



Pixlee Observation Well
Douglas County, Washington

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PIXLEE OBSERVATION WELL
(DOUGLAS COUNTY)
COMPLETION REPORT

Office Report #HQ842

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ABSTRACT

The Pixlee Observation Well was drilled into basalt near Ephrata, Washington in 1974. It was deepened to 1,190 feet in 1975 and to 1,315 feet in 1977. The well did not produce enough water for irrigation and was abandoned in 1978. The U.S. Geological Survey installed six piezometers in the well for long-term water level measurements in 1982.

Water bearing zones monitored by the piezometers show a generally decreasing potentiometric head with depth, typical of ground water recharge areas. Water levels over the period of October 1982 to March 1984 have varied the most (42 feet) in the shallowest piezometer and the least (7 feet) in the deepest piezometer.

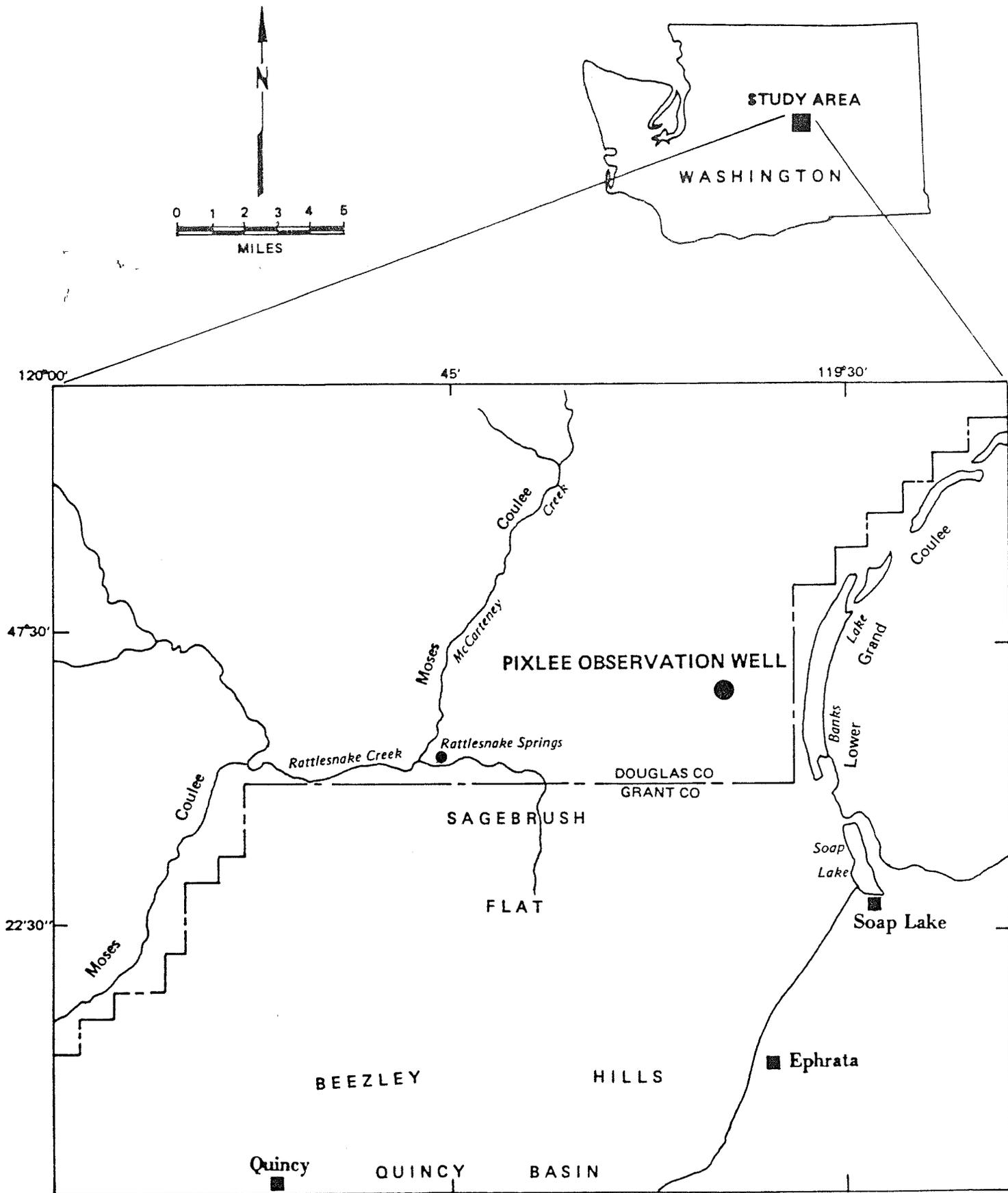
Key words: ground water, basalt, wells

INTRODUCTION

The Pixlee Observation Well is about 12 miles north of Ephrata in Douglas County, Washington as shown in Figure 1. It's specific location is the northwest quarter of the northwest quarter of Section 20, Township 23 North, Range 26 East of the Willamette Meridian. The well is located on land owned by the Washington Department of Natural Resources. Land surface elevation at the well is 1,920 feet mean sea level.

The well was drilled for irrigation but abandoned because of excessive pumping lift and insufficient yield. The driller's estimate of probable flow at a well depth of 802 feet, with a pump setting of 600 feet, was 60 to 80 gallons per minute.

