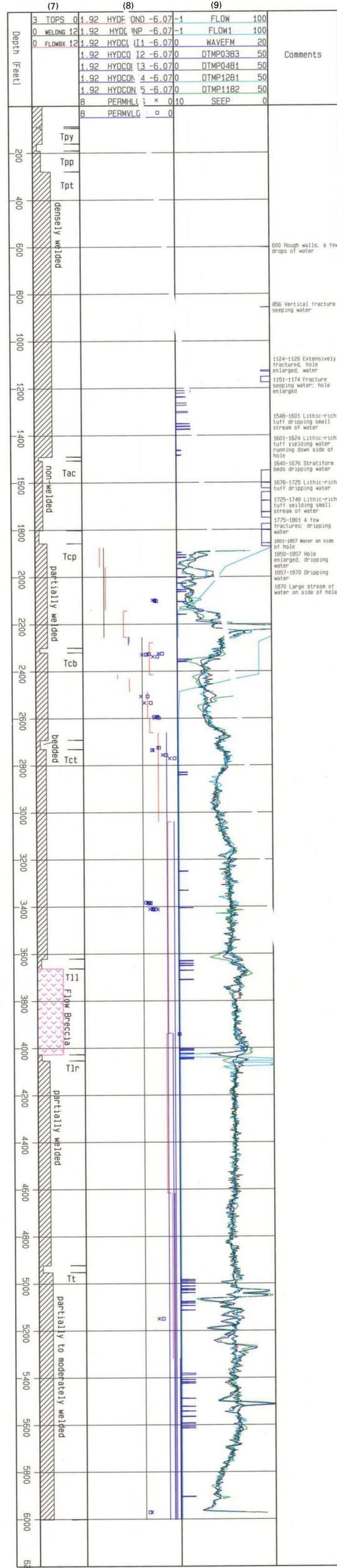
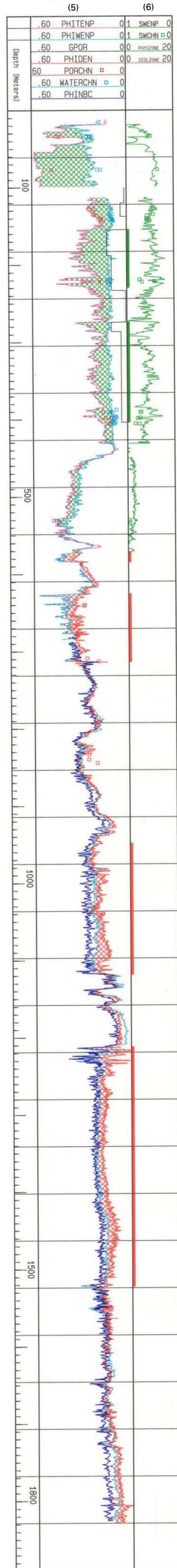
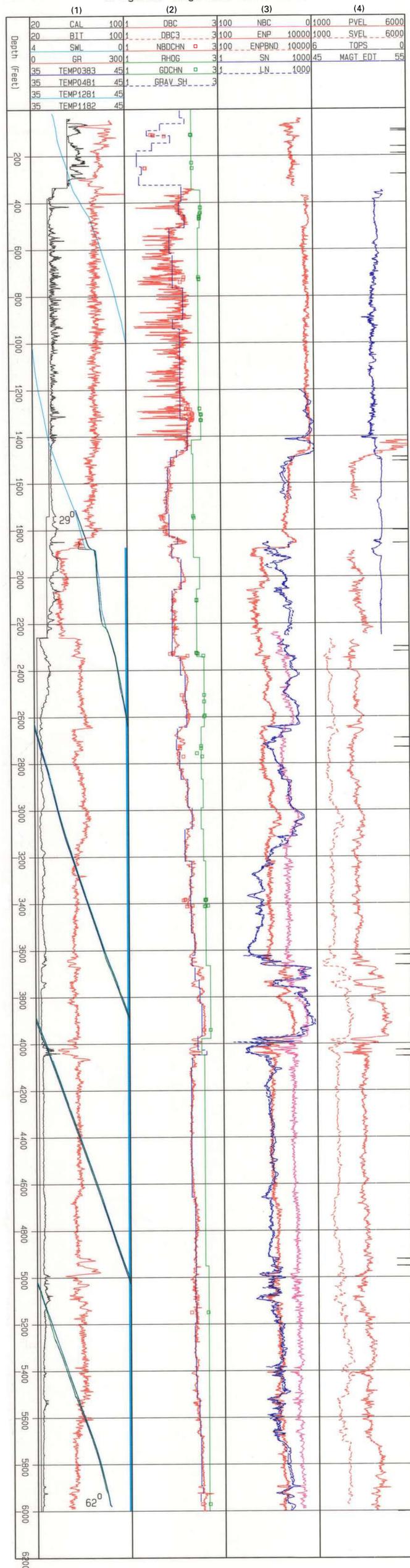


