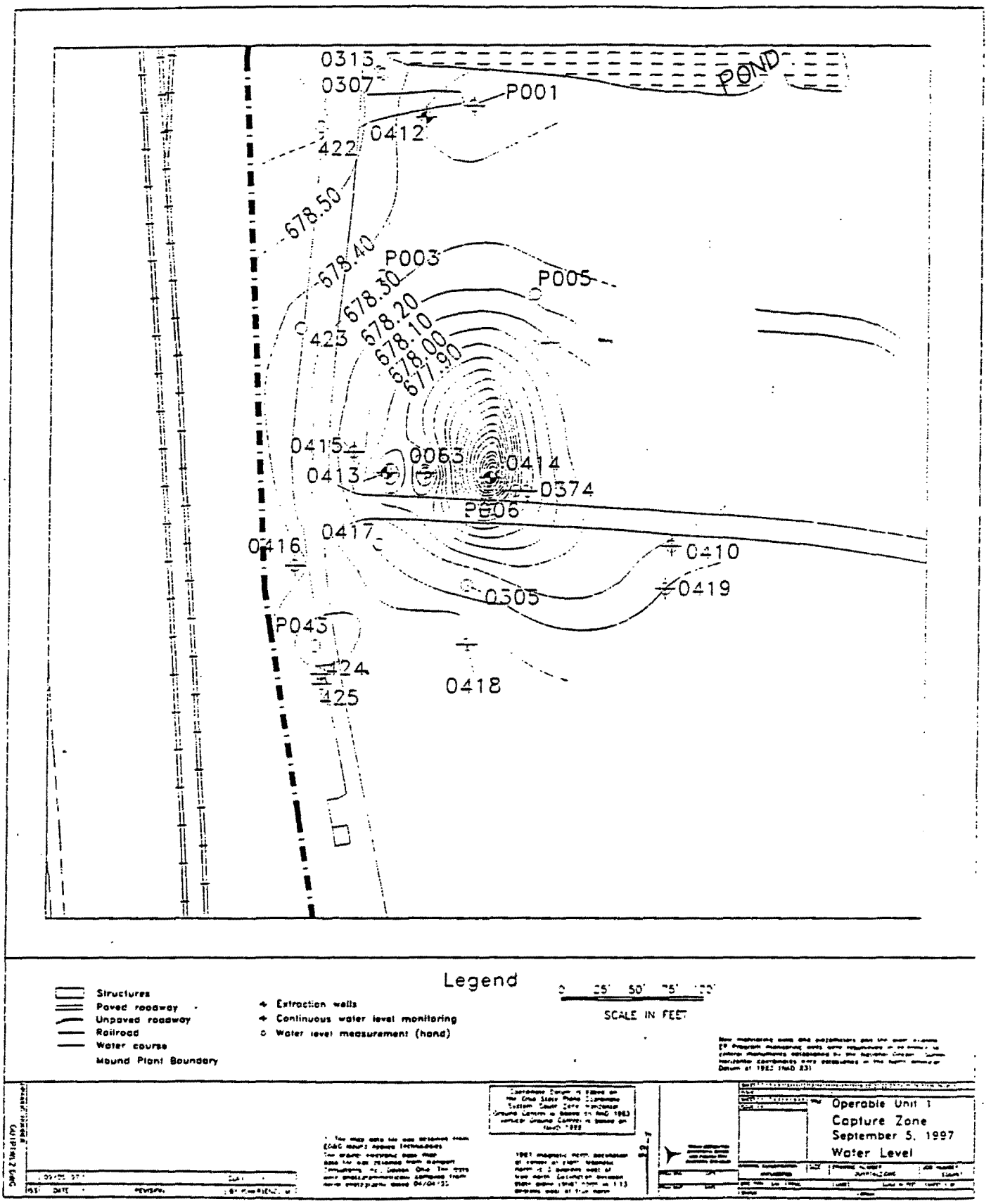


Figure 2.5. Groundwater potentiometric surface for September 5, 1997.

