EG&G Idaho

INTEROFFICE CORRESPONDENCE

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to Tony Allen

from Kevin P. McCarthy KPM

subject COMPUTER MODEL OF THE RAFT RIVER HYDROLOGIC SYSTEM
KPM-11-79

On October 24, 1979, Dennis Goldman and I met with Dr. Ed Tang and Dr. Ron Lantz of Intera Environmental Consultants, Inc. in Houston. The purpose of the meeting was to evaluate the computer runs made with our initial data input for the two-dimensional cross-sectional model. Experimental runs were then made with new input to evaluate the effects of such changes. The results of the meeting included adding another near-vertical zone and altering the vertical to horizontal transmissivity ratio to match pump testing results.

On Monday, November 19, Dr. Ed Tang will be in Idaho Falls to present the cumulative results of the model. Those who are interested are invited to Conference Room No. 4 at 9:00 A.M. on November 19 for the presentation.

jd

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The job requires utilizing existing two-dimensional computer programs to model quasi-transients of mass transport (mixing only), temperature, and hydraulic head in a vertical cross-section of the Raft River Geothermal Area in Idaho. The model must account for radial type flow from pumping/ injection wells so as not to distort flow paths. It is desired to have multiple runs utilizing different model designs and/or input parameters. The results should be contour plots of chemical species, temperature, and hydraulic head with the initial input data and projections after 1, 5, 10, 30, 50, and 100 years. No interpretation of the data or output is necessary.

The basic model showing all five of the optional zones is described in Figure 1. Note that the "horizontal discontinuity" in zone 4 represents a 1100-ft gap in depth. This is only for ease of presentation. The model should be continuous.

The wells shown are our control points. The hatched portion of a well is that part which is open to the formation. The distance between wells is shown at the top of Figure 1. The thickness of each zone can be determined by the scale on the left. The initial parameters of initial water quality, temperature, and hydraulic head are found in Figure 2 and Table I, Figure 3, and Figure 4, respectively. The additional input parameters, such as hydraulic conductivities and pump/injection rates, are given in Table II.

It is desired to run several cases as described in Table III.

