HYDROLOGIC DATA FOR CURLEW VALLEY, UTAH

By William H. Atkin

DIVISION OF WATER RIGHTS HYDROLOGIC DATA REPORT NO. 2

UTAH DIVISION OF WATER RIGHTS

Salt Lake City, Utah
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CONVERSION FACTORS, VERTICAL DATUM, AND ABBREVIATED WATER-QUALITY UNITS

Multiply	By	To Obtain
foot	0.3048	meter
mile	1.609	kilometer
square mile	2.59	square kilometer
gallon per minute	0.06308	liter per second

Water temperature is given in degrees Celsius (EC), which can be converted to degrees Fahrenheit (EF) by the following equation:

$$EF = 1.8(EC) + 32$$

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929, a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929.

Chemical concentration and water temperature are reported in metric units. Chemical concentration is reported in milligrams per liter (mg/L) or micrograms per liter (Φg/L). Milligrams per liter is a unit expressing the solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to 1 milligram per liter. For concentrations less than 7,000 milligrams per liter, the numerical value is about the same as for concentrations in parts per million. Specific conductance is reported in micromhos per centimeter (Φmhos/cm) or its equivalent, microsiemens (ΦS/cm), at 25 degrees Celsius.

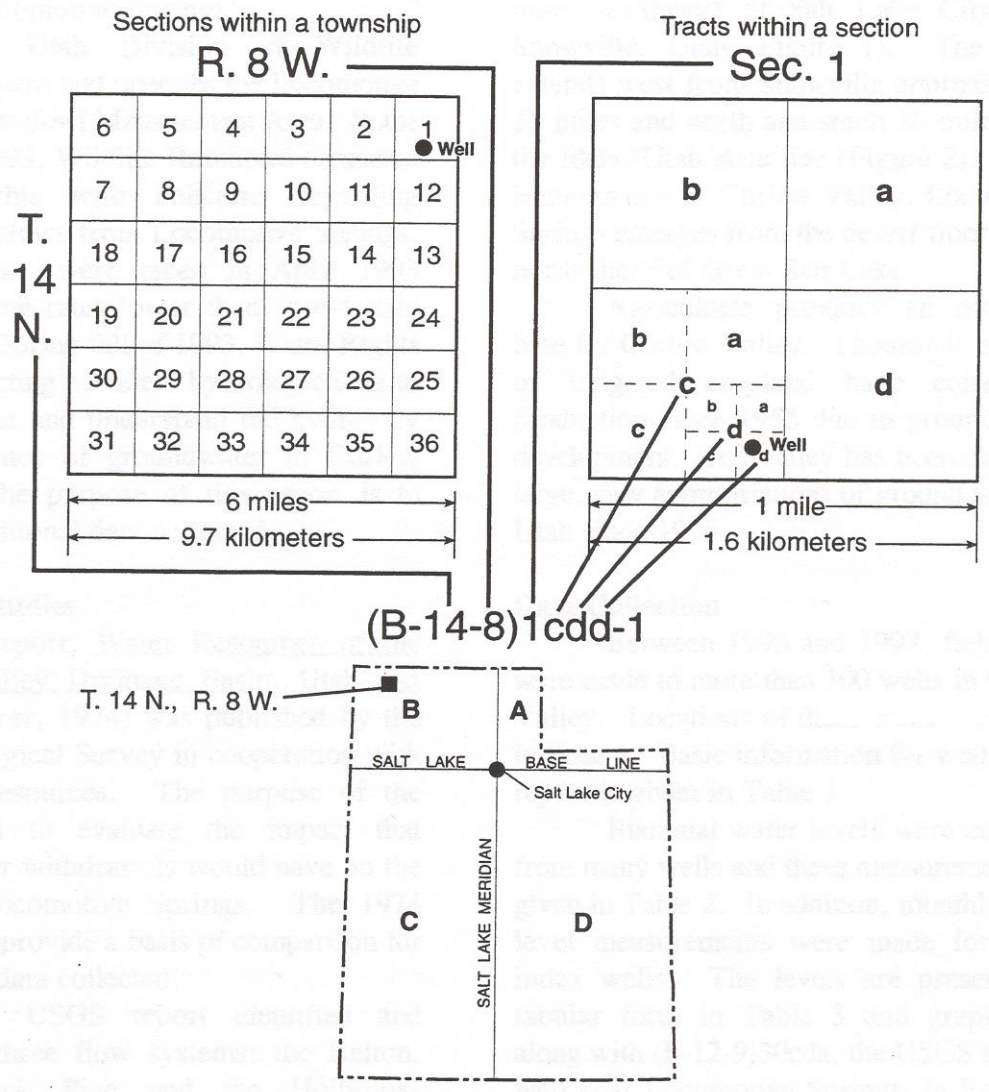
U.S. Geological Survey Classification of Natural Water

[After Heath, 1989, Table 2, p. 65]

Salinity	Dissolved - solids concentration (Milligrams per liter)
Fresh	0 to 1,000
Slightly saline	1,000 to 3,000
Moderately saline	3,000 to 10,000
Very saline	10,000 to 35,000
Briney	Greater than 35,000

WELL-NUMBERING SYSTEM

The well-numbering system used in Utah and in this report is based on the US Bureau of Land Management's system of land subdivision. The well number shows the location of the well by quadrant, township, range, section and position within the section and is relative to the Salt Lake Base Line and Meridian. Well numbers for wells located in Idaho are similarly designated based on the Boise Base Line and Meridian, except for the quadrant which is designated with "ID" rather than "B" in the parentheses. The numbering system is illustrated below.



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INTRODUCTION

This report presents well water level, conductivity and water quality data collected by the Utah Division of Water Rights in Curlew Valley, Utah, between 1993 and 1997. It also presents historic well water levels and well log information in addition to data for Locomotive Springs.

The Utah Division of Wildlife Resources owns and operates the Locomotive Springs Waterfowl Management Area. In the spring of 1993, Wildlife Resources contacted Water Rights with concerns regarding decreasing flows from Locomotive Springs. Measurements were taken in April 1993 showing flow rates lower than previously recorded. During fall of 1993, Water Rights began collecting pertinent hydrologic data to better define and understand the hydrology and occurance of groundwater in Curlew Valley. The purpose of this report is to present additional data collected.

Previous Studies

A report, Water Resources of the Curlew Valley Drainage Basin, Utah and Idaho, (Baker, 1974) was published by the U.S. Geological Survey in cooperation with Wildlife Resources. The purpose of the report was to evaluate the impact that groundwater withdrawals would have on the flow of Locomotive Springs. The 1974 report may provide a basis of comparison for evaluating data collected.

The USGS report identified and described three flow systems: the Kelton, Juniper-Black Pine and the Holbrook-Snowville. Although it is considered part of Curlew Valley, this report presents little additional data for the Kelton flow system.

The USGS also publishes annually a report of Groundwater Conditions in Utah showing water level trends and withdrawals.

Location and Description of Study Area

Curlew Valley lies approximately 100 miles northwest of Salt Lake City, near Snowville, Utah (Figure 1). The valley extends west from Snowville approximately 25 miles and north and south 20 miles from the Idaho-Utah state line (Figure 2). At the southern end of Curlew Valley, Locomotive Springs emerges from the desert floor on the north shore of Great Salt Lake.

Agriculture provides an economic base for Curlew Valley. Thousands of acres of irrigated cropland have come into production since 1955 due to ground-water development. The valley has been closed to large, new appropriations of ground water in Utah since 1976.

Data Collection

Between 1993 and 1997, field visits were made to more than 100 wells in Curlew Valley. Locations of these wells are shown in Plate 1. Basic information for wells in the report is given in Table 1.

Biannual water levels were collected from many wells and these measurements are given in Table 2. In addition, monthly water level measurements were made for seven index wells. The levels are presented in tabular form in Table 3 and graphically, along with (B-12-9)30cda, the USGS monitor well near Locomotive Springs, in Figure 3.

Conductivity and temperature were measured in the field using a conductivity meter on samples taken from pumping wells. Conductivity is reported in Table 2 and spatially depicted on the map in Figure 4.

Water quality samples were taken from selected pumping wells, Deep Creek and Locomotive Springs, and analyzed by the Utah Department of Agriculture and Food. Results of the chemical analysis are presented in Table 4.

The flows of Locomotive Springs were measured by various methods by Wildlife Resources. Records for three springs are shown in Figure 5.

Acknowledgments

Data presented in this report was compiled from field work conducted by Water Rights, Wildlife Resources, the USGS, and Department of Agriculture and Food. Appreciation is expressed to the water users of Curlew Valley who provided access to their wells.

The format for this report is adapted from Utah Division of Water Rights Hydrologic Data Report No. 1, by Ford and Grandy (1997).

RECORDS OF WELLS

Ground water in Curlew Valley is mostly encountered in unconsolidated valley-fill deposits and volcanic rocks (Baker, 1974) under water table conditions. Drillers' well logs often refer to sedimentary clay, sand and gravel, basalt or "lava". Domestic and stockwatering wells are drilled to depths ranging typically from 100 feet to 300 feet, with irrigation wells depths in the range of 300 to 600 feet. Table 5 summarizes selected drillers' well logs of wells drilled since 1974.

Well Levels

Well levels were measured biannually in Curlew Valley, beginning in fall of 1993. Static water levels of accessible wells were measured with an electronic probe and are given in Table 2. Some wells did not provide access for measuring well levels, while others were discontinued for a variety of reasons. The USGS also has monitor wells, most of which are measured each spring.

Water levels ranged from 25 feet below land surface in a well near Locomotive Springs, to 270 feet below land surface in irrigation wells near the Idaho-Utah state line. Depths to water in some stock wells were greater due to topography. Biannual fluctuation in the area of more intensive irrigation was as great as 20 feet in some irrigation wells. Figure 6 is a map showing water levels for measurements taken in fall of 1993.

Because of fluctuation in the water table over the course of a year, seven wells were selected to be monitored monthly. Figure 7 shows the cyclical nature of the relative drawdown of these index wells. Two of the wells, (B-14-8)5ddd and (B-14-9)1cdd, experience their low and peak water levels at different times than the other five wells. The cyclical nature and long-term trends of two wells reported by the USGS may be seen in figures 8 and 9. Well (B-14-8)11aba is immediately south of Snowville and well (B-12-9)30cda is just north of Locomotive Springs.

Conductivity

Conductivity is a measurement of the water's ability to conduct electricity. It is related to the mineral content of the water. A YSI 33 conductivity meter was used in the field to measure conductivity as well as temperature. All measurements of conductivity are reported as temperature adjusted for 25 degrees Celsius.

Field conductivity and temperature were measured and reported on 66 wells. Wells that could provide a sample were measured once in 1994. Some wells were not pumping when field visits were made or were unaccessible for taking samples.

Values of conductivity ranged from less than 400ΦS/cm to 10,000ΦS/cm. There were dramatic differences in conductivity in wells separated by a distance of only one mile as may be seen in Figure 4.

Water Quality

Water samples were collected from several sites over the course of the study and were analyzed for chemical water quality. Samples were analyzed for inorganic chemical constituents by the Utah State University Laboratory for the Department of Agriculture and Food. Results of these analyses are given in Table 4. Although results are not presented in this report, the Department of Agriculture and Food also tested some samples for pesticides.

Principle constituents of note from the samples include calcium (Ca), magnesium (Mg), sodium (Na), chloride (Cl), and bicarbonate (HCO_3). The pH, conductivity and sodium adsorption ratio (SAR) also are given for the laboratory samples.

Five of the wells sampled were sampled and reported previously for the USGS report (Baker, 1974). Baker and Bar-M Springs were also sampled and reported. Water quality differences between 1969 and present are not significant.

A comparison was made between laboratory measurements of conductivity and field measurements on the same samples. It was found that field measurements averaged 82 percent of laboratory measurements. Both field and laboratory measurements of conductivity are given, and duly noted, because of the relatively fewer labroratory samples.

LOCOMOTIVE SPRINGS

The springs known collectively as Locomotive Springs include West, Baker, Bar-M, Teal, Off and Sparks Springs. The USGS established gaging stations at these springs in conjunction with the 1974 report (Baker, 1974) and maintained them until 1980 when they were discontinued. Due to the flat topography, low velocities and operating conditions, it was and is difficult to establish and maintain measuring devices and recorders at the springs.

Wildlife Resources purchased and installed measuring devices and digital recorders in December 1993. Water Rights staff was consulted and assisted in installation of gaging stations at West, Bar-M and Baker Springs. Manual measurements have been taken at Teal, Off and Sparks Springs. The table below summarizes the methods of measurement and discharge of each spring as measured on July 20, 1994.

Spring	Device	cfs
West	2-48" Cipoletti weirs, Telog Recorder	4.60
Baker	48"Cipoletti weir, Telog recorder 0.94	
Bar-M	2-36" Cipoletti weirs Telog recorder	3.78
Teal	Current meter	2.60
Off	6" Parshall flume	0.52
Sparks	6" Parshall flume.	0.00
		11.84

Table 6 summarizes the manual measurements taken of Locomotive Springs by Wildlife Resources. Digitally recorded measurements of flows from West, Baker and Bar-M springs are shown graphically in Figure 5. These records were averaged monthly and are given in Table 7.

The flows of Teal, Off and Sparks Springs are relatively undisturbed as they

flow down their natural channels toward East Lake. Usually, flow from Sparks Spring doesn't make it to the parshall flume. Teal Spring is relatively flat, with no real head to be measured by any means other than current meter.

Bar-M Spring is impounded by a dike with an overflow through two 36 inch cipolletti weirs. A Telog recorder with a pressure transducer is installed in the pool near the weirs and is calibrated to record the depth of water going over the weirs. At times the weirs have been blocked by debris that causes the water to back up, giving higher readings.

West and Baker springs are connected by a canal so the water may be diverted either direction to facilitate management of the impoundments. This affects flows reported for these springs. Ice also may affect the reading at Baker Spring.

Originally, West Locomotive Spring was measured using an orifice plate and two sonar detectors to determine the difference between the two sides. This was replaced by installing two 48 inch cipolletti weirs further downstream with a Telog recorder similar to Bar-M Spring. There was a concern that the orifice plate was backing water up on the spring, possibly causing it to flow less.

In addition to measuring problems associated with the springs themselves, there were mechanical problems with the digital recording and data acquisition equipment, especially at West Locomotive Spring. Data were lost when a battery was stolen. Problems also occurred with the laptop computer and software used to download data from the recorders.

REFERENCES CITED

Baker, Claud H., 1974, Water Resources of the Curlew Valley Drainage Basin, Utah and Idaho, Utah Department of Natural Resources Technical Publication No. 45, 91p.

Ford, Casey, and Grandy, Allyson, 1997, Records of Well Water Levels and Water Quality in Alluvial and Bedrock Aquifers, Castle Creek Seepage Study, Precipitation, and Water Uses for Castle Valley, Grand County, Utah, Utah Division of Water Rights Hydrologic Data Report No. 1, 53p.

