

NATURAL GROUND-WATER-RECHARGE DATA FROM THREE SELECTED SITES
IN HARVEY COUNTY, SOUTH-CENTRAL KANSAS

By Charles A. Perry

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CONVERSION FACTORS

The inch-pound units of measurement used in this report can be converted to the International System (SI) of Units using the following factors:

<u>Multiply</u> <u>inch-pound unit</u>	<u>By</u>	<u>To obtain</u> <u>SI unit</u>
inch	1/ 25.4	millimeter
foot	0.3048	meter
mile	1.609	kilometer
ounce per cubic inch	0.578	grams per cubic centimeter

¹ Exact conversion factor.

NATURAL GROUND-WATER-RECHARGE DATA FROM THREE SELECTED SITES IN HARVEY COUNTY, SOUTH-CENTRAL KANSAS

By Charles A. Perry

INTRODUCTION

The "Equus beds" in the south-central part of the State is one of the major aquifers in Kansas. The cities of Wichita, Newton, and several smaller towns pump large quantities of water from the "Equus beds" in Harvey County. The aquifer also supplies large quantities of water for irrigation at a steadily increasing rate. The Harvey County Planning Department entered into a cooperative agreement with the U.S. Geological Survey to collect information on natural recharge in areas of different soils and unsaturated-zone lithologies. This information can be used in studying the possibility of protecting the major natural-recharge area of the "Equus beds" aquifer from any development that might impede recharge.

The purpose of this report is to present the data obtained between June of 1982 and June 1983 for three natural recharge sites in Harvey County. This information was included in an extensive investigation of natural ground-water recharge in the Kansas Plains, which was conducted jointly by the U.S. Geological Survey and the Kansas Geological Survey (Sophocleus and Perry, 1984).

DESCRIPTION OF INSTRUMENTED RECHARGE SITES

Harvey County lies within the Central Loess Plains resource area of the Central Great Plains Winter Wheat and Range resource region. The western part of the county contains a large supply of "good" quality water in the "Equus beds" in the Meade Formation of Pleistocene age. Parts of this region do not have established drainage patterns. Although some soils are steep, they are sandy and absorb the precipitation that falls (Soil Conservation Service, 1974). The average annual rainfall varies from 28 to 30 inches, although actual annual values can range from one-half to nearly twice these values (National Oceanic and Atmospheric Administration, 1980).

The sites for natural ground-water recharge were selected in the "Equus beds" aquifer within Harvey County. In addition to the main natural-recharge study site, located 2 miles northwest of Burrton, the three Harvey County sites (fig. 1) were chosen according to soil type and unsaturated-zone lithologies. The surface soil types are the Pratt loamy fine sand at the Harvey 1 recharge site, the Crete silt loam at Harvey 2 recharge site, and the Naron fine sandy loam and the Farnum-Slickspots complex at Harvey 3 recharge site (Soil Conservation Service, 1974). The underlying lithologies and the water-table levels at the time that lithologies were determined for each site are described in figures 2-4. The density of the underlying soils were measured by a density probe at selected points below the surface. Soil densities also are depicted in figures 2-4.

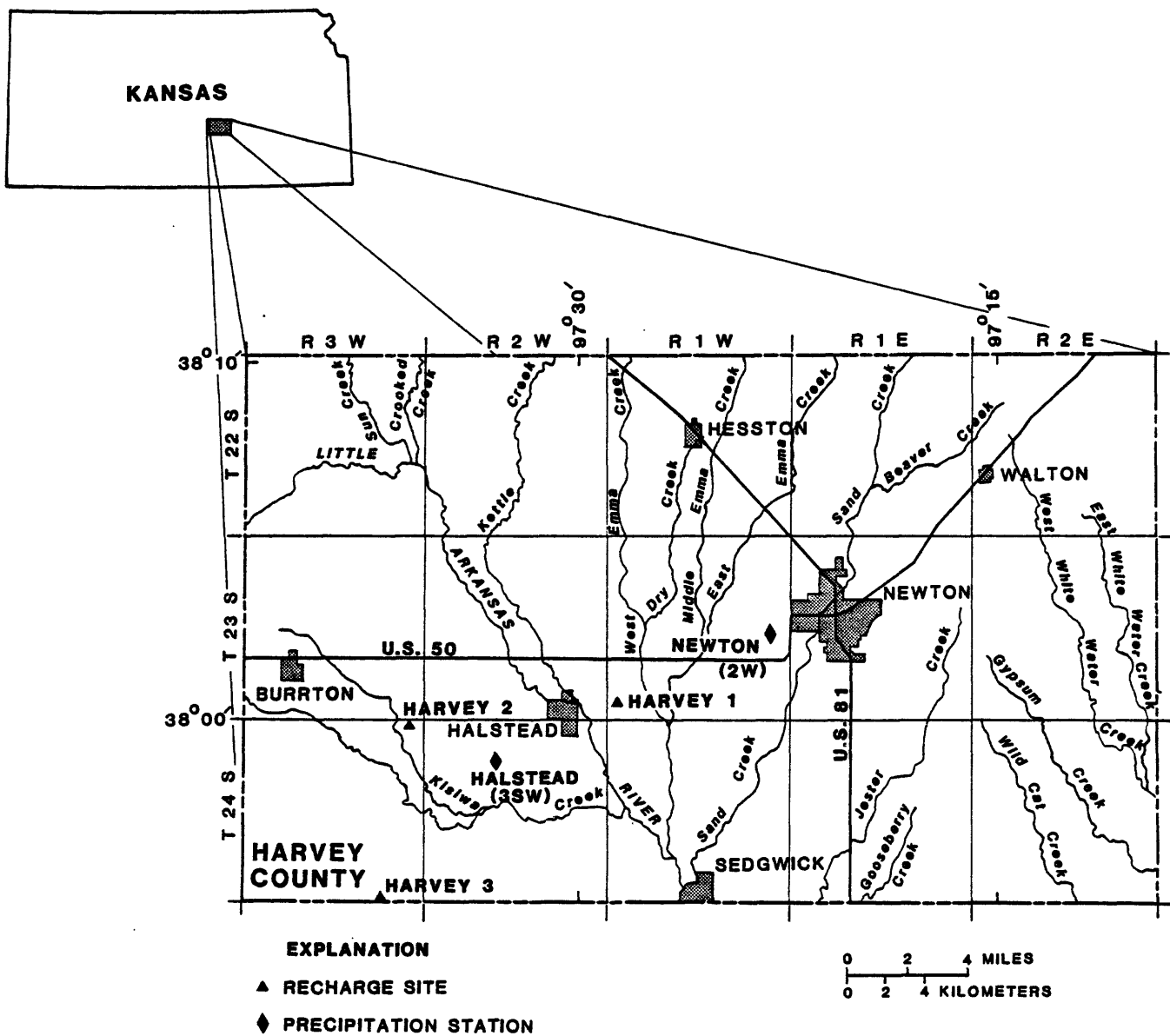


Figure 1.--Location of natural ground-water recharge instrumentation sites and National Weather Service precipitation stations.

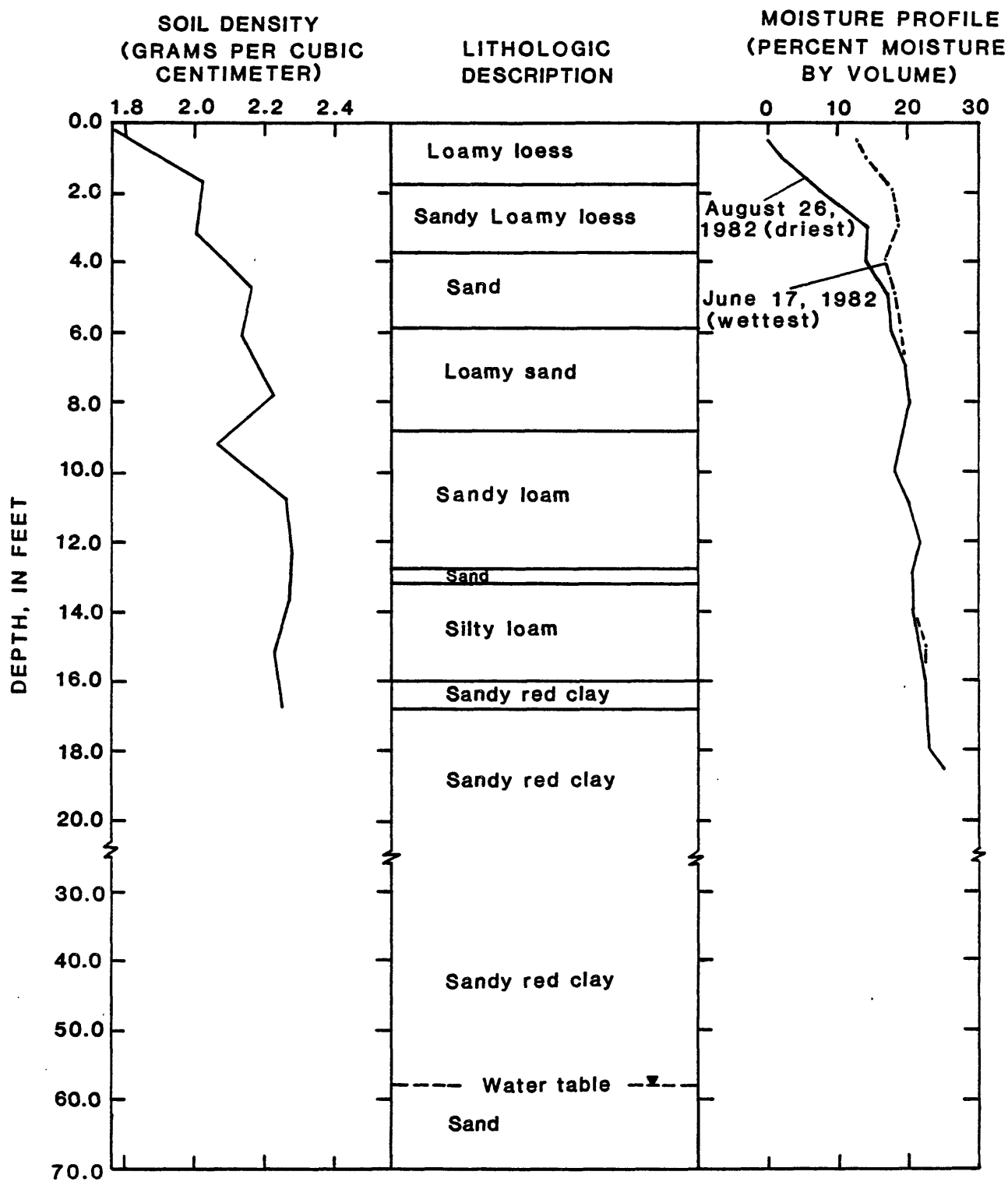


Figure 2.--Soil density, lithologic description, and moisture profile for Harvey 1 recharge site.