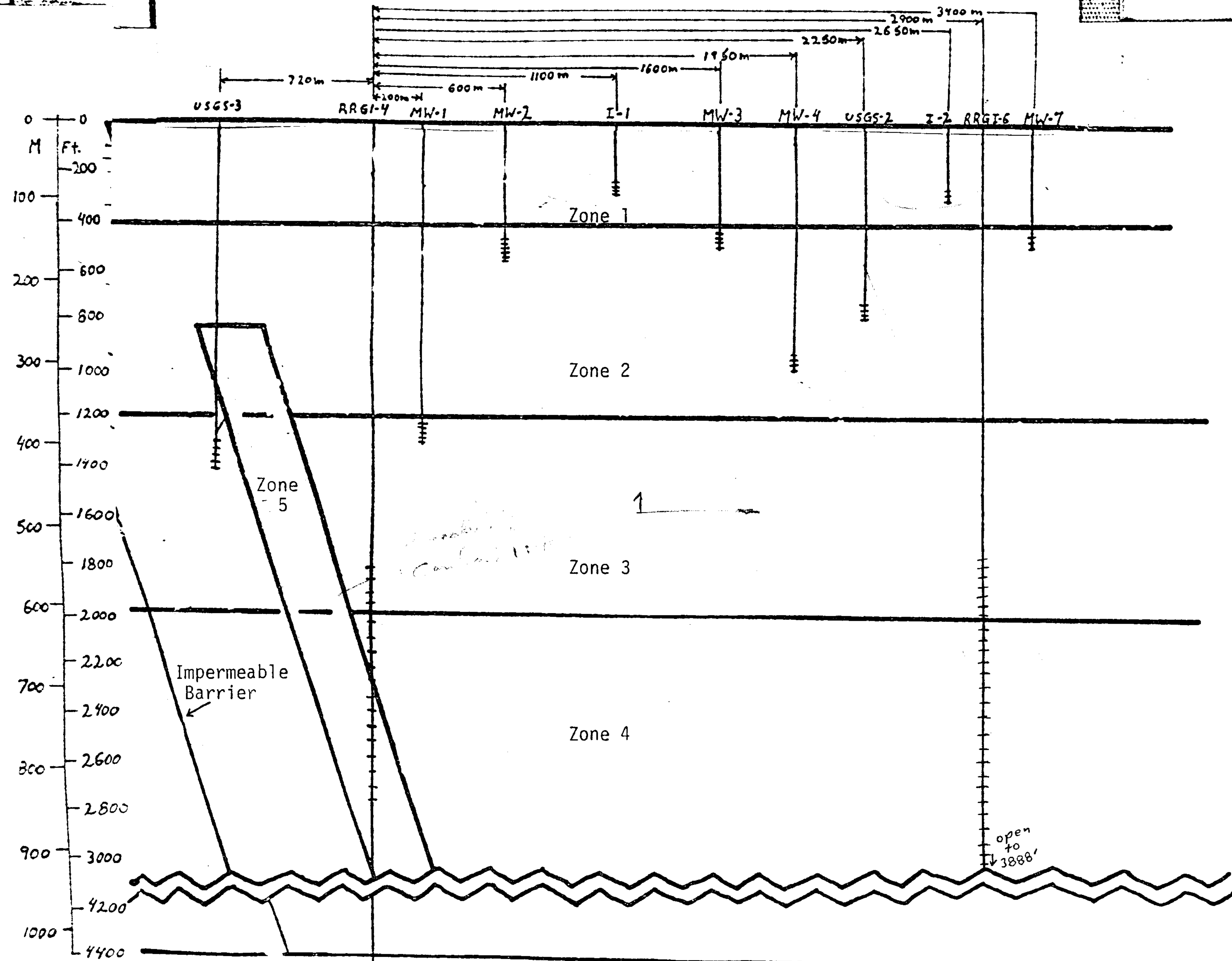

Figure 1 Permeable Zones

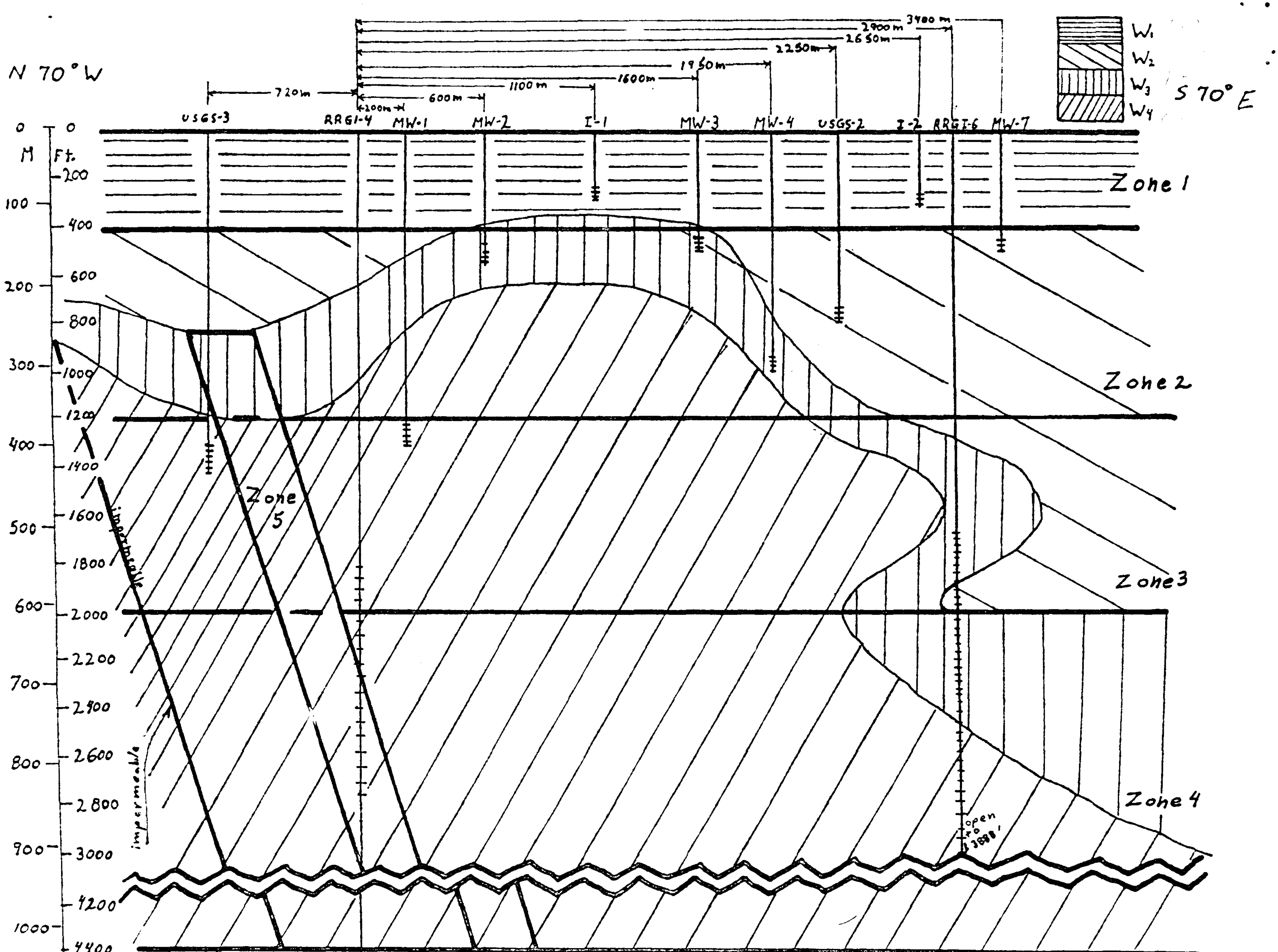

Figure 2 Water Quality

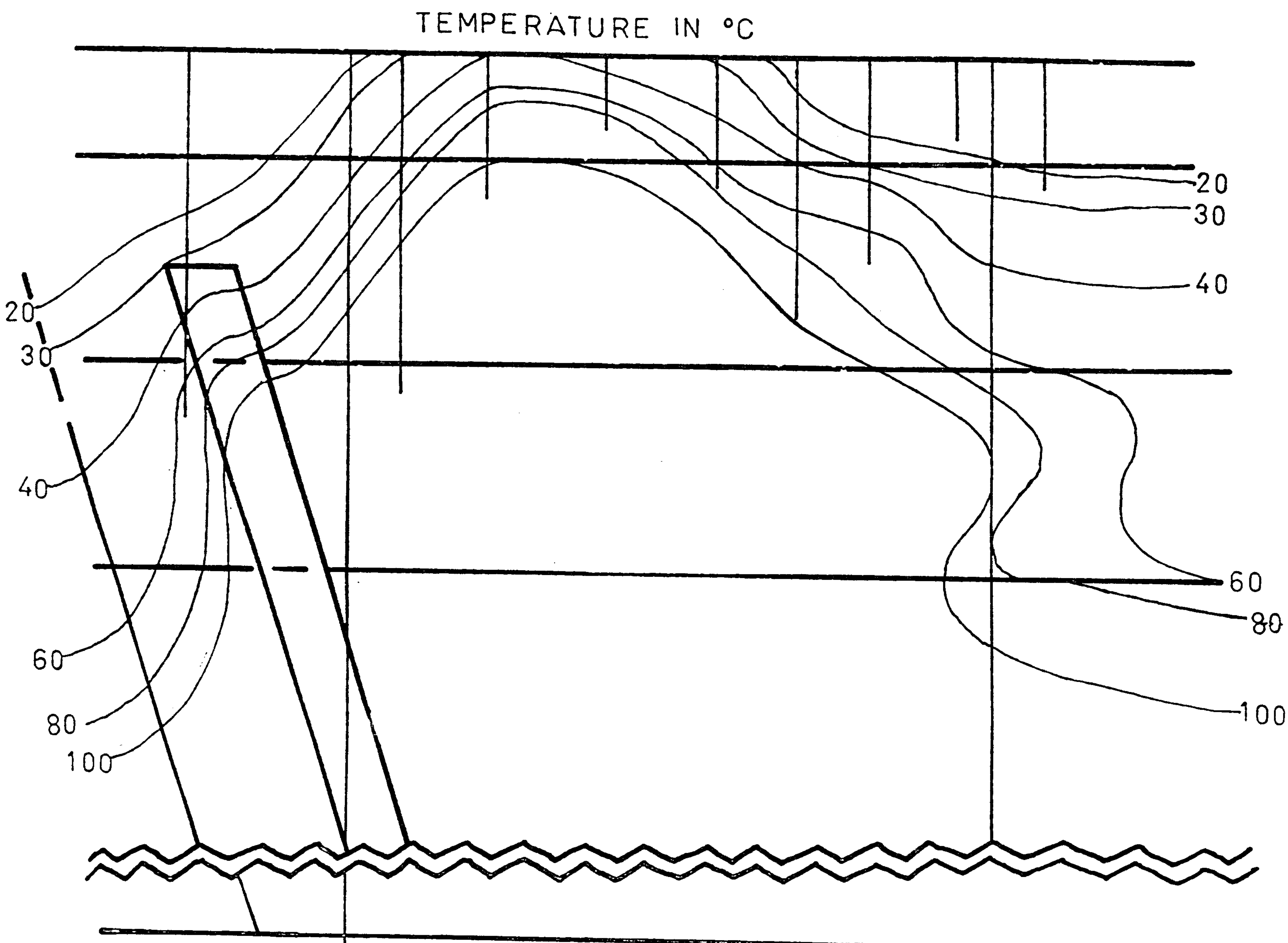

Figure 3

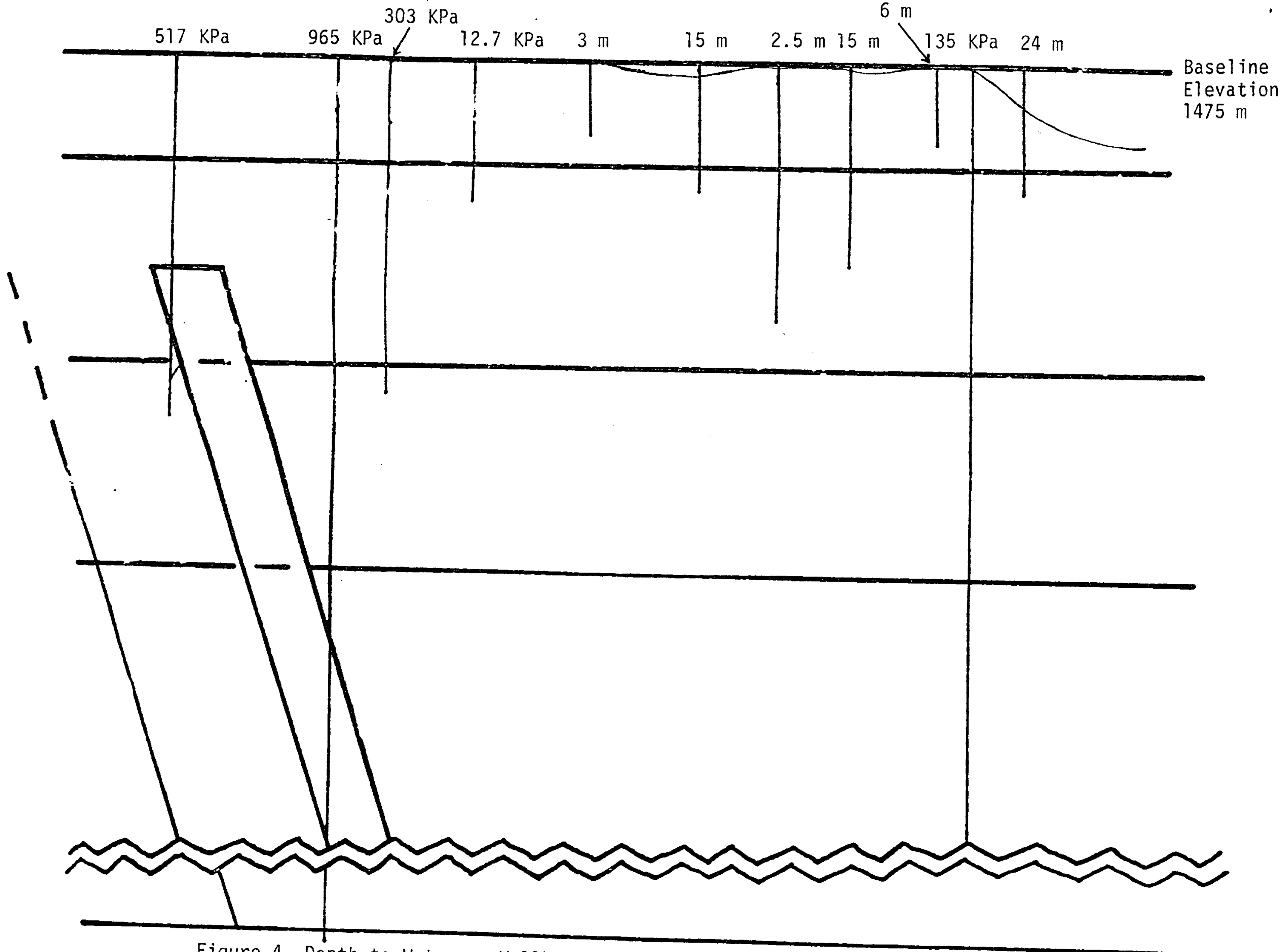

Figure 4 Depth to Water or Wellhead Pressure

TABLE I

Piezometric Surface

Well	DTW	WHP	Well	DTW	WHP
MW-4	2.5 m		RRGI-4		965 KPa
MW-3	15 m		MW-7	24 m	
MW-1		303 KPa	I-2	6 m	
MW-2		127 KPa	USGS-2	15 m	
I-1	3 m		USGS-3		517 KPa

Water Quality: (ppm)

	Cl	F	Na	Ca	K	Sr	TDS
W_1	267	0.43	200	75	8	0.45	1180
W_2	551	6.37	682	93.9	54	3.10	2322