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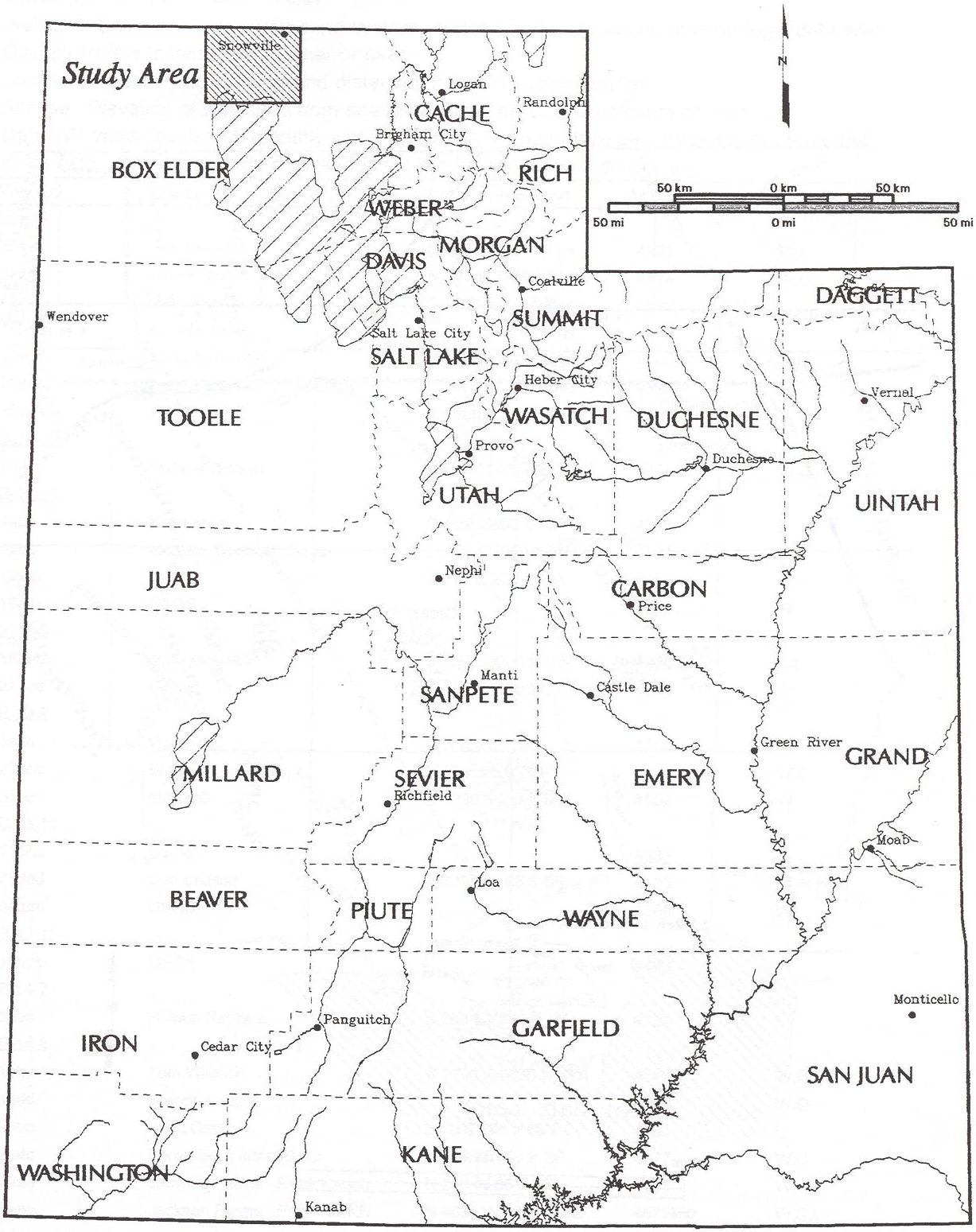


Figure 1. Location of Study Area

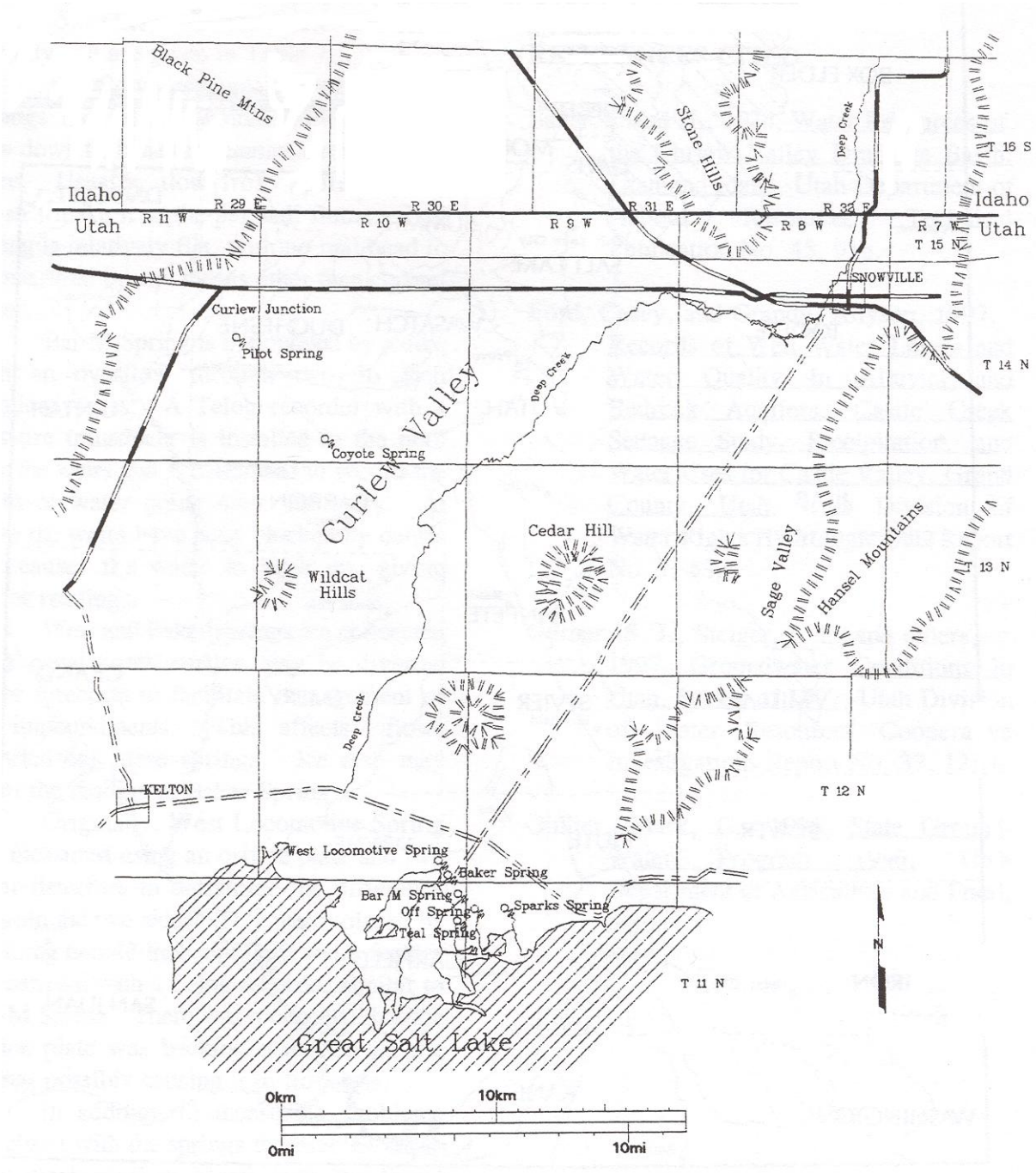


Figure 2. Location Map of Curlew Valley

Table 1. Curlew Valley Wells

Well ID#: See page v. for numbering system. See Plate 1. for location of hydrologic data sites
Owner: Refers to last known owner or user.
Location in Section: Directions and distances from (fr) section corner.
Altitude: Elevation of well head from sea level based on USGS estimate or map.
Data: W: water levels, M: monthly water levels, C: Temperature and conductivity measured in the field, Q: water quality analysed in the laboratory, L: well driller's log

Well ID#	Owner	Location in Section	Altitude	Data
B-12-9				
6abb	Don Eliason	S 393 E 225 fr N1/4	4421	W,L
9cda	Lavell Neal	N 700 E 1250 fr SW	4324	W,C,L
10abb	Don Eliason	S 200 E 62 fr N1/4	4396	L
16baa	George Neal	S 120 E 1250 fr NW	4320	L
17add	Ross Anderson	N 500 W 400 fr E1/4	4285	C,L
28add	Holmgren Land & Livestock	S 2000 W 500 fr NE	4311	W,C
30cda	USGS	N 1300 E 2000 fr SW	4239	W
B-12-10				
1aaa	Ross Anderson	S 50 W 50 fr NE	4402	W,C,L
B-12-11				
4aba	Karl Oman	S 40 E 3800 fr NW	4310	L
5bac	Morgan, Spencer, Oman	S 900 E 1520 fr NW	4355	L
5bbb	Oman	S 170 E 270 fr NW	4360	W
16cdc	USGS		4230	W
B-13-8				
18abb	John McNabb	S 550 E3000 fr NW	4616	C,L
21dcd	Grover	N 100 W 1900 fr SE	4605	W
B-13-9				
1adc	Warrick	W 1320 fr E1/4	4555	W,C
33ccc	BLM	N 75 E 75 fr SW	4424	W,C
35bbd	McNabb	S 1356 E830 fr NW	4502	W
B-13-10				
11dcd	USGS		4335	W
25ddd	Don Eliason	N 439 W 183 fr SE	4403	W
34ddc	USGS		4305	W
B-13-11				
10cdc	USGS		4480	W
B-14-7				
8bba	William Robbins	S 258 E 1303 fr NW	4720	L
B-14-8				
1bbc	Tom Wilcock	S 1100 E 1000 fr NW	4542	W,C,Q,L
1ddd	Joseph Larkin		4650	W,Q
2bbb	Keith Oman	S 70 E 180 fr NW	4560	L
2ddc	Snowville Water Works	N 640 W 720 fr SE	4537	W,C
4ddd	Jackson Farms - Rose Ranch	N 240 W 65 fr SE	4571	W
5bac	Jackson Farms - Rose Ranch	N 4090 W 3825 fr SE	4575	W,C,L
5dcc	Jackson Farms - Rose Ranch	N 490 W 2460 fr SE	4501	C,Q
5dcd	(Letty Smith)	N 100 E 900 fr S1/4	4502	L
5ddc	(Charles R. Taylor)	N 400 W 1200 fr SE	4509	L

Table 1. Curlew Valley Wells (continued)

ID#	Owner	Location	Altitude	Data
B-14-8 (continued)				
5ddd	Jackson Farms - Rose Ranch	N 450 W170 fr SE	4495	M
6aca	Jackson Farms - Rose Ranch	S 1700 E 950 fr N1/4	4487	W,C,L
6add	Jackson Farms - Rose Ranch	S 2310 W 150 fr NE	4500	W,C,L
8bab	(Cal Dredge)	S 520 W 65 fr N1/4	4495	
11aba	Arbon	S 270 W 1690 fr NE	4535	W
11bca-1	Morgan Farms	N 850 E 1265 fr W1/4	4526	W
11bca-2	Morgan Farms	S 1860 W 4150 fr NE	4526	C,Q
11dcc	Morgan Farms	N 50 W 2555 fr SE	4590	W,L
12cbd	Nolin Oman	S 720 E 810 fr W1/4	4635	C,L
15ddd	Holmgren Land & Livestock	N 90 W 50 SE	4595	W,C,L
20baa	Jackson Farms - Rose Ranch	S 270 W 720 fr N1/4	4560	W,C,L
28aba	McNabb	S 155 W 1675 fr NE	4558	W
28bbb	Anderson	S 50 E 180 fr NW	4539	W
32dba	Norman Grover	S 3180 W 1900 fr NE	4562	W,C,Q
B-14-9				
1cdd	Jackson Farms - Rose Ranch	N 400 E 2600 fr SW	4452	M,C,Q
3dbb	Taylor Farms	N 2620 W 2560 fr SE	4404	W,C,Q,L
4cbb	Alder	S 2700 E 50 fr NW	4401	W,C,Q,L
4ccc	Jackson Farms - Rose Ranch	N 400 E 75 fr SW	4394	W,C
5aaa	Alder	S 30 W 40 fr NE	4407	W,C
5abb	Alder	S 50 E 2650 fr NW	4416	C,Q
5bbb	Alder	S 50 E 50 fr NW	4420	C
5ccd	Taylor Farms	N 375 E 1288 fr SW	4397	W,C,Q
6add	Taylor Farms	N 400 W 400 fr E1/4	4409	W,C
6ccc	Mel Flinders	N 220 E 130 fr SW	4399	C,L
7bbb	Sandarosa Ranch #11	S 60 E 70 fr NW	4399	M,C,Q
9add	Jackson Farms - Rose Ranch	N 2640 fr SW	4384	W,L
9baa	Jackson Farms - Rose Ranch	S 350 E 2500 fr NW	4392	M
11bcb	Jackson Farms - Rose Ranch	S 2120 E 460 fr NW	4398	W,C,Q
14dac	Jackson Farms - Rose Ranch	N 1950 W 1400 fr SE	4410	W,C
16aaa	Jackson Farms - Rose Ranch	S 50 W 70 fr NE	4377	W,C,Q,L
16daa	Jackson Farms - Rose Ranch	S 2690 W 70 fr NE	4370	W,L
17caa	Taylor Farms	S 2661 E 2552 fr NW	4372	M
17cab	Taylor Farms	S 2875 E 1670 fr NW	4370	C,Q,L
18bdd	Sandarosa Ranch #12	S 2470 E2230 fr NW	4369	W,C
19bbb	Taylor Farms	N 5198 E 260 fr SW	4371	W,C,Q
20acc	Taylor Farms	S 2397 W 2561 fr NE	4359	W,C,Q,L
27acc	Tom Flinders	N 2640 E 2640 fr SW	4402	W,L
29bbb	Jackson Farms - Rose Ranch	S 20 E 160 fr NW	4352	W,C
B-14-10				
1abb	Mel Flinders	S 85 E 90 fr N1/4	4426	W,C,L
1bbb	Mel Flinders	S 85 E 75 fr NW	4436	C,Q
1dca	Mel Flinders	N 915 W 1600 fr SE	4405	W,C,L
4ccd	Sandarosa Ranch	N 90 E 1270 fr SW	4600	C
5bba	Juddabeth Ranch	S 330 W 3300 fr NE	4710	W

Table 1. Curlew Valley Wells (continued)

ID#	Owner	Location	Altitude	Data
B-14-10 (continued)				
11cbc	Sandarosa Ranch #3	S 940 E 70 fr W	4434	M,C
12bcb	Sandarosa Ranch #8	S 1900 E 20 fr NW	4402	C
12cbc	Sandarosa Ranch #9	N 1840 E 10 fr SW	4396	C
13cab	Sandarosa Ranch #10	S 10 E 1330 fr W1/4	4382	W
14acd	Sandarosa Ranch #7	S 10 W 1330 fr E1/4	4392	W,C
14bbb	Sandarosa Ranch	S 594 E 32 fr NW	4424	C,Q
14bbc	Sandarosa Ranch #4	S 910 E 50 fr NW	4423	C
14cbc	Sandarosa Ranch #5	S 1320 E 20 fr W1/4	4408	W
15bbb	Sandarosa Ranch #1	S 450 E 20 fr NW	4465	W,L
15ccd	Sandarosa Ranch #2	N 50 E 800 fr SW	4432	W,L
23bbc	Sandarosa Ranch #6	S 1320 E 10 fr NW	4402	W,C
B-14-11				
5acb	Silver Certificate Cattle Co.	S 1684 W 2522 fr NE	5007	L
B-15-7				
32bab	Skidmore	S 40 W 1025 fr N1/4	4664	L
32dbd	Skidmore	N 1325 W 1495 fr SE	4720	L
B-15-8				
31ccc	Jackson Farms - Rose Ranch	N 40 E 60 fr SW	4488	W,Q
31dcd	Jackson Farms - Rose Ranch	N 220 W 1640 fr SE	4628	L
34dad	Snowville Cemetary	N 1365 W 340 fr SE	4598	W,C,Q,L
35cbc	Roy Neal	N 1350 E 30 fr SW	4580	L
B-15-9				
28cbc	Alder	N 1460 E 50 fr SW	4456	W,C
28dbd	Alder	N 1460 W 1320 fr SE	4458	W,L
28dda	Alder	N 1120 W 165 fr SE	4455	W,C,Q
29cbc	Taylor Farms	N 1534 E 50 fr SW	4459	W,C,Q
31abc	Taylor Farms	S 1200 E 2640 fr NW	4444	W,C,Q
31bab	Taylor Farms	S 1200 E 1320 fr NW	4445	M
31cdc	Taylor Farms	N 25 W 780 fe S1/4	4424	W,C
32aca	Taylor Farms	S 1320 E 3960 fr NW	4435	Q,L
32ccc	Jon Bishop	N 40 E 104 fr SW	4421	W,C,L
33bcb	Alder	S 1640 E 50 fr NW	4430	W,C,Q,L
33dcd	Alder	N 10 W 1320 fr SE	4415	W,C,Q,L
34bbc	Alder	S 750 E 385 fr NW	4445	W,L
34dcc	Charles R. Taylor	N 382 E 64 fr S1/4	4420	L
35abb-1	Jackson Farms - Rose Ranch	S 30 W 2540 fr NE	4484	C,Q
35abb-2	Jackson Farms - Rose Ranch	S 20 E 100 fr N1/4	4479	W
36bcb	Jackson Farms - Rose Ranch	N 1000 fr W1/4	4492	W,Q,L
36cad	Jackson Farms - Rose Ranch	N 1760 W 25 fr S 1/4	4484	W,C
36dbc	Jackson Farms - Rose Ranch	N 1730 W 2620 fr SW	4492	W,C,Q
B-15-10				
25cad	Taylor Farms	N 1530 E 2250 fr SW	4464	W,C,L
33ddd	Calvin Dredge	N 760 W 570 fr SE	4563	W,C
34bcc	George Neal	N 150 E 60 fr W1/4	4557	W,L
34ccc	Tom Flinders	N 180 E 165 fr SW	4549	W,C

Table 1. Curlew Valley Wells (continued)

ID#	Owner	Location	Altitude	Data
B-15-10 (continued)				
36acc	Durbano	S 2640 E 2640 fr NW	4442	L
36bbb	Durbano	S 100 E 100 fr NW	4464	W,C
36bbc	Durbano	S 1370 E 270 fr NW	4454	W,L
ID-16-30				
9abb	Black Pine #1		4658	W,C,Q
16aab	Campbell		4588	C
16cbb	Campbell		4571	W
ID-16-31				
28acc	Jackson Farms - Rose Ranch		4500	W,C,Q
29bcd	Taylor Farms		4465	W,C,Q
ID-16-32				
23cdd	Tom Wilcock			Q