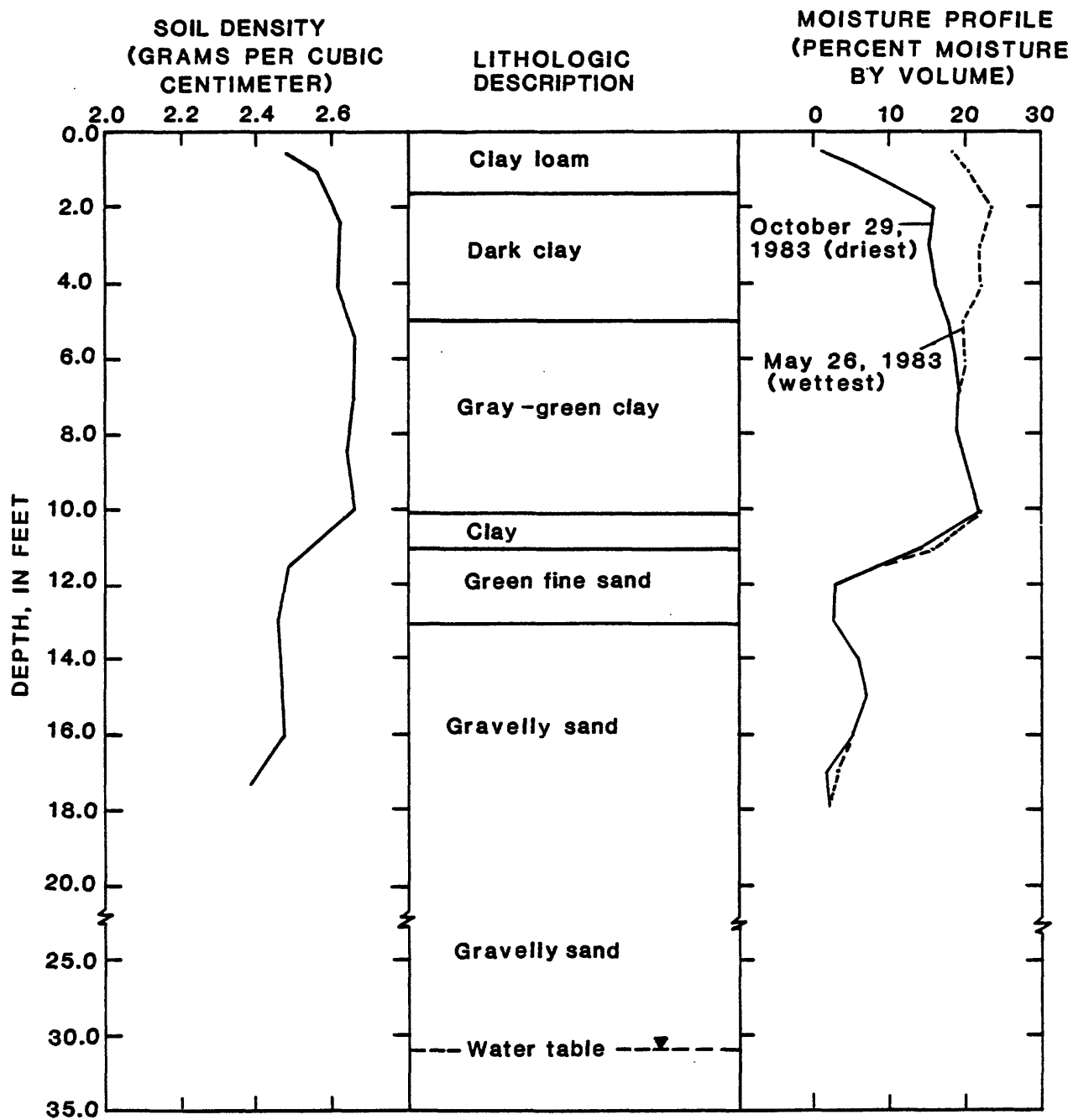


Figure 3.--Soil density, lithologic description, and moisture profile for Harvey 2 recharge site.

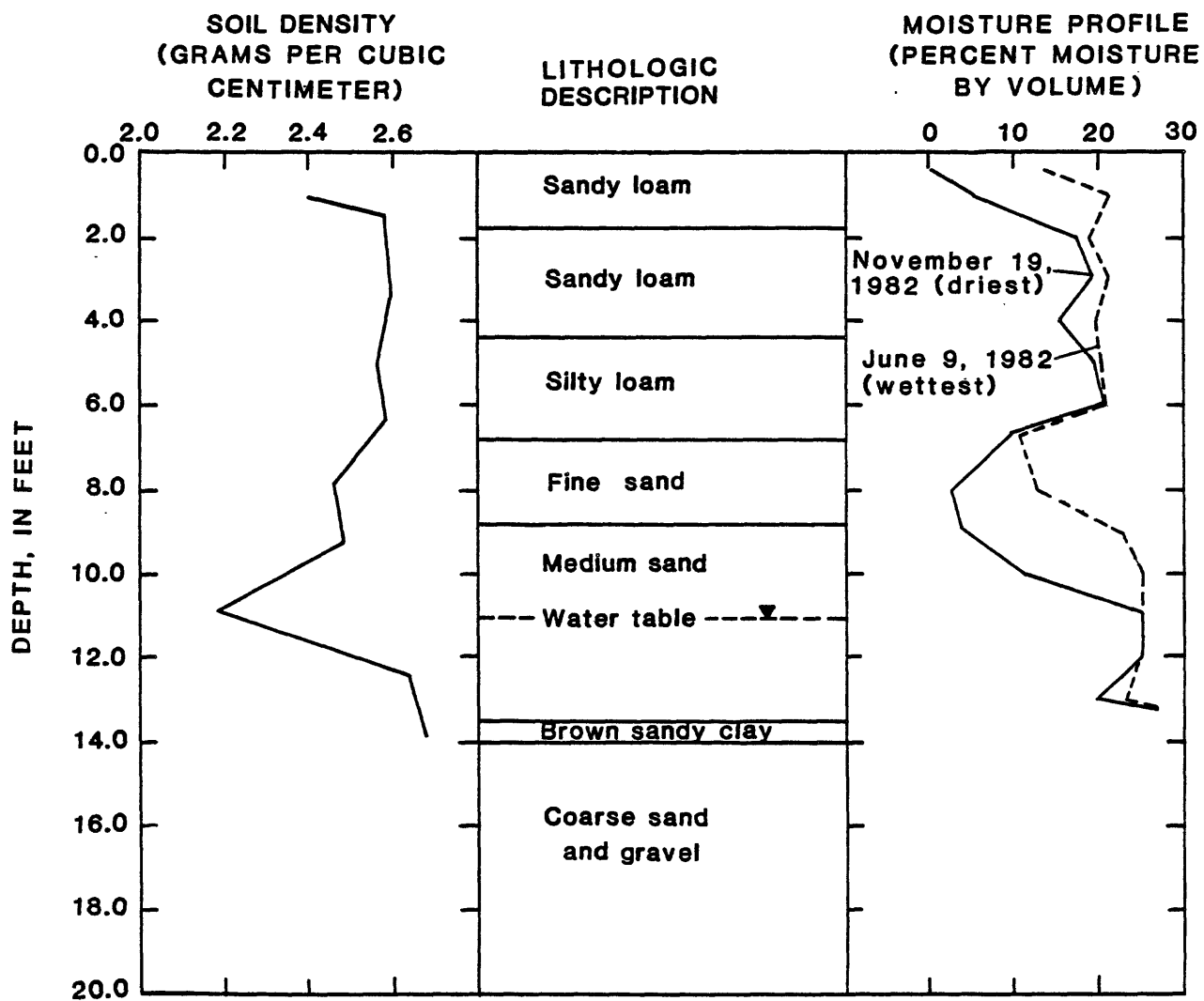


Figure 4.--Soil density, lithologic description, and moisture profile for Harvey 3 recharge site.

INSTRUMENTATION

The data collected at each instrumentation site included precipitation amounts, changes in soil moisture, and fluctuations of ground-water levels. The instruments used to collect this data were a recording rain gage, a neutron-moisture probe, and steel-tape measurements in observation wells.

The rain gages consisted of an 8-inch-diameter funnel atop a steel instrument shelter on steel legs. The catchment funnel was connected by plastic tubing to a plastic-pipe reservoir. A float in the reservoir was linked by beaded cable to a Fischer-Porter^{1/} paper-tape punch recorder. The reservoir was constructed to empty automatically when full. Rain gages were serviced at least monthly, and the paper tapes converted to precipitation tables. The rain gages were operated during nonfreezing months. Tables 1-3 (at the end of this report) contain daily precipitation values for the individual recharge sites. Periods of missing record were completed by incorporating precipitation data from National Weather Service stations at Newton (2W) and Halstead (3SW) (fig. 1). Precipitation data from the closest station available to the site were substituted for the missing record. Accumulations of precipitation from one series of neutron-soil moisture measurements to the next are included in table 4 (at the end of this report), and are plotted in figures 5-7.

Soil moisture was measured at various depths by an observer on a weekly schedule using a Campbell-Pacific Nuclear model 502DR moisture probe in an access tube. The neutron-probe access tubes were constructed from 2 1/8-inch outside diameter, 0.065-inch wall, cold-rolled electric-welded hydraulic tubing by sealing the lower end with a rubber stopper and a concrete-bentonite mixture. The tubes were pressed into holes made by a 2 1/8-inch press-core barrel, resulting in a tight fit. Soil-moisture values determined from soil samples in the press-core barrel were used to calibrate the soil-moisture probe. Individual soil-moisture-probe measurements are listed in tables 5-7 (at the end of this report). The wettest and driest soil-moisture profiles observed for each site are shown in figures 2-4. Time distributions of average soil moisture for various layers are depicted in figures 5-7. Individual soil-moisture values for depths within a specified layer were averaged.

Water levels were measured in wells located close to the neutron-access tubes. Existing wells at the Harvey 1 recharge site were used for water-level measurements.^{2/} The wells at the Harvey 2 and 3 sites were augered, and 2-inch plastic pipes, continuously screened, were inserted for measuring water-table altitudes. Lithologies below those obtained from the press-core barrel were described from auger cuttings or by continuous, natural gamma logs. Measurements of the distance from land surface to the water table were made with a steel tape. Water-table levels are listed in table 4 and are shown in figures 5-7.

¹ The use of brand names in this report is for identification purposes only and does not imply endorsement by the U.S. Geological Survey or the Harvey County Planning Commission.

² Due to placement of a pump into the primary well at the Harvey 1 recharge site by the landowner, a secondary well at a land-surface altitude of 8 feet lower than the primary well was utilized.

