EG&G Idaho

INTEROFFICE CORRESPONDENCE

date   July 27, 1978

to   J. H. Ramsthaler

from   R. C. Stoker

subject   RRGE-1 PRODUCTION ESTIMATES - RCSt-45-78

Attached is a paper concerning the data derived from reservoir tests conducted at RRGE-1. The data is of short duration (98.67 hours or 4.11 days) when compared to the expected operating time (5 years). However, projections based on these type of time differentials are considered normal for standard well hydrology interpretation. Undetected hydrologic boundaries present the greatest hazard in extrapolating the data over a five year period. A major boundary would cause the well to be even less productive than estimated in the attached paper.

la

Attachment: as stated

cc: D. W. Allman
       H. M. Burton
       M. R. Dolenc
       D. Goldman
       T. W. Lawford
       G. M. Millar
       L. G. Miller
       L. B. Nelson
       W. L. Niemi
       S. M. Prestwich
       R. D. Sanders
       S. G. Spencer
       R. R. Stiger
       J. F. Sullivan
       J. F. Whitbeck
       Central File

FORM EG&G-954
(Rev. 2-77)

W. L. Niemi
July 13, 1978

RRGE-1 PRODUCTION CAPABILITY

This paper is transmitted in response to personal communication with
Ray Sanders concerning the rate at which well RRGE-1 can be constantly pro-
duced over a five-year period. It is emphasized that figures presented here
are only estimates and are subject to change as more information concerning
the Raft River Geothermal Reservoir is obtained.

Some qualifying assumptions must be taken into account in estimating a
five year (43,800 hours) production rate for RRGE-1. The drawdown in well
head pressure at RRGE-1 was based upon a 99 hour pump test conducted between
February 2 and 6, 1976. It is assumed first, that a constant drawdown was
attained before RRGE-1 was shut-in. It is assumed next, that a barrier boundary
resulting in a constant doubling of drawdown would be experienced after 100
hours of production. The initial well head pressure before production begins
is assumed to be 160 pounds per square inch (psi). The ability of the reservoir
to transmit water between wells RRGE-1, RRGE-2, RRGP-4 and RRGP-5 is assumed to
be 33% higher than the reservoir's ability to transmit water between RRGE-1 and
the injection wells in the vicinity of RRGE-3. The assumed reservoir temperature
is 290°F. Drawdown well loss, due to head losses caused by turbulent flow in
the well, is not considered. Drawdown caused by the wells being open to differ-
ent portions of the reservoir is assumed negligible. Interference drawdown caused
by the pumpage of wells RRGE-2, RRGP-4 and RRGP-5, is calculated by use of the
Theis Nonequilibrium Formula, and reservoir characteristics based upon current
data. Interference build up caused by the injection of 2500 gallons per minute
(gpm) into wells in the vicinity of RRGE-3, RRGI-6 and RRGI-7 is estimated to be
equal to that caused by pumpage of RRGP-4.

Table 1 shows the drawdown in well head pressure acceptable for different pump bowl depths. It is assumed that 90 psia $(90 - P_{vapor} = 46.7$ 117' water) must be maintained above the pump bowls. The columns on the table represent: depth to pump bowls (Depth); initial well head pressure (WHP); total pressure above pump bowls (Pressure); acceptable drawdown after five years of pumpage (Drawdown).

TABLE 1

Depth	WHP	Pressure	Drawdown
650 ft.	160 psi	420 psi	330 psi
700 ft.	160 psi	440 psi	350 psi
750 ft.	160 psi	460 psi	370 psi
800 ft.	160 psi	480 psi	390 psi
850 ft.	160 psi	500 psi	410 psi

Table II estimates the drawdown to be expected at RRGE-1 for different pumping rates and reservoir conditions. The drawdown includes estimates of interference caused by production and injection wells. Columns in the table represent: production rate at RRGE-1 (Q); was the effect of a boundary assumed in the analysis (Boundary); the drawdown at RRGE-1 to be expected after five years of continuous pumpage (Drawdown); production rate at RRGE-2 (RRGE-2); production at RRGP-4 (RRGP-4); and production rate at RRGP-5 (RRGP-5).

TABLE II

Q	Boundary	Drawdown	RRGE-2	RRGP-4	RRGP-5
800 gpm	No	340 psi	400 gpm	650 gpm	650 gpm
800 gpm	Yes	370 psi	400 gpm	650 gpm	650 gpm
1000 gpm	No	410 psi	400 gpm	550 gpm	550 gpm
1000 gpm	Yes	470 psi	400 gpm	550 gpm	550 gpm

RRGE-1 currently appears capable of producing between 800 and 1000 gpm for five years and maintaining a 90 psi (117 feet of water) over the pump bowls. This prediction of production capability is subject to change as the reservoir characteristics are further defined by testing of RRGP-4 and RRGP-5. The prediction of RRGE-1 productivity becomes more reliable as additional information is obtained. Any increased production from wells No. 2, 4 or 5 above that assumed in Table II, will cause increased drawdown at RRGE-1. Encountering additional major undetected boundaries will also cause detrimental effects on RRGE-1 production estimates.

