Borehole Geophysical Data from Bedrock Wells at Windham, New York

By Paul M. Heisig and Kevin D. Knutson

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
	Length	
foot (ft)	0.3048	meter
	Area	
square mile (mi^2)	2.59	square kilometer
	Flow	
gallon per minute (gal/min)	0.06308	liter per second
	Temperature	
degree Celsius (°C)	(9/5 °C) + 32	degree Fahrenheit (°F)

Other units of measure

microSiemens per centimeter at 25°C (µS)

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

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Abstract

This report presents borehole geophysical logs from 21 wells completed in bedrock near the village of Windham, N.Y. The data were collected as part of a water-resources investigation conducted by the U.S. Geological Survey, during 1990-93, in cooperation with the New York City Department of Environmental Protection. Natural gamma logs, caliper logs, and fluid-conductivity and temperature logs are depicted for each well; driller's logs are included where available. Location maps and a table of selected well data are included. The geophysical logs provide indications of rock type and occurrence of water-bearing fractures.

INTRODUCTION

Water resources within the Catskill Mountain region of southeastern New York constitute much of New York City's water supply. The New York City Department of Environmental Protection (NYCDEP) is developing watershed-management regulations in an effort to maintain the integrity of the supply for the future and to meet U.S. Environmental Protection Agency drinking-water mandates. As part of this effort, the U.S. Geological Survey, in cooperation with the NYCDEP, conducted a water-resources investigation within a 27.6-mi^2 section of the Batavia Kill basin (fig. 1A) during 1990-93. The area was selected because it had undergone considerable development in association with the opening of a public ski area during the 1980s. The purpose of the study was to assess the effect of development on local water resources and to develop a conceptual model of the hydrogeologic system through collection of geologic and hydrologic data. The conceptual model, in turn, could be applied toward watershed management. This data report supplements an interpretive companion report (Heisig, written commun., 1994).

Study Area

The study area is in western Greene County, in the northeastern part of the Catskill Mountains. Local relief is about 1,500 ft. The geologic framework consists of discontinuous glacial deposits up to 120 ft thick overlying fractured, gently dipping clastic sedimentary rock of Devonian age. Glacial deposits are typically thickest within the largest valleys.

The water-resource potential of glacial deposits and of fractured bedrock is greatest within the valleys. Although well yields vary widely, bedrock is the most frequently tapped source of ground water throughout the area.

Purpose and Scope

This report makes available borehole geophysical logs from 21 wells completed in bedrock in and around the village of Windham, N.Y. The borehole geophysical logs for each well include four types of logs: (1) natural gamma radiation, (2) caliper (average borehole diameter), (3) fluid conductivity, and (4) fluid temperature.

Acknowledgments

Thanks are extended to the well owners (listed in table 1) for granting access to their wells, and to well drillers Thomas Falciano, Jr. and Troy Johnson, who provided driller's logs for many of the wells.

BOREHOLE GEOPHYSICAL LOGS

Well locations are shown in figure 1B, selected well data are listed in table 1. Borehole geophysical logs for each well (fig. 2) include natural gamma radiation, caliper, wellbore fluid conductivity, and wellbore fluid temperature. Rock types, as denoted on driller's logs, are indicated in the geophysical logs where available. Together, these logs provide subsurface information that is essential to interpretation of the local hydrogeologic system and has transfer value to similar settings within the Catskill Mountain region. Each type of log is described below; more detailed explanations can be found in Keys (1990).

Natural gamma (radiation) logs.—These logs record natural gamma radiation levels of rock materials intersected by a wellbore. Changes in natural gamma radiation levels indicate changes in lithology or rock type within a borehole. Natural gamma radiation, in the clastic sedimentary sequences of the Catskill Mountain region, is typically highest among fine-grained rocks (such as shale) and lowest among well-sorted, coarse-grained rocks (such as sandstone). Thus, natural gamma radiation logs can indicate subsurface lithologic changes in lieu of driller's logs, and provide a more consistent and objective indication of lithology within an area than do logs by different drillers.

Caliper logs.—These logs provide a record of average wellbore diameter from the response of three spring-loaded arms that maintain contact with the wellbore as the tool is drawn up from the bottom of the well. Discrete increases in wellbore diameter are indicative of fractures. Fractures identified by this method are not necessarily water bearing, however; they may represent artifacts of the drilling process that do not extend outward from the borehole. The caliper tool is most sensitive to horizontal (bedding-plane) fractures and least sensitive to high-angle fractures.

Fluid conductivity and temperature logs of wellbore water.—These logs can be used to identify flow within a wellbore and water-bearing fractures intersected by a wellbore. Changes in either conductivity or temperature within the water column are typically indicative of flow within the wellbore; thus, a point or zone of change within a log indicates the presence of a water-bearing fracture. Fluid-conductivity data also provide an indication of water potability; in general, waters within fluid conductivity above 1,000 µs/cm at 25°C tend to have elevated sodium and chloride concentrations and poor potability.

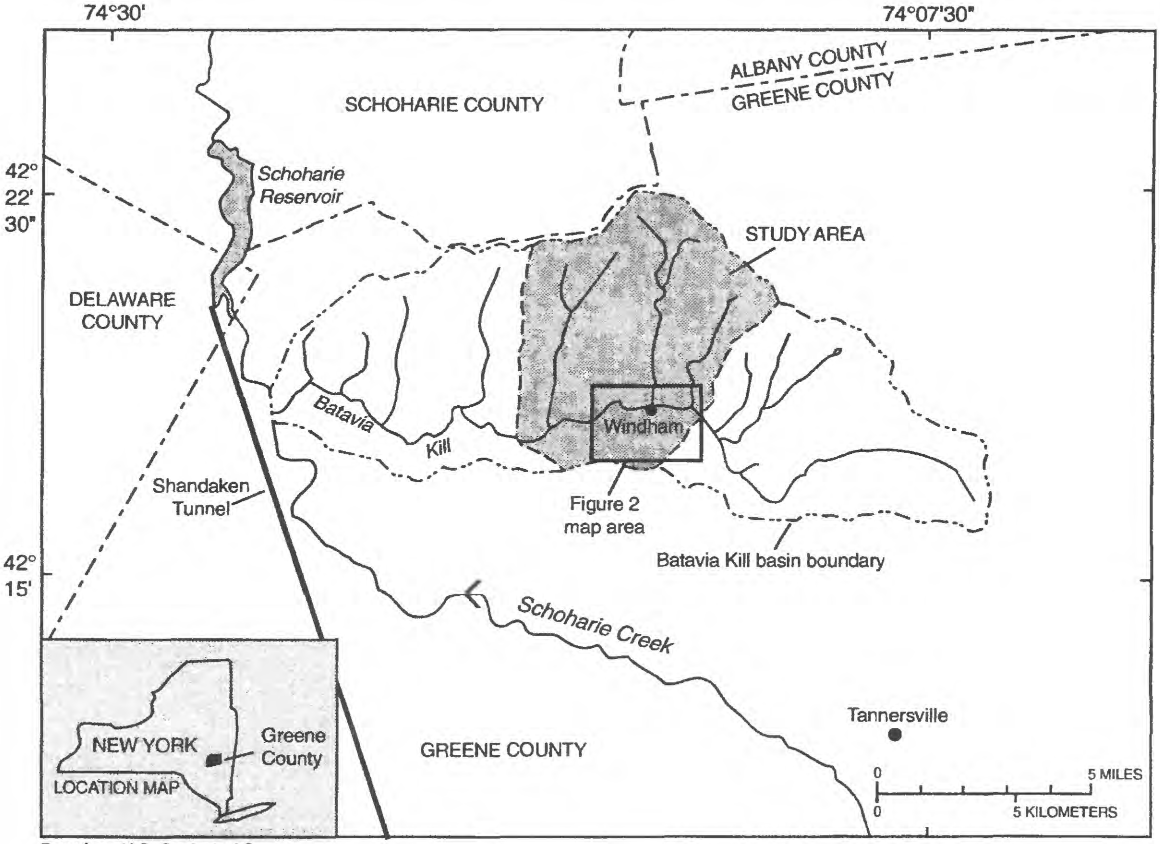
REFERENCE CITED

Keys, W. S., 1990, Borehole geophysics applied to ground-water investigations: U.S. Geological Survey Techniques of Water Resources Investigations, book 2, chap. E2, 150 p.

Table 1. Selected data for wells in Windham area, Greene County, N.Y. from which borehole geophysical data were collected, 1992-94.

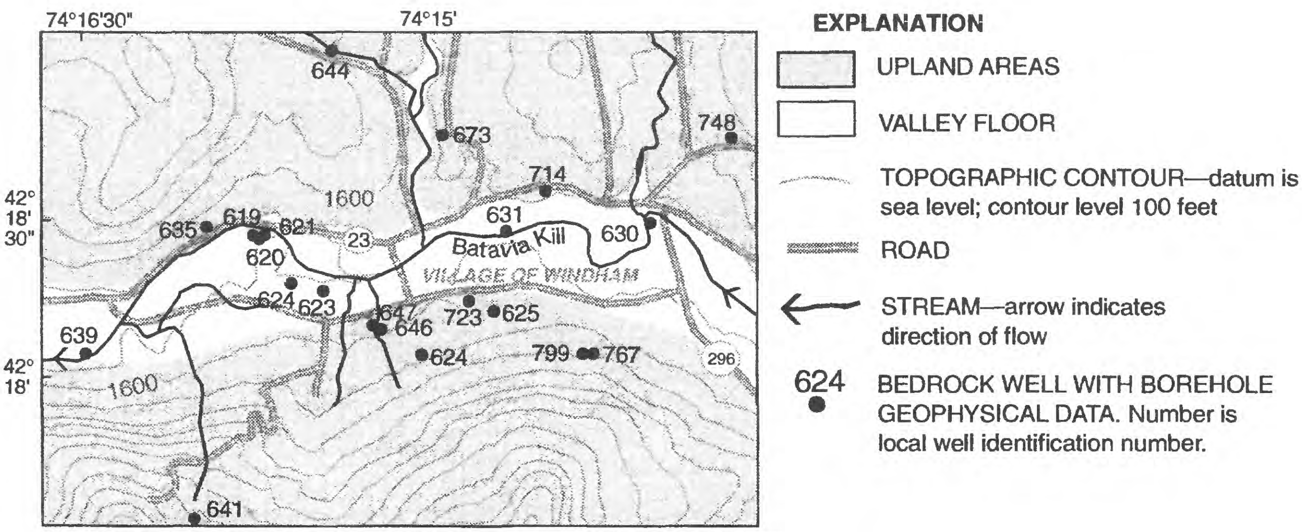
[Locations are shown in fig. 1B. Numbers in italics indicate depth or yield of deepened well.]

Local well number	Latitude (degrees)	Longitude (degrees)	Owner of record	Depth of well (feet)	Depth to bedrock (feet)	Yield (gallons per minute)
619	42°18'27"	74°15'43"	Ski Windham	83.0	39	24
620	42°18'27"	74°15'41"	Ski Windham	100	35	75
621	42°18'27"	74°15'40"	Ski Windham	148	36	100
622	42°18'18"	74°15'36"	Ski Windham	227	65	200
623	42°18'17"	74°15'27"	Madtes, W.	290	65	150
624	42°18'04"	74°15'00"	Sheridan, T.	902	35	2.3
625	42°18'12"	74°14'41"	Priebke, I.	440	35	320
630	42°18'29"	0741359"	Thompson House Resort	273	38	45
631	42°18'27"	74°14'38"	Town of Windham	252	55	≥100
635	42°18'28"	74°15'58"	O'Rourke, R.	427	32	—
639	42°18'05"	74°16'30"	Chicoy, J.	305	90	20
641	42°17'29"	74°16'05"	Ski Windham	480 *610*	48	— *2*
644	42°19'03"	74°15'23"	Town of Windham	340	25	10
646	42°18'09"	74°15'12"	Taylor, D.	427	85	—
647	42°18'10"	74°15'14"	Taylor, D.	200 *424*	86	5 —
673	42°18'47"	74°14'53"	Kokkoris, S.	226	40	100
714	42°18'36"	74°14'26"	Sheridan, T.	302	26	100
723	42°18'15"	74°14'46"	Turk	176	69	1.5
748	42°18'44"	0741337"	Porcello, J.	655	40	19
767	42°18'00"	74°14'18"	Sheridan, T.	702	18	1
799	42°18'01"	74°14'21"	Sheridan, T.	866	12	0.8



Base from U.S. Geological Survey
State base map, 1:500,000, 1974

A. Location of study area



Base from New York State Department of Transportation, Ashland, N.Y. ; Hensonville, N.Y.; 1:24,000, 1976

B. Well Locations

Figure 1. Location of (A) study area in vicinity of Windham, N.Y., and (B) bedrock wells from which borehole geophysical data were collected.