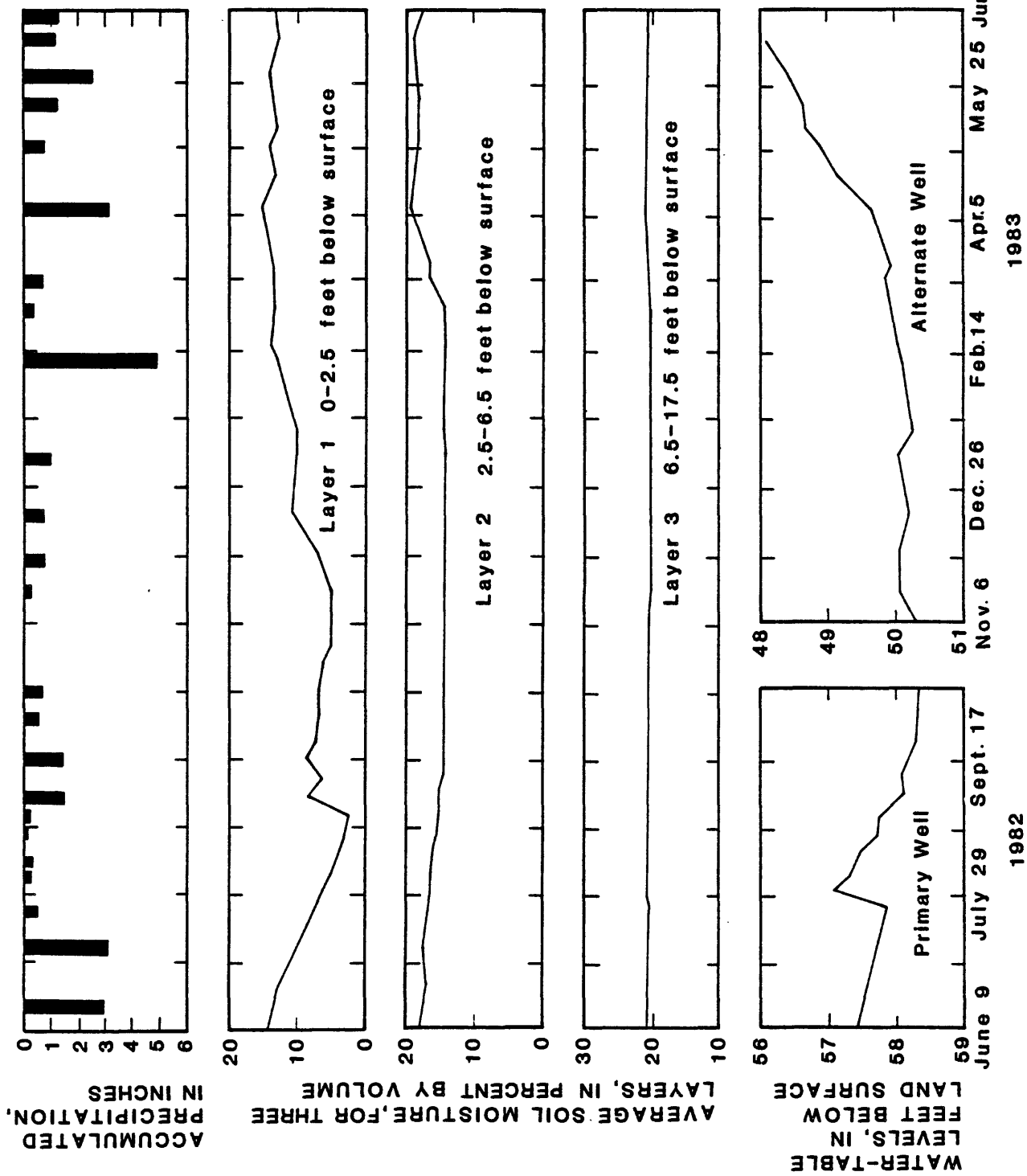


Figure 5.--Accumulated precipitation, average soil moisture for three layers, and water-table levels at Harvey 1 recharge site, June 10, 1982, to June 17, 1983.

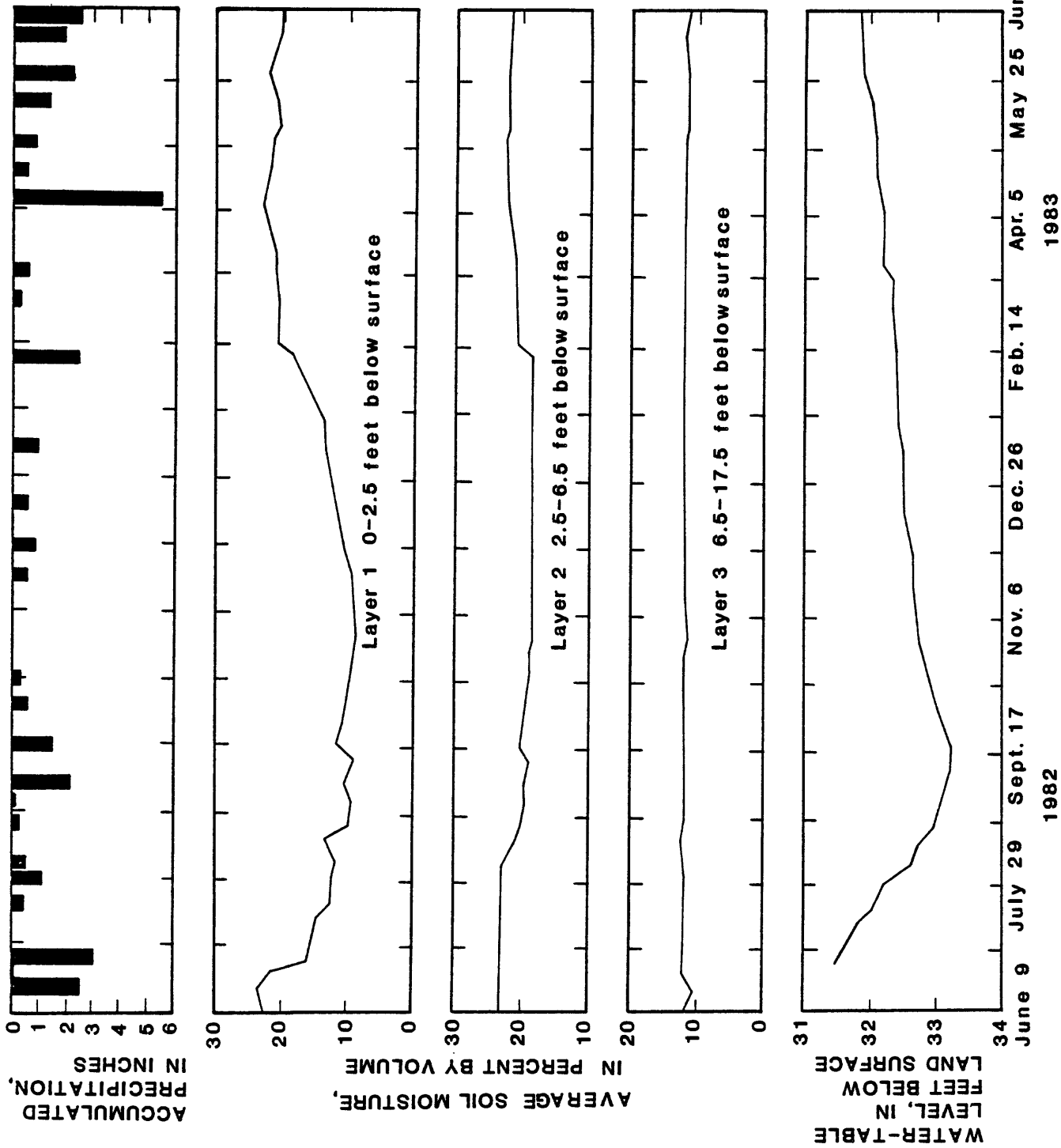


Figure 6.--Accumulated precipitation, average soil moisture for three layers, and water-table levels at Harvey 2 recharge site, June 9, 1982, to June 17, 1983.

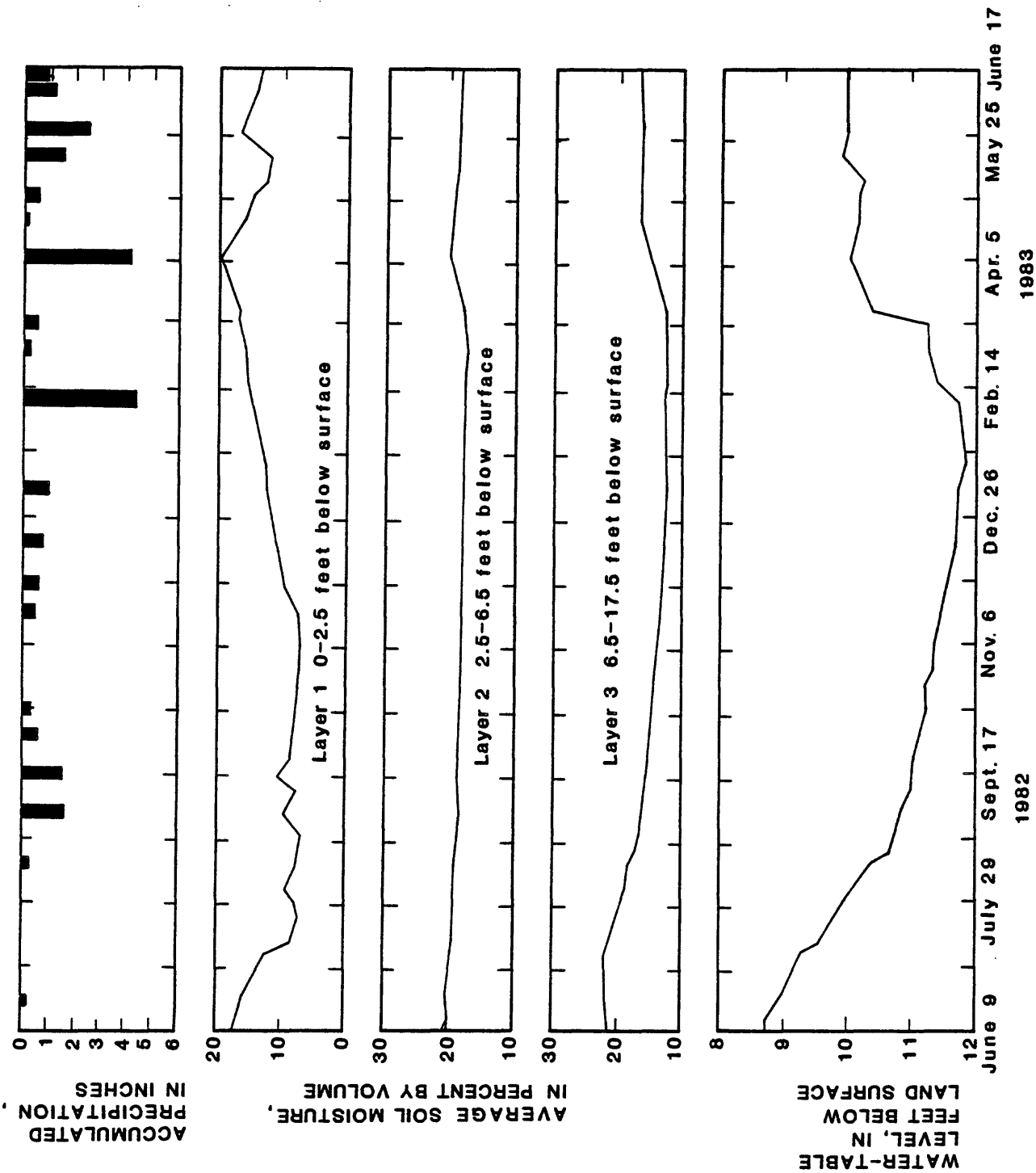


Figure 7.--Accumulated precipitation, average soil moisture for three layers, and water-table levels at Harvey 3 recharge site, June 9, 1982, to June 17, 1983.