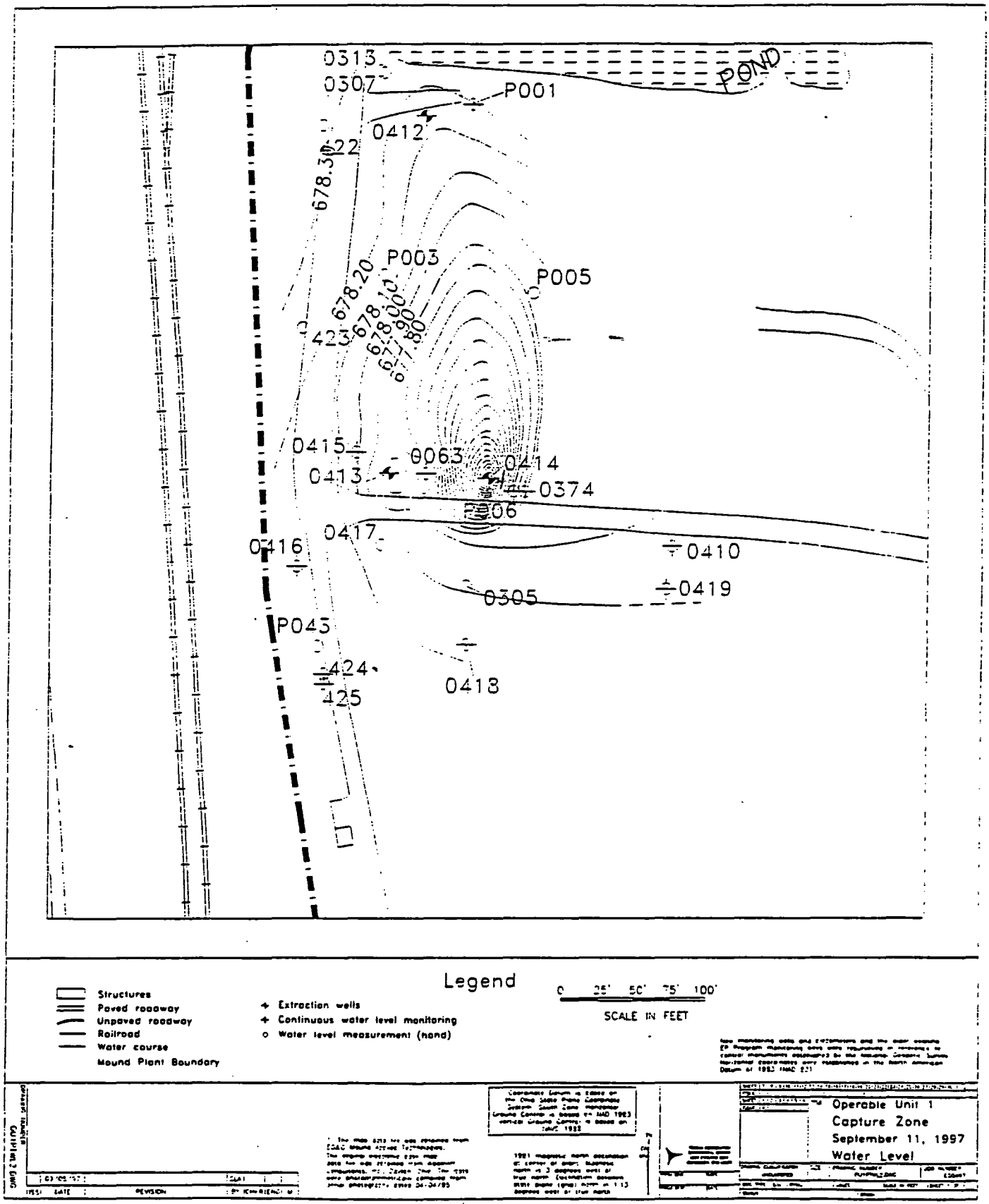


Figure 2.6. Groundwater potentiometric surface for September 11, 1997.

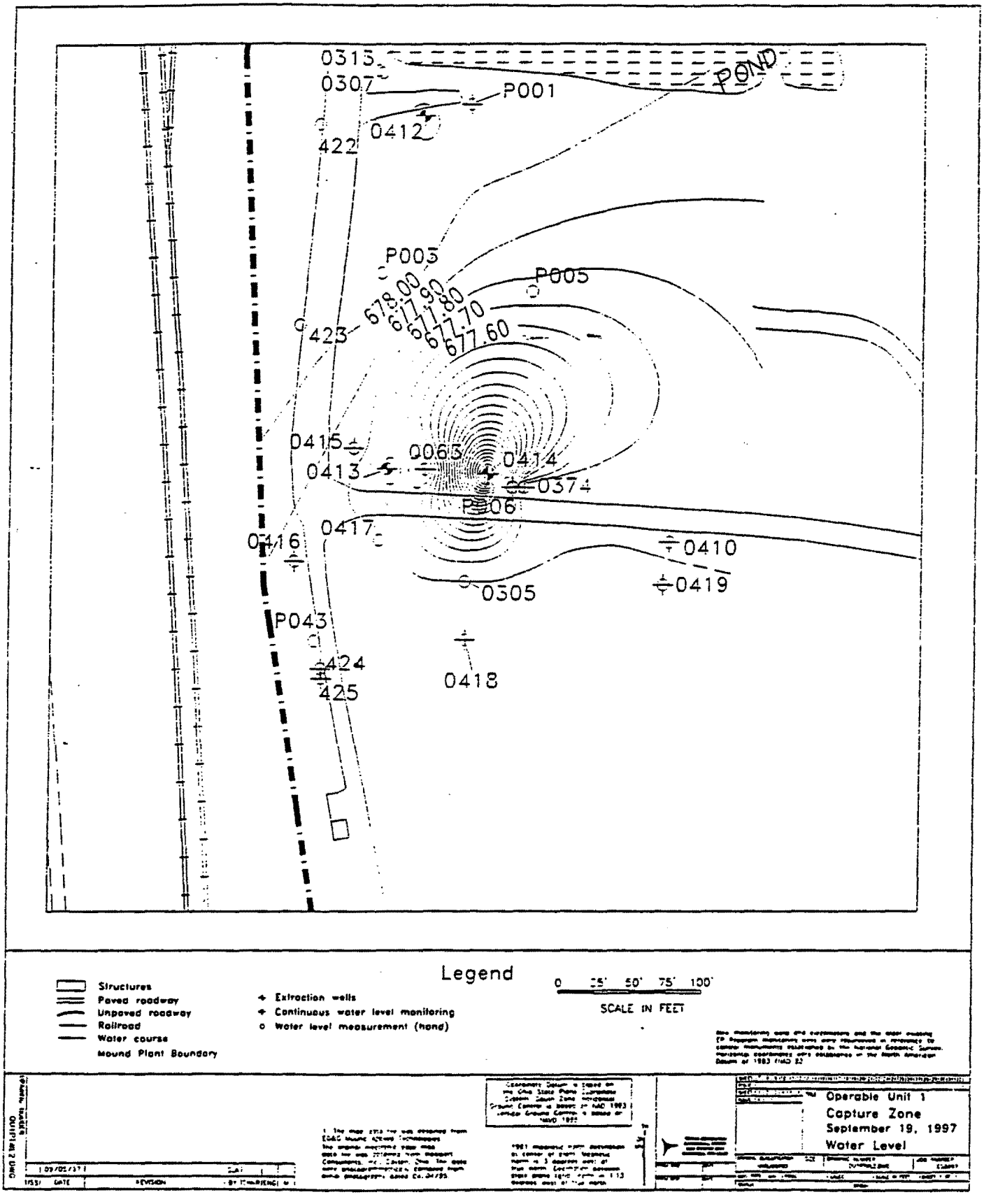


Figure 2.7. Groundwater potentiometric surface for September 19, 1997.

3.0 CONTINUOUS WATER LEVEL MONITORING RESULTS FROM AUGUST THROUGH SEPTEMBER 19, 1997

To assess the potential fluctuations in water levels due to external sources such as the Mound production wells, water levels were monitored continuously at 13 locations surrounding the pump-and-treat system. This continuous monitoring was provided by individual Telog Level Trackers 2100. These Trackers are dataloggers / pressure transducers which automatically record water levels. This instrumentation was installed in 13 monitoring wells on April 21, 1997. Figure 1. shows the location of the monitoring wells and extraction wells that contain Trackers. The dataloggers have been programmed to collect a water level measurement every 15 minutes. Once a week when the hand water level measurements are collected and each datalogger is downloaded into a Telog Data Transfer Unit (DTU). The DTU is returned to the office where the data is uploaded into a database that contains records for each well.