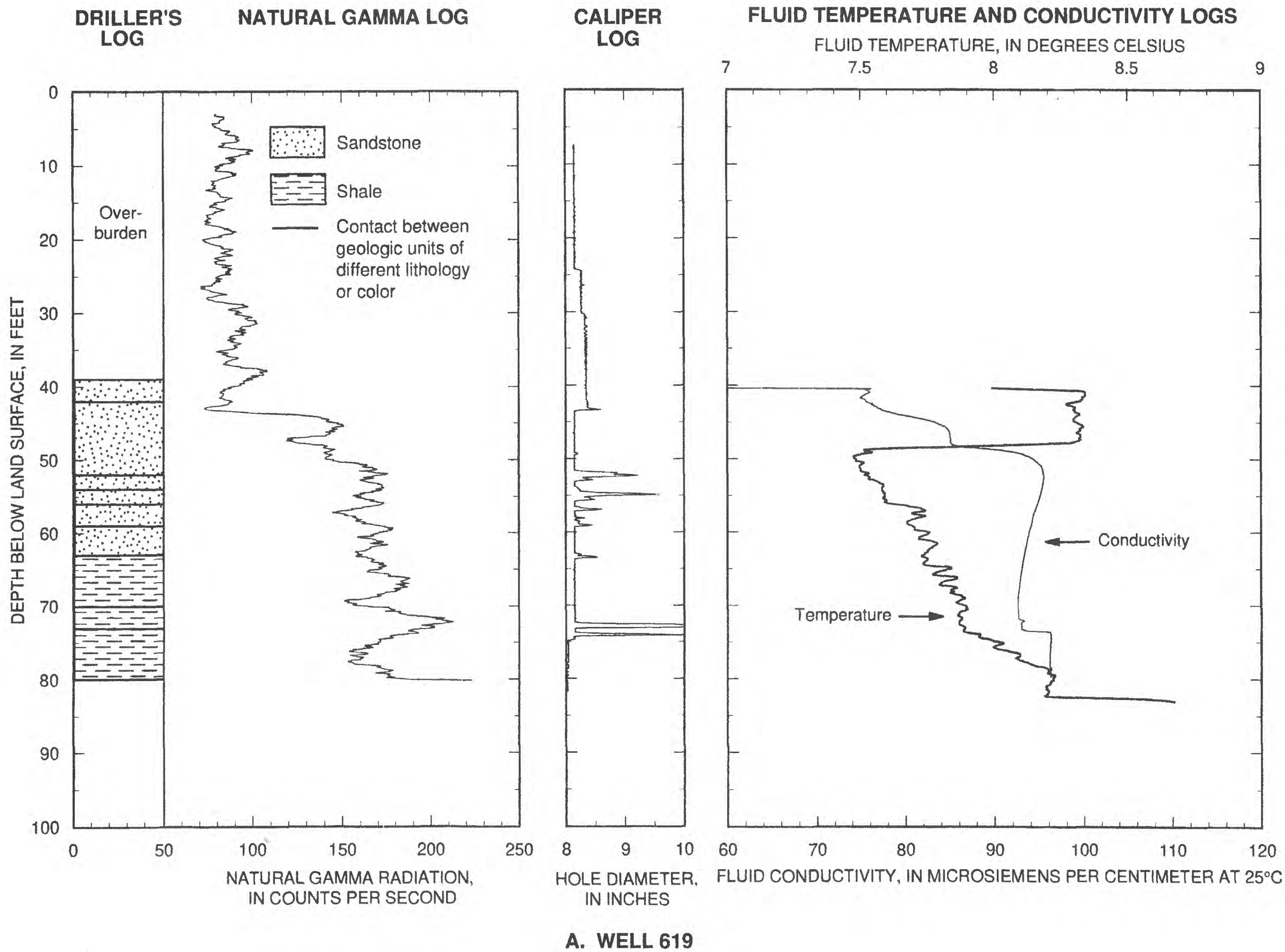


Figure 2. Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)

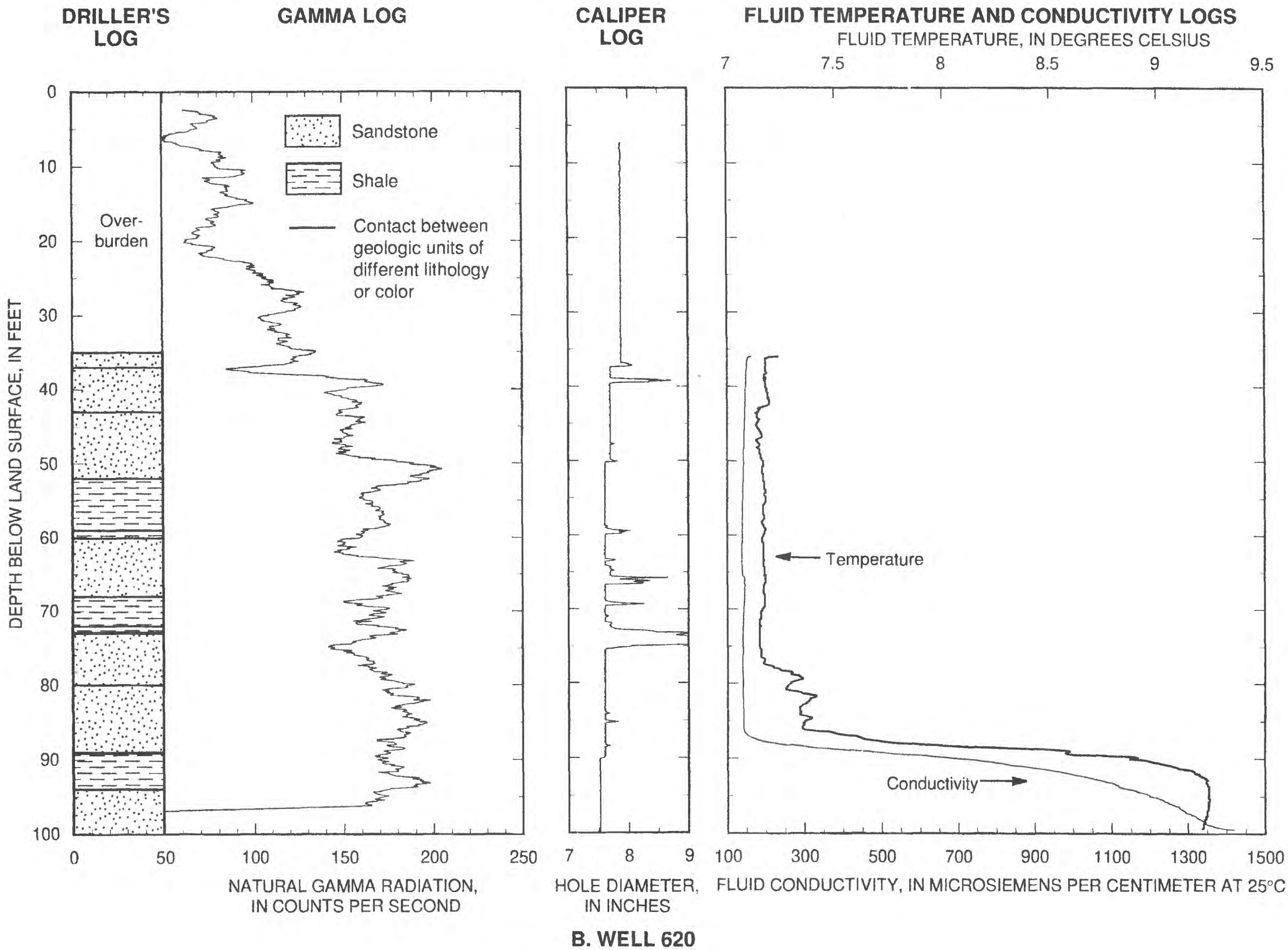
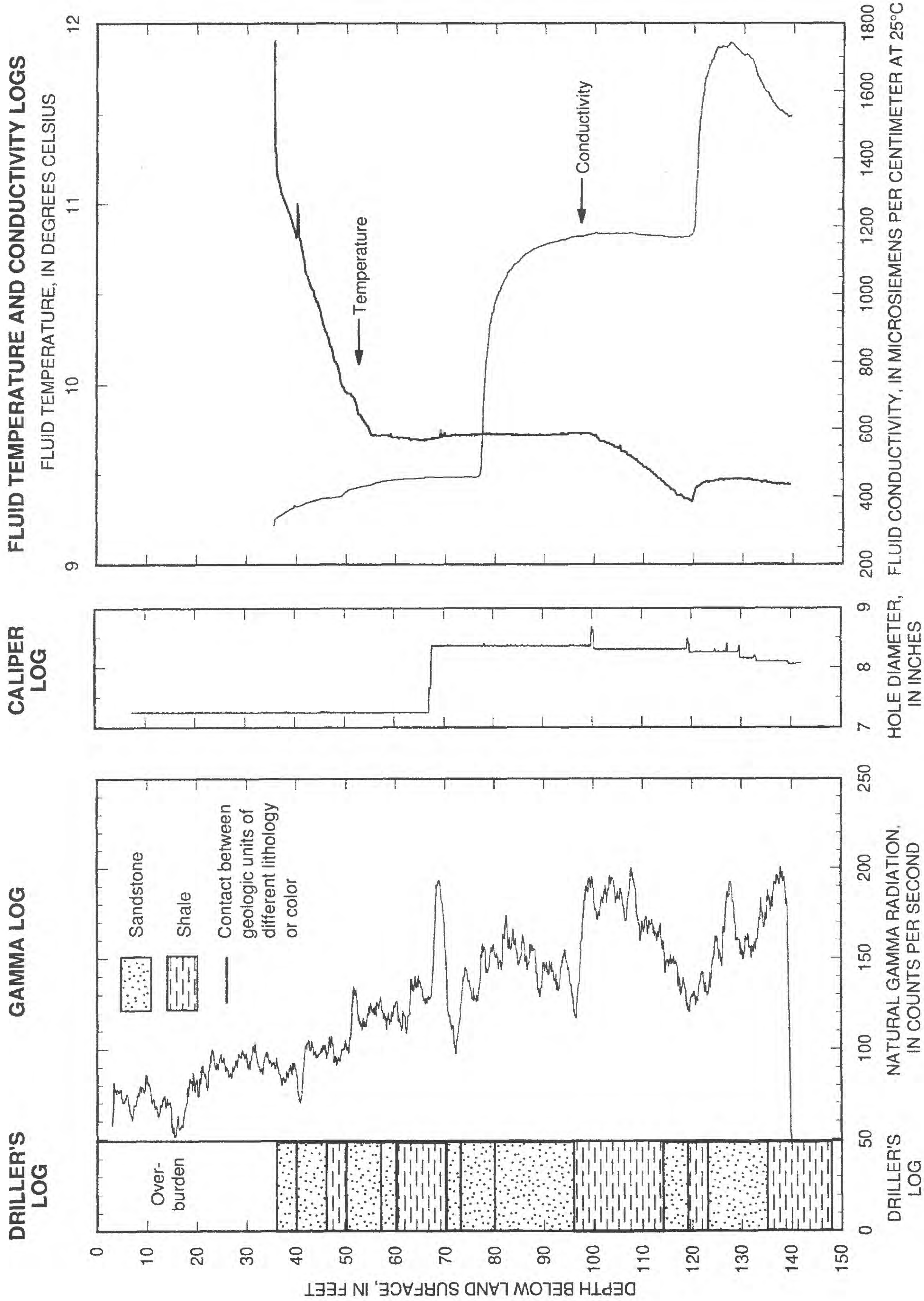


Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)



C. WELL 621

Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)

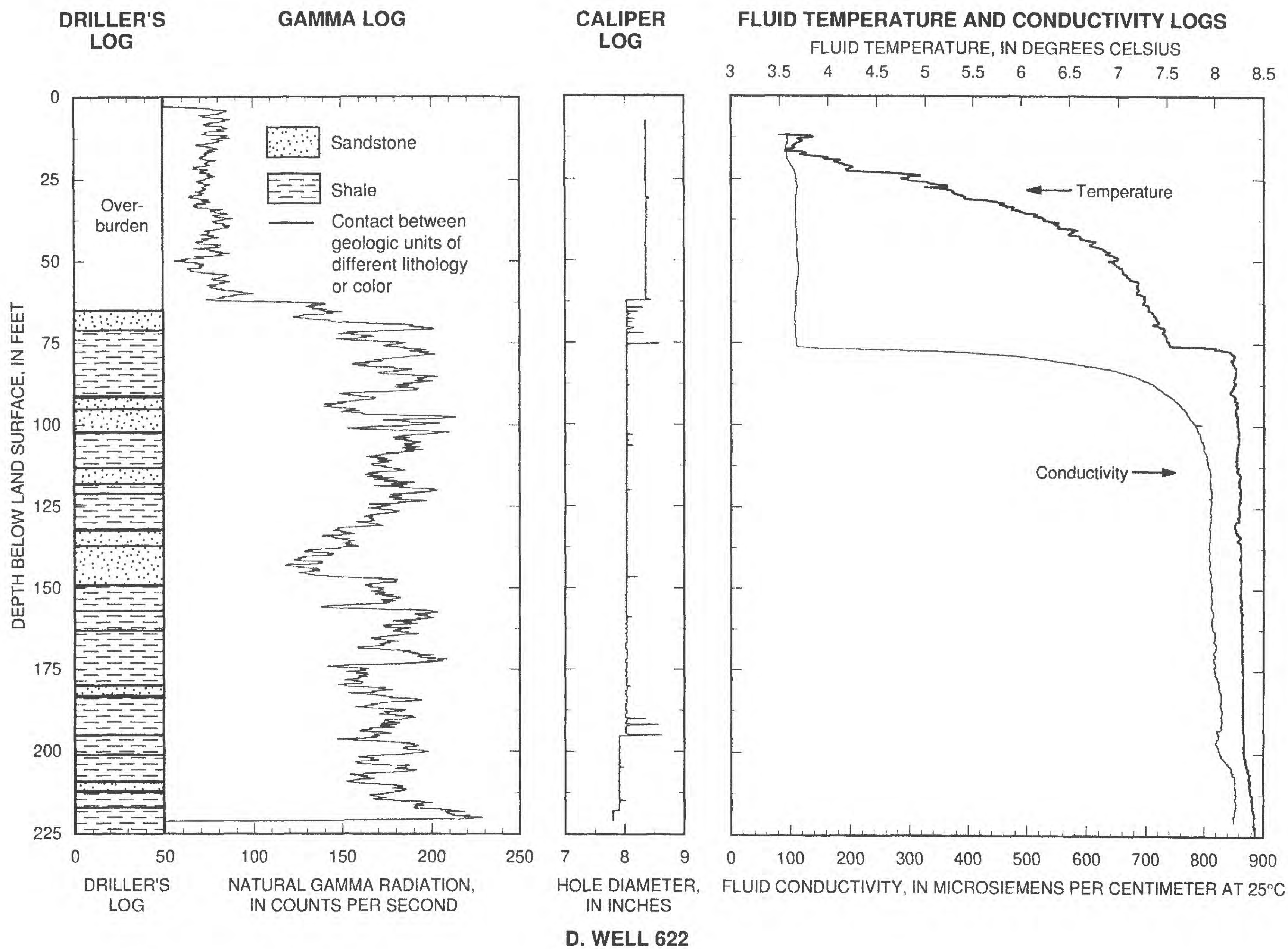
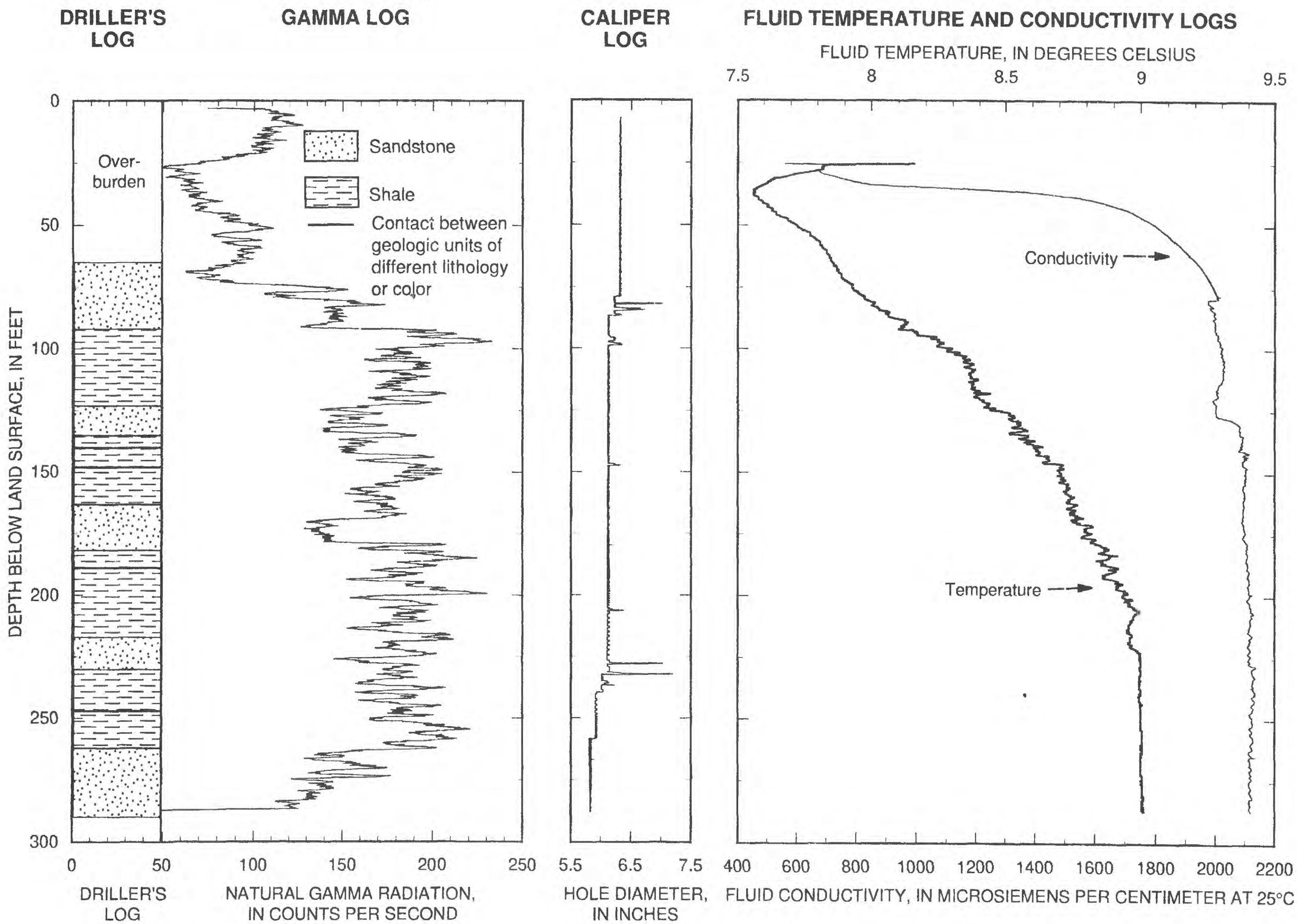


Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)



E. WELL 623

Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)