The geologic strata near the well include unconsolidated alluvial or colluvial deposits underlain by basalt rock and thin sedimentary interbeds of the Columbia River Basalt Group. Local unconsolidated deposits vary in thickness from 2 to 50 feet. The underlying basalt rock of the Grande Ronde formation extends to depths of several thousand feet.



From USGS open-file report no. 79-1530

Figure 1. MAP SHOWING LOCATION OF PIXLEE OBSERVATION WELL.

CONSTRUCTION

L and L Drilling of Goldendale, Washington drilled the original Pixlee well under contract to the Washington Department of Natural Resources. Adcock Drilling of Lewiston, Idaho subcontracted for drilling an 8-inch pilot hole to a depth of 802 feet. L and L Drilling enlarged the pilot hole to 12 inches to a depth of 600 feet in May 1974. Static water level in the well was 486 feet below the top of the casing on May 5, 1974.

L and L Drilling deepened the well to 1,190 feet in July 1975. Static water level in the deepened well was 436 feet below the top of the casing on July 2, 1975.

Leach Well Drilling of Moses Lake, Washington enlarged the well to 16-inch diameter, to a depth of 600 feet, and deepened it to 1,315 feet in October 1977. Static water level in the deepened well was 450 feet below the top of the casing on October 13, 1977.

The completed well is 1,315 feet deep with 16-inch casing to a depth of 55 feet, 16-inch open hole to a depth of 600 feet, and 8-inch open hole from 600 feet to 1,315 feet. The surface deposits, basalt flows, and sedimentary interbeds are shown on an illustration of the driller's log in Figure 2.