Hydrographs of continuous water level data for August through September 19, 1997 are shown in Appendix A (figures A.1 through A.14). The hydrographs reflect the natural water level fluctuations that occur in the Upper Buried Valley Aquifer. Abrupt increases in ground water levels due to rain events and stage increase of the Great Miami River occur frequently through out the year. One such increase is seen in mid August where ground water levels rose from 0.5 - 1 foot in just a few days. The ground water levels continued to decline from this high through September 19, 1997.

Additionally, there were two additional peaks seen in most of the hydrographs from August through September 1997 (Appendix A). These peaks range from 0.0 to 2.5 feet and were due to periods where the pump and treatment system was shut off for maintenance purposes. The negative peaks with high amplitude and short span were due to periods where that particular well was sampled.

Since the start of this monitoring the plant has been supplied by production well 3 (0076). Many of the hydrographs reveal the daily pumping of the production well. Monitoring well 0419 is most affected by production well 3 producing a daily drawdown of 0.4 feet between 0600 and 1000. Monitoring well 0374 has a 0.1 foot drawdown that occurs in the late afternoon each day. Based on a qualitative review of the other hydrographs the daily peak drawdown at all other monitoring wells used for this study is less 0.05 feet.

4.0 REFERENCES

DOE. 1994. "Determination of Aquifer Diffusivity from River Level Flucuations near the U.S. DOE Mound Facility in Miamisburg, Ohio". Environmental Restoration Program, U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE. 1995. "Operable Unit 9 Continuous Water Level Monitoring Results for the Buried Valley Aquifer May, 1993 through May, 1994." Environmental Restoration Program, U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE. 1996. "OU-1 Pump-and-Treat System Design"

APPENDIX A

HYDROGRAPHS FOR MONITORING WELLS P001, P006, 0374, 0063, 0410, 0412, 0413, 0415, 0415, 0416,0418, 0419, 0422, 0423

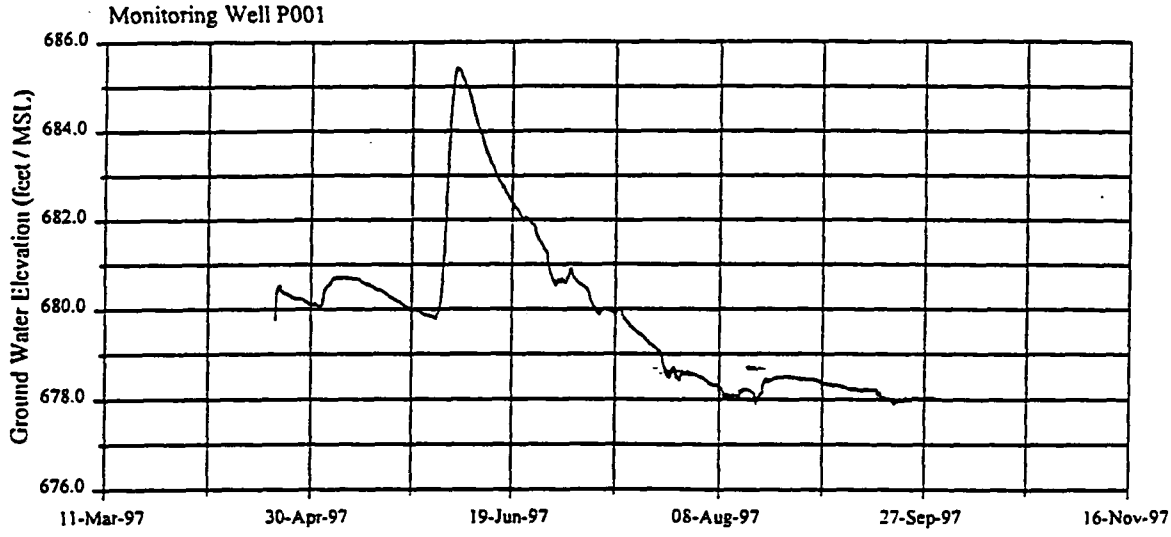


Figure A.1. Hydrograph of monitoring well P001.

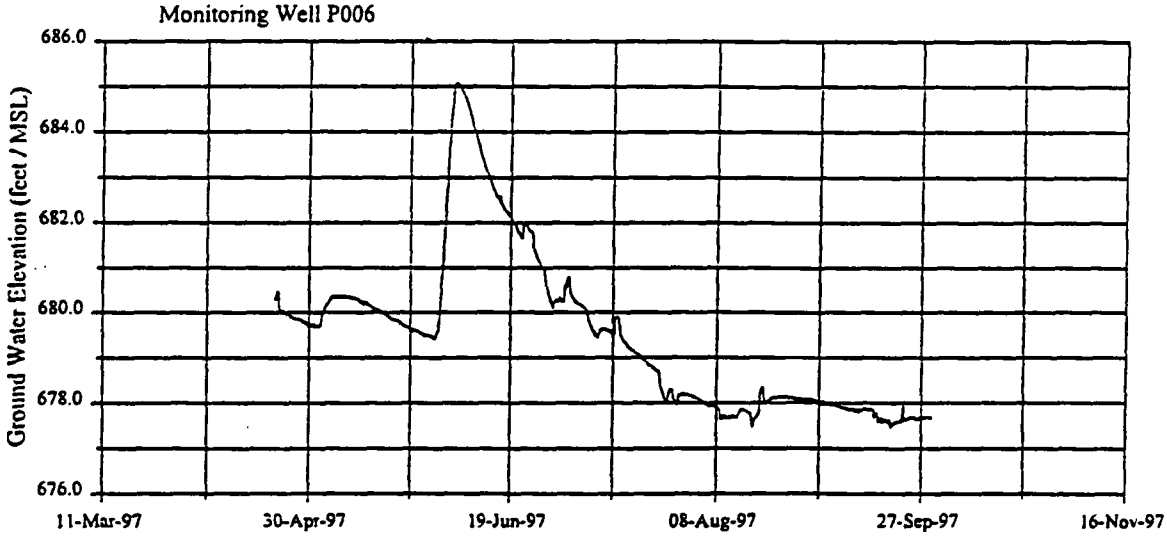


Figure A.2. Hydrograph of monitoring well P006.