REFERENCES CITED

- National Oceanic and Atmospheric Administration, 1980, Climatological data for Kansas--annual summary, 1980: U.S. Department of Commerce, v. 94, no. 13, 16 p.
- Soil Conservation Service, 1974, Soil survey of Harvey County, Kansas: U.S. Department of Agriculture, 55 p.
- Sophocleus, Marios, and Perry, C. A., 1984, Experimental studies in natural ground water recharge dynamics--Assessment of recent advances in instrumentation: Journal of Hydrology, v. 70. p. 369-382.
- Williams, C. C., and Lohman, S. W., 1949, Geology and ground-water resources of a part of south-central Kansas, with special reference to the Wichita municipal water supply: Kansas Geological Survey Bulletin 79, 455 p.

Table 1.--Summary of daily rainfall for Harvey 1 recharge site

(Values are given in inches)

Rainfall for 1982

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	-	-	-	-	-	0	1.66	0	0	0	0	0.10*
2	-	-	-	-	-	0.74	0	0	0.06	0.35	0	0
3	-	-	-	-	-	.66	0	0	0	0	0	0
4	-	-	-	-	-	0	0	0.06	0	0	0	0
5	-	-	-	-	-	0	0	.21	0	0	0	.10*
6	-	-	-	-	-	0	0	0	.02	0	0	0
7	-	-	-	-	-	0	0	0	0	0	0	0
8	-	-	-	-	-	0	0	0	0	.68	0	0
9	-	-	-	-	-	0	.21	0	0	0	0	.20*
10	-	-	-	-	-	0	0	0	0	0	0	.30*
11	-	-	-	-	-	.76	0	0	0	0	0.19	0
12	-	-	-	-	-	0	0	0	.16	0	0	0
13	-	-	-	-	-	0	0	0	.07	0	0	0
14	-	-	-	-	0.11	0	0	.10	1.23	0	0	0
15	-	-	-	-	.23	1.90*	0	0	0	0	0	0
16	-	-	-	-	.02	0	0	0	0	0	0	0
17	-	-	-	-	1.83	0	0	0	0	0	0	0
18	-	-	-	-	.22	.21	0	0	0	0	0	0
19	-	-	-	-	0	0	0	0	0	0	0	0
20	-	-	-	-	0	0	0	0	0	0	0	0
21	-	-	-	-	.12	0	0	0	0	0	0	0
22	-	-	-	-	0	0	0	0	0	0	0	0
23	-	-	-	-	0	0	.46	.14	0	0	0	.10*
24	-	-	-	-	.22	0	0	.09	0	0	0	0
25	-	-	-	-	.23	0	0	0	0	0	0	0
26	-	-	-	-	.13	.49	0	0	0	0	0	0
27	-	-	-	-	0	.68	0	0	0	0	.30*	.80*
28	-	-	-	-	.34	0	.21	0	0	0	.30*	0
29	-	-	-	-	0	0	0	1.32	.17	0	0	0
30	-	-	-	-	.26	0	0	0	0	0	0	0
31	-	-	-	-	.97	0	0	.06	0	0	0	0
TOTAL	-	-	-	-	4.57	5.46	2.54	1.98	1.71	1.03	0.79	1.60

* - INDICATES HALSTEAD 3SW PRECIPITATION
- INDICATES NEWTON 2W PRECIPITATION

Table 1.--Summary of daily rainfall for Harvey 1 recharge site--Continued

(Values are given in inches)

Rainfall for 1983

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	0	1.46#	0	0.64	0	0	0	0	-	-	-	-
2	0	.80#	0	0	0	0.10	0	0	-	-	-	-
3	0	.90#	.30*	.15	0	.44	0.47	0	-	-	-	-
4	0	0	0	.08	0	0	0	0	-	-	-	-
5	0	0	.20*	0	0	.13	0	0	-	-	-	-
6	0	.03#	.10*	0	0	.06	0	0.11#	-	-	-	-
7	0	0	0	0	0	0	0	0	-	-	-	-
8	0	0	0	0	0	0	0	0	-	-	-	-
9	0	0	0	0	0	0	0	0	-	-	-	-
10	0	0	0	0	.28	.43	0	0	-	-	-	-
11	0	0	0	0	0	0	0	0	-	-	-	-
12	0	0	0	0	.02	.74	0	0	-	-	-	-
13	0	0	0	0	.76	0	0	0	-	-	-	-
14	0	0	0	0	0	0	0	0	-	-	-	-
15	0	0	0	0	0	0	0	0	-	-	-	-
16	0	0	0	0	0	0	0	0	-	-	-	-
17	0	0	0	0	0	0	0	0	-	-	-	-
18	0	0	0	0	.22	0	0	0	-	-	-	-
19	0.20*	0	.25	0	0	0	0	0	-	-	-	-
20	0	.10#	0	0	.63	0	0	1.73#	-	-	-	-
21	0	.13#	0	.09	1.26	0	0	.10#	-	-	-	-
22	0	0	0	.07	0	0	0	0	-	-	-	-
23	0	0	0	0	0	0	0	0	-	-	-	-
24	0	0	0	0	0	.51	0	0	-	-	-	-
25	.10*	0	.68	0	.22	.90	0	0	-	-	-	-
26	0	0	.53	0	.08	.17	0	0	-	-	-	-
27	0	0	0	.55	.22	.02	0	0	-	-	-	-
28	0	0	0	0	0	0	0	0	-	-	-	-
29	0	0	.77	0	.25	0	0	.01#	-	-	-	-
30	.10*	0	0	.07	0	0	0	.06#	-	-	-	-
31	.40	0	0	0	0	0	0	0	-	-	-	-
TOTAL	0.80	3.42	2.88	1.65	3.94	3.50	0.47	2.01	-	-	-	-

* - INDICATES HALSTEAD 3SW PRECIPITATION

- INDICATES NEWTON 2W PRECIPITATION

Table 2.--Summary of daily rainfall for Harvey 2 recharge site
(Values are given in inches)

Rainfall for 1982

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	-	-	-	-	-	0	1.61	0	0	0	0	9.10*
2	-	-	-	-	-	0.47	0	0	0.03	0.20	0	0
3	-	-	-	-	-	.21	0	0	0	0	0	0
4	-	-	-	-	-	0	0	0.06	0	0	0	0
5	-	-	-	-	-	0	0	.40	0	0	0	.10*
6	-	-	-	-	-	0	0	.02	0	.07	0	0
7	-	-	-	-	-	0	0	0	0	.22	0	0
8	-	-	-	-	-	0	0	0	0	0	0	0
9	-	-	-	-	-	0	.55	0	0	0	0	.20*
10	-	-	-	-	-	1.06	.02	0	0	0	0	.30*
11	-	-	-	-	-	0	0	0	0	0	0.54	0
12	-	-	-	-	-	0	0	0	0	0	0	0
13	-	-	-	-	-	0	0	0	0	0	0	0
14	-	-	-	-	1.41	0	0	.22	1.46	0	0	0
15	-	-	-	-	0	.99*	0	0	0	0	0	0
16	-	-	-	-	1.87	0	0	0	0	0	0	0
17	-	-	-	-	.31	.59	0	0	0	0	0	0
18	-	-	-	-	0	0	0	0	0	0	0	0
19	-	-	-	-	.21	0	0	0	0	0	0	0
20	-	-	-	-	0	.08	0	0	0	0	0	0
21	-	-	-	-	0	0	.51	0	0	0	.17	0
22	-	-	-	-	0	0	0	0	0	0	0	0
23	-	-	-	-	.26	0	0	.11	0	0	0	.10*
24	-	-	-	-	.05	0	0	0	0	0	0	0
25	-	-	-	-	0	.94	0	0	0	0	0	0
26	-	-	-	-	0	0	1.21	0	0	0	.30*	.80*
27	-	-	-	-	.88	0	0	0	0	0	.30*	0
28	-	-	-	-	.04	0	0	1.72	.23	0	0	0
29	-	-	-	-	.20	0	0	0	0	0	0	0
30	-	-	-	-	1.13	0	0	.41	0	0	0	0
31	-	-	-	-	---	---	---	---	---	---	---	---
TOTAL	-	-	-	-	6.36	4.34	3.90	2.94	1.72	0.49	1.31	1.60

* - INDICATES HALSTEAD 3SW PRECIPITATION
- INDICATES NEWTON 2W PRECIPITATION

Table 2.--Summary of daily rainfall for Harvey 2 recharge site--Continued

(Values are given in inches)

Rainfall for 1983

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	0	0.60*	0	0.60#	0	0.04	0	0	-	-	-	-
2	0	.10*	0	.43#	0	0	0	0	-	-	-	-
3	0	.90#	0.30*	0	0	0	0	0	-	-	-	-
4	0	0	0	.97#	0	0	1.08#	0	-	-	-	-
5	0	.03#	.20*	.86#	0	.08	0	0	-	-	-	-
6	0	0	.10*	.01#	0	.75	0	0	-	-	-	-
7	0	0	0	0	0	0	0	0.11#	-	-	-	-
8	0	0	0	0	0	.25	0	0	-	-	-	-
9	0	0	0	.20#	0	.02	0	0	-	-	-	-
10	0	0	0	.02#	0.21	.16	0	0	-	-	-	-
11	0	0	0	0	.04	.41	0	0	-	-	-	-
12	0	0	0	0	0	0	0	0	-	-	-	-
13	0	0	0	0	.02#	0	0	0	-	-	-	-
14	0	0	0	.15#	1.00#	1.90*	0	0	-	-	-	-
15	0	0	0	0	.02#	0	0	0	-	-	-	-
16	0	0	0	0	0	0	0	0	-	-	-	-
17	0	0	0	0	0	0	0	0	-	-	-	-
18	0	0	0	0	.29#	0	0	0	-	-	-	-
19	0.20*	0	.18	0	0	0	0	0	-	-	-	-
20	0	.10#	0	0	.25#	0	0	0	-	-	-	-
21	0	.13#	0	0	1.60#	0	0	0	-	-	-	-
22	0	0	0	.20#	.01#	0	0	0	-	-	-	-
23	0	0	0	.10#	0	0	0	0	-	-	-	-
24	0	0	0	0	0	0	0	0	-	-	-	-
25	.10*	0	.71	0	.07#	.30*	.01*	0	-	-	-	-
26	0	0	.90*	0	0	.60*	0	0	-	-	-	-
27	0	0	.20*	0	.22#	.20*	0	0	-	-	-	-
28	0	0	0	.39#	.03#	.20*	0	0	-	-	-	-
29	0	0	.40*	0	.29#	0	0	.01*	-	-	-	-
30	.10*	0	.20*	0	0	0	0	.06*	-	-	-	-
31	.40*	0	0	0	.30	0	0	0	-	-	-	-
TOTAL	0.80	1.86	3.19	3.93	4.36	4.92	1.09	0.18	----	----	----	----