Table 2. Curlew Valley Well Data

Location	Water Quality Temp. (C)	Water Quality Cond. (uS/cm)	Water Level (ft)	Date 1993	Water Level (ft)	Date Spring 1994	Water Level (ft)	Date Fall 1994	Water Level (ft)	Date Spring 1995	Water Level (ft)	Date Fall 1995	Water Level (ft)	Date Spring 1996
B-12-9														
6abb											209.2	25-Oct		
9cda	12.0	3100	120.0	30-Sep	119.4	20-Apr	120.2	14-Oct	119.7	13-Apr	120.4	25-Oct		
17add	19.0	5500												
28add	19.0	4800	99.0	21-Sep	114.5	20-Apr			100.0	13-Apr	100.4	25-Oct		
30cda			25.8	30-Sep	24.31	08-Mar	25.6	14-Oct	25.3	08-Mar	25.5	10-Oct	25.0	22-Apr
B-12-10														
1aaa	12.0	2800												
B-12-11													189.0	21-Jan
5bbb					161.2	08-Mar			164.4	09-Mar				
16cdc					16.5	08-Mar			17.2	09-Mar			16.4	07-Mar
B-13-8														
18abb	19.0	8500				02-Jun								
21dcd					329.6	29-Apr								
B-13-9														
1adc	15.0	4800			339.0	29-Apr	339.7	14-Oct			339.6	25-Oct		
33ccc	21.0	4400			213.1	29-Apr	210.3	14-Oct			210.4	25-Oct		
35bbd			293.0	21-Sep	288.6	20-Apr	289.6	14-Oct	289.0	13-Apr	289.7	25-Oct	289.2	06-May
B-13-10														
11dcd			120.8	12-Mar	120.6	08-Mar	120.3	14-Oct	120.7	09-Mar	121.9	02-Nov	120.6	07-Mar
25ddd			180.5	30-Sep	188.7	20-Apr	189.6	14-Oct	189.0	13-Apr				
34ddc			87.2	12-Mar	86.9	08-Mar	85.8	14-Oct	87.0	09-Mar	87.5	25-Oct	86.8	07-Mar
B-13-11														
10cdc					250.3	08-Mar			250.5	09-Mar			251.0	07-Mar
B-14-8														
1bbc	14.0	1280									59.5	10-Oct	51.6	01-May
1ddd			51.0	11-Mar	51.0	29-Apr	51.3	25-Oct	51.2	21-Apr	51.8	10-Oct	51.8	01-May
2ddc	16.0	1450	85.0	09-Oct	77.0	19-May								
4ddd			272.1	21-Sep	261.7	02-May	269.3	25-Oct	264.1	21-Apr	271.0	10-Oct	265.5	01-May
5bac	20.0	1780	276.5	09-Nov	271.6	02-May			276.0	21-Apr	283.5	11-Oct	278.2	01-May
5dcc	20.0	1750		16-Nov										

Table 2. Curlew Valley Well Data (continued)

Location	Water Quality Temp. (C)	Water Quality Cond. (uS/cm)	Water Level (ft)	Date 1993	Water Level (ft)	Date Spring 1994	Water Level (ft)	Date Fall 1994	Water Level (ft)	Date Spring 1995	Water Level (ft)	Date Fall 1995	Water Level (ft)	Date Spring 1996
B-14-8 (continued)														
5ddd			90.0	02-Mar	83.7	14-Apr	90.3	11-Oct	87.7	03-Apr	87.5	03-Oct	85.6	01-May
6aca	20.0	1400	195.4	09-Nov	191.05	14-Apr	198.1	25-Oct	192.8	04-Apr	201.3	12-Oct	195.4	01-May
6add	19.0	1800	208.3	09-Nov	204.08	14-Apr	211.0	25-Oct	206.0	04-Apr	214.1	12-Oct	208.7	01-May
11bca-1	14.0	2000				02-Jun			43.5	21-Apr				
11dcc					129.2	20-Apr								
12cbd	21.0	1150				02-Jun								
15ddd	16.5	1250			167.8	20-Apr	170.6	14-Oct	170.1	21-Apr	172.8	25-Oct	172.0	06-May
20baa	24.0	1500			279.3	27-Apr	286.7	14-Oct			286.9	25-Oct		
28aba			133.7	30-Sep										
28bbb			158.6	28-Sep	159.3	20-Apr	164.2	14-Oct	175.9	21-Apr	184.6	25-Oct		
32dba	17.0	1800			332.6	29-Apr	330.7	14-Oct	330.9	02-May	330.9	25-Oct		
B-14-9														
1cdd	8.0	3150	140.9	09-Nov	124.7	13-Apr	130.9	11-Oct	126.0	03-Apr	124.9	03-Oct	121.7	01-May
3dbb	23.5	2450	190.3	02-Nov	182.1	27-Apr	191.9	25-Oct	185	02-Apr	194.0	10-Oct	183.4	30-Apr
4cbb	22.0	3350	206.0	02-Nov	191.4	27-Apr	211.3	20-Oct	192.9	03-Apr	211.6	10-Oct	194.2	30-Apr
4ccc	20.0	2400	188.9	16-Nov	180.7	02-May	194.5	25-Oct	182.4	04-Apr	196.2	10-Oct		
5aaa	17.0	1100	217.7	02-Nov	206.1	27-Apr								
5abb	18.0	1200				08-Jun								
5bbb	16.0	650				08-Jun								
5ccd	19.0	1950			186.6	02-May			187	02-Apr				
6add	16.0	1700	230.6	17-Sep	203.5	13-Apr								
6ccc	15.0	800				08-Jun								
7bbb	20.0	1100	196.9	26-Oct	184.6	14-Apr	199.3	21-Nov	187.2	03-Apr	206.9	03-Oct	185.0	30-Apr
9add			180.1	15-Sep	165.8	02-May			167.8	04-Apr	174.6	10-Oct	167.7	22-Apr
9baa			183.9	16-Nov	179.0	13-Apr	190.7	11-Oct	179.7	03-Apr	189.9	03-Oct	182.8	01-May
11bcb	19.0	1500	183.6	16-Nov	180.7	02-May			181.8	04-Apr	185.6	10-Oct		
14dac	22.0	3200				23-Jun			199.8	04-Apr	201.9	10-Oct	203.3	01-May
16aaa	15.0	1850	163.0	07-Nov	160.5	02-May			161.3	04-Apr				
16daa			154.4	02-Nov	153.0	02-May								
17caa			163.5	28-Oct	159.9	13-Apr	171.7	11-Oct	160.6	03-Apr	171.3	03-Oct	160.9	30-Apr

Table 2. Curlew Valley Well Data (continued)

Location	Water Quality Temp. (C)	Water Quality Cond. (uS/cm)	Water Level (ft)	Date 1993	Water Level (ft)	Date Spring 1994	Water Level (ft)	Date Fall 1994	Water Level (ft)	Date Spring 1995	Water Level (ft)	Date Fall 1995	Water Level (ft)	Date Spring 1996
B-14-9 (continued)														
17cab	18.0	2570												
18bdd	20.0	2000			160.1	27-Apr	166.8	21-Nov	161.1	03-Apr	173.6	12-Oct	160.8	29-Apr
19bbb	16.0	1200	167.8	28-Oct	159.0	20-Apr			160.0	03-Apr				
20acc	17.0	2520	146.7	28-Oct	144.5	13-Apr	146.3	21-Nov	144.8	03-Apr	148.2	12-Oct	146.6	30-Apr
27acc		1750	192.5	17-Sep	188.6	20-Apr			187.9	03-Apr	189.3	12-Oct		
29bbb	17.5	2780	135.4	3/90		06-May								
B-14-10														
1abb	16.5	460	222.7	17-Nov	212.7	02-May								
1bbb	17.5	500				08-Jun								
1dca	17.0	410	190.7	17-Nov	189.8	13-Apr	191.2	11-Oct	dry hole	21-Apr				
4ccd	18.0	465				06-May								
5bba					60.6	08-Mar			61.0	09-Mar			62.0	07-Mar
11cbc	20.5	520			203.8	27-Apr	220.1	21-Nov	207.5	03-Apr	223.7	03-Oct	206.1	30-Apr
12bcb	18.0	550				08-Jun								
12cbc	19.0	1050				23-Jun								
13cab					172.0	27-Apr			171.5	21-Apr			171.2	30-Apr
14acd	20.0	1450			184.3	06-May			186.4	21-Apr				
14bbb	19.0	750				08-Jun								
14bbc	21.0	900				08-Jun								
14cbc									196.5	21-Apr				
15bbb			219.3	11-Mar	216.0	27-Apr			218.5	21-Apr			219.0	30-Apr
15ccd					207.7	27-Apr			211.6	21-Apr			211.4	30-Apr
23bbc	19.0	1350				08-Jun			190.1	21-Apr				
B-15-8														
31ccc					202.5	14-Apr			191.6	04-Apr				
34dad	16.0	2100	231.9	21-Sep	240.0	29-Apr								
B-15-9														
28cbc	25.0	10000	266.4	02-Nov	254.0	27-Apr	267.4	25-Oct	255.5	04-Apr	265.2	12-Oct	253.2	29-Apr
28dbd													254.2	29-Apr
28dda	31.5	6000	259.7	02-Nov	259.5	18-Apr	260.1	20-Oct			260.6	12-Oct	257.9	29-Apr

Table 2. Curlew Valley Well Data (continued)

Location	Water Quality Temp. (C)	Water Quality Cond. (uS/cm)	Water Level (ft)	Date 1993	Water Level (ft)	Date Spring 1994	Water Level (ft)	Date Fall 1994	Water Level (ft)	Date Spring 1995	Water Level (ft)	Date Fall 1995	Water Level (ft)	Date Spring 1996
B-15-9 (continued)														
29cbc	21.0	5500	263.9	26-Oct	251.9	27-Apr			257	02-Apr				
31abc	18.0	600	245.9	26-Oct	231.7	27-Apr			236	02-Apr				
31bab			243.8	26-Oct	233.9	27-Apr	254.5	11-Oct	235.2	03-Apr	253.8	03-Oct		
31cdc	19.0	800			213.4	02-May								
32ccc	17.0	750	231.8	28-Oct	215.0	27-Apr	231.3	25-Oct	218.2	03-Apr	239.0	10-Oct	215.8	29-Apr
33bcb	23.0	8500	243.5	02-Nov	230.8	27-Apr	244.8	25-Oct	233.0	04-Apr				
33dcd	25.0	5900			201.9	20-Apr	218.7	11-Oct	207.9	03-Apr				
34bbc							247.3	11-Oct	242.6	03-Apr	247.9	12-Oct	241.9	29-Apr
35abb-1			186.4	09-Nov	176.4	18-Apr								
35abb-2	23.0	2800							185.0	03-Apr				
36bcc											203.0	12-Oct	195.8	30-Apr
36cad	17.0	1300			183.5	14-Apr	193.5	25-Oct	187.0	04-Apr	194.2	11-Oct		
36dbc	19.0	1400	197.6	09-Nov	193.4	14-Apr								
B-15-10														
25cad	16.5	440	233.0	26-Oct	207.0	27-Apr			210	02-Apr				
33dda	19.0	410			298.3	06-May								
34bcc					272.4	06-May			286.0	21-Apr				
34ccc	17.5	395	285.8	17-Nov	280.3	06-May								
36bbb	16.0	365	247.5	9/92		08-Jun								
36bbc			212.5	09-Dec					178.5	21-Apr			178.6	30-Apr
ID-16-30														
9abb	11.0	416	49.8	01-Dec	48.4	06-May			51.1	09-Mar				
16aab	13.5	390				06-May								
16cbb					115.1	06-May	117.4	21-Nov	115.4	13-Apr				
ID-16-31														
28acc	23.0	3250	230.4	09-Nov	224.6	18-Apr	233.3	20-Oct	228.1	04-Apr	235.0	12-Oct	229.0	29-Apr
29bcd	38.0	7500	184.1	09-Nov	179.4	18-Apr	187.1	20-Oct	181.9	04-Apr	188.7	12-Oct	182.7	29-Apr

CURLEW VALLEY MONTHLY MONITOR WELLS

Table 3. Water Levels for Selected Wells in Curlew Valley

See Plate 1. for location of hydrologic data sites.

Water levels are in feet below (-) land surface.

Date	Water Level	Altitude	Water Level	Altitude	Water Level	Altitude
Well ID#	**(B-14-8)5ddd**		**(B-14-9)1cdd**		**(B-14-9)9baa**	
Owner	**USGS**		**Rose Ranch**		**Rose Ranch**	
Well Head		**4495**		**4452**		**4392**
09-Nov-93			-140.85	4311.15	-183.88	4208.12
09-Dec-93			-138.16	4313.84	-182.40	4209.60
14-Jan-94			-138.06	4313.94	-180.99	4211.01
09-Feb-94			-136.29	4315.71	-180.47	4211.53
08-Mar-94	-85.27	4409.73	-128.42	4323.58	-178.14	4213.86
13-Apr-94	-83.70	4411.30	-124.68	4327.32	-178.99	4213.01
02-Jun-94			-123.25	4328.75	-191.10	4200.90
13-Jul-94			-118.80	4333.20	-195.90	4196.10
08-Aug-94			-122.25	4329.75	-195.00	4197.00
07-Sep-94			-126.85	4325.15	-196.70	4195.30
11-Oct-94	-90.30	4404.70	-130.90	4321.10	-190.70	4201.30
21-Nov-94	-92.00	4403.00	-134.70	4317.30	-184.20	4207.80
23-Dec-94	-92.40	4402.60	-136.10	4315.90	-182.00	4210.00
25-Jan-95	-91.80	4403.20	-136.10	4315.90	-180.95	4211.05
22-Feb-95	-91.20	4403.80	-136.05	4315.95	-180.45	4211.55
03-Apr-95	-87.20	4407.80	-126.00	4326.00	-179.70	4212.30
02-May-95	-84.60	4410.40	-123.15	4328.85	-179.60	4212.40
07-Jun-95	-82.40	4412.60	-122.05	4329.95	-189.05	4202.95
07-Jul-95	-82.90	4412.10	-122.00	4330.00	-189.75	4202.25
04-Aug-95	-84.35	4410.65	-123.20	4328.80	-193.90	4198.10
05-Sep-95	-86.20	4408.80	-125.30	4326.70	-192.60	4199.40
03-Oct-95	-87.50	4407.50	-124.90	4327.10	-189.90	4202.10
02-Nov-95	-89.10	4405.90	-132.90	4319.10	-185.00	4207.00
12-Dec-95	-90.50	4404.50	-140.70	4311.30	-181.35	4210.65
08-Jan-96	-91.60	4403.40	-136.20	4315.80	-180.80	4211.20
07-Feb-96	-92.10	4402.90	-134.30	4317.70	-180.40	4211.60
04-Mar-96	-91.70	4403.30	-133.00	4319.00	-179.65	4212.35
01-Apr-96	-89.10	4405.90	-123.00	4329.00	-178.95	4213.05
01-May-96	-85.60	4409.40	-121.65	4330.35	-183.00	4209.00
03-Jun-96	-83.10	4411.90	-120.60	4331.40	-187.10	4204.90
01-Jul-96	-83.80	4411.20	-121.10	4330.90	-194.70	4197.30
01-Aug-96	-85.50	4409.50	-120.90	4331.10	-194.50	4197.50
06-Sep-96	-87.60	4407.40	-122.20	4329.80	-190.90	4201.10
03-Oct-96	-89.00	4406.00	-122.50	4329.50	-189.70	4202.30
04-Apr-97	-87.70	4407.30	-115.80	4336.20	-178.90	4213.10

Table 3. Water Levels for Selected Wells in Curlew Valley (continued)

Date	Water Level	Altitude	Water Level	Altitude	Water Level	Altitude
Well ID#	(B-14-9)17caa		(B-14-10)11cbc		(B-15-9)31bab	
Owner	Taylor Farms		Farmland Inc.		Taylor Farms	
Well Head		4372		4434		4445
09-Nov-93	-168.58	4203.42			-243.80	4201.20
09-Dec-93						
14-Jan-94	-162.38	4209.62				
09-Feb-94	-161.59	4210.41				
08-Mar-94						
13-Apr-94	-159.92	4212.08	-203.80	4230.20	-233.90	4211.10
02-Jun-94	-170.30	4201.70			-244.40	4200.60
13-Jul-94	-174.40	4197.60				
08-Aug-94	-175.40	4196.60			-255.30	4189.70
07-Sep-94	-177.40	4194.60			-257.90	4187.10
11-Oct-94	-171.65	4200.35			-254.50	4190.50
21-Nov-94	-165.45	4206.55	-220.10	4213.90	-246.25	4198.75
23-Dec-94	-163.35	4208.65	-215.60	4218.40	-242.15	4202.85
25-Jan-95	-162.05	4209.95	-212.15	4221.85	-239.20	4205.80
22-Feb-95	-161.40	4210.60	-210.00	4224.00	-237.40	4207.60
03-Apr-95	-160.60	4211.40	-207.50	4226.50	-235.20	4209.80
02-May-95	-161.45	4210.55	-206.30	4227.70	-236.00	4209.00
07-Jun-95	-170.70	4201.30			-245.15	4199.85
07-Jul-95	-171.00	4201.00			-248.20	4196.80
04-Aug-95	-170.90	4201.10	-218.40	4215.60	-250.50	4194.50
05-Sep-95	-175.10	4196.90			-258.50	4186.50
03-Oct-95	-171.33	4200.67	-223.70	4210.30	-253.80	4191.20
02-Nov-95	-166.00	4206.00	-220.50	4213.50	-246.90	4198.10
12-Dec-95	-162.80	4209.20	-214.80	4219.20	-241.60	4203.40
08-Jan-96	-162.10	4209.90	-212.50	4221.50	-239.70	4205.30
07-Feb-96	-161.30	4210.70	-210.20	4223.80	-237.00	4208.00
04-Mar-96	-160.60	4211.40	-208.40	4225.60	-234.40	4210.60
01-Apr-96	-160.10	4211.90	-206.90	4227.10	-233.30	4211.70
01-May-96	-160.85	4211.15	-206.10	4227.90		
03-Jun-96	-170.00	4202.00				
01-Jul-96	-177.30	4194.70	-218.60	4215.40		
01-Aug-96	-179.00	4193.00	-222.00	4212.00		
06-Sep-96	-180.00	4192.00				
03-Oct-96	-175.50	4196.50	-226.00	4208.00		
04-Apr-97	-160.40	4211.60	-207.80	4226.20		