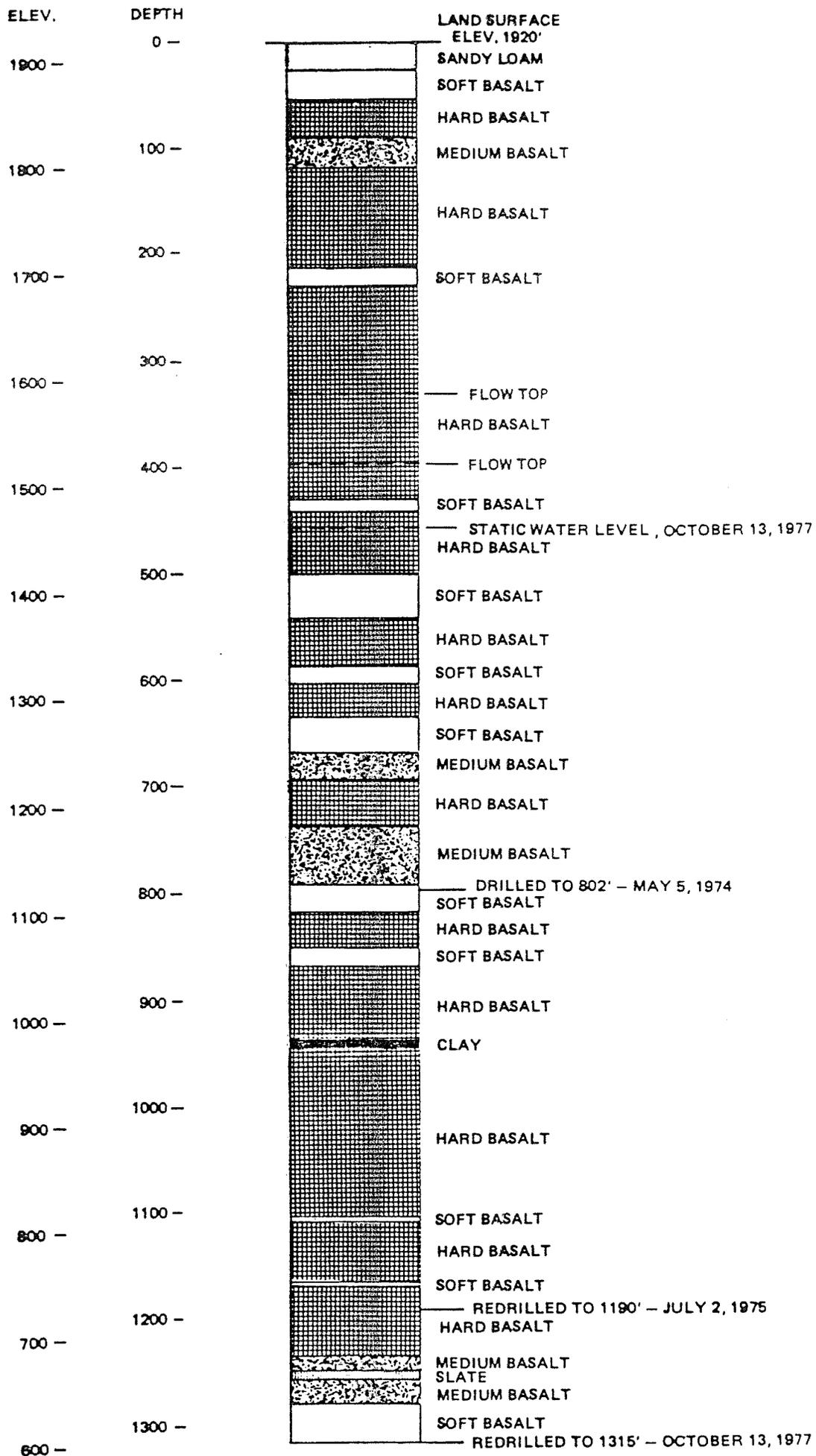


Figure 2. DRILLERS LOG FOR THE PIXLEE OBSERVATION WELL.

GEOPHYSICAL LOGS

Geophysical logs of the well were run by contract with the Washington State University, Geological Engineering Section in 1974, 1975, and 1977. The logs included:

gamma gamma	caliper*
neutron gamma	fluid resistivity*
neutron neutron	wall resistivity
natural gamma	spontaneous potential and
fluid temperature	flow meter*

*not included in 1974 and 1975

Flow in the well was insufficient for a flow meter log in 1974 and 1975.

The gamma gamma, natural gamma, fluid temperature, and wall resistivity logs for 1977 are reproduced in Figure 3. The other geophysical logs are not included here but may be obtained from the Washington State University, College of Engineering, Geological Engineering Section in Pullman, Washington 99164-3002.

The gamma gamma log shows three basalt zones of relatively low bulk density at depths of 530 to 610 feet, 880 to 950 feet, and below 1,265 feet. The neutron gamma and neutron neutron logs show the higher porosity and moisture contents corresponding to these three zones.