* - INDICATES HALSTEAD 35W PRECIPITATION

- INDICATES NEWTON 2W PRECIPITATION

Table 3.--Summary of daily rainfall for Harvey 3 recharge site

(Values are given in inches)

Rainfall for 1982

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	-	-	-	-	-	1.10	0	0	0	0	0	0.10
2	-	-	-	-	-	.12	0	0	0.31	0.39	0	0
3	-	-	-	-	-	.49	0	0	0	0	0	0
4	-	-	-	-	-	.57	0	0	.02	0	0	.10
5	-	-	-	-	-	0	0	0	0	0	0	0
6	-	-	-	-	-	0	0	0	.02	0	0	0
7	-	-	-	-	-	0	0	0	0	0	0	0
8	-	-	-	-	-	0	0	0	.01	.30	0	0
9	-	-	-	-	-	0	0	0	0	0	0	.20
10	-	-	-	-	-	0	0	0	0	0	0	.30
11	-	-	-	-	-	.26	0	0	0	0	0.47	0
12	-	-	-	-	-	0	0	0	.01	0	0	0
13	-	-	-	-	-	0	0	0	.12	0	0	0
14	-	-	-	-	0	0	0	0.29	1.35	0	0	0
15	-	-	-	-	0	0	0	0	0	0	0	0
16	-	-	-	-	0.57	0	0	0	0	0	0	0
17	-	-	-	-	0	0	0	0	0	0	0	0
18	-	-	-	-	2.19	0	0	0	0	0	0	0
19	-	-	-	-	.29	0	0	0	0	0	0	0
20	-	-	-	-	0	0	0	0	0	0	0	0
21	-	-	-	-	0	0	0	0	0	0	0	0
22	-	-	-	-	.49	0	0	0	.01	0	0	0
23	-	-	-	-	0	0	0	0	.01	0	0	0
24	-	-	-	-	0	0	0	0	0	0	0	.10
25	-	-	-	-	.03	0	0	0	0	0	0	0
26	-	-	-	-	0	0	0	0	0	0	0	0
27	-	-	-	-	.13	0	0	0	0	0	0	.80
28	-	-	-	-	.08	0	0	0	0	0	.30	0
29	-	-	-	-	0	0	0	1.14	.20	0	.30	0
30	-	-	-	-	.97	0	0	.09	0	0	0	0
31	-	-	-	-	0	0	0	.12	0	0	0	0
TOTAL	-	-	-	-	4.67	2.54	0	1.64	2.06	0.69	1.07	1.60

* - INDICATES HALSTEAD 35W PRECIPITATION

- INDICATES NEWTON 2W PRECIPITATION

Table 3.--Summary of daily rainfall for Harvey 3 recharge site--Continued

(Values are given in inches)

Rainfall for 1983

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	U	1.76#	0	U	0	0	0	0	-	-	-	-
2	U	.90#	0	U	0	0.05	0	0	-	-	-	-
3	U	.90#	0.30*	0.89	0	.46	1.06	0	-	-	-	-
4	U	U	U	.69	0	0	0	0	-	-	-	-
5	U	U	.20*	0	0	.24	0	0	-	-	-	-
6	U	.03#	.10*	0	0	0	0	0	-	-	-	-
7	U	U	U	0	0	0	0	0	-	-	-	-
8	U	U	U	0	0	0	0	0	-	-	-	-
9	U	U	U	U	U	0	0	0	-	-	-	-
10	U	U	U	0	0.12	.58	0	0	-	-	-	-
11	U	U	U	0	0	0	0	0	-	-	-	-
12	U	U	U	.12	1.26	.57	0	0	-	-	-	-
13	U	U	U	0	0	0	0	0	-	-	-	-
14	U	U	U	0	0	0	0	0	-	-	-	-
15	U	U	U	0	0	0	0	0	-	-	-	-
16	U	U	U	0	0	0	0	0	-	-	-	-
17	U	U	U	0	.18	0	0	0	-	-	-	-
18	U	U	U	0	0	.19	0	0	-	-	-	-
19	U	U	.08	0	0	0	0	0	-	-	-	-
20	0.20*	.10#	0	0	1.54	0	0	1.73#	-	-	-	-
21	U	.13#	U	.14	.42	0	0	.10#	-	-	-	-
22	U	U	0	.05	0	0	0	0	-	-	-	-
23	U	U	0	0	0	0	0	0	-	-	-	-
24	U	U	0	0	.09	0	0	0	-	-	-	-
25	.10*	U	.63	0	.19	.26	0	0	-	-	-	-
26	U	U	.62	0	0	.15	0	0	-	-	-	-
27	U	U	U	.22	.23	.71	0	0	-	-	-	-
28	U	U	.88	0	.11	.15	0	0	-	-	-	-
29	U	U	U	0	.07	0	0	.01#	-	-	-	-
30	.10*	U	U	0	0	0	.03	.06#	-	-	-	-
31	.40*	U	.31	0	0	0	0	0	-	-	-	-
TOTAL	.80	3.92	3.12	2.09	4.21	3.16	1.09	1.90	----	----	----	----

* - INDICATES HALSTEAD 35W PRECIPITATION

* - INDICATES NEWTON 2W PRECIPITATION

Table 4.--Average soil moisture for selected layers, water-table levels, and accumulated precipitation between soil-moisture measurements

Harvey 1 recharge site

DATE MO/DA/YR	AVERAGE SOIL MOISTURE (PERCENT-BY VOLUME)			WATER-TABLE LEVEL BELOW SURFACE ----(FEET)----	ACCUMULATED PRECIPITATION ----(INCHES)---
	LAYER 1 (0.5-2.0 --FEET)	LAYER 2 (3.0-6.0 --FEET)	LAYER 3 (7.0-17.0 --FEET)		
6/10/82	13.9	18.5	20.9	-	-
6/17/82	14.7	18.0	20.8	-	2.87
6/24/82	13.3	17.8	20.7	-	0
7/ 9/82	12.9	18.2	20.8	58.26	3.04
7/15/82	10.5	18.1	20.8	-	0
7/23/82	7.9	17.3	20.6	57.12	.46
7/30/82	6.7	17.1	20.8	57.36	.21
8/ 5/82	5.7	16.9	20.7	58.91	.27
8/13/82	4.0	16.4	20.7	57.75	0
8/19/82	3.5	16.1	20.7	57.80	.10
8/26/82	3.1	15.7	20.8	58.17	.23
9/ 5/82	8.8	15.7	20.7	58.13	1.42
9/11/82	6.5	15.1	20.6	58.22	.02
9/17/82	9.1	15.3	20.7	58.34	1.46
9/24/82	7.7	15.2	20.6	58.37	0
10/ 2/82	7.3	15.1	20.7	58.43	.52
10/11/82	7.3	14.9	20.8	-	.68
10/22/82	6.3	14.8	20.7	-	0
10/29/82	5.8	14.7	20.7	50.32*	0
11/ 8/82	5.4	14.5	20.7	50.14*	0
11/19/82	5.5	14.6	20.3	50.12*	.19
11/29/82	6.9	14.5	20.6	50.23*	.60
12/16/82	9.3	14.4	20.7	50.12*	.70
1/ 7/83	10.6	14.3	20.6	50.13*	.90
1/15/83	10.5	14.5	20.7	50.17*	0
2/10/83	13.1	14.1	20.5	50.07*	4.49
2/16/83	14.2	14.2	20.4	49.99*	0
3/ 1/83	13.6	14.6	20.3	49.88*	.23
3/13/83	13.7	16.6	20.4	49.96*	.60
3/18/83	13.9	16.6	20.4	49.70*	0
4/ 7/83	15.5	19.8	21.3	49.19*	3.15
4/19/83	13.6	19.1	21.2	48.93*	0
4/25/83	14.2	18.5	21.2	48.78*	.71
5/ 6/83	13.2	18.3	21.1	48.73*	.07
5/16/83	13.7	18.2	21.1	48.50*	1.06
5/26/83	14.4	19.7	21.2	48.16*	2.41
6/ 8/83	12.9	19.0	21.0	48.11*	1.20
6/17/83	13.1	17.8	21.1	48.11*	1.17

* Land surface at alternate well was approximately 8.1 feet lower than primary well

Table 4.--Average soil moisture for selected layers, water-table levels, and accumulated precipitation between soil-moisture measurements--Continued

Harvey 2 recharge site

DATE	AVERAGE SOIL MOISTURE			WATER-TABLE LEVEL BELOW SURFACE ----(FEET)----	ACCUMULATED PRECIPITATION ----(INCHES)----
	(PERCENT BY VOLUME)				
	LAYER 1 (0.5-2.0 ----(FEET)----	LAYER 2 (3.0-6.0 ----(FEET)----	LAYER 3 (7.0-17.0 ----(FEET)----		
6/ 9/82	22.2	23.3	11.9	31.63	-
6/17/82	23.0	23.0	10.6	31.57	2.64
6/24/82	21.3	23.2	12.1	-	.03
7/ 9/82	15.9	23.1	12.0	31.48	3.10
7/15/82	14.6	22.9	12.0	31.85	.02
7/23/82	12.6	23.0	11.9	32.08	.51
7/30/82	12.4	22.8	11.8	32.26	1.21
8/ 5/82	11.8	22.2	12.0	32.61	.46
8/13/82	15.0	21.9	10.4	32.76	.02
8/19/82	9.9	20.3	11.9	32.94	.22
8/26/82	9.4	19.6	11.9	33.08	.11
9/ 3/82	10.4	19.8	11.9	33.16	2.16
9/11/82	9.2	19.0	11.9	33.25	0
9/17/82	11.8	20.2	12.0	33.21	1.46
9/24/82	10.6	19.7	12.1	33.14	0
10/ 2/82	10.1	19.3	12.0	33.04	.43
10/11/82	9.6	18.8	11.9	32.95	.29
10/22/82	9.2	18.7	11.9	32.82	0
10/29/82	9.1	18.3	11.6	32.75	0
11/ 8/82	9.1	18.3	11.9	32.68	0
11/19/82	9.4	18.4	12.0	32.66	.54
11/29/82	10.9	18.4	12.0	32.59	.77
12/16/82	11.8	18.4	12.0	32.53	.70
1/ 7/83	13.6	18.5	12.0	32.50	.90
1/15/83	13.6	18.5	12.1	32.40	0
2/10/83	18.3	18.6	12.0	32.39	2.43
2/16/83	20.8	21.0	12.0	32.35	0
3/ 1/83	20.5	21.0	11.9	32.33	.23
3/13/83	20.9	21.4	11.9	32.32	.60
3/18/83	20.9	21.6	11.9	32.23	0
4/ 7/83	23.3	22.4	11.9	32.20	5.46
4/14/83	21.9	22.5	11.9	32.13	.37
4/29/83	21.7	22.5	11.9	32.09	.69
5/ 6/83	20.6	22.2	11.8	32.05	0
5/16/83	20.9	22.2	11.9	32.02	1.29
5/26/83	22.4	22.4	11.8	31.91	2.23
6/ 8/83	20.6	22.0	12.1	31.87	1.97
6/17/83	20.1	21.9	11.6	31.87	2.49