Table 3. Water Levels for Selected Wells in Curlew Valley (continued)

Date	Water Level	Altitude
Well ID#	(B-14-9)7bbb	
Owner	Farmland Inc.	
Well Head		4434
25-Jan-95	-190.60	4243.40
22-Feb-95	-188.60	4245.40
07-Mar-95	-186.60	4247.40
03-Apr-95	-186.20	4247.80
02-May-95	-187.20	4246.80
07-Jun-95	-198.90	4235.10
07-Jul-95		
04-Aug-95	-206.00	4228.00
05-Sep-95		
03-Oct-95	-205.85	4228.15
02-Nov-95	-198.45	4235.55
12-Dec-95	-192.50	4241.50
08-Jan-96	-190.35	4243.65
07-Feb-96	-188.20	4245.80
04-Mar-96	-186.40	4247.60
01-Apr-96	-185.00	4249.00
01-May-96	-184.00	4250.00
03-Jun-96		
01-Jul-96	-202.00	4232.00
01-Aug-96	-205.90	4228.10
06-Sep-96		
03-Oct-96	-206.60	4227.40
04-Apr-97	-185.50	4248.50

Figure 3. Water levels for Selected Wells in Curlew Valley

Depth measured in feet below land surface (-)

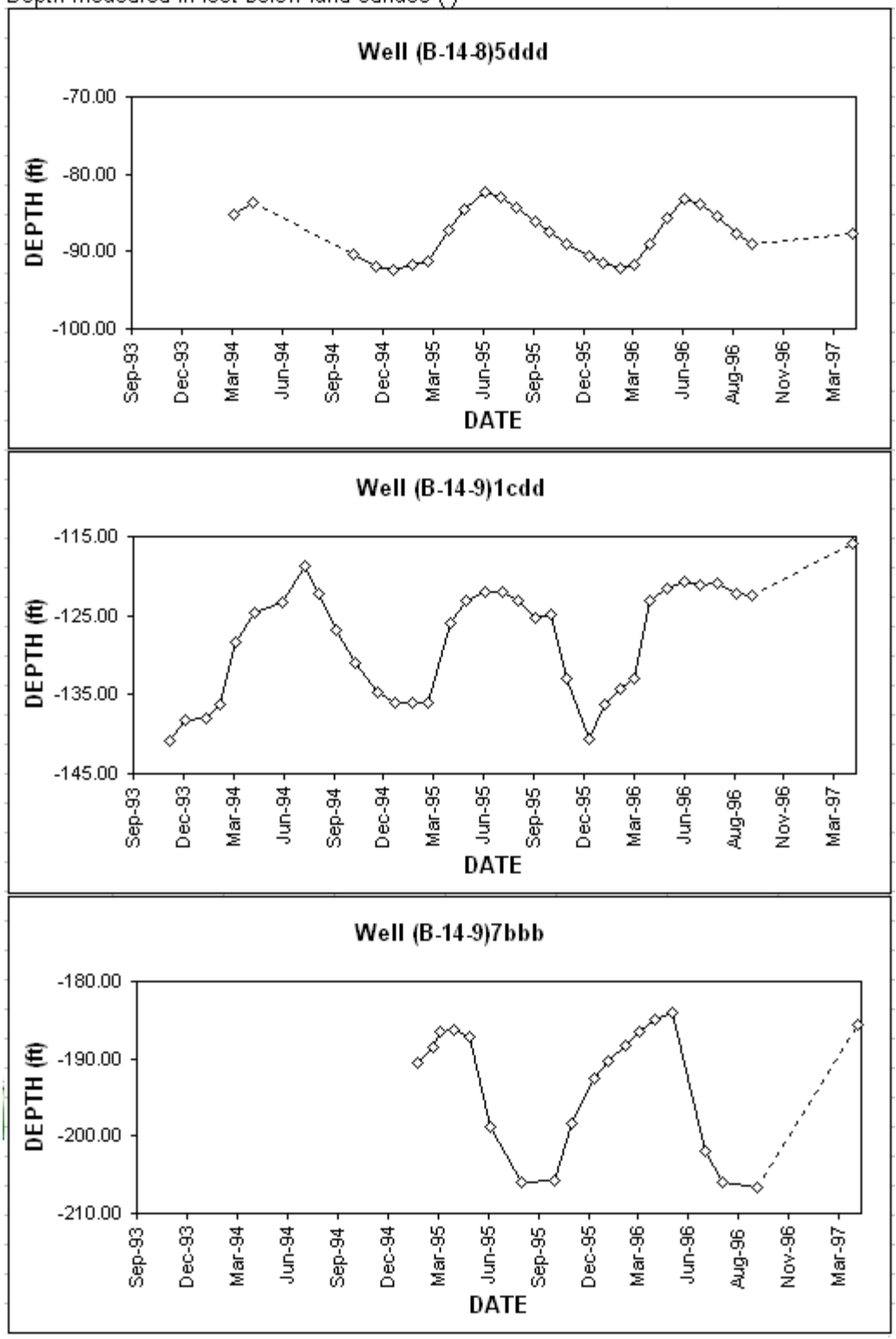


Figure 3. Water levels for Selected Wells in Curlew Valley (continued)

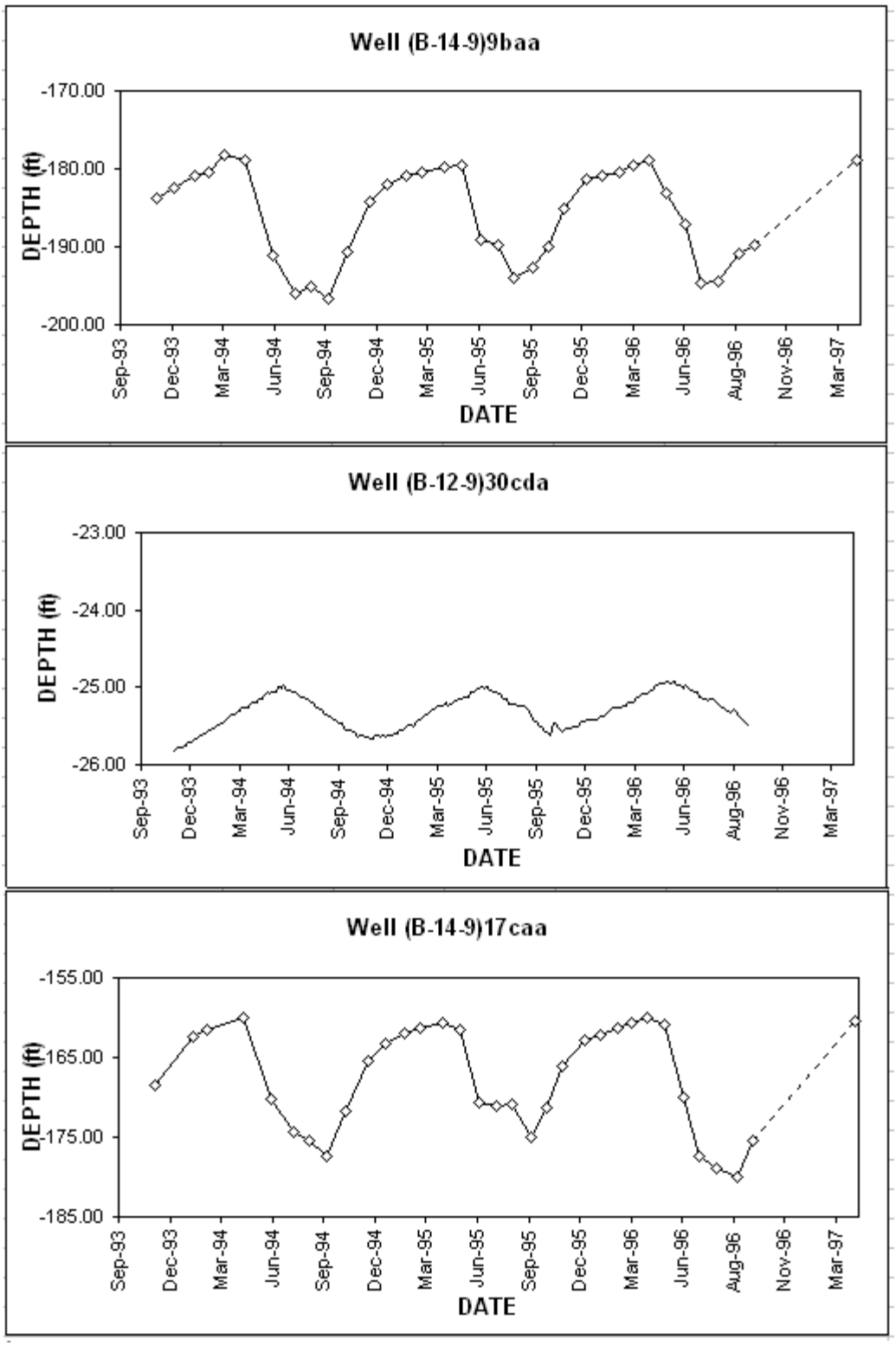
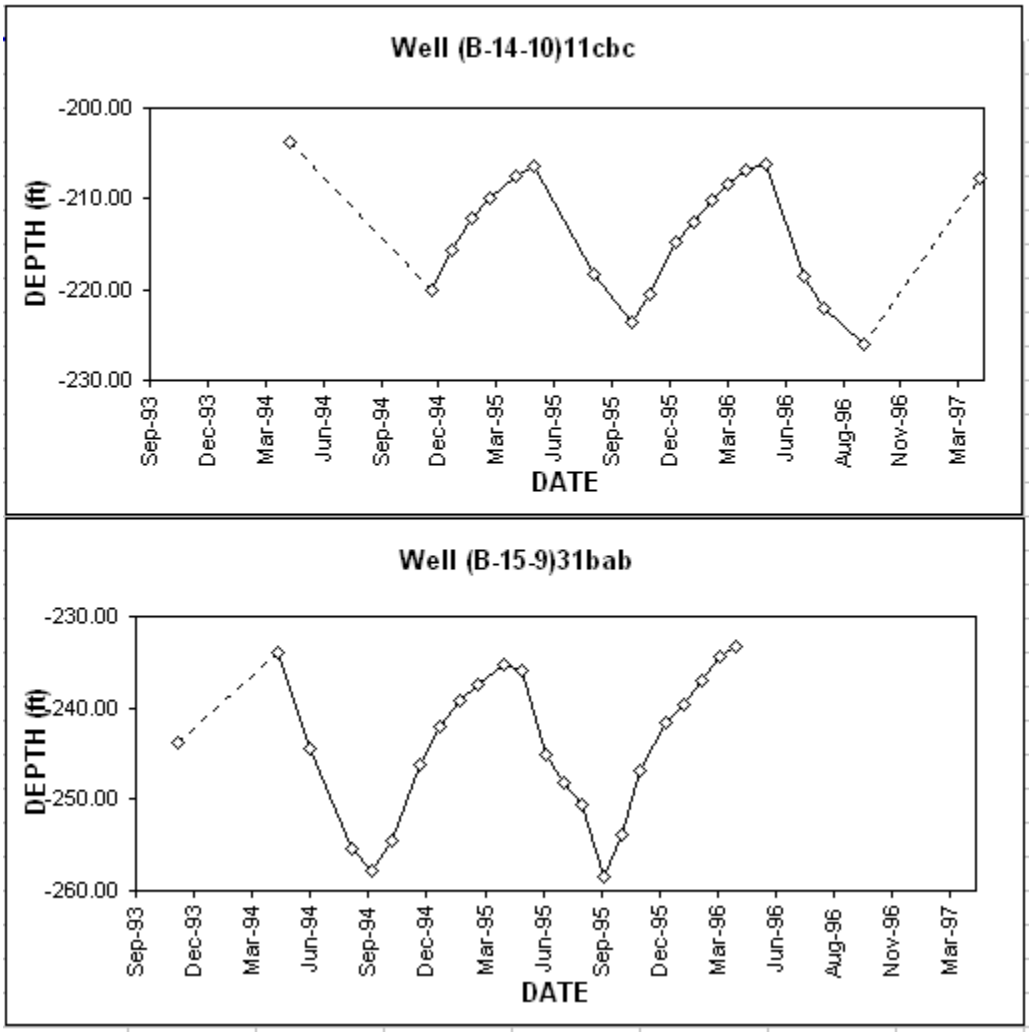


Figure 3. Water levels for Selected Wells in Curlew Valley (continued)