Conclusions drawn in this paper are based upon the pump test presented in Figure 1. Figure 1 is a semi-log graph of bubbler pressure versus time of production. Figure 2 presents the extrapolation of data over 5 years, again on a semi-log graph.

An assumed production rate from RRGE-1 of 800 gpm at a pump setting depth of 800 feet (considering one possible boundary) is the best estimate for planning purposes available at this time.
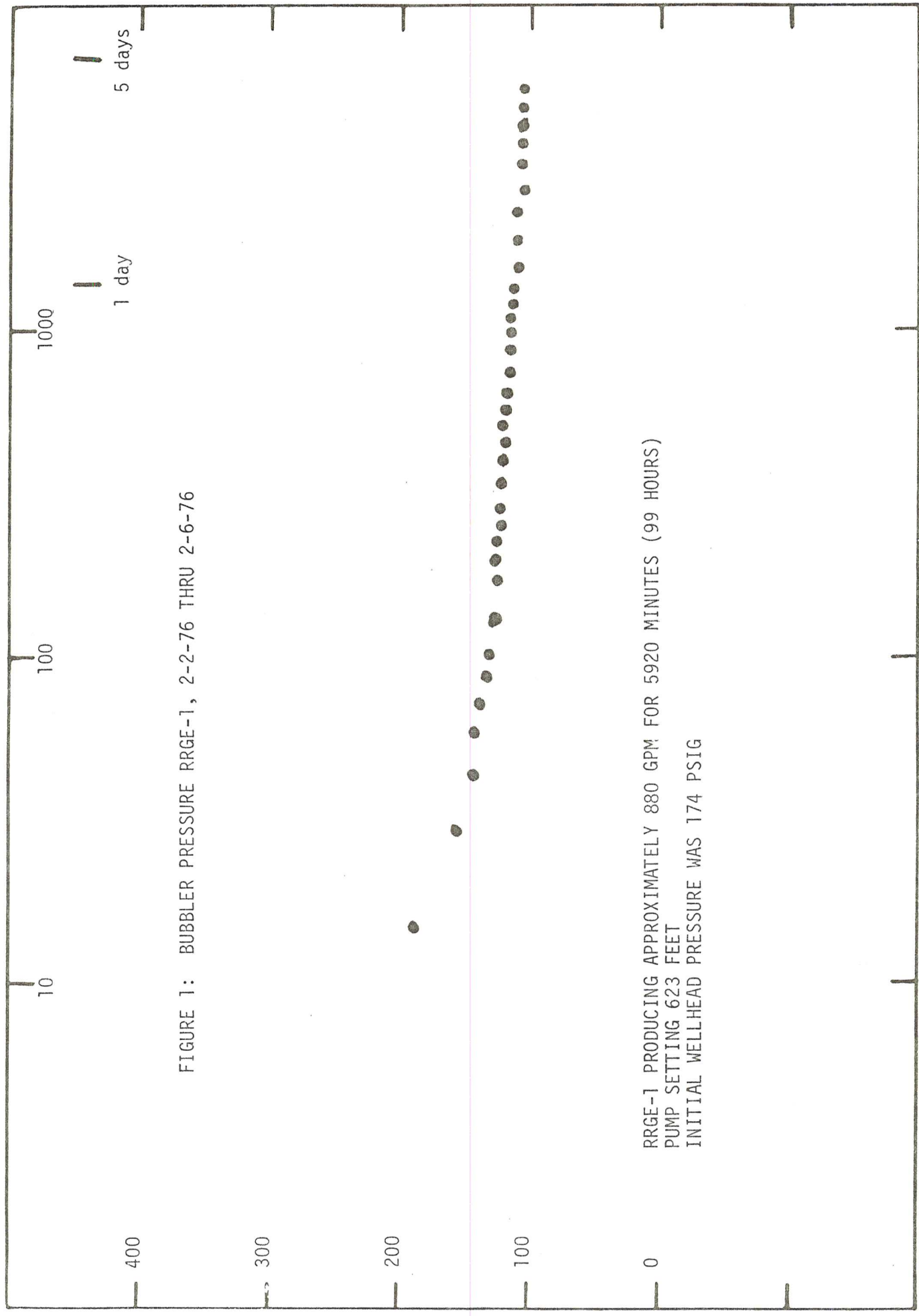
TIME SINCE PRODUCTION BEGAN (MINUTES)

FIGURE 1: BUBBLER PRESSURE RRGE-1, 2-2-76 THRU 2-6-76

RRGE-1 PRODUCING APPROXIMATELY 880 GPM FOR 5920 MINUTES (99 HOURS)
PUMP SETTING 623 FEET
INITIAL WELLHEAD PRESSURE WAS 174 PSIG

BUBBLER PRESSURE (PSIG)