Table 4.--Average soil moisture for selected layers, water-table levels, and accumulated precipitation between soil-moisture measurements--Continued

Harvey 3 recharge site

DATE MONTH/DAY/YEAR	AVERAGE SOIL MOISTURE (PERCENT BY VOLUME)			WATER-TABLE LEVEL BELOW SURFACE ----(FEET)----	ACCUMULATED PRECIPITATION ----(INCHES)---
	LAYER 1 (0.5-2.0 ---FEET)---	LAYER 2 (3.0-6.0 ---FEET)---	LAYER 3 (7.0-17.0 ---FEET)---		
6/ 9/82	17.8	20.4	20.8	8.75	-
6/17/82	17.0	19.9	21.3	9.72	0.26
5/24/82	16.0	20.4	21.6	9.99	0
7/ 4/82	12.7	19.7	21.5	9.23	0
7/16/82	8.8	19.4	21.1	9.55	0
7/23/82	7.8	19.2	20.0	9.77	0
7/30/82	9.2	19.3	18.8	9.88	0
8/ 5/82	9.6	19.1	18.4	10.12	0
8/13/82	7.9	19.0	17.9	10.37	0
8/19/82	7.5	18.8	17.0	10.60	.29
8/26/82	7.1	18.7	16.3	10.69	0
9/ 3/82	9.9	18.5	16.2	10.82	1.66
9/11/82	8.0	18.6	15.8	10.97	.05
9/17/82	10.5	18.7	15.2	10.98	1.43
9/24/82	9.2	18.4	15.4	11.02	.02
10/ 2/82	9.6	18.6	14.9	11.09	.59
10/11/82	8.1	18.4	14.7	11.22	.30
10/22/82	7.7	18.4	14.1	11.19	0
10/29/82	7.5	18.2	14.3	11.29	0
11/ 8/82	7.5	18.3	13.7	11.34	0
11/19/82	7.6	18.3	13.3	11.41	.47
11/29/82	9.4	18.3	13.2	11.53	.60
12/15/16	11.2	18.3	12.9	11.66	.70
1/ 7/83	12.6	18.3	12.6	11.70	.90
1/15/83	12.7	18.3	12.5	11.82	0
2/10/83	14.8	18.2	12.8	11.70	4.49
2/17/83	15.6	18.1	12.3	11.38	0
3/ 1/83	15.8	17.9	12.6	11.24	.23
3/13/83	16.7	18.3	12.7	11.25	.60
3/18/83	16.7	18.6	12.8	10.35	0
4/ 7/83	19.3	20.5	15.1	10.02	4.08
4/19/83	16.1	20.2	16.7	10.12	.12
4/29/83	15.0	19.7	16.8	10.14	.41
5/ 6/83	12.7	19.5	16.4	10.22	0
5/16/83	12.0	19.5	16.4	9.90	1.38
5/26/83	16.6	19.3	16.7	9.96	2.42
6/ 8/83	14.4	19.0	16.8	9.95	1.16
6/17/83	13.4	19.0	16.6	9.95	.95

Table 5.--Neutron-measured soil moisture for Harvey 1 recharge site

DEPTH BELOW LAND SURFACE (FEET)		SOIL MOISTURE (Percent by volume for dates indicated)											
		6/10/82	6/17/82	6/24/82	7/1/82	7/15/82	7/23/82	7/30/82	8/1/82	8/13/82	8/19/82		
0.5	11.3	12.6	10.6	9.0	4.7	2.6	1.2	0.0	0.0	0.0	0.0		
1.0	12.9	13.8	12.6	12.1	10.2	6.3	4.7	3.4	2.3	2.0	2.0		
2.0	17.5	17.8	16.8	17.3	16.5	14.9	14.1	12.4	9.8	8.5	8.5		
3.0	18.7	18.6	19.0	18.5	18.3	17.4	16.6	16.6	15.9	15.0	15.0		
4.0	17.1	16.4	16.1	17.1	17.5	16.2	16.1	15.7	14.4	14.5	14.5		
5.0	18.7	18.0	17.7	18.1	18.3	17.7	17.8	17.7	17.6	17.4	17.4		
6.0	19.7	18.8	18.4	19.1	18.2	17.8	18.0	17.8	17.4	17.4	17.4		
7.0	19.8	19.7	19.6	19.8	19.7	19.4	19.4	19.6	19.5	19.5	19.5		
8.0	20.1	20.2	19.9	20.1	20.3	20.0	20.1	20.0	20.2	20.1	20.1		
9.0	19.2	19.0	19.2	19.3	19.1	19.0	19.2	19.0	19.2	19.1	19.1		
10.0	18.2	17.9	18.2	18.1	18.1	17.9	18.2	18.1	18.0	18.2	18.2		
11.0	20.8	20.2	19.9	20.3	20.0	19.9	19.9	20.1	19.6	20.0	20.0		
12.0	21.9	21.9	21.6	22.0	21.9	21.5	21.9	21.3	21.3	21.6	21.6		
13.0	20.8	20.7	20.4	20.9	20.7	20.7	20.8	20.6	20.5	20.7	20.7		
14.0	20.9	20.9	21.1	21.0	21.2	20.9	20.8	21.0	21.2	21.0	21.0		
15.0	22.7	22.6	22.1	22.2	22.4	22.1	22.3	22.5	22.1	22.0	22.0		
16.0	22.6	22.7	22.7	22.6	22.8	22.5	22.6	22.8	22.7	22.6	22.6		
17.0	22.7	22.9	22.8	23.0	23.0	22.9	23.0	22.9	23.0	23.1	23.1		
18.0	23.2	23.0	22.9	23.2	23.3	23.1	23.2	23.3	23.0	23.3	23.3		
18.5	25.4	25.3	25.5	25.6	25.4	25.4	25.5	25.5	25.1	25.3	25.3		

Table 5.--Neutron-measured soil moisture for Harvey 1 recharge site--Continued

DEPTH BELOW LAND SURFACE (FEET)	SOIL MOISTURE (Percent by volume for dates indicated)													
	8/28/82	9/13/82	9/11/82	9/17/82	9/24/82	10/12/82	10/11/82	10/22/82	10/29/82	11/8/82				
0.5	0.0	8.0	4.1	9.2	6.6	6.0	6.7	4.6	3.9	3.1				
1.0	1.8	8.9	6.7	8.7	7.5	6.9	6.4	5.7	5.4	5.0				
2.0	7.4	9.5	8.7	9.5	9.1	9.0	8.8	8.5	8.2	9.2				
3.0	14.2	14.1	13.6	14.0	13.9	13.6	13.6	13.5	13.6	13.3				
4.0	14.0	13.7	13.0	13.0	12.7	12.5	12.2	11.9	11.5	11.5				
5.0	17.4	17.3	16.9	17.2	17.0	17.0	17.0	16.7	16.6	16.5				
6.0	17.2	17.6	17.1	17.2	17.3	17.1	16.9	17.0	17.0	16.9				
7.0	19.4	19.6	19.2	19.6	19.4	19.6	19.7	19.5	19.3	19.3				
8.0	20.2	20.4	19.9	20.0	19.9	20.1	20.1	20.0	20.0	19.8				
9.0	19.0	19.1	19.0	19.0	19.1	19.4	19.5	19.2	19.3	19.2				
10.0	18.3	17.8	17.9	18.0	18.0	18.3	18.3	18.0	17.9	18.0				
11.0	20.2	20.1	19.8	20.1	19.9	19.9	20.0	20.1	20.0	19.9				
12.0	21.8	21.6	21.4	21.5	21.6	21.7	21.5	21.4	21.5	21.7				
13.0	20.8	20.7	20.5	20.5	20.2	20.1	20.5	20.3	20.1	20.2				
14.0	21.0	20.8	20.7	20.9	21.0	21.0	21.0	21.0	21.0	21.1				
15.0	21.9	22.0	22.2	22.1	22.2	22.2	22.3	22.0	22.3	22.0				
16.0	22.7	22.8	22.8	22.7	22.8	22.9	22.8	22.7	22.9	22.9				
17.0	23.1	22.8	23.0	22.9	22.8	22.9	23.0	23.2	23.1	23.1				
18.0	23.0	23.1	23.4	23.2	23.0	23.2	23.1	23.4	23.2	23.1				
19.5	25.5	25.4	25.3	25.3	25.6	25.5	25.5	25.5	25.2	25.7				

Table 5.--Neutron-measured soil moisture for Harvey 1 recharge site--Continued

		SOIL MOISTURE (Percent by volume for dates indicated)											
DEPTH BELOW LAND SURFACE (FEET)		11/11/82	11/22/82	12/13/82	-12-2/83	-12/15/83	-2/16/83	-2/15/83	-3/-1/83	-3/13/83	-3/19/83		
		11/11/82	11/22/82	12/13/82	-12-2/83	-12/15/83	-2/16/83	-2/15/83	-3/-1/83	-3/13/83	-3/19/83		
0.5		3.5	7.3	10.5	11.5	10.8	13.0	12.3	11.2	11.5	11.9		
1.0		5.0	5.2	9.1	11.5	11.6	13.0	13.4	12.6	12.6	12.7		
2.0		8.2	8.3	8.3	9.8	9.1	13.2	17.0	16.9	16.8	16.9		
3.0		13.6	13.6	13.5	13.6	13.7	13.7	14.0	15.9	18.2	18.1		
4.0		11.4	11.3	11.2	11.0	11.3	10.7	10.9	10.8	15.9	16.2		
5.0		16.4	16.3	16.0	16.1	16.1	15.8	15.8	15.7	15.7	15.9		
6.0		16.9	16.7	16.7	16.6	16.8	16.3	16.3	16.2	16.5	16.3		
7.0		19.5	19.3	19.0	19.0	19.3	19.1	18.7	18.8	18.9	18.9		
8.0		15.6	19.8	20.0	19.8	19.8	19.6	19.4	19.3	19.4	19.5		
9.0		19.4	19.3	19.3	19.7	19.5	19.4	19.2	19.2	19.1	19.2		
10.0		17.9	17.7	17.9	17.5	17.7	17.5	17.3	17.3	17.1	17.1		
11.0		19.9	20.1	20.0	20.1	20.2	20.0	19.9	19.8	19.9	19.9		
12.0		21.5	21.7	21.7	21.7	21.8	21.5	21.5	21.3	21.5	21.5		
13.0		20.0	19.9	20.0	19.8	19.8	19.7	19.5	19.5	19.7	19.6		
14.0		20.8	20.9	21.0	21.0	20.8	20.7	20.6	20.7	20.7	20.7		
15.0		22.1	22.1	22.2	22.1	22.2	21.8	21.9	22.0	22.0	21.9		
16.0		22.9	23.1	23.0	22.8	23.0	23.0	23.1	22.7	23.1	23.0		
17.0		23.1	23.0	23.1	23.2	23.1	23.2	23.3	23.0	23.0	23.3		
18.0		23.2	23.1	23.2	23.3	23.3	23.2	23.2	23.2	23.3	23.1		
18.5		25.6	25.5	25.5	25.4	25.6	25.4	25.2	25.1	25.5	25.4		