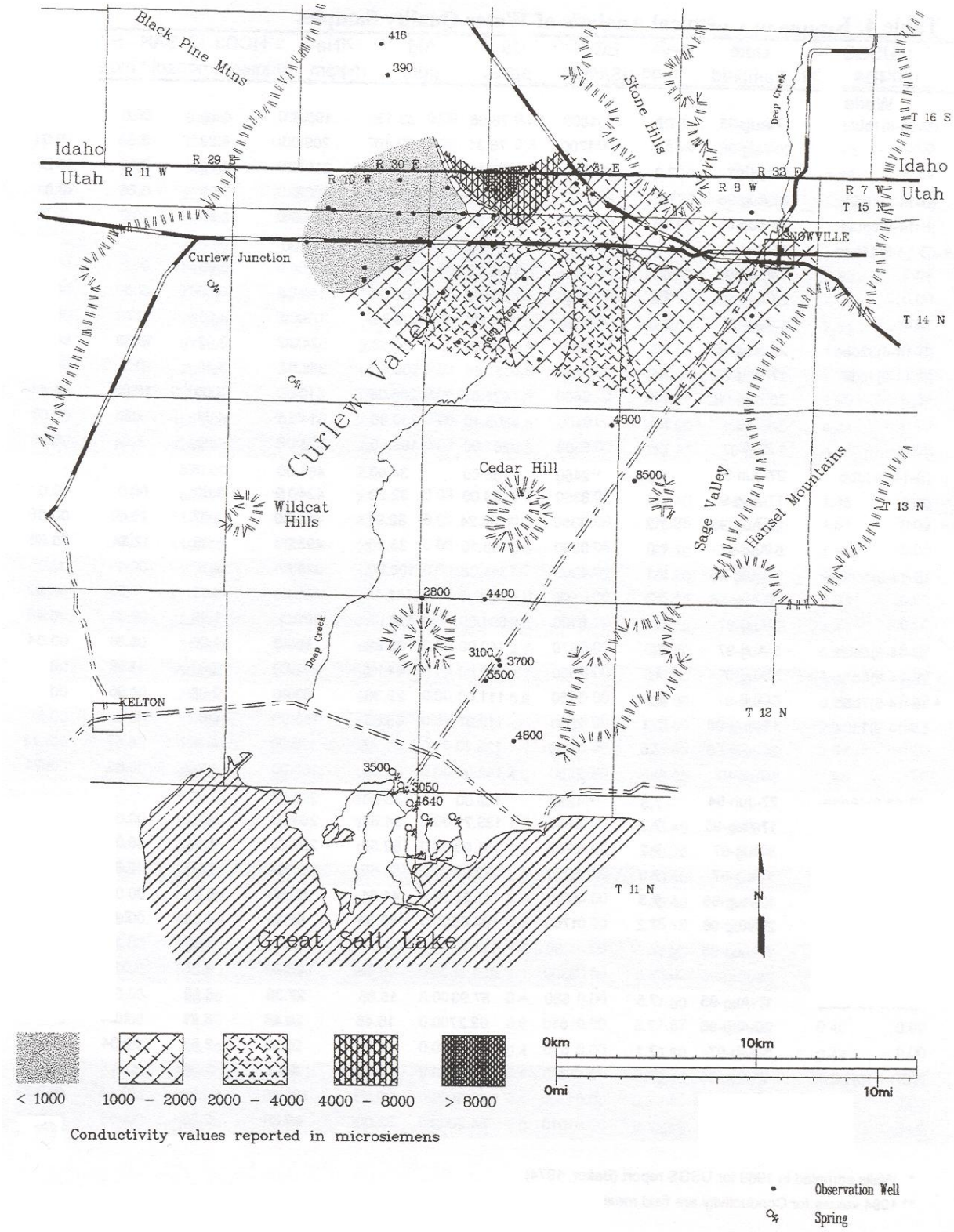


Figure 4. Conductivity of Groundwater in Curlew Valley

Table 4. Results of Chemical Analysis of Water Quality Samples

	USGS ID#	Date Sampled	pH	EC uS/cm	Ca ppm	Mg ppm	Na ppm	HCO3 meq/L	SAR adj.*	SAR
	Wells									
	(B-14-8)1bbc	17-Aug-95	7.2	1800	76.08	33.13	196.83	4.60		
		20-Aug-96	7.4	1700	76.31	32.10	209.00	4.28	6.88	5.06
		05-Aug-97	7.2	1700	77.10	32.40	219.00	4.11	6.12	5.28
	(B-14-8)1ddd	20-Aug-96	7.6	1300	57.65	42.02	130.00	3.93	3.86	3.81
	(B-14-8)5dcc	20-Aug-96	7.3	2340	135.24	51.75	233.00	3.68	6.27	4.32
*	(B-14-8)11bca	27-Jun-94	7.6	**2000	192.00	87.00	317.00			
		17-Aug-95	7.2	3300	161.85	84.60	323.43	5.00		
		20-Aug-96	7.5	3250	170.63	85.66	343.00	5.00	7.53	5.35
		05-Aug-97	7.1	3340	185.00	93.30	373.00	4.50	6.79	5.58
	(B-14-8)32dba	20-Aug-96	7.3	3200	55.25	24.82	524.00	3.93	18.69	14.71
	(B-14-9)1cdd	17-Aug-95	7.1	3750	157.46	108.47	355.98	5.40		
		20-Aug-96	7.1	8400	425.85	286.08	810.00	5.00	10.07	7.44
		Sep-96	7.4	6400	366.10	230.88	614.35	4.64	7.84	6.59
		05-Aug-97	7.0	5500	281.00	183.00	578.00	4.82	7.84	6.59
	(B-14-9)3dbb	27-Jun-94	7.8	**2450	88.00	34.00	461.00			
		17-Aug-95	7.3	3350	83.09	32.22	424.15	3.60		
		20-Aug-96	7.2	3350	88.24	32.91	484.00	3.57	15.40	11.16
		05-Aug-97	7.0	3380	88.10	33.20	493.00	3.39	12.84	11.36
	(B-14-9)4cbb	17-Aug-95	7.1	4900	344.08	108.80	329.98	2.10		
		20-Aug-96	7.1	7000	520.38	155.44	488.00	2.32	7.93	4.82
		05-Aug-97	6.9	8100	591.00	187.00	591.00	1.96	6.49	5.43
	(B-14-9)5abb	05-Aug-97	6.8	1370	140.00	35.20	58.40	1.96	1.28	1.14
*	(B-14-9)5ccd	05-Aug-97	7.0	2300	160.00	44.30	212.00	2.68	4.49	3.82
*	(B-14-9)7bbb	05-Aug-97	6.8	1150	111.00	29.30	53.40	2.68	1.36	1.16
	(B-14-9)11bcb	17-Aug-95	7.3	2000	110.97	55.65	156.08	4.60		
		20-Aug-96	7.5	2050	129.13	61.77	176.00	4.64	4.47	3.19
		05-Aug-97	7.0	2250	142.00	69.00	188.00	4.28	3.88	3.24
	(B-14-9)16aaa	27-Jun-94	7.5	**1850	139.00	56.00	252.00			
		17-Aug-95	7.2	2650	133.71	54.62	256.94	5.00		
		05-Aug-97	7.2	2700	151.00	60.50	293.00	4.64	6.38	5.09
	(B-14-9)17cab	05-Aug-97	7.0	3250	189.00	58.50	337.00	3.57	6.87	5.49
	(B-14-9)19bbb	17-Aug-95	7.3	1700	147.55	41.81	80.66	2.90		
		20-Aug-96	7.2	1700	164.65	43.89	87.36	2.86	2.49	1.56
	(B-14-9)20acc	17-Aug-95	7.3	3250	141.72	48.17	368.48	4.60		
		20-Aug-96	7.5	3300	154.35	49.13	386.00	4.28	10.68	6.93
*	(B-14-10)1bbb	17-Aug-95	7.5	580	57.93	15.86	27.36	3.20		
		20-Aug-96	7.5	610	62.27	16.48	30.43	3.21	1.24	0.89
		05-Aug-97	7.1	610	63.10	11.70	19.00	2.50	0.64	0.58
	(B-14-10)14bbb	17-Aug-95	7.5	1300	76.87	31.12	107.47	2.90		
		20-Aug-96	7.6	1300	80.30	30.59	105.00	2.86	3.43	2.53
		05-Aug-97	7.5	1010	84.20	32.00	60.80	2.50	1.59	1.43

* Wells sampled in 1969 for USGS report (Baker, 1974)

** 1994 values for Conductivity are field measurements which averaged 82 percent of laboratory.

Al	B	Cl	Fe	K	Mn	NO3	PO4-P	S	Si	Sr	Zn
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
0.00	0.00	368.00	0.00	9	0.00	0.2	0.00	19.30	15.60	1.24	0.38
0.00	0.00	350.00	0.00	9	0.00	0.3	0.00	15.96	17.06	1.24	0.00
0.00	0.00	349.00	0.00	9	0.00	0.1	0.00	24.80	0.00	1.23	0.84
0.00	0.00	271.00	0.00	26	0.03	0.0	0.00	10.20	37.90	1.27	0.00
0.00	0.00	569.00	0.00	15	0.00	2.0	0.00	37.00	19.70	1.90	0.00
		726.00		18							
0.00	0.00	719.00	0.00	18	0.00	1.3	0.00	108.40	21.50	2.53	0.00
0.00	0.00	790.00	0.00	18	0.00	1.5	0.00	97.78	23.12	2.57	0.00
0.00	0.17	751.00	0.00	19	0.00	1.3	0.00	126.00	0.00	2.81	0.00
0.00	0.18	875.00	0.00	33	0.00	0.3	0.00	21.50	23.00	1.16	0.10
0.00	0.15	763.00	0.00	16	0.00	8.8	0.00	136.80	10.17	1.78	1.69
0.00	0.00	2293.00	0.06	26	0.00	41.4	0.00	257.60	12.85	4.90	0.04
0.00	0.00	1565.00	0.08	25	0.00	34.8	0.00	214.00	14.31	4.34	0.00
0.00	0.00	1262.00	0.00	23	0.00	18.5	0.00	212.00	0.00	3.35	0.00
		870.00		21							
0.00	0.00	883.00	0.00	21	0.03	0.3	0.00	15.40	25.10	1.46	0.00
0.00	0.00	1152.00	0.00	23	0.00	0.3	0.00	14.25	27.53	1.51	0.00
0.00	0.00	1109.00	0.00	23	0.00	0.3	0.00	22.10	0.00	1.54	0.00
0.00	0.00	177.00	0.00	28	0.00	2.7	0.00	24.20	20.38	2.68	0.00
0.00	0.00	2180.00	0.00	37	0.00	4.0	0.00	25.44	30.11	3.83	0.00
0.00	0.16	2506.00	0.00	44	0.03	3.4	0.00	31.70	0.00	4.48	0.00
0.00	0.00	314.00	0.00	16	0.00	2.7	0.00	19.70	0.00	0.85	0.00
0.00	0.00	566.00	0.00	19	0.00	3.7	0.00	36.60	0.00	1.05	0.00
0.00	0.00	250.00	0.00	14	0.00	0.6	0.00	20.00	0.00	0.76	0.00
0.00	0.00	379.00	0.00	11	0.00	2.8	0.00	30.00	20.10	2.41	0.11
0.00	0.00	451.00	0.00	12	0.00	3.4	0.00	33.89	22.05	2.67	0.00
0.00	0.00	487.00	0.00	12	0.00	4.3	0.00	46.60	0.00	2.94	0.00
		578.00		15							
0.00	0.00	580.00	0.00	15	0.00	1.7	0.00	43.40	19.01	1.99	0.04
0.00	0.00	647.00	0.00	17	0.00	1.8	0.00	56.20	0.00	2.18	0.00
0.00	0.00	877.00	0.00	24	0.00	1.3	0.00	40.40	0.00	1.62	0.00
0.00	0.00	366.00	0.00	13	0.00	0.8	0.00	15.40	24.99	0.95	0.00
0.00	0.00	420.00	0.00	13	0.00	0.8	0.00	15.19	26.87	1.01	0.00
0.00	0.00	799.00	0.00	21	0.00	1.0	0.00	44.20	24.29	1.40	0.00
0.00	0.00	857.00	0.00	21	0.00	1.1	0.00	40.62	25.98	1.44	0.00
0.00	0.00	80.80	0.00	7	0.00	0.4	0.00	7.80	27.75	0.44	0.05
0.00	0.00	71.40	0.00	7	0.00	0.6	0.00	7.87	30.48	0.46	0.00
0.00	0.00	84.70	0.00	8	0.00	0.4	0.00	15.80	0.00	0.47	0.00
0.00	0.00	308.00	0.00	25	0.00	0.4	0.00	9.40	35.74	1.29	0.00
0.00	0.00	331.00	0.00	23	0.00	0.4	0.00	8.43	37.27	1.27	0.00
0.00	0.00	195.00	0.00	11	0.00	1.0	0.00	18.10	0.00	0.89	0.00

Table 4. Results of Chemical Analysis of Water Quality Samples (continued)

	USGS ID#	Date Sampled	pH	EC umhos/cm	Ca ppm	Mg ppm	Na ppm	HCO3 meq/L	SAR adj.*	SAR
	Wells									
	(B-15-8)31ccc	20-Aug-96	7.7	1600	103.99	49.57	140.00	3.21	3.82	2.83
	(B-15-8)34dad	17-Aug-95	7.0	2750	171.55	67.66	242.82	5.00		
		05-Aug-97	7.0	2880	195.00	74.70	284.00	4.64	5.56	4.38
	(B-15-9)28dda	20-Oct-94	7.1	5800	71.70	19.00	1038.00			
		17-Aug-95	7.3	5900	84.44	28.80	840.31	3.20		
		05-Aug-97	7.1	6000	94.00	30.70	1034.00	3.21	23.82	23.67
	(B-15-9)29cbc	05-Aug-97	6.7	9400	714.00	186.00	725.00	1.43	7.51	6.25
*	(B-15-9)31abc	27-Jun-94	7.8	**620	75.00	17.50	28.00			
		17-Aug-95	7.4	800	79.88	19.43	30.28	2.90		
		20-Aug-96	7.3	880	89.72	21.03	34.97	2.86	1.31	0.86
		05-Aug-97	7.1	910	93.80	22.40	35.90	2.32	0.96	0.86
	(B-15-9)32aca	05-Aug-97	6.8	5280	330.00	88.80	472.00	1.96	6.68	5.95
	(B-15-9)33bcb	27-Jun-94	7.3	**9300	803.00	204.00	905.00			
	(B-15-9)33dcd	05-Aug-97	7.5	3280	267.00	77.80	217.00	2.32	3.65	3.00
	(B-15-9)35abb-2	20-Oct-94	7.8	**3050	71.70	26.54	503.20			
		17-Aug-95	7.3	3600	68.71	28.73	484.66	3.90		
		20-Aug-96	7.4	3400	71.74	29.61	529.00	3.57	17.45	13.26
		05-Aug-97	7.1	3380	73.30	30.50	543.00	3.57	15.07	13.45
	(B-15-9)36bcc	20-Aug-96	7.7	1800	48.18	21.60	300.00	3.64	11.15	9.02
	(B-15-9)36dbc	20-Aug-96	7.5	1600	76.98	36.74	179.00	3.21	5.49	4.20
		05-Aug-97	7.2	1600	78.60	38.00	183.00	3.21	4.83	4.24
	(ID-16-30)9abb	24-Jun-92	8.0	493	61.00	13.00	19.00			
	(ID-16-30)16aab	17-Aug-95	7.5	470	59.13	11.32	18.21	3.20		
		20-Aug-96	7.4	500	62.18	11.35	18.81	2.93	0.85	0.58
		05-Aug-97	7.3	490	84.20	32.00	60.80	2.50	1.72	1.43
	(ID-16-31)28acc	05-Aug-97	7.2	3610	76.40	31.20	579.00	3.75	15.98	14.10
	(ID-16-31)29bcd	20-Aug-96	7.4	6300	37.69	33.77	1094.00	1.07	29.04	31.17
	(ID-16-32)23cdd	17-Aug-95	7.2	2720	111.27	50.55	308.86	5.40		
		20-Aug-96	7.3	1750	119.41	52.31	338.00	5.36	9.25	6.49
	Deep Creek									
	(B-14-8)11bcb	17-Aug-95	7.9	1250	52.27	36.44	144.84	3.60		
		20-Aug-96	7.4	1450	75.15	39.64	161.00	4.28	4.91	3.74
		05-Aug-97	7.5	1500	82.40	41.20	174.00	4.82	3.49	3.91
	Baker Spring									
	(B-12-10)36dcc	02-Jun-94	7.5	**3050	127.50	62.30	551.80			
		20-Aug-96	7.4	4000	124.10	61.85	519.00	3.21	12.82	9.50
	Bar-M Spring									
	(B-11-10)1adc	20-Oct-94	7.5	**4640	107.50	72.10	995.00			

* Wells sampled in 1969 for USGS report (Baker, 1974)

** 1994 values for Conductivity are field measurements which averaged 82 percent of laboratory.

Al	B	Cl	Fe	K	Mn	NO3	PO4-P	S	Si	Sr	Zn
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
0.00	0.00	391.00	0.00	4	0.00	0.8	0.00	12.74	10.02	1.92	0.00
0.00	0.00	523.00	0.00	12	0.00	0.5	0.00	107.10	18.39	1.81	1.27
0.00	0.00	594.00	0.00	15	0.03	0.7	0.00	122.00	0.00	2.01	0.00
		6.00		28							
0.00	0.19	167.00	0.12	25	0.00	0.2	0.00	21.80	28.05	2.92	0.37
0.00	0.19	1691.00	0.00	28	0.00	0.2	0.00	31.60	0.00	3.15	0.18
0.00	0.19	2932.00	0.00	57	0.00	0.8	0.00	24.00	0.00	7.41	0.00
		126.00		10							
0.00	0.00	154.00	0.00	11	0.00	1.1	0.00	8.00	28.98	0.51	0.15
0.00	0.00	163.00	0.00	11	0.00	1.5	0.00	7.93	31.27	0.55	0.00
0.00	0.02	172.00	0.00	13	0.00	1.2	0.00	12.60	0.00	0.58	0.00
0.00	0.00	1544.00	0.00	30	0.00	8.2	0.00	20.60	0.00	2.59	0.00
		3565.00		51							
0.00	0.00	969.00	0.00	22	0.00	2.8	0.00	16.60	0.00	1.85	0.00
		796.00		8							
0.00	0.00	946.00	0.00	8	0.00	0.3	0.00	15.50	8.75	2.18	0.20
0.00	0.00	1010.00	0.00	8	0.00	0.4	0.00	15.09	9.57	2.29	0.00
0.00	0.00	947.00	0.00	9	0.00	0.3	0.00	19.90	0.00	2.32	0.00
0.00	0.00	422.00	0.00	5	0.00	0.3	0.00	11.08	9.03	1.34	0.00
0.00	0.00	261.00	0.00	4	0.00	0.7	0.00	10.99	9.69	1.00	0.00
0.00	0.00	335.00	0.00	5	0.00	0.8	0.00	16.10	0.00	1.59	0.00
		51.00		2		0.4		18.00			
0.00	0.00	45.60	0.00	4	0.00	0.6	0.00	6.00	21.50	0.27	0.00
0.00	0.00	48.10	0.00	5	0.00	0.7	0.00	5.77	23.28	0.27	0.00
0.00	0.00	49.70	0.00	5	0.00	0.6	0.00	11.30	0.00	0.27	0.00
0.00	0.00	932.00	0.00	9	0.00	0.2	0.00	20.30	0.00	2.40	0.00
0.00	0.00	1908.00	0.00	16	0.13	0.3	0.00	2.29	2.07	1.42	0.00
0.00	0.00	599.00	0.00	12	0.00	0.7	0.00	42.50	18.03	1.98	0.00
0.00	0.00	643.00	0.00	12	0.00	0.7	0.00	42.48	19.55	2.06	0.00
0.00	0.00	227.00	0.00	10	0.00	0.1	0.00	41.00	5.75	0.88	0.00
0.81	0.00	240.00	0.39	10	0.00	0.2	0.00	44.18	9.36	1.05	0.00
0.00	0.00	246.00	0.00	11	0.00	0.2	0.00	57.80	0.00	1.09	0.00
		1064.00		27							
0.00	0.00	1121.00	0.00	28	0.00	0.5	0.00	30.97	17.86	2.52	0.00
		1678.00		8							

Figure 5. Flows of Locomotive Springs

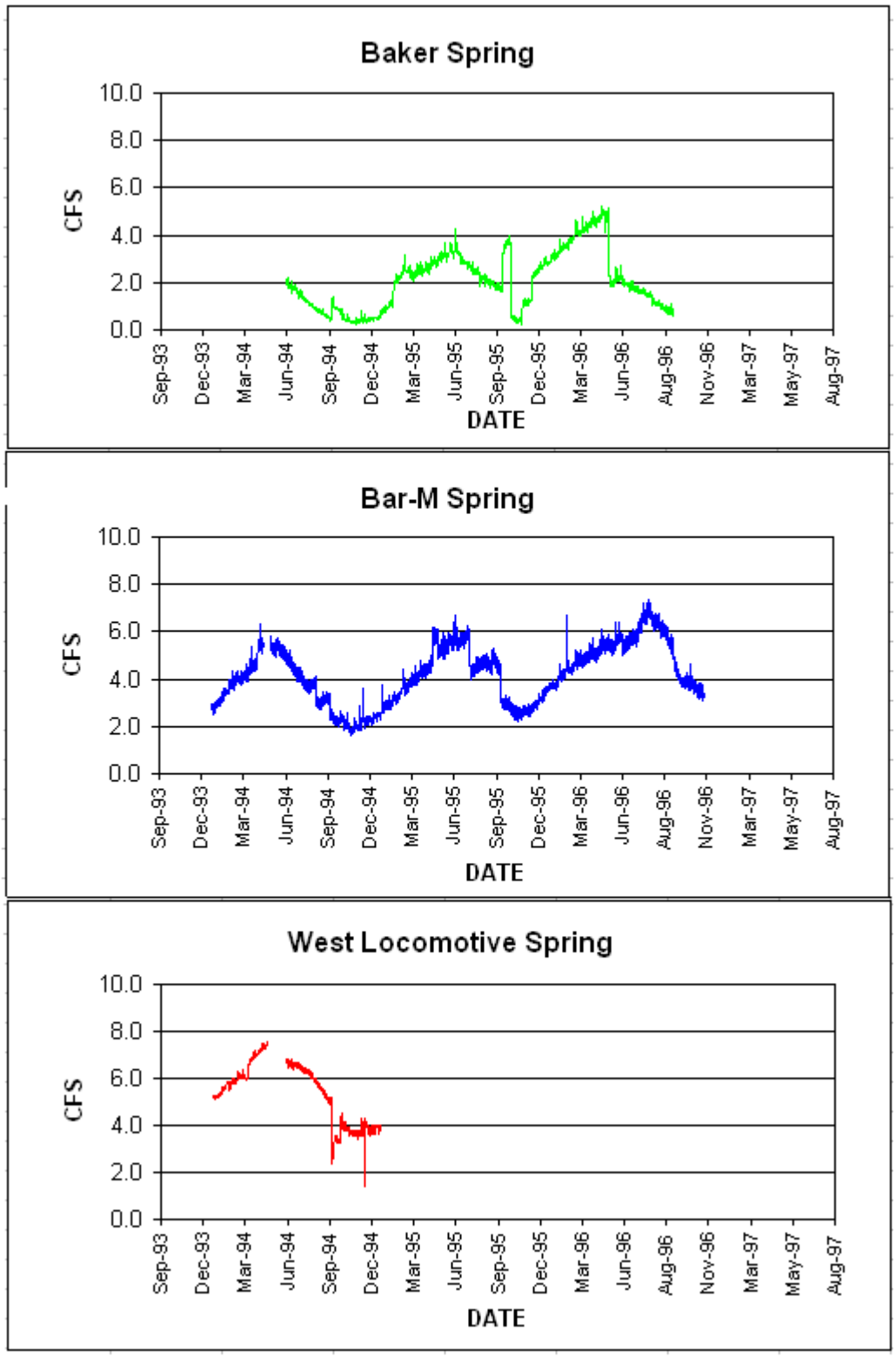


Table 5. Drillers' Logs for Selected Wells

Location: See plate 1 for hydrologic-data sites.
Altitude: Altitude of land surface, in feet above sea level.
Thickness: in feet.
Depth: Depth to the bottom of the interval, in feet below land surface.