USW H-1

Original Logs and Core Data

Porosity and Water Content

Stratigraphy, Fractures, and Flow



BOREHOLE USW H-1, YUCCA MOUNTAIN, NEVADA
 Compiled by Philip H. Nelson and Joyce E. Kibler
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Borehole H-1 was completed in November, 1980 to a total depth of 6000 feet. The hole was rotary drilled using air foam consisting of air, detergent, and water (Rush et al., 1984); spot cores were obtained as demonstrated by the few core measurements on this plot. Depth on the plot is measured along hole, and has not been corrected for deviation. Hole deviation is slight. (Plate 9 in Nelson and others, 1991); at a true vertical depth of 5847.2 feet, the measured depth is 5850 feet and the horizontal offset is 97 feet.

Original logs in columns 1-4, acquired between September 13, 1980 and March 25, 1981, were described and presented by Nelson and others, 1991. Four temperature logs (Sass and others, 1988) obtained in April 1981, December 1981, November 1982, and March 1983 also appear in column 1.

Porosity (phitenp, phiden) and water content (phiwep) are given in column 5. Phitenp and phiwep were computed from epithermal neutron and density logs (Nelson, 1994). Core measurements of porosity and water content (Rush et al., 1984) are posted for comparison with the log-based results. Green hatching between the porosity and water content curves denotes air-filled porosity. Red hatching appears where water content exceeds porosity, often indicating the presence of zeolitic minerals. Below 2240 feet, a second estimate of water content, phinrc, compares well with phiwep. Phinrc is based upon the thermal neutron log, nbc, after correction for hole size.

Muller and Spengler (1989) computed the lithophysical pore space, gpor, from density and gravimeter data. Compare gpor with the air-filled porosity denoted by the green hatching.

Saturation (column 6) is computed as the ratio of phiwep to phitenp; core-based saturation data are posted for comparison. The flags lithone and physzone (green and red bars in column 6) denote the presence of abundant lithophysae and extensive alteration, respectively. Their depth extent is taken from inspection of the green and red hatch areas in column 5 and from other considerations.

Stratigraphic tops and degree of welding, given in column 7, are taken from Rush et al. (1984). Hydraulic conductivity from pump tests and permeability from core measurements are also taken from Rush et al. (1984). The logarithmic scales in column 8 are arranged so that permeability and hydraulic conductivity can be compared, using a conversion of 1.196 darcy = 1 m/day. Rush et al. (1984) interpreted the original pump test results (hydrconpl, tracer results (flow), and injection test results (hydrconi)) to produce hydraulic conductivity values over refined intervals (hydrcond).

Disruptions in the sonic waveform log (wavefm, column 9) are often due to fractures or faults. Temperature gradient logs, dtmp, were computed by differencing the temperature logs over fourteen-foot intervals. They are displayed with two flow logs (Rush et al., 1984) in column 9, which were derived from tracer tests carried out during pump tests. Above the water level, seeps were observed with the television camera (Rush et al., 1983 and 1984).