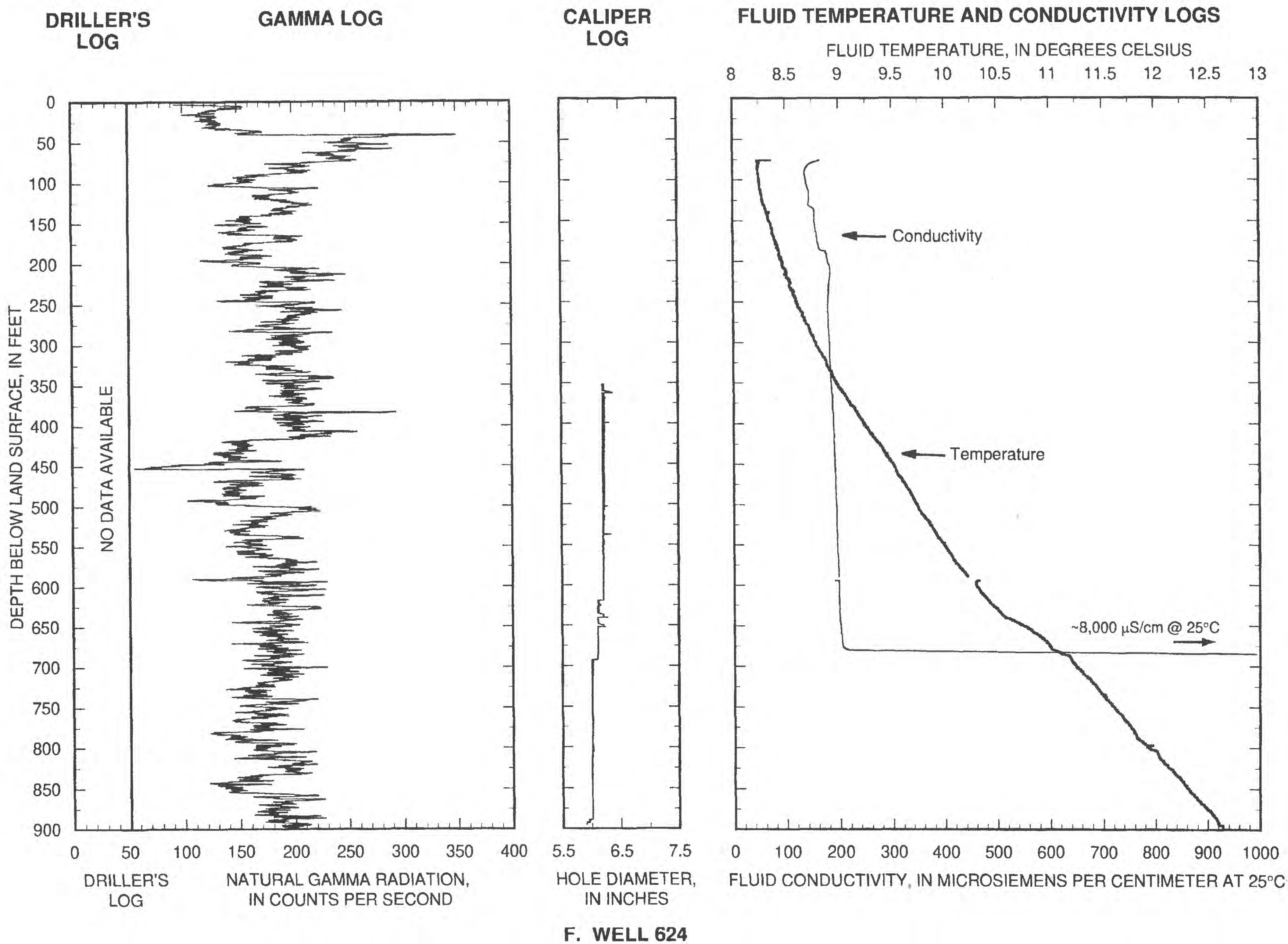
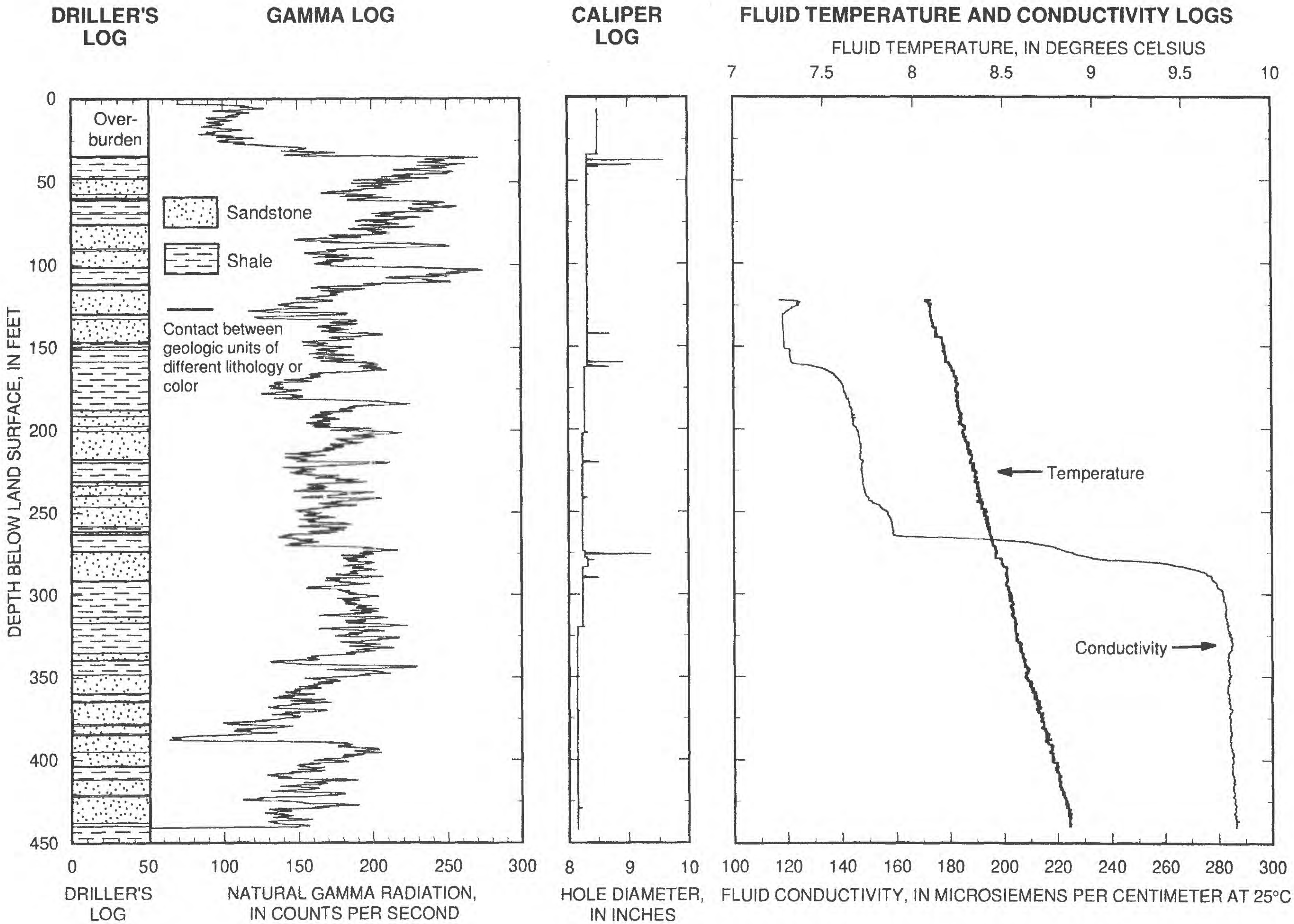


Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)



G. WELL 625

Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)

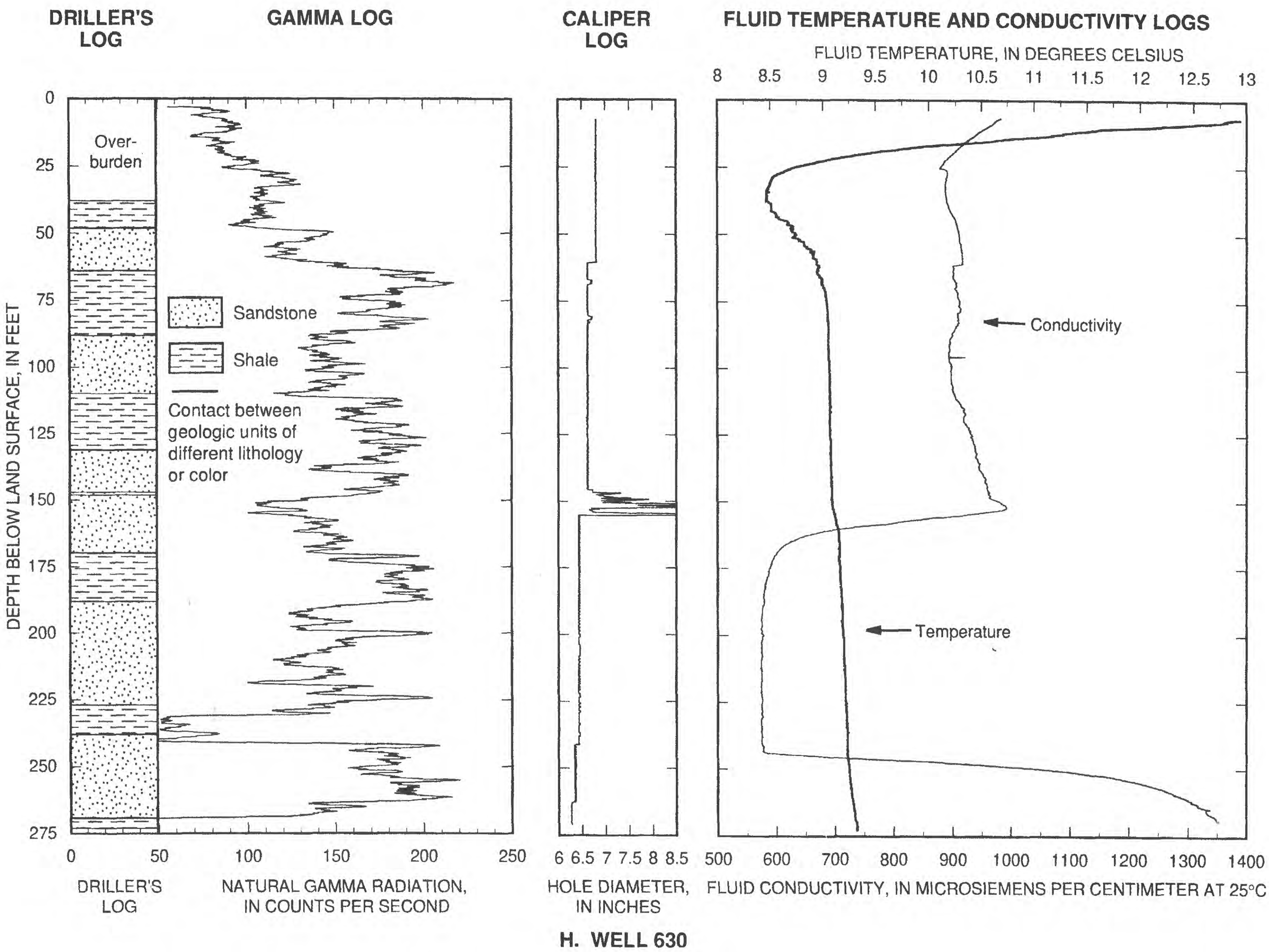


Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)

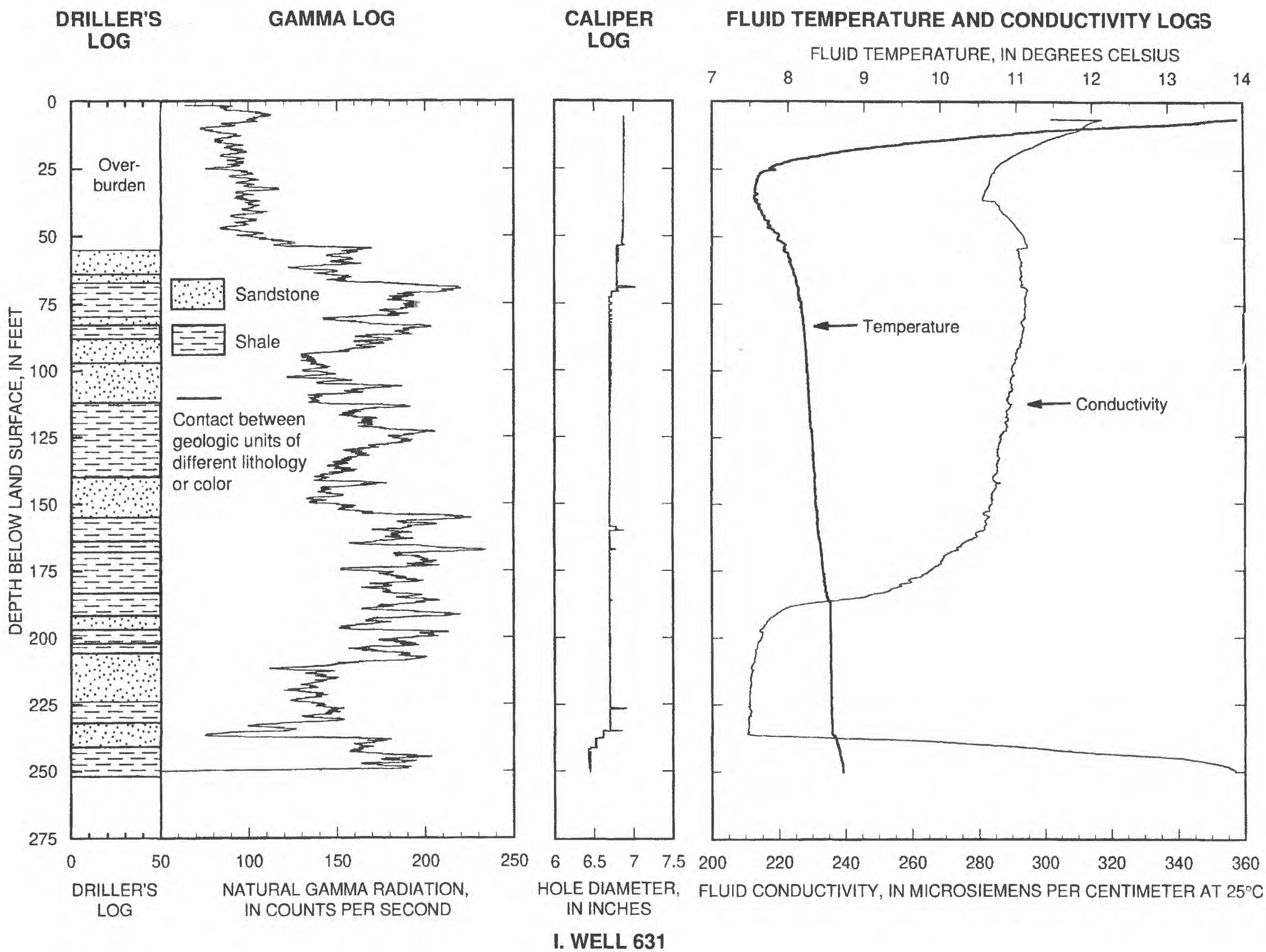


Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)