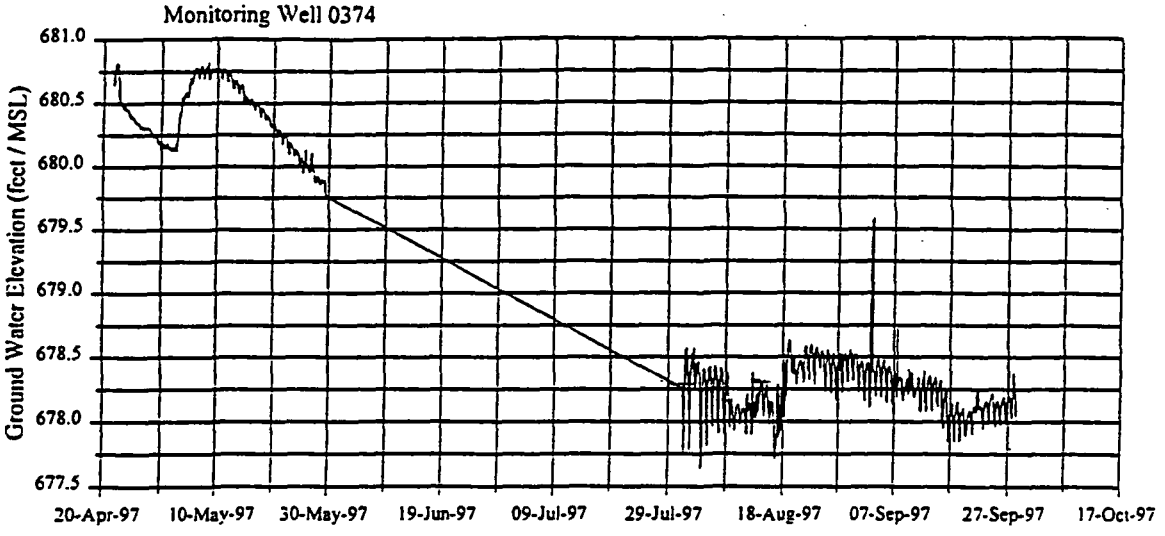


Figure A.3. Hydrograph of monitoring well 0374.

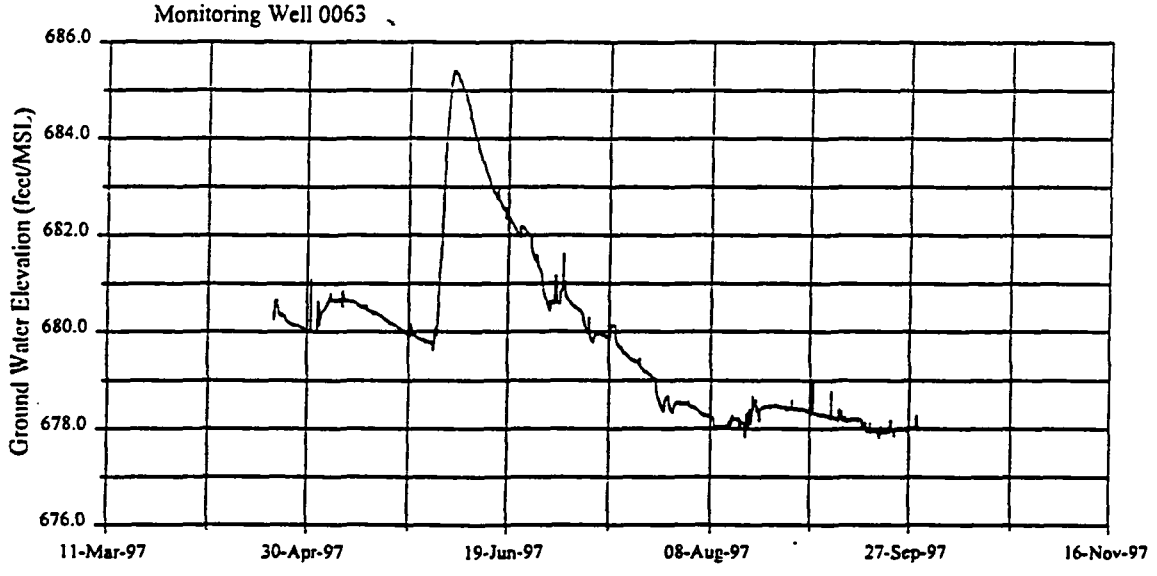


Figure A.4. Hydrograph of monitoring well 0063.

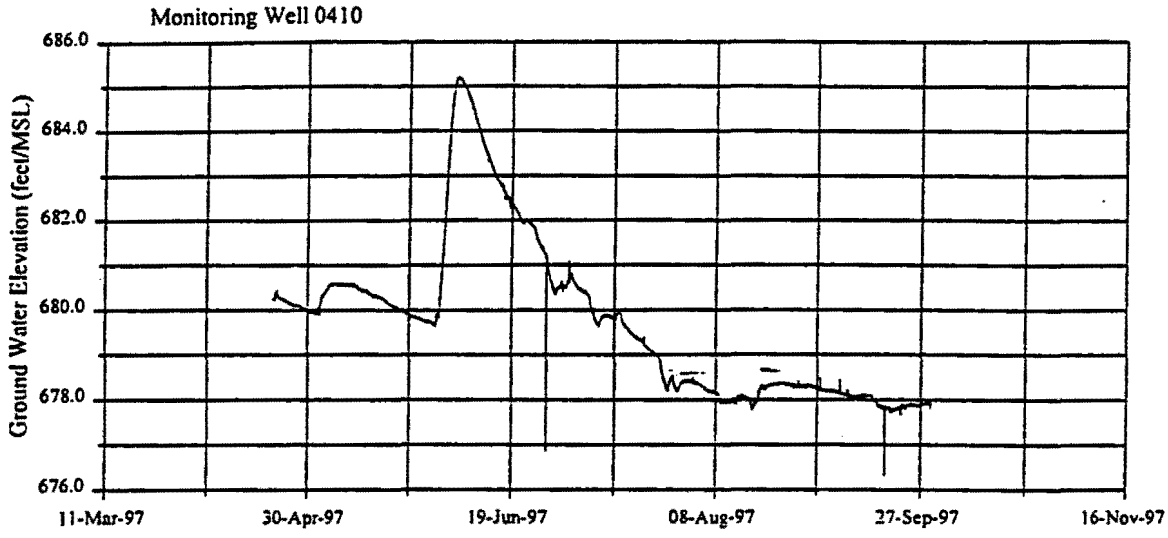


Figure A.5. Hydrograph of monitoring well 0410.