MATERIAL	THICKNESS	DEPTH
(B-12-9)6abb		
W.F. Stoddard Drilling		
Altitude 4421		
Silt	42	42
Basalt, black	120	162
Clay, L. tan, hard	5	167
Basalt, black	13	180
Clay, L. tan	4	184
Basalt, black	8	192
Clay, L. tan	2	194
Basalt, not as hard	15	209
Basalt, hard	3	212
Basalt, not so hard (water)	8	220
(B-12-9)9ccd		
Wright Drilling Co.		
Altitude 4315		
Topsoil	4	4
Clay and Gravel	12	16
Basalt	80	96
Sandstone	5	101
Lava	13	114
Lava (water)	46	160
(B-12-9)10abb		
Wright Drilling Co.		
Altitude 4404		
Clay, Silt, Sand	41	41
Lava Rock	179	220
(B-12-9)16bba		
Nelson Drilling Co.		
Altitude 4316		
Overburden, brown	7	7
Basalt, black	34	41
Basalt fractured	22	63
Basalt, black	50	113
Basalt, hard, fractured (water)	24	137
Basalt, black	22	159
Basalt, hard, fractured (water)	14	173
Basalt, hard, massive	10	183

MATERIAL	THICKNESS	DEPTH
(B-12-9)17add		
Nelson Drilling Co.		
Altitude 4285		
Overburden	5	5
Tuff, light gray, hard	14	19
Tuff, light gray, hard	44	63
Tuff, broken	55	74
Tuff, hard	49	123
Tuff, broken (water)	5	128
Tuff, hard	12	140
(B-12-10)1aaa		
Nelson Drilling Co.		
Altitude 4400		
Overburden	1	1
Clay	24	25
Basalt, hard	38	63
Basalt, broken	11	74
Basalt, hard, broken	12	86
Basalt, hard	60	146
Basalt, hard, broken	54	200
Basalt, hard	10	210
Basalt, broken (water)	10	220
Basalt, hard	20	240
(B-12-11)5bac		
F. Stanley Lloyd Drilling Co.		
Altitude 4355		
Soil	1	1
Clay	22	23
Clay, Gravel	32	55
Clay	21	76
Clay, Gravel	84	160
Sand, Gravel, Cobbles (water)	35	195
Clay, Gravel	8	203
Clay, silt	17	220

Table 5. Drillers' Logs for Selected Wells (continued)

MATERIAL	THICKNESS	DEPTH
(B-12-11)4aba		
F. Stanley Lloyd Drilling Co.		
Altitude 4359		
Silt	9	9
Ash	5	14
Clay	23	37
Gravel	4	41
Clay	10	51
Gravel	3	54
Clay	16	70
Ash	2	72
Gravel	3	75
Ash	42	117
Clay	13	130
Sand	2	132
Clay	38	170
Gravel	6	176
Clay	12	188
Gravel	2	190
Clay	14	204
Sand	3	207
Clay	5	212
Gravel	2	214
Clay	28	242
Gravel	2	244
Clay	22	266
Clay	17	283
Sand, Gravel	5	288
Basalt	2	290
Clay, red	27	317
Ash	18	335
(B-13-8)18abb		
Peterson Bros. Drilling Co.		
Altitude 4616		
Clay	63	63
Lava Rock	10	73
Lava Rock	30	103
Lava Rock	20	123
Lava Rock	20	143
Lava Rock	20	163
Lava Rock	20	183
Lava Rock	20	203
Lava Rock	20	223
Lava Rock	20	243

MATERIAL	THICKNESS	DEPTH
(B-13-8)18abb (continued)		
Lava Rock	40	283
Lava Rock	20	303
Lava Rock	40	343
Lava Rock	40	383
Lava Rock	20	403
Lava Rock	40	443
Lava Rock	40	483
Lava Rock	20	503
Lava Rock	40	543
Lava Rock	10	553
Lava Rock	10	563
Lava Rock	12	575
(B-14-7)8bba		
Yarbrough Drilling		
Altitude 4750		
Topsoil	2	2
Clay, brown	63	65
Sandy Clay	33	98
Clay	17	115
Gravel	5	120
(B-14-8)1bbc		
Cole Gardner		
Altitude 4542		
Topsoil, black	2	2
Clay, white, stiff	32	34
Sand, brown, with streaks of clay	7	41
Clay, white, gumbo	44	85
Clay, blue	5	90
Gravel, washed flat (water)	30	120
Clay, blue	30	150
Gravel, volc. glasses (water)	5	155
Sand, gray, vol. ash	2	157
Silt, black, vegetation	4	161
Sandy Clay, tan	7	168
Clay, tan	17	185
Gravel, gray, limestone (water)	13	198

Table 5. Drillers' Logs for Selected Wells (continued)

MATERIAL	THICKNESS	DEPTH
(B-14-8)2bbb		
Yarbrough Drilling		
Altitude 4560		
Topsoil	5	5
Clay, Sand	65	70
Clay	20	90
Gravel	22	112
Cemented Rock	2	114
Clay	6	120
Sand, Gravel	10	130
Sandstone	2	132
Sandy Clay	8	140
Sandstone	3	143
Sandstone	5	148
Clay	17	160
Sandstone	3	163
Sand , Pea Gravel	7	170
(B-14-8)5bac		
Yarbrough Drilling		
Altitude 4575		
Topsoil	6	6
Clay, Gravel	64	70
Limestone	160	230
Clay, Rock	50	280
Gravel	10	290
Gravel, Boulders	40	330
Clay, Rock	40	370
Limestone Boulders	80	450
Clay, Rock	40	490
Boulders	15	505
Limestone	45	550
(B-14-8)5dcd		
Yarbrough Drilling		
Altitude 4502		
Topsoil	12	12
Sandy Clay	30	42
Lava, hard, solid	60	102
Sand, red	18	120
Clay, pale blue	10	130
Clay, pale white	10	140
Lava Rock	20	243

MATERIAL	THICKNESS	DEPTH
(B-14-8)5ddc		
Siaperas Drilling		
Altitude 4509		
Silt	20	20
Sand, Clay	43	63
Lava	32	95
Sand	25	120
Sand, Clay	70	190
Lava	7	197
Sand (water)	43	240
Sand, Gravel	18	258
Sand, Gravel, fine	32	290
Gravel, fine	50	340
Gravel, fine with hard streak	60	400
(B-14-8)6aca		
Sherman Couch		
Altitude 4490		
Topsoil	1	1
Clay	85	86
Lava, gray, solid	19	105
Clay	107	212
Lava, gray, hard	16	228
Clay	5	233
Clay,Sand, Gravel	41	274
Lava, broken	16	290
Lava, solid	20	310
Lava, firm	31	341
Limerock	7	348
Lava, broken	7	355
Limerock, solid	3	358
Limerock, Sandstone	18	376
Clay, Gravel	17	393
Clay, Gravel, Boulders	24	417
Sandstone	5	422
Clay, Gravel	3	425
Limerock, Quartz Boulders	45	470
Limerock, solid	20	490
Limerock, broken	11	501
Clay, Gravel, Conclomerate	42	543
Limerock, broken	8	551
Limerock, solid	21	572
Limerock, broken	8	580
Limerock w/ cracks and crevices	80	660

Table 5. Drillers' Logs for Selected Wells (continued)

MATERIAL	THICKNESS	DEPTH
(B-14-8)6add		
Yarbrough Drilling		
Altitude 4500		
Clay	76	76
Lava	12	88
Clay	52	140
Sand, Pea Gravel (1st water)	47	187
Lava	103	290
Sand, Pea Gravel	30	320
Clay, blue	25	345
Sand	15	360
Clay	20	380
Clay, Sand	20	400
Clay	30	430
Sand, Muck(?)	30	460
Clay, sticky	30	490
Lava	35	525
Lava, hard	35	560
(B-14-8)8bab		
Yarbrough Drilling		
Altitude 4495		
Topsoil	8	8
Clay	59	67
Gravel, Boulders	5	72
Lava (water)	31	103
Mucky Sand	37	140
Clay, gray	25	165
Sandy Clay, Gravel	20	185
Lava	22	207
Clay, Sand	8	215
Lava	5	220
Clay, Sand	9	229
Lava	34	263
Clay	6	269
Gravel	6	275
Clay	14	289
Gravel	6	295
Clay, Gravel	11	306
Clay, Gravel, fine	6	312
Sandstone	2	314
Clay, Gravel, fine	16	330
Clay	21	351
Clay, Gravel	29	380
Clay	9	389
Sandstone	2	391

MATERIAL	THICKNESS	DEPTH
(B-14-8)8bab (continued)		
Clay, Gravel	18	409
Sandstone	1	410
Clay	15	425
Clay, Gravel	5	430
Lava	2	432
Clay	4	436
Lava	1	437
Clay	5	442
Lava	1	443
Clay	11	454
Clay with thin layers of Lava	18	460
(B-14-8)11dcc		
Yarbrough Drilling		
Altitude 4590		
Clay	25	25
Gravel	5	30
Sandy Clay	70	100
Sandstone	2	102
Clay	28	130
Sand, Gravel (1st water)	5	135
Sandy Clay	10	145
Sandy, caving Clay	5	150
Clay	10	160
Sandstone	5	165
Sandy Clay	5	170
Clay, sticky	10	180
Sandstone	5	185
Sand, Gravel	7	192
Clay	8	200
(B-14-8)12cbd		
Yarbrough Drilling		
Altitude 4635		
Clay	30	30
Gravel	5	35
Clay, brown, band	65	100
Clay, brown, baked	5	105
Clay, brown	25	130
Clay, sticky (1st water @ 165')	35	165
Clay	5	170
Sand, Gravel	40	210
Clay	20	230
Sand, Gravel	7	237
Sandy Clay, blue	8	245

Table 5. Drillers' Logs for Selected Wells (continued)

MATERIAL	THICKNESS	DEPTH
(B-14-8)15ddd		
Keith MacKenzie		
Altitude 4700		
Clay, Sand, tan	1	1
Boulders, Conglomerate, tan	101	102
Clay, Sand, Gravel, tan	11	113
Gray Bedrock	4	117
Conglomerate, brown	18	135
Clay	10	145
Boulders, gray	1	146
Clay, brown	3	149
Boulders, Conglomerate, brown	11	160
Conglomerate, brown, hard	65	225
Conglomerate, brown	45	270
Conglomerate, tan	88	358
Boulders, Conglomerate, hard	16	374
Boulders, tan	15	389
Conglomerate, tan	71	460
Conglomerate, light gray	22	482
Conglomerate, brown	15	497
Boulders, brown	25	522
Conglomerate, brown	36	558
Boulders, brown	6	564
(B-14-8)20baa		
Robinson Drilling		
Altitude 4458		
Clay	7	7
Clay, Boulders	34	41
Cobbles	7	48
Clay, Gravel	14	62
Cobbles	7	69
Clay, Gravel, Cobbles	59	128
Gravel, Cobbles	24	152
Clay, Gravel	95	247
Clay, Cobbles	25	272
Lava, black, fractured	175	447
(B-14-9)3dbb		
Yarbrough Drilling		
Altitude 4404		
Sandy Soils	70	70
Lava	33	103
Clay	62	165
Clay, Silt, soft	7	172
Lava	13	185

MATERIAL	THICKNESS	DEPTH
(B-14-9)3dbb (continued)		
Lava cinders	7	192
Lava, broken	35	227
Clay, red	4	231
Clay, brown	83	314
Gravel	2	316
Clay, brown	86	402
Gravel	2	404
Clay, blue	37	441
Lava	26	467
(B-14-9)4cbb		
Yarbrough Drilling		
Altitude 4401		
Top Soil	12	12
Clay , some sandy	178	190
Lava boulders	5	195
Lava	57	252
Sand	8	260
Clay	10	270
Sandy Clay, caving	20	290
Clay	40	330
Sand, Gravel	10	340
Clay	15	355
Sand, some gravel	5	360
Clay	5	365
(B-14-9)6ccc		
Bill Chesley Drilling		
Altitude 4399		
Clay, brown	23	23
Clay, Gravel	17	40
Clay, dark brown	25	65
Clay, gray	40	105
Clay, Gravel, sticky	18	123
Lava, gray	49	172
Clay, brown	38	210
Clay, Gravel	58	268
Clay, Gravel, green, sticky	50	318
Clay, Lava, mixed	24	342
Lava, gray	13	355
Clay, Lava, brown	13	368
Clay, Gravel	7	375

Table 5. Drillers' Logs for Selected Wells (continued)

MATERIAL	THICKNESS	DEPTH
(B-14-9)9add		
Intermountain Drilling		
Altitude 4384		
Clay, brown	47	47
Pea Gravel	8	55
Clay (80%), Gravel	15	70
Clay	43	113
Lava, black	7	120
Lava, gray, hard (1st water)	13	133
Clay, brown, soft, runny	27	160
Clay, Hardpan, brown	25	185
Clay, Hardpan, Lava	10	195
Lava, black	10	205
Lava, gray	20	225
Lava, red, black, Clay, brown	5	230
Sandstone, brown, Lava, gray	8	238
Basalt, gray	7	245
Lava, gray	15	260
Lava, red & gray	15	275
Clay, brown	22	297
Clay, Hardpan, brown & white	13	310
Clay, white	5	315
Clay, green	10	325
Clay, brown, sticky	50	375
Clay, brown	25	400
(B-14-9)16aaa		
Paul Frandsen		
Altitude 4377		
Clay, brown	25	25
Gravel, very little Clay	25	50
Clay	40	90
Lava, gray (1st water @ 140)	50	140
Clay, brown	65	205
Lava, black	10	215
Lava, gray	5	220
Lava, gray, very hard	12	232
Lava, black	8	240
Lava, red (water)	10	250
Lava, gray	10	260
Lava, red	5	265
Lava, gray, very hard	30	295
Clay, red	15	310
Clay, white & blue	20	330
Clay, brown, sticky	70	400

MATERIAL	THICKNESS	DEPTH
(B-14-9)16daa		
Intermountain Drilling		
Altitude 4370		
Clay	30	30
Clay, Gravel, brown	48	78
Lava, gray, hard	62	140
Lava, purple, hard	0	140
Clay, red & brown	35	175
Clay, brown	32	207
Lava, black	43	250
Lava, red & black	25	275
Lava	10	285
Lava, gray, hard	12	297
Clay, brown	103	400
(B-14-9)17cab		
Yarbrough Drilling		
Altitude 4370		
Clay	158	158
Lava	14	172
Clay, Sand (water)	18	190
Lava	40	230
Clay	55	285
Sand, Gravel	12	297
Sandy Clay	31	328
Lava	15	343
Clay, some Gravel	12	355
Lava	12	367
Gravely Clay	18	385
(B-14-9)20acc		
Yarbrough Drilling		
Altitude 4359		
Topsoil	2	2
Clay	43	45
Clay, Gravel	57	102
Lava	49	151
Clay	14	165
Clay, Silt, Sand	22	187
Clay, brown	18	205
Lava	22	227
Boulders	4	231
Lava, fine grain	23	254
Lava, very porous	11	265
Lava, broken, crevious	17	282
Lava, solid	23	305