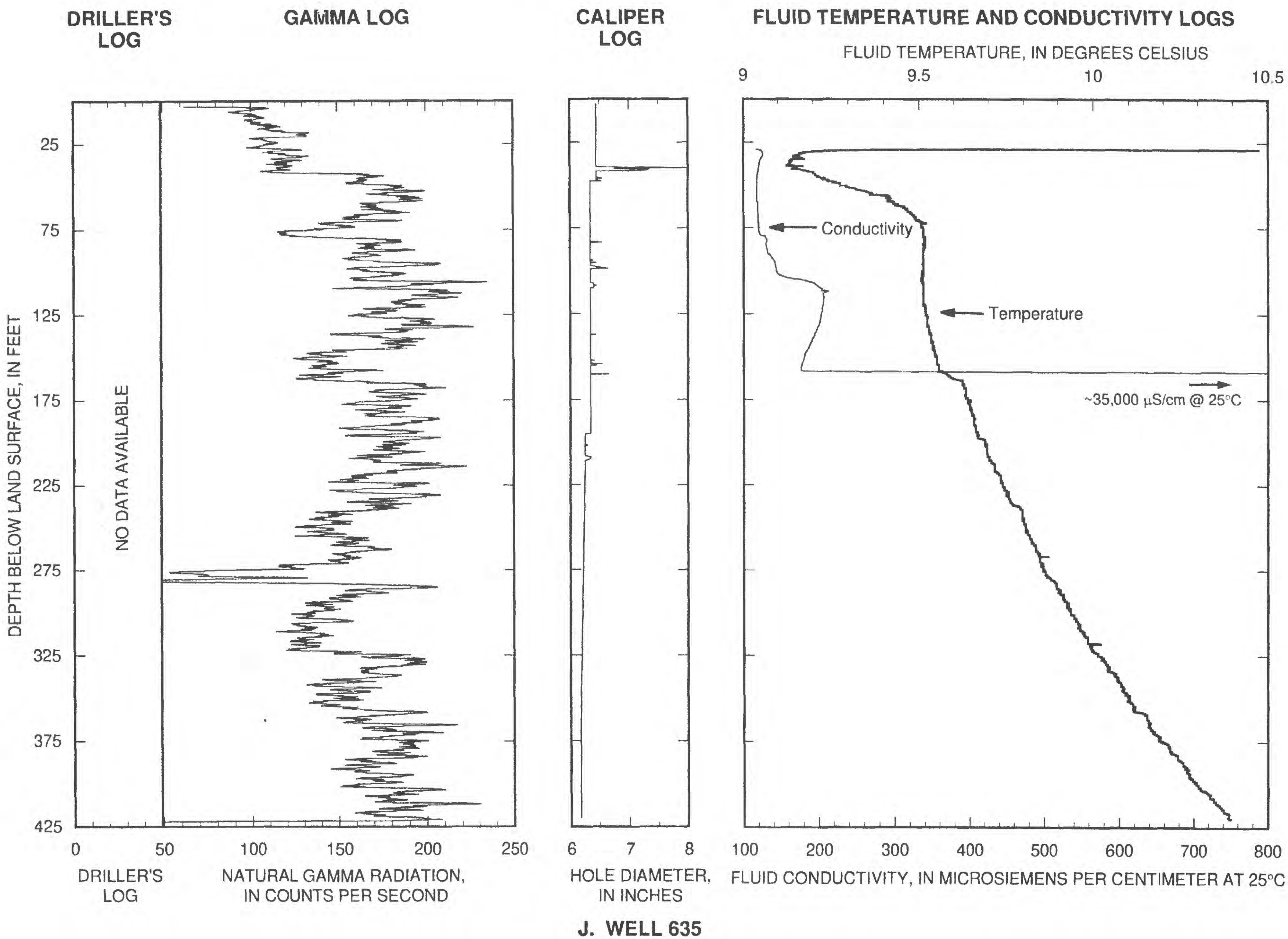
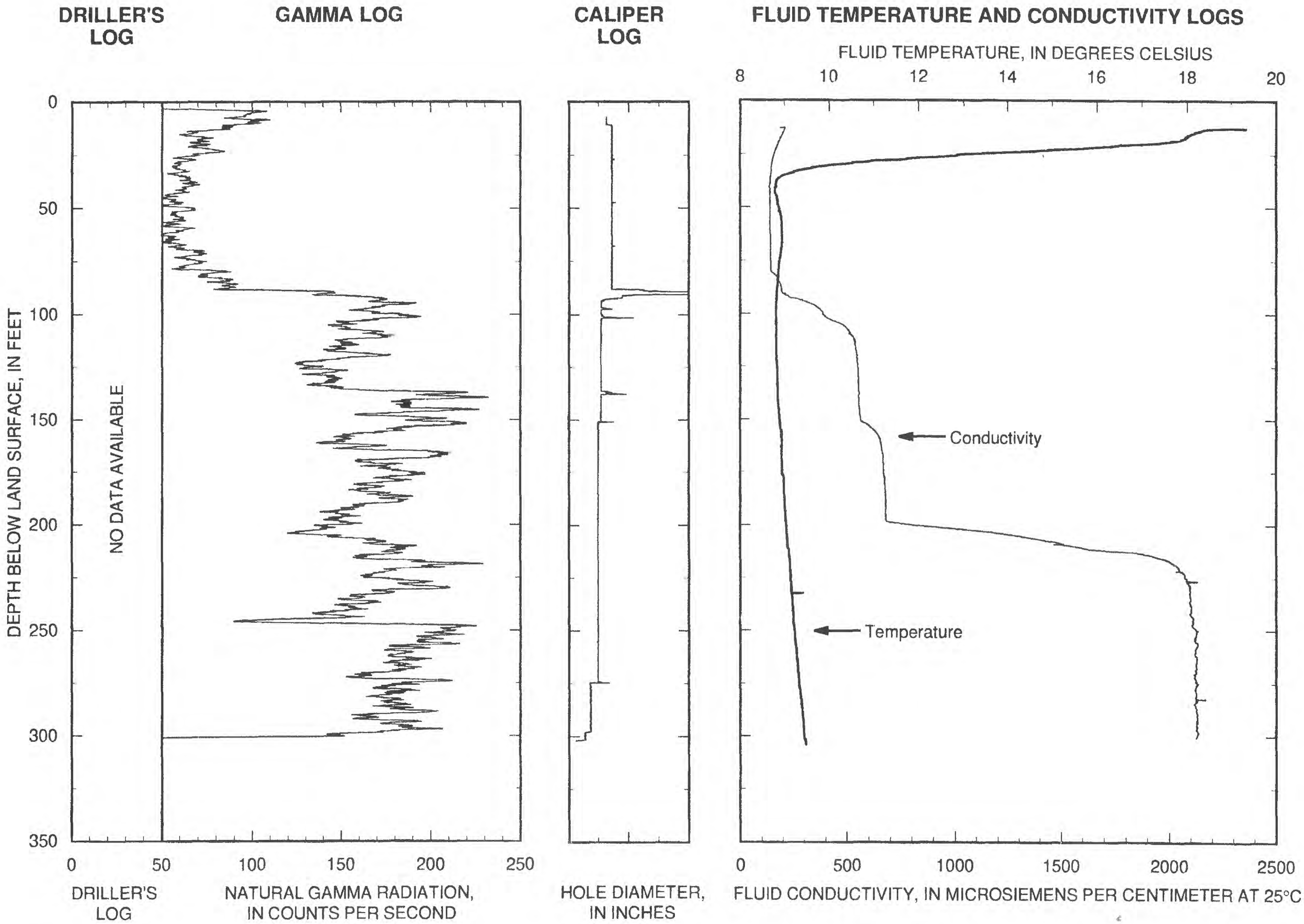


Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)



K. WELL 639

Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)