The natural gamma log shows two distinct sedimentary layers, noted in the driller's log as "green clay" and "green slate," associated with the high porosity zones at depths of 880-950 feet and below 1,265 feet.

The fluid temperature log shows an area of uphole flow extending from a depth of 600 feet toward the composite piezometric surface (depth of 530 feet). The fluid temperature log also shows some uphole flow from a depth of 940 feet to a depth of 800 feet and a slight downhole flow loss below a depth of 1,265 feet. The fluid resistivity log shows increasing resistivity in the zones of uphole flow, and a slight decrease in resistivity in the zone of downhole flow, noted in the fluid temperature log. The flow meter log for 1977 also shows uphole flow conditions from a depth of 610 feet to the piezometric surface at a depth of 530 feet. Some flow loss is evident on the log below a depth of 1,265 feet, to what is noted in the driller's log as "porous basalt."

The wall resistivity and spontaneous potential logs show the same response to changes in strata from vesicular to dense basalts between depths of 600 to 900 feet and below depths of 1,260 feet.

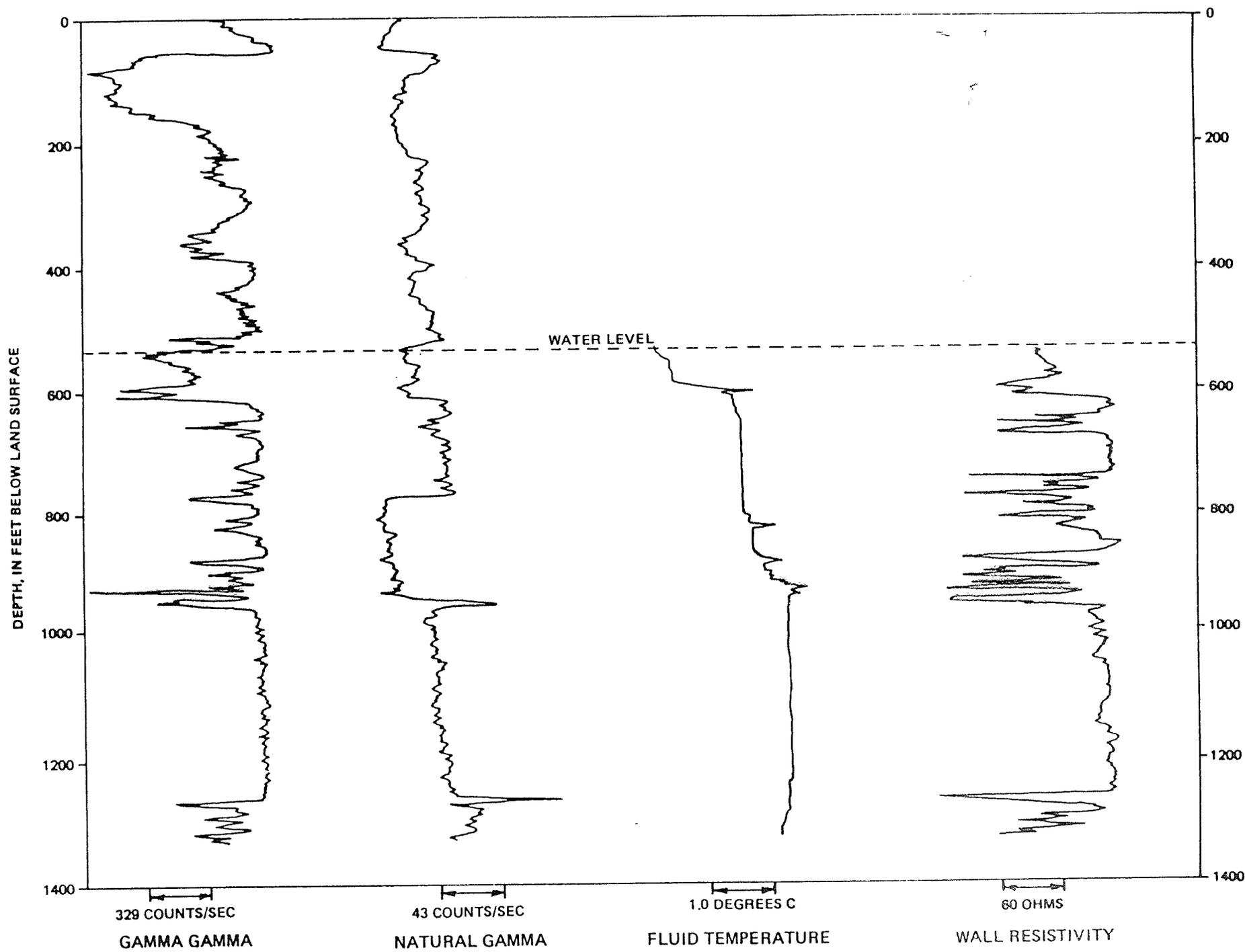


Figure 3. GEOPHYSICAL LOGS FOR THE PIXLEE OBSERVATION WELL.

PIEZOMETERS

The U.S. Geological Survey, in September 1982, installed piezometers in each of six water bearing zones that were identified on the geophysical logs. The installation was designed and supervised by Denzel Cline of the U.S. Geological Survey, Water Resources Division of Tacoma, Washington. The contractor for installation was Ponderosa Drilling and Exploration, Inc. of Spokane, Washington.

The six piezometers are set to different water bearing zones below a depth of 360 feet (elevation 1,560 feet mean sea level) in the Grande Ronde basalt, as shown in Figure 4.

Each piezometer is screened with a wirewound stainless steel screen (60 slot, .006 inch). The water-bearing or piezometer intervals are separated in the casing by cement plugs. The backfill is standard pea gravel.