Table 5. Drillers' Logs for Selected Wells (continued)

MATERIAL	THICKNESS	DEPTH
(B-14-9)27acc		
Clearwater Drilling		
Altitude 4402		
Topsoil, Clay, white	3	3
Lava, red & black	297	300
(B-14-10)1abb		
Yarbrough Drilling		
Altitude 4426		
Sandy Clay	130	130
Lava	40	170
Clay (water)	45	215
Pea Gravel	10	225
Sandy Clay, brown	40	265
Sand, Gravel	9	274
Lava	66	340
(B-14-10)1dca		
Chesley Well Drilling		
Altitude 4405		
Topsoil	24	24
Sandy Clay	32	56
Lava	71	127
Clay	49	176
Pea Gravel	29	205
Sandy Clay, brown	2	207
Sand, Gravel	107	314
Lava	29	343
(B-14-10)15bbb		
J.S. Lee & Sons		
Altitude 4465		
Topsoil	1	1
Clay, Gravel	2	3
Clay, brown	10	13
Gravel	2	15
Clay, Gravel	65	80
Clay, brown	30	110
Clay, Gravel	42	152
Lava, hard	75	227
Lava, soft	9	236
Clay	11	247
Lava, soft	7	254
Lava, hard	81	335
Lava, soft, Clay	15	350
Clay, light tan	105	455

MATERIAL	THICKNESS	DEPTH
(B-14-10)15bbb (continued)		
Clay w/ Pumice stone	123	578
Clay, sticky	7	585
Clay, brown	35	620
Lava	5	625
Clay, brown	98	723
Clay, Sand, hard	32	755
Clay, sticky	35	790
(B-14-10)15ccd		
Intermountain Drilling		
Altitude 4432		
Clay	40	12
Clay, Gravel	45	22
Clay, brown	10	40
Clay, blue	40	74
Lava, black	9	105
Clay, red, Sand	66	113
Clay, Gravel, brown	24	137
Granite, gray	13	150
Lava, red & gray, loose	5	155
Lava, red & gray	10	165
Lava, red & gray, Clay, brown	10	175
Clay, brown	10	185
Lava, gray, Clay, brown	5	190
Lava, red & gray & black	20	210
Lava, gray	9	219
Clay, white & brown	8	227
Lava, gray & black	27	254
Granite, gray	11	265
Lava, red & gray, Sand, red	11	276
Granite, very very hard	39	315
Gravel, muddy, Sandstone	5	320
Clay, brown, Sandstone	5	325
Clay, white & brown, Gravel	5	330
Sandstone, white, Clay, Gravel	20	350
Clay, Sand, brown	90	440
Sandstone, brown	55	495
Sandstone, brown, Gravel	5	500
Sandstone, green & gray	5	505

Table 5. Drillers' Logs for Selected Wells (continued)

MATERIAL	THICKNESS	DEPTH
(B-14-11)5acb		
Stan Lloyd Drilling		
Altitude 5007		
Clay, Gravel	10	10
Clayey Gravel	8	18
Gravely Clay	14	32
Clay, Gravel	28	60
Clay, Sand	5	65
Gravel, cemented	12	77
Clay, Sand	2	79
Clay, Gravel	23	102
Clay, Gravel, white	13	115
Clay, Sand	12	127
Clay, Gravel	15	142
Clay, Sand	4	146
Clay, Gravel	6	152
Clay, Sand, Gravel	16	168
Clay, Gravel	4	172
Clay, Sand, Gravel	18	190
Clay, Gravel	22	212
Sandstone, hard	1	213
Clay, Sand	22	235
Clay, Gravel	4	239
Gravel, cemented (water)	8	247
Clay, Sand	29	276
Gravel, cemented (water)	25	301
Clay, Sand	3	304
(B-15-7)32dbd		
Yarbrough Drilling		
Altitude 4720		
Boulders	75	75
Clay, Boulders	45	120
Gravel	10	130
Clay	50	180
Sand	10	190
Boulders	15	205
Clay	15	220
Clay	55	275
Limestone	25	300
Clay	25	325
Clay	15	340
Clay, hard	20	360
Clay	20	380
Shale	10	390
Clay	10	400

MATERIAL	THICKNESS	DEPTH
(B-15-7)32bab		
Yarbrough Drilling		
Altitude 4664		
Topsoil	25	25
Clay	10	35
Clay, Sand, Gravel	3	38
Gravel, coarse (water)	6	44
Clay, Sand	21	65
Clay	40	105
Sand	8	113
Clay	15	128
Gravel (water)	2	130
Clay	5	135
Gravel (water)	2	137
Clay with some Sand & Gravel	92	229
Sandstone	3	232
Clay, Gravel	30	262
(B-15-8)31dcd		
Yarbrough Drilling		
Altitude 4628		
Topsoil	4	4
Sandy Clay	94	98
Boulders	7	105
Clay	30	135
Gravel	30	165
Clay	55	220
Clay, Gravel	27	247
Clay (water)	13	260
Clay, Gravel	30	290
Clay	30	320
Clay, Gravel	50	370
Clay, rock	15	385
Clay, Gravel	30	415
Clay, rock	10	425
Clay, Gravel	65	490
Sand, Gravel	10	500
Clay	20	520
Sand, Gravel	10	530
Clay	15	545
Clay, Gravel	10	555
Limestone Boulders	5	560
Clay	10	570
Sand, Gravel	10	580
Clay	10	590
Sand, Gravel	10	600

Table 5. Drillers' Logs for Selected Wells (continued)

MATERIAL	THICKNESS	DEPTH
(B-15-8)34dad		
W.F. Stoddard Drilling		
Altitude 4598		
Topsoil	2	2
Clay	18	20
Clay, Gravel	5	25
Clay	5	30
Clay, Sand	70	100
Clay	5	105
Clay, Gravel	135	240
Limestone, fractured	125	365
(B-15-8)35cbc		
Yarbrough Drilling		
Altitude 4580		
Topsoil	4	4
Sandy Clay	60	60
Clay, hard	30	90
Clay, Gravel	20	110
Gravel, cemented	10	120
Sandstone	5	125
Clay, Gravel (water)	35	160
Sand, Gravel	10	170
Gravel	8	178
Sand	12	190
Gravel	5	195
Sand	44	204
(B-15-9)28dbd		
Jesse Beaman		
Altitude 4458		
Topsoil	4	4
Hardpan	5	9
Clay, gray	12	21
Clay, Gravel	114	135
Gravel	5	140
Clay	18	158
Lava	7	165
Clay, Sand, Gravel	55	220
Clay	85	305
Sand, Gravel	10	315
Clay, Gravel	20	335
Sandstone	120	340
Clay, Gravel	55	395
Shale, blue-gray	15	410
Clay	40	450

MATERIAL	THICKNESS	DEPTH
(B-15-9)32aca		
Yarbrough Drilling		
Altitude 4435		
Clay	32	32
Sandy Clay	15	47
Gravel	28	75
Clay	95	170
Lava, black	37	207
Sand, Gravel	11	218
Sandy Clay	21	239
Sand, Gravel (1st water)	52	291
Clay	33	324
Gravel	3	327
Clay	11	338
Gravel	3	341
Clay	31	372
Sand, Gravel (water)	24	396
Clay	4	400
(B-15-9)32ccc		
Yarbrough Drilling		
Altitude 4421		
Topsoil	4	4
Clay	33	37
Gravel	10	47
Clay	108	155
Lava	42	197
Sandy Clay	13	210
Sandstone	10	220
Clay	10	230
Gravel	10	240
Clay	30	270
Gravel	15	285
Sandstone	5	290
Clay	5	295

Table 5. Drillers' Logs for Selected Wells (continued)

MATERIAL	THICKNESS	DEPTH
(B-15-9)33bcb		
Yarbrough Drilling		
Altitude 4430		
Topsoil	4	4
Clay	14	18
Gravel	7	25
Clay	128	153
Lava	30	183
Sandy Clay	57	240
Sandy Gravel	20	260
Sandy Clay	10	270
Gravel	80	320
Boulders, cemented	70	330
Gravel	70	340
Sandstone	17	357
Gravel, Boulders	53	410
(B-15-9)33dcd		
Wright Drilling		
Altitude 4415		
Clay	4	4
Hardpan	4	8
Clay, Silt	22	30
Clay	22	52
Clay, Sand, Gravel	28	80
Clay, Sand	25	105
Clay	81	186
Lava, black	21	207
Lava, red (1st water)	20	227
Clay, Sand	60	287
Clay, Gravel	67	354
Clay	16	370
Clay, Hardpan	15	385
Clay	8	393
Gravel (water)	11	404
Clay, Gravel	4	408
Clay	6	414
Clay, Gravel	10	424
Clay, Sand	12	436
Lava, black	29	465
(B-15-9)34bbc		
Klint Lloyd Drilling		
Altitude 4444		
Clay	53	53
Sand, Gravel (water)	4	57

MATERIAL	THICKNESS	DEPTH
(B-15-9)34bbc (continued)		
Clay, Sand, Gravel	26	83
Clay	22	105
Clay, Sand	19	124
Clay	16	140
Lava, black	35	175
Lava, red cinders	6	181
Clay, Sand	67	248
Clay, Silt	38	286
Sandstone, tan	11	297
Clay, Silt, Sand, Gravel (water)	14	311
Gravel (water)	2	313
Silt, Sand, Gravel	50	363
Sandstone, tan	14	377
Sand, Gravel (water)	5	382
Clay, Silt, Sand	148	530
Clay, Silt, Gravel	90	620
(B-15-9)34dcc		
Yarbrough Drilling		
Altitude 4420		
Clay, green	45	45
Clay, brown	25	70
Clay, green	22	92
Conglomerate	71	163
Lava	49	212
Lava, brown	78	290
Lava, w/ inlay	30	320
Sandy Clay	178	390
(B-15-9)36bcb		
Humbolt Drilling		
Altitude 4492		
Clay, w/ small rock layers	36	36
Sand, Gravel	5	41
Clay	21	62
Gravel, Cobbles	25	87
Clay	5	92
Gravel, Cobbles	16	108
Clay	6	114
Limestone, hard	6	120
Basalt	90	210
Basalt, Clay	155	365
Lava, red cinders	3	368
Basalt	37	405
Basalt, fractured	85	490

Table 5. Drillers' Logs for Selected Wells (continued)

MATERIAL	THICKNESS	DEPTH
(B-15-10)25cad		
Yarbrough Drilling		
Altitude 4464		
Clay	18	18
Gravel	7	25
Clay	33	58
Gravel	7	65
Clay	45	110
Gravel	7	117
Clay, Gravel	101	218
Gravel	2	220
Lava	4	224
Lava, broken, Gravel	6	230
Lava	55	285
Boulders, Gravel	7	292
Clay, Gravel	18	310
Clay	58	368
Gravel	5	373
Clay	28	401
Limestone	62	463
Clay	4	467
Lava, white ash	43	510
(B-15-10)34bcc		
Yarbrough Drilling		
Altitude 4557		
(Overburden)	80	80
Sand, Gravel	8	88
Lava	70	158
Clay	127	285
Sandy Clay (1st water)	10	295
Clay	55	350
(B-15-10)36bbc		
Mike Frandsen		
Altitude 4454		
Clay	75	75
(Basalt)	17	92
Basalt, broken	31	123
Clay	13	136
Basalt, broken, w/ clay	2	138
Clay	51	189
Basalt, broken, w/ clay	7	196
Clay	32	228
Basalt, broken, w/ clay	30	258
Lava, broken (water)	2	260

MATERIAL	THICKNESS	DEPTH
(B-15-10)36bbc (continued)		
Sandstone	35	295
Cinders	5	300
(B-15-10)36acc		
Yarbrough Drilling		
Altitude 4442		
Topsoil	8	8
Sandy Clay	32	40
Clay	80	120
Clay, Gravel	10	130
Lava	10	140
Sandy Clay	40	180
Lava	115	295
Clay	25	320
Sandstone	5	325
Clay	20	345
Sandstone	5	350
Sand, Gravel	7	357
Clay, Sand, Gravel	18	375
Sandstone	5	380
Sandy Clay	15	395
Lava	22	417
Clay	3	420
Lava	3	423
Clay	7	430