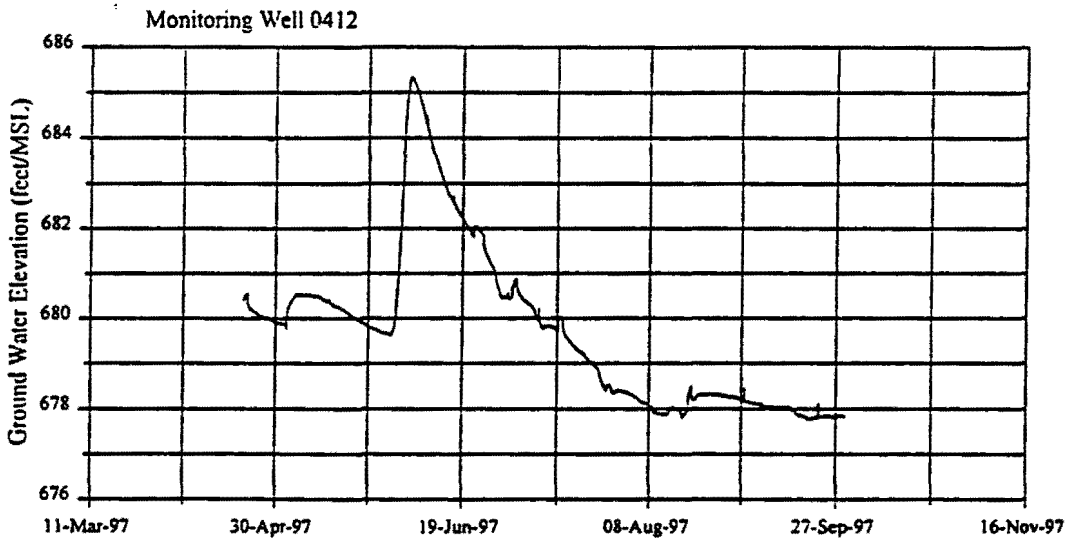


Figure A.6. Hydrograph of monitoring well 0412.

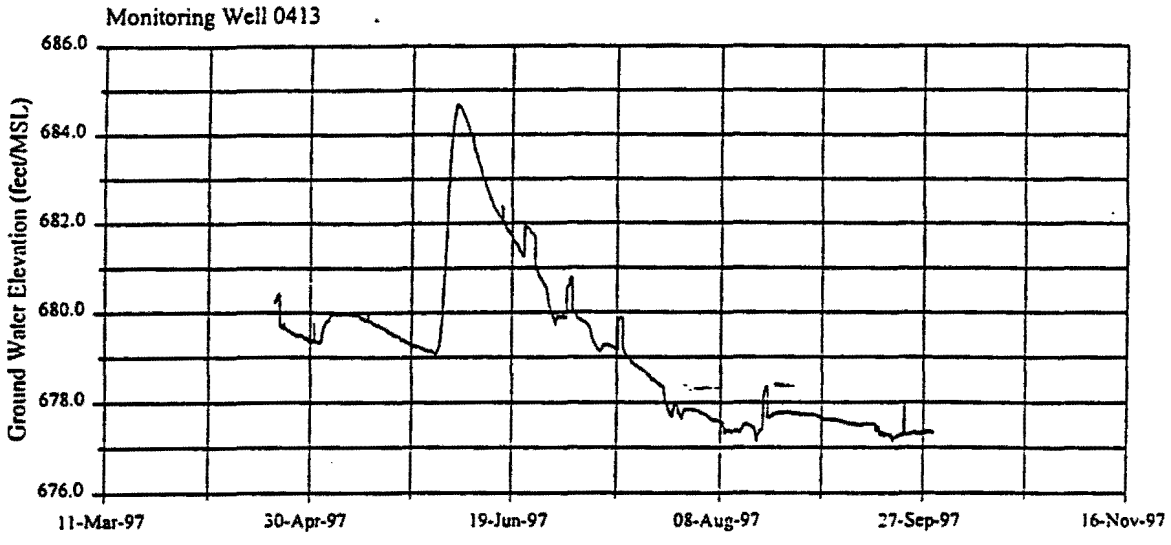


Figure A.7. Hydrograph of monitoring well 0413.

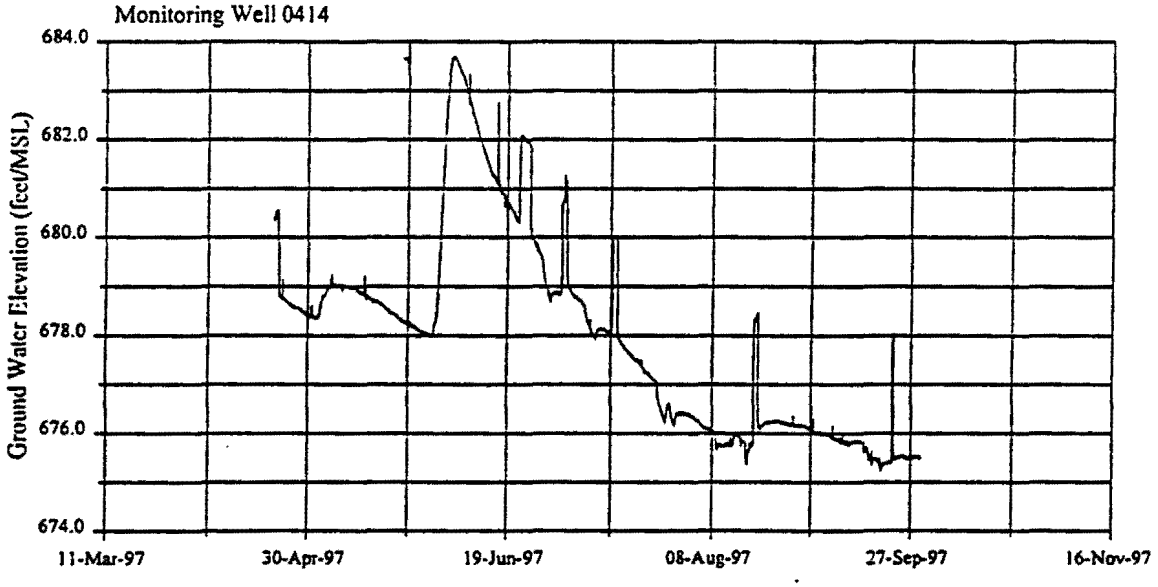


Figure A.8. Hydrograph of monitoring well 0414.