TIME OF PRODUCTION

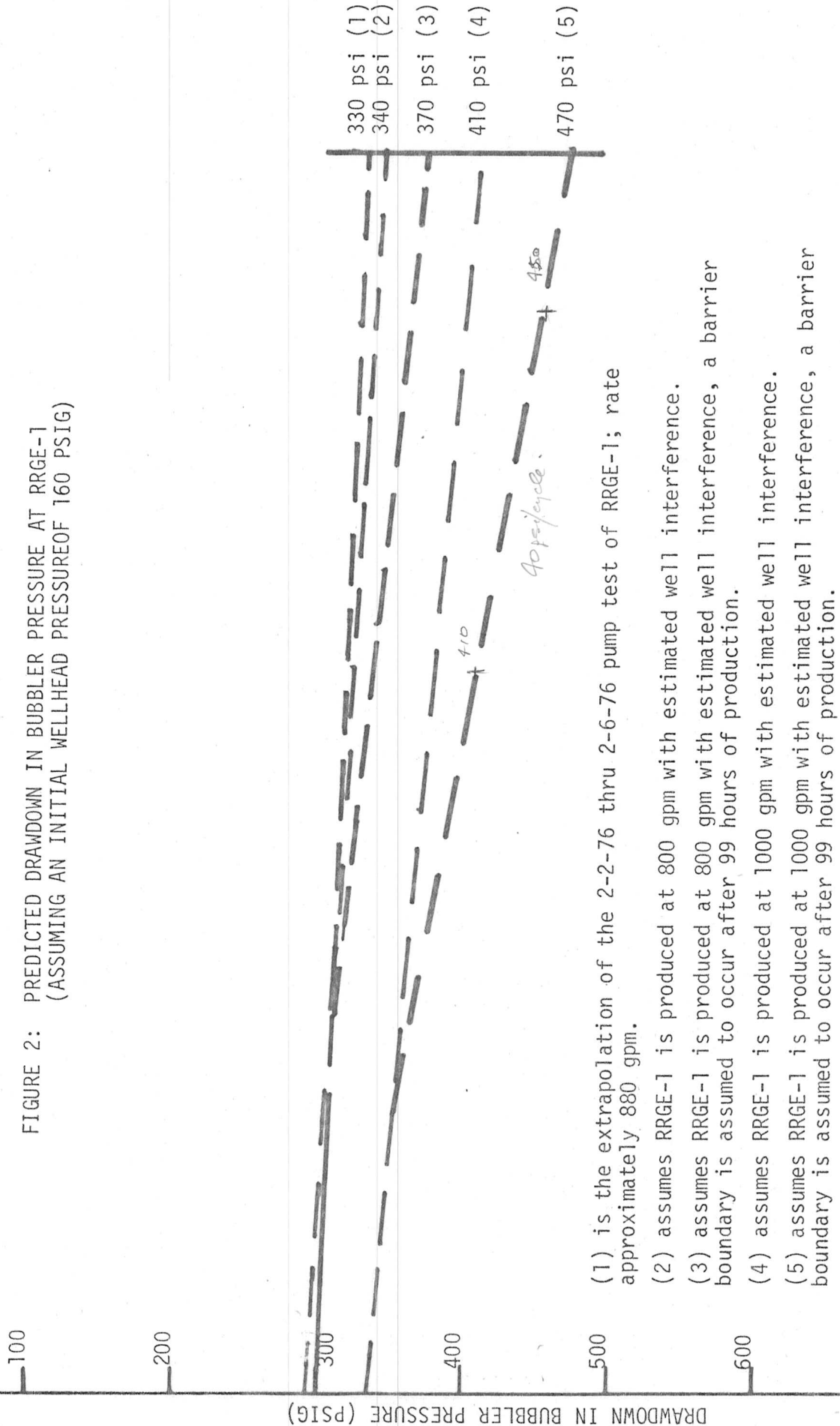| HOURS	48	99	240	720	1440	4320	8760
DAYS	2	4.1	10	30	60	180	365
YEARS							1

FIGURE 2:   PREDICTED DRAWDOWN IN BUBBLER PRESSURE AT RRGE-1
(ASSUMING AN INITIAL WELLHEAD PRESSURE OF 160 PSIG)

330 psi (1)
340 psi (2)
370 psi (3)
410 psi (4)
470 psi (5)

410

450

90p/p/cycle.

(1) is the extrapolation of the 2-2-76 thru 2-6-76 pump test of RRGE-1; rate
approximately 880 gpm.

(2) assumes RRGE-1 is produced at 800 gpm with estimated well interference.

(3) assumes RRGE-1 is produced at 800 gpm with estimated well interference, a barrier
boundary is assumed to occur after 99 hours of production.

(4) assumes RRGE-1 is produced at 1000 gpm with estimated well interference.

(5) assumes RRGE-1 is produced at 1000 gpm with estimated well interference, a barrier
boundary is assumed to occur after 99 hours of production.

DRAWDOWN IN BUBBLER PRESSURE (PSIG)

100
200
300
400
500
600