Table 5.--Neutron-measured soil moisture for Harvey 1 recharge site--Continued

		SOIL MOISTURE (Percent by volume for dates indicated)										
DEPTH BELOW LAND SURFACE (FEET)		5/7/83	5/19/83	5/29/83	5/31/83	5/16/83	5/26/83	6/3/83	6/17/83			
		13.7	11.2	12.3	10.5	11.6	12.1	10.3	10.4			
0.5												
1.0		14.6	12.5	13.3	12.3	12.7	13.2	11.8	12.2			
2.0		18.2	17.0	17.1	16.9	16.8	17.8	16.6	16.6			
3.0		19.5	18.2	17.9	17.6	19.1	18.3	22.0	17.6			
4.0		19.9	18.7	17.4	17.0	16.7	17.5	16.7	16.6			
5.0		19.5	19.3	18.9	18.7	18.4	18.8	18.1	18.2			
6.0		20.3	20.3	19.9	19.8	19.6	20.1	19.2	18.7			
7.0		20.6	20.4	20.2	20.1	20.0	20.6	19.9	20.1			
8.0		21.0	20.5	20.6	20.5	20.5	20.7	20.6	20.4			
9.0		20.2	20.0	19.9	19.9	19.7	20.1	19.6	19.9			
10.0		19.0	18.8	18.8	18.7	18.7	18.9	18.5	18.5			
11.0		20.7	20.9	20.7	20.6	20.8	21.0	20.6	20.6			
12.0		22.0	21.9	22.0	21.8	21.9	21.9	21.9	22.1			
13.0		20.6	20.7	20.9	20.6	20.7	20.8	20.6	20.9			
14.0		21.2	21.0	21.1	21.2	21.0	21.3	21.0	21.0			
15.0		23.0	22.8	23.1	22.9	22.8	22.7	22.9	23.0			
16.0		22.8	22.9	23.0	23.0	22.9	22.5	22.8	22.7			
17.0		23.3	22.9	23.0	22.8	22.9	23.2	22.7	23.0			
18.0		23.4	23.1	23.2	23.3	23.2	23.1	23.3	23.1			
18.5		25.4	25.4	25.4	25.5	25.4	25.3	25.4	25.4			

Table 6.--Neutron-measured soil moisture for Harvey 2 recharge site

DEPTH BELOW LAND SURFACE (FEET)	SOIL MOISTURE (Percent by volume for dates indicated)													
	6/22/82	6/27/82	6/28/82	7/1/82	7/15/82	7/23/82	7/30/82	8/15/82	8/23/82	9/13/82	9/27/82	10/11/82	10/27/82	11/10/82
0.5	14.8	19.7	17.6	9.0	7.3	5.1	6.5	5.9	7.3	3.7				
1.0	21.6	25.2	21.4	13.8	12.3	10.2	10.5	9.9	19.1	9.0				
2.0	25.2	24.2	25.0	24.9	24.1	21.6	20.3	19.5	18.7	18.0				
3.0	23.6	23.5	23.5	23.4	23.2	23.0	22.0	20.4	20.2	17.4				
4.0	23.7	23.6	23.7	23.6	23.4	23.4	23.3	23.0	23.1	19.2				
5.0	23.3	22.9	23.3	23.1	22.9	23.1	23.2	23.0	22.4	22.2				
6.0	22.4	21.9	22.3	22.4	22.2	22.4	22.4	22.5	21.3	22.3				
7.0	20.7	21.0	20.9	20.9	20.6	20.7	20.7	20.8	20.9	20.8				
8.0	20.5	19.1	20.6	20.2	20.1	20.4	20.1	20.6	19.6	20.2				
9.0	20.9	22.1	21.0	20.9	21.1	20.9	21.3	21.2	22.5	21.0				
10.0	22.8	21.8	22.8	22.8	23.0	22.6	22.6	22.8	20.3	22.8				
11.0	16.9	8.3	17.5	17.0	17.0	17.2	16.5	16.9	4.3	16.5				
12.0	3.4	4.5	4.2	4.3	4.0	3.9	3.8	3.8	4.3	3.6				
13.0	3.4	3.3	3.5	3.6	3.4	3.5	3.4	3.5	5.0	3.5				
14.0	6.7	3.9	6.6	6.6	6.6	6.5	6.5	6.5	4.9	6.6				
15.0	6.8	4.9	6.5	6.8	6.8	6.8	6.8	6.7	5.2	6.7				
16.0	5.6	5.4	5.7	5.5	5.6	5.5	5.5	5.5	4.8	5.6				
17.0	3.5	2.8	3.7	3.6	3.5	3.2	3.0	3.3	2.3	3.3				
17.7	3.1	-	3.2	3.3	3.2	2.5	2.3	2.4	-	2.4				

Table 6.--Neutron-measured soil moisture for Harvey 2 recharge site--Continued

DEPTH BELOW LAND SURFACE (FEET)	SOIL MOISTURE (Percent by volume for dates indicated)													
	8/26/82	9/13/82	9/11/82	9/12/82	9/24/82	10/12/82	10/11/82	10/22/82	10/22/82	10/22/82	10/22/82	11/15/82	11/15/82	11/15/82
0.5	3.2	4.6	2.9	6.5	4.4	4.1	3.5	2.7	2.7	2.7	2.7	2.6	2.6	2.6
1.0	7.8	9.1	7.5	10.9	9.0	8.2	7.8	7.6	7.6	7.6	7.4	7.5	7.5	7.5
2.0	17.5	17.6	17.3	18.1	18.3	17.9	17.4	17.3	17.3	17.3	17.1	17.2	17.2	17.2
3.0	16.6	16.8	16.5	17.8	17.4	17.3	16.8	16.8	16.8	16.8	16.3	16.4	16.4	16.4
4.0	17.8	18.9	17.5	19.9	19.0	18.1	17.7	17.4	17.4	17.4	17.3	17.2	17.2	17.2
5.0	21.4	21.3	20.0	21.1	20.5	20.1	19.5	19.4	19.4	19.4	19.2	19.1	19.1	19.1
6.0	22.4	22.1	21.9	21.9	21.7	21.8	21.4	21.1	21.1	21.1	20.7	20.5	20.5	20.5
7.0	20.7	20.7	20.8	20.6	20.9	20.7	20.4	20.6	20.6	20.6	20.4	20.5	20.5	20.5
8.0	20.4	20.2	20.4	20.6	20.4	20.5	20.5	20.4	20.4	20.4	20.3	20.4	20.4	20.4
9.0	21.1	21.2	21.1	21.0	21.3	21.1	21.1	21.3	21.3	21.3	21.6	21.2	21.2	21.2
10.0	22.7	22.8	22.6	22.8	22.8	22.7	22.8	22.9	22.9	22.9	23.0	23.1	23.1	23.1
11.0	16.9	16.5	16.7	17.3	17.1	17.4	16.6	16.7	16.7	16.7	15.0	16.7	16.7	16.7
12.0	5.6	3.5	3.6	3.5	3.5	3.5	3.6	3.5	3.5	3.5	3.7	3.5	3.5	3.5
13.0	5.5	3.4	3.5	3.7	3.5	3.8	3.4	3.5	3.5	3.5	3.1	3.5	3.5	3.5
14.0	6.6	6.5	6.5	6.5	6.6	6.6	6.7	6.6	6.6	6.6	6.2	6.7	6.7	6.7
15.0	6.9	6.7	6.6	6.6	6.8	6.4	6.7	6.9	6.9	6.9	6.7	6.8	6.8	6.8
16.0	5.6	5.6	5.6	5.7	6.8	5.6	5.5	5.6	5.6	5.6	5.5	5.6	5.6	5.6
17.0	3.5	3.3	3.2	3.7	3.3	3.6	3.3	3.1	3.1	3.1	2.4	3.1	3.1	3.1
17.7	2.5	2.4	2.4	2.4	2.3	2.4	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4

Table 6.--Neutron-measured soil moisture for Harvey 2 recharge site--Continued

DEPTH BELOW LAND SURFACE (FEET)	SOIL MOISTURE (Percent by volume for dates indicated)													
	11/17/82	11/22/82	12/12/82	1/7/83	1/12/83	2/10/83	2/16/83	3/1/83	3/13/83	3/18/83	4.0	5.0	6.0	7.0
0.5	5.5	6.1	9.5	11.9	11.8	18.2	17.8	16.9	17.6	17.4				
1.0	7.7	8.7	9.3	10.9	11.1	18.5	20.9	20.1	20.2	20.2				
2.0	17.2	17.8	17.7	19.0	17.8	18.3	23.9	24.5	24.8	25.2				
3.0	16.5	16.4	16.5	16.6	16.4	16.6	20.7	21.3	22.4	22.9				
4.0	17.5	17.4	16.9	17.8	17.7	17.6	20.9	20.7	21.0	21.1				
5.0	19.2	19.2	19.3	19.1	19.2	19.4	21.5	20.9	21.2	21.4				
6.0	20.5	20.6	20.8	20.6	20.8	20.6	21.1	21.0	21.0	21.0				
7.0	20.4	20.4	20.4	20.6	20.5	20.4	20.6	20.3	20.3	20.6				
8.0	20.7	20.5	20.8	20.5	20.8	20.6	20.6	20.4	20.5	20.5				
9.0	21.1	21.1	21.0	21.0	21.6	21.1	21.1	21.3	21.2	21.2				
10.0	22.8	23.2	22.9	23.0	23.0	22.9	23.0	22.9	22.9	23.1				
11.0	17.4	17.1	17.4	17.2	17.3	17.4	16.8	16.7	16.4	16.7				
12.0	3.5	3.4	3.4	3.4	3.5	3.4	3.5	3.4	3.5	3.5				
13.0	3.6	3.6	3.7	3.8	3.7	3.6	3.7	3.5	3.5	3.6				
14.0	6.6	6.5	6.5	6.5	6.5	6.5	6.5	6.6	6.5	6.5				
15.0	6.6	6.8	6.5	6.6	6.6	6.5	6.9	6.9	6.6	6.6				
16.0	5.6	5.6	5.7	5.5	5.6	5.6	5.6	5.5	6.7	5.4				
17.0	5.5	3.4	3.6	3.6	3.7	3.6	3.3	3.2	3.2	3.2				
17.7	2.5	2.3	2.4	2.4	2.4	2.4	2.3	2.3	2.2	2.3				