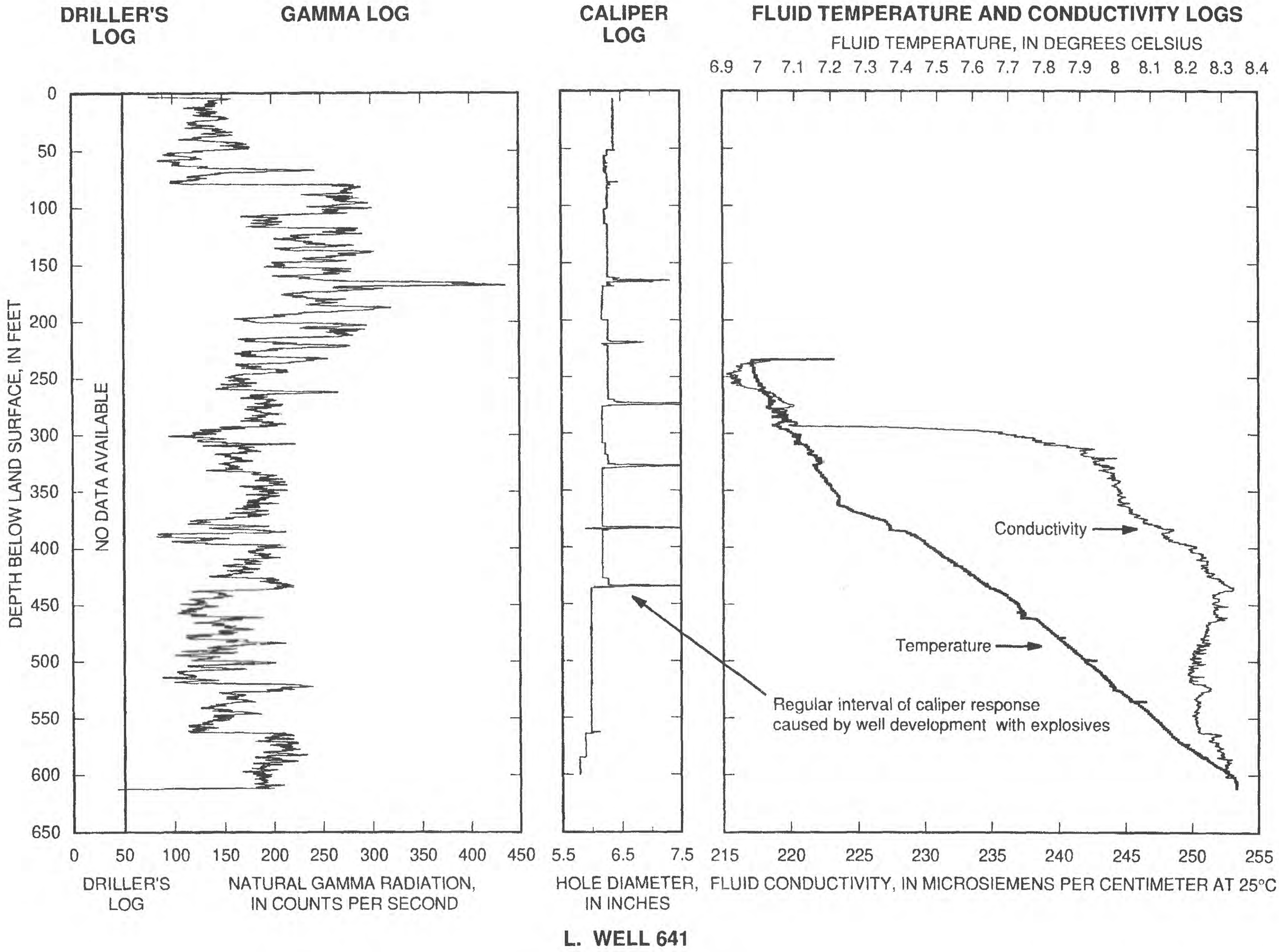
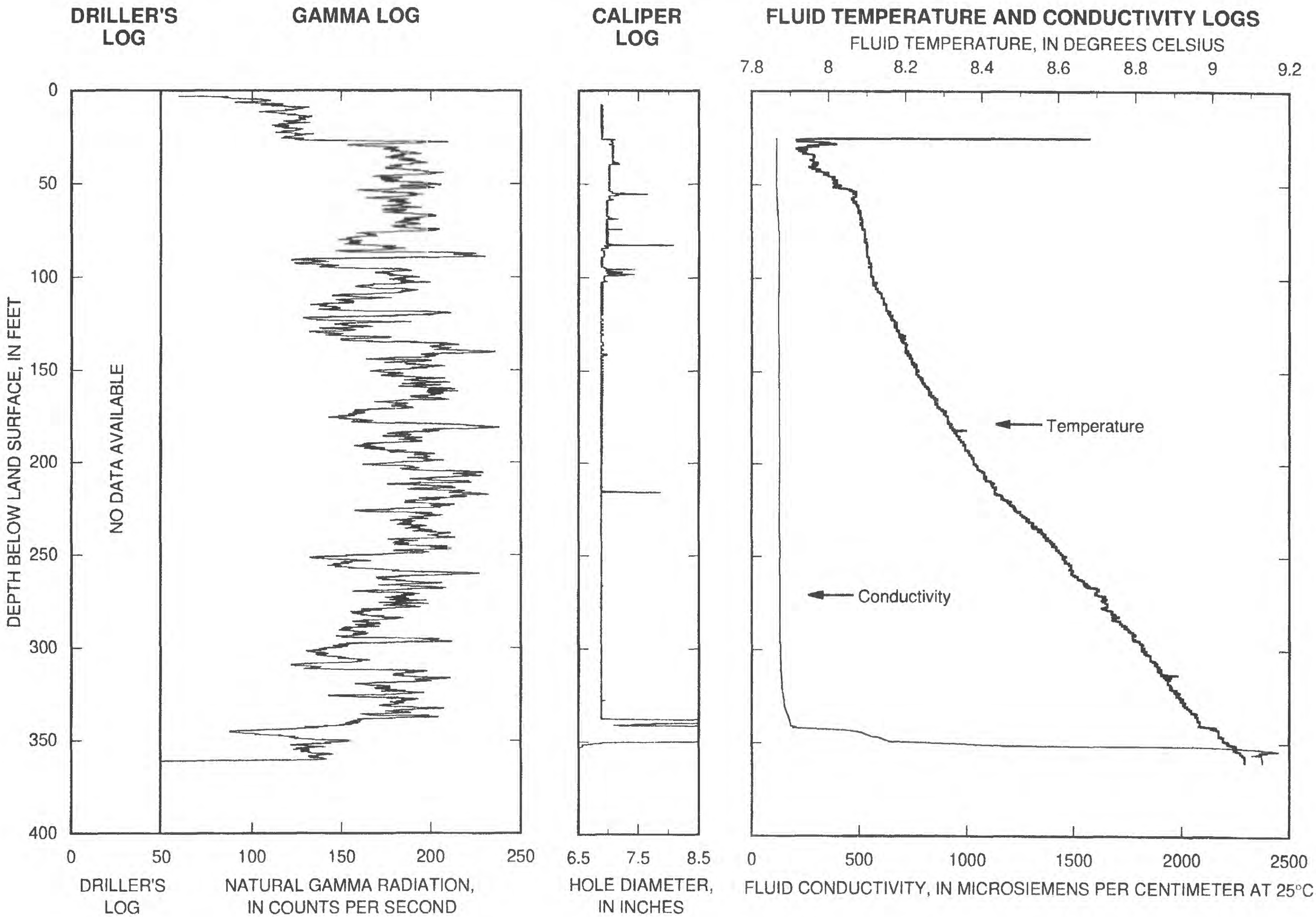


Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)



M. WELL 644

Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)

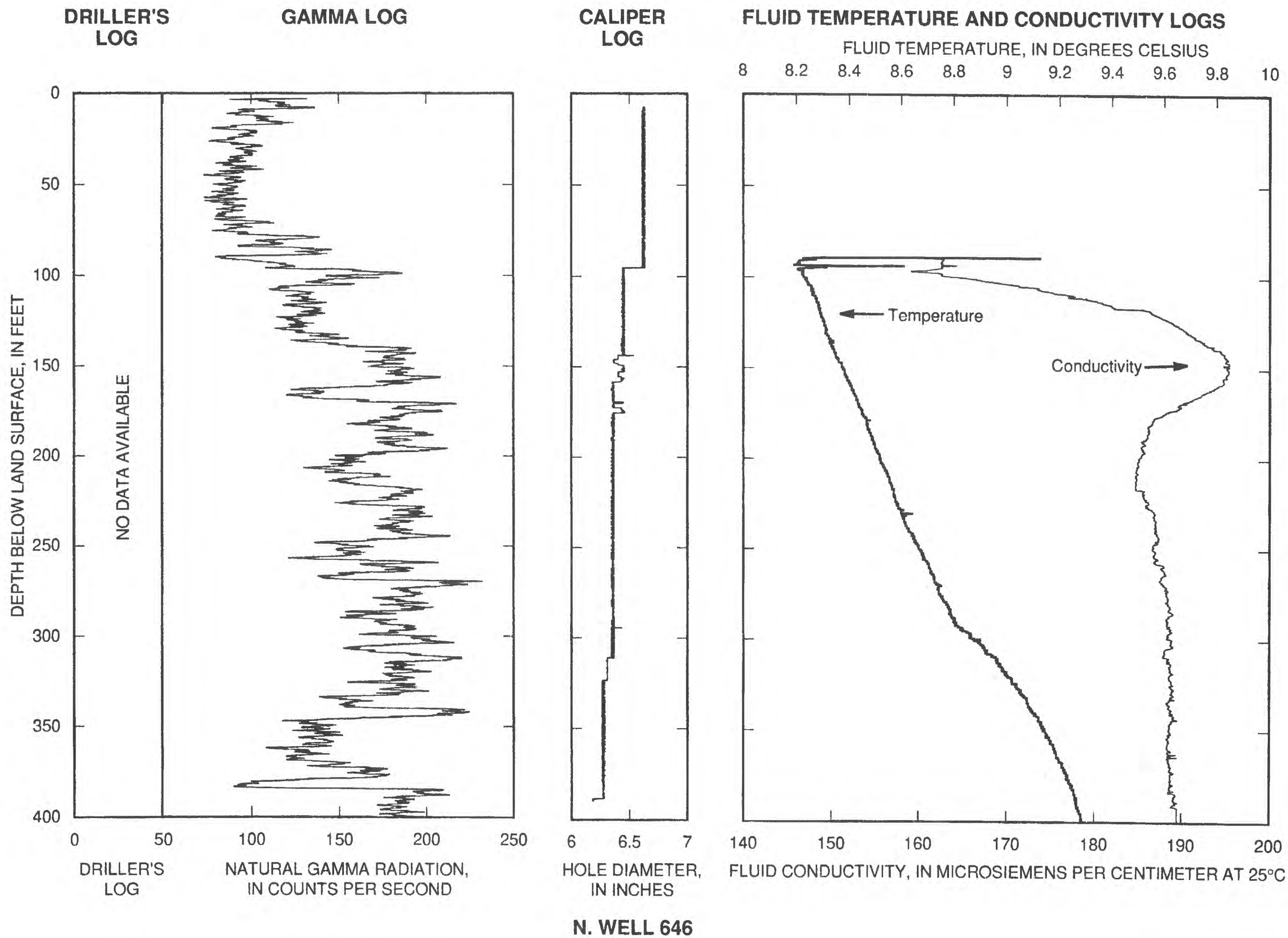


Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)