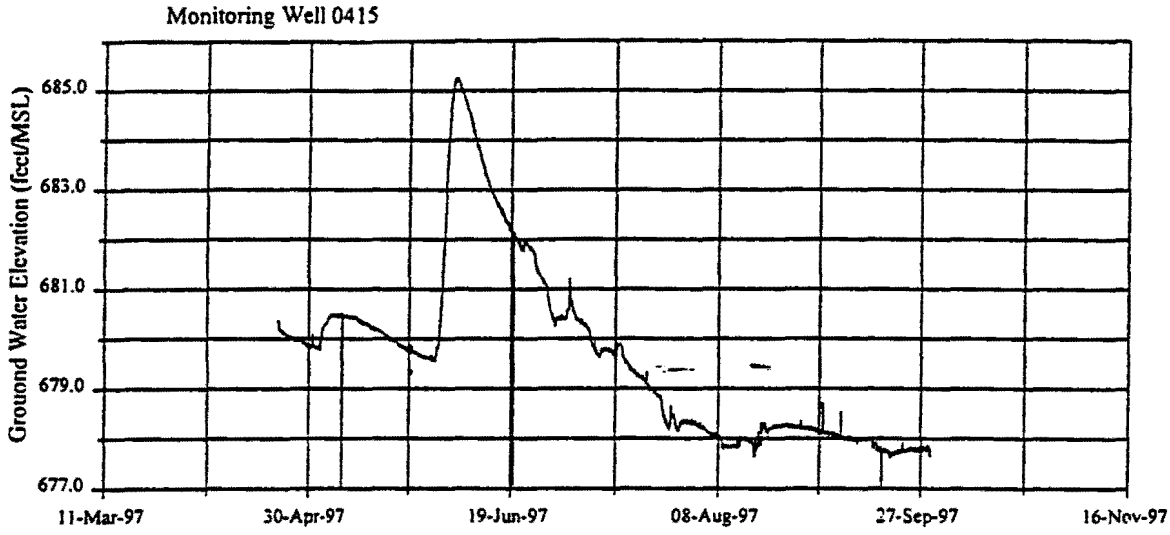


Figure A.9. Hydrograph of monitoring well 0415.

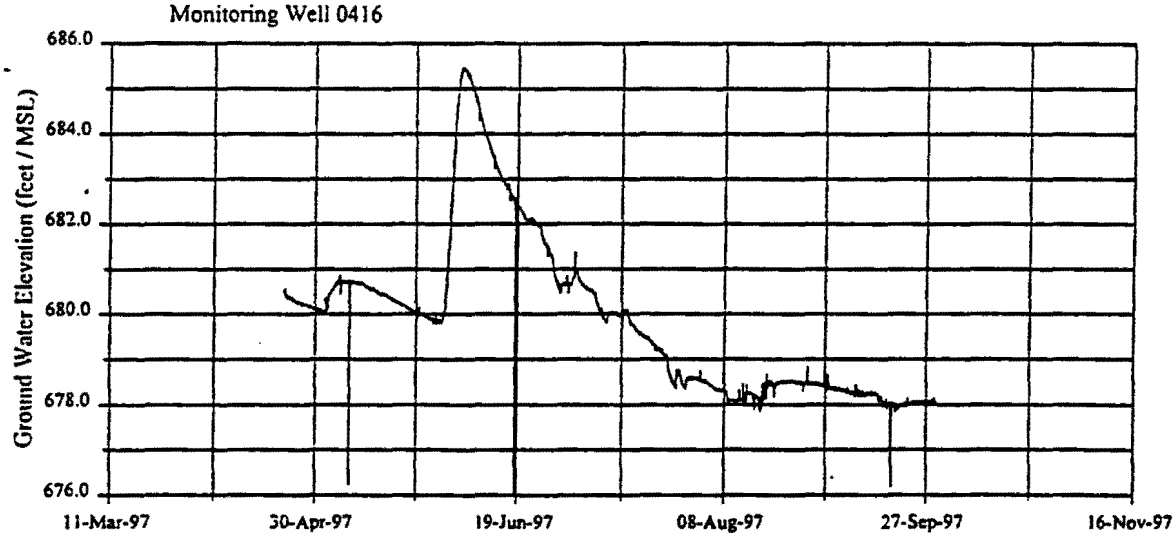


Figure A.10. Hydrograph of monitoring 0416.

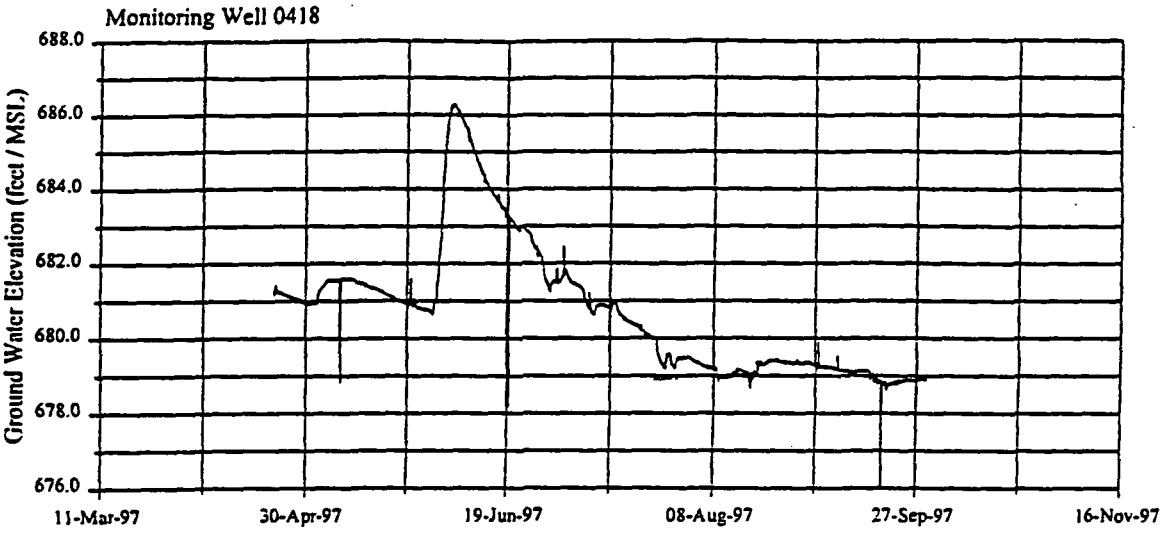


Figure A.11. Hydrograph of monitoring well 0418.