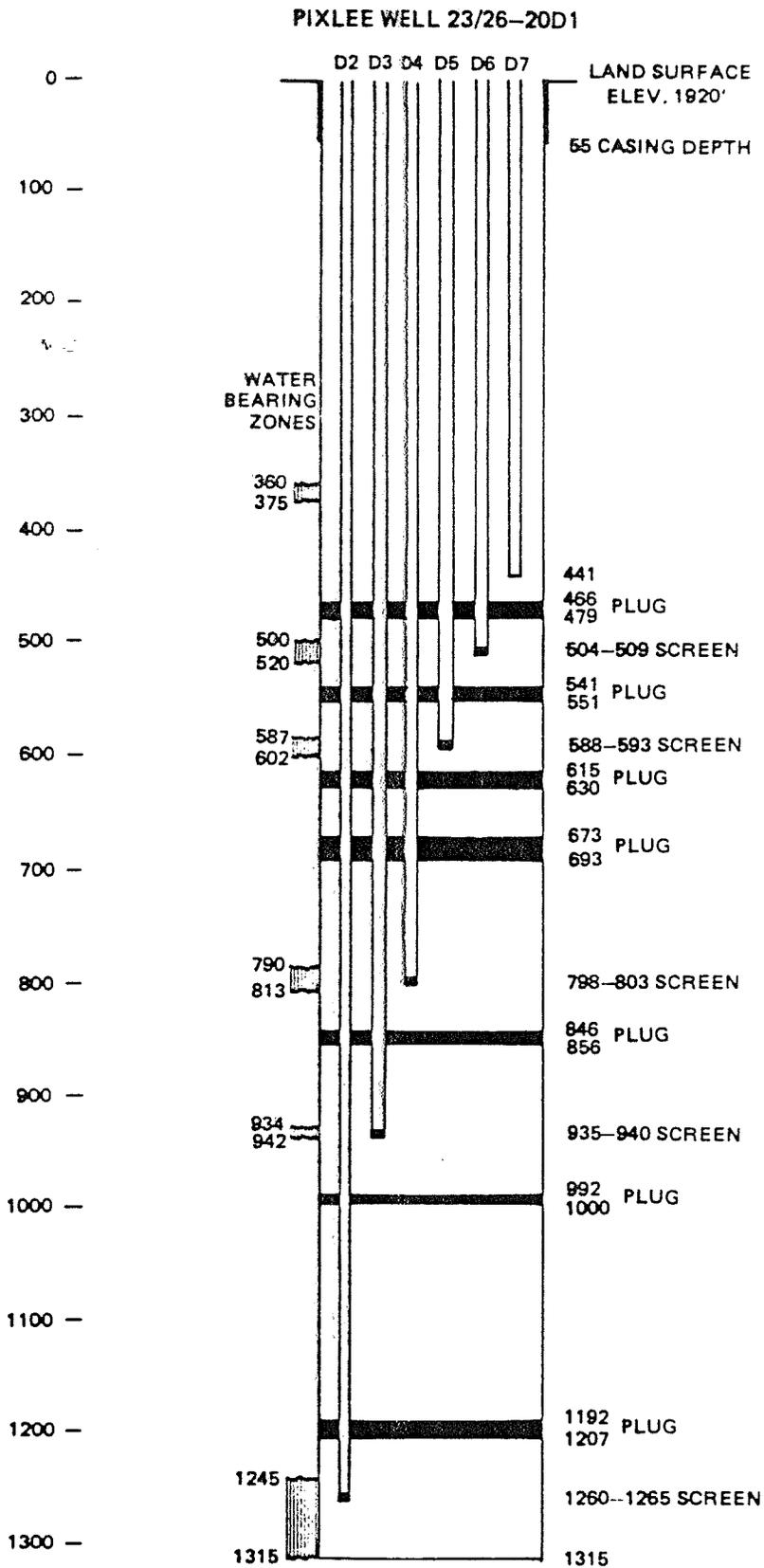


Figure 4. SCHEMATIC SHOWING DETAILS OF PIEZOMETER INSTALLATION IN PIXLEE OBSERVATION WELL.

WATER LEVELS

The U.S. Geological Survey has measured water levels in the piezometers since October 1982. The schedule for these measurements was changed from bimonthly to semiannual (March and October) in 1984. The measurements to date are as follows:

Table 1. Water Level Measurements

<u>Piezometer</u>	<u>Depth Interval</u>	<u>4/27/82</u>	<u>10/1/82</u>	<u>1/28/83</u>	<u>3/22/83</u>	<u>4/27/83</u>	<u>6/22/83</u>	<u>8/17/83</u>	<u>10/19/83</u>	<u>3/6/84</u>
D2	1207-1315	602	602.55	603.0	601.6	601.8	601.9	601.8	602.1	595.9
D3	856-992		515.9	498.3	493.0	493.0	492.3	491.9	491.6	489.8
D4	693-846		523.05	497.2	496.8	496.3	494.5	494.8	494.3	492.4
D5	551-615		566.8	549.4	546.8	546.0	544.4	543.0	541.7	538.6
D6	479-541		Dry	Dry						
D7	Top-466		373.5	362.3	356.8	359.1	399.2	*	*	*

Note: 9/27/82 measurement composite water level
* No measurement because of obstruction in pipe

The water levels in the piezometers show a generally decreasing potentiometric head with depth in the upper three zones, then increasing head with depth from the third through fifth zones. Potentiometric heads decrease with depth from the fifth to lowermost (sixth) zone. Water levels have varied the most, or 42 feet, in the shallowest piezometer (D7) and the least, or 7 feet, in the deepest piezometer (D2) over the period of record. The highest water levels of record for four of the piezometers were measured in March 1984. Potentiometric heads in these zones are probably re-equilibrating to the natural vertical head distribution for the different aquifers. This distribution was disturbed by the flow between zones while the well was uncased from 1975 to 1982. It may take several years before seasonal water level fluctuations are evident in the shallow zones again.