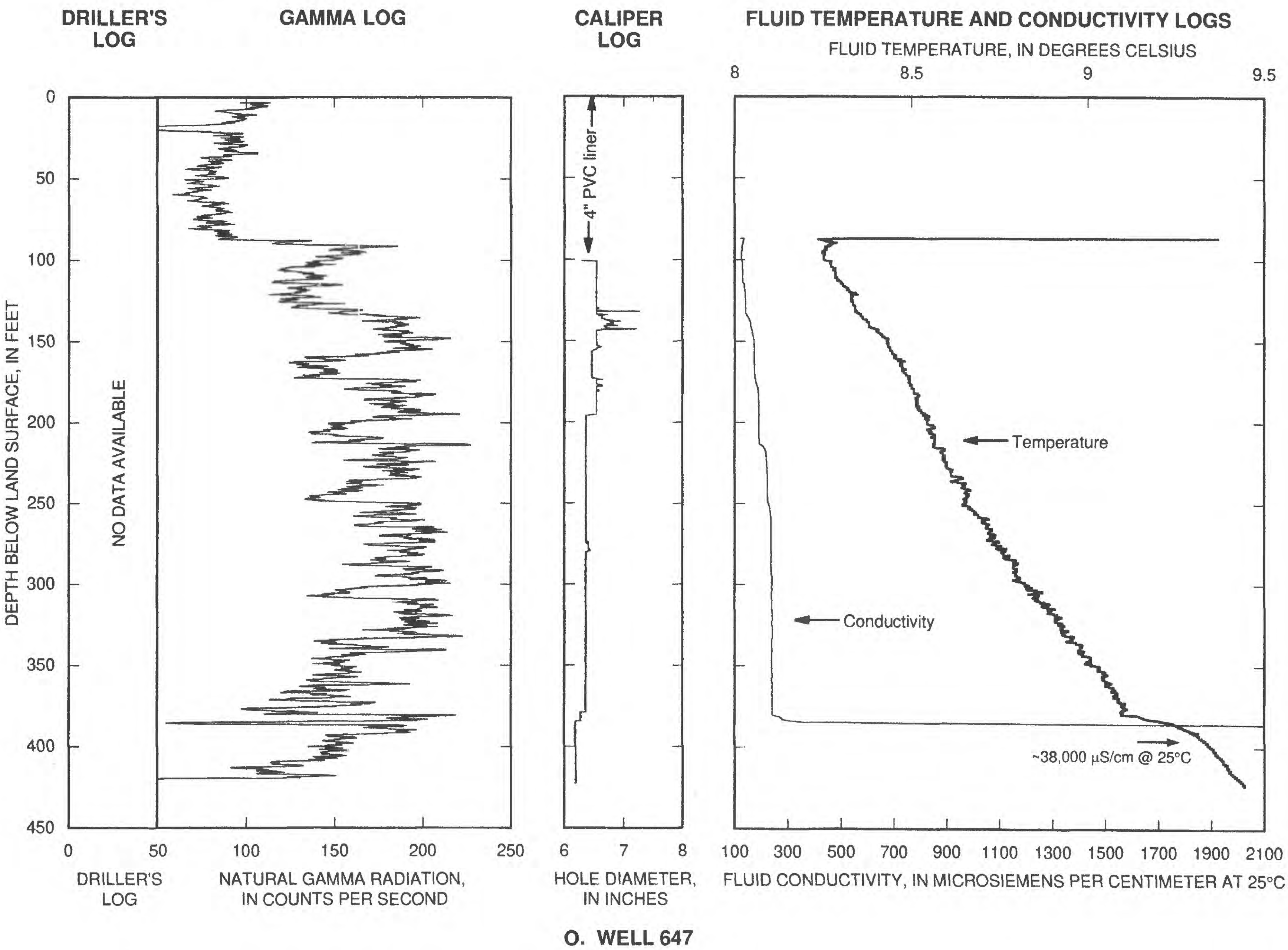
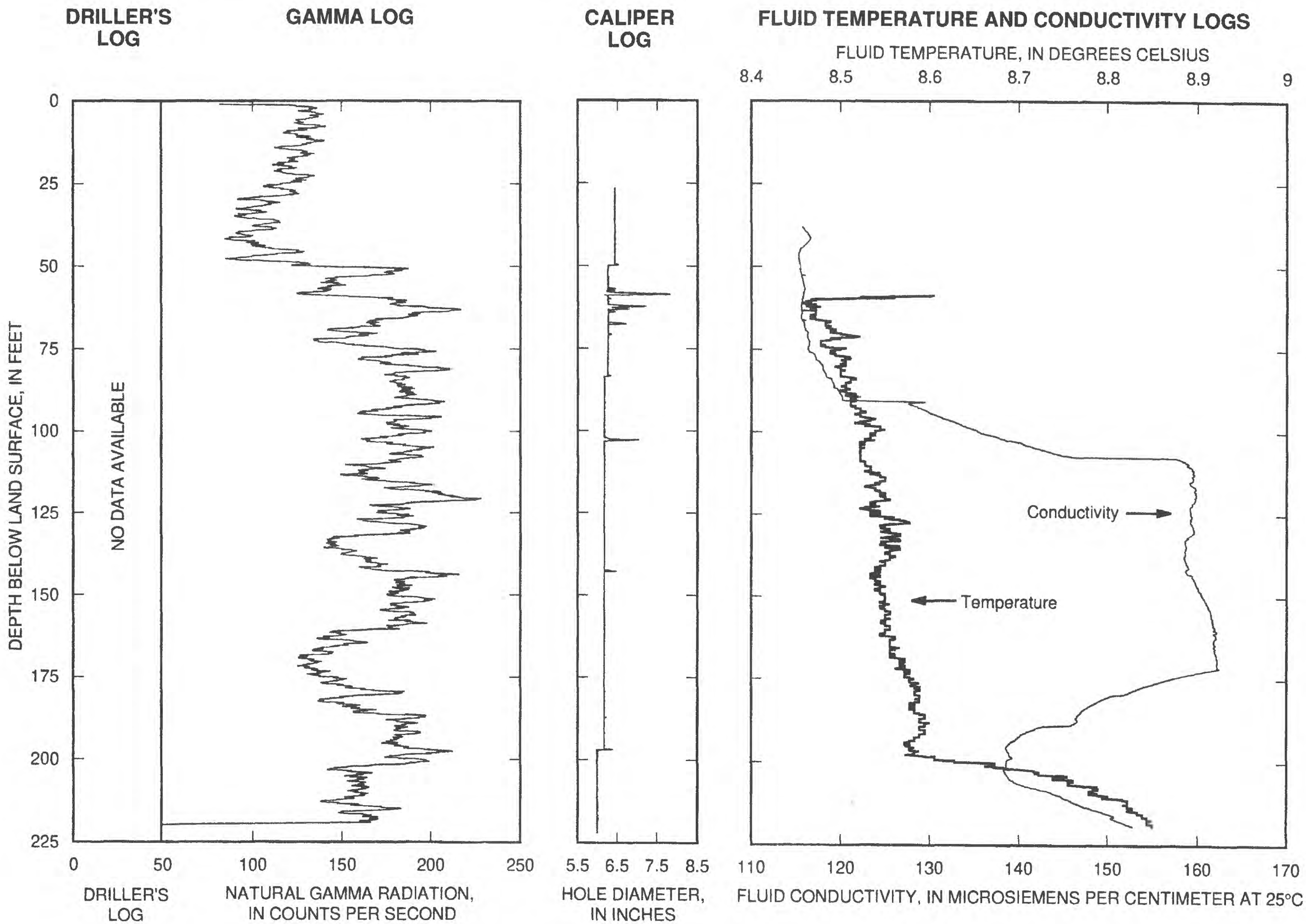


Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)



P. WELL 673

Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)

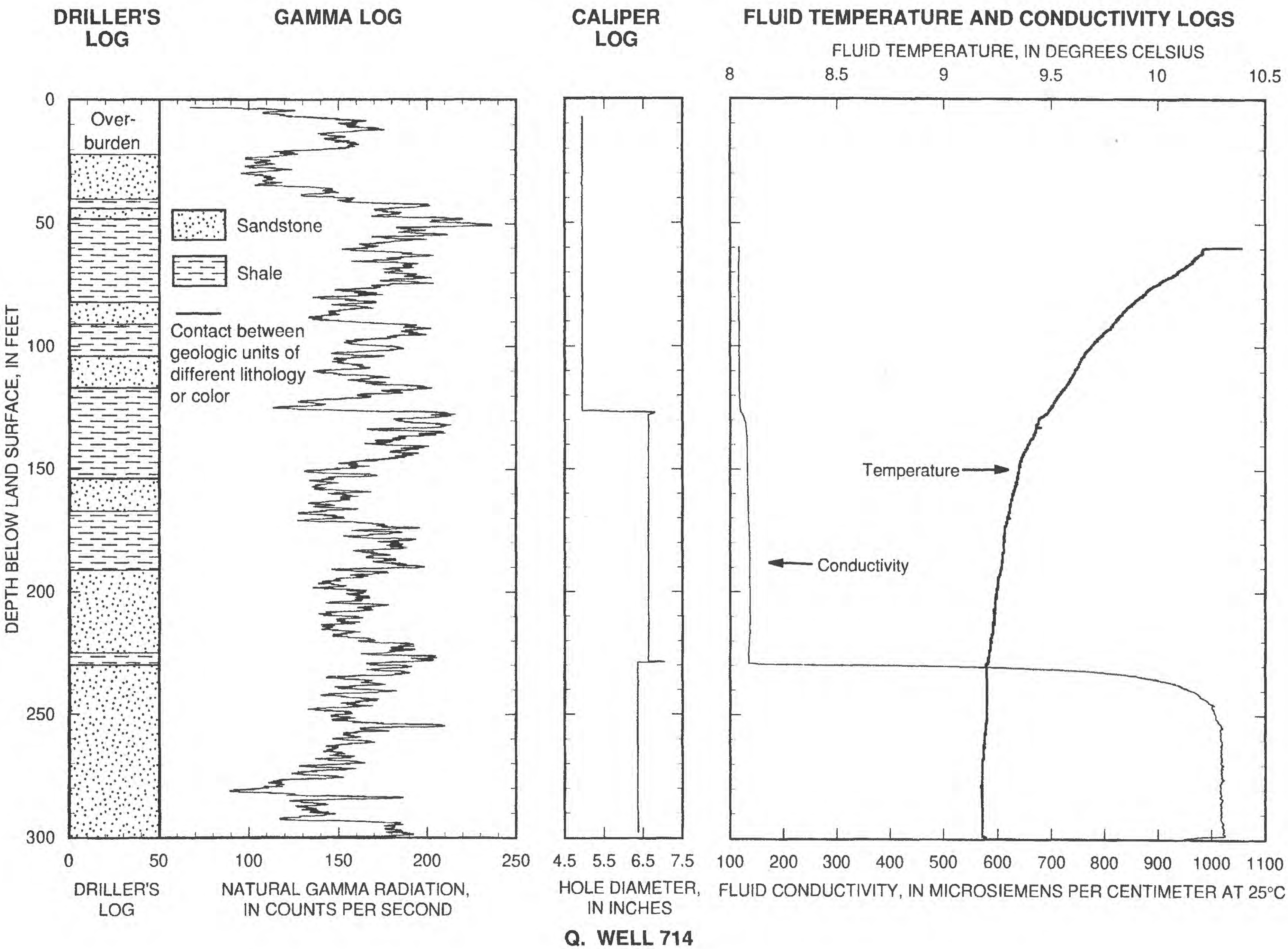
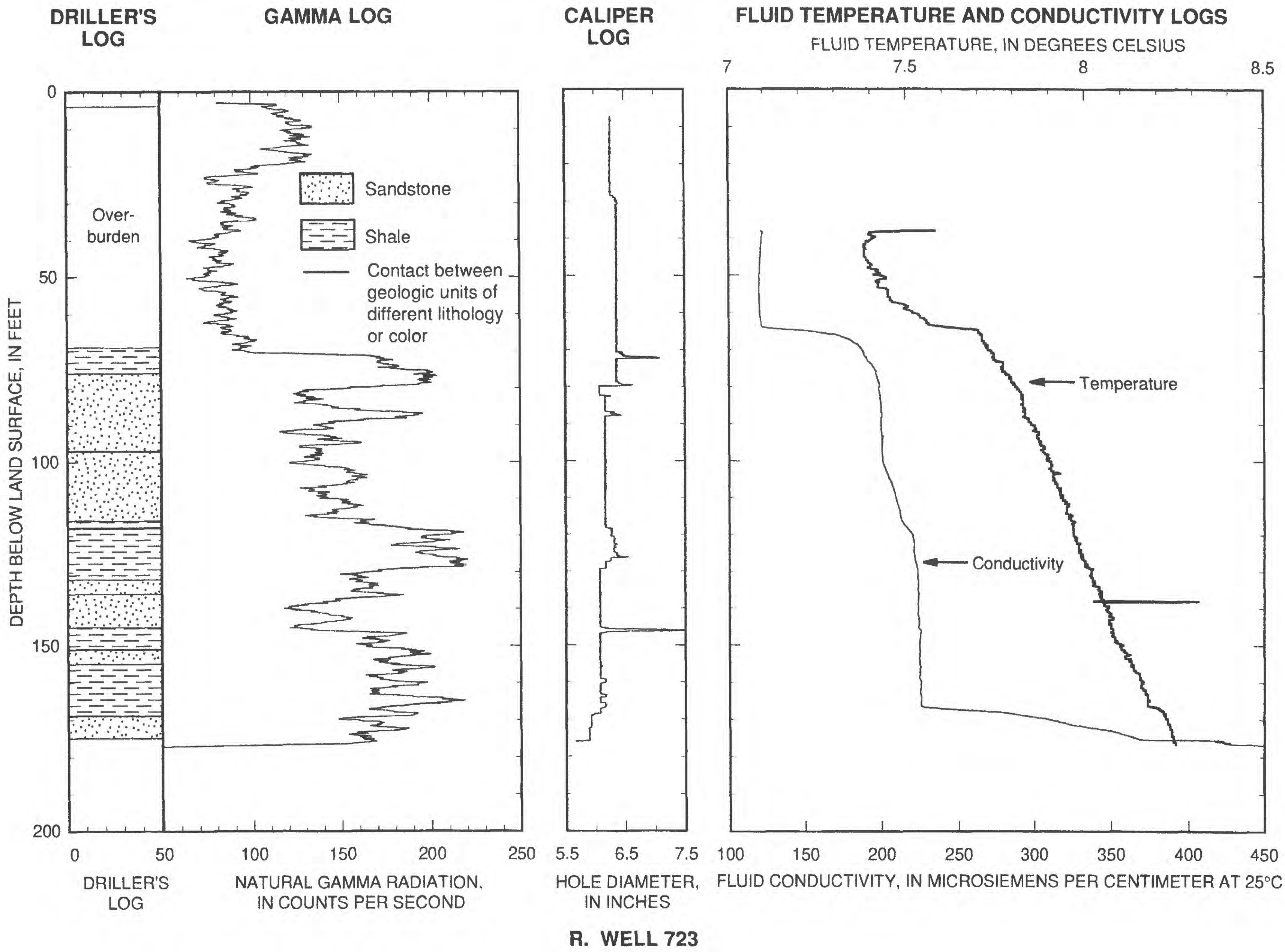


Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)



R. WELL 723

Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)

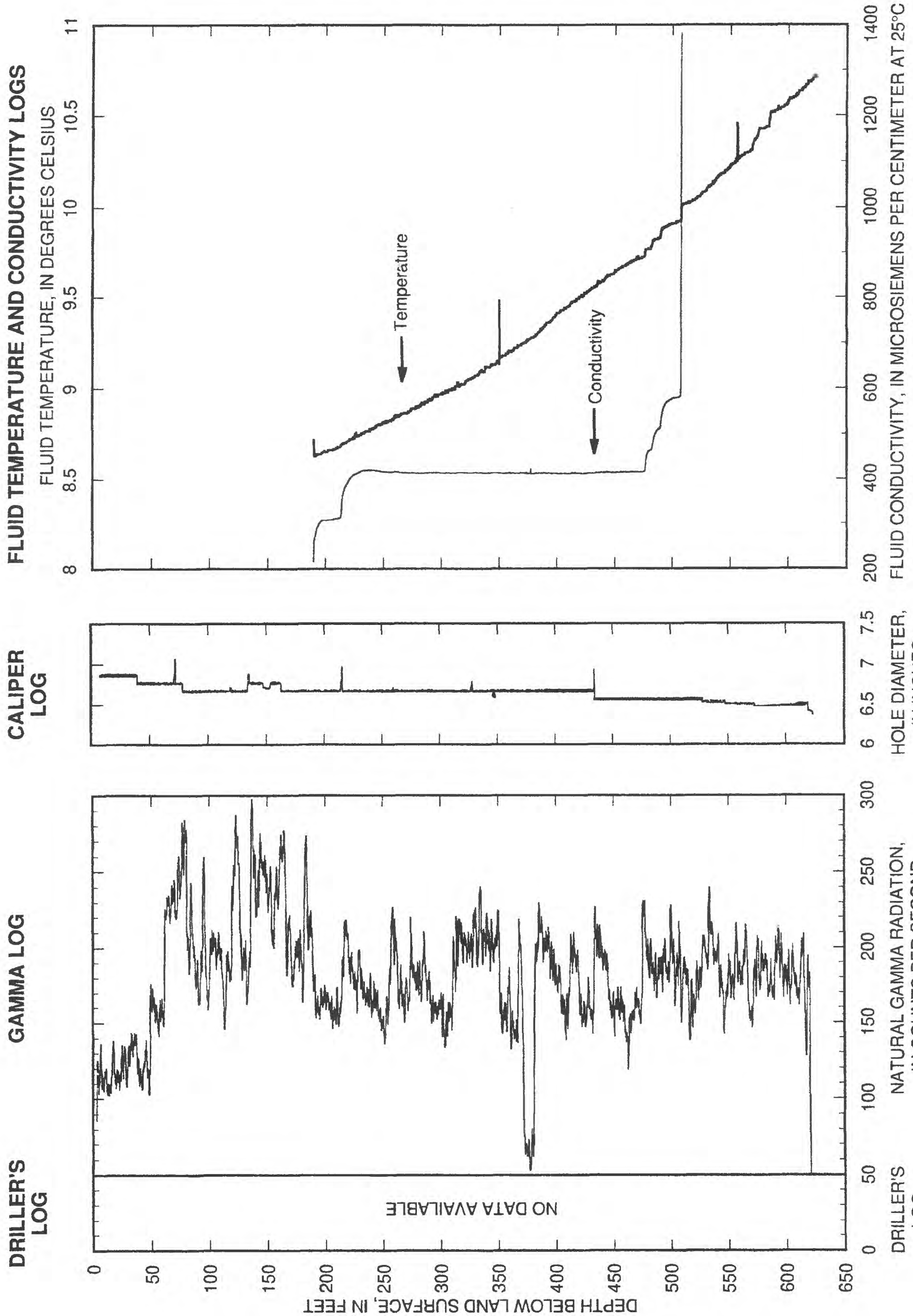


Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)

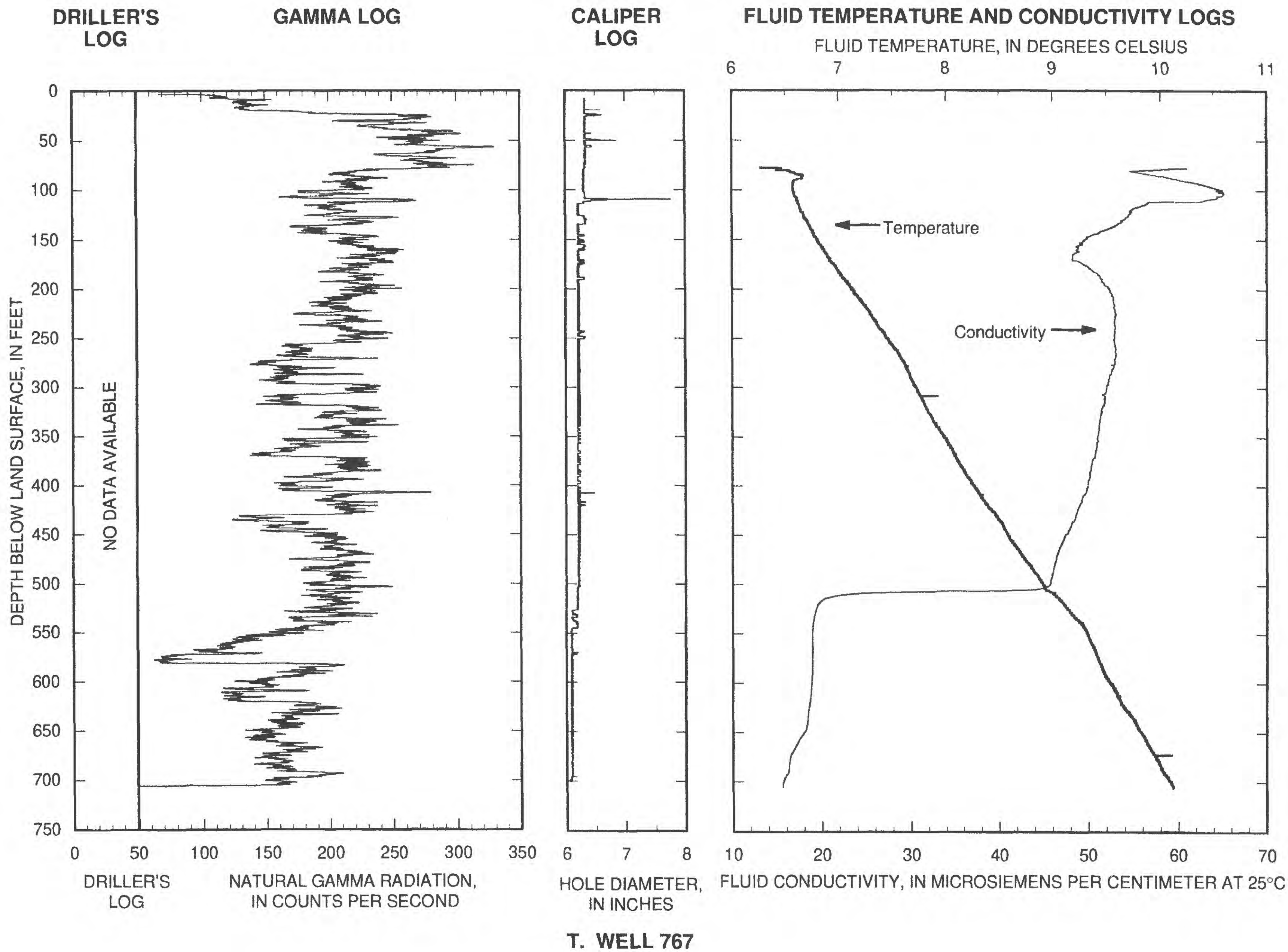


Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)

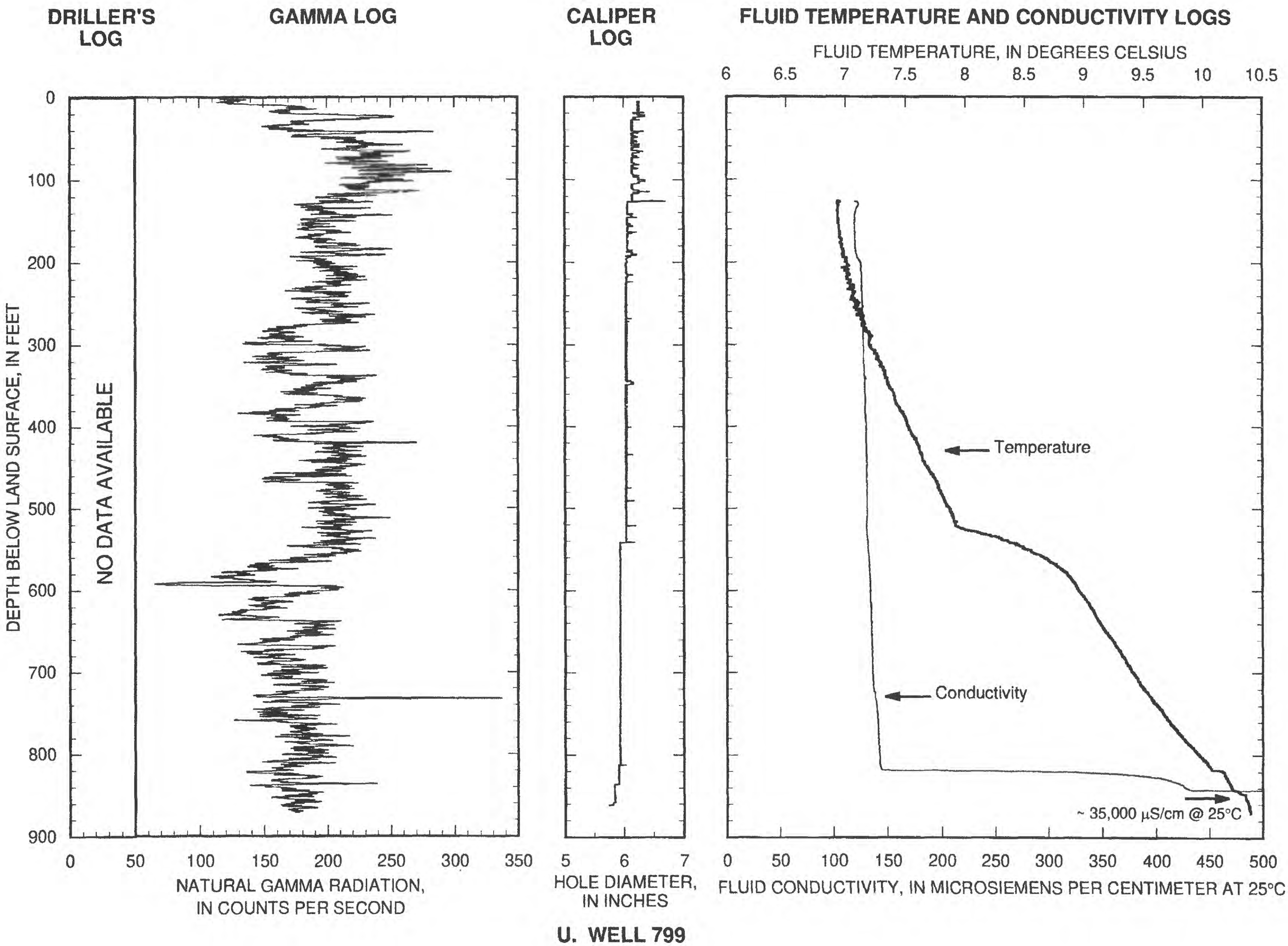


Figure 2. (continued) Logs from selected wells at Windham, N.Y. (Driller's log, natural gamma log, hole diameter, fluid temperature, and fluid conductance)