W_3	2150	5.34	1323	150	34	1.95	4208
W_4	7306	4.3	2145	205	30	7.5	6460

TABLE II

Hydraulic Conductivity:

Zone 1	3.47×10^{-4} m/s	5.79 / 6
Zone 2	(5.79×10^{-8} m/s x6) $= 9.84 \times 10^{-2}$ ft/day	(3.47×10^{-7} m/s)
Zone 3	4.13×10^{-6} m/s -5	
Zone 4	4.78×10^{-7} m/s	
Zone 5	1.10×10^{-6} m/s	

Injection Rate:

Q_I 1000 gpm per well

Production Rate:

Q_P 200 gpm from each well

Injection Temperature:

140°F (60°C)

Injection Wells:

RRGI-4

RRGI-6

TABLE III

Case	Zones	Injection/Pumping	Permeabilities
1	1,2,3,4	Injection only	Horizontal = Vertical
2	1,2,3,4	Injection only	Horizontal = 10 x Vertical
3	1,2,3,4	Injection & Pumping	Horizontal = Vertical
4	1,2,3,4	Injection & Pumping	Horizontal = 10 x Vertical
5	1,2,3,4,5	Injection only	Horizontal = Vertical
6	1,2,3,4,5*	Injection only	Horizontal = 10 x Vertical
7	1,2,3,4,5	Injection & Pumping	Horizontal = Vertical
8	1,2,3,4,5	Injection & Pumping	Horizontal = 10 x Vertical
9	1,2,3,4,5*a)	Injection only	Horizontal = 10 x Vertical
10	1,2,3,4,5*a)	Injection & Pumping	Horizontal = 10 x Vertical
11	1,2,3,4,5*b)	Injection only	Horizontal = 10 x Vertical
12	1,2,3,4,5*c)	Injection & Pumping	Horizontal = 10 x Vertical
13	1,2,3,4,5*d)	Injection only	Horizontal = 10 x Vertical
14	1,2,3,4,5*e)	Injection & Pumping	Horizontal = 10 x Vertical

5* Zone 5 always has horizontal = vertical permeability.

a) Remove the impermeability boundary in lower left portion and extend to infinity (no boundaries).

b) Increase permeability in Zone 3 by 10X from original.

c) Decrease permeability in Zone 3 by 10X from original.

d) Increase permeability in Zone 5 by 10X from original.

e) Decrease permeability in Zone 5 by 10X from original.