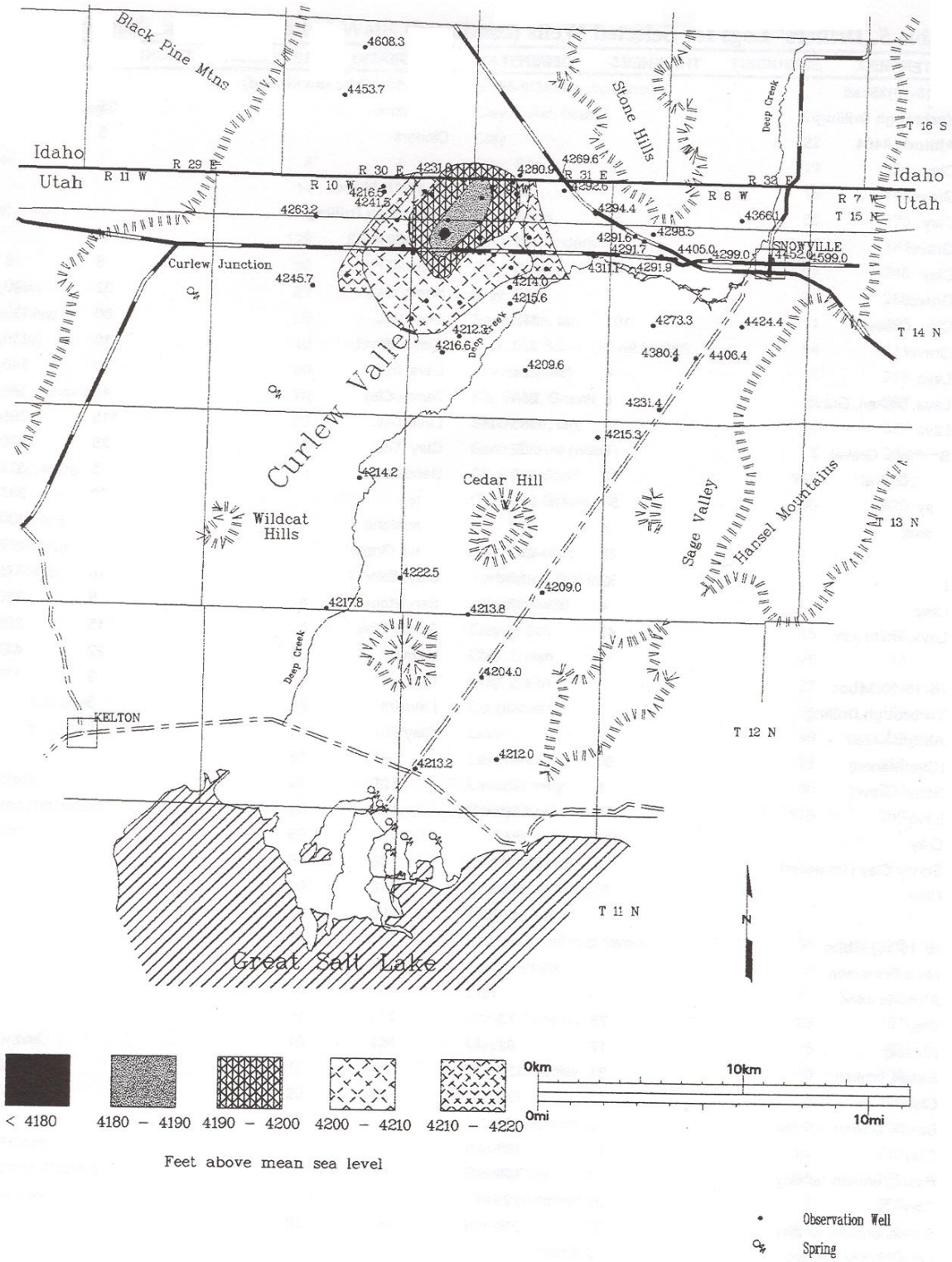


Figure 6. Water levels in Curlew Valley, Fall 1993

Figure 7. Relative Drawdown of Selected Wells in Curlew Valley

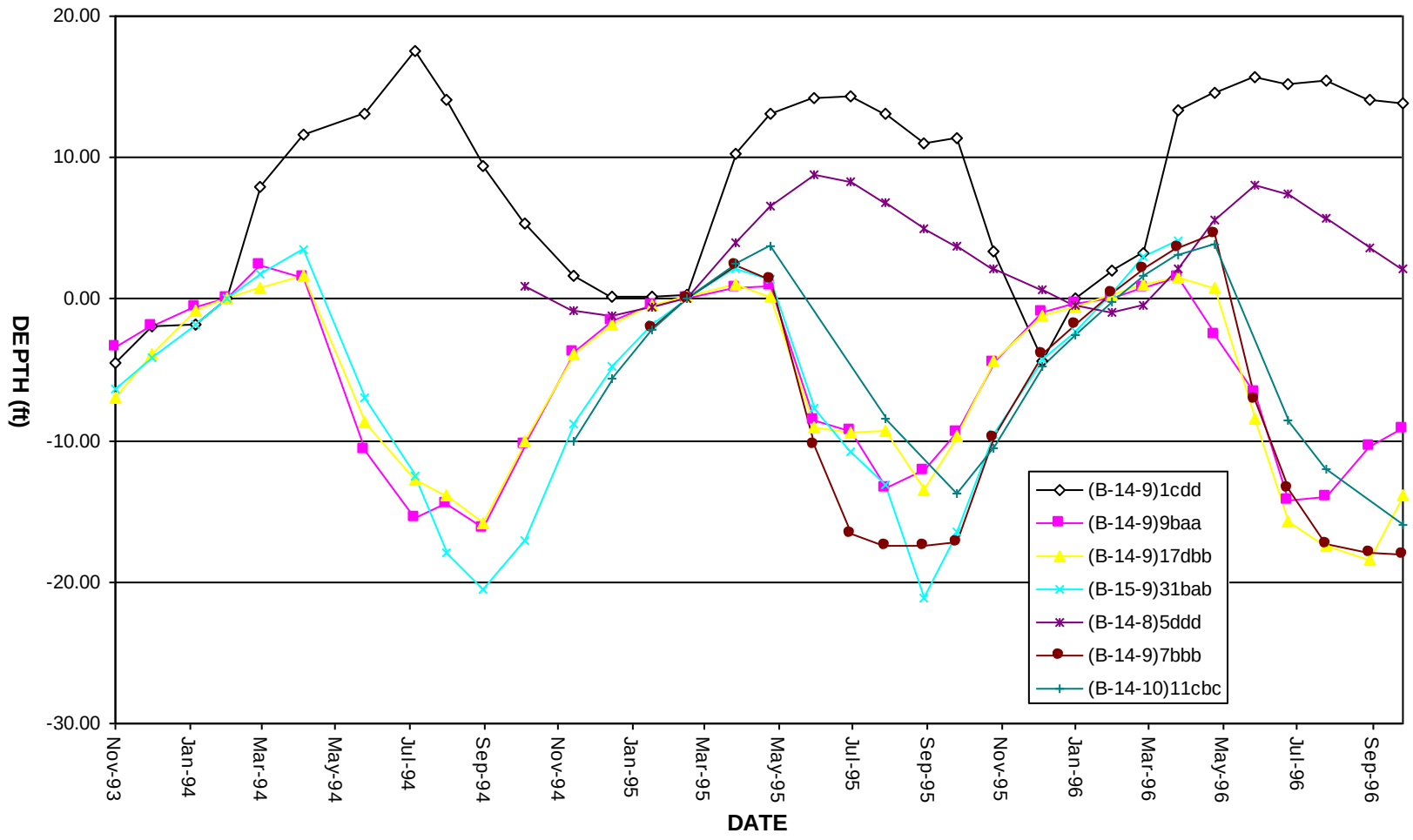


Figure 8. Historic Water Levels for Well (B-14-8)11aba near Snowville, Utah

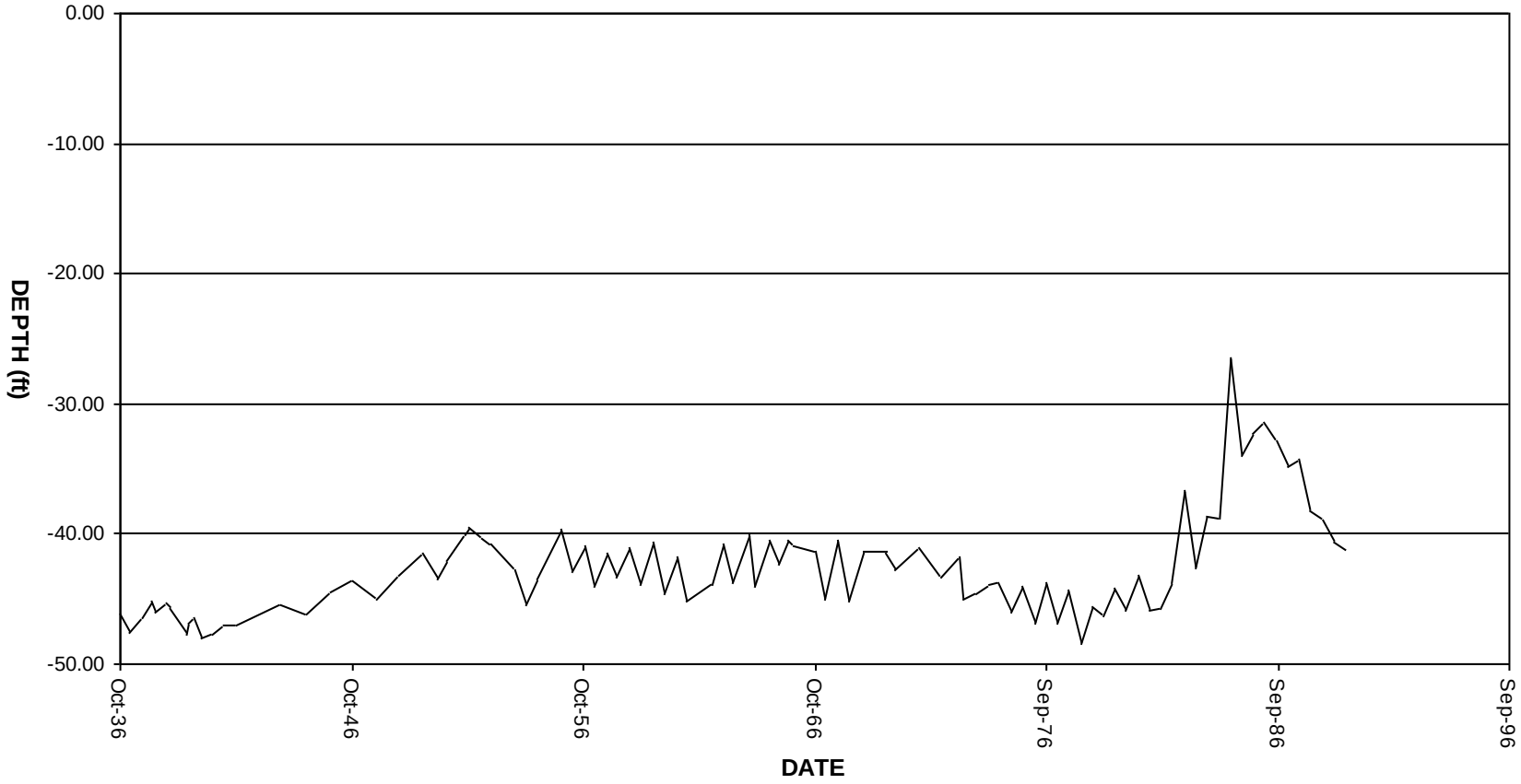


Figure 9. Historic Water Levels for Well (B-12-9)30cda near Locomotive Springs, Utah

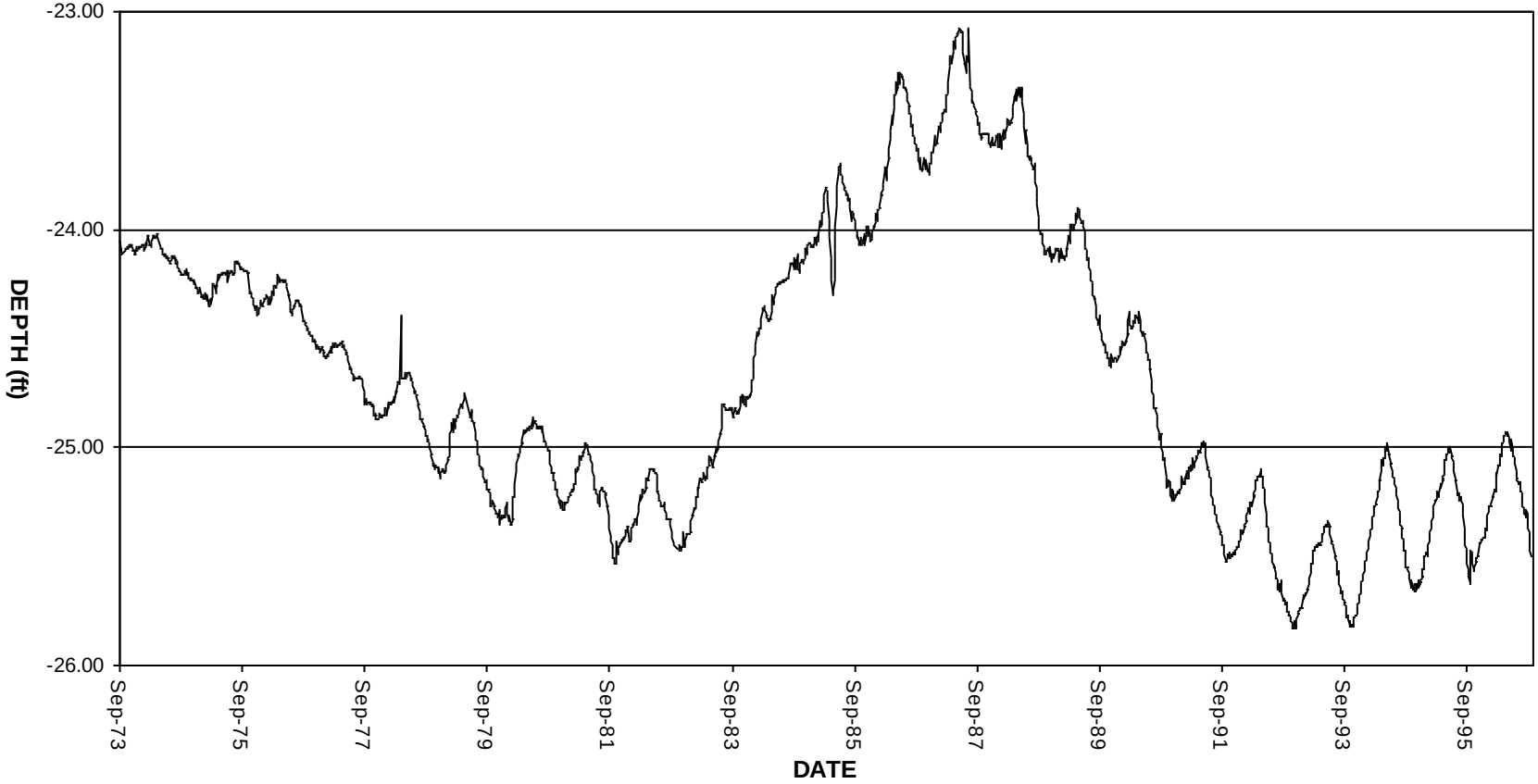


Table 6. Manual Measurements of the Flows of Locomotive Springs (cfs)

Date	West	Baker	Bar-M	Sparks	Off	Teal
21-Dec-93	4.43		2.53		0.22	1.81
18-Feb-94	5.58		3.49		0.41	
24-Mar-94	5.82		4.36		0.52	
01-Apr-94	5.82		4.36		0.52	
21-Apr-94	6.06		9.62		0.62	2.30
02-Jun-94	5.11	2.00	4.55		0.62	
06-Jul-94	4.65	1.30	4.01		0.54	
20-Jul-94	4.65	0.94	3.83		0.52	2.60
11-Aug-94	5.58	0.63	3.49		0.50	1.60
07-Sep-94	6.31	0.43	3.49	0	0.41	1.47
04-Nov-94	2.78	0.36	2.08	0	0.30	
25-Nov-94	9.24	0.36	2.08	0	0.23	
23-Dec-94	3.37	0.56	2.53	0	0.28	
15-Mar-95	7.60	2.44	4.01	0	0.47	
30-May-95	8.40	3.03	5.11	0.02	0.73	
07-Jul-95	7.07	2.55	5.50	0	0.87	
07-Aug-95	7.07	2.00	4.73	0	0.73	
29-Sep-95	6.06	3.80	3.15	0	0.52	
07-Nov-95	6.56	1.03	2.53	0	0.37	1.36
12-Dec-95	2.78	2.91	3.32	0.01	0.50	
18-Apr-96	0.40	5.20	5.11	0.04		1.60
19-Sep-96	4.88	1.79	4.55	0	0.48	1.26
26-Nov-96	2.59	0.43	2.83	0	0.29	1.97
04-Apr-97	3.17	2.55	4.36			2.85
30-Sep-97	3.17	0.43	2.99	0	0.31	1.28

Table 7. Average Monthly Flows of Locomotive Springs (cfs)

Month	West	Baker	Bar-M
Dec-93	5.16		2.74
Jan-94	5.52		3.14
Feb-94	5.99		3.89
Mar-94	6.60		4.33
Apr-94	7.26		e 5.37
May-94	e 7.25		e 5.33
Jun-94	6.59	1.80	4.61
Jul-94	6.26	1.24	3.85
Aug-94	5.54	0.75	3.21
Sep-94	3.75	0.83	2.49
Oct-94	3.81	0.40	2.02
Nov-94	3.78	0.41	2.19
Dec-94	3.90	0.58	2.45
Jan-95		1.40	2.99
Feb-95		2.46	3.56
Mar-95		2.47	4.13
Apr-95		2.82	5.03
May-95		3.24	5.41
Jun-95		3.09	5.68
Jul-95		2.48	4.73
Aug-95		2.01	4.67
Sep-95		2.82	3.57
Oct-95		0.69	2.59
Nov-95		1.76	2.75
Dec-95		2.82	3.40
Jan-96		3.35	4.03
Feb-96		3.96	4.62
Mar-96		4.40	4.92
Apr-96		4.78	5.30
May-96		2.23	5.57
Jun-96		1.87	5.54
Jul-96		1.58	6.47
Aug-96		1.09	6.28
Sep-96		0.78	5.13
Oct-96			3.88
Nov-96			3.49

e Estimated

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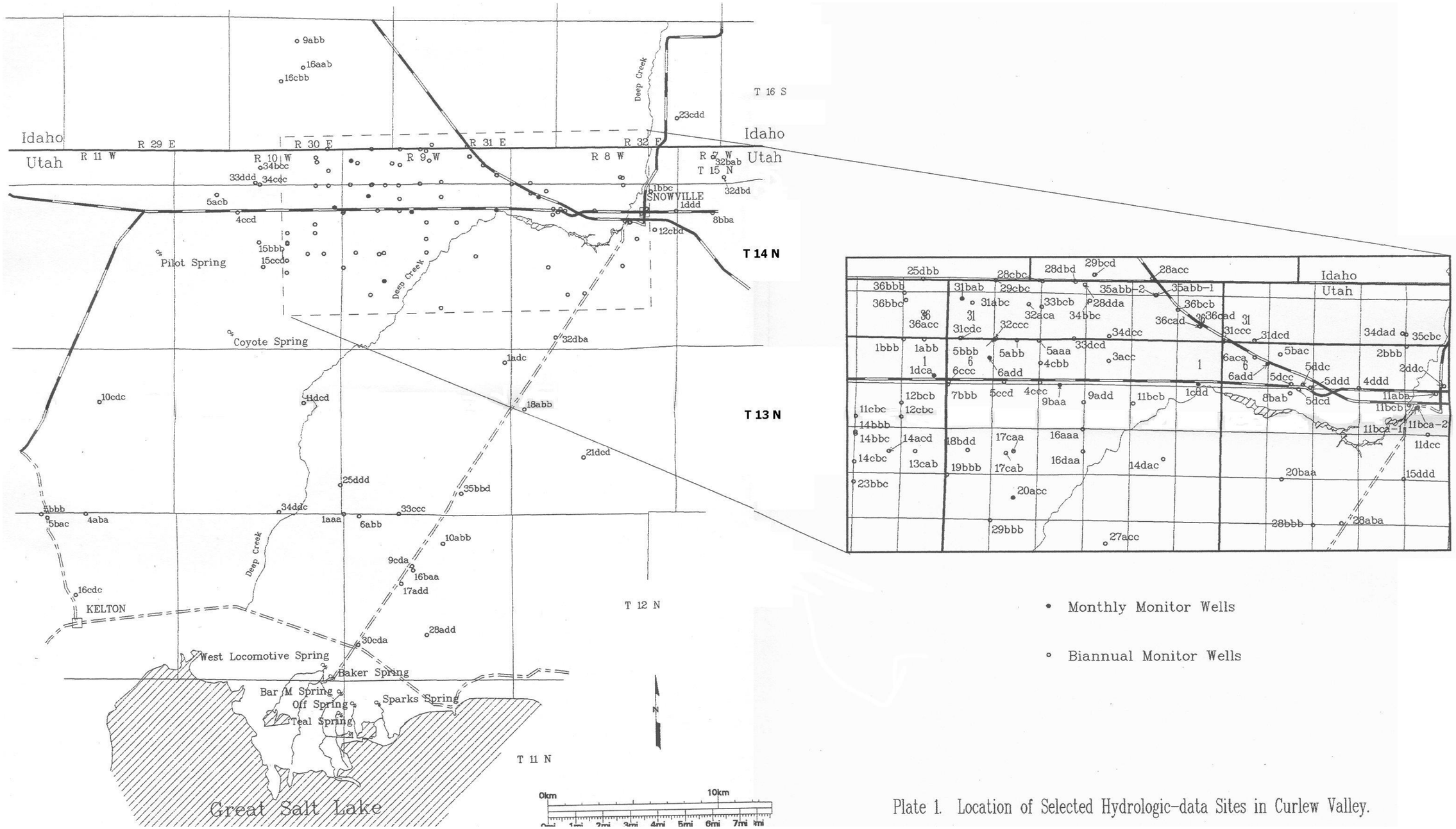

Plate 1. Location of Selected Hydrologic-data Sites in Curlew Valley.