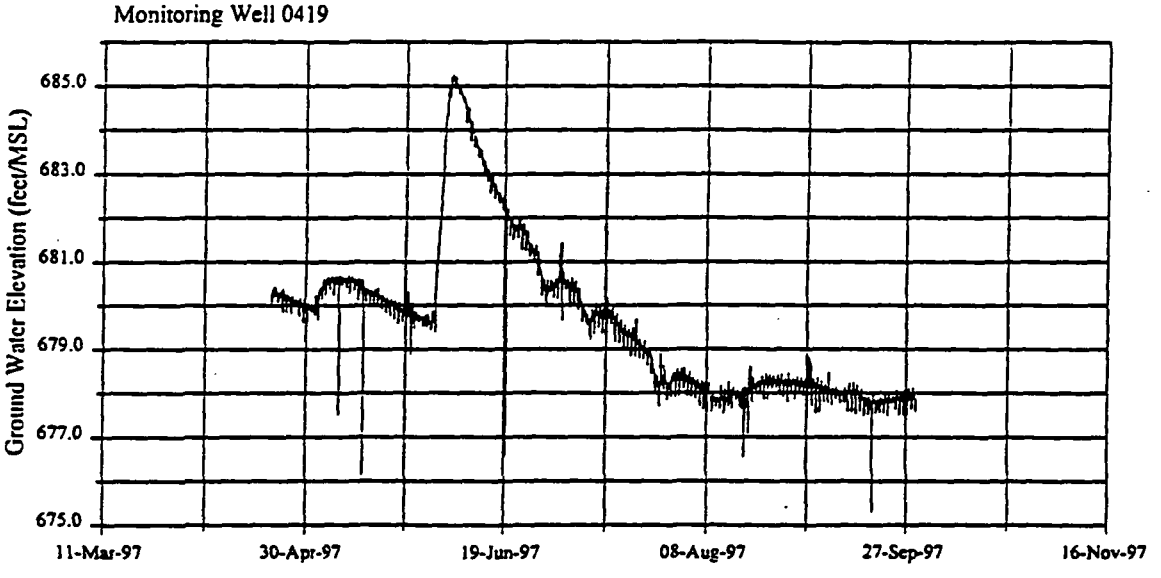


Figure A.12. Hydrograph of monitoring well 0419.

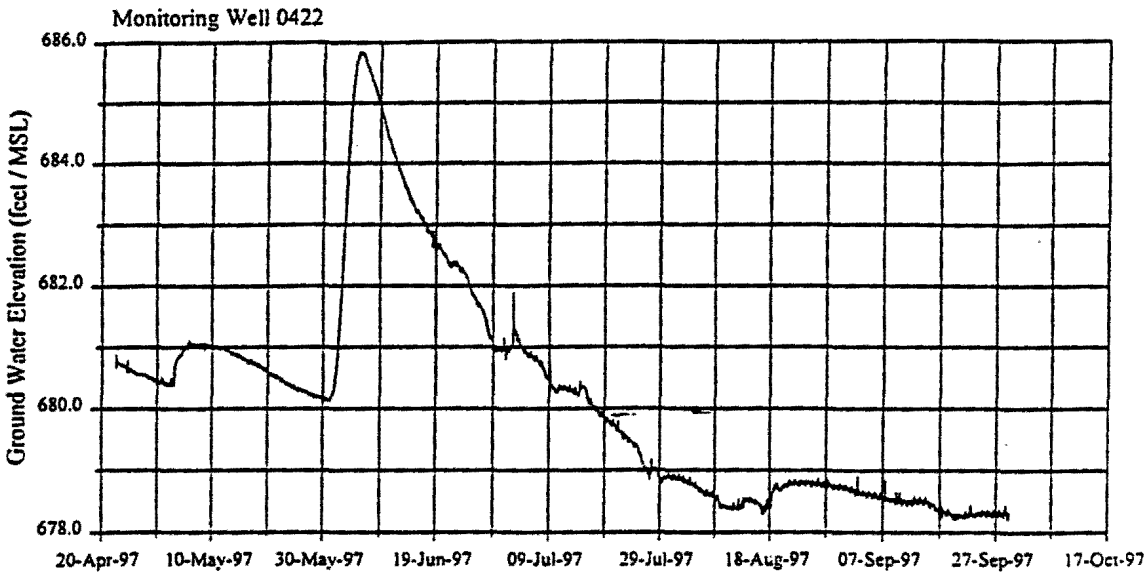


Figure A.13. Hydrograph of monitoring well 0422.

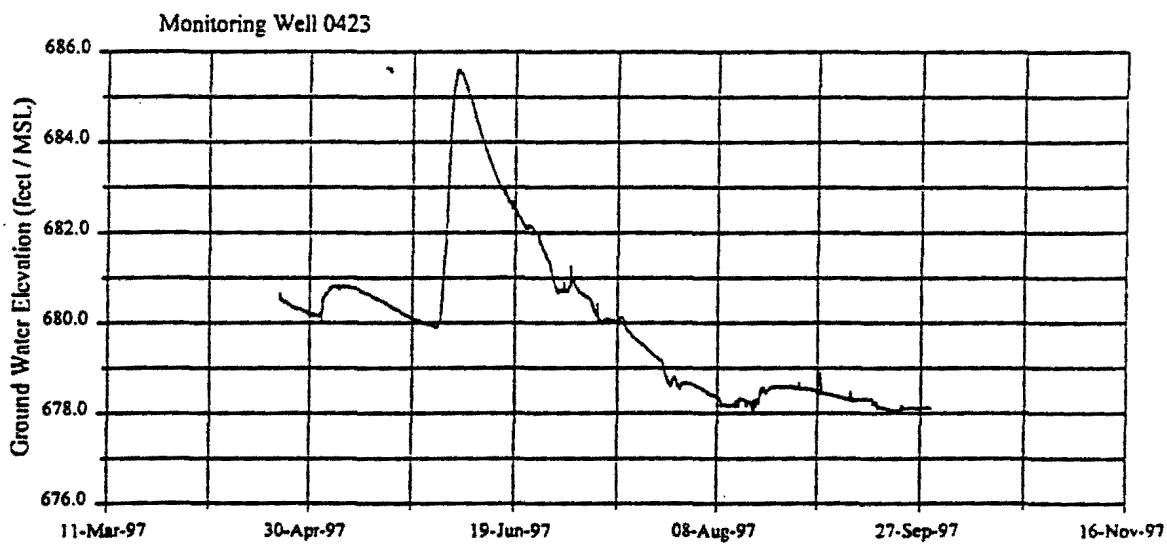


Figure A.14. Hydrograph of monitoring well 0423.