EXPLANATION OF CURVES AND SYMBOLS

Column 1
 CAL Calliper in cm, black curve.
 BIT Bit size in cm, black line.
 SWL Static water level, vertical cyan bar.
 TEMP Temperature in degrees C, four colors dated by month, year.
 GR Gamma ray in API units, red curve.

Column 2
 DBC Density in g/cm³, red curve.
 DBC3 Density bound in g/cm³, red dash curve.
 NBOCHN Density of saturated cores, red squares.
 RHOG Grain density in g/cm³, green curve.
 GDOCHN Grain density from cores, green open squares.
 GRAV_SH Density from gravimeter, blue dash curve.

Column 3
 ENP Epithermal neutron in counts/sec, red curve.
 ENPBND Epithermal bound, red dash curve.
 NBC Thermal neutron log in porosity, magenta curve.
 SN Short normal resistivity in ohm-m, blue curve.
 LN Long normal resistivity in ohm-m, blue dash.

Column 4
 PVEL Compressional-wave velocity in m/s, red curve.
 SVEL Shear-wave velocity in m/s, red dash curve.
 MAGT EDT Total magnetic field in microtesla, blue curve.
 TOPS Stratigraphic boundaries, black ticks.

Column 5 [fractional volume of whole rock, increasing to left]
 PHITENP Water-filled porosity, from ENPBND and DBC3 logs, cyan curve.
 PHITENP Porosity, from ENPBND and DBC3 logs, magenta curve. (green hatch where PHITENP > PHITENP).
 PHIDEN Porosity, computed from DBC3 log, red curve. (red hatch where PHIDEN < PHITENP).
 PHINRC Water content from NBC, blue curve.
 PORCHN Porosity from core measurements, red squares.
 WATERCHN Water content from core measurements, cyan squares.
 GPOR Void space from gravity and density logs, black solid.

Column 6
 SWENP Water saturation, ratio of PHITENP to PHITENP, green curve.
 SWCHN Water saturation from core measurements, green squares.
 PHYSZONE Lithophysical zone, picked from logs, green bar.
 ZEOLZONE Zeolitic zone, picked from logs, red bar.

Column 7
 TOPS Stratigraphic boundaries, black ticks.
 WELONG Degree of welding from core inspection, black slant.
 FLOWBX Flow breccia, magenta fill with granite symbol.

Column 8
 PERMW Permeability in microdarcy, vertical plugs, blue squares.
 PERMH Permeability in microdarcy, horizontal plugs, blue x.
 HYDRCOND Hydraulic conductivity in m/day, interpreted from all tests, red lines.
 HYDRCONP Hydraulic conductivity in m/day, from pump tests, black lines.
 HYDRCONI Hydraulic conductivity in m/day, from injection tests, blue lines.

Column 9
 WAVEFM Disruptions in sonic waveform log, blue ticks, bars.
 DTMP Temperature gradient, degC/km, labelled by month and year.
 FLOW, FLOW1 Flow logs from tracer tests while pumping, cyan curves.
 SEEP Water seepage observed with television camera, blue boxes.

Stratigraphic Names
 (Unmarked ticks are bedded units)

-Paintbrush Group-
 Tpc Tiva Canyon Tuff
 Tpy Yucca Mountain Tuff
 Tpp Pah Canyon Tuff
 Tpt Topopah Spring Tuff

-Calico Hills Formation
 Tac Calico Hills Formation

-Crater Flat Group-
 Tcd Prow Pass Tuff
 Tcb Bullfrog Tuff
 Tct Tram Tuff

T
 Tll Flow breccia and lava
 Tlr Lithic-rich tuff
 Tt Older ash flow and bedded tuff

NOTES
 Date of last computation: June 1995
 Plot Date: September 1995
 Scientific Notebook: SN-0092

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