Table 6.--Neutron-measured soil moisture for Harvey 2 recharge site--Continued

DEPTH BELOW LAND SURFACE (FEET)	SOIL MOISTURE (Percent by volume for dates indicated)									
	5/17/83	5/19/83	5/22/83	5/26/83	5/30/83	6/3/83	6/7/83	6/10/83	6/14/83	6/17/83
0.5	22.0	19.2	18.9	16.5	17.4	20.3	17.1	16.6		
1.0	22.6	21.2	21.0	20.2	20.3	21.9	19.9	19.0		
2.0	25.4	25.2	25.2	25.1	25.2	25.2	24.7	24.6		
3.0	23.9	23.6	23.7	23.5	23.6	23.6	23.4	23.3		
4.0	22.8	23.5	23.6	23.3	23.3	23.5	23.2	23.0		
5.0	21.9	21.6	21.4	21.1	21.1	21.2	20.7	20.8		
6.0	21.4	21.4	21.2	21.0	20.9	21.1	20.6	20.7		
7.0	20.4	20.5	20.5	20.5	20.3	20.3	20.2	20.1		
8.0	20.7	20.5	20.4	20.4	20.1	20.4	20.4	20.2		
9.0	21.0	21.4	21.2	21.0	21.0	21.2	20.9	20.9		
10.0	23.0	23.1	22.9	22.9	22.9	22.9	22.8	22.6		
11.0	17.1	16.6	16.9	16.5	16.7	16.6	20.3	15.2		
12.0	3.4	3.2	3.2	3.2	3.3	3.3	3.2	3.1		
13.0	3.7	3.4	3.5	3.5	3.5	3.4	3.2	3.4		
14.0	6.5	6.5	6.4	6.5	6.5	6.5	6.6	6.3		
15.0	6.4	6.9	6.6	6.5	6.7	6.7	6.7	6.7		
16.0	5.4	5.6	5.5	5.5	5.6	5.5	5.4	5.4		
17.0	5.5	5.2	3.5	3.5	3.4	3.4	3.0	3.2		
17.7	2.2	2.3	2.3	2.3	2.3	2.2	2.1	2.2		

Table 7.--Neutron-measured soil moisture for Harvey 3 recharge site

DEPTH BELOW LAND SURFACE (FEET)	SOIL MOISTURE (Percent by volume for dates indicated)													
	5/27/82	6/17/82	6/24/82	7/1/82	7/16/82	7/23/82	7/30/82	8/7/82	8/13/82	8/19/82				
0.5	15.4	15.0	12.7	5.9	0.1	0.0	1.4	3.4	0.1	0.0				
1.0	21.1	17.5	16.3	13.1	7.7	5.1	5.2	7.7	5.3	5.1				
2.0	18.8	18.6	19.0	15.9	18.6	19.4	18.1	17.7	17.8	17.4				
3.0	21.0	20.7	20.8	20.6	20.3	20.3	20.4	20.1	20.0	19.8				
4.0	19.8	18.8	19.5	18.0	17.6	17.2	17.0	16.8	16.7	16.3				
5.0	20.4	19.9	20.5	19.9	19.7	19.3	19.7	19.5	19.4	19.4				
6.0	20.6	20.2	20.8	20.2	20.2	20.1	20.0	20.1	19.9	19.9				
7.0	11.5	11.5	12.3	11.6	10.9	10.3	10.2	10.1	9.8	9.6				
8.0	12.6	17.2	18.6	17.2	14.1	8.8	6.2	5.3	4.3	3.4				
9.0	22.2	22.2	22.3	22.3	22.2	21.6	19.9	18.5	16.3	11.7				
10.0	25.0	25.1	25.1	25.0	25.1	24.7	25.3	25.1	24.9	24.9				
11.0	25.2	25.3	25.0	25.1	25.4	25.1	25.0	25.0	25.2	25.0				
12.0	25.1	25.1	25.1	25.2	25.2	24.9	25.1	24.7	25.1	24.7				
13.0	23.9	23.0	23.0	24.2	24.4	24.7	19.8	19.9	19.9	19.9				
13.4	27.1	-	-	-	-	-	26.5	26.1	26.9	24.8				

Table 7.--Neutron-measured soil moisture for Harvey 3 recharge site--Continued

DEPTH BELOW LAND SURFACE (FEET)	SOIL MOISTURE (Percent by volume for dates indicated)											
	8/28/82	9/1/82	9/11/82	9/17/82	9/25/82	10/1-2/82	10/11/82	10/22/82	10/22/82	10/22/82	11/1-2/82	11/1-2/82
0.5	0.0	4.9	0.4	5.9	2.9	1.9	0.6	0.0	0.0	0.0	0.0	0.0
1.0	4.3	7.9	6.5	8.4	7.6	6.9	6.6	5.7	5.6	5.6	5.3	5.3
2.0	17.0	16.9	17.1	17.1	17.0	17.1	17.2	12.3	17.0	17.0	17.1	17.1
3.0	19.5	19.2	19.5	19.5	19.1	19.0	19.0	19.1	16.7	16.7	19.0	19.0
4.0	16.1	15.8	15.8	15.9	15.5	15.8	15.6	15.4	15.1	15.1	15.2	15.2
5.0	19.2	19.3	19.3	19.4	19.1	19.5	18.9	19.3	18.8	18.8	19.0	19.0
6.0	19.9	19.9	19.9	20.1	19.9	20.0	20.1	20.0	20.0	20.0	20.0	20.0
7.0	9.4	9.2	9.4	9.4	9.2	9.5	9.1	9.4	8.6	8.6	8.9	8.9
8.0	3.1	2.9	2.8	2.7	4.0	2.7	2.4	2.5	2.3	2.3	2.2	2.2
9.0	8.0	7.3	6.2	5.1	5.1	4.8	4.5	4.0	4.3	4.3	3.8	3.8
10.0	24.0	23.9	22.4	19.0	19.4	17.4	16.3	13.2	13.8	13.8	11.1	11.1
11.0	24.8	24.8	24.9	24.9	25.0	25.2	25.1	24.9	25.5	25.5	24.9	24.9
12.0	25.1	24.9	25.1	25.2	25.2	25.0	25.1	25.1	25.1	25.1	25.0	25.0
13.0	19.7	20.1	19.8	20.0	20.1	19.6	20.0	19.9	20.6	20.6	20.1	20.1
15.4	26.0	26.2	25.8	25.9	26.3	26.3	26.0	26.2	25.9	25.9	25.9	25.9

Table 7.--Neutron-measured soil moisture for Harvey 3 recharge site--Continued

		SOIL MOISTURE (Percent by volume for dates indicated)									
DEPTH BELOW LAND SURFACE (FEET)		11/11/82	11/29/82	12/16/82	-1/-2/83	-1/12/83	-2/10/83	-2/17/83	-3/-1/83	-3/13/83	-3/18/83
		0.0	4.3	7.3	10.2	9.7	14.0	14.1	13.5	13.6	13.4
1.0	5.9	5.7	9.2	9.2	10.7	11.4	13.2	15.8	16.8	17.6	17.5
2.0	16.9	17.1	17.1	17.1	17.0	17.1	17.0	17.0	17.1	18.9	19.3
3.0	18.6	18.8	18.8	18.7	18.6	18.6	18.5	18.8	18.6	19.0	19.5
4.0	15.2	15.3	15.3	15.2	15.3	15.3	15.2	14.6	14.6	15.3	15.6
5.0	19.2	19.2	19.3	19.3	19.3	19.2	19.3	18.9	18.8	18.9	19.1
6.0	20.0	20.1	20.0	19.8	20.2	20.2	20.0	20.0	19.8	19.8	20.1
7.0	9.2	9.1	9.2	8.4	9.3	9.3	9.3	8.7	8.7	8.9	9.7
8.0	2.4	2.3	2.1	2.1	2.2	2.2	2.1	2.0	1.9	1.9	1.9
9.0	3.3	3.3	3.2	3.0	2.9	2.9	2.9	2.9	3.0	2.9	3.0
10.0	9.0	8.1	6.6	5.3	5.1	8.2	8.2	4.7	5.8	6.3	6.3
11.0	24.4	24.3	23.7	23.2	22.4	22.4	21.8	22.2	23.0	23.6	23.9
12.0	25.2	25.2	25.2	25.4	25.4	25.4	25.1	25.3	25.2	24.9	25.3
13.0	19.7	20.0	20.1	20.0	19.9	19.9	20.3	20.3	20.4	20.2	20.3
14.3	25.9	26.0	25.9	26.0	25.9	25.9	25.8	25.0	25.5	25.4	25.3

Table 7.--Neutron-measured soil moisture for Harvey 3 recharge site--Continued

DEPTH BELOW LAND SURFACE (FEET)	SOIL MOISTURE (Percent by volume for dates indicated)									
	-5/7/78	-5/12/78	-5/22/78	-5/26/78	-5/19/78	-5/26/78	-6/2-8/78	-6/17/78	-6/17/78	-6/17/78
0.5	17.8	11.4	9.3	4.7	5.5	13.6	9.6	7.7		
1.0	20.0	17.2	16.1	14.0	11.2	16.9	14.8	13.7		
2.0	20.0	19.8	19.6	19.5	19.2	19.1	18.0	18.9		
3.0	21.0	20.9	20.6	20.5	20.7	20.3	20.1	19.9		
4.0	20.4	19.4	18.3	18.1	17.6	17.5	16.8	16.8		
5.0	20.5	20.2	19.8	19.5	19.5	19.5	19.2	19.2		
6.0	20.2	20.4	20.1	20.0	20.0	19.9	19.7	19.8		
7.0	9.5	9.9	9.6	9.5	9.5	9.5	9.0	9.4		
8.0	2.1	3.6	3.6	3.4	3.2	3.3	3.3	3.2		
9.0	4.0	10.1	10.1	9.8	9.2	11.0	12.1	10.7		
10.0	19.9	23.0	23.1	23.2	23.2	23.2	23.2	23.2		
11.0	24.7	24.8	25.2	24.9	24.8	24.8	25.1	24.6		
12.0	25.1	25.2	24.9	24.9	25.0	24.9	24.9	24.9		
13.0	20.1	20.3	20.8	20.3	20.1	20.2	20.4	20.1		
13.3	25.4	25.5	25.6	25.6	25.1	25.0	25.0	24.8		