Attachment B

OU1 VOC CONTAMINANTS OF CONCERN

Date	Carbon Tetrachloride		Chloroform		1,2-Dichloroethane		Tetrachloroethene		Trichloroethene		Vinyl Chloride		cis 1,2-Dichloroethene		trans 1,2-Dichloroethene	
	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent
02/20/97	1.9	<1.0	5.7	<1.0	<1.0	<1.0	20.9	<1.0	46.8	<1.0	<2.0	<2.0	43.6	<1.0	<1.0	<1.0
03/12/97	<1.0	<1.0	3.2	<1.0	<1.0	<1.0	17.9	<1.0	42.9	<1.0	<2.0	<2.0	3.0	<1.0	27.8	<1.0
03/19/97	<1.0	<1.0	3.2	<1.0	<1.0	<1.0	20.9	<1.0	48.1	<1.0	<2.0	<2.0	27.7	<1.0	<1.0	<1.0
04/09/97	<1.0	<1.0	2.1	<1.0	<1.0	<1.0	16.6	<1.0	21.2	<1.0	<2.0	<2.0	<1.0	<1.0	<1.0	<1.0
04/21/97		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0		<1.0		<1.0
05/06/97	<1.0	<1.0	1.2	<1.0	<1.0	<1.0	10.6	<1.0	13.4	<1.0	<2.0	<2.0	11.3	<1.0	<1.0	<1.0
06/04/97		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0		<1.0		<1.0
06/18/97	<1.0	<1.0	2.6	<1.0	<1.0	<1.0	9.7	<1.0	25.8	<1.0	<2.0	<2.0	27.3	<1.0	<1.0	<1.0
07/09/97	<1.0	<1.0	1.6	<1.0	<1.0	<1.0	10.6	<1.0	12.3	<1.0	<2.0	<2.0	13.6	<1.0	<1.0	<1.0
08/06/97	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	9.1	<1.0	7.3	<1.0	<2.0	<2.0	9.1	<1.0	<1.0	<1.0
09/10/97	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	8.5	<1.0	6.1	<1.0	<2.0	<2.0	7.5	<1.0	<1.0	<1.0
10/08/97	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.3	<1.0	5.3	<1.0	<2.0	<2.0	5.9	<1.0	<1.0	<1.0
11/20/97	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	6.0	<1.0	5.2	<1.0	<2.0	<2.0	5.6	<1.0	<1.0	<1.0
12/03/97	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.9	<1.0	5.2	<1.0	<2.0	<2.0	4.9	<1.0	<1.0	<1.0
97 AVG	<1.0	<1.0	1.6	<1.0	<1.0	<1.0	12.0	<1.0	20.0	<1.0	<1.0	<1.0	13.3	<1.0	2.3	<1.0
97 SDEV	0.5	0.0	1.8	0.0	0.0	0.0	5.6	0.0	17.0	0.0	0.0	0.0	12.9	0.0	8.0	0.0
97 MAX	1.9	<1.0	5.7	<1.0	<1.0	<1.0	20.9	<1.0	48.1	<1.0	<1.0	<1.0	43.6	<1.0	27.8	<1.0
97 MIN	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.9	<1.0	5.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
97 SAMPLES	12	14	12	14	12	14	12	14	12	14	12	14	12	14	12	14

OU1 WATER QUALITY PARAMETERS

Date	pH		Calcium		Magnesium		Iron		Dissolved Oxygen	
	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent
04/01/97		7.22								
04/09/97	6.60	7.00	133	117.0			<0.1	<0.1		10.40
04/15/97	6.90	7.50	125	107.0	38.2	36.6	<0.1	<0.1		
04/17/97	6.90	7.90								10.40
04/24/97	6.50	7.20	110	134.0	39.1	39.7	<0.1	<0.1		10.97
05/05/97	6.75	7.52	122	101.0	36.9	35.2	<0.1	<0.1	6.41	10.52
05/12/97	6.62	7.43	123	99.5	38.8	37.5			7.33	11.72
05/20/97	6.52	7.63	113	86.7	36.4	33.8	<0.1	<0.1	5.73	11.12
05/28/97	6.58	7.73	109	94.3	34.3	34.6	<0.1	<0.1	6.53	10.80
06/04/97	6.80	7.40	109	89.3	32.5	31.7			5.90	11.20
06/10/97	6.90	7.20	136	118.0						
06/17/97	6.50	7.20	113	93.6	35.1	34.6				
06/24/97	7.40	7.70	127	99.7						
07/01/97	7.49	7.96		91.1						
07/09/97	7.34	8.17	126	102.0						
07/16/97	7.20	8.22	121	104.0						
07/23/97	7.11	7.86	120	100.0						
07/30/97	7.05	7.90	117	98.8						
08/06/97	7.17	7.96	116	96.5						10.42
08/13/97	7.13	7.95	122	96.2						10.80
08/20/97	7.10	7.98	126	81.9						11.11
08/27/97	7.11	8.20	133	108.0					4.76	10.30
09/03/97	7.13	7.94	128	102.0						10.92
09/10/97	6.95	7.95	114	93.2						10.12
09/17/97	7.15	7.92	118	94.9						10.15
09/24/97	7.06	7.79	124	108.0					5.21	10.25
10/01/97	7.33	7.93	123	103.0						11.18
10/07/97	7.33	7.84	133	102.0						13.34
10/14/97	7.08	7.46	120	95.6						11.98
10/16/97	7.20	7.70								11.64
10/23/97	7.27	7.77	114	98.0						11.3
10/30/97	7.20	7.80	114	95.6						11.69
11/06/97	7.34	7.75	124	103						11.71
11/13/97	7.54	7.78	140	114						11.23
11/20/97	7.45	7.86	110	97.8						11.34
11/26/97	7.43	8.01	130	112						10.27
12/04/97	7.27	7.88	127	108						10.76
12/11/97	7.32	7.68	135	100						10.31
12/18/97	7.42	7.63								10.71
12/23/97	7.35	7.60								10.77